Building a port

Stockholm Norvik Port

Building a port

Stockholm Norvik Port

www.portsofstockholm.com

Contents

Introduction

The Stockholm Norvik Port book describes the third and final Ports of Stockholm major development project during the 2010 to 2020 decade that has contributed to developing port infrastructure in the Stockholm region for the next 100 years.

This is also the third and final book in the Building a port series. The earlier books (in Swedish only) describe the development of the Värtahamnen Port and the Port of Kapellskär

Stockholm Norvik Port – the Baltic Sea's new freight port

Stockholm Norvik Port was built 2016–2020 as a freight port with a container terminal and a RoRo terminal. This new major port provides new opportunities for Ports of Stockholm's customers. It also paves the way for new business and efficient, sustainable transport to and from the Stockholm region.

Ports of Stockholm built the infrastructure for the container terminal, including the container yard, quays and buildings. The container terminal is run by Hutchison Ports, one of the world's biggest terminal operators. The company has invested in the superstructure, in other words the container cranes, straddle carriers, IT equipment and everything else that is not part of the fixed infrastructure.

Hutchison Ports selected super-post-Panamax cranes for Stockholm Norvik Port. These can handle the largest vessels able to operate in the Baltic Sea. The company is also investing in developing the latest technologies at the new port.

The RoRo terminal has been built and is run by Ports of Stockholm. RoRo operations are integrated with Ports of Stockholm's similar operations at the Port of Nynäshamn, sharing for example stevedore operations and machinery.

The new freight port, Stockholm Norvik Port, is one of Sweden's largest and most modern ports, as well as being the new Baltic Sea hub for sustainable transport.

The RoRo terminal (left)| Maiden call by Stena Flavia on 9th November 2020.

The container terminal (image on page 12)| SCA Tunadal became the first container ship to call at Stockholm Norvik Port, late on the summer evening of 26th May 2020.

Stockholm Norvik Port May 2020 | The container terminal is ready for use. At the RoRo terminal the work to lay the paving stones is still in progress.

”Developing Sweden's newest freight port jointly with our customers is of great benefit to both the climate and consumers”

| Johan Wallén

An investment for the next 100 years

Ports of Stockholm is tasked by its owners, the City of Stockholm, to secure a sustainable supply of goods to the Stockholm region. To fulfil this mandate, Ports of Stockholm has built Stockholm Norvik Port with three prerequisites in mind.

SHIPS ARE GETTING BIGGER

Ships continue to increase in size, and this development has happened faster than anticipated. The previous container terminal at the Frihamnen Port could no longer function as a container port. The Furusund fairway access was too narrow and too long, the port was too shallow, the cranes and port areas too small and the capacity was insufficient to handle the larger container ships.

MORE GOODS ARE BEING TRANSPORTED BY SEA

To avoid congestion on the road and railway networks, in addition to the environmental benefits, the EU and Swedish government are working to transfer more transport from land to sea. By creating Stockholm Norvik Port and its increased capacity, Ports of Stockholm contributes to being able to transport goods by sea as close to their final destination as possible. Today nine goods in ten arrive in Sweden by sea.

STOCKHOLM IS GROWING

Stockholm is one of the fastest growing capital cities in Europe, and the Stockholm region accounts for half of Sweden's consumption. As resident numbers increase, the need for goods also increases. Stockholm Norvik Port is essential to meet the needs for sustainable transport.

Johan Wallén | CCO at Ports of Stockholm. Johan Wallén was also responsible for customer needs during the complicated operation of switching the flow of goods to the new port.

Farewell to Frihamnen | The Essence was the last ship to depart from CTF, the Frihamnen Port container terminal, on 1st June 2020.

The permit process takes time and is important

In 1992 Ports of Stockholm bought 60 hectares of land at the ness of Norvik, just north of Nynäshamn and 60 kilometres south of Stockholm. A number of planning projects to build a new freight port at Norvik were initiated, but nothing came of them. It was not until the mid-2000s that the work resulted in plans being put into action.

PORT VISION 2015 – CITY AND PORT DEVELOPING SIDE BY SIDE

At the beginning of the 2000s the urban planning department was planning the urban development of the area spanning from Loudden to Hjorthagen in Stockholm. The plans included 10,000 homes and 30,000 workplaces on port land in the Värtan-Frihamnen-Loudden area, but did not include the Frihamnen Pier or Värtahamnen Pier. Decommissioning of the energy port Loudden and the container terminal in Stockholm to free up land were prerequisites for the planned urban development.

In response to these plans, "Port Vision 2015" was presented by Ports of Stockholm.

This was a Ports of Stockholm initiative to coordinate the long-term development needs of the city with the future needs of the Värtahamnen Port and Frihamnen Port areas, while at the same time ensuring the development of Port of Kapellskär and Port of Nynäshamn.

In 2004, the Board of Directors of Ports of Stockholm adopted Port Vision 2015 as the working document for Ports of Stockholm's future planning. The main outlines of Port Vision 2015 were the development of Port of Kapellskär and Port of Nynäshamn for freight traffic, with cruise and ferry operations continuing in Stockholm.

