2020 IECA Awards for Environmental Excellence
Fulton Hogan HEB Construction Joint Venture Entry

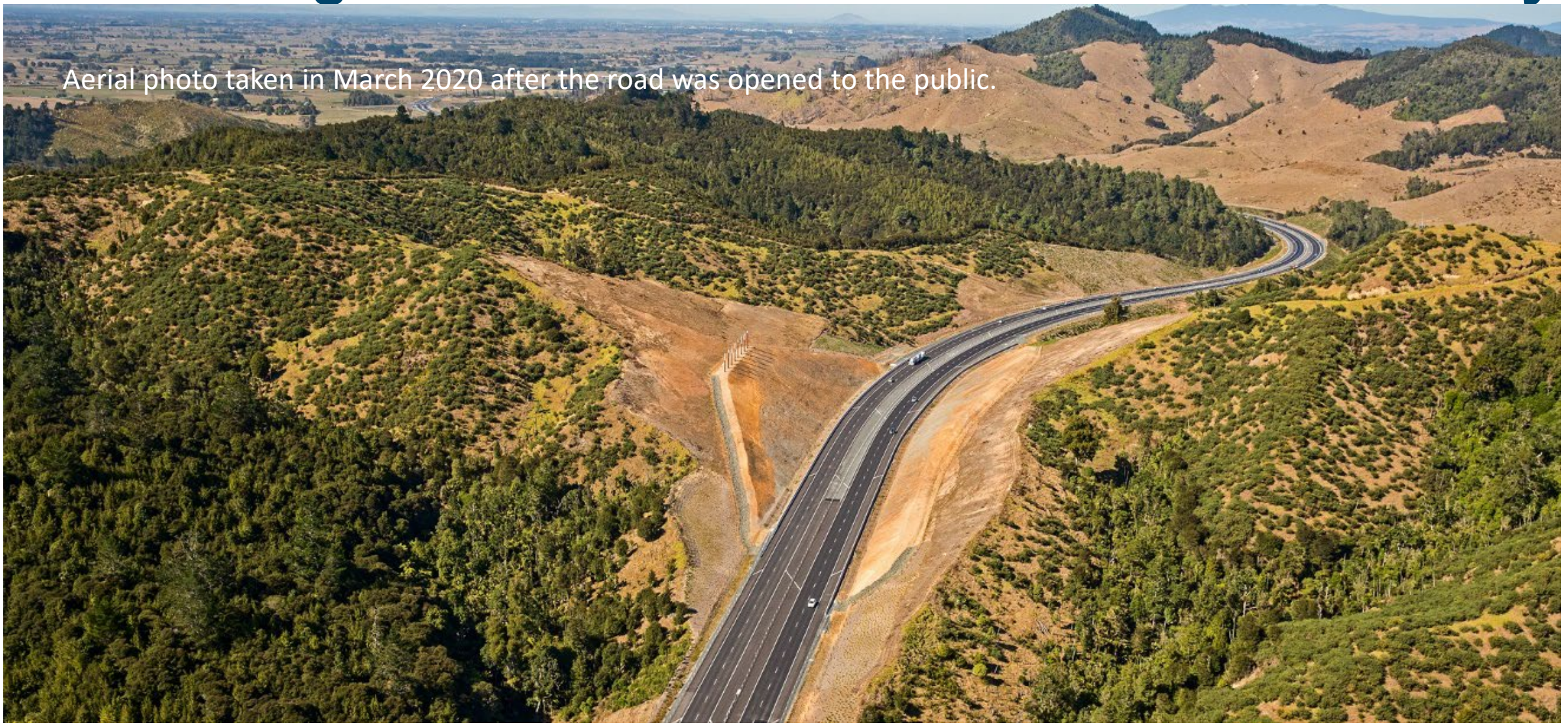

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Photo 1: November 2015, Johnson Valley to Taupiri Summit – one example of the terrain that the road was constructed through

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Varied Landscape; Diverse Challenges

Photo 2: North of the summit, MSE wall being built with no room for controls in DoC land. The area was controlled by directing water run off to the western side and into control devices at the bottom of the gully.
Photo 3: December 2017 summit works progressing. (Insert: an SRP at the bottom of the summit cut works on the southern side. One of many SRP's at various levels as the cut progressed, and the fills came up on either side).

