Ngā Ūranga ki Pito One Shared Path Health and Safety in Design Register

Te Ara Tupua Alliance
Shifting gear to connect past, present and future

Risk Details									Pre-Treatment Risk Level						Treatment & Residual Risk						
Risk ID	Risk Title	Area	Design Work Package	Status	Risk Owning Organisation (PCBU)	AMT Owner	Risk Owner	Date Raised	Potential Causes	Potential Impacts (Consequences)	Existing Controls (Project)	Consequence Rating	Likelihood Rating	Current Risk Rating	Risk Treatment Actions (Project's mitigation)	Consequence Rating	Likelihood Rating	Residual Risk Rating	Residual Risk	Residual Risk Owner
1	There is a threat of temporary stability issues related to existing revetment (related to temporary support)	000 - Ngā Ūranga ki Pito-One	DWP-RV-01 DWP-SE-01	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)			The unknown condition of existing revetment. Collapse of temporary excavation, undermining of rail causing injury.	The consequence of the threat include: - Collapse of sections of existing revetment - Fatalities and serious injury of workers - Damage to plant and materials - Increased temporary works and support to protect existing revetment stability and railway corridor	Temporary works design to be considered as part of construction methodology.	Extreme	Unlikely	HIGH	Pre-construction investigations of existing rock revetment stability during design with current information and develop mitigation solutions and methodologies to be used during construction. Collaborative workshop with Construction team and KiwiRail to develop a temporary stability Trigger Action Response Plan (TARP) focused on temporary stability to be implemented during construction	Extreme	Rare	HIGH	Risk remains during construction though mitigated somewhat through investigations and TARP reducing likelihood of risk occurrence.	Construction [redacted]
2	There is a threat of working in confined spaces for manhole inspection and construction	000 - Ngā	N/A	Live - Treat	Te Ara Tupua Alliance				The cause of the threat is the requirement to access manholes for installation and inspection	The consequence of the threat is serious injury and potentially death of workers	Rungs in manhole to enable access	Severe	Unlikely	MEDIUM	**To be developed** Safe working method to be develop to govern work in confined spaces	Severe	Rare	LOW	Risk remains during construction though mitigated somewhat through Safe working method reducing likelihood of risk occurrence.	Construction [redacted]
3	There is a threat of unavailability of Rail Protection Officers	000 - Ng	N/A	Live - Treat	Te Ara Tupua Alliance				The cause of the threat is RPO resource availability one RPO needed per site (but may require spotters)	The consequence of the threat is that If RPOs are not available programme could be affected	Agreement with KiwiRail on Digital shield to reduce the number of RPO required	Moderate	Unlikely	MEDIUM	**To be developed** Train and develop project RPOs	TBC	TBC	#N/A	TBC	Construction [redacted]
4	There is a threat that the lack of sufficient availability of Electrical Safety Observer Officers causes delays to work fronts not being able to operate	000 - Ngā Ūranga ki Pito-One	N/A	Live - Treat	Te Ara Tupua Alliance				The cause of the threat is that not enough ESOs for required construction plant. Noting that 1 x ESO required per work group for each piece of shape changing plant - Currently c.10 in WLG region Number of work groups could be dependent on the number of ESO's	Consequence of the threat is the impact on delivery (critical path) - reducing the number of work groups (Base price assumes 3 ESO's - there is potential these may not be available and a team would not be able to be mobilised extending the programme based on ESO availability)	KiwiRail have committed to us 3 ESO's This will provide 1 ESO per work crew. (If 1 ESO not available for any reason one work crew may need to stand down until an ESO is available.)	Extreme	Likely	CRITICAL	TBC	TBC	TBC	#N/A	TBC	Construction [redacted]
5	There is a threat that cyclists choose to stay on State Highway over using the path. Risk of fatality on this road.	000 - Ngā Ū	DWP-TS-01 DWP-TS-02 DWP-PS-01	Live - Treat	Te Ara Tupua Alliance				The potential cause of the threat is user frustration with the design of the shared path (width, design speed) and maybe how busy it is	The consequence of the threat is that the project fails to achieve objective for commuters	TBC	Extreme	Likely	CRITICAL	Widening of the path, separated cyclist and pedestrian cycleways. The Ngā Ūranga ki Pito-One shared path has been designed to provide for high speed cyclists. Key considerations include the landings on the bridge design and separation of path users	TBC	TBC	#N/A	TBC	Waka Kotahi (operation)
6	There is a threat that the number of people using the completed path are lower than the numbers forecast.	000 - Ngā Ūranga ki Pito-One	N/A	Live - Treat	Te Ara Tupua Alliance				The project design or implementation does not shift enough people onto the path, from other modes of transport. The number of people using the path is dependent on the quality of the connections to the path which are outside the scope of the project but are being investigated by Waka Kotahi. The existing path to the south of the proposed tie-in provides a lower level of service for path users. It's narrow and does not have shared path treatments across conflict points with motor vehicles. This will result in an area of low level of service for path users between this project and the separated path on Hutt Road, limiting the potential for modal shift.	The project does not realise the outcomes sought. Fails to meet one of 2 project objectives.		Severe	Possible	HIGH	The intention is to ensure the design, implementation and ongoing maintenance create an environment that attracts people to use the shared path, including people already cycling on SH2. This will be supported by communications and behaviour change initiatives to raise awareness and support people to use Te Ara Tupua. 1. Ensure the design of the path is attractive and meets the needs of people walking, cycling and using micro-mobility devices. 2. Work with our Council partners to deliver wider connections for end-to-end journeys. 3. Ensure people have the knowledge, tools & skills to use the path through delivery of communications, marketing and behaviour change initiatives (together with our Council partners) that result in the numbers forecast being met Treatment Actions: 1. Work with the Te Ara Tupua Alliance to ensure the design of the path will meet the needs of people walking, cycling and using micro-mobility devices, including people already cycling on SH2. 2. Identify critical gaps in connections and work with Council partners to resolve prior to opening. 3. Identify and agree baselines and how uptake and mode shift will be measured.	Severe	Unlikely	MEDIUM		Waka Kotahi (operation)
7	There is a threat of people falling from bridge during construction (In NZ there have been 40 Fatalities 2011-2021 from falling from height)	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance				Cycleway bridge has to go over rail Barrier requirements influence bridge design and features Working at height for bridge erection and site splices for beams	Potential Fatality Costs of Prosecution / Enforceable Undertaking	Downer Critical Risk controls	Extreme	Rare	HIGH	Simplify site joints - bolted I-girder splices versus welding box girders Provide suitable barriers on bridge Look to modularise as much as possible to minimise on site activities	Extreme	Rare	HIGH	**Residual risk with the construction team**	Construction [redacted]
8	There is a threat of a train impact to a bridge pier during a large earthquake event due to potential displacements	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance				Trains travel past bridge piers (Bridge founded into rock, rails built on reclaimed land)	Potential fatalities or serious injuries for occupants in train or users on bridge Extreme Rare Event - Should not need pricing of multiple smaller events Noting in Extreme earthquake a train could be impacted, derail be affected by landslide or multiple other factors along this route	Additional clearance is provided. There is also a 3m maintenance route between rail and pier	Extreme	Rare	HIGH	Consideration of seismic effects on adjacent structures and how the land will look around the bridge in an IL2 and IL3 sized event Noted that: Health and Safety by Design an Alliance responsibility Cost impact of future earthquakes during operational life remains with Waka Kotahi / KiwiRail The chance of a train approaching the bridge just as a very large earthquake hits, would be a rare (very low probability event), but if it did occur, it could be serious. However consequences on passengers on a train anywhere along this stretch in a very large earthquake event could be similar.	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi & KiwiRail
9	Wave overtopping flows on path users during operation	000 - Ngā Ūranga ki Pito-One	DWP-RV-01 DWP-TS-02	Live - Treat	Te Ara Tupua Alliance				Crest level insufficiently high to mitigate overtopping flows. Sea level rise faster than allowed for in design. Wave modelling/overtopping analysis underpredicts overtopping flows.	Overtopping flows being hazardous to path users more frequently than anticipated in design.	Design to mitigate overtopping in accordance with MRs and international best practice guidelines. Consider sea level rise over project life and future adaptation options.	Minor	Likely	MEDIUM	Consideration of overtopping flows during various storm events over the project life. Public communication and digital signage for 'comfort' limits for users. Wave modelling and analysis to understand the LoS and design to achieve an agreed threshold. ITS warning signs and apps to improve user awareness. TARP allows for ongoing calibration against storm events to inform ITS messaging.	Minor	Possible	MEDIUM	Risk remains during operations though mitigated somewhat due to design process, TARP and ITS reducing likelihood of risk occurrence.	Waka Kotahi (operations and maintenance)
10	General service strike	000 - Ngā Ūranga ki Pito-One	DWP-UN-01	Live - Treat	Te Ara Tupua Alliance				- Limited and inaccurate information from utility providers - A large number of services in the northern and southern areas	- Death to workers from service strike - Negative environmental impact if gas or wastewater released - Reputation damage from public - Additional cost of unknown service relocations - Service outage	None	Extreme	Likely	CRITICAL	-'Desktop study (before you dig) identification of services in the corridor - Consultation with utility asset owners to improve understanding network and accuracy of data - Obtain GIS data from asset owners where available - Site Investigations complete to assist with design - Allowing the utility asset owners to review the permanent design solution - Allowing the utility asset owners to review the construction methodology if required. - Following correct breaking ground procedures where ground is broken	Extreme	Unlikely	HIGH	Risk of service strike reduced by following correct breaking ground procedures	Construction [redacted]

11	Threat of construction vehicles operating on a the temporary rail crossing	000 - Ngā Ūranga ki Pito-One	CWP-CO-11	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)	Construction vehicles are required to cross the live rail corridor to access the site.	Potential fatalities or serious injuries for occupants in train or driver of the construction vehicles.	- Restricted access to the KiwiRail Level Crossing.	Extreme	Possible	CRITICAL	- All staff to have completed appropriate KiwiRail safety training prior to access to the site - Visitors to site to be chaperoned across the construction level crossing by elected Alliance representatives - Temporary level crossing designed with appropriate sight lines, no stopping hatch, barrier arm with warning bells and flashing lights	Extreme	Rare	HIGH	Risk remains during construction though mitigated somewhat due to design process, and construction operating procedures reducing likelihood of risk occurrence.	Construction [redacted]
12	Cyclist speeds on bridge ramps	001 - Ngā Ūranga	DWP-TS-01 DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		A cyclist coming down bridge ramp picks up too much speed. Becomes unbalanced and loses control.	Cyclists lose control, resulting in a serious injury		Severe	Possible	HIGH	- Reduced landings on bridge. - Pavement markings to encourage slower speeds - Straight alignment and long sight distances - Extend the rub rail bar at the bottom of the bridge (at both ends) to consider a high speed zone and potential for user impact	Severe	Possible	HIGH	Risk remains, to be transferred to Waka Kotahi for operations and maintenance	Waka Kotahi (operations and maintenance)
13	SH2 cycle lane closure	001 - Ngā Ūranga	DWP-TS-01	Live - Treat	Te Ara Tupua Alliance		Cycle connection from SH2 is removed, to allow for the extension of the guardrails. Cyclists travelling southbound on SH2 are unable to join back onto the shared path at the SH2 KiwRail access. As a result, cyclists are required to stay on the shoulder of SH2, where the road narrows down substantially.	Vehicles side swipe cyclists, resulting in a serious injury or fatality.		Extreme	Unlikely	HIGH	Restrict cyclist access to SH2. Widen the shoulder on SH2. Path access still available at the Ngā Ūranga intersection	Moderate	Rare	LOW	- Cyclist choosing to use SH2 will not be prohibited	Waka Kotahi (operations and maintenance)
14	Maintenance Bay Access	000 - Ngā Ūranga ki Pito-One	DWP-TS-01	Live - Treat	Te Ara Tupua Alliance		KiwiRail vehicles drive on the shared path to access the KiwiRail maintenance bays.	Increased likelihood of conflict between KiwiRail vehicles and path users. Potential serious injury or fatality.		Severe	Unlikely	MEDIUM	Controlled access. Standard Operating Procedures for all KiwiRail vehicles. Spotter required if reversing onto the shared path is required. Operation restrictions for example operation outside of peak path periods. Signage and paint marking at maintenance bays. - Warning on VMS boards	Moderate	Unlikely	MEDIUM	- Turning of vehicles larger than utes requires reversing which enhances user vehicle clash - Risk of damage to specified pavement of maintenance bays	Waka Kotahi & KiwiRail
15	Conflict at Ūranga	000 - Ngā Ūranga ki Pito-One	DWP-TS-01 DWP-LS-01	Live - Treat	Te Ara Tupua Alliance		Cyclists travelling at high speeds colliding with pedestrians exiting Ūranga locations. Bike users riding to bike stand and parks	Collision resulting in serious injuries.		Severe	Possible	HIGH	- pavement and cultural markings to highlight increased risk. - Strategic positioning of bike parks to prevent access restrictions - Tactile delineation of Ūranga transitions points - movement of people, including wheelchairs and mobility scooters through Ūranga accesses	Moderate	Possible	MEDIUM		Waka Kotahi (operations and maintenance)
16	Tsunami	000 - Ngā Ūranga ki Pito-One	N/A	Live - Treat	Te Ara Tupua Alliance		Lack of escape routes for pedestrians and all path users	Multiple fatalities		Extreme	Rare	HIGH	Closure of path. Signage to direct pedestrians to nearest evacuation points. - Track crossing evacuation route via the track disregarded - Relying on mobile phone notification - Standard signage approach - Potential escape to the bridge a high point	Extreme	Rare	HIGH		Waka Kotahi (operations and maintenance)
17	Debris on path	000 - Ngā Ūranga ki Pito-One	DWP-TS-01 DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		Debris and ballast from the track washing over path. Gravel landscaping finishes migrating on to the path	Hazard to cyclists and micro-mobility users.		Moderate	Likely	HIGH	Maintenance of path to be agreed. Closure of path in significant weather events. Nib kerb or similar reduced level of gravel finish areas to contain loose finish materials Concrete finishes between path and Ūranga with ripping to capture finer materials Gravel areas are at a lower level than the path to reduce gravel onto the path 1m offset between planting and the path edge. Planting specified to minimise the impact on the path. Species mix to minimise the planting impact on the path			#N/A	- Gravel materials still expected to track across to be dealt with path sweeping	Waka Kotahi (operations and maintenance)
18	ITS cabinets	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance		Opening of ITS cabinets onto path may result in cyclists colliding with ITS doors.	Injury to cyclists.		Moderate	Unlikely	MEDIUM	ITS cabinets to be located away from shared path, with consideration for how they will be accessed and opened. ITS cabinets located minimum of 1m off the path, and open away from the path			#N/A		Waka Kotahi (operations and maintenance)
19	Boat ramp	000 - Ngā Ūranga ki Pito-One	DWP-TS-01	Live - Treat	Te Ara Tupua Alliance		Conflict between vehicles and path users.	Serious injury for cyclists.		Severe	Unlikely	MEDIUM	Restricted vehicle access to Honiana Te Puni Reserve west. Realign boat ramp to be away from the main desire line for cyclists. Widening of the boat ramp access to ensure that vehicles can wait before entering the shared path. Reversing of boat trailers with a spotter.			#N/A		Waka Kotahi (operations and maintenance)
20	Dog exercise area	003 - Honiana Te Puni Reserve	PEP-C	Live - Treat	Te Ara Tupua Alliance		Risk of off-lead dogs in the dog exercise area running across the shared path.	Serious injury for cyclists.		Moderate	Unlikely	MEDIUM	No dogs allowed on the main shared path. Lower cyclist speeds, through path marking and signage			#N/A	TBC - discussions regarding dog access are ongoing	HCC (operations and maintenance)
21	Low vision and blind users	000 - Ngā Ūranga ki Pito-One	DWP-TS-01 DWP-TS-02	Live - Treat	Te Ara Tupua Alliance		Risk of low vision or blind users wandering across into the cyclist area of the separated path.	Serious injury for pedestrians or cyclists.		Moderate	Unlikely	MEDIUM	Tactile delineation between the pedestrian and cyclist paths at high conflict points. Tactile delineation through Honiana Te Puni reserve. Pedestrians consistently located on the seaward side of the path			#N/A		Waka Kotahi