Värtahamnen Port (left)| The new pier and terminal at Värtahamnen Port in Stockholm were built in the period between 2013–2016 and replaced the old pier in the same location. Värtahamnen Port is primarily used for ferry services to and from Finland and the Baltic States.

Port of Kapellskär (right)| The Port of Kapellskär was also modernised and expanded during the period 2013–2016. RoRo services to and from Finland and the Baltic States are predominant at Port of Kapellskär.

Early visions | Illustrations of the proposed Stockholm Norvik Port at the beginning of the 2000s. The quay outlines, roads and railway are similar to the completed port, although the port surface has been redesigned for more modern goods handling.

CITY OF STOCKHOLM EXAMINES PORT CAPACITY NEEDS

Port Vision 2015 was the basis for Stockholm City Council in 2004 to commission an independent analysis into the future development needs of Ports of Stockholm. This analysis was led by Bo Malmsten who among other things previously had headed the regional transport agency. The mandate given was, ”together with the municipalities and stakeholders involved, develop a strategy for Stockholm.”

The port analysis report "Hamnutredningen – Att hamna rätt eller Navigare Necesse est" was ratified by Stockholm City Council in 2006. It included three major port projects: development of Port of Kapellskär, expansion of the Värta Pier, and an entirely new freight port at Norvik. At the same time, Ports of Stockholm would give up large expanses of the existing port areas at Värtahamnen, Frihamnen and Loudden so that this could be used for urban development.

A TEN-YEAR PERMIT PROCESS

The Swedish Environmental Code stipulates that construction and operation of a port requires legal permits. In addition, there must be detailed plans defining how the land and water areas will be used. The Norvik project also required plans for the railway, defining what the connections to the port would look like and how these would be built.

With these requirements as the basis, the permit process began by applying for detailed planning approval from Nynäshamn Municipal Council. Together with the Municipality of Nynäshamn, the work began to develop a detailed plan for Stockholm Norvik Port in the area that Ports of Stockholm had bought at Norvik and the surrounding area. The plans were discussed by the Municipal Council in the years spanning 2005 and 2007 and were approved at the third attempt. An appeal against this approval was submitted to the Swedish government, but was rejected in 2011 and the detailed plan was ratified.

A Swedish Environmental Code application was submitted to the Environmental Court in 2007. This application was rejected, but Ports of Stockholm appealed the case further to the Environmental Court of Appeal and the application was approved. An appeal against this decision was again submitted by the challenging party, this time to the Supreme Court. The Supreme Court ruled that it would not grant the right to appeal, resulting in the decision of the Land and Environmental Court of Appeal being upheld.

The case that the Land and Environmental Court of Appeal had ruled on was to grant permission for the port to be built, but the terms and conditions for construction and operation had still to be granted. This was the start of a new round of hearings by the Land and Environmental Court to determine the terms and conditions for construction of the port. These terms and conditions were also contested in the Land and Environmental Court of Appeal, where they were modified somewhat with supplementary terms, such as conditions for transport to and from the port.

Following the Land and Environment Court of Appeal decision, there was a subsequent appeal by the challenging party to the Supreme Court. In April 2016, the Supreme Court ruled not to grant the appeal. This meant that the port now had permission to be built according to the stipulations of Swedish Environmental Code. The entire environmental permit process and court proceedings took around ten years to complete.

At a festive ceremony on 16th September 2016, 1500 residents of Nynäshamn, as well as specially invited guests, celebrated the official Stockholm Norvik Port construction start.

Visionary image from 2018 (page 20) | Construction was in full swing in 2018. The 2018 vision closely resembles the port completed in 2020. You can even see the Mount Norvik mound.

The logistics part that NCC planned to build can be seen between the port area and the railway line.


SPRÄNGNING PÅGÅR
SIGNALER
FÖRE
EFTER
YAMAH

Construction start (this page) | The official Stockholm Norvik Port construction start was celebrated with an open house for the public on 16th September 2016. The symbolic groundbreaking ceremony was held with around 1500 visitors and invited guests.

Groundbreaking ceremony (page 22) | From the left, the incumbent Ports of Stockholm CEO Johan Castwall, Clemence Cheng, CEO Hutchison Ports Europe, Karin Wanngård, incumbent Mayor of Stockholm, Svante Hagman, incumbent NCC Business Director for Infrastructure, and Anna Ljungdell, incumbent Mayor of Nynäshamn.

”Our earlier development projects in Värtahamnen and Kapellskär have given our organisation many experienced and skilled procurement experts”

| Anders Nordlund

Integrated development and decommissioning

A huge challenge throughout the process was to keep the growing container business at the terminal at Frihamnen Port operating with a good level of service until Stockholm Norvik Port opened. The container terminal at Frihamnen Port was shallow, it had a small container yard and the container cranes were from the 1970s.

Due to the protracted environmental permit processes, there was a long period of uncertainty about when Stockholm Norvik Port could open. This made planning difficult. Thanks to service-minded and constructive personnel, who worked magic with the old equipment for a number of years, the move was able to be handled seamlessly. The last container ship at Stockholm's Frihamnen Port was unloaded on 1st June 2020.

