



# **CONCRETE CANVAS®** Concrete on a Roll

## PETROCHEMICAL CASE STUDIES



The Queen's Awards  
for Enterprise:  
International Trade  
2019



Board of Trade  
Winner  
2018



Winner  
Technical Innovation Award



award  
winner

Innovation Award  
ICE Wales Cymru Awards 2017



British Board of Agrément  
Certified



ACS Registrars Ltd  
ISO 9001 Accreditation



Certified CPD  
Provider



Corporate  
Member



Proud Supporter of  
Exporting is Great



RAIL



ROAD



MINING



PETROCHEM



AGRO



PUBLIC WORKS



UTILITIES



DEFENCE



DESIGN



SHELTER



## Project Info



15 / 06 / 15



CC8™ and CC13™  
Bulk Rolls



14,770m<sup>2</sup>



Transverse and  
Longitudinal layers



OPF Chayvo, Sakhalin,  
Russia



CH2M Hill



CC was used to line  
a series of ditches to  
prevent erosion of camp  
infrastructure.

**ExxonMobil**

**ch2m**



Completed installation

In June 2015, Concrete Canvas® GCCM\* (CC) was used to line a series of drainage channels at the Onshore Processing Facility (OPF) in Chayvo, Sakhalin, Russia. The camp is built on a class C sand substrate and is exposed to harsh weather conditions and temperatures as low as -40°C. A trial channel installed the previous year proved CC could cope with these conditions, leading to this much larger installation. CC is the only viable solution for this site. The works were carried out by CH2M Hill for Exxon Neftgas Ltd., a subsidiary of ExxonMobil.

The channels were excavated and compacted using a vibrating plate, with anchor trenches dug along each shoulder. Bulk rolls of CC8™ and CC13™ were mounted onto a spreader beam hung from a tele-handler and unrolled longitudinally or transversely depending on the channel profile. The CC was overlapped by 100mm, specifically in the direction of water flow for transverse layups. Pegs were inserted into the anchor trench through every overlap for transverse layups and every 2m for longitudinal layups. The overlaps were sealed with an adhesive sealant and jointed with screws placed at 200mm centres. Hydration was achieved using a 7000L water truck and hose with spray nozzle attached.

In total, 9250m<sup>2</sup> of CC8™ and 5520m<sup>2</sup> of CC13™ were installed over three weeks by six people. The client was very impressed with the speed of installation as well as the drastically reduced costs. The client subsequently ordered more material for the next construction season, to be used on further projects.

\*Geosynthetic Cementitious Composite Mat







*The channels were prepared by hand and anchor trenches dug*



*Both longitudinal and transverse layups were used*



*CC was fixed with adhesive sealant and screws*



*Anchor trenches were backfilled with soil and packed down*



*Hydration taking place*



*Completed installation*



## Project Info



31 / 01 / 16



CC5™ Bulk Rolls



3,000m<sup>2</sup>



Transverse layers



Abu Dhabi, UAE



OQC



CC used to prevent the erosion of a pipe protection berm.



Completed bund lining installation

In January 2016, Concrete Canvas® GCCM\* (CC) was trialled as an erosion prevention method on a pipe protection berm for a gas pipeline in Abu Dhabi. The bund was at risk of weathering erosion which could have led to the exposure of the gas transport pipe beneath, risking infrastructure and environmental damage. Other conventional methods, such as Bitumen, can quickly degrade under high levels of UV exposure and can have a huge environmental impact. In addition, there is risk of wildlife damage to the bund, to which CC would be much more resistant. The works were carried out by OQC for GASCO.

The bund was compacted using the bucket of an excavator before bulk rolls of CC5™ were delivered to site. The rolls were mounted onto a spreader beam and hung from plant equipment before being deployed transversely across the berm, with each layer overlapping the previous by 100mm. Sealant was used to increase the impermeability of the overlap and screws were inserted at 100mm intervals. A 3000-gallon water truck was used to hydrate the material. Due to the high temperatures and arid climate, hydration was undertaken hourly to ensure sufficient hydration.