						s 9(2)(a)														
22	CCTV poles	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Risk of CCTV poles collapsing onto electrified rail lines	Electrocution		Severe	Rare	LOW	CCTV poles to be offset from the path (minimum 2m). Located at Ūranga and landscaped areas			#N/A		Waka Kotahi (Operations and Maintenance)
23	Collision between vehicles and bridge piers	001 - Ngā Ūranga	DWP-TS-02 DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Risk of vehicles losing control on SH2 and colliding into the bridge piers	Fatalities.		Extreme	Unlikely	HIGH	Thrie beam guardrail and crash cushion design to TL-3.	Severe	Unlikely	MEDIUM	Risk remains comparable to all State Highways	Waka Kotahi (Operations and Maintenance)
24	Derailment of train	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Risk of train derailing and colliding into the bridge piers	Fatalities.		Extreme	Unlikely	HIGH	In accordance with the Bridge Manual, the piers are designed for pier redundancy or impact loads.	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
25	Public using SH2 off-ramp	001 - Ngā Ūranga	DWP-TS-01 DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Vehicles accidentally use the SH2 off-ramp, thinking it is a public slip lane. Vehicles are then unable to exit, and dangerously try to rejoin SH2.	Accident on SH2	Existing signage on SH2	Severe	Unlikely	MEDIUM	Markings and signage to deter public/unauthorised vehicles	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
26	Public safety	000 - Ngā Ūranga ki Pito-One	N/A	Live - Treat	Te Ara Tupua Alliance			Anti-social behaviour on the shared path.	Serious injury or intimidation.	No public access over the rail corridor	Moderate	Unlikely	MEDIUM	CPTED principles, including full CCTV coverage of the path, good lighting, landscaping design to minimise hiding spots	Moderate	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
27	Bollards	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Cyclists collide with bollards at Honiana Te Puni reserve	Serious injury to cyclists	No bollards	Moderate	Likely	HIGH	Markings, stick on hazard markers Hazard markings on approach to bollards Sizing, spacing and hazard markings in accordance with Waka Kotahi design guidance note Access Control Devices on Paths (August 2021)	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
28	Cyclist joining path from Hutt Road	004 - Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Cyclists travelling from Petone are required to cross Hutt Road to join the path.	Serious injury to cyclists	There is an existing median island for pedestrians, but this may not provide sufficient protection for cyclists.	Severe	Unlikely	MEDIUM	Provision for existing crossing retained, pedestrian ramp to allow for cyclists and pedestrians to join path.	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
29	Lack of alternative routes for users during path closure	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Extreme weather	Path users are stranded, either on the path or at eithe rend of their journey. If cyclists choose to continue on their journey in extreme weather, there is a risk of serious injury in the exposed coastal environment	No public access to the coastal area	Moderate	Likely	HIGH	VMS and mobile phone communications. Path users encouraged to use public transport in event of path closure.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi. Operations and Maintenance plan and communication stratgey required.**	Waka Kotahi (Operations and Maintenance)
30	Slip on path markings	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Path marking materials becoming slippery in wet weather	User crash leading to serious injury	No risk	Moderate	Likely	HIGH	Slip resistance considered in material choice of path markings. A specification for all paint markings to have a minimum British Pendulum Number (BPN) has been 60 specified.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
31	Mixture of path users and vehicles at Honiana Te Puni Reserve (shared user zone)	003 - Honiana Te Puni Reserve	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Vehicle access alon gthe shared path, and through Honiana Te pUni Reserve	Vehicle collision with cyclists or pedestrians, resulting in serious injury or fatality.	No cyclists and pedestrians through this area during construction.	Severe	Possible	HIGH	- Cultural path markings - Tactile delineator to identify the main through route for vehicles and walking/cyclist users - Retractable bollards for restricted vehicle access (Waka Kotahi maintenance, KiwiRail (TBC), boat ramp and integrated club vehicle access, Mana Whenua	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi. Vehicle speeds and operation through this area to be determined through development of the Operations and Maintenance plan.**	Waka Kotahi (Operations and Maintenance)
32	Vegetation encroachment clashing with users	000 - Ngā Ūranga ki Pito-One	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance			Vegetation, landscaping finishing features clashing with path users	User crash leading to serious injury	N/A	Moderate	Possible	MEDIUM	- Vegetation free zone as part of the design specification - set back to standard - Planting plan to specify planting locations, offsets and species adjacent to the path - Long sight lines - Pruning of encroachment during maintenance as required	Moderate	Rare	LOW	**Residual risk with Waka Kotahi through maintenance.**	Waka Kotahi (Operations and Maintenance)
33	Sharp edges of hard finishes, artworks, interpretative signage	000 - Ngā Ūranga ki Pito-One	DWP-LS-02	Live - Treat	Te Ara Tupua Alliance			Sharp edges of hard finishes, adjacent to path. Cyclists travelling at speed	User crash leading to serious injury	N/A	Moderate	Possible	MEDIUM	- Climbing preventions - offsets from the path - located on the pedestrian side of the path - removal of sharp edges, radiuses added to all sharp edges	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
34	User slip and trips on the revetment rock surfaces at Ūranga	002 - Ūranga	DWP-RV-01	Live - Treat	Te Ara Tupua Alliance			Location of revetment adjacent to the path.	User crash leading to serious injury	N/A	Moderate	Possible	MEDIUM	Users not actively encouraged to climb down the revetment. Seating provided on the Ūranga. Offset from the path to the revetment. Appropriate lighting levels to highlight risk.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)

35	Soft landscaping finishes and mulch being blown into users	002 - Üranga	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance				High winds kicking up mulch or dust material into users and their eyes	Resulting in loss of control for pedestrians or cyclists, resulting in serious injury.	N/A	Moderate	Possible	MEDIUM	- Intentional placement of plants and species to provide shelter - No organic mulch on the site - heavy pebble gravel, offset from the path	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
36	Trees restricting sight lines, at Üranga and intersections in Honiana Te Puni reserve	002 - Üranga	DWP-LS-02	Live - Treat	Te Ara Tupua Alliance				Plant and rock finishes impeding user sight lines entering and exiting Üranga to main path	Collision between path users, resulting in serious injury.	N/A	Moderate	Likely	HIGH	- Consider sight lines when placing landscape finishes elements (trees, rocks, artwork) - low planting specified to maintain required sight lines for high speed cyclists - existing trees in Honiana Te Puni reserve	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
37	Long bikes parked at racks encroaching into the path	002 - Üranga	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance				Long bikes parked at racks encroaching into the path	Collision for pedestrians or cyclists, resulting in serious injury.	N/A	Moderate	Possible	MEDIUM	- Location of the bike park set into the rock gardens or planted area of Üranga to provide sufficient clearance between parked bikes and users	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi.**	Waka Kotahi (Operations and Maintenance)
38	Skateboarders / Riders on angled walls at Üranga	002 - Üranga	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance				Freestyle riders riding up angle of furniture	Accident resulting in serious injury.	N/A	Moderate	Possible	MEDIUM	- Consideration of loading in fixings - surfacing of furniture (seating) designed to be rough, to discourage skateboarding	Moderate	Unlikely	MEDIUM	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
39	Tāwharau Pods foundation opened out	003 - Honiana Te Puni Reserve	DWP-BU-02	Live - Treat	Te Ara Tupua Alliance				- Users climbing underneath the pod buildings	Accident resulting in serious injury.	N/A	Moderate	Unlikely	MEDIUM	- Closing off access under the pod buildings	Moderate	Rare	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
40	Climbing the canopy at the Tāwharau pods	003 - Honiana Te Puni Reserve	DWP-BU-02	Live - Treat	Te Ara Tupua Alliance				- Users climbing on top of the Tāwharau pods canopy	Fall from heights accident resulting in serious injury.	N/A	Moderate	Possible	MEDIUM	Structural design of the canopy in accordance with F4 Safety from Falling guidelines.	Moderate	Unlikely	MEDIUM	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
41	Open fires at Honiana Te Puni Reserve	003 - Honiana Te Puni Reserve	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance				Fires on the beach at Honiana Te Puni Reserve	Fire resulting in injury, or serious environmental impact	Fire restrictions on Honiana Te Puni Reserve beach	Severe	Unlikely	MEDIUM	- pebble beach to be retained at Honiana Te Puni reserve - driftwood in furniture to be secured - management of fires to be confimed in the Operations and Maintenance plan development. Through this, management of fires will likely be transferred to HCC	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi (operations and maintenance)
42	Tree stakes being removed and used	000 - Ngā Üranga ki Pito-One	DWP-LS-01	Live - Treat	Te Ara Tupua Alliance				Presence of tree stakes required for planting	Tree stakes present a hazard if pedestrians or cyclists fall, but also could be used as a weapon	N/A	Moderate	Rare	LOW	Planting maintenance to be managed by Waka Kotahi and the WTA	Moderate	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi (operations and maintenance)
43	Risk if the maintenance crews who replace the fence need to do this from KR's side of the fence	000 - Ngā Üranga ki Pito-One	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance				Causes of the mesh replacement is corrosion. Expected replacements approx. every 5-10 years	Injury/ death from trains	N/A	Severe	Possible	HIGH	- Ensure mesh can be replaced in segments from the path side of the project. - Ensure KiwiRail approvals have been gained - Ensure the chainlink mesh can be replaced from the shared path and not KiwiRail corridor - KiwiRail procedures for work in the rail corridor to be followed	Moderate	Rare	LOW	**Residual risk with Waka Kotahi, to be agreed with KiwiRail**	Waka Kotahi (operations and maintenance)
44	Consideration of mesh size to limit bicycle handlebar snagging	000 - Ngā Üranga ki Pito-One	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance				Installation of a fence which has gaps for handlebars to catch	Falling off bike causing serious injury.	N/A	Moderate	Possible	MEDIUM	- Ensuring that the fence is considered flush to avoid handlebar snag (aperture <25mm)	Moderate	Rare	LOW	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
45	Fence foundation design to consider ease of maintenance to replace fence posts.	000 - Ngā Üranga ki	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance				Required maintenance to replace the poles at certain intervals	Workers in proximity to rail and injury Long closure of path impacting user experience and forcing commuters to use the SH2 cycle lane (higher risk of injury to user).	N/A	Severe	Possible	HIGH	- Flange base connections to enable quick replacement of fence posts - Design allows maintenance to be completed from shared path, away from rail - 50 year design life foundations - Ability to replace the fence in small sections so it can be opened everyday and work on overnight	Moderate	Rare	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
46	The role of the fence for emergency evacuation	000 - Ngā Üranga	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance				Fence acts as barrier for emergency egress.	Places limitations of emergency egress of users in event of emergency such as easrthquake or tsunami	N/A	Severe	Unlikely	MEDIUM	-Tsunami signs and directional signs will be attached to the fence - Concept of Operations to be developed WK/KR - KiwiRail access gate and pedestrian gates could be used for purpose of emergency evacuation - to be developed as part of the Concept of Operations plan.	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	KiwiRail / Waka Kotahi
47	Fencing becoming live due to fall of KiwRail overhead DC power lines	000 - Ngā Üranga ki Pito-One	DWP-TS-03 DWP-TS-04	Live - Treat	Te Ara Tupua Alliance		Sep-22		Conductive fence material is within the KiwiRail Overhead Contact Line Zone and the overhead line drops onto it	Electrocution of path users who are in contact with the fence	N/A	Extreme	Unlikely	HIGH	- Adopt BS EN 50122 parts 1 and 2 - Follow KiwiRail guidance - Isolation of the fence within the OCLZ from fence outside the OCLZ through air gaps - Bonding of the fence via a spark gap inside the OCLZ to the KiwiRail earthing system via spark gap allowing current to flow back to source upon overhead line striking fence	Severe	Rare	LOW	Residual risk of a short duration shock if touching fence as the line falls. Residual risk transferred to Waka Kotahi	KiwiRail / Waka Kotahi