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Varied Landscape; Diverse Challenges

Photo 4: Bridge works over one of the Red Rivers streams (Komakorau Stream), wrapped bunds protected the stream from run-off from the crane pad. Note the water levels showing on the cloth, these river levels regularly rose to the top of the bund and there was times where it overtopped it.

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Fulton Hogan HEB Construction Joint Venture Entry – Stream Diversions; Culvert Construction

Photo 5: (August 2016) Example of stream diversion works, stream diversion 14, a reconstructed meandering stream to mirror the existing conditions of the relocated waterway.
Photo 6 (December 2017) showing the riparian planting along the same stream. The area is to be held with the road to protect the stream and plantings in perpetuity.

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Fulton Hogan HEB Construction Joint Venture Entry – Withstanding Significant Storm Events

Photo 7: Mangatoketoke and Komakarua Stream bridge sites following storm event in July 2016, where water overtopped the clothed embankments and swamped the crane platforms. In-house control and manufacture of precast elements enabled successful sequencing in areas where high water levels meant access delays.
Additional photos show extent of ground surface flooding at the northern end of the site

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Fulton Hogan HEB Construction Joint Venture Entry – Optimised Sediment Retention Ponds and Decanting Earth Bunds

Photo 8: Area B working with varied soil conditions, including a coal seam. The area above has been stabilised to prevent erosion.
(Insert: Examples of SRP's located through area B. In the background is the access track with multiple DEB's for haul road runoff control).

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Challenges of the Taupiri Ranges

Photo 9: October 2016: 180t excavator tracking along widened farm track to gain access to the south side of the summit.

Photo 10: October 2016: Taupiri summit works continue
Insert: January 2016: Early temporary bridge over the Mangawhara opened the south side of the summit for construction machinery

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Cultural Recognition and Protection

Photo 11: Te Iringa pou site located just north of Te Iringa Lagoon.

Photo 12: Te Tihi (“the Summit) Whakanoa (blessing)

Photo 13: Official opening 14 February 2020 with Brad Totowera and Kingii Tuhetia (the Maori King), with the Honourable Phil Twyford, Minister of Transport

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Unique Aspects

Photo 14: Huglekultures created to capture and reuse the waste vegetation from the clearance through the Department of Conservation area
Photo 15: Stumperies were also a good way to improve ecology by creating mini ecosystems.
Photo 16: Captured one of the gang of planters who planted 1.4 million native eco-sourced plants throughout the alignment and surrounding areas.

2020 IECA Awards for Environmental Excellence

Fulton Hogan HEB Construction Joint Venture Entry – Unique Aspects

Photo 17: Evans Road wetland (5ha) under construction, which was then colonised by Royal Spoonbill, White Heron and Bittern, along with other water fowl

IECA Environmental Excellence Awards 2020

Project Name: Huntly Section, Waikato Expressway

Summary

Construction of a 15.5km four-lane expressway east of Rāhui Pōkeka Huntly Township, over lowlands and streams, and through the steep terrain of the Taupiri Range.

Key features of the work:

- Large-scale and challenging earthworks: 4.4 million m^3 of cut and 3.5 million m^3 of fill, across flood-prone, steep and difficult to access terrains, including cuts up to 57m deep and fills 20m high.
- Construction of nine new expressway bridges, including four bridges over ecologically and culturally sensitive waterways that are highly sacred to Waikato-Tainui iwi.
- Large-scale drainage works including installations of 36 major culverts ranging from 13 to 130m long and up to 2.4m in diameter.
- Erosion and sediment controls in very challenging environments dealing with steep slopes and high velocity of water.
- Planting of up to 1.4 million eco sourced local and native plants as part of forest, wetland and stream mitigation.

