Transport Accident Investigation Commission

Final report
Tuhinga whakamutunga

Rail inquiry RO-2024-105
Safe-working irregularity electric shock
Parnell, Auckland
4 September 2024

November 2026

The Transport Accident Investigation Commission
Te Kōmihana Tirotiro Aituā Waka

No repeat accidents – ever!

"The principal purpose of the Commission shall be to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future, rather than to ascribe blame to any person."

Transport Accident Investigation Commission Act 1990, s4 Purpose

The Transport Accident Investigation Commission is an independent Crown entity and standing commission of inquiry. We investigate selected maritime, aviation and rail accidents and incidents that occur in New Zealand or involve New Zealand-registered aircraft or vessels.

Our investigations are for the purpose of avoiding similar accidents and incidents in the future. We determine and analyse contributing factors, explain circumstances and causes, identify safety issues, and make recommendations to improve safety. Our findings cannot be used to pursue criminal, civil, or regulatory action.

At the end of every inquiry, we share all relevant knowledge in a final report. We use our information and insight to influence others in the transport sector to improve safety, nationally and internationally.

Commissioners

Chief Commissioner	David Clarke
Deputy Chief Commissioner	Stephen Davies Howard
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Commissioner	Bernadette Roka Arapere (until 6 November 2025)
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Notes about Commission reports
Kōrero tāpiri ki ngā pūrongo o te Kōmihana

Photographs, diagrams, pictures

The Commission owns the photographs, diagrams and pictures in this report unless otherwise specified.

Verbal probability expressions

For clarity, the Commission uses standardised terminology where possible.

One example of this standardisation is the terminology used to describe the degree of probability (or likelihood) that an event happened, or a condition existed in support of a hypothesis. The Commission has adopted this terminology from the Intergovernmental Panel on Climate Change and Australian Transport Safety Bureau models. The Commission chose these models because of their simplicity, usability, and international use. The Commission considers these models reflect its functions. These functions include making findings and issuing recommendations based on a wide range of evidence, whether or not that evidence would be admissible in a court of law.

Terminology	Likelihood	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	



Figure 1: Hi-rail elevated work platform
(Credit: KiwiRail)

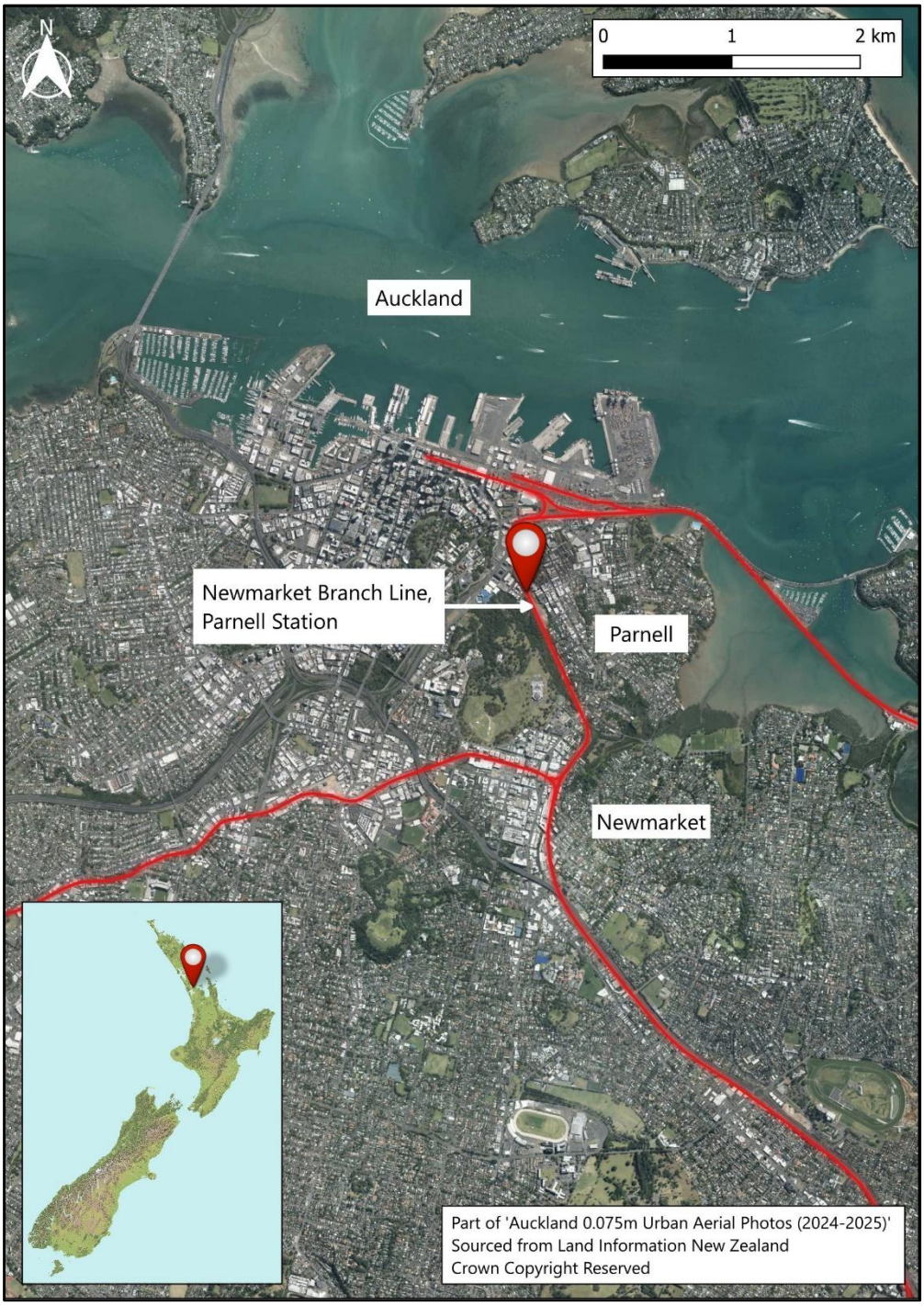


Figure 2: Location of accident

(Credit: Toitū Te Whenua Land Information New Zealand)

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1 Executive summary
Tuhinga whakarāpopoto

What happened

1.1. On the night of 3 September 2024, and into the morning of 4 September 2024, routine inspection and maintenance was being conducted on the electrified rail network in Auckland. This included visual inspections and maintenance of the overhead line equipment (OLE) supplying power to commuter trains in Auckland.

1.2. At 0104 on 4 September 2024, three crew (the workers) were operating a specialist hi-rail vehicle (HRV) equipped with an elevated work platform (EWP) near Parnell Station on the Newmarket Branch Line.

1.3. The EWP operator[1] and a traction electrician[2] were in the boom basket of the platform as it was being raised towards the contact wires that formed part of the OLE.

1.4. When they approached the contact wire, an electrical arc flash occurred, causing serious burns to the traction electrician and minor injuries to the EWP operator. The HRV sustained extensive damage to the electrical and computer systems.

Why it happened

1.5. The planned work changed following the briefing because an issue arose with the EWP operating within the tunnel to Waitematā station on the North Island Main Trunk line.

1.6. The electrical isolation applied did not cover the entire protected work area or worksite limits, and the isolation limits were neither clearly defined nor physically delineated.

1.7. The workers were unclear about the isolation limits and their relation to the authorised worksite boundaries, and they moved beyond their briefed area.

1.8. Before raising the EWP, the workers had no tools or testing procedure available to confirm the OLE was isolated and safe before starting maintenance activities.

What we can learn

1.9. When work plans change, the activity must be reviewed to identify and mitigate any new safety risks.

1.10. Effective communication of safety-critical information includes clear explanations, accessible documentation, consistent terminology and a delivery tailored to the intended audience.

[1] A hi-rail mobile elevated work platform operator.
[2] Also known as a traction line mechanic, is a specialised electrical professional who constructs, installs and maintains high-voltage electrical propulsion supply networks used to power electric trains.

Who may benefit

1.11. Industries involved in high-hazard operations where safety-critical work is conducted may benefit from the findings in this report.

2 Factual information
Pārongo pono

Background

2.1. On the night of 3 September 2024, and into the morning of 4 September 2024, workers were carrying out scheduled maintenance on the Auckland Metropolitan Rail Network between Pukekohe and Waitākere, including its associated branches.

2.2. The maintenance activity included track work, maintenance and inspections on the overhead line equipment (OLE) located at Waitematā Station (Britomart), sections of the Newmarket Branch Line (NEW)[3] and the North Island Main Trunk (NIMT) line including Auckland Station (the Strand).

2.3. The Daily Information Bulletin (DIB)[4] (dated 4 September 2024) described the protected work area (PWA) [5] and included blocking protection[6] (*see* Appendix 1), which set signals to stop to prevent unauthorised rail movements into the PWA.

2.4. The DIB also described the arrangements for the isolation of the OLE, which did not cover the entire worksite, leaving parts of the OLE within the worksite live.

2.5. The OLE supplied 25 kilovolts (kV) of power to the Auckland electrified area for the purposes of providing traction power to propel trains.

2.6. The maintenance worksite was one of multiple worksites across a large portion of the rail network within Auckland.

Narrative

2.7. The Rail Protection Officer (RPO)[7] scheduled to work that evening arrived at Scene Lane, Auckland (the designated safe place)[8] at about 2235[9] on 3 September 2024.

2.8. They contacted train control (TC) to establish the protection and requested blocking using rule TS06 Blocking[10] on signals 11, 14 and 87 on the NIMT, signals 130 and 132 on the NEW, end of line Platform 1 Waitematā (Britomart) (*see* Figure 3, blue line).

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[3] The Newmarket Branch Line code is abbreviated to NEW within KiwiRail's infrastructure information but is often referred to as NBL on completed documentation.

[4] A controlled instruction, printed, typed or handwritten, issued by those authorised in the Rail Operating Rules.

[5] Section of line or lines where rail personnel are carrying out activities using an approved protection method. Fixed and/or mobile worksites will operate under the direction of a Rail Protection Officer in a protected work area.

[6] Requires the RPO to contact train control and request signals in the worksite be placed at stop to prevent the movement of rail vehicles into the area.

[7] Person responsible for managing potential hazards between worksite activities by ensuring that track occupations do not conflict with other work being carried out. They also ensure that access to the track is orderly and unobstructed, allowing safe travel to the relevant work location.

[8] A place where people and equipment cannot be struck by passing rail traffic, which may be at a designated location that is at least 2.5 metres (m) from the centre of the nearest running line, within an approved refuge, behind a permanent safety line on a designated walkway, behind a permanent structure or permanent physical barrier that protects against moving trains, or behind authorised fencing.

[9] Times in this report are in New Zealand Daylight Time (Universal Coordinated Time +13 hours) expressed in a 24-hour format

[10] The process of using a Mis.71 Track Occupancy Cross Check or Mis.72 Release Code Blocking with signal blocking to establish a protected work area.

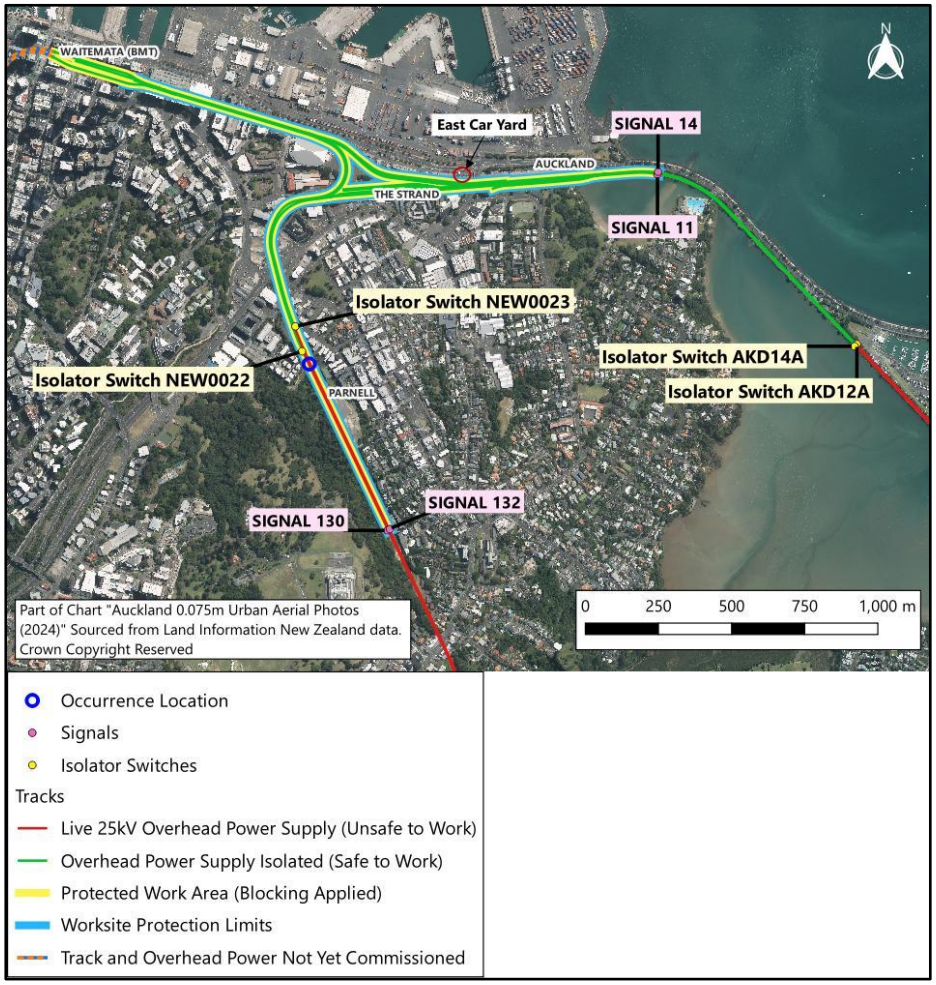


Figure 3: Auckland PWA limits as per the Daily Information Bulletin

2.9. They also arranged for separate blocking beyond signals 11 and 14 at Ōrākei to enable the Traction Isolation Team[11] to access the track and put in place isolation at AKD12A and AKD14A isolator switches (*see* Figure 3).

2.10. Following confirmation of the blocking and completion of the Mis.71[12] form by the RPO (*see* Appendix 2), the worksite protection limits[13] were established (*see* the blue line on Figure 3).

2.11. KiwiRail's rules and procedures require a worksite to be established within a PWA. The PWA establishes the blocking limits to prevent unauthorised rail movements into the protected area, and the worksite limits establish the area where work can be conducted (*see* Figure 4).

[11] Specialised group of electrical and rail personnel responsible for safely cutting off, testing and grounding the high-voltage electricity (traction power) in a specific section of the rail network so that crews can safely perform maintenance or emergency repairs.

[12] A form required to be completed for track occupation cross-checks when requesting track time from train control. KiwiRail has several different 'Mis' (Miscellaneous) forms.

[13] An area with defined limits that is protected so that work can be performed.

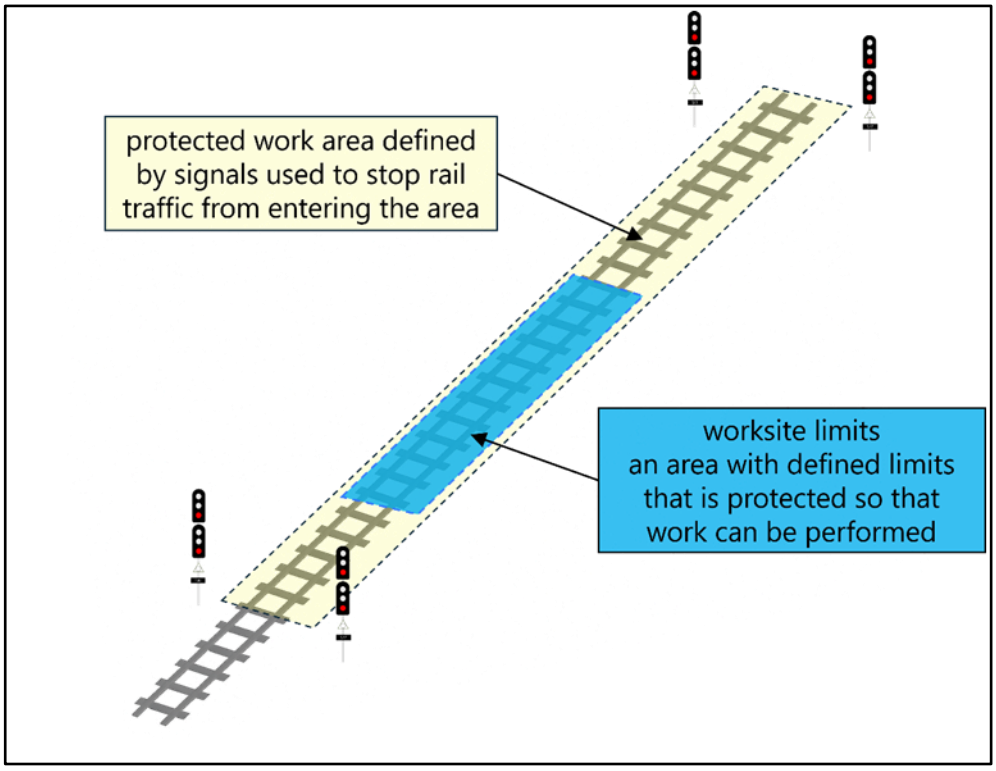


Figure 4: Relationship between protected work area and worksite

2.12. The RPO contacted the assigned Traction Isolation Team who advised them what protection was needed to give the workers access to the network.

2.13. The workers were divided into two teams, Team 1 and Team 2, to complete the inspection and maintenance of the OLE.

2.14. Team 1 consisted of a team leader and four traction workers. Team 2 consisted of the team leader, a traction electrician and an elevated work platform (EWP) operator. The traction electrician was also acting in the role of Mobile Plant Controller.[14]

2.15. At the start of their shift, while still at the traction depot, the Night Shift Traction Supervisor briefed the two team leaders about the maintenance work to be completed that night. The team leaders then briefed their team members.

2.16. Following the briefing, the two teams travelled to the East Car Yard siding to wait for the safety briefing about the track protection limits and the isolation limits.

2.17. The RPO arrived at the East Car Yard siding where Team 1 and Team 2 were waiting and briefed the teams on the protection arrangements for the night, including the protection limit of the worksite.

2.18. Then the Traction Isolation Team gave a briefing, advising that the EF201 Permit to Work Near Railway Powerlines (*see* Appendix 3)[15] provided for the OLE to be isolated and earthed at Waitematā between the NIMT 678/39 pole[16] and the NEW 02/02 pole. The Isolation Team recorded this same information on the EF202 Planned Worksite Electrical Hazard Assessment, which also recorded that the power was live beyond isolator switches NEW 0022 and NEW 0023 (*see* the red line on Figure 3).

[14] The competent worker responsible for controlling mobile plant within a worksite.
[15] A permit to work under isolated overhead line equipment.
[16] The reference refers to the track kilometre (km) reference followed by the pole number. In this example, the location is at the 678-km track reference and at pole 39.

2.19. The EF202 required all workers to sign that they understood the electrical isolation limits, and they all did so (*see* Appendix 3).

2.20. The RPO completed the TS90 Work Site Register[17] and lock-on procedures[18] (*see* Appendix 4). Fourteen track workers, including KiwiRail employees and contractors, signed onto the Work Site Register. In addition, five vehicles were listed on the register as working within the PWA: three EWPs, a hi-rail vehicle (HRV) and a trailer. The workers and vehicles were all locked on by 2300.