3000m<sup>2</sup> of CC5™ was installed in 5 days in high temperatures on a remote site. The client deemed the trial a huge success and is looking to specify CC on similar future projects. CC has many distinct advantages for projects of this nature, such as the low material volume reducing the logistical burden for works in remote locations, as gas pipelines often are. In addition, the rapid installation rates mean reduced time on site, which allows for a more cost-effective installation whilst reducing health and safety risk.

\*Geosynthetic Cementitious Composite Mat







CC was delivered to site in bulk rolls and deployed from a spreader beam



Screws were used to secure the CC



The CC was laid transversely across the bund



Completed installation



Completed installation



## Project Info



10 / 10 / 16



CC8™ Bulk Rolls



3,900m<sup>2</sup>



Longitudinal layers



Falkirk, UK



Luddon Construction  
on behalf of Petroineos



CC used to as weed  
suppression under  
complex series of pipe  
tracks at Grangemouth  
Refinery



Completed installation at Grangemouth Refinery

In October 2016, Concrete Canvas® GCCM\* (CC) was used to provide weed suppression under a series of pipe tracks at Grangemouth Refinery, operated by Petroineos in Falkirk, UK. Since buying the site from BP in 2005, Ineos have heavily invested in infrastructure and, as part of the Refinery Integrity Improvement Project, identified a section of pipework as in need of remediation.

Poured concrete and stone chips were also considered, but would have required additional digging and resulted in dirt and vegetation build up. Due to the possibility for weed suppression, minimal preparation, less installation time and several other factors, CC was chosen. The work was carried out by Luddon Construction Ltd. with input from IKM.

Prior to installation, the pipe track area was graded, evened out and vegetation removed. Due to the restricted access caused by low pipes and little clearance between the pipes and track floor, the CC was deployed using a modified light weight spreader beam. Layers were laid perpendicular to the pipe track to accommodate the majority of pipe upstands and minimise length and subsequent weight of each layer. Layers were overlapped by 100mm and screwed together at 200mm intervals. CC was then fixed to the substrate using a combination of steel and plastic ground pegs, depending on the ground condition at specific points. Hydration was given using onsite water mains.

In total, 3,900m<sup>2</sup> of CC8™ was installed over 6 weeks with inclement weather and restricted access.

\*Geosynthetic Cementitious Composite Mat







CC was delivered to site in bulk rolls and unrolled from spreader beam



A modified light-weight spreader beam was used to pull CC under the pipes



A revisit to the site showed that CC was successfully providing leak detection



Site post-installation

*"After a year of installation, nothing has grown within the Concrete Canvas® lined areas, whereas vegetation continues to grow within the stop chipped sections of the pipetrack. Concrete Canvas® has proven to be the better and more cost effective vegetation suppressor and we look forward to specifying the material wherever possible for this type of control."*

**Stewart Woolley**  
**Mechanical Asset Care Engineer**  
**Petroineos**



## Project Info



11 / 08 / 14



CC5™ Bulk Rolls



900m<sup>2</sup>



Transverse layers



PCK refinery, Schwedt,  
Germany



Undisclosed



CC5™ used to improve  
the impermeability of an  
extinguishing basin.



Completed installation at PCK Refinery, Germany

In August 2014, Concrete Canvas® GCCM\* (CC) was used to line an extinguishing basin at the PCK Refinery in Schwedt, Germany. The original poured concrete had cracked and spalled, resulting in excessive water loss. Removing the basin and re-building it using poured concrete was considered, however this would have been more time consuming, taking the basin out of operation for an extended period of time. As a result, CC was chosen. The works were carried out by an approved contractor, who had no prior experience of installing CC, for PCK in a joint venture between BP, Rosneft, Shell, Eni and Total.

The existing concrete was cleaned and mortar applied to large cracks to eliminate voids under the CC. An anchor trench was then created on the shoulder to prevent ingress and provide neat termination. Bulk rolls of CC5™ were delivered to site, mounted onto a spreader beam and hung from a Zoom Boom for easy unrolling. The project was completed in sections with the two shorter sides of the basin completed first. The CC was unrolled on the flat, cut to profile length and positioned in the basin by hand with alternating perpendicular overlaps at the corners. This allowed the CC to be unrolled across the width of the basin for the remaining sections, starting at each end and working towards the middle. The CC was fixed to the concrete using 40mm wedge anchors at 2m intervals, with overlaps of 100mm hydrated and then sealed. Hydration was then achieved across the rest of the installation via extinguishing hose.