Key environmental challenges, solutions, and successes:

- Over 250 ESC features were implemented and managed that included 124 decanting earth bunds, 67 sediment ponds and over 60km of silt retention earth bunds to manage and treat water along the site during construction. Major decommissioning in conjunction with network drainage and ecological planting was a significant element of work relating to these controls.
- Responding to diverse consenting requirements that included creating a new five-hectare wetland, two hectares of multiple meandering stream diversions (some in steep gullies) and riparian planting and fencing of 17km of stream banks of the Waikato-Tainui Red Rivers.
- Strict consenting requirements on the movement of vegetation saw the creation of Huglekultures and Stumperies within the lagoon riparian margin to form new natural ecosystems.
- Over the 4.5 years there were no significant environmental issues caused by the works, despite the unseasonal summer cyclones and storms that plagued the site for three earthworks seasons.

The Huntly Section project won Waikato Regional Council's earthworks site of the year for 2016 and 2017 (during the height of the earthworks and through two extremely wet summers), and in the third year shared with another project. The most scenic, natural, 15.5 km section of the expressway showcases the large scale earthworks, large sections of native planting blending into natural landscapes and impressive artworks – the most complex greenfields project completed in the Waikato to date.

Project details

Location
East of Huntly, Waikato, New Zealand

The Huntly section is located within the Waikato area and dissects the Taupiri ranges. The area is known for challenging weather conditions, and frequently saw conflicting weather across the site, such as heavy rainfall on one side of the summit, while it was dry and sunny on the other. Along with high intensity rainfall and fog through the winter months, due to the location of the construction site, heat and dust was a common challenge throughout the summers.

Major parties involved with this entry
Fulton Hogan and HEB Construction in a construction Joint Venture. The client was Waka Kotahi.

Key milestone dates
Construction commenced 1 October 2015 with the road opening on 9 March 2020.

The project was awarded to the Joint Venture in March 2015. Between March and October, a collaborative approach was taken with the regulatory authorities, both regional and district councils, the Department of Conservation, and iwi through the tangata whenua working group. This allowed for critical design development and a suite of management plans being staged, written, reviewed and approved to allow for construction works to commence on 1 October 2015.

(Waka Kotahi – Map of the sections of the Waikato Expressway)

The first construction season saw the sole focus on enabling works to gain access to the steep slip gullies that had to be mucked out, fill compacted and then culverts installed before structural fills could commence. Tracks were made to reach the summit and other hard to access areas so that vegetation removal could commence after the ecological requirements and checks had been completed. It was critical that this vegetation removal commenced in October 2015 to allow for earthworks to commence in this area in the next earthworks season. Vegetation removal was limited to the months of October – April but had to satisfy stringent Lizard and Bat Management Plan requirements, which meant the first month was spent undertaking lizard searches and bat monitoring.

Track creation and upgrading required multiple DEB's to be installed on catchments with steep slopes and high intensity rainfalls. Having ESC plans designed, reviewed and approved by council meant good clear communication was required so that critical path approvals were received, and no delays occurred in the construction.

Bridge construction had to commence in the first season over the Mangawhara stream to gain access to the south side of the site and enable earthworks equipment to access the summit. Earthworks targets were set each season across in-house and subcontracted teams, and by the final season all targets had been met. All sub-contractors worked as a team to achieve the task of moving high volumes. With the restriction of not being able to import material offsite, fill areas were under demand to perform and controls in these areas were constantly under stress and maintenance due to the changing nature of material coming in. Of the 4.4 million m_3 of cut and 3.5 million m_3 of fill programmed to be shifted, the peak daily earthworks volumes of 32,000m^3 was achieved of cut to fill. Two and a half years after starting, 1 million m^3 of cut material had been shifted from the main cut of Taupiri Pass, with the remaining 300,000m^3 completed the following December 2018.

Decommissioning of the control devices as the areas were completed was a major achievement, as each control device had to be approved by council and the area stabilised before it could be removed. Each control had a quality control pack, involving all the documentation for the device from the ESC plan, approval, construction and maintenance to the decommission approval and final removal. These packs covered each of the 124 DEB's and 67 SRP's and were all completed and signed off.

Pavement construction bought its own challenges with cement stabilisation, emulsion and chip sealing especially as the weather turned inclement through Autumn and during the last 18 months of October 2018 to March 2020. Consideration, discussion and adaption of controls was required to ensure no run-off of these materials occurred to the neighbouring waterways. Between the dedicated ESC team and the pavements teams this was successfully achieved.