Another challenge was to define the standards and commission an entirely new port. The Stockholm Norvik project has involved the close contact and collaboration of Ports of Stockholm's business operations within shipping, safety, IT, technology, property and other areas. This has enabled the transition from the building phase to full-scale operation to happen as efficiently and smoothly as possible and has ensured the facilities are well adapted for daily business operations.

Anders Nordlund | Harbour Master and Traffic and Operation Manager, Ports of Stockholm. Anders Nordlund had an important role in commissioning the work to build Stockholm Norvik Port.

Frihamnen Port area 2017 (page 26) | The new Värtahamnen Port is on the right, the Frihamnen Pier in the middle. The container terminal that Stockholm Norvik Port replaced can be seen on the other side of the harbour. Loudden Energy Port, which closed in 2019, is beyond the container port.

Stockholm Royal Seaport (top) | A visionary image of the City of Stockholm plans for the same area. Large expanses of the old ports have become part of the developing city. However, the port has not left the city entirely. Port operations continue at the Värta Pier and the Frihamnen Pier.

Decommissioning (left) | The last container ship unloaded its cargo at Frihamnen Port in Stockholm on 1st June 2020.


SÜD
HOYER

Location

The location of the new freight port was a natural choice. The area surrounding Norvik has been a shipping area for thousands of years. The location is ideal for larger ocean-going vessels. It is close to the open sea and only sixty kilometres from Stockholm.

Close to the sea and the market

The history of Stockholm is the history of a city that grew up around a port, a gateway between Lake Mälaren and the Baltic Sea. The location, deep inside the archipelago, protected against enemies but the meandering routes past the islands were unnecessarily long. That was the reason the Port of Nynäshamn was built more than a hundred years ago. It was close to the open sea and only sixty kilometres from Stockholm. Since its construction, Port of Nynäshamn has been one of the region's most important ports.

To create emergency stockpiles in the 1970s the state decided to blast out storage shelters in the rock under the refinery close to Norvik. The rubble was dumped into the sea just north of the refinery. The stretch of water outside Norvik was filled in, joining the small Norvikholmen island area at the time to the mainland.

It was intended to use the area for industrial purposes. A fence and gate was erected on the headland, but the land remained unused for a long time. It was not difficult to get around the fence, so dog walkers, anglers and youths looking for a bathing spot could easily access the rocks that had once been the island of Norvikholmen.

When Ports of Stockholm acquired the Port of Nynäshamn in 1992, the company also bought the area of land at Norvik, to potentially extend the port in the future. When the decision was taken that the Frihamnen Port in Stockholm would have to be moved to free up space for other businesses, the location of the new port was a natural choice. With significantly shorter approach fairways, space for many more metres of quayside, greater depth than Frihamnen, and expanses of land for parking, storage and port logistics, Norvik had all of the prerequisites needed for a modern and efficient port. The nearby areas also had good preconditions for the transport of both containers and RoRo goods on the road and railway networks.

View to the south (pages 32–33) | Norvik before the expansion of the port with its closest neighbour, the oil refinery and the Port of Nynäshamn, in the background. Picture from 2007.

Stockholm Norvik Port (left) | The location of Stockholm Norvik Port, close to the open sea, with short approach lanes and good communication links via Highway 73 and the railway provides optimal access to the region's markets. The image was taken in May 2020.

”Nynäshamn is a port town. Developing shipping wisely is essential for our municipality”

| Harry Bouveng

A major port, past and present

The area surrounding Norvik was already used as a port in the 1600s, both by naval vessels and for trade purposes. At that time it was called Nyhamn (New Port). Port activities continued for several centuries, before falling into decline and fading from memory.

The vision of Nynäshamn as a major port grew during the second half of the nineteenth century. In 1892, Professor Hjalmar Sjögren purchased Nynäs Gård. He had big plans for the Nynäshamn area. In addition to the railway that he wanted to build, he intended to construct a garden city, seaside resort and full-scale port, with a free port and direct steamboat connections to Russian Baltic Sea ports. He formed a committee of railway shareholders in 1898, the Stockholm-Nynäs Jarnvägsaktiebolag (SNJ), which also acquired the port area.

After much debate, the concession to build the railway was eventually granted in 1898 and construction began in November the same year. At the same time the building work started on the Port of Nynäshamn. The railway was built for both heavy and fast traffic and opened in 1902.

Sailings to Gotland also began in 1902. Starting in 1905, the s/s Hansa sailed daily to Visby. From the start of the twentieth century, Nynäshamn is Stockholm's port for travel to Gotland.

Before the turn of the twentieth century trade had also blossomed between Sweden and Russia. Swedish companies such as Nobel, Ericsson and ASEA had business operations in Saint Petersburg and business with Stockholm was intense. More port capacity was needed. Nynäshamn had the best prerequisites and a new port was going to be built at Norvik, north of the old fishing port. A railway line was also included in the plans. The building of Norvik however never happened, as the Russian Revolution in 1917 put a stop to business with Russia.