In total, 900m<sup>2</sup> of CC5™ was installed by five people in 4 days with some inclement weather. The client was impressed with the result and instigated a bund trial as well as planning to line a 6000m<sup>2</sup> extinguishing basin with CC.

\*Geosynthetic Cementitious Composite Mat







Site prior to installation



The team first laid alternating perpendicular layers at the corners



CC was unrolled from a spreader beam loaded on a Zoom Boom



Overlapping layers were sealed with an adhesive sealant



Hydration taking place



Completed installation



## Project Info



29 / 12 / 14



CC8™ Bulk Rolls



3,550m<sup>2</sup>



Vertical layers



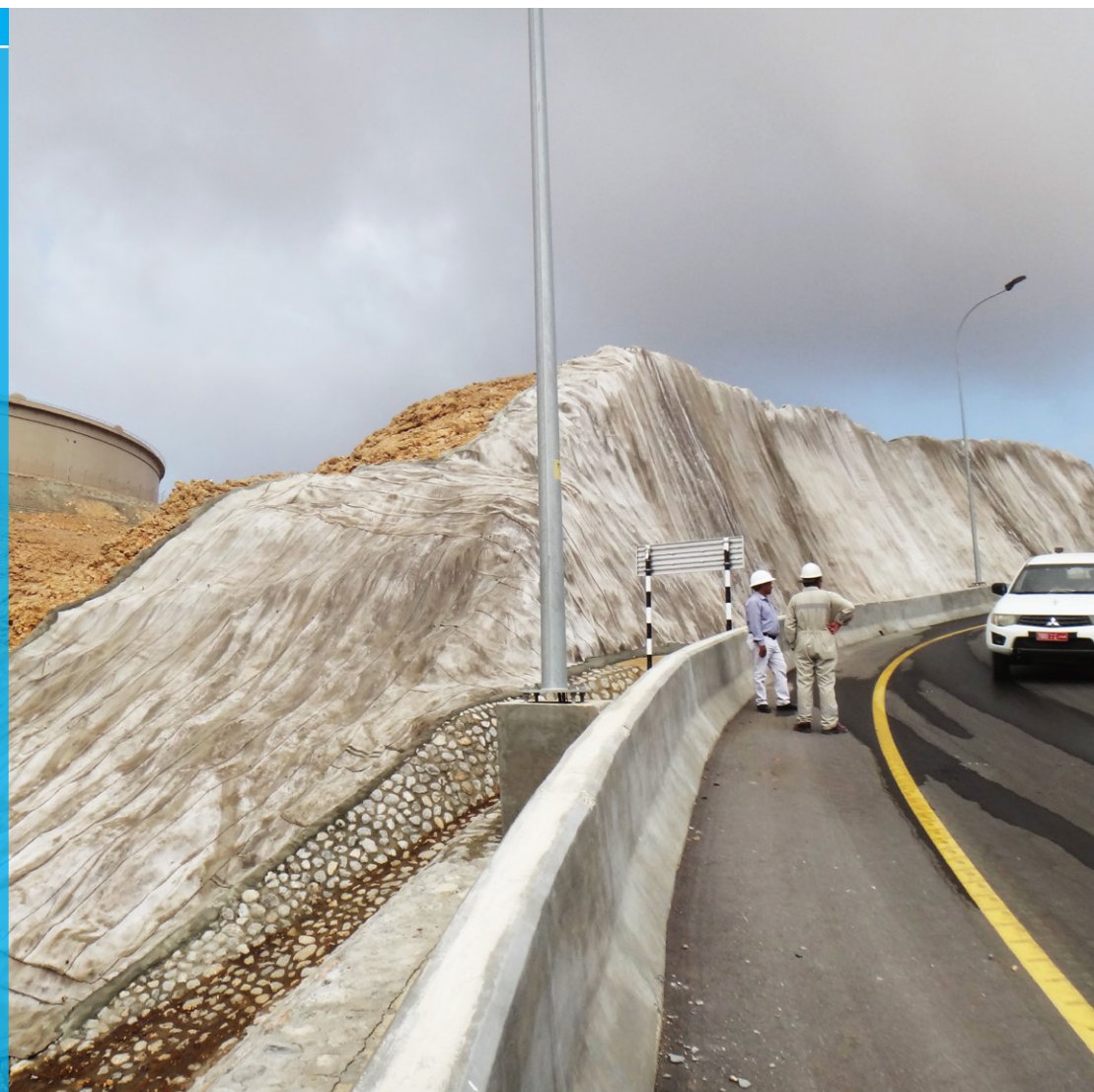
Undisclosed Tank Farm,  
Oman



Undisclosed



CC8™ was used to prevent the weathering of a roadside slope which was leading to rockfall onto the road.



*Completed installation*

In December 2014, Concrete Canvas® GCCM\* (CC) was used to protect a roadside slope near a petrochemical facility in Oman. The slope was suffering from weathering erosion which was causing rocks to fall onto the road below. CC was installed in a trial, with shotcrete simultaneously installed on a different part of the slope to establish which was the better method for this application.

Loose rock was removed from the slope face to ensure intimate contact with the CC. Bulk rolls of CC8™ were delivered to site and mounted onto a spreader beam and hung from a crane. The rolls were lifted to the top of the slope and the leading edge placed in an anchor trench and pegged in place. The CC was then unrolled down the slope and cut to length, to avoid wastage. Layers were overlapped by 100mm and then sealed with an adhesive sealant and screwed at 100mm intervals. Pegs were also inserted where needed, and mortar used to seal the CC to the concrete substrate and to the pipes installed to allow the egress of water. Hydration was achieved using a 200-gallon tanker at the crest of the slope and a bowser at the base. Due to high temperatures, a second hydration was given an hour later.

A total of 3,550m<sup>2</sup> of CC8™ was installed over a period of five days, compared to the 12 days installation time for the shotcrete. The CC also resulted in cost savings and allowed the road to remain open for the duration of the installation. Unlike the shotcrete, there have been no signs of cracking or failure, and CC is being considered by this client for further projects.