The formal opening of the road involved a dawn blessing by a large contingent of Waikato Tainui and associated iwi, and the ribbon cutting by the Māori King. The passing of the pou whenua, carved by project carvers and presented to the king by the project team, was handed back in recognition of the work well done.

The final milestone of the road being completed, signed off by Waka Kotahi and their engineers BBO prior to being opened to public use was achieved on 9 March 2020; well before the project completion date of November 2020.

Distinctive features, challenges and accomplishments for environmental protection

1. Erosion and Sediment Control across a varied landscape with diverse challenges

Work was performed across a very wide variety of terrestrial ecosystems ranging from rolling to steep pastoral hill county, wetlands, lakes, rivers and streams, regenerating kanuka forest and modified remnant broadleaf-podocarp, all of which required protection. Key receiving aquatic and wildlife environments included:

- The Waikato River
- The Kimihia Wildlife Management Reserve
- The nationally significant Kimihia Wetland including Lake Kimihia and Kimihia Stream
- Te Iringa Lagoon
- The Taupiri Range, which is the largest tract of indigenous forest remaining in the Hamilton and Meremere Ecological Districts and includes the 700 hectare Taupiri Scientific Reserve
- Four waterways at the southern end, the Mangawara, Whangamaire, Komakorau and Mangatoketoke Streams (known as the Red Rivers), all of which are tributaries of the Waikato River.

To protect these environments and all other areas of the corridor the project team implemented 250 individual erosion and sediment controls (ESCs) installed across the site. This included 124 decanting earth bunds, 67 sediment retention ponds, and a total of 60km of diversion bunds. There was also significant lengths of silt and super silt fencing throughout the construction site. From the bottom of a 20m fill gully protecting a stream to a spoil site, from along the length of watercourse to the edges of the Lake Kimihia and Te Iringa lagoon, all areas of earthworks had at times multiple layers of controls in place to protect the environment and ensure compliance with the stringent consent conditions.

As areas were partially and fully completed, every effort was made to progressively stabilise with grass and hay mulch to minimise erosion on both temporary and permanently completed areas. Bark mulch to 1.5 to 1 batters was used as a sustainable and permanent control and long term assistance for native planting. The bark mulch was a 50/50 blend of pine bark and chip from recycled pallets. Native plans were used for root hold to enhance stabilisation of large steep batters.

The steep terrain of the Taupiri Range was a significant challenge during rain events and effort was focused into slowing down the water to minimise erosion. Some methods used were installing preliminary sumps and cut off drains to mitigate the sediment run off before it entered the environmental controls. When the road surface started reaching levels where rainfall could discharge over batters, bunds, temporary head walls and flumes were used to allow water to pond and then discharge in a controlled manner over the batter into sumps and diversion channels before entering control devices.

Where conventional controls could not be used, mainly due to fluctuating water levels over winter, (lake and lagoon levels would rise and swamp the controls) constructed embankments were used, such as through Lake Kimihia and other sections of ponds, swamps, wetlands, and lagoons.

2. Complex stream diversions and large culvert construction

Throughout the site there were six stream diversions required as their locations were under the proposed road footprint. Careful planning and management resulted in these stream diversions being designed to mirror the natural stream environment. Of these six stream diversions, two were continually flowing meandering streams and on completion had tree roots and rock pools. Were possible, stream diversions were planted along the riparian edges and in two areas these diversions were fenced off and remain as part of the road network to be protected in perpetuity.

Five large culverts were constructed in live streams. This required temporary diversions to be put in place prior to construction. Where possible, culvert works were constructed and completed offline, and then minor stream diversions works were undertaken to align the watercourses. This ensured that there was minimal impact on the environment, and a better and safer working environment for the construction team.

Every waterway, whether it was a stream diversion or culvert installation, was temporarily dammed and fished. All native aquatic life was relocated back upstream of the existing network, and pest species were

euthanized. The project aquatic ecologist signed off on all diversions being completed in accordance with the designs and achieving fish passage for native fish.