48	Step and Touch Potential Risk	000 - Ngā Ūranga ki Pito-One	DWP-TS-03 DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			A KiwiRail worker being in contact with the fence and a traction pole at the same time. Touch potential. There is a risk that these are at a different voltage potential which causes electrocution of the worker	- Electrocution of KiwiRail maintenance workers who may touch the fence and KiwiRail infrastructure (i.e. traction pole) at the same time.	N/A	Severe	Possible	HIGH	- Adopt BS EN 50122 parts 1 and 2 - Follow KiwiRail guidance - Provision to install bonding of fence to all traction poles - KiwiRail alternative is the inclusion of an insulating shroud to each traction pole to eliminate step and touch potential risk (KiwiRail)	Minor	Rare	LOW	- Shroud eliminates only touch potential risk. - Step potential risk remains. Short period of fault current. - Kiwi Rail to advise any further mitigation measures needed for step potential risk	KiwiRail / Waka Kotahi
49	Provision of 230V AC supply to steel feature posts	000 - Ngā Ūranga ki Pito-One	DWP-TS-03 DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Power supply	Risk of electrocution during fault	N/A	Moderate	Rare	LOW	Installation of RCBO protection for all circuits	Minor	Rare	LOW	**Residual risk with Waka Kotahi**	KiwiRail / Waka Kotahi
50	CPTED considerations. Visual permeability of fence	000 - Ngā Ūranga ki Pito-One	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance			Fence not being able to be seen through	Some path users may feel unsafe when using the path Fear/risk of assault	N/A	Minor	Possible	MEDIUM	Ensure the fence is a visually permeable fence (chainlink) Inclusion of CCTV	Minor	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
51	Users climbing over the top of the fence	000 - Ngā Ūranga ki Pito-One	DWP-TS-03	Live - Treat	Te Ara Tupua Alliance			Fence is easy to climb over	Trespassing into railway area, risk of electrocution or hit by train	N/A	Extreme	Unlikely	HIGH	- We will not be using razor wire - There are no stable horizontal components to the fence which makes this fence difficult to climb - Fence is 1.8m high - Fence adopts 25mm mesh making climbing difficult	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	KiwiRail / Waka Kotahi
52	Maintenance accessways	000 - Ngā Ūranga ki Pito-	DWP-TS-01	Live - Treat	Te Ara Tupua Alliance			Unauthorised pedestrian access to the rail corridor	Trespassing into railway area, risk of electrocution or hit by train	N/A	Extreme	Unlikely	HIGH	- Lockable gates - sliding gates where possible. - Gate at the traction station to be confirmed - All KiwiRail access to be completed under Standard Operating Procedures. - Use of the gates to be restricted to outside of peak cyclists commuter time	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	KiwiRail / Waka Kotahi
53	CPTED considerations - lighting the path	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Lack of lighting on the path	Safety and crime risk for path users and Waka Kotahi	N/A	Moderate	Almost Certain	HIGH	Lighting has been designed to PP3 (AS/NZS 1158 Part 3.1:2020) along the length of the path	Minor	Unlikely	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
54	CPTED considerations - vertical lumination of faces	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Lack of lighting height on the path	Safety and crime risk for path users and Waka Kotahi	N/A	Moderate	Almost Certain	HIGH	- Luminaire post height increased to 2.4 m and spaced very 15 m to ensure people faces can be lit up across the entire path - Increased lighting standard from MR requirement of PP4 to PP3 to meet vertical illumination requirements	Minor	Unlikely	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
55	CPTED - illumination of Ūranga	002 - Ūranga	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Lack of lighting in the Ūranga	Safety and crime risk for path users and Waka Kotahi	N/A	Moderate	Almost Certain	HIGH	- Provision of pole lighting and CCTV together at Ūranga	Minor	Unlikely	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
56	Fall from heights - Maintenance access on bridge and adoption of false kerb	001 - Ngā Ūranga	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Installation of the cable duct on the soffit of the bridge	Fall from heights - death/injury	N/A	Extreme	Unlikely	HIGH	- Cable ducts have been incorporated into the bridge structure with access chambers - Luminaires, drivers and circuits are accessible from the bridge deck	Moderate	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
57	Maintenance access of lighting units and drivers in feature posts to be from the path side (not in KR corridor)	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Installation of the lighting units are drivers in the KiwiRail corridor	Difficult to maintain due to KiwiRail access requirements	N/A	Moderate	Almost Certain	HIGH	- Maintenance access to drivers and luminaires from the shared path side of the fence through a steel plate cover	Minor	Unlikely	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
58	Grounding of feature posts, fence and bridge handrail to protect against electrocution	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Not grounding conductive objects	Electrocution	N/A	Extreme	Unlikely	HIGH	Appropriate earthing and bonding of conductive materials as directed by KiwiRail	Extreme	Rare	HIGH	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]

59	Light glare for train drivers	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Cause includes the train driver experiencing glare from the light source including direct glare, strobing which obscures their view	Driver is unable to see signals for a short time	N/A	Moderate	Possible	MEDIUM	- luminaire fitting directional and forward facing to reduce glare - Directional optic - Fine tuning of model to account for height and potion of train drivers and glare effects - Visors have been added to all Ūranga luminaires	Minor	Unlikely	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
60	Lighting spill at gravel beach/seawall locations	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Poor luminaire direction and colour temperature	Adverse ecological impact	N/A	Moderate	Likely	HIGH	- Modelling of lighting spill to be limited to the crest of the revetment and seawall capping beam crest - High quality directional LED lighting - Low colour temperature 2700-3000K	Minor	Unlikely	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
61	Signal lighting conflict between shared path and Ūranga	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara Tupua Alliance			Poor sighting of poles and poor lighting direction	Interruption of sightlines with KR signals	N/A	Minor	possible	MEDIUM	- Obtrusive calculations undertaken to show less than minor effect - Luminaire visors used for all Ūranga luminaires - Use of high quality directional luminaires	Minor	Unlikely	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
62	Slips / trips and falls on the pavement surface	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			- Inadequate surface finish once construction is complete - Loose chip or dirt on the pavement surface - Slippery manhole/ chamber lids	- Potential harm to the user	N/A	Moderate	Likely	HIGH	-Selection of appropriate asphalt - Project specification including pavement vertical tolerances. - Provision of adequate surface for end use, considering ride quality, skid resistance and waterproofing	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
63	Screwing motion of maintenance vehicles causing damage to pavement which may cause path users to trip and fall	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			- Maintenance vehicles turning in and out of maintenance bay areas and gates	- Uneven surface and asphalt damage leading to an injury	N/A	Moderate	Almost certain	HIGH	- Provision of concrete pavement at maintenance bay locations extended to the full width of the shared path to avoid pavement issues at these locations	Moderate	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
64	Trips and falls from kerbing and items around the pavement	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			- Variations in the surface at the fence edge, Ūranga tie in, service lid tie in	- Uneven surface leading to an injury causing incident	N/A	Moderate	Likely	HIGH	- Avoid trip hazards through appropriate design of edging, service lids and interfaces with Ūranga such as using flush nibs and high friction lid covers - Ensure all work packages design levels work with other work packages	Moderate	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
65	Management of differential settlement to avoid early pavement failure, uneven surfaces and ponding of water leading to path users triping over.	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			- Consolidation of bulk fill materials - Leaching of fines from bulk fill and pavement materials due to tidal actions and stormwater run off from adjacent KiwiRail corridor - Incorrect geotechnical information leading to inaccurate settlement calculations	- Short and long term settlement cause cracking of the pavement and early pavement failure - Ponding of water leading to ingress into the pavement leading to failure - Compounding detrimental effects.	N/A	Severe	Likely	CRITICAL	- Interception of runoff from rail corridor through a piped subsoil drainage system (DWP-DR-01) - Development and inclusion of a trigger action resposne plan for settlement/consolidation as part of the bulk earthworks. - Trafficked by construction plant to speed up consolidation process - Use of filter cloth to retain fines in seawall and revetments - Controlled bulk earthwork materials in geotechnical specification including use of a 20/75 (fine free) material for seawalls - Use of a heavy geotextile filter cloth between Type A and Type E materials at seawalls - Permeability gradient in fill material - Monitoring regime applies	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
66	Speeding of maintenance vehicles	000 - Ngā Ūranga ki Pito-One	DWP-TS-02	Live - Treat	Te Ara Tupua Alliance			Maintenance vehicle access to the shared path	Vehicle collision with cyclists or pedestrians, resulting in serious injury or fatality.	N/A	Severe	Possible	HIGH	- Signage - tight turning radiuses for maintenance vehicles - all maintenance vehicles accessing the path will be required to operate in accordance with a Standard Operating Procedure, and the Operations and Maintenance plan for the path	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
67	Slips and trips from pavements joints between surface types or asphalt pore joints	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			Pavement joints or uneven surface	Cyclists or pedestrians falling or tripping.	N/A	Moderate	Possible	MEDIUM	- Asphalt width controlled by fencing foundation at one side and nib kerb on the seaward side in the shared path and through the Ūranga - Path markings location at joints to mitigate visual impact	Moderate	Unlikely	MEDIUM	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
68	Plant adjacent to the rail (parked)	000 - Ngā Ūranga ki Pito-One	DWP-TS-01	Live - Treat	Te Ara Tupua Alliance			Plant adjacent to the rail corridor. Distraction for Train drivers, or interrupted sight lines.	Train incident or collision, due to distracted driver.	N/A	Severe	Unlikely	MEDIUM	- Digital shield for plant movements - Vortok fencing - RPO control and ITD control - Proximity sensors - Beacons - Permit to work from KiwiRail - ESO	Severe	Rare	LOW	**Residual risk with Construction, to be transferred to Waka Kotahi**	Construction [redacted]
69	Access for pavement maintenance plant	000 - Ngā Ūranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance			Heavy access required for pavement maintenance and renewals	Disruption to path use, potential damage to shared path, collision between heavy vehicles and shared path users	N/A	Severe	Possible	HIGH	- Pavement design life is 25 years, but asphalt requires resurfacing after approx. 15 years - All heavy maintenance vehicle access through the north end at Honiana Te Puni Reserve - All vehicle access, including heavy access to be defined in the development of the Operations and Maintenance plan	Severe	Rare	LOW	Residual Risk with Waka Kotahi	Waka Kotahi (Operations and Maintanance)