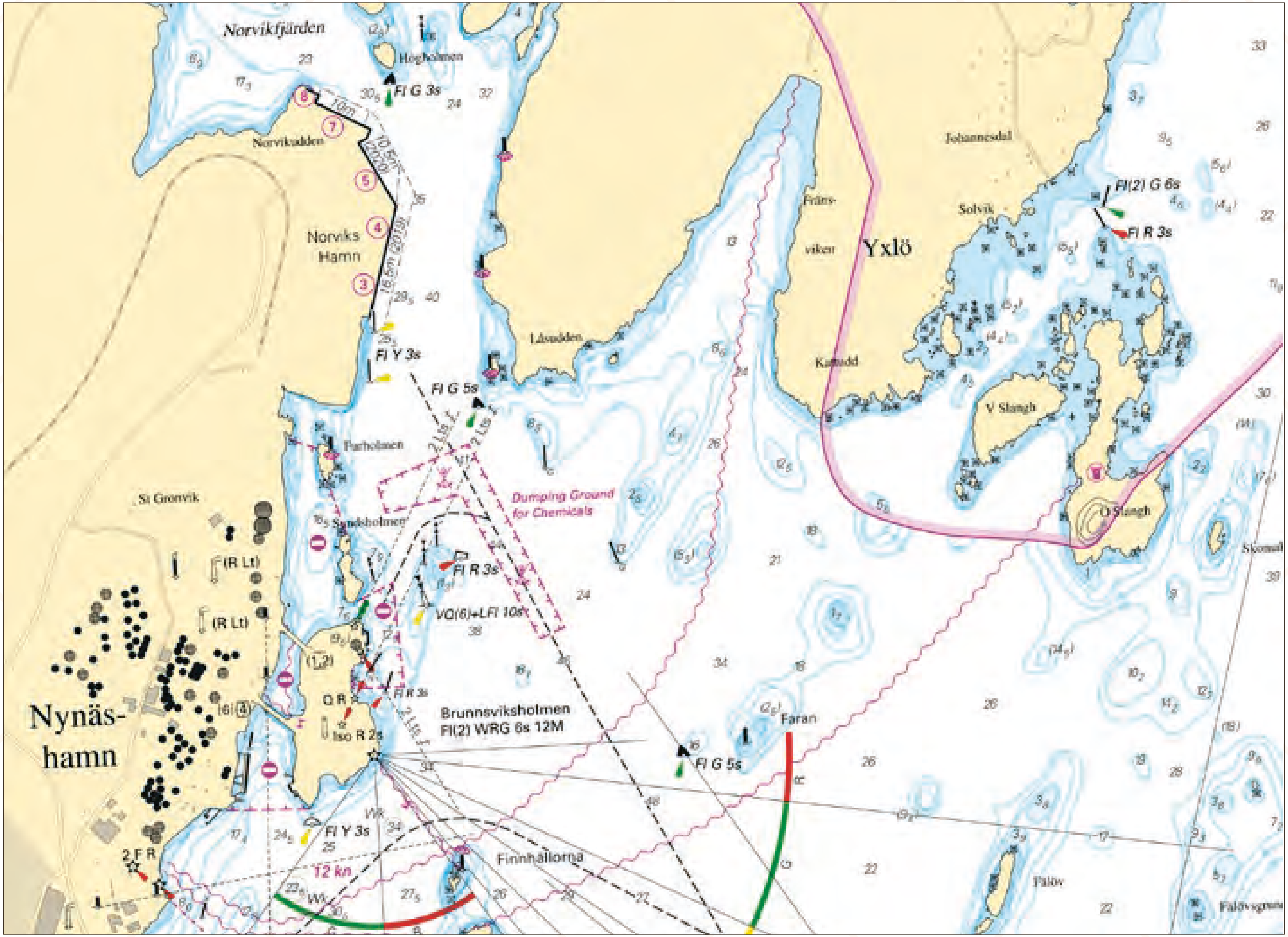
Nynäshamn 1912 | The meeting of shipping and railway at the Gotland quay in Nynäshamn. The image was taken during the sailing events that took place in Nynäshamn as part of the 1912 Olympic Games in Stockholm.

Harry Bouveng (M) | Chair of Nynäshamn Municipal Council and Chair of the Board of Nynäshamns Mark AB.

Norvik 2006 (top) | Norvik before the port expansion, with the refinery in the foreground.

Norvik (right) | The road between Highway 73 and Norvik was built by Ports of Stockholm in 2001.

Approach fairway (page 39) | The new fairway to the port. Some buoys were repositioned and new buoys added to the new fairway. A navigation marker has been installed on Furholmen islet and three on the island of Yxlö, directly opposite the port. A new navigational buoy was also installed south of Högholmen islet. This buoy and the navigation markers are what are known as smart SSA (shipping safety aides) and can be controlled remotely. The lighting and communication is powered by solar cells. A west buoy has been installed east of Högholmen islet to make navigation easier for passing private and pleasure boats.


Norvikfjärden
Fl G 3s
Norvikudden
Norviks
Hamn
Fl Y 3s
Fl G 5s
Låsudden
Farholmen
Dumping Ground
for Chemicals
Fl R 3s
VQ(6)+LFl 10s
(R Lt)
(R Lt)
Nynäs-
hamn
Q R
Iso R 2s
Brunnsviksholmen
Fl(2) WRG 6s 12M
Fl G 5s
Faran
Fl Y 3s
12 kn
Finnhällorna
2 F R
Yxlö
Johannesdal
Solvik
Fl(2) G 6s
Fl R 3s
V Slangh
Ö Slangh

Archaeology

In 2008, a Stone Age settlement was discovered on the hill behind the intended port location. The remains were from the Middle Neolithic period, around 3300–2300 BC. At that time the hill was very close to the coastline and the finds revealed that the people who lived there were seal hunters and fishermen.