Maintaining fish passage throughout construction was a challenge. Over the period of construction, de-fishing of waterways resulted in the capture and relocation to nearby streams of over 1,000 tuna (eels), as well as inanga, banded kokopu, koura and cran's bully. In one area, freshwater mussels were discovered. They had not been seen in this area since the 1900's. These were carefully collected and relocated back up into the Taupiri Reserve streams so they could be protected. Iwi Kaiārahi (leaders) and up to nine Kaitiaki (environmental representatives) were onsite working with the project team to assist with culture, custom, and environmental protection processes. All these stream works were performed with the help of local iwi and our site kaitiaki.

Sediment controls were designed and built in accordance with the Waikato Regional Council's 'Erosion & Sediment Control – Guidelines for Soil Disturbing Activities' (Technical Report No.2009/02). These guidelines are almost identical to Technical Publication 90 used in Northland, Auckland, and the Bay of Plenty. The project team used these guidelines as an absolute bare minimum when managing sediment runoff onsite, and consistently, and voluntarily, exceeded these guidelines. We worked with a team of ecologists, worked closely with DoC and Waikato Regional Council staff, to develop and implement all solutions as part of the project's Environmental and Ecological Mitigation Management Plans.

3. Withstanding five storms in two years

One of the challenges experienced on the Huntly section was the weather. Five cyclonic storms were experienced across the 2016 and 2017 earthworks seasons, which was in itself not normal weather behaviour. This resulted in the historical rainfall data on which the construction tender programme was based being significantly exceeded. In 2017 there were events in both March and April, raising groundwater and surface water ponding levels onsite to unprecedented levels. Rainfall over a 12 hour period exceeded 90mm on the summit and southern side. Following these cyclones, water levels in the Red Rivers bridge construction sites did not reduce for up to 18 months causing some construction challenges for the structures crews.

Early, and during the middle of the project, there was a significant area that remained unstabilised as works progressed. This meant the project was exposed to a degree of risk of sediment discharging into the sensitive surrounding catchments. However, close monitoring and dedicated earthworks and erosion and sediment control teams worked closely together to monitor and maintain primary and secondary controls. This kept the site functioning and was able to recommence earthworks quickly and efficiently once the site dried out and the earthworks seasons recommenced.

4. Solutions to optimise sediment ponds and decanting earth bunds

The project team developed wing innovations to optimise and improve the efficiencies of both sediment retention ponds and decanting earth bunds, working closely with the Waikato Regional Council, to suit the site environment and conditions:

By increasing the controls' capacity between 10% and 50% the construction team added 'insurance' to the control functionality and ability to deal with steep terrain and more extreme weather events – as described above. This included events that registered periods of extremely heavy rainfall.

Consent conditions required the floor of the ponds to be sloped in the high risk, steep terrain sections. This requirement was then taken and also used in other high risk areas of the site. The floor of the devices sloped backwards from the entrance to the rear of the pond away from the outlet, which prolonged the time that sediment has available to fall out of suspension inside the control. The use of silt fences through the middle of some ponds to generate baffles also offered further levels of treatment within the ponds.

Additional measures were also trialled and implemented in areas where there was space and need. Creating a deep 'plunge pool' in the floor of the control at the inlet helped to promote download movement of sediment as it entered, and easily maintained and accessible pre-treatment sumps in series immediately prior to the control not only slowed the water velocities but also allowed for the initial 'pre-treatment' to occur.

Armouring the inlet of the device with geotextile fabric and stabilising the control exterior and interior slopes with hydro-seed and/or geotextile, also helped to prevent the device itself being a source of sediment generation. Geotextile armouring of sloped approaches to the control also helped to minimise erosion and sediment loading into the devices.

The use of flocculent blends were key to the success of efficient ponds and DEB's. Flocculent blends were targeted to the complete spectrum of sediment size and characteristics rather than one section of the discharge. This provided exceptional water quality outcomes. We used a blend of Poly Aluminium Chloride and Poly-Dadmac both in flocculent socks and in rain activated delivery systems (Floc BoxTM). By installing floc socks (flocculent within socks) in tunnels, it was found that the tunnels prolonged the life of the floc sock and more effectively treated the water.