70	Scada maintenance crew - electrification by HV DC lines.	000 - Ngā Ūranga ki Pito-One	DWP-UN-01	Live - Treat	Te Ara Tupua Alliance		-SCADA fibre being pulled through and jointed in the same chamber as the HV DC traction lines	- Injury or death to workers - Reputational damage - Programme delays	N/A	Extreme	Possible	CRITICAL	- Separation of SCADA chambers from HV cable - ESO KiwiRail permit to dig requirements	Moderate	Unlikely	MEDIUM	Residual risk of accessing incorrect chamber, to be transferred to Waka Kotahi	Waka Kotahi, KiwiRail
71	Service strike via drill shot under SH2	000 - Ngā Ūranga ki Pito-One	DWP-UN-01	Live - Treat	Te Ara Tupua Alliance		- Limited and inaccurate information from utility providers - Large number of services present may have a more complex service network than anticipated - Insufficient controls in place during construction	- Injury/ death to workers from service strike - Reputational damage - Programme delays - Interruption of an important service	N/A	Extreme	Likely	CRITICAL	- Reduction of the size of drill shots and/or need for the drill shots. - Require that all services must physically located prior to commencing the drill shot - Consultation with asset owners and identification of stand over requriements, where required. - Design discussed with the construction team and modified where appropiate - Follow breaking ground proceedure	Extreme	Unlikely	HIGH	Risk of service strike	Construction [redacted]
72	Undermining the rail and while constructing the CSR	000 - Ngā Ūranga ki Pito	DWP-UN-01	Live - Treat	Te Ara Tupua Alliance		Undermining the railway by digging too deep into the existing rock/sea walls	-Unacceptable movement of the Railway resulting in an increase in cost and programme losses	None	Moderate	Possible	MEDIUM	- Move the subsoil drain as close to the fence foundation as possible - Approval granted for a departure to reduce the trench cover from 1m to 600mm	Minor	Unlikely	LOW	Shallower treanch reduces both consequence and likelihood of occurance. Risk to be transferred to Construction.	Construction [redacted]
73	Safety risk caused by construction of the CSR in the main site access road	000 - Ngā Ūranga ki Pito-One	DWP-UN-01	Live - Treat	Te Ara Tupua Alliance		- The main utility trench moving from side to side along the path	-Programme delays	None	Moderate	Almost Certain	HIGH	- Position main service trench to allow vehicles to pass during construction - Generally, the CSR shall be close to and offset to the fence foundation	Minor	Unlikely	LOW	Minor path crossings required at uranga etc. Ducts crossing shared path to be protected during construction. Risk to be transferred to Construction.	Construction [redacted]
74	Locking of ITS and electrical cabinets to avoid tampering by general public	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara TupuaAlliance		Public tampering with unlocked cabinets	Electrocution, failure of lights on path	None - no cabinets exist	Severe	possible	HIGH	Cabinets will be lockable and one of the hinges will be reversed so the cabinet door cannot be taken off	Severe	Unlikely	MEDIUM	Residual risk to be transferred to Construction.	Construction [redacted]
75	Appropriate IP rating of all cabinets for coastal environment	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara TupuaAlliance		Causes of damage include: - Wave overtopping - Inundation	Increase vulnerability of luminaires	None	Moderate	Likely	HIGH	IP rating have been adopted in terms of outdoor use, wave over topping considerations to be looked into during Stage C	Moderate	Unlikely	MEDIUM	Residual risk to be transferred to Construction.	Construction [redacted]
76	Chamber lids not appropriate for use causing damage to the lid or a person / cyclist slipping over	000 - Ngā Ūranga	DWP-UN-01	Live - Treat	Te Ara TupuaAlli		- Too slippery for the users - Too weak for maintenance vehicles	- Inadequate chamber cover sets causing an increase in maintenance increasing cost. - Potential injury for a person/cyclist slipping over	None	Moderate	Likely	HIGH	- Anti slip rating is compliant with ITS chamber lid standards - Use appropriate service lid cover rating for heavy vehicles (Class D)	Moderate	Unlikely	MEDIUM	Slip performance to be monitored. Ensure lids are class V slip resistance.	Waka Kotahi (Operations and Maintenance)
77	Chambers becoming inundated	000 - Ngā Ūr	DWP-UN-01	Live - Treat	Te Ara Tupua		- Water entering the chamber which is unable to exit	-Flooding and short circuiting of electrical cables and ITS infrastructure	None	Severe	Possible	HIGH	- Ensure the chambers have drainage holes in the bottom of them and do not seal duct entry point to chambers	Severe	Rare	LOW	Residual risk to be transferred to Waka Kotahi	Waka Kotahi, KiwiRail, One NZ
78	Threat of lifting/placement of culverts and manholes into position	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		Causes of the threat include: - A Lack of space on site, and specific culvert locations around xblocplus units - Close proximity to the rail corridor - Rotation of the pipe during placement	Consequences of the threat include: - may cause injury to workers - Clash with KiwiRail overhead electrical lines or trains resulting in injury to workers or public	Most culverts to be made from PE (i.e. light weight material) to reduce lift weight and improve plant control.	Severe	Possible	HIGH	Risk treatments include: -Calibrate digital shield control to include pipes being lifted - Weather consideration, choosing to lift when wind is low - Prepare a lifting procedure in construction work package - Suitable plant and trained, competant staff - Concrete pipe and manhole components specified to be less than lifting limits.	Moderate	Unlikely	MEDIUM	The residual risk is that pipes and manholes still need to lifted into position by workers, albeit with a slightly reduced consequence from material weight choice and worker training. Manholes are still concrete.	Construction [redacted]
79	Threat of transporting culverts to site	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		Causes of the threat include: - long vehicles required to transport to site. - Narrow worksite corridor	Consequences of the threat include Injury for workers when lifting/moving and damage to plant	- Material and length selection to reduce lift weight	Moderate	Unlikely	MEDIUM	Use of suitable equipment and trained, competent staff.	Moderate	Unlikely	MEDIUM	The residual risk is that pipes still need to be transported and handled by workers, albeit with a slightly reduced consequence from material weight choice and worker training.	Construction [redacted]
80	Threat of culvert storage on site prior to installation	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua A		Causes of the threat include: - Small site footprint means that there is less space for manoeuvring	Consequences of the threat include increased risk of trips and falls due to reduced space	N/A	Insignificant	Unlikely	LOW	Use of suitable equipment and trained, competent staff. Pre planning of pipe storage location, and staggering ordering culvert and manhole materials to suit culvert construction schedule.	Insignificant	Rare	LOW	Although the location for the pipe storage is pre-determined within the yard, the pipe will still occupy space within the worksite. This still presents the threat to workers, albeit at a lower likelihood.	Construction [redacted]
81	Threat of path collapse from storm events driving piping and blowout underneath path	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alli		The cause of the threat is water from storm events (rainfall and storm surge) piping outside culvert causing blow out or undermining	The consequence of the threat is injury to path users	- Concrete encasement through revetment	Moderate	Rare	LOW	End of pipes through revetments to be concrete encased, and use of Hynds PKS pipes with ribbed outer face and rubber ring joints will mitigate this risk.	Moderate	Rare	LOW	**Accepted by residual risk owner.** Low to residual risk. Combination of concrete encasement and water collar eliminates piping during rainfall. Residual Risk to be transferred to Waka Kotahi	Waka Kotahi (operations and maintenance)
82	Construction plant damaging pipe during installation	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		Incorrect use of plant, lack of site awareness	Difficulties in pipe installation. Risk to public if pipe is installed damaged.	- Pipe Material and thickness selection against construction loading	Insignificant	Possible	LOW	- Construction staging design - Temporary cover protection design to be checked by designer (minimum 500mm) - Discussion with constructors around Temporary cover protection - QA process while installing culverts to be followed - if pipe is damaged, to be removed and replaced with undamaged pipe.	Insignificant	Unlikely	LOW	There is still a low residual risk of culverts being damaged during construction, however if a 500mm minimum cover is achieved before tracking over the culverts, and manufacturer's guidance followed, this risk is low.	Constructor

83	Threat of working in water where pipe outlets are within the tidal range	002 - Ūranga	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)	The cause of the threat is the proposed culvert level is controlled by the outlet location of the existing culvert	Consequences of the threat include: workers slipping, injury, or drowning	- PE pipe selected to reduce weight of pipes	Extreme	Possible	CRITICAL	- Use of suitable equipment and trained, competent staff. - Pipe grade decreased where possible to enable construction above MSL. - Installation of culverts to be undertaken at low tide. - Construction team to consider use of a coffer dam or shields to prevent seawater entering construction space while installing culverts below sea level.	Extreme	Unlikely	HIGH	Residual risk is the requirement to install pipes within the tidal range, albeit with a lower frequency of occurrence	Constructor
84	Threat of public and/or maintenance workers entering confined spaces by entering the pipes from the outlet end	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The cause of the threat is ease of access for public climbing down the revetment from the path to culvert outlets. This is heighted at Ūranga section of the rock revetment due to benches at MHWS, shallow slope of rock as primary armour.	The consequences of the threat include public drowning, becoming trapped in confined space	Consideration of outlet control measures	Severe	Possible	HIGH	- Angle culvert 5 and 6 so that they do not outfall beneath or at a rock revetment bench - Undertaking maintenance through CCTV and flushing from the upstream end - Maintenance workers to have appropriate confined space training	Minor	Unlikely	LOW	**Accepted by residual risk owner.** Refer to NKP-TAT-MEM-CV-DR-000002 Health and Safety and Maintenance consideration at culvert outlets memo for more detail on the treatment of this risk. Residual risk to be transferred to Waka Kotahi.	Waka Kotahi (Operations and maintenance)
85	Threat of a spill of hazardous material used in culvert construction into the ocean	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		Cause of the threat includes misuse of plant, uneven terrain, uncontrolled refuelling procedures	Exposure for construction workers, public and marine life	N/A	Moderate	Unlikely	MEDIUM	Environmental Control Plan. Use of suitable equipment and trained, competent staff.	Moderate	Unlikely	MEDIUM	Residual risk is that spill may still occur, however the environmental controls plan will enable the risk owner to adequately manage effects for both work safety and environmental	Constructor s 9(2)(a)
86	Threat of fall from heights during placement of revetment units (rock and XBlocPlus) around culvert	002 - Ūranga	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		Cause of the threat includes lack of space on site, slippery surface, and specific culvert locations around xbloc units and rock revetment	The consequence of the threat is that it may cause injury to workers	N/A	Extreme	Unlikely	HIGH	Use of suitable equipment and trained, competent staff. Construction to take place at low tide, and not on a rainy day while area is slippery. Xbloc units to be placed with a GPS locator grapple.	Extreme	Unlikely	HIGH	Residual risk is that although adequate training is in place, workers may still be subject to a fall from height while placing revetment block/rock around the culverts. Residual risk to be	Constructor s 9(2)(a)
87	Threat of fall from heights during shared path operation (and maintenance)	002 - Ūranga	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The cause of the threat is ease of access for public climbing down the revetment from the path to culvert outlets. This is heighted at Ūranga section of the rock revetment due to benches at MHWS, shallow slope of rock as primary armour. There is also alack of visibility of culvert, slippery surfaces around outlets	The consequence of the threat is that it may cause injury to maintenance workers and the public	N/A	Extreme	Unlikely	HIGH	- Culvert outlet terminates before the revetment edge (set back by 600mm from revetment face for rock revetment, and set back to align with the back of the adjacent xbloc wings on xbloc revetments) - Angle culvert 5 and 6 so that they do not outfall beneath or at a rock revetment bench. Therefore no outfalls are at benches, reducing the risk of public access.	Extreme	Rare	HIGH	**Accepted by residual risk owner.** Refer to NKP-TAT-MEM-CV-DR-000002 Health and Safety and Maintenance consideration at culvert outlets memo for more detail on the treatment of this risk. Residual risk to be transferred to Waka Kotahi.	Waka Kotahi (Operations and maintenance)
88	Threat of slippery surface/inadequate space at outlet, causing slips, trips and falls when maintaining the outlet	002 - Ūranga	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The causes of the threat include lack of space on site, slippery surface	The consequence of the threat is that it may cause injury to maintenance workers and the public	Culvert outlets designed with consideration to have minimal maintenance	Severe	Unlikely	MEDIUM	Maintenance to take place at low tide, and not on a rainy day while area is slippery. Identification of risk in maintenance manual Undertaking maintenance at the upstream end where possible, including CCTV and flushing from manholes	Moderate	Unlikely	MEDIUM	Residual risk that the maintence workers are still undertaking work on a slippery surface around the outlets	Waka Kotahi (Operations and maintenance)
89	Threat of undermining of existing rail corridor when constructing large chambers to allow connection of extension	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The cause of the threat include insufficent or lack of temporary retaining during construction	The consequence of the threat include: - May cause serious injury to construction staff, rail passengers, and KR staff - may cause significant damage to rail corridor	N/A	Extreme	Rare	HIGH	Temporary works design for manhole installation to be undertaken by cosntruction team. Action for 'Trigger Action Response Plan' (TARP) to be prepared by construction team.			#N/A	TBC follow preparation of TARP by construction team	Constructor s 9(2)(a)
90	Threat of addition of manhole covers within shared path due to connection manholes - could cause slip / trip / fall / public lifting manhole covers	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The causes of the threat includes: - Manhole lids for a lip or a dip from settlement - Lid material is a slippery surface for users	The consequence of the threat is it may cause injury to public	- Anti-slip coating on manhole lids - Lockable lids - Design requirements and specifications on manhole settlement	Moderate	Unlikely	MEDIUM	- Using sleeved coupling instead of manhole to eliminate the cover hazard - incorporating asphalt on manhole lids (Wundercovers) to reduce slippery surface area - Manholes to be bolted to prevent public lid lifting	Moderate	Rare	LOW	**Residual risk accepteded by risk owner.** Measure to minimise no. of lids in combination of non-slip lid provide a low risk of the threat to the public. Residual risk to be transferred to Waka Kotahi	Designer
91	Threat of connection to existing culvert results in existing culvert collapsing beneath due to poor condition of existing culvert.	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The cause of the threat is poor structural integrety of existing culvert	The consequence of the threat includes: - May cause injury to construction workers, - May cause undermining of railway above, - Requires replacement/repair of existing culvert	N/A	Extreme	Unlikely	HIGH	Structural assessment of outlets to be completed prior to culvert connections. Construction TARP for rail corridor threat to include section on existing pipe stability.	Extreme	Rare	HIGH	**Residual risk with the construction team**	Constructor
92	Threat that connections that degrade earlier than design life and require maintenance to recitfy	000 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		The causes of threat includes localise differential settlement around the connection failure from: - Settlement beyond design requirements - Earthquake - Connection installation not meeting design spec/standards	The consequence of the threat is uneven path surfaces leading trips and injury to public	- selection of couple type and materials - design requirements and specifications to ensure design life is met	Minor	Rare	LOW	Where couplers are used for connections to existing culvert, couplers to be wrapped in 2 layers of denso tape in accordance with manufacturer's guidance, and encased in concrete. WWL dispensation for this detail has been agreed.	Minor	Rare	LOW	**Residual risk accepteded by risk owner.** Design requirements ensure that differeintial settlement that poses a trip hazard is sufficiently minimised	Designer
93	Earthquake occuring during the construction of the bridge	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		There is a threat of a large earthquake 7.0 or greater during construction	Threat of injury (or worse) to construction workers	Design adopts prefabrication off site before installing on site to optimise the construction programme to minimise the time on site	Severe	Unlikely	MEDIUM	Any temporary works to be design for appropiate seismic return period, Precast/prefabrication elements	Moderate	Unlikely	MEDIUM	**Residual risk with the construction team**	Construction
94	Confined access entering/exiting to the bridge site adjacent to SH2	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		Risk of conflict/collision of vehicles accessing site from SH2. Existing cycleway also crosses this accessway	Injury/death, vehicle damage	Traffic Management Plan	Severe	Possible	HIGH	Traffic Management Plan	Moderate	Possible	MEDIUM	**Residual risk with the construction team**	Construction
95	Structure Collapse during demolition	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		Collapse of structure during demolition, leading to collapse or injury	Injury, death, damage to other property	Operation and maintenance manual to be prepared as part of PS4 handover at the end of construction	Severe	Unlikely	MEDIUM	Operate and maintence manual to outline elements of the structure where specific treatment is required during demolition. Recommend to demolish in the reverse order to construction	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
96	People falling from Height from the Bridge Structure during Operation	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		People falling from height off the bridge	Injury, death to path users	Bridge Railing to meeting NZBC F4 and Kiwirail W201 for railing height and design loadings - typical 1200mm railing height with sections that are	Severe	Unlikely	MEDIUM	Bridge Railing to meeting NZBC F4 and Kiwirail W201 for railing height and design loadings - typical 1200mm railing height with sections that are	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Waka Kotahi
97	Clash between path users and maintenance/emergency vehicles over the bridge	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance		There is a treat that a conflict could arise betweena path user and maintenance/emergency vehicle during the design life of the structure	Injury, death to path users	N/A	Severe	Unlikely	MEDIUM	Recommend that maintenace and emergency vehicles have a person in front of the vehicle	Severe	Possible	HIGH	**Residual risk with Waka Kotahi**	Waka Kotahi