Before the railway line to Stockholm Norvik Port was laid, an extensive archaeological examination of the area was carried out. Archaeologists from the Stiftelsen Kulturmiljövård environmental heritage foundation found many cupmarks, shallow indentations in the rock known in folk-legend as "spirit mills" or "elf mills" – that are thought to have been used in rituals. There were also many shards of pottery, arrowheads and flint axes. Flint is not naturally occurring in this area, so these axes probably originated in Skåne or Denmark. Import has therefore been happening for thousands of years. Some of the rocks with cupmarks can be seen today outside the main building at the port.

Archaeological dig | A site of exemplary finds. Flint axes. Examination and documentation of the 4,500-year old settlements at Alhagen, close to Norvik.

Project management

pro • ject [-ʃec´t or -jec´t] noun ~projects; pl. ~ • planned activities on a large scale (Swedish Academy Word List, SAOL).

1) propose, draft, plan; now in gen. use to include a proposal etc., to a (practical) company of a comparatively complicated nature on a large scale. (Swedish Academy Dictionary, SAOB).

Experienced in house project management

The key to success for the project was putting together a project organisation at an early stage and recruiting the foremost experts in every area. To be able to get off to a fast start, the organisation began to take shape before all permits were obtained.

During the process, it was decided that the project organisation from Ports of Stockholm would lead the work and collaboration between the various contractors procured for each task. As Ports of Stockholm had newly reconstructed the ports at both Kapellskär and Värtahamnen, the company had unique in house expertise capable of managing such a huge infrastructure project.

Common goals for the organisation, clear responsibilities and mandates, continuous reporting and coordination between sub-projects and contractors created the best preconditions. The organisation was also supported by specialists, for example in procurement, communication, time planning, financial planning and quality, environmental and work environment management.

Project management | Anna Källgården, responsible for work environment and coordination, in a discussion with other project managers and quay construction workers.