5. The challenges of Taupiri Range

Work to cut through the Taupiri Range was a significant challenge. The range is the first geographic feature in the northern Waikato region that interrupts the westerly weather coming from the Tasman Sea. This frequently created high intensity rainfalls and changeable conditions, with corresponding impacts on earthwork operations. The range also contains the largest tract of indigenous forest remaining in the Hamilton and Meremere Ecological Districts and included the Taupiri Scientific Reserve.

One of the biggest challenges for construction was to cut through the Taupiri Ranges to create the 57m-deep, 400m-long, 40m-wide (300m-wide top batter to top batter) Taupiri Pass. To add to the challenge of the cut, there were 20m gullies needing to be filled on both sides, giving the construction team an almost 80m high hill to have to climb.

Access to the summit started with machinery being walked up very steep terrain from the south side to access the top of the range in October 2015. This machinery initially had to be bought in via the local farmers internal farm roads until construction access could be gained from the south with the temporary staging of the Mangawhara Stream bridge. Earthwork crews created steep haul roads down both sides of the range and started moving dirt with 30 tonne Moxy dump trucks to fill the valleys. Haul roads were so steep that some were unusable even in 4WD vehicles. At the peak of the season more than 250 pieces of machinery were working, including 100-tonne dump trucks, a 180-tonne excavator, as well as a fleet of motor scrapers.

Water was crystal clear in the Taupiri Ranges streams prior to the works commencing, and this was maintained as stream diversions were created and livened up, which is testament to the success of erosion and sediment controls in the Taupiri cut and fill operation.

The other challenges that Taupiri Ranges threw at the construction crews were the changeable and often varying weather conditions from one side to the other. It was not uncommon to have rain on the north side, while it was dry on the south. Fog frequently delayed the daily earthworks day through Autumn and Spring. Throughout summer, dust was the challenge as the crews balanced the need for productivity and the movement of earth against the generation of dust and the potential ecological damage this could cause through DoC corner (the corner of the Department of Conservation controlled Taupiri Reserve) around and along to Te Iringa Lagoon and the Red Rivers network.

Dust was constantly monitored and managed (by both speed reductions and water cart) by the earthworks team working closely with the environmental team. Stockpiles were stabilised as quickly as possible on completion.

6. Ensuring cultural recognition and protection

The corridor crosses the Taupiri Range and tributaries of the Waikato River, which are among the most culturally significant features of the Waikato Region to Waikato-Tainui. A particularly significant location near the corridor is the Taupiri Urupā (cemetery) where many ancestors and relatives of Waikato-Tainui are buried. Additional sites of significance include the Te Iringa Lagoon, Lake Kimihia, Te Uapata Pā and Otaahau Pā.

A mandated group of tangata whenua representatives were brought together as the Huntly Tangata Whenua Working Group (TWWG). Waka Kotahi resourced the TWWG.

Engagement continued into construction, with the TWWG integrated into the project team to address their concerns and develop culturally acceptable solutions and mitigate the environmental effects of the project. Subject experts in the fields of archaeology, structures, stormwater management, ecology and land issues were brought in to provide specific expertise when required. This included a project Kaiārahi (guide and counsellor) and a Māori Tohunga Whakairo (master carver).

Together with the TWWG the project team managed and delivered the construction of four stream bridges at the southern end of the project across the culturally and ecologically significant Mangawara, Whangamaire, Komakorau and Mangatoketoke Streams, locally known as the 'Red Rivers'. A Red Rivers Cultural and Ecological Restoration Strategy was developed to offset the cultural impacts of the bridge piers in the floodplains of the waterways. Utilising the skills of specialist ecologists in conjunction with members of the TWWG set the framework for the restoration and enhancement of almost 17km of streams and 40.5 hectares of river margin within the lower catchment of the four affected streams.

Development of a Cultural Symbolism Plan by the Tohunga Whakairo in collaboration with the construction team and approved by the TWWG, identified three main areas throughout the alignment to carry the symbolism structures and carvings (pou). Each one of these pou has a story to tell, that can be taught to generations to come. They are a mixture of traditional carving, metal work and concrete casting. In addition to the pou sites, there is also the reinstatement of tūwhatawhata (palisades) and also waharoa (gateways) on two pā sites immediately adjacent to the alignment.