2.21. At 2307, the RPO received confirmation of the isolation of the overhead power from the Traction Isolation Team, and a copy of the EF201 permit (*see* Appendix 3).

2.22. Team 2 was preparing to work at Waitematā up to signals 3 and 27 on the UP Main of the NEW, while Team 1 was preparing to work on the NIMT through to the Strand and meet Team 2 on the DOWN Main of the NEW (*see* Figure 5).

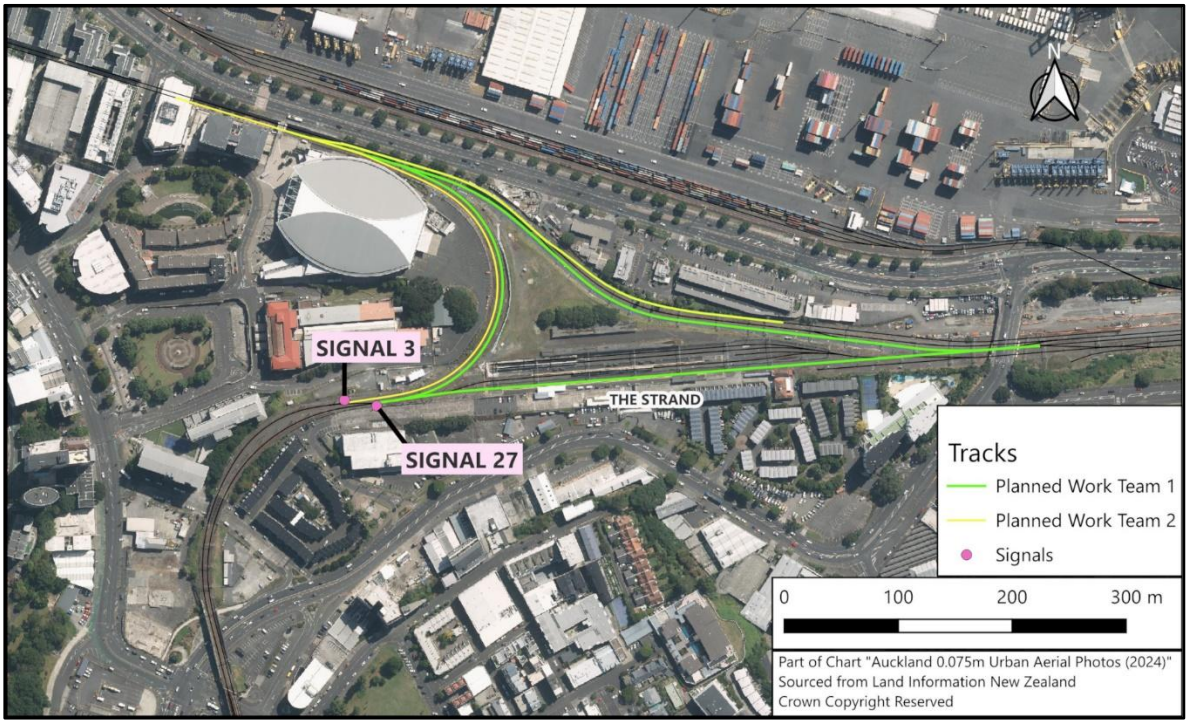


Figure 5: Work areas of Team 1 and Team 2

2.23. Immediately before on-tracking, a City Rail Link project worker checked the necessary permits for Team 2's EWP and noted there was no current diesel permit displayed (required when entering Waitematā Tunnel) but no action was taken.

2.24. Because the necessary diesel permit had not been obtained before the shift, the Night Shift Traction Supervisor decided that rather than inspecting the Waitematā Tunnel, Team 2 would instead carry out the remaining planned work from traction pole NEW 002/49.

2.25. Team 2 on-tracked at 0028 at the East Car Yard siding and headed towards signal 34, as directed by the RPO, to enable them to move from the NIMT onto the NEW.

[17] A document that records the name and contact details of the RPO, the names and contact details of people who have been briefed and are locked onto a worksite, and the details of vehicles operating within the worksite. The register also includes the identifying padlock used by each worker or vehicle as appropriate, and the time of entry and departure from the worksite so that workers and vehicles can be accounted for.

[18] The method of either placing a padlock on a lock-on frame or removing it in a dedicated protected work area location.

2.26. At 0030, Team 2's EWP was set a route from the NIMT towards NEW. At 0036 the EWP moved onto the DOWN Main on the NEW.

2.27. At 0054, the EWP moved past signal 118, the last signal before the end of the overhead isolation, stopping short of signal 24 at Parnell Station (*see* Figure 6).

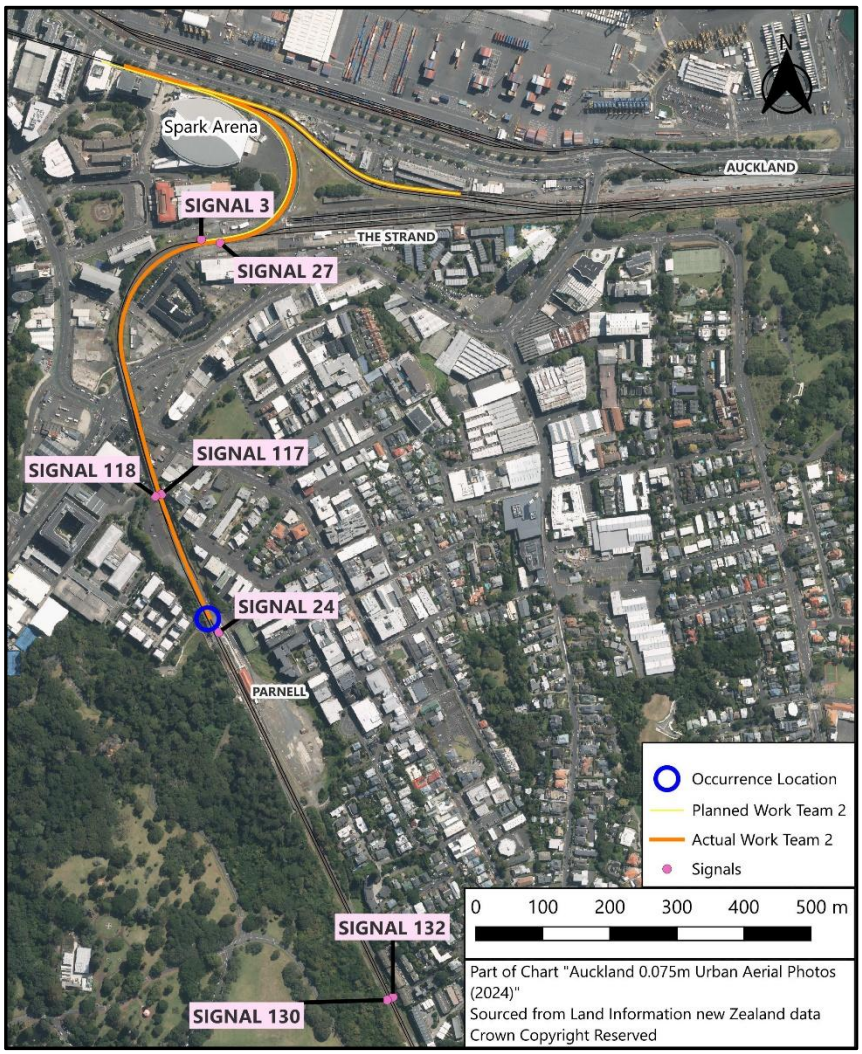


Figure 6: Team 2's location

2.28. At about 0104, the traction electrician and the EWP operator were on the EWP and raised it to conduct maintenance on the OLE while the team leader walked towards signal 24.

2.29. As the EWP moved closer to the OLE, an electrical arc formed, followed by a flashover.[19] The accident was captured on closed-circuit television (CCTV) from Parnell Station (*see* Figure 7). The traction electrician, who was taller than the EWP operator, was positioned closer to the OLE and was more directly exposed.

[19] A type of electrical explosion or discharge that results from a connection through air to ground or another voltage phase in an electrical system.

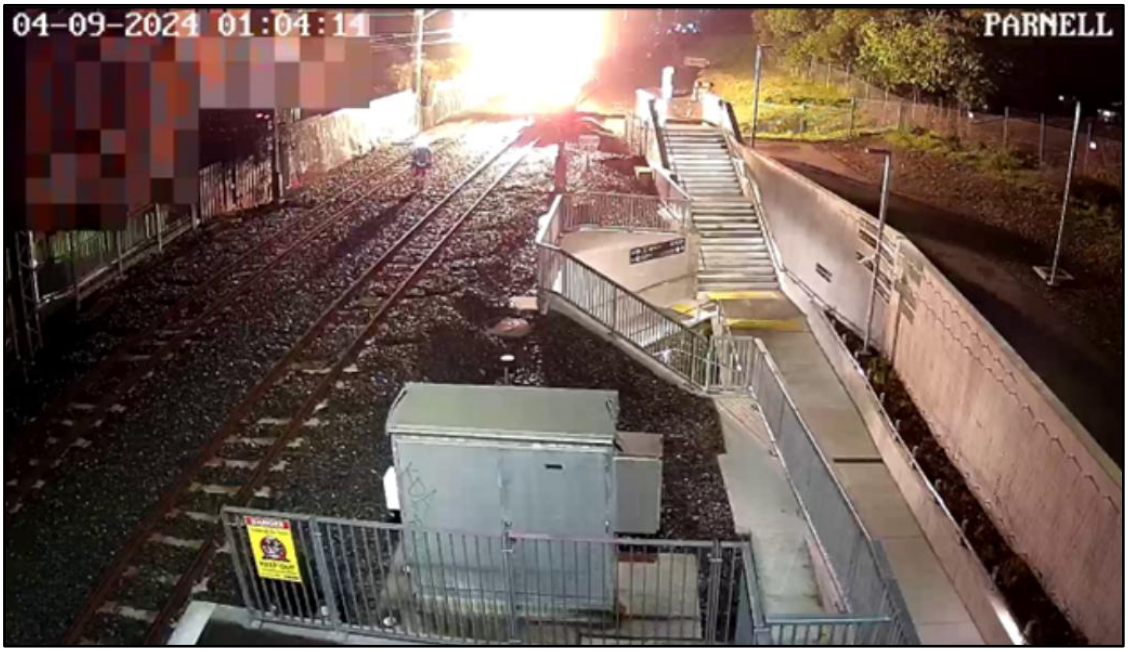


Figure 7: CCTV of the electrical flashover at Parnell

(Credit: Auckland One Rail)

2.30. Seeing the flashover, the team leader immediately returned to the EWP and saw that the EWP operator had climbed down, but the traction electrician was unconscious and remained on the EWP.

2.31. At 0107, the team leader phoned the Night Shift Traction Supervisor, informed them of the accident and requested assistance. The supervisor confirmed Team 2's location and, realising they were outside the isolation limits, instructed the team leader to call Traction Control immediately, give them information about what had happened and request emergency services.

2.32. At about 0108, the RPO, unaware of the accident, received a call from the Traction Control Room Operator to say the power had been tripped on the overhead on the UP Main at Newmarket and seeking clarification if power could be restored.

2.33. The RPO stated to the Traction Control Room Operator that they didn't have anyone working at that location but to wait until they had gone to the location to confirm that there was no one there.

2.34. The RPO then attempted to contact the traction electrician but could not get a response so contacted Team 2's team leader.

2.35. Emergency services arrived on site at 0128, with an ambulance arriving at Parnell by 0132.

2.36. The flashover caused serious burns to the traction electrician and minor burns and lacerations to the EWP operator.

2.37. The EWP was seriously damaged and non-operational.

Personnel information

Rail Protection Officer

2.38. The RPO had been employed by KiwiRail since 2023 and was appropriately qualified for the position of RPO, with a Licence to Operate that included the application of the protection methods of blocking.

Traction electrician

2.39. The Traction Electrician had been employed by KiwiRail since 2022 and at the time of the accident was engaged in the inspection of OLE. They held a licence from the Electrical Worker Registration Board and had completed KiwiRail's Electrical Awareness Advanced training. They had also completed training and possessed unit standards in Mobile Elevated Work Platform operation.

Elevated work platform operator

2.40. The EWP operator had been employed by Martinus Rail New Zealand Limited (Martinus) since July 2022. They had completed the required KiwiRail Electrical Awareness Intermediate training. They had also completed the required unit standards for operating the EWP and working at heights and were qualified to operate HRVs on KiwiRail's rail network.

Team leader of Team 2

2.41. Team Leader 2 was employed as a traction line mechanic leading hand responsible for supervising workers on site. They had been employed by KiwiRail since 2021 and had previous related experience in the rail industry in other jurisdictions. At the time of the occurrence, they had completed the required KiwiRail Electrical Awareness Intermediate training.

Vehicle information

2.42. The EWP HRV was an Isuzu FVR purpose-built road-rail vehicle. It was fitted with an EWP used to conduct work at heights within the rail network.

2.43. The vehicle was fitted with a power take-off unit that allowed the vehicle to be operated from the cab or from the EWP. The speed when operating in EWP mode was restricted to 3 kilometres per hour (km/h).

2.44. The EWP compliance certificate was current at the time of the accident. The EWP had current certification for operation on the network and there was no evidence of any defects with the EWP that contributed to the accident.

Organisational information

KiwiRail Holdings Limited

2.45. KiwiRail Holdings Limited (KiwiRail) is a New Zealand state-owned enterprise. It operates trains and rail vehicles, controls rail movements on the national rail network and maintains the railway infrastructure as the rail access provider.

Martinus Rail New Zealand Limited

2.46. Martinus is a privately owned rail infrastructure company founded in Australia in 2005. It was contracted by KiwiRail to supply the HRV (involved in the accident) and its own EWP operator. While on site, the EWP operator worked under KiwiRail's direction.

Recorded data

Hi-rail vehicle EWP

2.47. The Commission obtained recorded data from the E-Roads system fitted to the EWP and used this data in the inquiry.

Closed-circuit television

2.48. The accident was captured on CCTV from Parnell Station and the Commission obtained copies from Auckland One Rail.

Train control replay file

2.49. The Commission obtained train control replay files of the vehicle movements. These showed the various route settings and movements of the EWP as it progressed from the on-tracking location to the accident location at Parnell.

Previous occurrences

2.50. The following occurrences reviewed by the Commission highlight the importance of safe systems of work around electrical isolations. These occurrences highlight that workers must be informed of the electrical isolation limits through diagrams. They emphasise the dangers that exist where the limits of electrical isolation are not clearly identified or understood and the importance of a 'test before touch' before starting work.

WorkSafe Victoria, Australia : Linesman injury, arc flash incident, Kooyong Station, Victoria, July 2018

2.51. In July 2018, a linesman sustained burns to their hand and required hospital treatment after a live wire caused an arc flash while they were installing a steel bracket on an overhead gantry near Kooyong Station.[20]

2.52. A WorkSafe Victoria investigation found that a 600-volt (V) feeder cable running into the intersection had not been isolated because diagrams prepared for the work did not show where the live electrical assets were physically located.

[20] https://www.worksafe.vic.gov.au/news/2022-03/metro-trains-fined-100000-after-arc-flash-injury

2.53. The investigation found that there was a failure to:

- provide safe systems of work and the necessary information and training for identifying and isolating the tram squares
- inform workers of the location of all electrical assets through sectionalised diagrams
- perform a site inspection where each asset was identified and isolated.

Office of Rail and Road investigation: Linesman serious electric shock, Kensal Green, London, UK

2.54. On 25 December 2019 at Kensal Green, London, a linesman suffered serious burns and damage to their eyesight and hearing after touching an overhead line. The workers were unaware they were outside their isolated work area. The Office of Rail and Road (ORR) investigated and found that there was no effective system in place with regards to the planning of this work and inadequate supervision in place to oversee the safe conduct of the works.

2.55. Amey Rail Limited, the principal contractor, was later fined for inadequate planning and supervision and for failure to ensure a 'test before touch' was properly carried out (Office of Rail and Road, 2023).

Rail Accident Investigation Branch 07/2015: Train driver receiving a severe electric shock at Sutton Weaver, Cheshire, UK

2.56. On 23 September 2014, a train driver received a severe electric shock from a hanging live wire after leaving the train to inspect damaged overhead lines.

2.57. The Rail Accident Investigation Branch (RAIB) found that:

- overhead line examinations did not inspect for signs of wire damage at attachment positions
- clarification was needed on what actions a train crew should take if they are required to leave a train where the OLE is known to be damaged and still live (Rail Accident Investigation Branch, Department of Transport, 2015).

3 Analysis
Tātaritanga

Introduction

3.1. On the night of 3 September 2024, and into the morning of 4 September 2024, two teams of workers were conducting routine inspection and maintenance over multiple worksites on the electrified rail network in Auckland. Team 2 entered a portion of track that had not had the OLE isolated, resulting in a high voltage flashover. This caused serious injuries to the traction electrician and minor injuries to the EWP operator.

3.2. The following section analyses the circumstances surrounding the event to identify the factors that increased the likelihood of the event occurring or increased the severity of its outcome. It also examines any safety issues that could adversely affect future operations.

Track protection and electrical isolation arrangements

Safety issue 1: The track protection limits and the overhead line isolation limits within the work area were misaligned, adding an unnecessary complexity to the protection arrangements. These arrangements left an electrically live section of the overhead line equipment within the protected work area, exposing traction workers to the risk of electrocution.

Rules and procedures for protected work areas and worksites

3.3. Rules and procedures for rail worksites are essential to create a structured, safe and efficient environment for everyone involved. The rules and procedures for establishing a worksite are contained in KiwiRail's Track Safety (KiwiRail, updated 2026) and, specific to Auckland, the Auckland Electrified Area (AEA) Traction Electrical Safety Principles.[21]

3.4. Track Safety rule TS01 Planning Work in the Railway Corridor defines nine underlying principles. Principle 9 states, 'people must be protected from the hazards associated with electrical infrastructure'.

3.5. When undertaking work within the rail corridor, protection arrangements for workers must ensure unauthorised rail traffic does not enter the location.

3.6. When the PWA and worksite locations are established, workers entering are subject to Track Safety rule TS02 Protected Work Area. This rule ensures all personnel and equipment at a worksite are accounted for when on-tracking and when completing and clearing the track, before the PWA is released and protections removed.

3.7. On the night of the accident, all workers and equipment assigned to the worksite had completed the lock-on process and had registered this on the TS90 document, meeting the requirements of TS02 (*see* Appendix 4).

[21] AEA Traction Electrical Safety Principles [Document E-PR-AE-0010 effective 31/07/2015]

Protection arrangements for the worksite

3.8. On the evening of 3 September 2024, the RPO obtained blocking for the PWA in accordance with Rule TS06 Blocking (*see* Appendix 5).

3.9. The PWA, worksite and blocking extended to signals 11 and 14 on the NIMT at Ōrākei. In addition, blocking was also obtained beyond those limits to allow the Traction Isolation Team to on-track and travel to the isolator switches 12A and 14A to put the electrical isolation in place (*see* Figure 8).