\*Geosynthetic Cementitious Composite Mat







*The CC was delivered to site in bulk rolls*



*The CC was suspended from a spreader beam and excavator for unrolling*



*Overlapping layers of CC were secured with adhesive sealant and screws*



*Edges of the CC were backfilled using concrete at the crest of the slope*

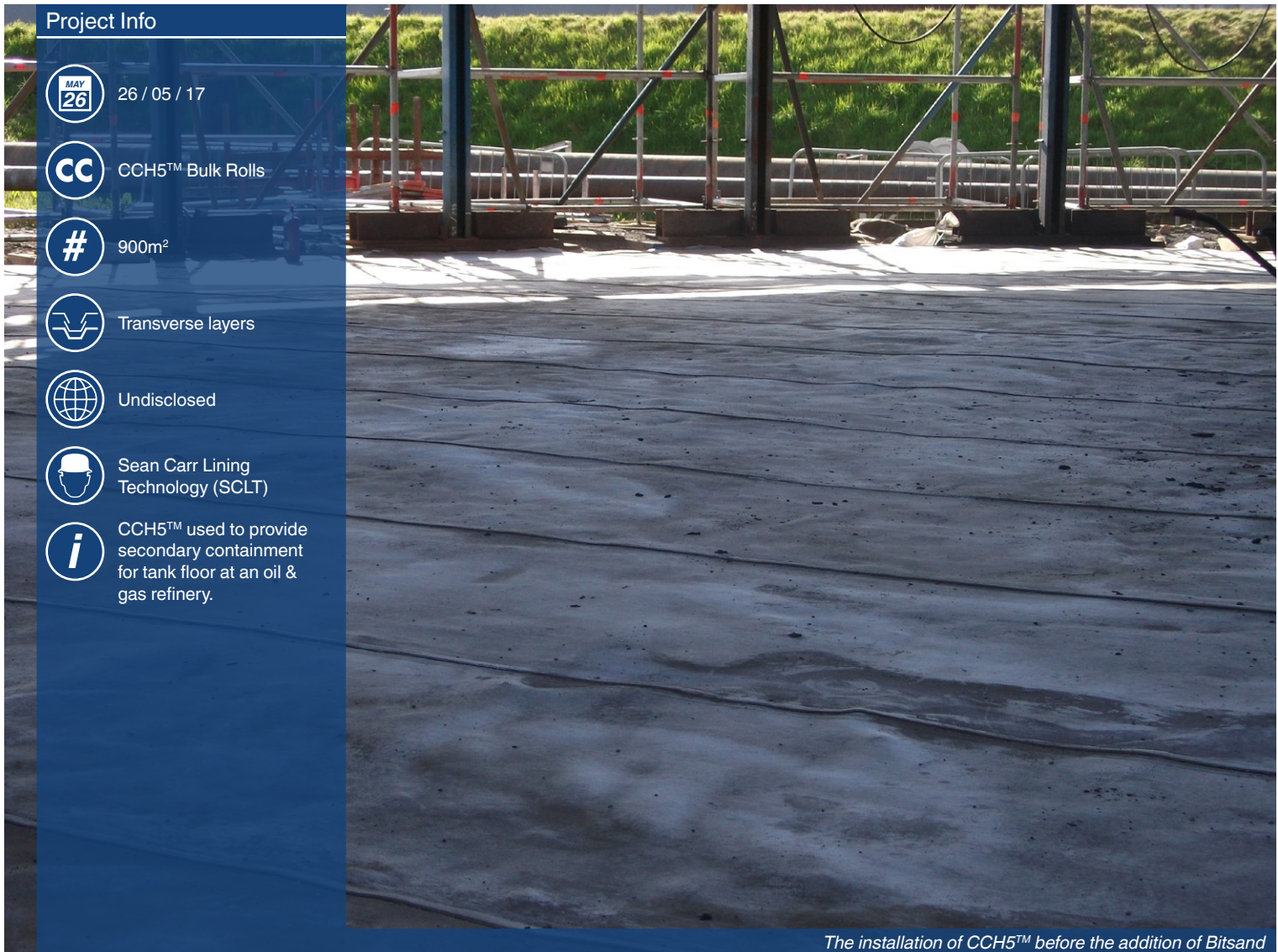


*The end of the slope was covered using longitudinal and transverse layers*



*Completed installation*





## Project Info



26 / 05 / 17



CCH5™ Bulk Rolls



900m²



Transverse layers



Undisclosed



Sean Carr Lining Technology (SCLT)



CCH5™ used to provide secondary containment for tank floor at an oil & gas refinery.

*The installation of CCH5™ before the addition of Bitsand*

In May 2017, CC Hydro™ (CCH) GCCB\* was used to provide a retrofit below-tank liner for a tank overhaul project at a refinery in the UK. CCH5™ was specified by a consulting agency with 20 years of Oil & Gas and Petrochemical experience. Work was carried out by Sean Carr Lining Technology (SCLT) on behalf of the client.

When tanks are taken out of service for inspection, the floor plate integrity is checked in accordance with industry requirements. Where deemed to be out of tolerance or specification, floor plates are normally either repaired or replaced. In this instance, despite the tank still being in good condition, the client decided to replace the floor plates to ensure longer lifespan. The client took this opportunity to also install a new below-tank liner, which acts as a mitigation measure to prevent the spread of product in the event of leakage.

The tank was jacked up by 2m around the perimeter in order to allow the ground underneath to be prepared for the installation of the CCH. The CCH was then laid with 100mm overlaps, which were thermally welded to create impermeable joints, then hydrated using a hose. The CCH was then allowed to dry and totally harden before the tank was lowered back into place.

In challenging weather conditions, and with limited access, 900m² of CC Hydro™ was installed over a six-day period by a crew of five. Following the success of this installation, CC Hydro™ is now being considered for several future tank remediation and containment schemes across the site.