Having the project Kaiārahi, Kawe Nikora, engaging with crews across all aspects of construction to upskill cultural awareness greatly helped with site specific awareness and ownership, and assisted in developing and growing the relationship between the local iwi groups and the project team. Both the Kaitiaki and Kaiārahi were based at the site office and by being part of the team, communications between iwi and project was strengthened. Engagement increased when te reo started to be used onsite in both the spoken and written word. Cultural education became part of the Kaiārahi's day, and Kawe became highly respected by all those working on the site.

7. Other unique aspects of work delivered

Despite there being a consent requirement to provide native planting and pest control, the project team went well beyond what was required. This resulted in outstanding achievements for the local ecology including:

- In total 1.4 million native plants were planted across the corridor – with the help of local iwi.
- Cleared trees were used to form 700m of underground hugelkulture beds, which break down tree matter to provide soil nutrients.
- Pest plant control was performed over an area of 680 hectares. This included a large number of bait boxes placed and used over the four years of construction and the next six years to complete the 10 year statutory requirement. The use of bait boxes is significant, as it would have been easier and cheaper to undertake yearly 1080 poison aerial drops however this was not what those managing this programme in the project team wanted to see. Not only is it highly contentious to be undertaking 1080 aerial poisoning drops, it was also strongly felt in the project team that there could be a better and more effective way of undertaking the pest control.
- Along with the control of rats and possums, there was also a requirement to eradicate feral goats from the reserve. This condition proved to extra challenging as the reserve is not fenced and feral goats roam freely on the farms surrounding the reserve. Conversations with the neighbouring landowner to the west of the construction saw an agreement in place that allowed for goat hunting to occur of the farm up to the immediate ridgeline. This slowed the infestation of goats into the reserve. By year two, of the pest control, birds were seen and heard again at the summit and in the bush, and Rata was seen flowering in the reserve.
- Extensive bat inspections and monitoring prior to tree felling, followed by ongoing seasonal bat monitoring over the following three summers was undertaken. At the time, this was the largest bat monitoring ever on a roading project. This requirement is shortly to be taken over by Waka Kotahi New Zealand Transport Agency.
- Part of the lizard management plan required that the areas of lizard habitat being cleared needed to be searched and cleared of all skinks and geckos prior to any vegetation felling occurring. At the completion of these night and day searches, 20 skinks and geckos were found and taken to an approved facility until the release pen could be competed and a season of pest control undertaken.

By the time the skinks and geckos were due to be relocated and released, their numbers had climbed to 24.

- On one of the neighbouring farm drains, the project team agreed to install a culvert for the farmer. Following protocols, the area was dammed off and de-fishing commenced. Within a very short timeframe, the nationally at-risk Black Mudfish was found in high numbers. All works ceased immediately and following consultation with the farmer, the area was fenced off and 1,300 native plants were planted to create a better environment to protect them. The culvert installation was moved to another location and the area has now been fenced for permanent protection. This was a shining example of collaboration between the project team and the neighbouring farmer to protect a small part of the environment.
- At the four bridges built across waterways we used temporary staging and falsework to minimise our footprint in the water. Very soft ground was a big challenge that required extensive ground improvements. At several bridge sites, over 2000 timber poles up to 15m in length were driven into the ground to provide vertical support to overlying fills and prevent liquefaction from happening.
- There were many gullies up to 5m deep in the swamps that needed to be dug out and filled. Over 450,000 linear metres of wick drains were installed.

We became the team to beat for the local council earthworks awards. One of two major earthworks projects undertaken in the area at the same time, the project won Waikato Regional Council's earthworks site of the year for 2016 and 2017, and in the third year shared top honours with another project.

Quantifiable benefits created

Benefits to the environment

Overall, the numerous receiving aquatic and wildlife environments within and around the corridor have benefitted from extensive ecological mitigation measures during construction, and permanent treatment systems now onsite.

Of the 1.4 million plants, 200,000 new native plants planted and pest plant removal (crack willow poisoning) around Lake Kimihia will improve water quality significantly. Construction of a new wetland adjacent to Lake Kimihia has already seen an increase in bird life with white heron (nationally critical), royal spoonbill (nationally uncommon), and bittern (nationally endangered) making appearances.