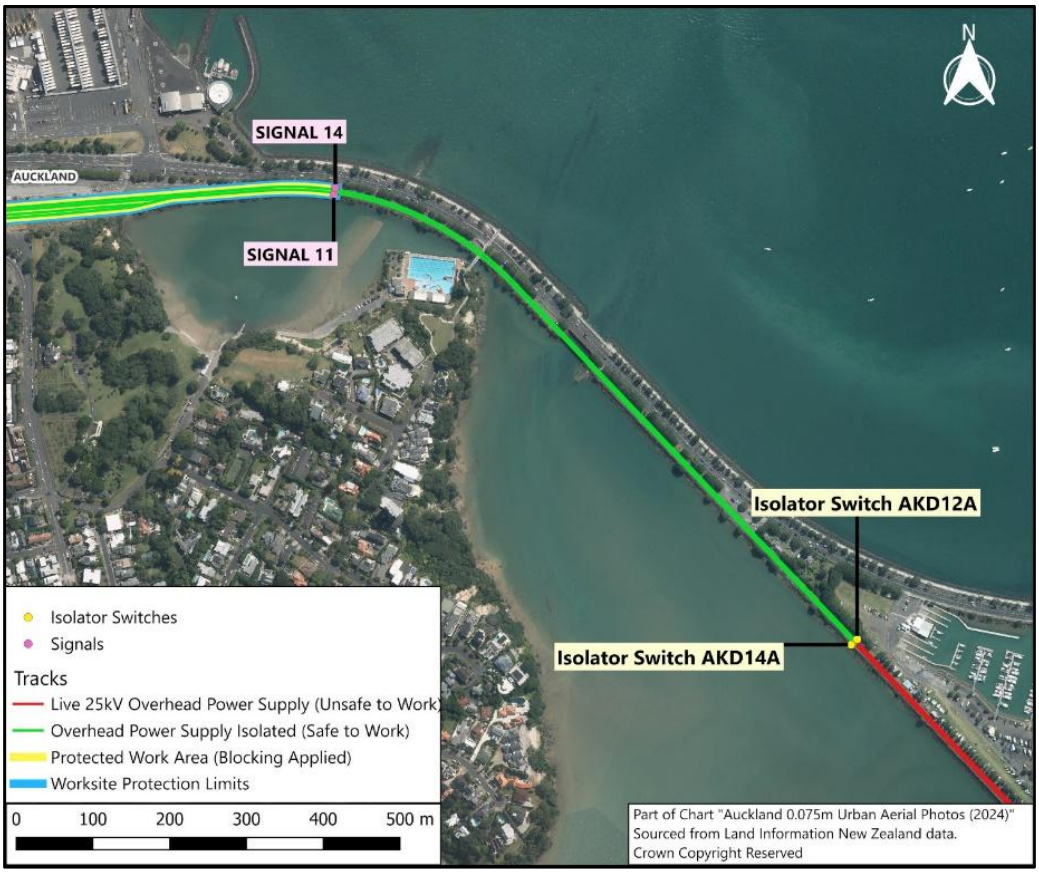


Figure 8: Electrical isolation, PWA and worksite layout on the North Island Main Trunk line

3.10. Once the electrical isolation was in place, the additional blocking obtained for that portion of the network was removed.

3.11. In organising the protection in this way, the electrical isolation extended beyond the PWA and worksite. This meant the risk posed by live OLE had been eliminated from the worksite.

3.12. In contrast, the protection arrangements for the PWA and worksite limits on the NEW were located at signals 130 and 132.

3.13. Signals 130 and 132 were used to provide blocking for the PWA and to establish the limits of the worksite.

3.14. The electrical isolation on the NEW extended to isolator switch NEW 0022 and NEW 0023. These isolators were located within the worksite limits (*see* Figure 9).

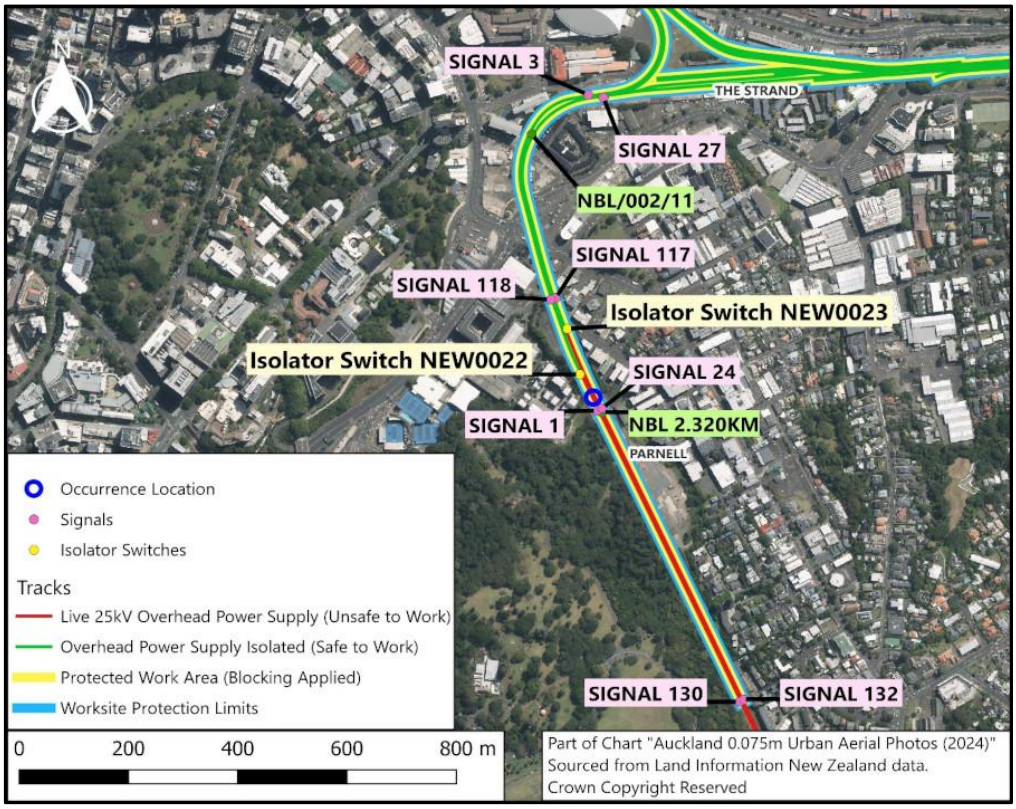


Figure 9: Electrical isolation, PWA and worksite layout on the Newmarket Branch Line

3.15. In organising the protection in this way, the electrical isolation did not cover the entire worksite. This meant the risk posed by the live OLE remained within a portion of the worksite (*see* Figure 10).

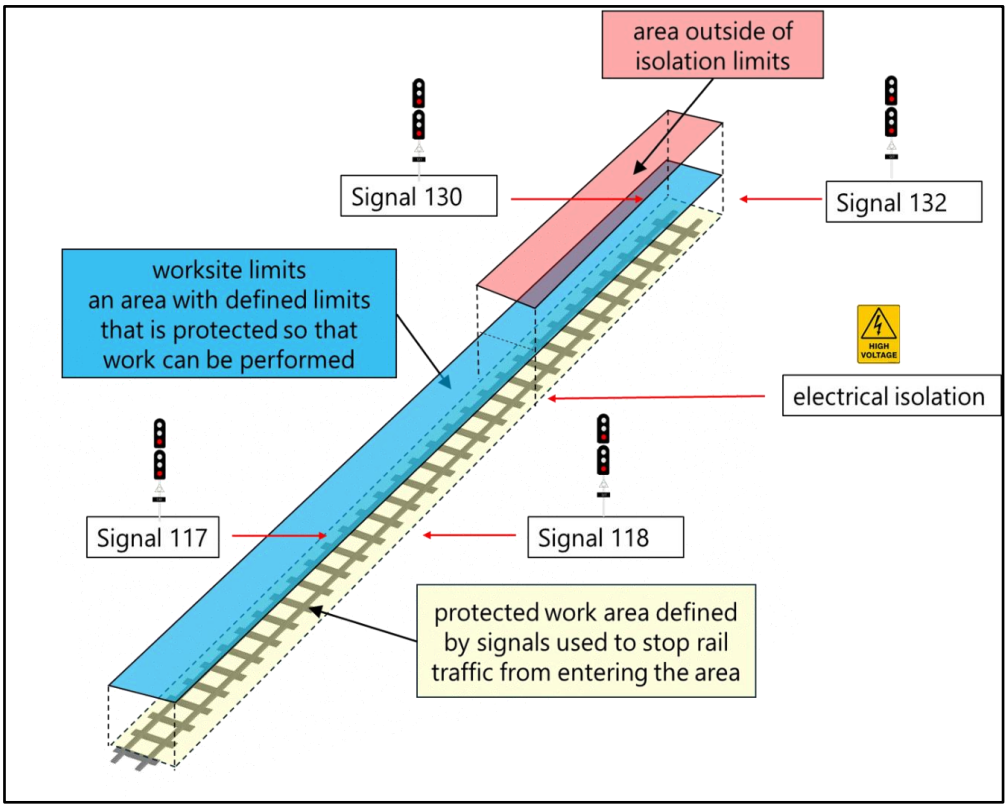


Figure 10: Electrical isolation limit and live OLE contained within the worksite

KiwiRail's safety system for managing electrical isolation

3.16. Additional controls are essential when working with overhead electrical wires for several safety and operational reasons, including:

- overhead wires in rail corridors often carry high-voltage electricity and accidental contact or even close proximity can result in injury or harm
- without proper controls, workers or equipment may enter unsafe zones.

3.17. Under single worksite arrangements, the rules and procedures did not require the placement of additional signage or equipment to define the worksite boundary limits.

3.18. In November 2013, KiwiRail published an interim guide[22] to obtaining an Electrical Permit to Work in the AEA. The guide formed part of KiwiRail's documented safety system and outlined that 'worksites were to be completely protected by both electrical and track (rail movement) protection'.

3.19. Section 11 of the guide stated, 'The Track Protection boundary should normally be greater than the electrical protection and an electrical safety buffer used to ensure that the electrical protection is not compromised.'

3.20. In addition, the guide stated that the electrical isolation should be greater than the worksite limits and defined by worksite limit boards, safety buffer zone, electrical isolation limits and stop protection to allow workers to conduct maintenance and inspection activity (*see* Figure11).

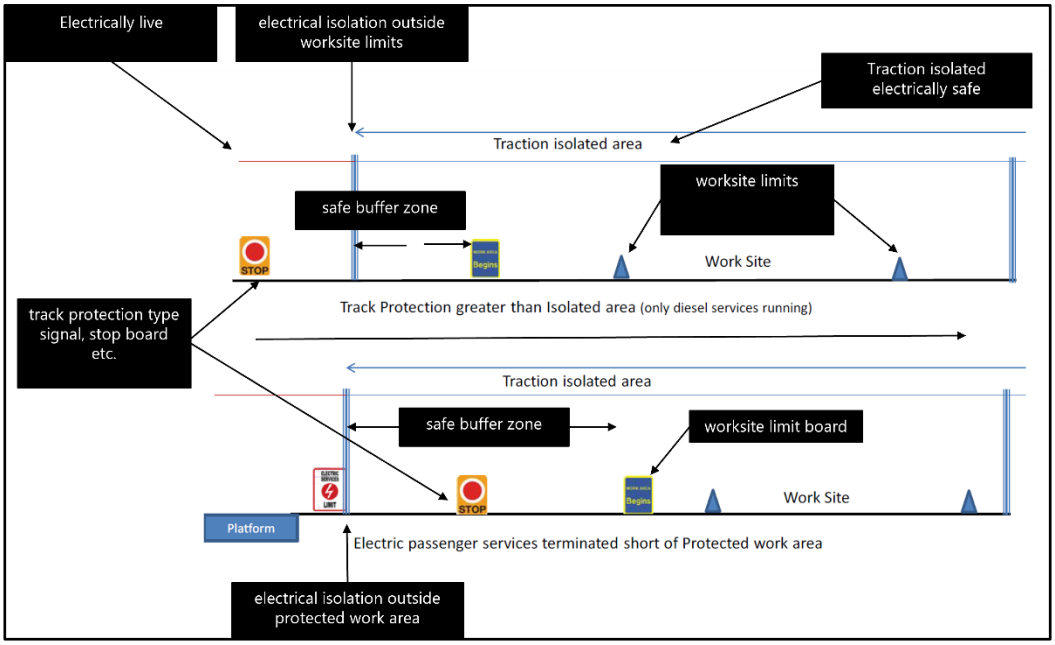


Figure11: Diagram from KiwiRail's Interim Guide to Electrical Permit to Work

(Credit: KiwiRail annotated by TAIC)

3.21. The absence of boards to define the worksite limits meant the opportunity to show the demarcation between the limits of the electrical isolation protection and live OLE was missed.

[22] Interim Guide to Electrical Permit to Work in Auckland Electrified Area Nov 2013.

3.22. Since there were no provisions for multiple worksites to be deployed at the site, all the activities came under a single worksite provision. To comply with the guide the options available were:

- to electrically isolate beyond the PWA limits coinciding with complete isolation of the worksite (*see* Figure 12), or
- confine the worksite to within the electrical isolation, with appropriate protections in place to show workers the physical limits of the worksite, together with the appropriate buffer (*see* Figure 13).

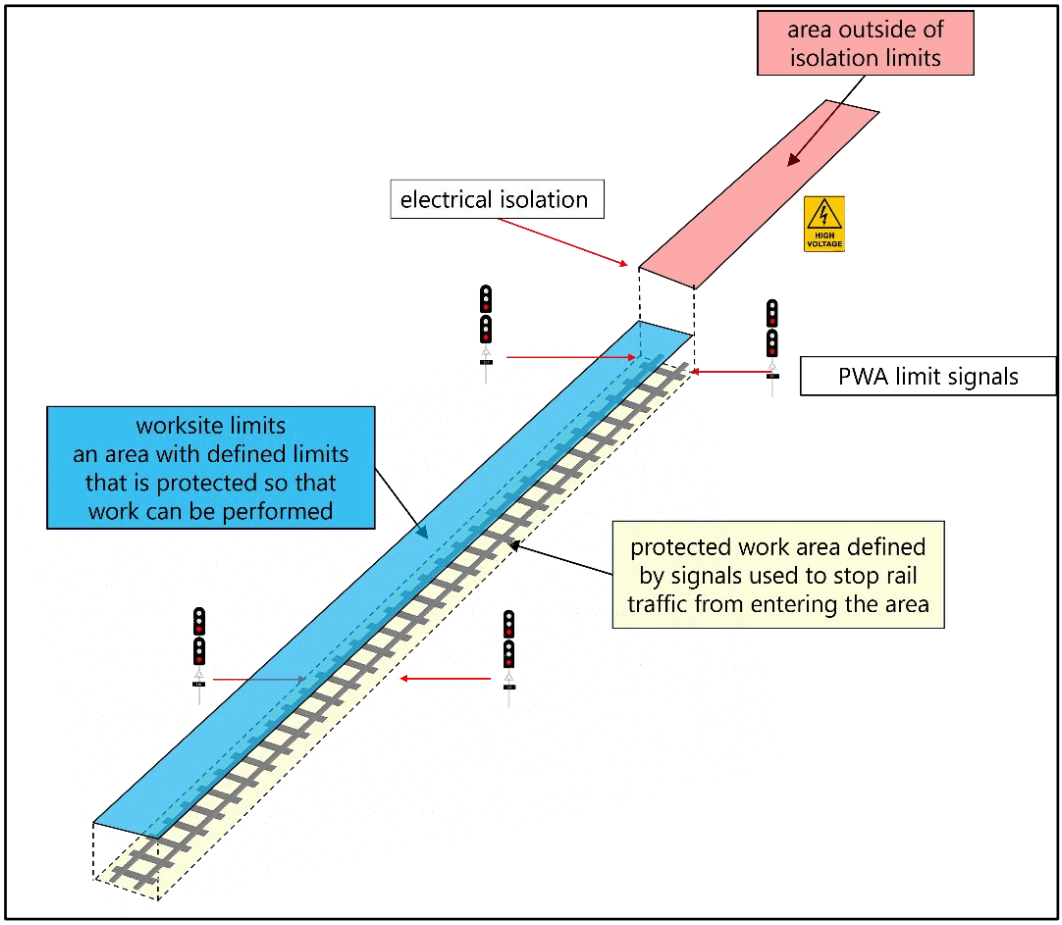


Figure 12: Electrical isolation limit and live OLE outside the PWA and worksite

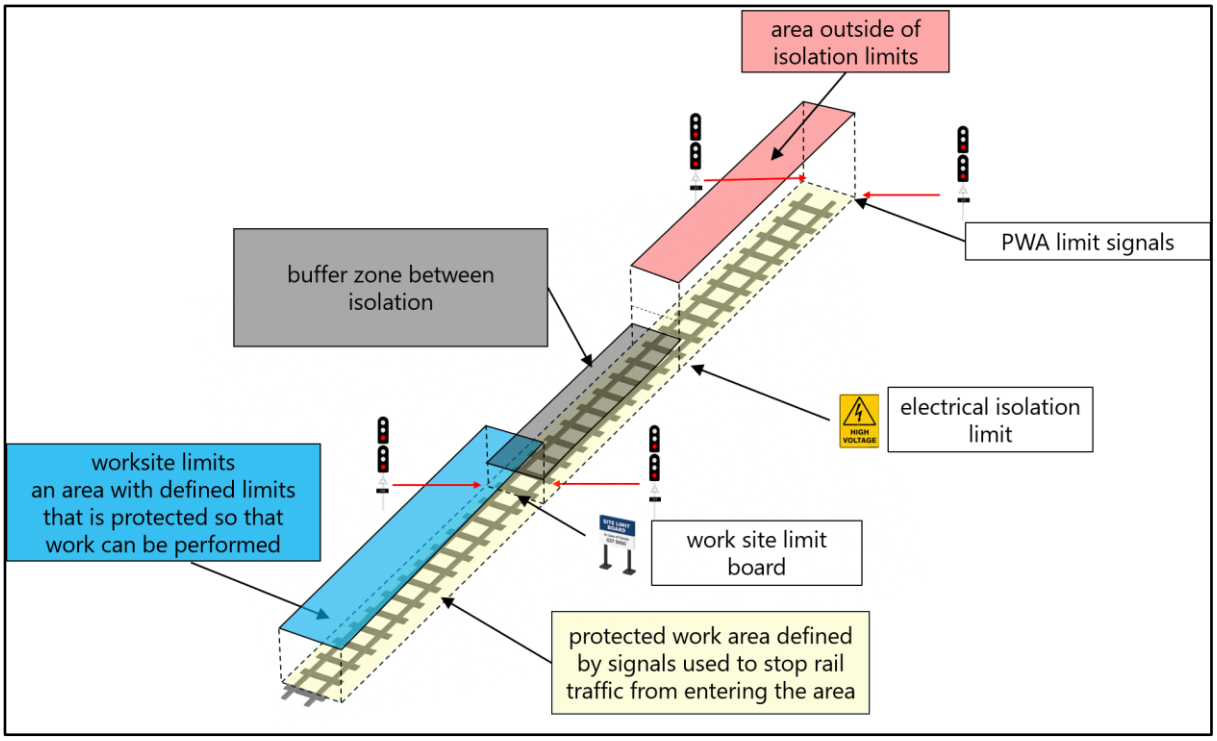


Figure 13: Electrical isolation limit and live OLE inside the PWA with the appropriate protections to show the worksite limit and a buffer zone to the live OLE

3.23. On the night of the accident, the track protection limits coincided with the worksite limits. This meant that there was not a complete electrical isolation or safety buffer within the worksite at the Parnell end of the PWA and those arrangements did not comply with the interim guide.