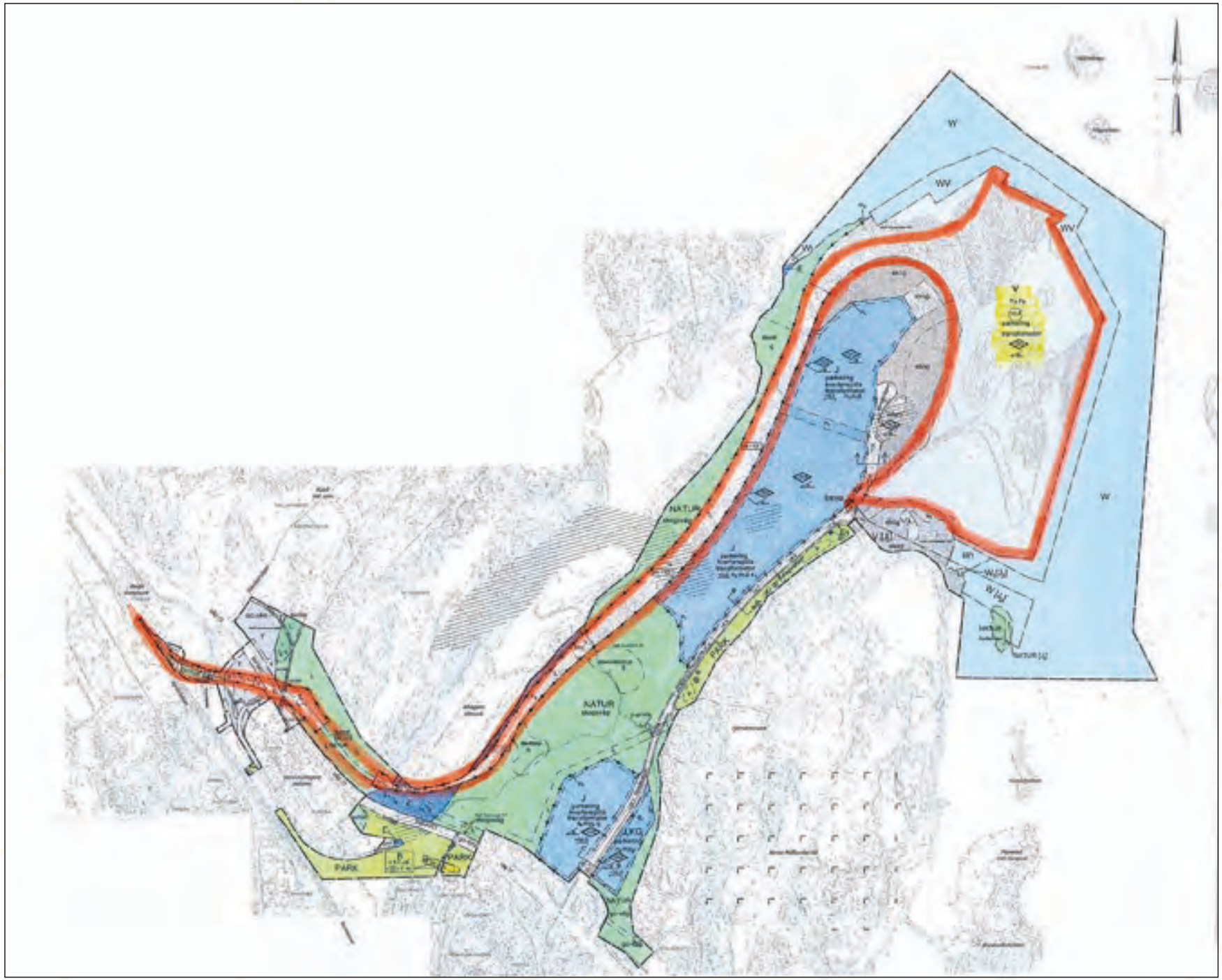

HH

Ports of Stockholm's project office (top) | Ports of Stockholm project managers Keijo Huikuri, Mats Tellefors and Kristian Martti were on board from an early stage in the project. Their responsibilities included rock extraction and management of the resultant aggregates.

Anna Lindblad (left) | Project manager for the buildings at the port, coordinating the work of the various building constructors.

Alexander Lenhsjö (right) | Construction manager for several of the buildings at the port.

Zonal plan (page 49) | A map showing the entire construction site. Red zones are the port areas and railway. Blue indicates the planned industrial areas, and green indicates nature and park areas.


W
WV
NATUR
PARK

”Good work environment, working together and open dialogue with all stakeholders are guiding lights for a successful infrastructure project”

| Magnus Sjöberg

Visitors (top) | The site attracted a large number of visitors over the course of the project. Safety hats and high visibility jackets are mandatory for visitors to a building site.

Plans (left) | There are larger printers for the drawing plans, but construction manager Ulf Pettersson is content with some A3-sized sheets.

Magnus Sjöberg (right) | Stockholm Norvik Port Project Manager until 2019. Magnus Sjöberg was responsible for setting up the project organisation.

Planning meeting (top) | Project management meeting with tunnel visit. Major project meetings were held at regular intervals, although the smaller meetings were what kept the organisation operating smoothly.

Tobias Kednert (left) | Stockholm Norvik Port Project Manager 2019–2020. Tobias also led the work to rebuild the Port of Kapellskär 2013–2016.

Sam Victorin (right) | Balancing transparency and taking all other factors into account could sometimes be challenging for Communications Officer Sam Victorin.

Open house (pages 54–55) | The start of construction ceremony and three open house events attracted thousands of visitors. Unfortunately the coronavirus pandemic meant the planned opening ceremony could not be held in 2020.

”Completing a project on time and on budget is an incredibly good feeling”

| Tobias Kednert


CAT
7756

Land

Port operations are heavy and dynamic. This means the underlying substrate must have good load-bearing capabilities. Many different methods were used to stabilise the land at Norvik.

”Following this very demanding project, so well run from start to finish, has been incredibly exciting and rewarding”

| Sven Landelius

Land preparation

The land at Norvik had been wasteland since it was backfilled in the 1980s. At that time the Swedish state had blasted out subterranean shelters in the rock under the adjacent refinery to stockpile oil. The land surface consisted of rocky and muddy ground with overgrown shrubs and bushes – a habitat best suited to snakes.

During the backfill process, two large clay nodes had been formed – deep pockets of clay from the sea bed that the dumped rock aggregate had squeezed together. Port operations are heavy and dynamic. The underlying ground must be stable. A variety of different methods were used to stabilise the ground.

The clay was stabilised by driving in a large number of pilings to support the clay. The pilings were created by jet injection or cold cement – where a drill bores down equipment that injects cement under torsion and high pressure, at the same time as the tool is withdrawn from the borehole. In some areas overburden was used, placing rock aggregate on top of the substrate to compress and stabilise the ground.

The entire area that would become the port surface had to be stabilised, but there was not enough time for overburden to be used over the whole area, as overburden needs to be allowed to settle for between six months to a year. Parts of the area were instead stabilised using dynamic compaction, where machines drop twenty tonne weights from a height of twenty metres to compress the land.

Norvik | An image from the early 1980s, just after backfill. Where Norvikholmen island used to be can be seen on the left. The tops of the two clay nodes formed by the backfill can be seen in the centre.

Sven Landelius | Chair of the evaluation committee that reviewed the Stockholm Norvik Port project, as well as other Ports of Stockholm development projects. As CEO of Øresundsbro Konsortiet, Sven Landelius also had ultimate responsibility for building the Öresund Bridge.

Land in comparison to water level (top) | Rise in land level (green): 141,244 m^2 Drop in land level (red): 2,913 m^2.

Total increase in Sweden's land area: 138,431 m^2.

Port surface (left)| The overburden on the port area could be removed after 3–6 months and the land flattened for future construction.

Substrate stations (right) | After trees were felled, timber was laid out in a number of what are known as substrate stations to become new habitat for insects in the forest outside Alhagen.