The native plantings in and around Taupiri Scientific Reserve, include bat habitat mitigation and enhancement and making culturally important plant species accessible to iwi on foot. It will also assist to improve the health of Te Iringa lagoon with its riparian planting as will the 16km of riparian fencing and planting along the significant waterways of the Red Rivers that all flow to the Waikato River.

There is increased fish passage throughout the area due to specifically designed and constructed stream diversions and culvert works (using baffles and spat ropes, ponds and distilling basins)

Over five years of construction, there was no increase in sedimentation in any of the natural streams within the worksite.

Benefits to the community

Engagement with greater Waikato Tainui iwi resulted in strong relationships being built, with iwi acting to fully support the project. By project close, trust, strong partnerships and mutual respect developed over five years was recognised when Waikato-Tainui King Tūheitia's spokesman Brad Totorewa presented Project Director, Tony Adams with a pouwhenua 'Kahu Pookere', which is a marker of ownership and a symbol of support. This is a very high honour.

Sites of significance within the area were enhanced for public use and enjoyment. This included employing five carvers for the construction and installation of pou at three areas of cultural significance. There were also the construction of patterned MSE walls designed by local iwi artists, and the installation of ceremonial palisades and waharoa at two pā sites.

During discussions with the local Maori Immersion school it became apparent that there was a need for additional carparking as it was becoming a safety concern for the school. We consented, designed and built a new teachers carpark for the school.

Working with the client Waka Kotahi, the project team designed and built the only carpark on the Waikato Expressway, which in the future, will open up the Taupiri Reserve for improved access pathways for the public and DoC staff.

The project teams young engineers spoke at the local schools, showcasing engineering and environmental aspects for students of all ages. Our project management staff would visit schools regularly to give project updates and explain the details of work undertaken. As the site became more accessible, school trips would be arranged for students.

The project team also assisted the local communities through sponsorship of the Annual Koi Carp bowfishing competition for five years, and sponsorship of the local volunteer fire brigade fundraising golf tournament for a number of years.

Benefits to the erosion control industry

The site was used as best practice training for Waikato Regional Council erosion and sediment control training courses for three years. The project has been the subject of many presentations for both national councils and at IECA conferences.

The site was used to trial different and changing aspects of erosion and sediment control. Two particular trials that were undertaken was the use of polymers for dust control and clean water diversion with outstanding results as follows:

- The use of polymers on haul roads improved dust management by binding the particles together so that the fine dust particles did not rise up into the air column. This reduced the amount of times the haul road needed to be watered thereby improving water management and efficiency.
- The use of polymers at the right dilution to a high flow dirty water channel to reduce erosion and sedimentation caused by water flow. This diminished the need for diversions to be clothed and minimised reliance on non-renewable or reusable materials and volumes being disposed of to landfill once the diversion was removed.

The project is now being used as an example of best practice erosion and sediment control and environmental practice on other similar challenging sites across the country. The learnings that the project team have taken off this site are already being used in the pre-construction planning for the next major project Te Ahu a Turanga – Manawatu to Tararua Highway also being constructed by a Fulton Hogan/ HEB partnership.

Benefits to our companies

Both Fulton Hogan and HEB Construction have raised the bar in how environmental and cultural challenges are addressed and mitigated during construction. The learnings and processes developed on the project for ESCs and environmental protection will be applied on all future projects as above.

The project was a great place for young engineers to learn a huge range of different types of engineering skills, from ESCs and large scale earthworks, right through to pavement construction and building bridges. This included Fulton Hogan and HEB Construction’s cadet and graduate programmes.

The project provided numerous opportunities for site based development within crews and also ensured excellent succession planning. As an example, eight female operators who already had high skills using a number of different machines made the most of the project to work in different areas across the alignment, including moving over 1 million cubic metres at the Taupiri Pass – a once in a lifetime opportunity that has kept a diverse workforce on top of their game.

Apprentice carpenters and steel workers were employed by the project structures team. Apprentices were given practical work experience, mentoring and guidance toward their apprenticeships.

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