3.24. The Commission found that on the night of the accident each end of the worksite had different control measures in place (*see* Figure 14).

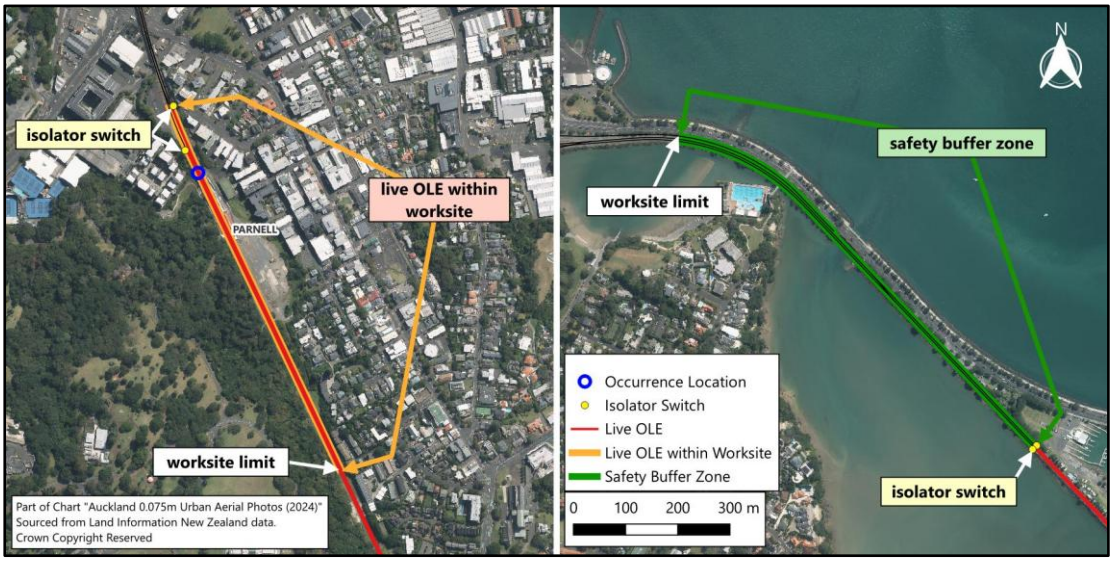


Figure 14: Differences between protection methods used on the night of the accident

3.25. The misalignment of the track protection and the OLE isolation at the Parnell end of the worksite meant that 1.14 km of track was not isolated from the 25-kV electrical supply, creating an additional complexity to the protection arrangements.

Safe area of work

3.26. Additional protection is required for workers who are engaged in the maintenance of overhead traction systems.

3.27. In establishing and planning a safe area to work on the OLE, KiwiRail's documented process included the AEA Traction Electrical Safety Principles, which require in part:

> Work on or near traction systems shall be subject to sufficient planning, risk assessment and checking that all electrical hazards or contributions to other hazards due to the electrical hazards are removed or adequately mitigated.
>
> There must be clear processes for making live HV (high voltage) equipment safe to work on or in proximity to, and for proving and demonstrating it is safe. This shall include isolating the **worksite** [emphasis added] from all possible sources of electricity, including power line crossings, and mitigation of any induced voltage risk or EPR (earth potential rise) due to nearby HV faults on other circuits.

3.28. In addition, the AEA – Instructions to Plan provides instructions to establish the safe working area and requires the isolation and earth points[23] to be outside the safe working area (*see* Figure 15).

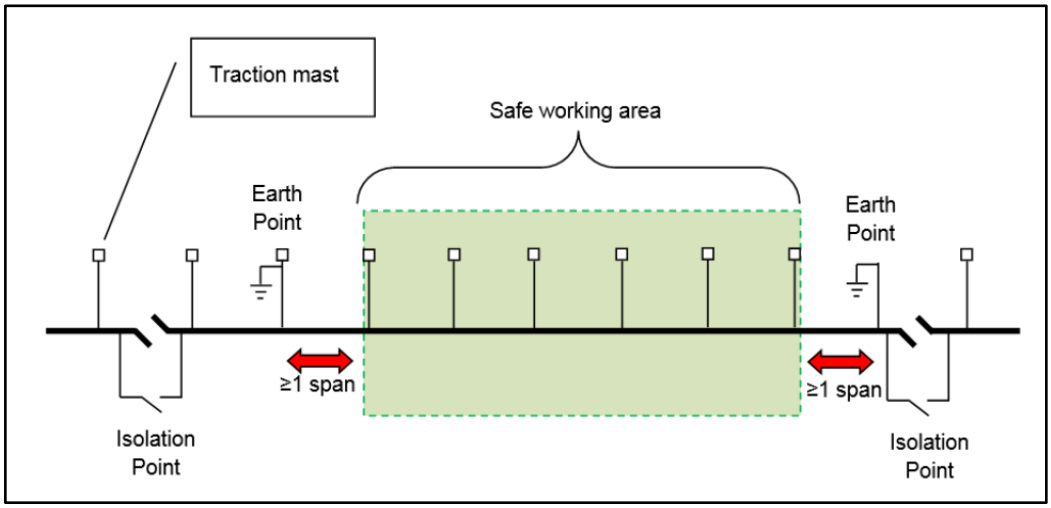


Figure 15: Safe working area described in KiwiRail's AEA – Instructions to plan
(Credit: KiwiRail)

3.29. The isolation planned and conducted on the day of the accident included the isolation and earth points on approaches to the electrical isolation at Parnell.

3.30. KiwiRail's documentation on safety procedures when working on or near high-voltage traction equipment is contained in its Traction & Electrical Standard.[24] This standard provided the safety procedures to protect people working on or near any traction asset.[25]

3.31. The procedure required that:

> When working, an Electrical Safe Working Area must be created. The boundary of the Electrical Safe Working Area may be marked if deemed necessary for safety. These markings are more and above the blue visual markings

[23] Designated locations where parts of the railway's electrical infrastructure are connected to the ground (earth).
[24] KiwiRail internal standard, Traction & Electrical Standard [E-ST-TR-0109]
[25] The context of electrified railways, the term 'traction asset' (or traction asset) typically refers to the equipment and infrastructure dedicated to providing propulsion power – that is, moving the train.

demarcating the earthing at the isolation limits. The marking shall be agreed between the Traction Competent Person and the Person in Charge. Boundary markers are more likely to be used where:

- The people involved in the work are not familiar with the site.
- There is a risk that people in the worksite may stray outside it.
- Live equipment is close to the edge of the working area.

The agreed access point(s) to the Electrical Safe Working Area are important to safety. All workers requiring to be protected by the Electrical Work Authority shall sign the Job Plan Book / TS90 Work Site Register to acknowledge their understanding of the Electrical Safe Working Area and the controls that have been implemented.

Should the work scope or method change, then the hazards shall be reviewed and any additional control measures applied.

3.32. The Traction and Electrical Task Instructions to Test and Earth OLE detailed the methods for earthing, using short leads to connect a Designated Earthing Point (DEP) on the 25-kV side of OLE and an earth connection on the mast or the earth wire (*see* Figure 16).

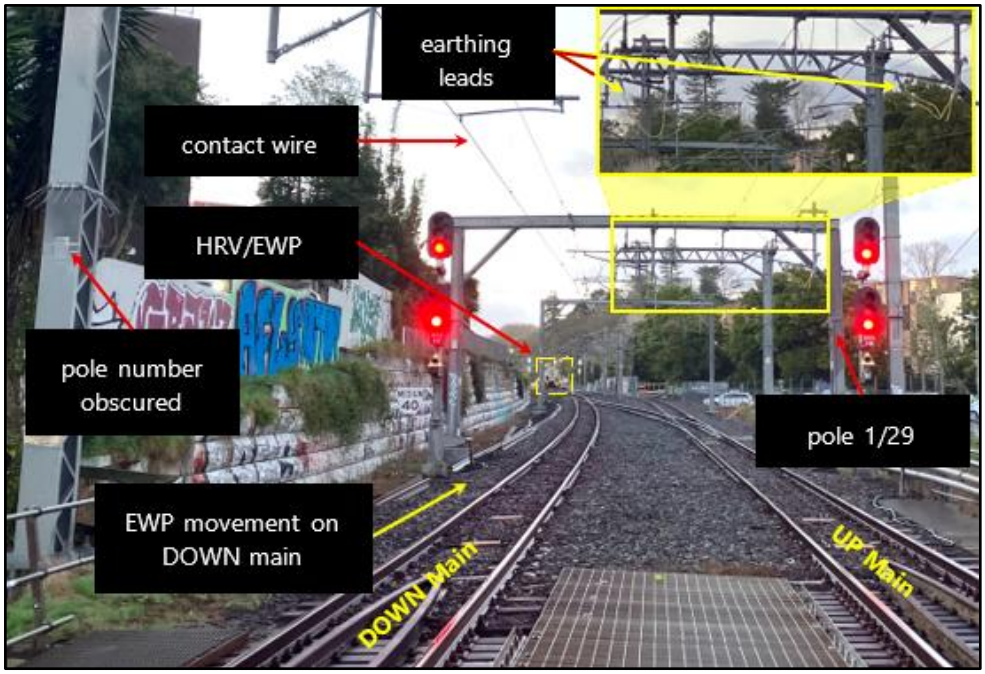


Figure 16: Location of accident and isolation limit

(Credit: KiwiRail annotated by TAIC)

Additional task instructions caution that the earthing leads in some situations should not hang below the contact wire to avoid contact with diesel- hauled rolling stock. In addition to the application of earthing leads, the isolation switches are opened, tagged and locked as part of the process.[26] These tags and locks were applied at the approach to Parnell Station at NEW 0022 and NEW 0023 (*see* Figure 17).

[26] These instructions are contained in Traction Task Instruction AEA Instructions to Lock and Tag Switches.



Figure 17: Lock-off tag at the electrical isolation

(Credit KiwiRail annotated by TAIC)

3.33. The protection markers were almost all located near the UP Main track. However, Team 2 was operating on the DOWN Main, with the EWP headlights providing the main source of illumination.

3.34. There were no additional markers at the electrical isolation limits on the NEW to alert Team 2 that they were crossing beyond the limits of the isolation, other than the earth straps that were difficult to identify, especially at night.

3.35. On the night of the accident the approach to Parnell was unlit, therefore it was **very likely** that the earthing leads, tags and locks were not seen by Team 2 as they approached Parnell.

Testing for electrical isolation to confirm safe work limits

Safety issue 2: Before starting work, workers have no way to confirm that the lines are not live and that it is safe to proceed, relying instead on their understanding of where the protection limits are. This increases the likelihood of workers starting work in an unsafe area, which could result in injuries or death.

3.36. 'Test Before You Touch' is a critical safety procedure in electrified railway environments, especially where high-voltage traction power systems are present.

3.37. Team 1 and Team 2 carried out traction system maintenance and operated independently of the Traction Isolation Team. The Traction Isolation Team was responsible for implementing the planned electrical isolation and confirming that the overhead line equipment (OLE) was electrically safe before maintenance started.

3.38. The purpose of the EF201 Permit to Enter form was to disclose to personnel operating in a location that the OLE had been electrically isolated and was safe to work on. As part of the isolation process, the Traction Isolation Team tested the isolation using an approved device. This device was a voltage detection unit mounted on an insulated pole. When the unit is held close[27] to the contact wire of the OLE, the tester provides a visual and audible alarm if the OLE is live (*see* Figure 18).

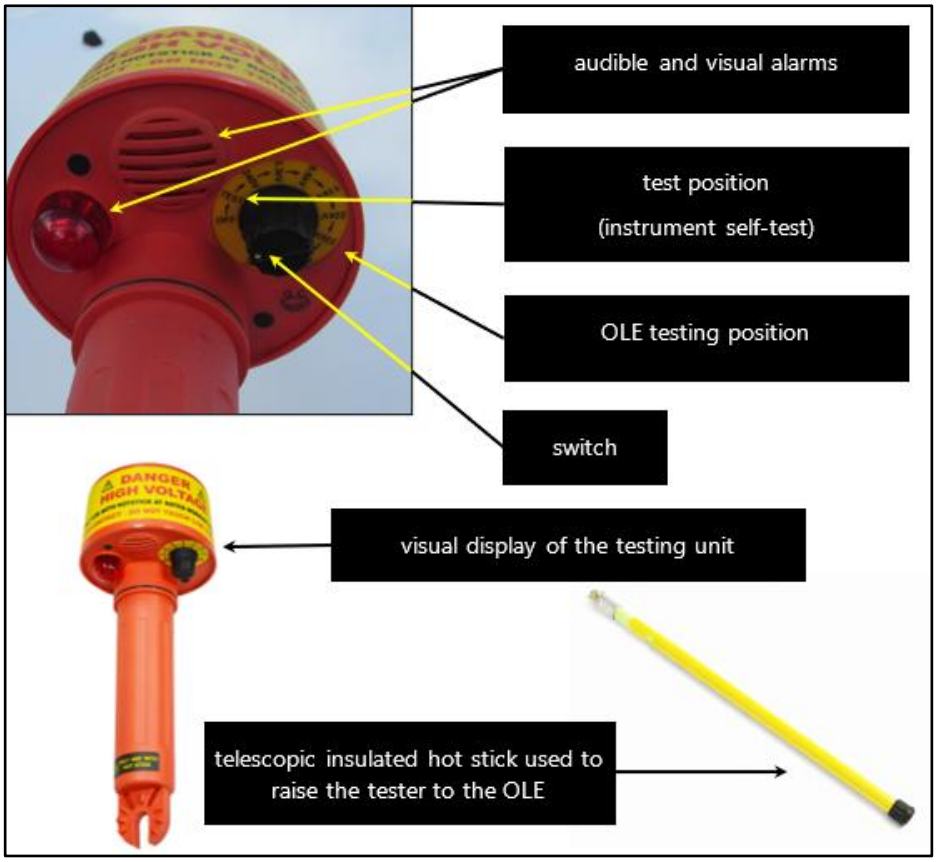


Figure 18: Testing equipment for high-voltage OLE
(Credit: KiwiRail annotated by TAIC)

[27] The recommended position is about 100 millimetres (mm).

3.39. Team 2 relied on the Traction Isolation Team to conduct the 'test before touch' to confirm that the area was electrically isolated. Team 2 did not have any equipment with them to confirm that the OLE had been appropriately isolated and was safe.

3.40. The expectation that the area was electrically safe was based on the team leader's experience that work had always occurred in electrically isolated areas.

3.41. Had Team 2 been provided with and used testing equipment, it is **very likely** they would have identified that the OLE was not isolated and was energised.

Protection and isolation limit information

Safety issue 3: The track protection and isolation limit information shared in the prestart briefings did not provide all workers with a shared understanding of the limits, increasing the likelihood of workers exposing themselves to risk within the protected work area.

3.42. The original plan was for Team 2 to conduct maintenance towards Waitematā Tunnel on the NIMT, meaning they would be far from any exposure to the isolation limits on the NEW. However, when the work location changed, so too did the risks associated with the team's maintenance activity.

Management of change in work circumstances.

3.43. Effective change management is critical when planned work activities change, particularly in safety-critical environments.

3.44. Any change in the direction, sequence or intent of work can not only alter risk exposure, but also how it is perceived and managed. Once a plan is established and endorsed, workers may not consciously reassess risk without a clear trigger (such as new documents, additional reference material or a further briefing).

3.45. The original prestart briefing included the location of the isolation limits. However, the workers' mental models were shaped by the knowledge that their intended work area was far from the isolation limits. Additionally, the workers thought that worksites would be isolated from power, based on Team Leader 2's previous experiences of worksites always being isolated from live OLE.

3.46. When the work instruction changed, the original mental model of risk was no longer valid. However, without an active step in the process, the opportunity to reassess Team 2's understanding of the isolation limits did not occur.

Documents plans and maps about the isolation

3.47. The Traction Isolation Team responsible for implementing the isolation on site had tested the isolation and, before work started, briefed the RPO and both teams about the isolation limits by completing the following:

- EF201 Permit to Work Near Railway Power Lines
- EF202 Work Site Electrical Hazard Assessment, which was acknowledged and signed for.

3.48. The procedure prohibited anyone from taking photocopies or photographs of either EF201 or EF202 without the specific approval of the issuer of the permit to work. There was no requirement within the procedure for persons to take notes.

3.49. The prestart briefing given by the RPO to Team 1 and Team 2 included information about the protection and isolation limits. These were shown to the teams on the RPO's iPad using the signal and interlocking diagram. The isolation limits were presented as between two sets of points at Parnell.

3.50. Team 1 continued with their briefed area of work while Team 2 started work that was different to what was originally planned within Waitematā Tunnel. Team 2 did not have any information immediately available to them concerning the isolation limits. Instead, they relied on memory of what had been discussed earlier.

3.51. During interview, the team leader for Team 2 recalled that the worksite limits were at signal 130 and signal 132, and from the signal and interlocking diagram they had not passed that location. They had never worked within a worksite on OLE that had not been isolated and had an expectation the OLE was isolated up to those signals, and that the entire worksite was isolated.

Work methods and safety briefings

3.52. The Commission reviewed other jurisdictions' approaches to work methods and safety briefings. For example, Network Rail Limited in the United Kingdom provided workers with 'go no-go' zones (*see* Figure 19 and Appendix 7).

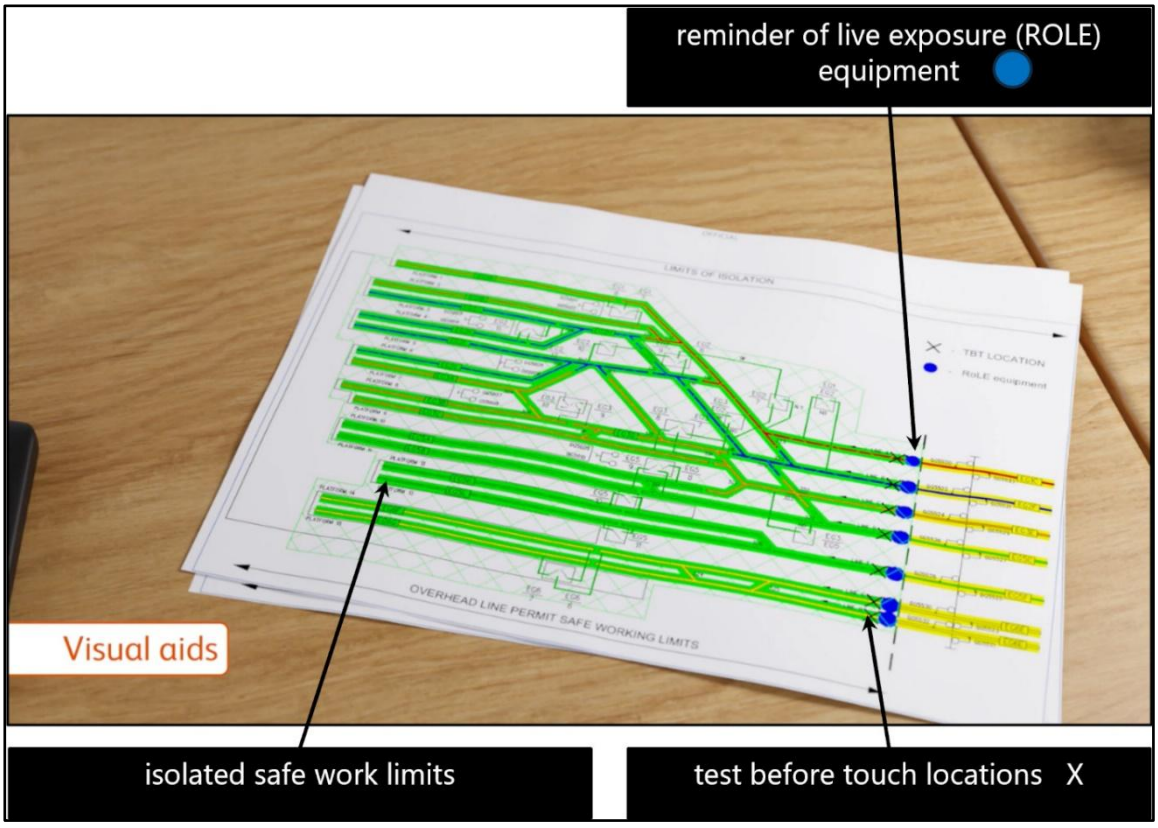


Figure 19: Marked-up diagram showing 'go no-go' zones with location of tests and Reminder of Live (RoLE) equipment to delineate isolation

(Credit: Network Rail)

3.53. The information provided to the workers included:

- marked-up diagrams showing the isolated areas that were safe to work

- the location at which live OLE was located by placement of 'equipment reminder of live equipment'
- the location where 'test before touch' was to be completed by staff.