\*Geosynthetic Cementitious Composite Barrier





## Project Info



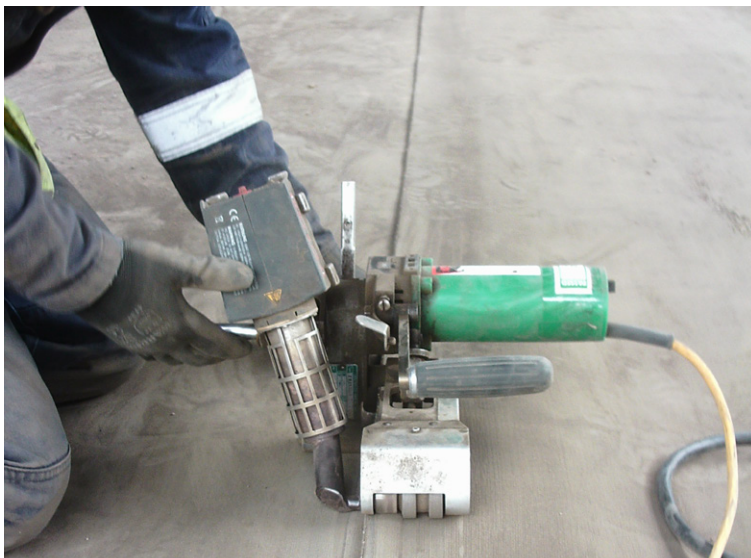
Tank jacked up by 2m around the full perimeter



Preparation of the substrate



Deployment of the CC Hydro™



Thermal welding



Thermal welding and testing of the joints



CC Hydro™ fully saturated



## Project Info



08 / 09 / 16



CCH5™ Bulk Rolls



4000m<sup>2</sup>



Vertical layers



Milford Haven, UK



Jones Brothers  
(Henllan) Ltd.



CCH used to provide  
secondary containment  
to earthen bunds at oil  
storage facility.



Completed CCH lined Tank 114, Milford Haven

In September 2016, CC Hydro™ (CCH) GCCB\* was used to provide secondary containment to a 5000m<sup>2</sup> berm face at an oil storage facility in west Wales operated by SemLogistics Ltd.

SemLogistics Milford Haven is one of the largest petroleum products storage facilities in the UK, accounting for nearly 25 per cent of the UK's independent multiproduct storage. Located on the Milford Haven waterway, the facility serves ships transporting in and out of international locations.

There are 52 tanks of various sizes within the site that are used to store different petrochemical products: gasoline, gasoline blendstocks, naphtha, jet fuel, gas oil and diesel, as well as crude oil. Each tank sits within a bunded area formed with granular fill during the original construction of the site. As part of ongoing improvements, the company embarked on a programme to install secondary containment around two of the site's most critical storage tanks.

SemLogistics engaged Mott MacDonald to design a robust solution which would take into account safety during construction, use and maintenance, as well as ease and speed of installation. Following the successful application of CC at an earlier tank (206) in 2014, CCH was specified as part of major investment into providing secondary containment for tank 114. CCH, as well as satisfying the required regulatory and environmental requirements, offered an opportunity to significantly reduce the construction time, operational disruption and cost of secondary containment works within the site. Installation was carried out by Jones Brothers (Henllan) Ltd, with support from Concrete Canvas Ltd.

\*Geosynthetic Cementitious Composite Barrier





A total of 4000m<sup>2</sup> of CCH5™ were installed in under 5 months despite very adverse weather conditions. For a facility like SemLogistics getting the tank back in service on time was of paramount importance in order to meet their client's expectations. Not only were the secondary containment requirements of the bund area met, the project was undertaken using a locally sourced product, enabling the capital expenditure to remain largely within the area.

Concrete Canvas Ltd. worked closely with Mott MacDonald in the initial research and preparation phase, developing details for complex existing infrastructure, including pipe penetrations, corner and valley sections, and concrete infrastructure.

Similarly, Concrete Canvas Ltd. worked closely with the contractor, Jones Brothers. Significant product improvements were made over the course of the project including the introduction of a reinforcement scrim into the material to enable more efficient welding on site. Development of a priority Triple Track Weld also took place during this installation, providing the standard of weld required for pressure testing of a joint, along with a third weld which secures the top layer of CCH™ to the layer beneath. This provides additional protection to the membrane from environmental exposure and neater finish.

Following the success of the lining of tank 114, the system is being proposed for future containment schemes across the site and was awarded an ICE (Institute of Civil Engineers) Innovation Award in July 2017.



*Northern elevation of the CCH lined tank 206 berm with perimeter drain*





*CCH installed around the steps*



*Completed installation surrounding Tank 114*