98	People throwing objects from the bridge	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)		People climbing or throwing objects above the railway leading to falls or electrocution	Injury, death to path users, damage to train, vehicles & property below	1800mm fall protection railing on the side of the bridge adjacent to the rail line to stop items being thrown or people jumping. Earthing and bonding of the structure and handrail to prevent electrocution.	Severe	Possible	HIGH	N/A	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
99	Wind/weather affecting users on bridge. Potential for slips and trips, particularly on the ramp	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Wind and weather on exposed bridge leading to slips/falls	Injury to path users	Slip resistant surface on the bridge ramps and central spans, railing provided on each site of the path over the bridge. In the event of inclement weather, light is provided for safe passage across the bridge	Moderate	Possible	MEDIUM	N/A	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
100	Maintaining of structure over the rail	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Bridge steelwork and drainge requires maintenance over its operational life. This is over an operational railway with frequent rail movements	Conflict with rail movements, injury to maintenance works, with potential for injury	Design to adopt features with low maintenace requirements. I.e long design life for steelwork coatings	Moderate	Possible	MEDIUM	Prepare an operations and maintenance manual at handover to outline maintenance and access requirements	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
101	Need for divers during revetment construction for setout and/or QA	002 - Ūranga	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance			Divers working around machinery and construction materials leading to injury. Standard risks associated with diving leading to injury at work.	Diver injury.	Diver usage for inspection and QA with standard dive H&S protocols in place	Severe	Possible	HIGH	Quality assurance requirements and design outputs (specifications) for below water construction allowing for digital methods (excavator GPS and post construction multibeam survey) reducing the need for divers. Design sensitivity analysis of multiple sections to justify a reduction in the length of revetments requiring construction stage investigations.	Severe	Unlikely	MEDIUM	Risk remains during construction though mitigated somewhat through specification requirements condusive to use of electronic QA methods.	Construction [redacted]
102	User falling from path and onto revetment surface	002 - Ūranga	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance			Slips trips and falls along path leading to user landing on revetment surface and being injured.	Injury	No specific controls, consider fall hazard in accordance with the NZ Building Act 2004.	Minor	Possible	MEDIUM	Revetment crest level considered relative to bike pedal height. Gaps in crest rock filled to reduce potential void size adjacent to path. Fast users located on landward side of path.	Minor	Unlikely	LOW	Risk remains during operations though mitigated somewhat due to design process and consideration of user safety reducing likelihood of risk occurrence.	Waka Kotahi (operations and maintanence)
103	Path user access down revetment slope.	002 - Ūranga	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance			User wanting to climb down revetment to access water edge	Risk of user injury from accessing revetment face - slips, trips, falls	No controls, consent design encouraged access through project visuals. Consider locations where fall from height risk requires treatment in accordance with the NZ Building Act 2004.	Minor	Possible	MEDIUM	Not encouraging user access down revetment face through project renders and public communication. Material usage not condusive to access. No specific access (steps,ramps etc) provided in design. Communication strategy on revetment access for: 1) Confirm the access strategy, considering Mana Whenua access expectations 2) Develop strategy	Minor	Unlikely	LOW	Risk remains during operations though mitigated somewhat due to design process and materials usage reducing likelihood of risk occurrence.	Waka Kotahi (operations and maintanence)
104	Current path users interface with bridge during construction	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Current path user wanting to cycle past the site along the current path and coming close or into the bridge construction site	Risk of injury /fatality	No current controls	Severe	Possible	HIGH	Provide a clear pathway for cyclists during construction, which is well separated from the site.	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
105	Fall/slip risk to path users during high wind conditions in the bridge operation phase	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Path users traversing the bridge may experience high winds in some weather conditions, and become unstable. Could result in fall/slips.	Risk of injury	No current controls	Moderate	Possible	MEDIUM	Provide handrail/deflection rail on each side of the bridge for path users to hold onto during high wind events.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
106	Risk of path users climbing up onto and/or over the artwork at the viewpoint during operation	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Risk that the small kerb created by the fascia panel at the viewing platform creates a step for path users to climb up onto	Risk of injury /fatality and risk of damage to artwork	No current controls	Severe	Unlikely	MEDIUM	Ensure placement of artwork at the fascia panel is etiher ontop or sitting proud of the fascia panel. This will ensure there is no capacity for the panel to be used as a step.	Insignificant	Rare	LOW	**Residual risk with Waka Kotahi**	Construction [redacted]
107	Risk of electrification during construction of rail span	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Close proximity of the steelwork and the overhead lines creates an electrification risk for construction crew, especially for the span which crosses the rail	Risk of injury/fatality	No current controls	Extreme	Possible	CRITICAL	Lift full ladder deck steelwork span into place. Ensure durability coating is on the steel work prior to bring to site. Use thermal spray which is scratch resistance, to limit the number of touch-outs required to do once the steelwork is in place over the rail. Disconnect (power off) when lifting in the superstructure over the rail.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
108	Risk to path users of careering off the path and into the revetment during operation	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Risk of path users coming down the northern ramp at speed and careering off into the revetment	Risk of injury/fatality	No current controls	Moderate	Possible	MEDIUM	Waka Kotahi enforcing speed limits on the bridge/shared path, and these will be sign posted. Tactile delineation used on the path to encourage cyclists to stay on the landward side of the bridge, away from the revetment. Trees/rock armour/other urban design features used as a "last-resort", to stop any cyclists falling into the revetment.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
109	Risk of public access to rail corridor and bridge during operation/maintenance	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Clearance between northern bridge approach and revetment allows access to underside of bridge and therefore rail corridor	Risk of injury/fatality	Southern end --> fence along KiwiRail boundary which aligns with handrails of bridge approach to stop access to KiwiRail yard; Northern end --> fence along landward side	Severe	Possible	HIGH	Trees/rock armour/other urban design features used to limit access to the rail corridor at the northern end. Signage at bridge approaches outlining the risks and/or consequences of entering the rail corridor .	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi and KiwiRail
110	Maintenance vehicle impact with bridge piers during operation/maintenance	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Limited clearance between rail and bridge piers causes maintenance vehicle impact with bridge pier	Risk of injury, damage to cover concrete/artwork at pier	No current controls	Minor	Likely	MEDIUM	Restrict speed of maintenance vehicle using the permanent level crossing/maintenance track under the bridge. Locate a steel plate within the cover concrete of the pier to mitigate damage from vehicle impact.	Minor	Possible	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi
111	Risk to contractor when undertaking regular maintenance and/or inspections of the bridge within the rail corridor	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Maintenance may need to be carried out during green-time and/or BoL to ensure the safety to of the maintenance contractors.	Risk of injury/fatality, non-compliance with KiwiRail H&S Standards	Fences with gates located in close proximity to the bridge. KiwiRail controls access to the site and has their own H&S inductions which must be completed prior to going to site. Ample space provided between girders and fascia to allow access to bearing/steelwork.	Severe	Unlikely	MEDIUM	Include within Operation and Maintenance Manual.	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	KiwiRail

112	Safety risk to path users at night-time during operation	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)		Lack of visibility across the bridge from insufficient lighting, and lack of security	Risk of crime, risk of injury to path users	Transport/geometric team using CPTED Principles to ensure user safety, CCTV cameras at each end of the bridge	Minor	Likely	MEDIUM	Ensure sufficient lighting across the whole bridge	Minor	Possible	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
113	Improper placement of fascia panels during construction	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Lack of understanding around the centre of gravity of the fascia panel (horizotnal position)	Risk of large construction gaps, risk of instability during lifting, risk of injury	No current controls	Moderate	Possible	MEDIUM	Undertake test lifts and adhere to specified placement tolerances.	Moderate	Possible	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
114	Poor visibility of path users during operation	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Curved/s-shape of the bridge plus the 1m solid height creates some difficulty for path users to see oncoming traffic on the bridge	Risk of injury/fatality	Geometric team has used AustRoads to guide design and ensure compliance	Moderate	Possible	MEDIUM	Path markings to delineate spaces on the bridge. Cultural markings used to slow path users over the bridge.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
115	Risk of electrification during construction of piers/hammerheads	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua Alliance			Close proximity of overhead lines/trains and the piers which are adjacent to the rail	Risk of injury, risk of disruption to KiwiRail operations	Precast both the pier and hammerhead elements to reduce the amount of formwork needed in these critical location	Severe	Possible	HIGH	Engage with KiwiRail for review of construction methodology. Adhere to KiwiRail offset requirements.	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
116	Risk of electrification during maintenance of handrails/rods for balustrades	001 - Ngā Ūra	DWP-BR-01	Live - Treat	Te Ara Tupua			Close proximity of overhead lines and balustrades	Risk of injury/fatality	No current controls	Severe	Unlikely	MEDIUM	Ensure bonding/flash strip is continuous across the whole bridge and effective at all times.	Severe	Rare	LOW	**Residual risk with Waka Kotahi**	Construction [redacted]
117	Throwing of landscape rocks	000 - Ngā Ūranga ki Pito-One	DWP-LS-01	Live - Treat	Te Ara Tupua A			Landscape rocks and/or lizard habitat rocks in damage causing throwable grades	User crash leading to serious injury	No rocks sized between pea gravel mulch and throwable grades.	Moderate	Possible	MEDIUM	sizing of rocks of 300mm and above to minimise the likelihood of throwing of rocks - 20mm rock (loose pebbles) - maintenance of the path	Moderate	Rare	LOW	Residual risk to be managed in Construction	Construction [redacted]
118	Ūranga timber deck slip resistence inadequate	002 - Ūranga	DWP-LS-01	Live - Treat	Te Ara Tupua A			Stage B design - underlying slab has drainage fall. If decking follows this it will not meet code	Risk of injury	No current controls	Moderate	Almost Certain	High	Deck is bandsawn and level. A prototype will be subject to the pendulum test.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi** . Carbide strips may be retrofitted if weathering of surface occurs	Waka Kotahi (Operations and Maintenance)
119	Large Artwork structural competancy and climbability	000 - Ngā Ūranga ki Pito-One	DWP-LS-03	Live - Treat	Te Ara Tupua A			Structural design of large artworks incomplete / by other	Risk of injury/fatality	Raised with Artist	Moderate	Possible	High	- Subcontractors MWH to complete the design of the artwork, including structural design completed by the engineers - design will be in accordance with F4 Safety from Falling guidelines	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	HCC (operations and maintenance)
120	Honiana Te Puni West boat access slip risk	003 - Honiana Te Puni Reserve	DWP-LS-02	Live - Treat	Te Ara Tupua A			Grass component of grass pavers is slippery in wet conditions	Risk of injury	No current controls	Moderate	Possible	Medium	Detailed design, previous use review. HCC engagement.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	HCC (operations and maintenance)
121	Interpretative signage structure	000 - Ngā Ūranga ki Pito-One	DWP-LS-03	Live - Treat	Te Ara Tupua A			Steel component. Sharp edges and corners, user impact	Risk of injury/fatality	Detailed design	Moderate	Possible	Medium	Review of placement. Detailed design to address edges and sharp corners.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Construction [redacted]
122	Weight and ergonomics of off the form timber facing for ūranga walls	002 - Ūranga	DWP-LS-03	Live - Treat	Te Ara Tupua A			timber formwork requires lifting, is in long sections and is potentially not manouverable within prescast yard or onsite if insitu.	Risk of injury	None- precast considered safer	Moderate	Possible	Low	Substituted by a Recki off the shelf formliner.	Moderate	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
123	Contaminated land Honiana Te Puni Reserve East and West	003 - Honiana Te Puni Reserve	DWP-LS-02	Live - Treat	Te Ara Tupua A	5-Jul-23		Low level contamination with possible discrete acute spots	Negative health impacts	Contamination Management Plan	Moderate	Possible	low	Non disturbance, topsoil testing. Topsoil to be imported to the site Where minor piling for the building is required, contaminated land specialists will be engaged	Moderate	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
124	Instability of coastal edge protection	002 - Ūranga	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance	5-Jul-23		Unstable ground Tidal and weather conditions Lack of understanding of stability	May cause injury to exposed worker; Injury to train passengers and operators Damage to plant Reputational damage	- Seawall in-situ cast footing at rock level - Track settlement monitoring - Inspection of grouted seawall at random inetrvals - Sand lacing at toe of proposed seawall to test depths to rock	Severe	Likely	CRITICAL	- Construction staging check by designer - Approved temporary work if required - Response plan for any slope failures - Response plan for unforseen conditions - Focus on potential weakeness around culverts - Installation during BoL - Temp barrier for wave protection	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
125	Working in close proximity of electricified rail	002 - Ūranga	DWP-SE-01	Live - Treat	Te Ara Tupua Allian			Setbacks not properly established as per JSEA.	May cause injury or death to exposed workers; May damage machinery and equipment; May cause delays to KiwiRail track	Use of Vortok Fencing Machine Control (Digital Shield)	Severe	Possible	HIGH	- Planned locations of plant - Power isolation during works - Plant heights - Spotter located at strategic places - RPO on site while works are carried on	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
126	Falling from height when accessing outside face of ecological barriers for inspection and maintenance	002 - Ūranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Constrained access to the seaside of seawalls	May cause injury to exposed workers;	Vortok Fencing Machine Control (Digital Shield)	Severe	Possible	HIGH	- Site Fencing - Gate person	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]