3.54. The documentation and diagrams used by KiwiRail to describe the location of protections varied, with no common identifier. Instead, the following were all interchangeably used:

- meterage
- traction pole reference
- structures
- signal number
- interlocking and traction diagrams
- traction worksite limits
- Daily Information Bulletin.

3.55. The lack of common identifiers for the protection limits inhibited those involved from having a shared understanding of the isolation and track-protection complexities.

3.56. The EF201 provided the meterage of the isolation, but there was no graphical representation provided to Team 2 that would have assisted them in visualising the location of the isolation limits.

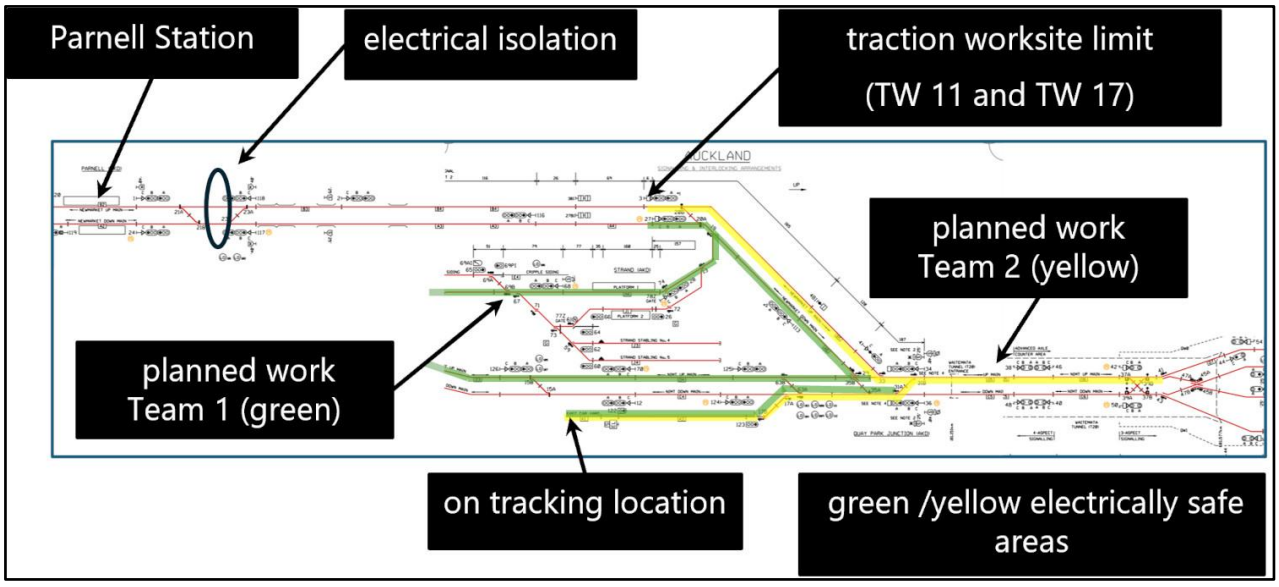


Figure 20: KiwiRail Signal and interlocking diagram with mark ups
(Credit: KiwiRail annotated by TAIC)

3.57. The signal and interlocking diagrams (while not providing a common identifier) were available to graphically represent the isolation and planned work limits (*see* Figure 20)

Visual markers in the field and asset description

3.58. In reviewing KiwiRail's traction assets at other locations around New Zealand, the Commission found that other areas, such as the NIMT in Wellington, provide greater clarity as to the location by use of the km and meterage referenced on the asset. Queensland Rail, Australia, further expands this by adding direction and line identifier (*see* Figure 21).

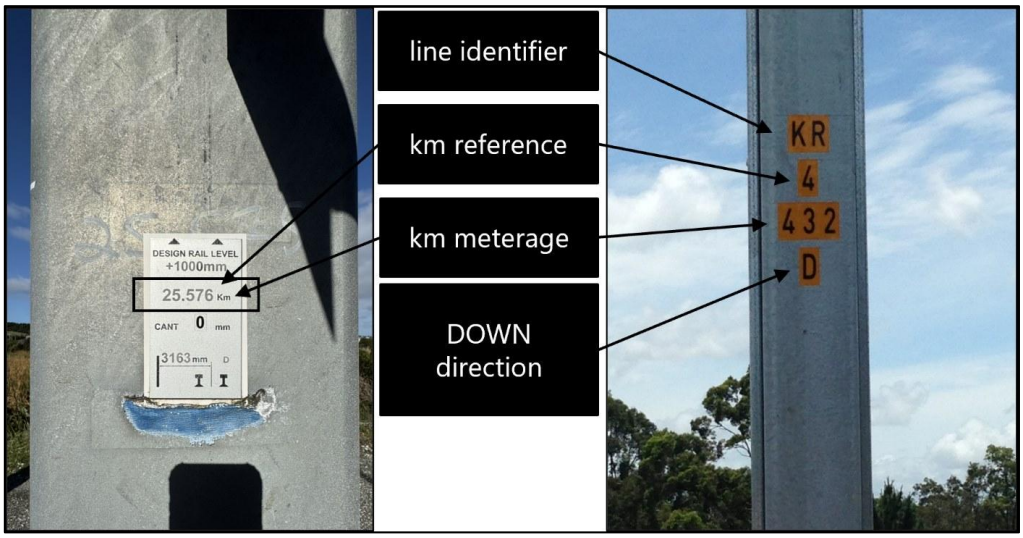


Figure 21: Traction asset location information around Wellington (left) and Queensland, Australia (right)

3.59. Had Team 2 been provided with clear, concise signage at the isolation mast, it is **likely** they would have identified the end of the isolation point of the OLE.

Discrepancies in track meterage and asset reference

Safety issue 4: The track meterage on the Newmarket Branch Line differed from KiwiRail's track meterage described within the documented safety system. This increased the risk of rail personnel applying the incorrect meterage, which can result in maintenance activity being conducted outside the protection limits.

Track meterage

3.60. In the rail industry, track meterage is the primary reference used to define the exact location of every asset, defect, worksite and rail vehicle operating on a network. Unlike road systems that might rely on street addresses or GPS coordinates, rail networks operate on a single-dimensional line where every point is defined by its distance from a fixed reference origin (km 0.000) for a particular railway line.

3.61. The meterage system is the foundation of track protection. If the system contains inconsistent location data, it undermines the reliability of information used to identify where activities are being conducted and which areas require protection.

3.62. There is an ongoing risk that personnel may apply protection to the wrong area or undertake work in an unintended location, which can result in potentially significant consequences.

3.63. The meterage system acts as the common language between railway disciplines, which include:

- the signalling system – defining the location of signals, interlocking points and train detection loops
- civil and track – defining specific assets such as bridges, culverts, level crossings and track components
- traction power – locating items such as overhead masts, tensioning equipment and circuit breakers
- operations – in which train controllers issue track warrants and other movement authorities and institute track blocking so workers can safely access the network
- emergency response to occurrences – in which emergency services are dispatched to specific access gates or track locations based on the km reference.

How were the traction maintenance and assets organised in Auckland?

3.64. The traction assets were divided into specific locations within a section of track and had the following details defined to show their limits:

- start mast number
- start meterage
- end mast number
- end meterage.

3.65. The location of each area was known as a 'traction worksite' (TW) and was listed on a display board located in a prominent position at the traction depot where the traction workers were based (*see* Appendix 6, Figure A6.2).

3.66. In reviewing KiwiRail's documentation, Commission investigators identified that TW 11 listed on the board had subsequently been divided into two separate areas: TW 11 and TW 17 (*see* Appendix 6, Figure A6.3). TW 17 was the actual location in which both Team 1 and Team 2 were to be conducting the maintenance activity on the night of the accident.

3.67. The boundary between TW 11 and TW 17 was pole NBL/002/11. According to KiwiRail documentation, this was located at 2.320 km.

3.68. Both TW 11 and TW 17 were located within the PWA and 'worksite limits' under the control of the RPO, meaning they were both protected.

Traction maintenance conducted by traction workers

3.69. The Commission obtained information from KiwiRail regarding maintenance activities undertaken by Team 2. Investigators specifically identified that the last maintenance task closest in proximity to the isolation limit was a defect at pole NBL/002/13A.

3.70. The documentation listed the asset as being located at the 2.356 km, meaning the defect was located about 36 m within the limits of TW 17. The physical location of the maintenance activity was within the isolation limits and within the limits of TW 17, based on the Geographic Information Systems (GIS) mapping of the traction assets.

3.71. However, the documented meterage position of pole NBL/002/13A did not correlate with the actual position on track. When plotted using the documented km meterage, the asset was located between NEW 0022 and NEW 0023 isolators, and outside the isolation limits.

3.72. The documented position of TW 17 was clear of the isolation at 2.780 km at its actual location. When plotted using the documented meterage of 2.320 km, however, its boundary was located 13 m from isolator NEW 0022 and outside the isolation limits (*see* Figure 22).

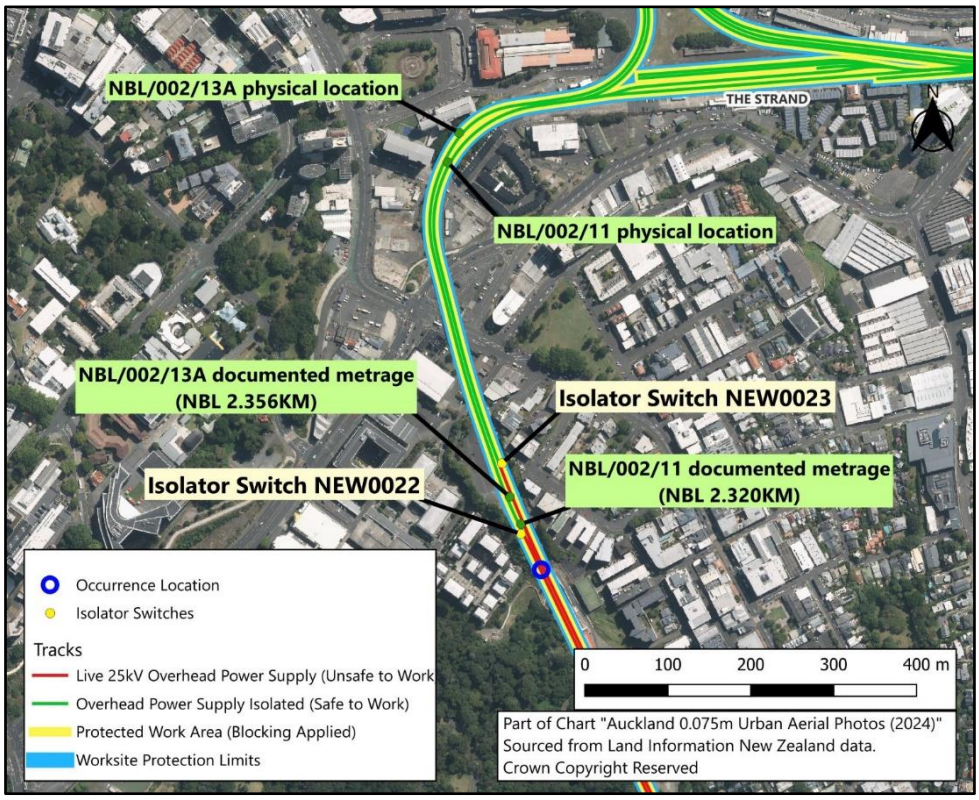


Figure 22: Map showing documented and physical locations of traction assets

3.73. The isolation limits were in effect located at NEW 0022 and NEW 0023; their stated positions in the DIB were at 2.307 km and 2.431 km respectively. Their metrages were consistent with the signal and interlocking diagrams, the GIS data and their physical location on the track.

3.74. Commission investigators correlated the documented assets, including the isolators, masts and TW 17 boundary, and compared them to their mapped locations and the location of the accident using the GIS data (*see* Table 1).

Table 1: Documented and actual meterage

Description	Described meterage (km) based on KiwiRail's documentation	Physical location (km) on the rail corridor based on GIS data	Variation (m)
Pole NBL/002/13A	2.356	2.816	460
Pole NBL/002/11	2.320	2.780	460
TW 17 inspection limit	2.320	2.780	460
NEW 0023 isolator	2.431	2.431	0
NEW 0022 Isolator	2.307	2.307	0

HRV stopped position		2.260	0

Track meterage inconsistency and its effects

3.75. KiwiRail was aware of the inconsistency in the meterage because it had been incorporated into the notes on the traction diagrams.

3.76. During interview, Team Leader 2 stated that they had relied on the PWA and worksite limits of signals 130 and 132 as the isolation limits.

3.77. While the inconsistency of the meterage could not be directly attributed to Team 2's entry into the non-isolated section at Parnell, the location at which they stopped was 60 m outside the documented meterage of 2.320 km for TW 17.

3.78. The meterage of the assets on track was insufficient to assist Team 2 in confidently confirming their location. Even if this had been available, the 460-m variation in documented and actual location of the assets would have further undermined their ability to accurately gauge their position.

3.79. The absence of a common meterage amongst all the railway disciplines presented additional risks to safe operations. The use of an incorrect meterage for the purposes of defining a safe limit of operation or directing workers to a specific meterage for maintenance had the potential to expose workers to harm.

4 Findings
Ngā kitenga

4.1. The work scope changed on the night when the tunnel work was unable to proceed as planned. When the new plan took effect there were no additional briefings with the RPO; despite that, the work limits were left unchanged.

4.2. The misalignment of the track protection and the OLE isolation at the Parnell end of the worksite meant that 1.14 km of track was not isolated from the 25-kV electrical supply, creating an additional complexity to the protection arrangements.

4.3. The elevated working platform of the HRV encroached on the safe working distance from a live line. This was because the track team had expected that section of overhead line to have been isolated as it was within the area of the PWA and the confines of the established worksite.

4.4. On the night of the accident the approach to Parnell was unlit, therefore it was **very likely** that the earthing leads, tags and locks were not seen by Team 2 as they approached Parnell.

4.5. Had Team 2 been provided with and used the testing equipment, it is **very likely** they would have identified that the OLE was energised.

4.6. Had Team 2 been provided with clear, concise signage at the isolation mast, it is **likely** they would have identified the end of the isolation point of the OLE.

4.7. The absence of a common meterage amongst all the railway disciplines presented additional risks to safe operations.

4.8. The use of an incorrect meterage for the purposes of defining a safe limit of operation or directing workers to a specific meterage for maintenance had the potential to expose workers to harm.

5 Safety issues and remedial action
Ngā take haumaru me ngā mahi whakatika

General

5.1. Safety issues are an output from the Commission's analysis. They may not always relate to factors directly contributing to the accident or incident. They typically describe a system problem that could adversely affect future transport safety.

5.2. Safety issues may be addressed by safety actions taken by a participant, otherwise the Commission may issue a recommendation to address the issue.

Safety issue 1: The track protection limits and the overhead line isolation limits within the work area were misaligned, adding an unnecessary complexity to the protection arrangements. These arrangements left an electrically live section of the overhead line equipment within the protected work area, exposing traction workers to the risk of electrocution.

5.3. On 14 November 2025, KiwiRail supplied the Commission with the following information relating to safety action taken:

> It is generally not possible to align isolation and rail protection areas because of the way the infrastructure is designed: it is almost always the case that these have to be different.
>
> It is also necessary to allow the isolation work to be carried out within a rail protected environment – i.e. you can't have people working to isolate, and then reconnect, the system without having a wider rail protection zone to protect those workers while they do that work.
>
> The work site on the night of the incident was confined well inside both the isolation limit and the rail protection area – work is designed so as not to occur near the isolation boundary.
>
> A rail protected work site may have also have other works sites where traction isolation is not required for that type of activity. Certain works can be carried out under live traction, with rail protection.
>
> Having different isolation and rail protection zones is common in other railway jurisdictions also.

5.4. On 29 July 2026, KiwiRail supplied the Commission with the following information relating to safety action taken:

> Since the occurrence, KiwiRail has implemented a range of improvements relating to electrical isolation processes, permit controls, worksite planning and the physical demarcation of isolation limits. These measures are intended to strengthen worker protection and support a clear understanding of electrical safe working areas within electrified environments.
>
> KiwiRail has also strengthened isolation planning processes, including additional controls around changes to planned isolations. These changes provide greater assurance that electrical safe working limits are clearly established, communicated and maintained throughout the delivery of work, supporting the safety of workers undertaking activities within or near electrified infrastructure.
>
> KiwiRail will continue to review and enhance its electrical safe working arrangements to support a clear and consistent understanding of isolation

limits, worksite controls and associated risks by those involved in planning and undertaking the work.

5.5. The Commission welcomes the safety action to date. However, it believes more action needs to be taken to ensure the safety of future operations. Therefore, the Commission has made a recommendation in Section 6 to address this issue.

Safety issue 2: Before starting work, workers have no way to confirm that the lines are not live and that it is safe to proceed, relying instead on their understanding of where the protection limits are. This increases the likelihood of workers starting work in an unsafe area, which could result in injuries or death.

5.6. On 14 November 2025, KiwiRail supplied the Commission with the following information relating to safety action taken:

> Test Before Touch (TBT) process - KiwiRail has not changed the TBT procedure. It was and always has been done as part of the isolation procedure as required.
>
> The EF201/202 forms state the control measures identifying the isolation points and the earth locations (see below), and improved physical demarcation of the isolation limits has been introduced. Also, Personal Voltage Detectors (PVDs) have been implemented for workers working under isolated AC electrical systems;
>
> KiwiRail has reviewed the EF201/202 forms to:
>
> - Cleary identify who the permit was issued to as the holder of the permit for the duration of the EF201.
> - Cleary state the control measures identifying the isolation points and the earth locations.
> - The Electrical Work Safe Limits are listed that will be the demarcation of the Electrical Work Safe Area that are recorded as part of the Safety Briefing and parties sign on and off (Currently EF202).
> - Added change of holder to accommodate shifts or relief etc.
> - Clear instructions to hand back the permit to the Traction Competent Person and cancel the permit.
> - We have ongoing work around the EF202 permit and Job plan book
> - The change management for implementation is still to be fully rolled out to the printing of books required for the EF201, finalising the access permit for ESO working and the updating of the Job Plan Book.