Dynamic compaction (top) | The method involves dropping a 20-tonne weight from a height of 20 metres. At each point, six drops were made, in total on around 15,000 points. The method is effective, but is not commonly used in Sweden and the machinery had to be rented from Abu Dhabi and Brazil.

Land reinforcement (left)| The clay areas of the port surface were reinforced using pilings inserted into the clay by drilling and concrete casting in situ. The pilings are made of lime-cement, with a combined length of over 200 km, as well as 35 km of jet-injected supports.

Deep compaction under water (right)| Parts of the sea bed also had to be stabilised using a method similar to the dynamic compaction of the port surface.

Overburden (pages 64–65) | Around 200,000 m^3 of aggregate from the rock blasting was used as overburden to stabilise the ground in parts of the emerging port area.

Watering | A water truck constantly sprayed the ground in the emerging port area to keep hazardous dust to a minimum.

Rock extraction

To make space for both the railway line and port, the rock had to be extracted – in other words blasted and excavated. Of the almost twelve million tonnes of rock that was blasted out to make way for Stockholm Norvik Port, around ten million tonnes were reused in the project.

Rock reuse

The permit for the railway stipulated the track should run through the hillside, so as not to disturb the Alhagen wetlands, just north of the port. To make space for both the railway line and the port, the rock had to be extracted – in other words blasted, excavated and removed. The blasting created vast amounts of rock that needed to be dealt with.

All infrastructure projects strive for mass balance – reuse of rock that has been blasted and earth that has been moved to other sites in the project. Of the almost twelve million tonnes of rock blasted out to make way for Stockholm Norvik Port, around ten million tonnes could be reused in the project as back-fill, concrete ballast and railway tarmac. At times rock crushers ran seven days a week.

At the southern area of the port, the mound nicknamed Mount Norvik gradually emerged, a 60-metre pile of waste rock. When this mound is completely levelled, the next phase of construction can begin – where the container quay can be extended by 350 metres and the port area by ten hectares.

Around one million tonnes of soil also had to be excavated. A few kilometres away, at Valsjö, some of this was reused in a nature conservation project.

Excavating (left) | To handle the vast amounts of rock blasted out from the hillside, the project used machinery normally used in mining. At the height of activities, eleven huge rock trucks and a 110 tonne bulldozer were on site.

The big blast (left) | The biggest blast removed 351,000 tonnes of rock to make room for the railway yard. It took 475 bore holes and almost 100 tonnes of explosives to remove so much rock. This was the largest rock extraction ever in Sweden, outside of mining.

The explosives team (top left) | Meticulous coordination was needed to ensure safety during blasting and to handle the blasted rock efficiently.

Drill rig (top right) | Bore holes for the explosives were usually 80 mm in diameter and could have a depth of 40 metres. Removing almost twelve million tonnes of rock needed 540 major rounds of blasting.

February 2018 | The port area starts to take shape. Mount Norvik has started to grow, and the clay nodes are covered in overburden after inserting the pilings. Work on the quays has just begun.

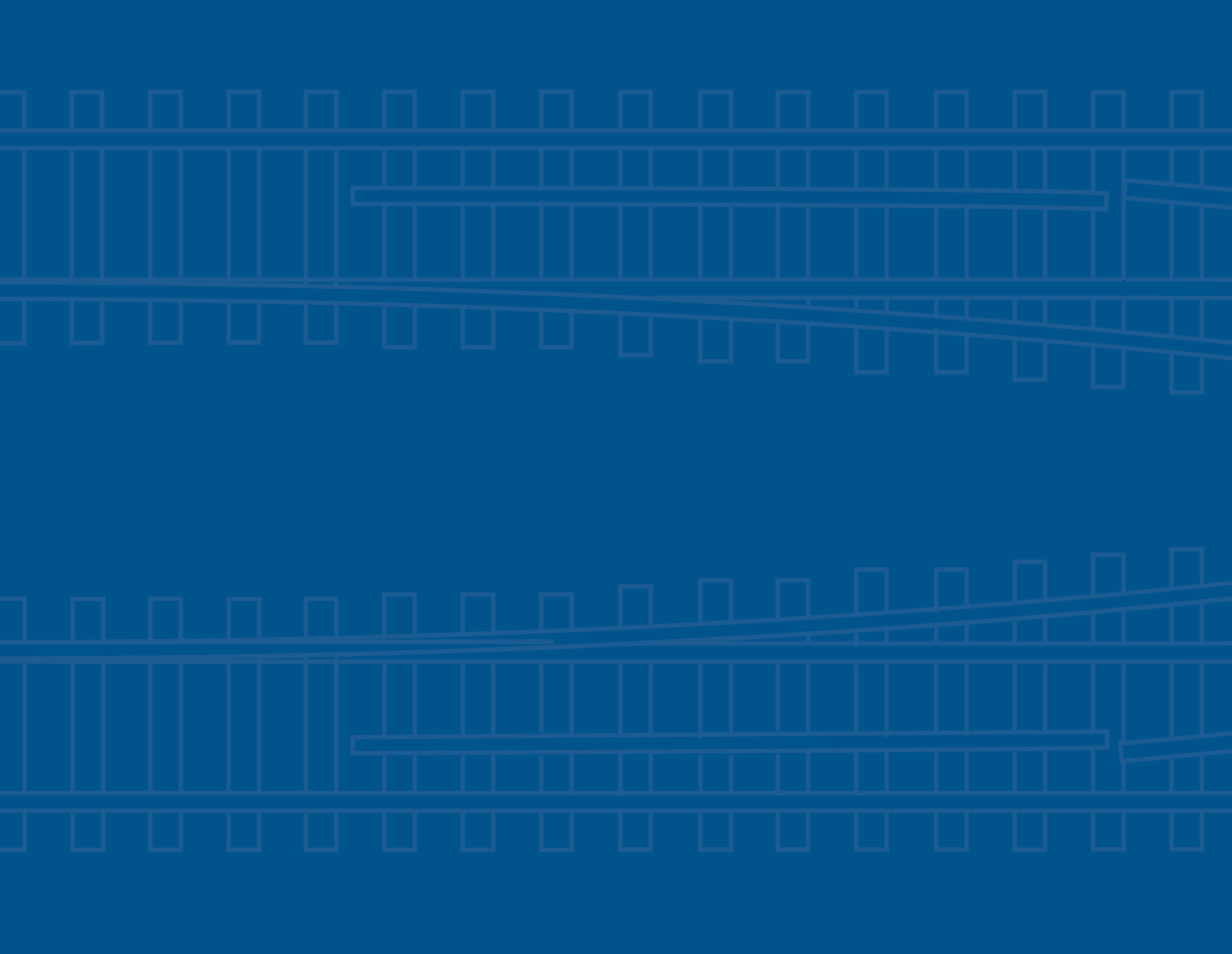
Tunnelling (pages 76–77) | The 270 metre-long railway tunnel runs through the hillside beside Highway 73. When rock from the most recent blasting is excavated, the hillside is scraped clean of loose boulders (a process termed trimming and scaling) to make sure no rock will come loose as the work proceeds.