127	Access on the beaches for weepholes maintenance	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Allia	s 9(2)(a)		Constrained access to the seaside of seawalls	May cause injury to workers, harm to environment	Drainage free layer material placed as backfill, connected to accessible outlet system for easy maintenance from path level	Moderate	Likely	HIGH	- Include handover notes to design report on maintenance	Moderate	Possible	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
128	Path user entering maintenance area	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Failure of barrier, regular maintenance	Reputation, cost	Barrier is designed to resist SLS events without damage	Minor	Possible	MEDIUM	- Minimise repair time by having ecological barriers in segments, local break out of concrete ground beam required for new connections - Add signs and warnings prior to maintenance works commences	Minor	Unlikely	LOW	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
129	Falling from height following failure of ecological barriers	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Design loading worse than assumed, deterioration of structural elements	May cause injury or death to exposed users; Reputation damage	Design to MRs	Severe	Possible	HIGH	-Sensitivity analysis to assess displacement on the seawall due to impact	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
130	Debris falling onto path from deteriorating ecological barrier	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Inadequate durability, strength and quality of structural elements	Reputation, cost	Design to MRs, QA controls	Moderate	Possible	MEDIUM	- Selection of appropppriate materials set out in the specification - Construction method to follow specification requirements	Moderate	Rare	LOW	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
131	Fire truck impact on ecological barrier	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Allia			Congested site	May cause injury to workers and the public; Damage to seawall compromising its performance	Impact loading equivalent to a TL-4 has been incorportated in the seawalls designs to achieve satisfactory factor of safety	Severe	Possible	HIGH	- Additional widening of the path at the seawall location as result of the capping beam tie-in with the adjacent revetment nib kerb	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
132	Restrict public access to the high ecological value beaches	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Public accessing beaches through revetments	Impact on avifauna during breeding season	Each end of seawalls/Capping unit will flair out towards the sea to discourage public access	Severe	Possible	HIGH	- Signage for user awareness and reference to narrative around beach protection and telling the story of Te Ara Tupua - Seasonal signage to get noticed during nesting etc	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
133	Removal of the existing rock revetment to construct the new seawall	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Slope instability causing risk to KiwiRail operations and workers on site	May cause injury to workers and damage to Kiwirail tracks	Drawings specify a safe angle to batter slope	Severe	Possible	HIGH	Removal of existing rock revetment shall be carefully undertaken in stages.	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
134	Lifting precast ecological units and placing into position	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Machinery with not enough power capacity to lift precast unit; Unexperienced operator; Unstable platform	May cause injury to workers;	- Units are properly sized to suit machinery capacity on site. - Optimising size of pre-cast unit for plant selection	Extreme	Possible	CRITICAL	- Specification requires that experienced operators to maneveur machinery - Use of BoL for installation	Extreme	Unlikely	HIGH	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
135	Construction under MHWS	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Allia			Not sufficient protection against MHWS waves	May cause injury to workers, instability of exposed ground, and harm to environment	- Appropriate selection of material considered during design - Concrete toe raised up above MHWS to avoid compaction under MHWS	Moderate	Likely	HIGH	- Trained Divers - GPS controls - Checks from a boat	Moderate	Possible	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
136	Mobile crane on platform	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Unstable ground; poor built temporary platform	May cause injury to workers; Damage to equipment;	- Analysis cases considered temporary works up to half of the retained height	Severe	Possible	HIGH	-Additional temporary works design check by designer -Site investigations - Develop a thorough construction methodology	Severe	Possible	HIGH	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
137	Deep excavation for construction of the raised toe	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Unstable ground, high groundwater flow, poor built excavation batter	May cause injury to workers; Damage to equipment;	None	Severe	Possible	HIGH	- Temporary works design - Length of cut - Develop a thorough construction methodology	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
138	Concrete pour	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance			Spill, environmental impact	May disturb marine life	- Observe tidal conditions during construction - Minimise extent of concrete pour - Concrete truck accessing from the north end to eliminate need for truc to cross live rail lines	Moderate	Possible	MEDIUM	- Develop a good construction methodology specific to concrete pour	Moderate	Possible	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
139	Falling/crushing due to overturning of ecological barriers	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Inadequate temporary works design, reliance on other elements (seawalls, footings)	Injury, death, reputation damage	Temporary fastening design including allowance for 1.5kN/m horiz. barrier load, wind.	Severe	Unlikely	MEDIUM	Exclusion zone below this until work complete	Severe	Unlikely	MEDIUM	**Residual risk with construction, to be transferred to Waka Kotahi**	Construction [redacted]
140	Cyclist handle bar strike on the capping unit	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance			Constrained shared space for cyclists	May cause injury to path users, may cause damage to fence or ecological barrier unit	- Rake on capping beam out toward the harbour to minimise probabaility of handlebar strike - Delineation to encourage users on to the other side of the path	Moderate	Possible	MEDIUM	- Additional widening of the path at the seawall location as result of the capping beam tie-in with the adjacent revetment nib kerb	Moderate	Rare	LOW	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
141	CPTED hazard to users (particularly at night)	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance			Not sufficient lighting provided during dark hours	May cause injury to path users, may cause damage to new structures	- Permeability of lourves to allow light through `-Lighting posts provided at an appropriate interval throughout the entire length of the seawall	Moderate	Possible	MEDIUM	- Assess if additonal lighting through seawall sections might be increased - Assessment of camera coverage throghout length of path	Moderate	Rare	LOW	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
142	Graffiti on ecological screen	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Long lengths of plain concrete surface exposed	Reputation damage	- Cultural graphics impressions will be added to the inner surface of the wall	Minor	Almost Certain	MEDIUM	- Anti-graffiti coatings shall be applied over the minimum extent of concrete elements as follows or as otherwisespecified on the drawings	Minor	Possible	MEDIUM	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
143	Clash between users and maintanence plant on cycleway to clean any debris buildup between the seawall and seaward path edge, including drainage holes	002 - Üranga	DWP-SE-01	Live - Treat	Te Ara Tupua A			Lack or inadequate placement of warnings	May cause injury to path users and workers	- Cross fall adopted longitudinally between stub drains to reduce the frequence of maintenance	Moderate	Possible	MEDIUM	- Include handover notes to design report on maintenance	Moderate	Rare	LOW	**Residual risk with Waka Kotahi** - to be documented in the Operations and Maintenance plan	Waka Kotahi (Operations and Maintenance)
144	High risk acitivity - constructing pavement adjacent to the rail corridor	000 - Ngā Üranga ki Pito-One	DWP-PS-01	Live - Treat	Te Ara Tupua Alliance	20-Jun-23		Lack or inadequate risk identification and elimination in place	Site shutdown and/or serious/fatal harm	None (prior to construction)	Extreme	Possible	CRITICAL	This is a project key risk that needs to be managed through the various construction workpacks. Controls include but are not limited to: - Permit to work - Machine avoidance system – digital shield - Vortok fencing - Site protector (SP) - Electrical Safety Officer (EPO) - Rail Protection Officer (RPO) - Appropriate training	Extreme	Rare	HIGH	To be managed in construction workpacks	Constructor [redacted]

145	Constructing pavement adjacent to the Wellington Harbour (Te-Whanganui-a-Tara)	000 - Ngā Ūran	DWP-PS-01	Live - Treat	Te Ara Tupua A	s 9(2)(a)	20-Jun-23	Lack or inadequate risk identification and elimination in place	Site shutdown and/or serious/fatal harm	None (prior to construction)	Severe	Unlikely	MEDIUM	This is a project key risk that needs to be managed through the various construction workpacks. Controls include but are not limited to: - Appropiate training, inductions and toolbox meeting. - Appropiate PPE and emergency planning.	Severe	Rare	LOW	To be managed in construction workpacks	Constructor s 9(2)(a)
146	Safety at ūranga, with hiding spots for perpetrators	002 - Ūranga	DWP-LS-01	Live - Treat	Te Ara Tupua A		5-Jun-23	The ūranga could have areas that are poorly lit and there could be places that perpetrators may hide.	Risk of injury to path users	None (prior to construction)	Severe	Possible	HIGH	- Crime Prevention Through Environmental Design principles applied, including avoid dense planting at ūranga, lighting design at ūranga to minimise dark spots, CCTv coverage of the entire path	Severe	Rare	LOW	To be managed in construction workpacks	Constructor s 9(2)(a)
147	Trip hazard of gobi blocks on the boat ramp	003 - Honiana Te Puni Reserve	DWP-LS-02	Live - Treat	Te Ara Tupua A		5-Jun-23	Uneven surface, caused by gobi blocks.	Risk of injury to path users	None (prior to construction)	Moderate	Possible	MEDIUM	Levels on the boat ramp designed to minimise trip hazard. Construction monitoring to confirm that construction of gobi blocks is acceptable. Maintenace required to confirm the levels are acceptable.	Moderate	Rare	LOW	To be documented in the Operations and Maintenance Plan	Waka Kotahi (Operations and Maintenance)
148	Fishing from the path	002 - Ūranga	DWP-LS-01	Live - Treat	Te Ara Tupua		5-Jun-23	Fishing from path	Collision between path users and fish hooks, fishing lines. Fishing mess on path causing slips and trips. Risk of fisherman falling into ocean and potentially drowning.	None (prior to construction)	Moderate	Possible	MEDIUM	Uranga areas constructed to provide space for path users off of the main path.	Moderate	Possible	MEDIUM	To be documented in the Operations and Maintenance Plan	Waka Kotahi (Operations and Maintenance)
149	Maritime safety - people jumping in and swimming. Risk of drowning	002 - Ūranga	DWP-LS-01	Live - Treat	Te Ara Tupua		5-Jun-23	Coastal loction of the path	Risk of drowning (fatality)	Pedestrian access to the path is restricted by the rail corridor and State Highway	Moderate	Possible	MEDIUM	Access from the path into the harbour is not encouraged through the design of the shared path	Moderate	Unlikely	MEDIUM	To be documented in the Operations and Maintenance Plan	Waka Kotahi (Operations and maintenance)
150	Suicide risk	000 - Ngā Ūranga ki Pito-One	DWP-BR-01	Live - Treat	Te Ara Tupua		5-Jun-23	Suicide risk from bridge over rail line	Risk of injury/fatality	None (prior to construction)	Severe	Possible	HIGH	1.8m high fencing along the entiorety of the path, to prevent pedestrian access into the rail corridor. Minimum 1.4m high balustrade across the shared path bridge at Ngā Ūranga	Severe	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and maintenance)
151	Cyclists crashing into or riding through open KiwiRail access gates	000 - Ngā Ūranga ki Pito-One	DWP-TS-03	Live - Treat	Te Ara Tupua		6-Jun-23	Gate open during cycle way use	Electrocution, hit by train or other injury Bad user experience	Cyclist access to the path is restricted by the rail corridor and State Highway	Extreme	Unlikely	HIGH	- Where possible, KiwiRail gates will be sliding - Gates to be closed as soon as vehicle passes throguh - Spotter to be used at all times during gate operation - Management of the opening and closing of gates needs to be managed through a concept of operations and standard operating proceedures	Severe	Rare	LOW	Residual risk to be managed through the Operations and Maintenance Plan and KiwiRail operating procedures	Waka Kotahi and KiwiRail
152	Risk of cyclists snagging on the fence	000 - Ngā Ūranga ki Pito-One	DWP-TS-01	Live - Treat	Te Ara Tupua		7-Jun-23	Fence adjacent to the path	Snagging of handlebars on path causing serious injury to cyclists	None (prior to construction)	Moderate	Likely	HIGH	- Flush fence design - no razor edges included - where the fence terminates, the wire will be wrapped around the fence posts	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
153	CPTED - SH2 overpass	003 - Honiana Te Puni Reserve	DWp-TS-01	Live - Treat	Te Ara Tupua		8-Jun-23	SH2 overpass at the northern end of Honiana Te Puni Reserve	Anti-scoial behaviour, due to poor lighting	None (prior to construction)	Moderate	Likely	HIGH	- Straightening of the path to improve sight lines on approach to the intersection - Improved lighting under the SH2 overpass - CCTV cameras to be installed under the Overpass	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology, and transferred to Waka Kotahi	Waka Kotahi (Operations and Maintenance)
154	Collision between cyclists and SH2 Overpass structure	003 - Honiana Te Puni Reserve	DWp-TS-01	Live - Treat	Te Ara Tupua		9-Jun-23	Proximity of the SH2 overpass structure at Honiana Te Puni Reserve	Collision between cyclists at high speeds with the overpass structure, resulting in serious injury	None (prior to construction)	Moderate	Likely	HIGH	- The path extends straight through the SH2 overpass and the wing wall - KiwiRail boundary fence installed between the shared path and the SH2 overpass - Straightening of the path to improve sight lines on approach to the intersection	odera	Rare	LOW	Residual risk to be managed in Construction Methodology, and transferred to Waka Kotahi	Waka Kotahi (Operations and Maintenance)
155	Impact of Piling on KiwiRail Operations	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua		3-Aug-23	Close proximity of piling to the rail line	Risk of damage/injury/fatailty	None (prior to construction)	Severe	Unlikely	MEDIUM	-Identify which piles fall within block of line requirements -For those that requre BoL, consider the impact of vibration effects and impact on Train Operations	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
156	Vibration during piling impacting the revetment	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua		3-Aug-23	Vibrations from the piling rig	Damage to the revetment	None (prior to construction)	Moderate	Unlikely	MEDIUM	-Check slope instability of the piling rig and the impact of having the rig close to the edge of the revetment crest - Proposal to strengthen the revetment at the southern end - KiwiRail has already strengthed the northern end revetment	Moderate	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
157	Bridge Piling Clash with Existing in Ground Services	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua		3-Aug-23	Clash with existing in ground services during piling	Service Strike	None (prior to construction)	Severe	Possible	HIGH	- Check and locate existing services before digging	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
158	Pile Inspection, eliminate Pile Entry by Personnel	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua		3-Aug-23	Inspection of pile shaft during piling	Confined space works	None (prior to construction)	Moderate	Possible	MEDIUM	- Use of camera/scanning to check ground conditions, water to eliminate the need for personnel access during piling	Moderate	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
159	Treatment of Contaiminated Water during piling	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua		3-Aug-23	Water contaminated from ground extracted during piling	Environmental and health risks	None (prior to construction)	Moderate	Likely	HIGH	-Include provisions for treatment ponds in Construction Methodology	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
160	High wind area	002 - Ūranga	DWP-TS-03	Live - Treat	Te Ara Tupua		22-Aug-22	Strong winds coming from Horokiwi wind tunnels along the route. This produces some scary, unpredictable gusts. Currently on the existing cycling shoulder there are no novice cyclists around to get blown sideways, this will not be the case in the new facilities.	When there are novices on the new cycleway, and sooner or later they'll be in proximity to other path users travelling at speed and this situation could result in people being pushed by the wind, with risk of serious injuries	Currently, cyclists travelling along this section of SH2 are experienced cyclists.	Severe	Possible	HIGH	While the consequence of users on the current SH2 cycleway being blow into a live lane is very high/critical, the Alliance has assessed this risk being much lower for the new shared path, being 5m wide with no/very limited vehicles. At this stage, we propose to install wind gust warning signs approximately +/-50 either end of the Horokiwi Corridor for users travelling in both directions.	Moderate	Unlikely	MEDIUM	Residual risk to be managed through Waka Kotahi operations.	Waka Kotahi (Operations and Maintenance)
161	Service lids at the northern bridge approach cause cyclists to swerve to avoid cover sets.	001 - Ngā Ūranga	DWP-UN-01	Live - Treat	Te Ara Tupua A		23-Aug-22	Location of lids in high speed cycle lane	Cyclists conflict with pedestrain movements	None	Severe	Possible	HIGH	- Move lid covers at the base of the northern approach ramp to the pedestrian side of the shared path	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
162	Seismic, wind loading on partially-completed structure during construction	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua A		15-Aug-23	A significant seismic or wind event could occur during construction of the bridge, when the structure is not yet complete.	Partial or full collapse of the structure and/or temporary works. This could affect rail or road operations, and could result in loss of life.	None (prior to construction)	Extreme	Unlikely	HIGH	- Design temporary works considering suitable seismic and wind loading events. - Design to consider construction phase loading in accordance with the Bridge Manual.	Extreme	Rare	HIGH	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)
163	Train or road vehicle impact on partially completed structure during construction	001 - Ngā Ūranga	DWP-BR-01	Live - Treat	Te Ara Tupua A		15-Aug-23	A train could derail at the bridge site during construction, or an errant vehicle could impact on the bridge part way through construction	Partial or full collapse of the structure and/or temporary works. This could affect rail or road operations, and could result in loss of life.	None (prior to construction)	Extreme	Rare	HIGH	- Engage with KiwiRail on construction methodology and temporary works. - Undertake works during Block of Line for activities within inner hazard zone (5m).	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction s 9(2)(a)