5.7. In the Commission's view, this safety action has addressed the safety issue. Therefore, the Commission has not made a recommendation.

Safety issue 3: The track protection and isolation limit information shared in the prestart briefings did not provide all workers with a shared understanding of the limits, increasing the likelihood of workers exposing themselves to risk within the protected work area.

5.8. On 14 November 2025, KiwiRail supplied the Commission with the following information relating to safety action taken:

> As interim steps, listed in relevant regional Return to Work documents, we implemented physical demarcation at isolation limits. In Auckland Metro this includes blue cones, blue bunting attached to earthing cables at isolation points, RoLE signs and blue lights attached to traction poles.
>
> The UNI, LNI and Wellington have adopted the same process.

For the permanent steps, the regions have provided their requirements and are awaiting sign off to procure/use. Meterage marking and naming conventions are also to be standardised.

Supervision – KiwiRail has completed a full review and restructure of the Auckland Metro Traction team. This review has focused on bolstering leadership capability, role clarity and removing duplication of responsibility within the leadership structure. Importantly we have added an additional Isolation Planner role to allow greater capacity, and we have located the Isolation Planners under the lead Traction Field Engineer to ensure technical oversight.

We have also introduced three new Field Production Manager roles to enhance scoping and planning of works and supervision, particularly during nighttime maintenance operations.

Recruitment and HR have reviewed and amended PDs to ensure that they are accurate as far as role pre-requisites are concerned and have also amended procedures to confirm that background and prerequisite checks on skills and experience have been improved.

Our Learning & Development team (L&D) has just implemented CheckSafe, a competency management system and platform for management of safety observations of LE's operating in the Auckland Metro Rail Network. The further planned rollout of CheckSafe functionality will allow more effective management of competencies related to individual job profiles (i.e., the skills people require for individual roles).

5.9. On 27 July 2026, KiwiRail supplied the Commission with the following information relating to safety action taken:

KiwiRail notes that actions have already been implemented to improve the identification and communication of electrical isolation limits, including the introduction of physical demarcation measures such as blue cones, blue bunting, RoLE signs and blue warning lights at isolation points. Enhancements have also been made to the EF201 and EF202 permit processes to more clearly identify isolation points, earth locations and electrical safe working limits.

KiwiRail supports the objective of ensuring that electrical isolation limits are referenced through clear, consistent and readily accessible information. A revised Job Workbook has been developed and reviewed and, subject to final approval, will be published and implemented to support a common understanding of electrical safe working limits and field references.

5.10. In the Commission's view, this safety action has addressed the safety issue. Therefore, the Commission has not made a recommendation.

Safety issue 4: The track meterage on the Newmarket Branch Line differed from KiwiRail's track meterage described within the documented safety system. This increased the risk of rail personnel applying the incorrect meterage, which can result in maintenance activity being conducted outside the protection limits.

5.11. No action has been taken to address this safety issue. Therefore, the Commission has made a recommendation in Section 6 to address this issue.

6 Recommendations
Ngā tūtohutanga

General

6.1. The Commission issues recommendations to address safety issues found in its investigations. Recommendations may be addressed to organisations or people and can relate to safety issues found within an organisation or within the wider transport system that could contribute to future transport accidents and incidents.

6.2. In the interests of transport safety, it is important that recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

New recommendations

6.3. On 23 September 2026, the Commission recommended that the chief executive of KiwiRail improve track worker safety within a protected work area by ensuring the isolation of the overhead line equipment results in a fully protected work area. **[030/26]**

6.4. On 12 October 2026, KiwiRail replied:

> **Recommendation not accepted as worded**
>
> **KiwiRail's position**
>
> KiwiRail acknowledges the circumstances of the Parnell incident and agrees that workers must be able to clearly understand and readily identify the Electrical Work Safe Limits applying to their work.
>
> Since the incident, KiwiRail has strengthened the physical demarcation and communication of electrical work limits, revised its permit documentation, and introduced additional controls intended to improve workers' awareness of electrical hazards and safe working boundaries. The applicable safety procedure also requires workers covered by an Electrical Work Authority to understand the Electrical Work Safe Area, the equipment covered by the authority and the precautions associated with the work.
>
> KiwiRail therefore does not accept Recommendation 030/26 as worded. KiwiRail considers that a more effective safety outcome is delivered by ensuring that:
>
> 1. the purpose and limits of the PWA are clearly understood.
> 2. each worksite is defined and controlled according to the activity taking place.
> 3. electrical work requirements are determined through assessment of the task and its proximity to live traction equipment.
> 4. Electrical Work Safe Limits are clear, consistent, and readily identifiable.
> 5. the applicable Electrical Work Authority clearly records the authorised work, limits, and controls; and
> 6. the relationship between the Protected Work Area, individual worksites, electrical isolation limits, earthing arrangements, and the Electrical Work Safe Area is clearly communicated, understood, and verified by all personnel involved in the work.

6.5. On 26 September 2026, the Commission recommended that the chief executive of KiwiRail take appropriate steps to require a common set of track metrages across all the railway disciplines. **[031/26]**

6.6. On 12 October 2026, KiwiRail replied:

> **Response Status: Accepted**
>
> KiwiRail agrees that the use of a common location referencing system across railway disciplines is important to ensuring a shared understanding of asset location, worksite limits, operational controls and maintenance activities. Consistency of location information supports safe planning, communication and execution of work across operational, infrastructure and engineering functions.
>
> KiwiRail has adopted track metreage as the primary location reference standard and has already commenced work to address identified inconsistencies. This includes funded initiatives to correct traction pole numbering and associated location references, improve labelling and identification of traction assets, and align supporting records and documentation.
>
> As part of implementing this recommendation, KiwiRail will verify alignment between the documented safety system, asset management systems and supporting engineering records to confirm that a consistent track metreage reference is being applied. Where discrepancies are identified, corrective actions will be implemented through established engineering governance and change-management processes.
>
> KiwiRail notes that major construction works, renewals and infrastructure modifications may temporarily create differences between design information and operational records while projects are underway. These situations are managed through project-specific controls and change-management processes until all affected records can be fully aligned.
>
> KiwiRail therefore accepts Recommendation 031/26 and will continue the programme of work already underway to strengthen consistency of location referencing across railway disciplines.

7 Other safety lessons
Ngā akoranga matua

7.1. When planned work changes, parties responsible for planning, authorising, supervising and carrying out safety-critical work should establish a process to fully review and identify any new safety risks that might arise before proceeding with the new plan.

7.2. Effective communication is more than verbal instructions. Organisations should ensure that safety details are documented and accessible for future reference.

7.3. When referencing safety-critical information consistent terminology should be used and understood across roles and teams to avoid confusion and support a shared understanding.

8 Data summary
Whakarāpopoto raraunga

Vehicle particulars

Hi-rail vehicle EWP:	NSJ714
Classification:	Infrastructure Maintenance Equipment
Year of Manufacture:	2021Year of manufacture
Operator:	Martinus Rail New Zealand Limited

Date and time	4 September 2024, 0104
Location	Newmarket Branch Line, Parnell
Operating crew	traction electrician and EWP operator
Injuries	serious electrical burns
Damage	extensive to electrical circuitry

9 Conduct of the inquiry
Te whakahaere i te pakirehua

9.1. On 4 September 2024, the New Zealand Transport Agency notified the Commission of the occurrence. The Commission subsequently opened an inquiry under section 13(1) of the Transport Accident Investigation Commission Act 1990 and appointed an Investigator-in-Charge.

9.2. The Commission obtained documentation and records including:

- data from the transport vehicle involved
- train control records
- train control voice recordings
- traction control logs and System Control and Data Acquisition (SCADA) information
- maintenance records
- track and infrastructure records
- video recordings
- standards, rules and procedures
- documented processes.

9.3. The Commission investigators conducted 10 interviews with staff directly involved in the accident and attended various KiwiRail locations to obtain further information.

9.4. On 30 April 2026, the Commission approved a draft report for circulation to nine interested parties for their comment.

9.5. Six interested parties provided detailed submissions and three interested parties did not respond. Any changes as a result of the submissions have been included in the final report.

9.6. On 23 September 2026, the Commission approved the final report for publication.

Abbreviations
Whakapotonga

AEA	Auckland Electrified Area
CPP	Career Progression Plan
CRO	Control Room Operator
DEP	Designated Earthing Points
DIB	Daily Information Bulletin
EF201	Permit to Work Near Railway Power Lines
EF202	Planned Worksite Electrical Hazard Assessment form
EWP	elevated work platform
EWRB	Electrical Workers Registration Board
HRV	hi-rail vehicle
kV	kilovolt
MAD	minimum approach distance
MPC	Mobile Plant Controller
NIMT	North Island Main Trunk
NEW	Newmarket Branch Line
OLE	overhead line equipment

PPE	personal protective equipment
PWA	protected work area
RPO	Rail Protection Officer
TC	train control
TS90	Work Site Register

Glossary
Kuputaka

arc rated	refers to materials typically used in flame-resistant clothing and personal protective equipment that have been tested for their ability to withstand exposure to an electrical arc
competence	the combination of training, skills, experience and knowledge that a person has, and their ability to apply them to perform a task safely
electrical arc flash	electrical explosion or discharge that results from a connection through air to ground or another voltage phase in an electrical system
EF201 Permit to Work near Railway Power Lines	records the details of an Electrical Work Authority issued by a Competent Traction Person to a person at a worksite, providing assurance that work within the minimum approach distance from 25 kV OLE can be safely undertaken
EF202 Planned Worksite Electrical Hazard Assessment	completed by a Competent Traction Person at the worksite, recording the hazards and associated control measures for that specific worksite
electrified area	any area that has traction power equipment
Electrical Work Authority	an authorisation given to a Person in Charge or an Electrical Safety Observer, allowing work to start on or near specific high-voltage equipment normally in service (or ready for service). It states that the specified equipment is isolated and earthed, and that it is safe to begin work on or near the equipment
EWP operator	a hi-rail mobile elevated work platform operator
isolated	refers to equipment that has been intentionally and securely disconnected from any supply of electricity and has been de-energised but not necessarily earthed
live	connected to a source of electrical supply or subject to hazardous induced or capacitive voltages
live line tester	a device used on electrical equipment that gives an indication when a voltage is present in equipment

lock-on (lock-off) procedure	the method of placing a padlock to a lock-on frame (or removing it) in a dedicated protected work area
minimum approach distance	the safe working distance that provides rail personnel protection when working on or in the vicinity of energised lines and equipment
overhead line equipment (OLE)	catenary contact wire and associated equipment used to supply power to trains
permit to work near railway power lines (electrical)	records the details of an Electrical Work Authority issued by a Traction Competent Person to a person at a worksite for any work that could intrude inside the minimum approach distance
protected work area	section of line or lines where rail personnel are carrying out activities using an approved protection method. Fixed and/or mobile worksites will operate under the direction of a Rail Protection Officer in a protected work area
rail corridor	the land between the legal boundaries of railway land, or land within 4 m of the centreline of any operational track if the land boundary is less than this distance
Rail Protection Officer	the person with overall responsibility for providing rail protection for the protected work area
safe place	a place where people and equipment cannot be struck by passing rail traffic, which may be: • at a designated location that is at least 2.5 m from the centre of the nearest running line • within an approved refuge • behind a permanent safety line on a designated walkway • behind a permanent structure or permanent physical barrier that protects from moving trains • behind authorised fencing
safe work area	the area located between isolation points and more than one traction mast clear of any earth points used to establish the isolation
Traction Competent Person	a person registered with the Electrical Workers Registration Board (EWRB) who holds a current Electrical Practicing Licence from EWRB and has satisfied the Traction and Electrical Engineering Technical Committee (TEETC), or delegated authority, that they can safely

	perform the required electrical work, through successful completion of on-the-job training and other training requirements
Traction Control Room Operator	competent person responsible for monitoring and managing the high-voltage traction power supply systems powering electric trains
traction asset diagram	a visual representation that maps out the components and infrastructure related to the OLE
traction line mechanic	a person whose role includes maintenance, repair and replacement of traction overhead line assets and is endorsed for the equipment type being used
traction worker	specialist worker responsible for the maintenance, inspection and repair of railway electrification infrastructure
TS90 Work Site Register	records the names and contact details of the RPO and people who have been briefed and locked on to a worksite, and the details of vehicles operating within the worksite. The register also includes the identifying padlock used by each worker or vehicle and the time of entry and departure from the worksite, so that workers and vehicles can be accounted for
work area	a work area consisting of single or multiple worksites under the control of a Rail Protection Officer/Site Protector
worksite	an area with defined limits that is protected so that work can be performed

Citations
Ngā tohutoru

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Appendix 1 DIB protected work area

Wednesday 04 September 2024
Pukekohe – Waitākere and Branches

Pukekohe – Auckland (NIMT) continued:

Protected Work Area		Rule	Work Details
Auckland 11AR, 14ABR, 87, 104, 106, 122 Signals Up & Down mains, West Car Exchange No.1 and 2, Port Yard Centre, East Car Yard	Waitematā 51ABC, 52AC, 53AC, 54ABC Signals All Lines Auckland 130ABC, 132ABC Signals Up & Down mains	**TS06** Blocking	**2235, previous day to 0430** **2235 to 0430, next day** • Ventia • C9 Works • Link Alliance S Khan 027 287 6315 O/H Ref No.3518

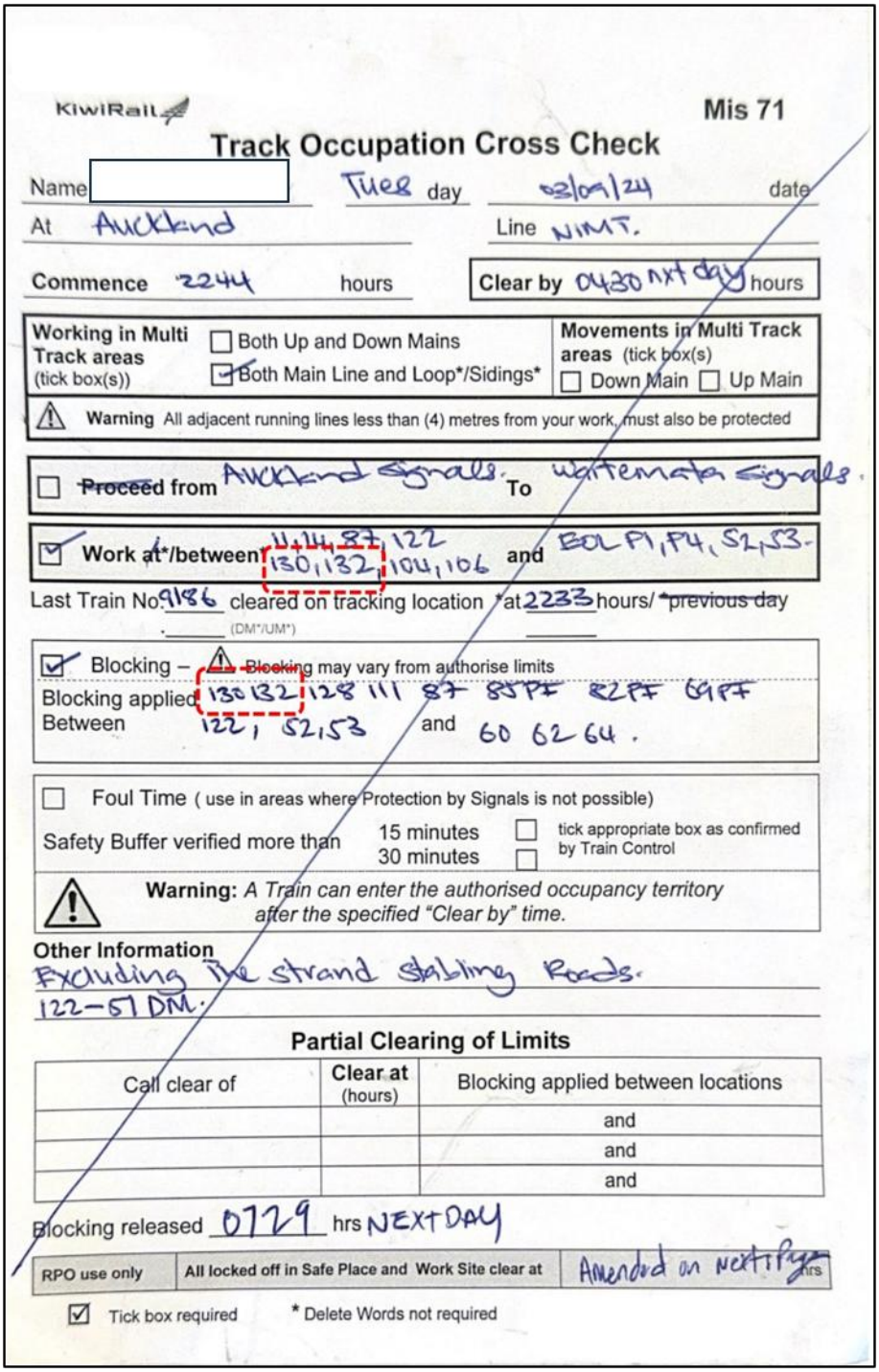
Line Impassable:
During the hours of work, the Line will be **Impassable** between the above limits.
Secondary Protection Arrangements:
Auckland:
- Lockout Zones LZ007, LZ101, LZ102, LZ103, LZ106, LZ107 and LZ110 will be applied.

Note:
- Includes the Strand and the West Car Exchange No.1 and 2 Roads.
- Excludes Strand Stabling Roads No.2, 4 and 5.

Parnell – Orakei (including Auckland Station Limits):
The overhead power will be cut off between:
- NEW 0022 at 2.307km, NEW 0023 at 2.431 km, (NEW)
  - Locations are between 21A/23A Points and 23B Points/117ABC Signal, Auckland Up & Down mains.
- AKD 12A, AKD 14A at 678.851 km (NIMT)
  - Locations are between M6784AB/M6783 Signals, Orakei and 111ABC/128ABC Signals, Auckland Up & Down mains.

This isolation covers all lines as described above unless otherwise specified.
Electric Service Limit Board's will be erected as required to indicate limits for EMU services. **Hours:** 2230, previous day to 0440 and 2230 to 0440, next day.
O/H Reference No.3518.

Appendix 2 Mis 71



KiwiRail

Mis 71

Track Occupation Cross Check

Name [redacted] Tues day 03/09/24 date

At Auckland Line NIMT.

Commence 2244 hours **Clear by** 0430 Nxt day hours

Working in Multi Track areas (tick box(s))
☐ Both Up and Down Mains
☑ Both Main Line and Loop*/Sidings*

Movements in Multi Track areas (tick box(s))
☐ Down Main ☐ Up Main

⚠ **Warning** All adjacent running lines less than (4) metres from your work, must also be protected

☐ ~~Proceed from~~ Auckland Signals. To Waitemata Signals.

☑ **Work at*/between** 44, 87, 122 130, 132, 104, 106 **and** EOL P1, P4, S2, S3.

Last Train No 9186 cleared on tracking location *at 2233 hours/ ~~*previous day~~
(DM*/UM*)

☑ Blocking – ⚠ ~~Blocking~~ may vary from authorise limits

Blocking applied 130 132 128 111 87 ~~83PF~~ ~~82PF~~ ~~69PF~~
Between 122, 52,53 and 60 62 64.

☐ Foul Time (use in areas where Protection by Signals is not possible)

Safety Buffer verified more than 15 minutes ☐ 30 minutes ☐ tick appropriate box as confirmed by Train Control

⚠ **Warning:** *A Train can enter the authorised occupancy territory after the specified "Clear by" time.*

Other Information
Excluding the strand stabling Roads.
122-57 DM.

Partial Clearing of Limits

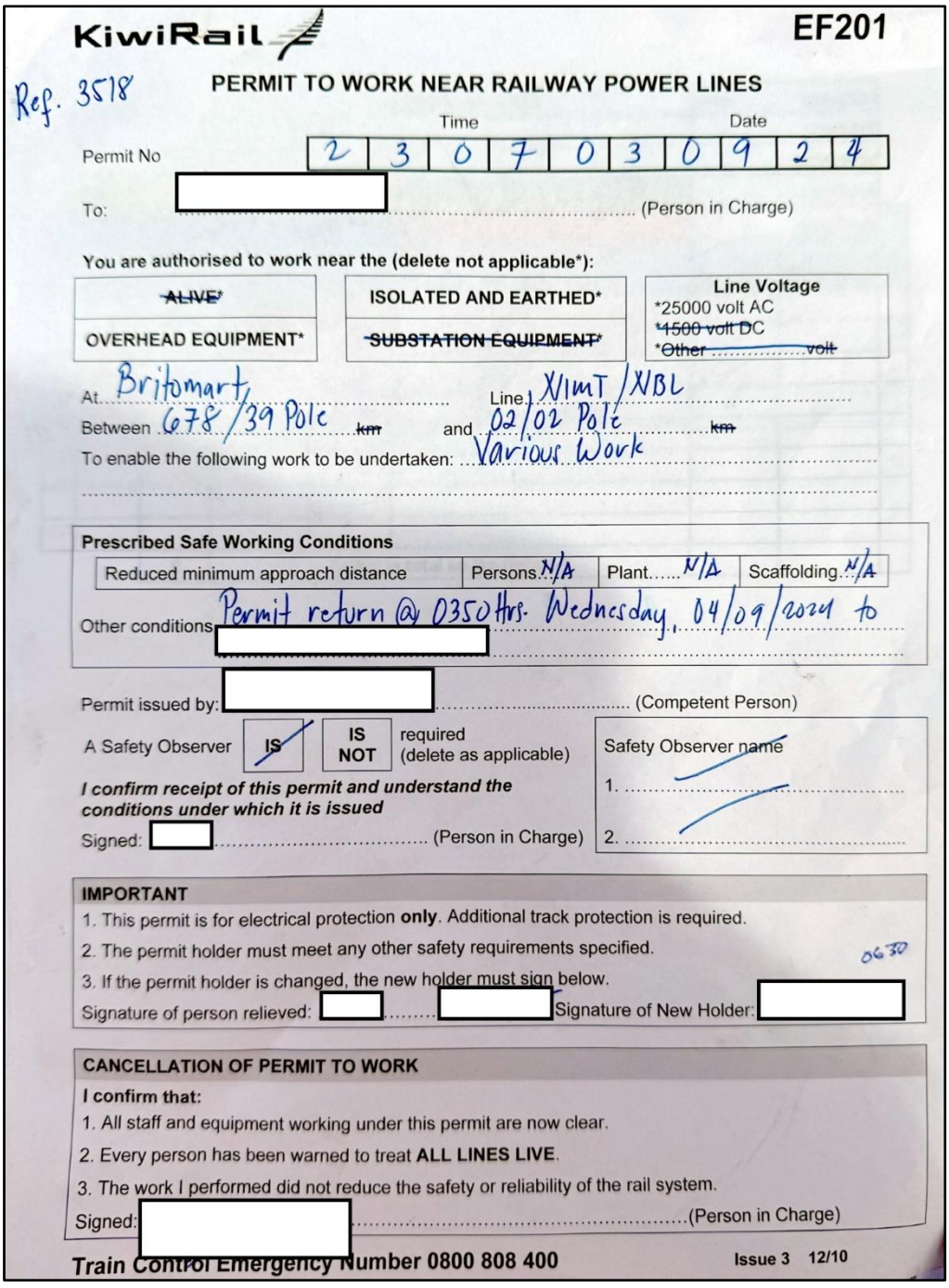
Call clear of	Clear at (hours)	Blocking applied between locations
		and
		and
		and

Blocking released 0729 hrs NEXT DAY

RPO use only	All locked off in Safe Place and Work Site clear at	Amended on next Page hrs

☑ Tick box required * Delete Words not required

Appendix 3 EF201 permit and EF202 electrical hazard assessment



KiwiRail

EF201

Ref. 3518

PERMIT TO WORK NEAR RAILWAY POWER LINES

Time Date

Permit No 2 3 0 7 0 3 0 9 2 4

To: [redacted] (Person in Charge)

You are authorised to work near the (delete not applicable*):

~~ALIVE*~~	ISOLATED AND EARTHED*	Line Voltage
OVERHEAD EQUIPMENT*	~~SUBSTATION EQUIPMENT*~~	*25000 volt AC
		~~*1500 volt DC~~
		~~*Other ..... volt~~

At Britomart, Line NIMT / NBL

Between 678 / 39 Pole ~~km~~ and 02/02 Pole ~~km~~

To enable the following work to be undertaken: Various Work

Prescribed Safe Working Conditions

Reduced minimum approach distance | Persons N/A | Plant N/A | Scaffolding N/A

Other conditions: Permit return @ 0350 hrs. Wednesday, 04/09/2024 to [redacted]

Permit issued by: [redacted] (Competent Person)

A Safety Observer ~~IS~~ / IS NOT required (delete as applicable)

Safety Observer name

1. ...

2. ...

I confirm receipt of this permit and understand the conditions under which it is issued

Signed: [redacted] (Person in Charge)

IMPORTANT

1. This permit is for electrical protection **only**. Additional track protection is required.
2. The permit holder must meet any other safety requirements specified.
3. If the permit holder is changed, the new holder must sign below.

0630

Signature of person relieved: [redacted] Signature of New Holder: [redacted]

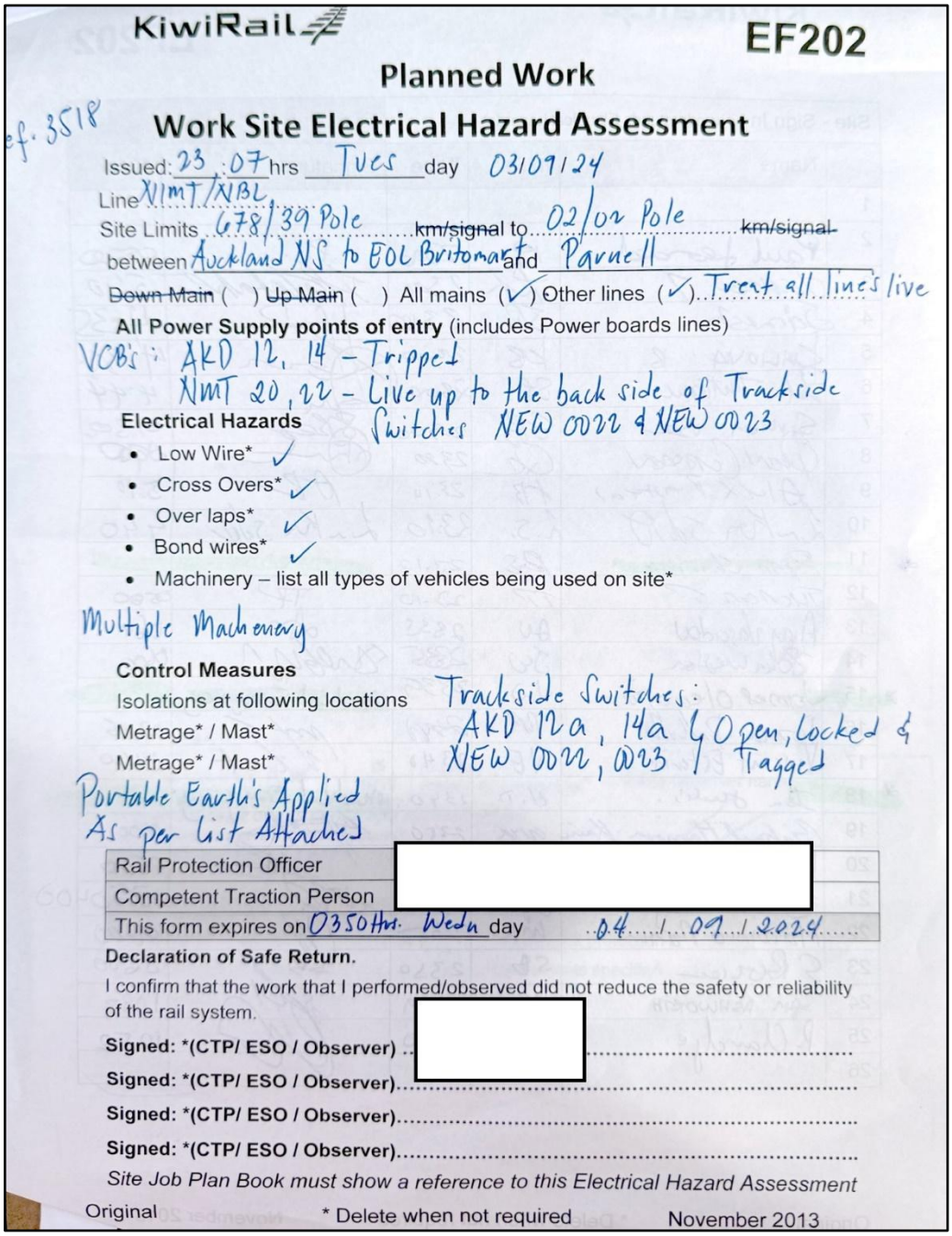
CANCELLATION OF PERMIT TO WORK

I confirm that:

1. All staff and equipment working under this permit are now clear.
2. Every person has been warned to treat **ALL LINES LIVE**.
3. The work I performed did not reduce the safety or reliability of the rail system.

Signed: [redacted] (Person in Charge)

Train Control Emergency Number 0800 808 400 Issue 3 12/10



KiwiRail

EF202

Planned Work

ef. 3518

Work Site Electrical Hazard Assessment

Issued: 23 :07 hrs Tues day 03/09/24

Line NMT/NBL

Site Limits 678/39 Pole km/signal to 02/02 Pole ~~km/signal~~

between Auckland NS to EOL Britomart and Parnell

~~Down Main~~ ( ) ~~Up Main~~ ( ) All mains (✓) ~~Other lines~~ (✓) Treat all lines live

All Power Supply points of entry (includes Power boards lines)

VCB's: AKD 12, 14 – Tripped
NMT 20, 22 – Live up to the back side of Trackside Switches NEW 0022 & NEW 0023

Electrical Hazards

- Low Wire* ✓
- Cross Overs* ✓
- Over laps* ✓
- Bond wires* ✓
- Machinery – list all types of vehicles being used on site*

Multiple Machenary

Control Measures

Isolations at following locations Trackside Switches: AKD 12a, 14a & Open, Locked & Tagged

Metrage* / Mast*

Metrage* / Portable Earth's Applied As per List Attached

Rail Protection Officer	
Competent Traction Person	
This form expires on 0350 Hrs. Wedn day 04/09/2024	

Declaration of Safe Return.

I confirm that the work that I performed/observed did not reduce the safety or reliability of the rail system.

Signed: *(CTP/ ESO / Observer) .....

Signed: *(CTP/ ESO / Observer).....

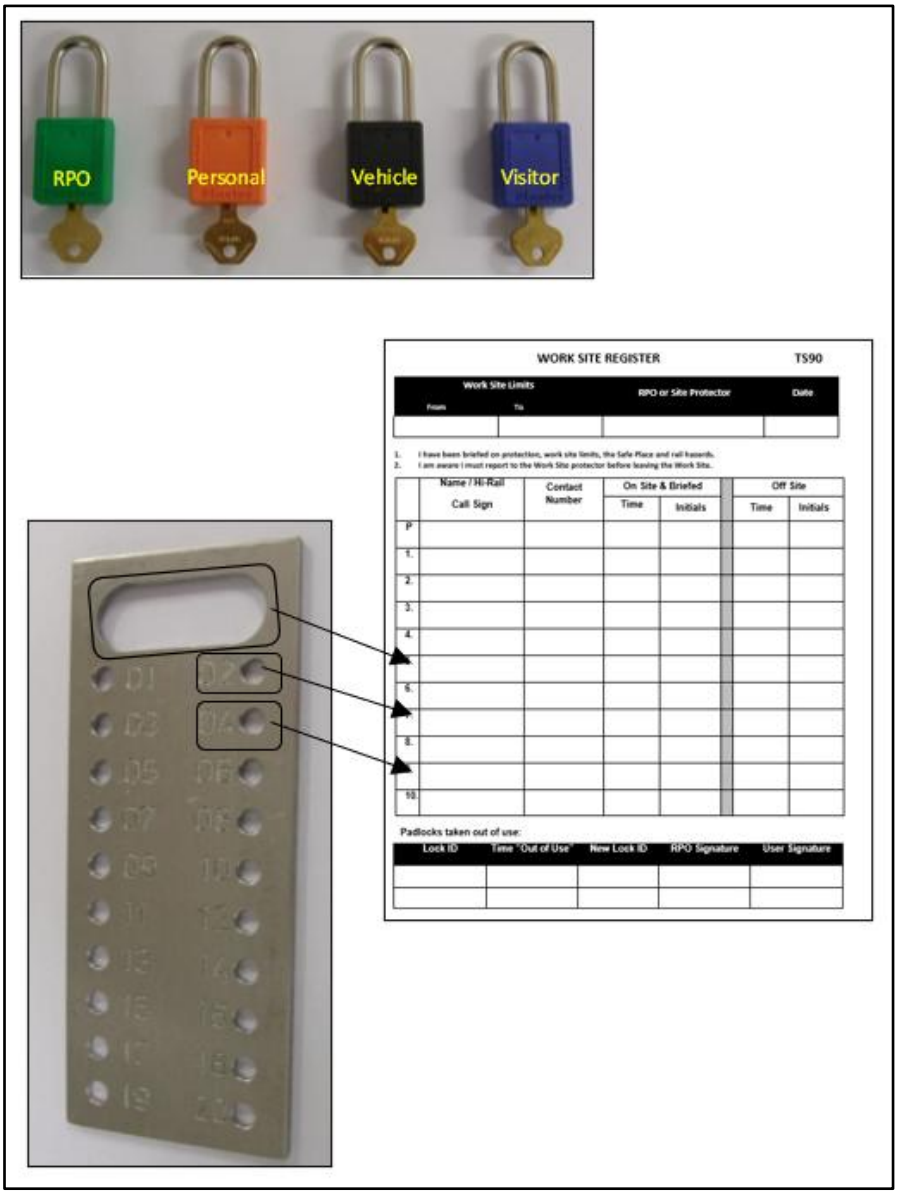
Signed: *(CTP/ ESO / Observer).....

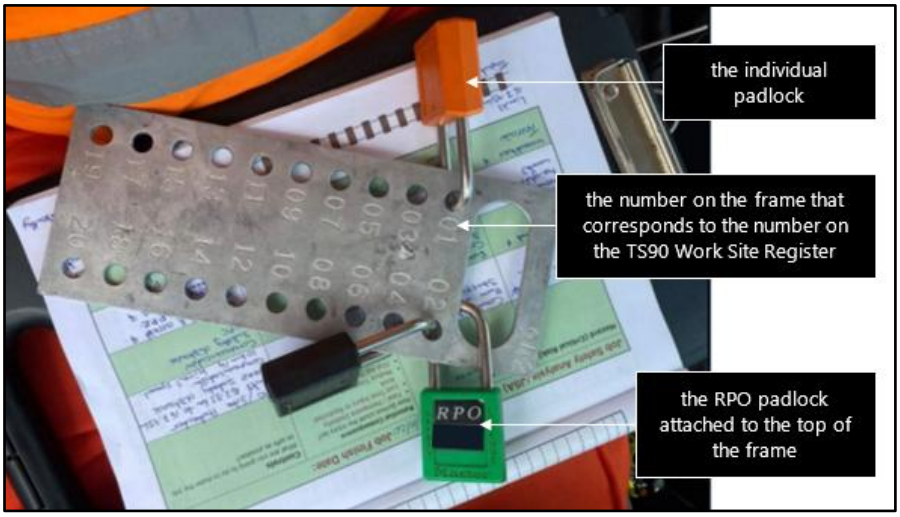
Signed: *(CTP/ ESO / Observer).....

Site Job Plan Book must show a reference to this Electrical Hazard Assessment

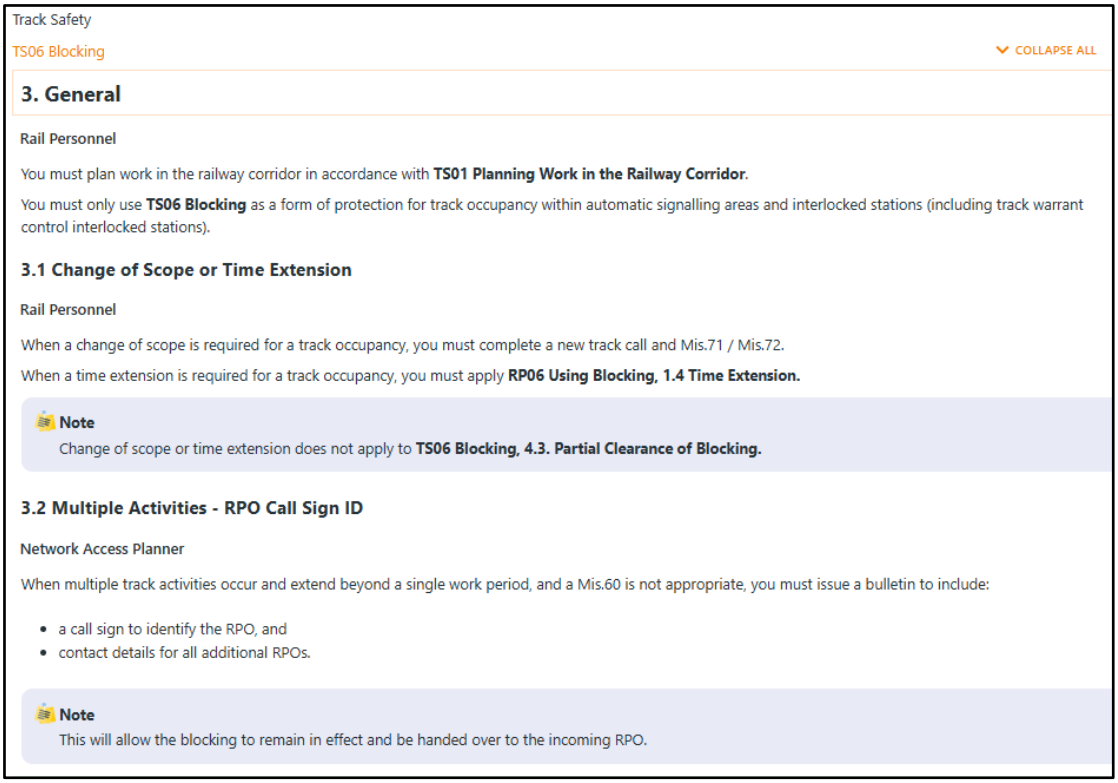
Original * Delete when not required November 2013

Appendix 4 TS90 Work Site Register, lock-on frame and colour-coded padlocks





Appendix 5 TS06 Blocking



Track Safety

TS06 Blocking

COLLAPSE ALL

3. General

Rail Personnel

You must plan work in the railway corridor in accordance with **TS01 Planning Work in the Railway Corridor**.