164	Undermining of existing rail corridor when constructing subsoil trenches and catchpit manholes	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)	23-Aug-22	Vertical cut to install subsoil drains	Injury, reputation, cost	Survey to understand the existing ground levels and distances between down main track and proposed subsoil location	Extreme	Possible	CRITICAL	Temporary works check by designer. Workshop between design and construction teams	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	s 9(2)(a)
165	Plant damaging drains during construction requiring additional maintenance	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		23-Aug-22	Incorrect use of plant, lack of site awareness	Difficulties in pipe installation.	Pipe Material and thickness selection against construction loading.	Insignificant	Possible	LOW	- Construction staging design - Temporary cover protection design to be checked by designer - Discussion with constructors around Temporary cover protection	Insignificant	Unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
166	Working in water where outlets are within the tidal range/GWT	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Controlled by the outlet location of the existing culvert	Slipping, drowning and injury. Difficulties in pipe installation	Weight of pipes. Bedding backfill specification suitable for working in water	Extreme	Possible	CRITICAL	Use of suitable equipment and trained, competent staff.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
167	Installation of bridge uPVC downpipes resulting in fall from height	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Incorrect plant and equipment	Injury and reputation	Construction sequencing and connection material selection	Extreme	Unlikely	HIGH	Use of suitable equipment and trained, competent staff.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
168	Construction plant damaging structures (e.g. bridge piers/robust kerb) during installation of manholes and pipes to convey stormwater from bridge	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		23-Aug-22	Incorrect use of plant, lack of site awareness	Difficulties in SW network installation.	Construction sequencing, material selection	Moderate	Possible	MEDIUM	Use of suitable equipment and trained, competent staff. Managed through Health and safety processes and construction methodology.	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
169	Construction plant damaging existing pipes/culverts during installation, requiring additional work to achieve saddle connection	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		23-Aug-22	Incorrect use of plant, lack of site awareness	Difficulties in SW network installation.	Survey to understand the location of the existing pipe	Moderate	Unlikely	MEDIUM	Use of suitable equipment and trained, competent staff. Managed through Health and safety processes and construction methodology.	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
170	Transportation and storage of subsoil pipes on site	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		23-Aug-22	Long length of subsoils may result in difficulty transporting across site due to narrow corridor	Injury for workers when lifting/moving, increased risk of trips and falls due to reduced space, damage to other material and plant. Injury to construction workers.	- Material and length selection to reduce lift weight	Severe	Unlikely	MEDIUM	Use of suitable equipment and trained, competent staff. Pre planning of storage location. Managed through Health and safety processes and construction methodology.	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
171	Slippery surface/inadequate space at subsoil outlet, causing slips, trips and falls when maintaining the outlet	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Lack of space on site, slippery surface	May cause injury to maintenance staff and public	Subsoil outlets designed with consideration to have minimal maintenance	Severe	Unlikely	MEDIUM	Maintenance to take place at low tide, and not on a rainy day while area is slippery. Identification of risk in maintenance manual	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
172	Installation and maintenance of bridge uPVC connection pipe underneath bridge deck	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Working from heights	Injury and reputation	Construction sequencing, required work from heights training	Extreme	Possible	CRITICAL	Use of suitable equipment and trained, competent staff. Development of safe work procedures	Extreme	Possible	CRITICAL	Residual risk to be managed in Construction Methodology	Construction [redacted]
173	Slip lane longitudinal drainage works - working in close proximity to SH2	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Vehicles driving at high speeds adjacent to works. Potential risk of vehicle incident into works.	Injury or death	Traffic Management Plan	Extreme	Unlikely	HIGH	Staff made aware of risks. Managed through Health and safety processes and construction methodology.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
174	Public falling or climbing into manholes	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua		23-Aug-22	Public opening manhole lids or slip, trip or falls	Drowning, injury or death	None	Extreme	Unlikely	HIGH	Locking manhole lids	Extreme	Rare	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
175	Hitting unknown existing KR Earthenware drains during subsoil installation	000 - Ngā Ūranga ki Pito-One	DWP-DR-01	Live - Treat	Te Ara Tupua Alliance		23-Aug-22	Earthenware drain inlet buried	May cause injury to construction workers, damage to material and plant	Site inspection completed prior to IPAA phase identifying KR earthenware drains.	Moderate	Almost certain	HIGH	Identification of services prior to construction commencement	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
176	Risk of electrocution from fence	000 - Ngā Ūranga ki Pito-One	DWP-TS-04	Live - Treat	Te Ara TupuaAlliance		23-Aug-22	Fence being within KiwiRail overhead contact line zone (OCLZ)	Electrocution if lines fall onto fence	None	extreme	unlikely	HIGH	- Fence outside OCLZ is electrically isolated - Integrated lighting within the fence inside the OCLZ is not bonded to the shared path (MEN) electrical system - Provision of predrilled holes in the feature posts for KiwiRail spark gap arrestor	extreme	rare	HIGH	**Residual risk with Waka Kotahi**	Waka Kotahi (Operations and Maintenance)
177	Groundcovers in sightline mix impedeing sightlines at intersections within Honiana Te Puni Reserve West.	003 - Honiana Te Puni Reserve	DWP-LS-02	Live - Treat	Te Ara Tupua		20-Jun-23	Stage C design has too many large species in the HTPRW mix. Large species included to reduce plant numbers.	Potential extra cost to project	None	Severe	Possible	HIGH	Remove larger species from mix. Phormium cookianum to be replaced by lower growing species. Will result in	Minor	Unlikely	LOW		
178	Shared betterment services and chambers results in harm or damage to assets	001 - Ngā Ūranga	DWP-UN-01	Live - Treat	Te Ara TupuaAllia		23-Aug-22	Shared chambers with multiple services in each chamber belonging to various asset owners	- Injury to workers unfamilar with asset - Damage to assets between asset owners - Ambiguity re maintenace responsibility	None	Severe	Possible	HIGH	- Each asset owner has their own chambers to accommodate only the assets owneed and operated by Each party.	Moderate	Unlikely	MEDIUM	**Residual risk with Waka Kotahi**	Waka Kotahi, KiwiRail, One NZ
179	Shallow ducts are crushed during construction	001 - Ngā Ūranga	DWP-UN-01	Live - Treat	Te Ara TupuaAllianc		23-Aug-22	Heavy construction plant traversing over utilities trenches during construction	Heavy construction plant crushes shallow ducts	None	Moderate	Likely	HIGH	- Final design protects shallow ducts (<600mm) with incorporation of a reinforced concrete slab - Condition of departure approval is that the Constructor shall adequately protect shall ducts during construction (i.e overfilling, no go zones or similar)	Moderate	Unlikely	MEDIUM	Risk of crushing ducts during construction, to be transferred to construction.	Construction [redacted]
180	Lifting xblocs into position causing injury/death	000 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lifting of xblocs	Serious injury or fatality for worker.	None	Moderate	Likely	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising plant size	Moderate	Possible	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
181	Production of Xbloc at pre-cast yards	000 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAllianc		28-Sep-22	Heavy machinery, risk of uncontrolled collapse of the elements and being crushed between a precast concrete element and another object	Serious injury or fatality for worker.	None	Moderate	Likely	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising plant size	Moderate	Possible	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]

182	Transport of xbloc	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance	[redacted]	28-Sep-22	Transport requirements of xblocs to site.	Vehicle accident causing serious injury or multiple fatalities.	None	Severe	Possible	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising plant size	Severe	Possible	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
183	Storage of Xblocs on site	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Storage of Xblocs on site presents risk of uncontrolled collapse of the elements and being crushed between a precast concrete element and another object	Collapse of xbloc stacks causing serious injury or fatalities for workers.	None	Severe	Possible	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising pile size and stacking on site	Severe	Possible	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
184	Transport of rock	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Transport requirements of rocks to site.	Vehicle accident causing serious injury or multiple fatalities. Barge transport presents risk of sea accident or fatality.	None	Severe	Possible	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising plant size	Severe	Possible	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
185	Storage of rock	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Storage of rock piles on site presents risk of uncontrolled collapse of the elements and being crushed between a precast concrete element and another object	Collapse of rock piles causing serious injury or fatalities for workers.	None	Severe	Possible	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising pile size and stacking on site	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
186	Lifting rock armour into position causing injury/death	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Unexperienced operator; Unstable platform	May cause serious injury or fatalities for workers.	None	Severe	Possible	HIGH	-Specification requires that experienced operators to maneveur machinery -Approved lifting systems - Minimising pile size and stacking on site	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
187	Instability of coastal edge protection - revetment	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Unstable ground Tidal and weather conditions Lack of understanding of stability	May cause injury to exposed worker; Injury to train passengers and operators Damage to plant Reputational damage	None	Severe	Possible	HIGH	- Revetment design which minimises removal and excavation of existing slope/seawall - Track settlement monitoring - Inspection of grouted seawall at random intervals - Sand lacing at toe of revetment to test depths to rock -Construction staging check by designer - Approved temporary work if required -Temporary or permanent toe bund - Response plan for any slope failures - Response plan for unforseen conditions - Focus on potential weakeness around culverts	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
188	Rock placement from Barge (Offshore Habitat)	0 - Ngā Ūranga ki Pito-One	DWP-OH-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Inexperienced operator, Unstable platform, Incorrect plant	- Instability and tip over of plant and placement - May cause injury to workers;	None	Severe	Possible	HIGH	- Narrow grading as much as possible to minimise number of large rocks. - Removal of larger architectural rocks - Checks on weather for stability of barge - Sizing and positioning of plant	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
189	Diver confirmation of xbloc placement	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	movement of rock/xbloc during dive inspections, construction plant (excavator boom)	May cause injury to workers; risk of drowning for divers	None	Extreme	Possible	CRITICAL	-Pre-made spaces to improve placements and eliminate/reduce need to divers - Facilitate inspections with CCTV as required	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
190	Vehicle, plant and people movements across site	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Heavy vehicles and machinery movements throughout the site	May cause injury to exposed worker; Injury to train passengers and operators Damage to plant Reputational damage	None	Moderate	Likely	HIGH	Radio controls Internal traffic management	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
191	Lifting operations near electrified overhead lines	0 - Ngā Ūranga ki Pito-One	DWP-RV-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Lifting operations near electrified overhead lines	Electrocution, fatalities	None	Moderate	Likely	HIGH	Managed through the various construction workpacks. Controls include but are not limited to: - Permit to work - Machine avoidance system – digital shield - Vortok fencing - Site protector (SP) - Electrical Safety Officer (EPO) - Rail Protection Officer (RPO) - Appropriate training	Moderate	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
192	Instability of coastal edge protection - seawalls	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Unstable ground Tidal and weather conditions Lack of understanding of stability	May cause injury to exposed worker; Injury to train passengers and operators Damage to plant Reputational damage	None	Severe	Likely	CRITICAL	- Seawall in-situ cast footing at rock level - Track settlement monitoring - Inspection of grouted seawall at random inetrvals - Sand lacing at toe of proposed seawall to test depths to rock - Construction staging check by designer - Approved temporary work if required - Response plan for any slope failures - Response plan for unforseen conditions - Focus on potential weakeness around culverts - Installation during BoL - Temp barrier for wave protection	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
193	Working in close proximity of electricified rail	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Setbacks not properly established as per JSEA.	May cause injury or death to exposed workers; May damage machinery and equipment; May cause delays to KiwiRail track	None	Severe	Possible	HIGH	- Planned locations of plant - Power isolation during works - Plant heights - Spotter located at strategic places - RPO on site while works are carried on	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
194	Removal of the existing rock revetment to construct the new seawall	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Slope instability causing risk to KiwiRail operations and workers on site	May cause injury to workers and damage to Kiwirail tracks	None	Severe	Possible	HIGH	Removal of existing rock revetment shall be carefully undertaken in stages.	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]