You must only use **TS06 Blocking** as a form of protection for track occupancy within automatic signalling areas and interlocked stations (including track warrant control interlocked stations).

3.1 Change of Scope or Time Extension

Rail Personnel

When a change of scope is required for a track occupancy, you must complete a new track call and Mis.71 / Mis.72.

When a time extension is required for a track occupancy, you must apply **RP06 Using Blocking, 1.4 Time Extension.**

Note

Change of scope or time extension does not apply to **TS06 Blocking, 4.3. Partial Clearance of Blocking.**

3.2 Multiple Activities - RPO Call Sign ID

Network Access Planner

When multiple track activities occur and extend beyond a single work period, and a Mis.60 is not appropriate, you must issue a bulletin to include:

- a call sign to identify the RPO, and
- contact details for all additional RPOs.

Note

This will allow the blocking to remain in effect and be handed over to the incoming RPO.

Appendix 6 Auckland rail corridor meterage and traction worksites

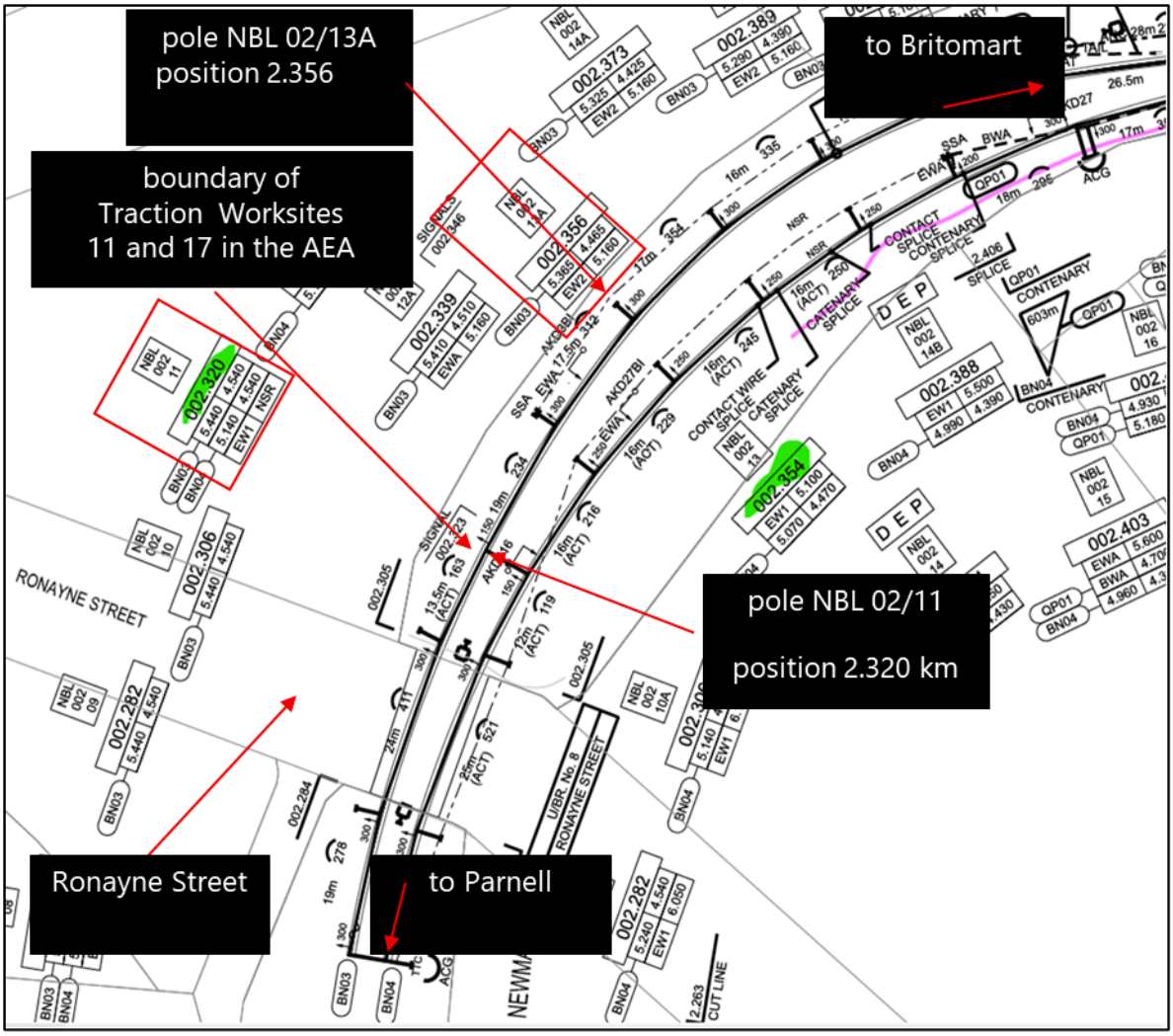
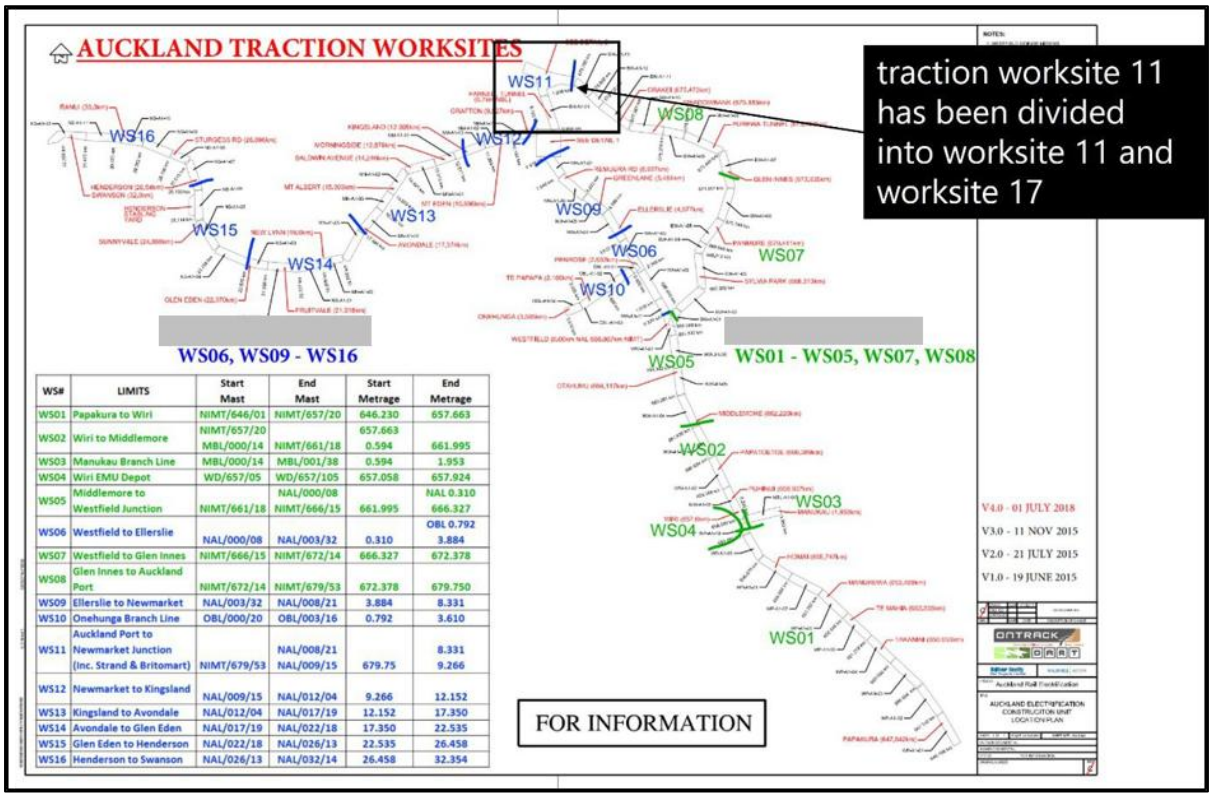


Figure A6.1 Map of traction poles



WS#	LIMITS	Start Mast	End Mast	Start Metrage	End Metrage
WS01	Papakura to Wiri	NIMT/646/01	NIMT/657/20	646.230	657.663
WS02	Wiri to Middlemore	NIMT/657/20 MBL/000/14	NIMT/661/18	657.663 0.594	661.995
WS03	Manukau Branch Line	MBL/000/14	MBL/001/38	0.594	1.953
WS04	Wiri EMU Depot	WD/657/05	WD/657/105	657.058	657.924
WS05	Middlemore to Westfield Junction	NIMT/661/18	NAL/000/08 NIMT/666/15	661.995	NAL 0.310 666.327
WS06	Westfield to Ellerslie	NAL/000/08	NAL/003/32	0.310	OBL 0.792 3.884
WS07	Westfield to Glen Innes	NIMT/666/15	NIMT/672/14	666.327	672.378
WS08	Glen Innes to Auckland Port	NIMT/672/14	NIMT/679/53	672.378	679.750
WS09	Ellerslie to Newmarket	NAL/003/32	NAL/008/21	3.884	8.331
WS10	Onehunga Branch Line	OBL/000/20	OBL/003/16	0.792	3.610
WS11	Auckland Port to Newmarket Junction (inc. Strand & Britomart)	NIMT/679/53	NAL/008/21 NAL/009/15	679.75	8.331 9.266
WS12	Newmarket to Kingsland	NAL/009/15	NAL/012/04	9.266	12.152
WS13	Kingsland to Avondale	NAL/012/04	NAL/017/19	12.152	17.350
WS14	Avondale to Glen Eden	NAL/017/19	NAL/022/18	17.350	22.535
WS15	Glen Eden to Henderson	NAL/022/18	NAL/026/13	22.535	26.458
WS16	Henderson to Swanson	NAL/026/13	NAL/032/14	26.458	32.354

Figure A6.2 Auckland traction worksite map

Auckland Traction Worksite – old naming convention

WS#	Section	Line	Start Mast	End Mast	Start Metrage	End Metrage
WS11A	Auckland Port to Britomart	NBL / NIMT	NBL/002/11 NIMT/679/53	NBL/002/49 BRT Reg 215	2.320 679.986	2.742 681.829
WS11B	Newmarket Junction to Strand	NAL/ NBL	NAL/008/21 NBL/000/01	NAL/009/15 NBL/002/11	8.331 0	9.266 2.320

Auckland Traction Worksite – new naming convention

WS#	Section	Start Mast	End Mast	Start Metrage	End Metrage
WS11	Newmarket triangle & NBL	NAL/008/21	NAL/009/10 & NBL/002/11	8.331	9.164 & 2.320
WS17	Auckland Port to Britomart	NIMT/679/53	REG215 & NBL/002/11	679.75	681.829 & 2.320

Figure A6.3: Old and new traction worksite boundary limits and locations in the Auckland Electrified Area

Appendix 7 Network Rail

Research to determine what practices other jurisdictions had in place on 'test before touch' found Network Rail in the UK had introduced the Test Before Touch standard[28] for OLE to enhance electrical safety and prevent life-changing injuries caused by inadvertent contact with live equipment (*see* Figure).

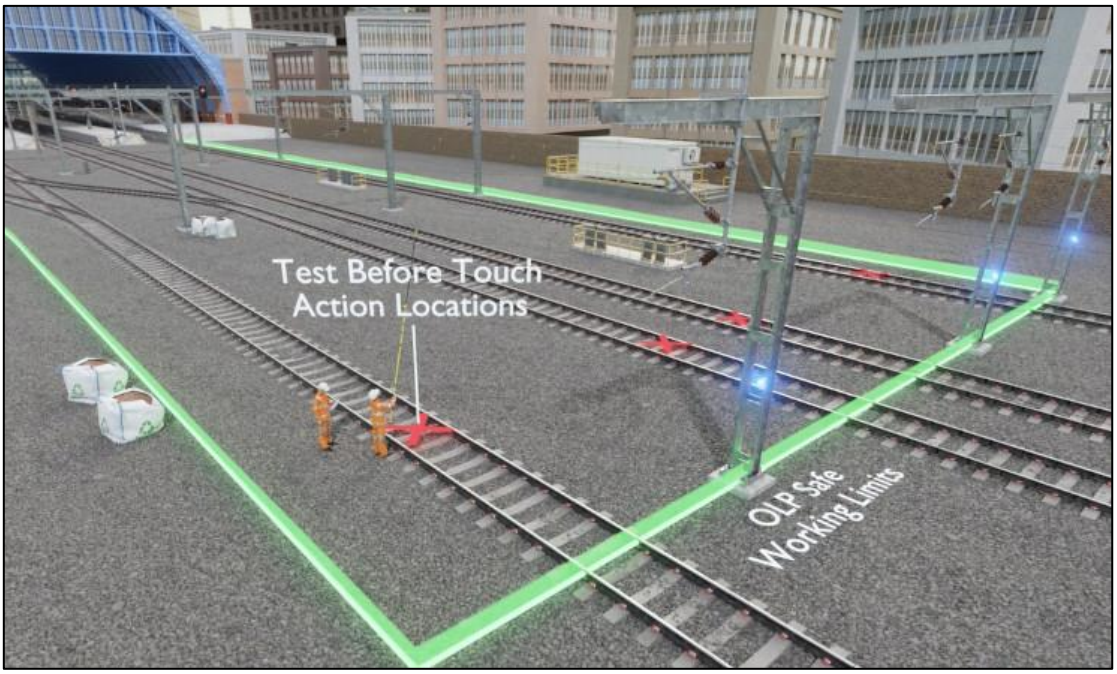


Figure A7.1: OLE safe working limits equipped with blue strobe light at the traction masts and Test Before Touch location

(Credit: Network Rail)

The standard formalised existing guidelines on the Test Before Touch Life Saving Rules. The test is a final step in the isolation process demonstrating that the OLE is de-energised at the test location.

The standard contains four different methods. For example, Method 1 provides the opportunity for an Equipment Competent Person to test at the time of the work. This does not require pre-planning, but it must be witnessed and documented.

[28] Network Rail standard NR/L3/ELP/27720

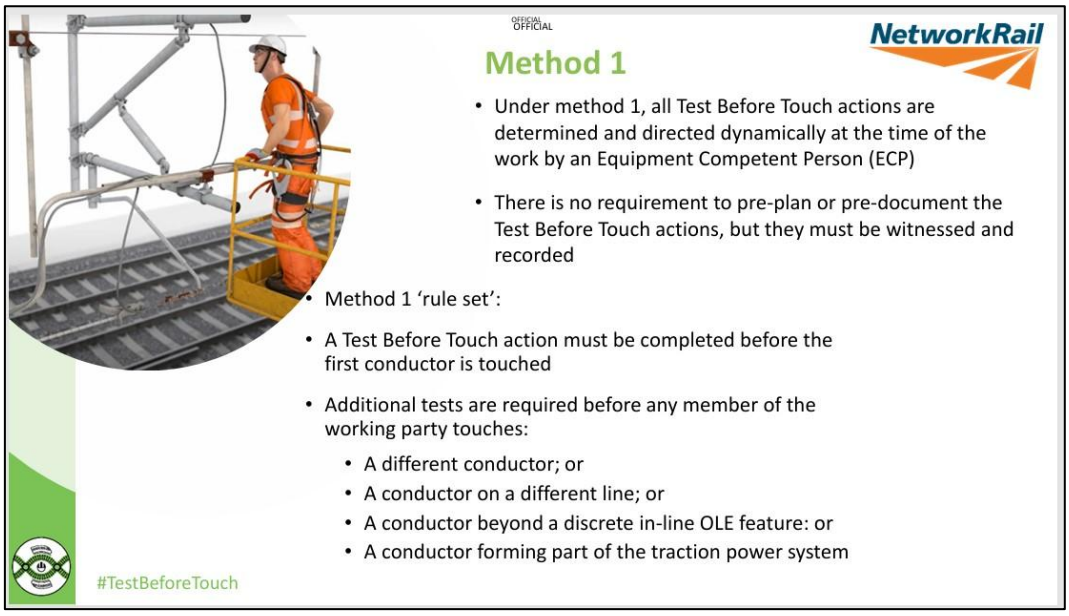


Figure A7.2: Test Before Touch Method 1 Network Rail standard.

(Credit: Network Rail)

Kōwhaiwhai - Māori scroll designs

TAIC commissioned its four kōwhaiwhai, Māori scroll designs, from artist Sandy Rodgers (Ngāti Raukawa, Tūwharetoa, MacDougal). Sandy began from thinking of the Commission as a vehicle or vessel for seeking knowledge to understand transport accident tragedies and how to avoid them. A 'waka whai mārama' (i te ara haumaru) is 'a vessel/vehicle in pursuit of understanding'. Waka is a metaphor for the Commission. Mārama (from 'te ao mārama' – the world of light) is for the separation of Rangitāne (Sky Father) and Papatūānuku (Earth Mother) by their son Tāne Māhuta (god of man, forests and everything dwelling within), which brought light and thus awareness to the world. 'Te ara' is 'the path' and 'haumaru' is 'safe' or 'risk free'.

Corporate: Te Ara Haumaru - the safe and risk free path



The eye motif looks to the future, watching the path for obstructions. The encased double koru is the mother and child, symbolising protection, safety and guidance. The triple koru represents the three kete of knowledge that Tāne Māhuta collected from the highest of the heavens to pass their wisdom to humanity. The continual wave is the perpetual line of influence. The succession of humps represents the individual inquiries.

Sandy acknowledges Tāne Māhuta in the creation of this Kōwhaiwhai.

Aviation: Ngā hau e whā - the four winds



To Sandy, 'Ngā hau e whā' (the four winds), commonly used in Te Reo Māori to refer to people coming together from across Aotearoa, was also redolent of the aviation environment. The design represents the sky, cloud, and wind. There is a manu (bird) form representing the aircraft that move through Aotearoa's 'long white cloud'. The letter 'A' is present, standing for a 'Aviation'.

Sandy acknowledges Ranginui (Sky father) and Tāwhirimātea (God of wind) in the creation of this Kōwhaiwhai.

Maritime: Ara wai - waterways



The sections of waves flowing across the design represent the many different 'ara wai' (waterways) that ships sail across. The 'V' shape is a ship's prow and its wake. The letter 'M' is present, standing for 'Maritime.

Sandy acknowledges Tangaroa (God of the sea) in the creation of this Kōwhaiwhai.

Rail: rerewhenua - flowing across the land



The design represents the fluid movement of trains across Aotearoa. 'Rere' is to flow or fly. 'Whenua' is the land. The koru forms represent the earth, land and flora that trains pass over and through. The letter 'R' is present, standing for 'Rail'.

Sandy acknowledges Papatūānuku (Earth Mother) and Tāne Mahuta (God of man and forests and everything that dwells within) in the creation of this Kōwhaiwhai.

Transport Accident Investigation Commission

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