195	Lifting precast ecological units and placing into position	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)	28-Sep-22	Machinery with not enough power capacity to lift precast unit; Unexperienced operator; Unstable platform	May cause injury to workers;	None	Severe	Likely	CRITICAL	- Specification requires that experienced operators to maneveur machinery - Use of BoL for installation	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
196	Construction under MHWS	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Not sufficient protection against MHWS waves	May cause injury to workers, instability of exposed ground, and harm to environment	None	Moderate	Likely	HIGH	- Trained Divers - GPS controls - Checks from a boat	Minor	Unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
197	Mobile crane on platform	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Unstable ground; poor built temporary platform	May cause injury to workers; Damage to equipment;	None	Severe	Likely	HIGH	-Additional temporary works design check by designer -Site investigations - Develop a thorough construction methodology	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
198	Deep excavation for construction of the raised toe	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Unstable ground, high groundwater flow, poor built excavation batter	May cause injury to workers; Damage to equipment;	None	Moderate	Likely	HIGH	- Temporary works design - Length of cut - Develop a thorough construction methodology	Moderate	Likely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
199	Concrete pour	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Spill, environmental impact	May disturb marine life	None	Moderate	Likely	HIGH	- Develop a good construction methodology specific to concrete pour	Minor	Likely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
200	Falling/crushing due to overturning of ecological barriers	0 - Ngā Ūranga ki Pito-One	DWP-SE-01	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Inadequate temporary works design, reliance on other elements (seawalls, footings)	Injury, death, reputation damage	None	Severe	Likely	MEDIUM	Exclusion zone below this until work complete	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
201	Lifting/placement of culverts into position causing injury due to awkward position	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lack of space on site, and specific culvert locations around xblocks	May cause injury to workers	None	Moderate	Likely	MEDIUM	Use of suitable equipment and trained, competent staff. Placement of culverts at low tide, and not on a rainy day while area is slippery.	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
202	Transport to site	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Long vehicles required to transport to site. PE pipes to be welded off site.	Injury for workers when lifting/moving	None	Moderate	Likely	MEDIUM	Use of suitable equipment and trained, competent staff.	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
203	Storage on site	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	PE pipes will be welded off site so will be longer. Small site footprint means that there is less space for maneouvering	Increased risk of trips and falls due to reduced space	None	Insignificant	Likely	LOW	Use of suitable equipment and trained, competent staff.	Insignificant	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
204	Transport across the active site	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Long length and large culverts may result in difficulty transporting across site due to narrow corridor	Damage to other material, plant. Injury to construction workers	None	Severe	Likely	HIGH	Use of suitable equipment and trained, competent staff.	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
205	Placement and lifting of culverts	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lifting of culvert in close proximity to rail. Rotation of culverts during lifting	Clash with KiwiRail overhead lines or rail Injury to worker and public	None	Moderate	Likely	HIGH	-Calibrate digital shield control to inlcude pipes being lifted - Weather consideration, choosing to lift when wind is low - Prepare a lifting procedure in construction work package	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
206	Construction plant damaging pipe during installation requiring additional maintanence	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Incorrect use of plant, lack of site awareness	Difficulties in pipe installation.	None	Insignificant	Likely	LOW	- Construction staging design - Temporary cover protection design to be checked by designer	Insignificant	Unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
207	Working in water where pipe outlets are within the tidal range	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Controlled by the outlet location of the existing culvert	Slipping, drowning and injury	None	Extreme	Likely	CRITICAL	Use of suitable equipment and trained, competent staff.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
208	Spill of hazardous material used in culvert construction into the ocean	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Misuse of plant, uneven terrain	Exposure for construction workers, public and marine life	None	Severe	Likely	HIGH	Environmental Control Plan. Use of suitable equipment and trained, competent staff.	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]

209	Fall from heights during placement of revetment blocks around culvert	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara TupuaAlliance	s 9(2)(a)	28-Sep-22	Lack of space on site, slippery surface, and specific culvert locations around xblocks	May cause injury to workers	None	Extreme	Likely	HIGH	Use of suitable equipment and trained, competent staff. Construction to take place at low tide, and not on a rainy day while area is slippery.	Extreme	Unlikely	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
210	Undermining of existing rail corridor when constructing large chambers to allow connection of extension	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lack of temporary retaining during construction	May cause serious injury to construction staff, rail passengers, and KR staff and may cause significant damage to rail corridor	None	Extreme	Likely	HIGH	Temporary works check by designer	Extreme	Rare	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
211	Lifting and placement of large manholes	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Size of manholes, small corridor for works	May cause injury to construction workers, may cause damage to manhole	None	Moderate	Likely	MEDIUM	- Using sleeved coupling instead of manhole to eliminate the cover hazard	Minor	Unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
212	Connection to existing culvert results in existing culvert collapsing beneath due to poor condition of existing culvert.	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara TupuaAlliance		28-Sep-22	Poor structural integrety of existing culvert	May cause injury to construction workers, may cause undermining of railway above, require replacement/repair of existing culvert	None	Extreme	Likely	HIGH	Site survey of structural integrity of outlets	Extreme	Rare	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
213	Maintenance required for the connections that degrade earlier than design life	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Ground movement	May cause settlement, causing uneven path surfaces (and posing a trip hazard for path users).	None	Minor	Likely	LOW	N/A	Minor	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
214	Inspection of revetment over design life	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	- Slippery rocks/armour units - Inspection requirmeents after earthquake greater than 10 yr ARI - Inspection after storm events greater than 10 yr ARI storm	May cause injury to inspectors	None	Moderate	Almost certain	HIGH	- Designed to meet minimum requirements and reduce the need for maintanence - Detailed inspection method including Inspection by UAV, multibeam below the surface and viewing point (above or by boat) - Xbloc material selection	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
215	Wave overtopping during operation	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	overtopping of revetment crest during large wave events	May cause injury	None	Moderate	Almost certain	HIGH	- Maximising height of revetment crest - Path closure communicated using VMS board - Communication and mana	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
216	using the path during repair of revetment following damage, memebr of public enters construction site	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Significant damage to revetment following major storm or seismic event	Reputation, serious injury or fatality	None	Moderate	Possible	MEDIUM	- Path closure communicated using VMS board - Communications strategy around user expectations - Temporary signnage - Focus on Ūranga as acees points	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
217	Failure of xbloc before end of life	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Concrete quality may be inadequate, design loading worse than assumed	Reputation, cost, unstable ground resulting in trip hazard	None	Moderate	Possible	MEDIUM	- design requirements, specifications and MSQA process	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
218	User falling from path and onto revetment surface	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Trip hazard, fall from heights.	Serious injury for pedestrians or cyclists.	None	Moderate	Possible	MEDIUM	-Revetment crest is above the path level - Rock shape and size seletection for rocks on path edging	Moderate	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
219	Falling from height when accessing outside face of ecological barriers for inspection and maintenance	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Constrained access to the seaside of seawalls	May cause injury to exposed workers;	None	Severe	Possible	HIGH	Vortok Fencing Machine Control (Digital Shield)	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
220	Access on the beaches for weepholes maintenance	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Constrained access to the seaside of seawalls	May cause injury to workers, harm to environment	None	Moderate	Possible	MEDIUM	Drainage free layer material placed as backfill with multiple weepholes for contigency	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
221	Path user entering maintenance area	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Failure of barrier, regular maintenance	Reputation, cost	None	Insignificant	Likely	LOW	- Barrier is designed to resist SLS events without damage - Minimise repair time by having ecological barriers in segments, local break out of concrete ground beam required for new connections - Add signs and warnings prior to maintenance works commences	Insignificant	unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
222	Falling from height following failure of ecological barriers	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Design loading worse than assumed, deterioration of structural elements	May cause injury or death to exposed users; Reputation damage	None	Severe	Unlikely	MEDIUM	- Design to MRs - Sensitivity analysis to assess displacement on the seawall due to impact	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]

223	Debris falling onto path from deteriorating ecological barrier	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance	s 9(2)(a)	28-Sep-22	Inadequate durability, strength and quality of structural elements	Reputation, cost	None	Moderate	Unlikely	MEDIUM	- Design to MRs, QA controls - Selection of appropriate materials set out in the specification - Construction method to follow specification requirements	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
224	Fire truck impact on ecological barrier	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Congested site	May cause injury to workers and the public; Damage to seawall compromising its performance	None	Severe	Possible	HIGH	- Impact loading equivalent to a TL-4 has been incorportated in the seawalls designs to achieve satisfactory factor of safety - Additional widening of the path at the seawall location as result of the capping beam tie-in with the adjacent revetment nib kerb	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
225	Restrict public access to the high ecological value beaches	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Public accessing beaches through revetments	Impact on avifauna during breeding season	None	Severe	Possible	HIGH	- Ensure that the crest of the revetment overlaps the seawall by at least 1 m as to limit or remove the public access to the beaches. - Signage for user awareness and reference to narrative around beach protection and telling the story of Te Ara Tupua - Seasonal signage to get noticed during nesting etc	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
226	Cyclist handle bar strike on the capping unit	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Constrained shared space for cyclists	May cause injury to path users, may cause damage to fence or ecological barrier unit	None	Moderate	Unlikely	MEDIUM	- Rake on capping beam out toward the harbour to minimise probability of handlebar strike - Delineation to encourage users on to the other side of the path - Ensure that the crest of the revetment overlaps the seawall by at least 1 m as to limit or remove the public access to the beaches. - Additional widening of the path at the seawall location as result of the capping beam tie-in with the adjacent revetment nib kerb	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
227	CPTED hazard to users (particularly at night)	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Not sufficient lighting provided during dark hours	May cause injury to path users, may cause damage to new structures	None	Minor	Unlikely	LOW	- Permeability of lourves to allow light through -Lighting posts provided at an appropriate interval throughout the entire length of the seawall Assess if additonal lighting through seawall sections might be increased - Assessment of camera coverage throghout length of path	Minor	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
228	Graffiti on ecological screen	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Long lengths of plain concrete surface exposed	Reputation damage	None	Insignificant	Almost certain	LOW	- Cultural graphics impressions will be added to the inner surface of the wall - Further controls to be established during Stage C	Insignificant	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
229	Clash between users and maintanence plant on cycleway to clean any debris buildup between the seawall and seaward path edge, including drainage holes	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lack or inadequate placement of warnings	May cause injury to path users and workers	None	Minor	Likely	MEDIUM	- Cross fall adopted longitudinally between stub drains to reduce the frequence of maintenance - Include handover notes to design report on maintenance	Minor	Unlikely	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
230	Path collapse from storm events driving piping and blowout underneath path	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Water from storm events (rainfall and storm surge) piping outside culvert causing blow out or undermining	Injury, reputation, cost	None	Moderate	Rare	LOW	- Concrete encasement through revetment - Water stop collars along upstream length	Moderate	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
231	Public entering confined spaces by entering the pipes from the outlet end	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Ease of access	Drowning, trapped in confined space	None	Severe	Unlikely	MEDIUM	- Consideration of outlet control measures - Physical separation of users from the outlets - Signage	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
232	Maintenance operators entering confined spaces by entering the pipes from the outlet end	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Blockage of culverts	Drowning, trapped in confined space	None	Severe	Unlikely	MEDIUM	- Maintenance carried out from upstream end - CCTV and flushing TBC	Severe	Rare	LOW	Residual risk to be managed in Construction Methodology	Construction [redacted]
233	Fall from heights during shared path operation (and maintenance)	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lack of visibility of culvert, slippery surface	May cause injury to public	N/A	Extreme	Unlikely	HIGH	Use of design features to create visibility of danger or reducing the impacts of falling	Extreme	Rare	HIGH	Residual risk to be managed in Construction Methodology	Construction [redacted]
234	Slippery surface/inadeqaute space at outlet, causing slips, trips and falls when maintaining the outlet	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Lack of space on site, slippery surface	May cause injury to maintenance staff and public	N/A	Severe	Unlikely	MEDIUM	Culvert outlets designed with consideration to have minimal maintenance	Severe	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
235	Creating larger acccessible confined spaces that could be accessed by the public	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	N/A	May cause injury to public	N/A	Moderate	Unlikely	MEDIUM	Outlet design to deter public from entering large culverts	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]
236	Addition of manhole covers within shared path due to connection manholes - could cause slip / trip / fall / Public lifting manhole covers	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	Live - Treat	Te Ara Tupua Alliance		28-Sep-22	Manhole lids for a lip or a dip from settlement	May cause injury to public	N/A	Moderate	Unlikely	MEDIUM	- Anti-slip coating on manhole lids - Lockable lids - Design requirements and specifications on manhole settlement - Using sleeved coupling instead of manhole to elimaite the cover hazard	Moderate	Unlikely	MEDIUM	Residual risk to be managed in Construction Methodology	Construction [redacted]

237	Collapse of existing culvert resulting in subsidence/sink hole formation on rail/path	0 - Ngā Ūranga ki Pito-One	DWP-DR-02	**Live - Treat**	Te Ara Tupua Alliance	[redacted]	[redacted]	28-Sep-22	Structural integrity of existing culvert may be poor	Injury, reputation, cost	N/A	Moderate	Unlikely	**MEDIUM**	Site survey of structural integrity of outlets	Moderate	Unlikely	**MEDIUM**	Residual risk to be managed in Construction Methodology	Construction [redacted]