Summit (page 78) | The view from the top of the mound in September 2018. The mound reached 63 metres above sea level, one of the highest points in Nynäshamn.

Valsjö (left) | The majority of the clay excavated from Norvik was transported to Valsjö, a few kilometres away. There the barren mass was transformed into rolling hills and a lake habitat for birds.

October 2018 (pages 80–81) | The mound of leftover rock from the rock extractions grew and grew and was nicknamed Mount Norvik. Parts of the mound will remain until the port needs extending. There is space for a further ten hectares of port area and 350 metres of quay. Rock extraction took place over the period 2016–2019.

Managing the mass (pages 82–83) | Most of the rock was crushed into gravel of different fractions, depending on what it was to be used for. Most of the aggregate was used for backfill, concrete ballast and railway tarmac. A smaller portion was sold to the local market in the Nynäshamn area.



Railway

Ports of Stockholm built almost four kilometres of industrial branch line to connect Stockholm Norvik Port to Sweden's national railway network. The railway is an important pre-requisite for sustainable transport.


CARGO
CMA CGM
CMA CGM


CMA CGM
CONTAINERSH

Stockholm Norvik Port branch line and Highway 73

Almost all railway lines in Sweden are state owned and run. Shorter stretches, such as industrial branch lines, can be privately owned. A freight port naturally needs a railway, and the one built to Stockholm Norvik Port is unique, as Ports of Stockholm financed, built, owns and maintains the railway line.

The industrial Norvikbanan branch line is 4 400 metres long, with an additional 360 metres of two-way track in the container yard to enable railway wagons to be loaded and unloaded. A railway yard has also been built with three 750 metre-long tracks where trains can be coupled together, as well as a 100 metre-long siding. The railway line runs from the port, through a large cut, over the wetlands, through a tunnel and under Highway 73, then joins the existing Nynäsbanan railway line.

Highway 73 is the main artery for traffic into to the city and to the port in Nynäshamn. Traffic was diverted for two years to enable a bridge to be built. Now the road traffic has a bridge that is dimensioned for four lanes, if the need should arise, with the railway running underneath.

Irene Svenonius | County Mayor (M) Region Stockholm with overall responsibility for traffic issues. Irene Svenonius was also City of Stockholm Executive Board Director when Stockholm Norvik Port was at the planning stage.

Pedestrian and cycle overpass | A visionary view of the new pedestrian and cycle bridge over Highway 73. The railings are now more elaborate than originally planned. You can see the final result on page 96.

”A growing city needs sustainable transport solutions. Shipping is the future and Ports of Stockholm is a key player”

| Irene Svenonius

The railway | An overview of the work to prepare for the railway line connecting Stockholm Norvik Port to the Nynäsbanan railway. In the foreground you can see the bend leading to the cargo handling area of the port. At the top or the image the cut leading to what will become the railway yard can be seen, with the railway line continuing across the Alhagen wetlands to the Nynäsbanan railway line and onwards to the national rail network. The construction access road on the right is now a footpath between Alhagen and the railway line, running almost to the northern end of the port.

Intersection (page 94) | Highway 73 was diverted between October 2018 and December 2019 to make way for a bridge to be constructed, with the railway running under and a pedestrian and cycle bridge passing over the roadway. Stockholm Norvik Port can be seen at the top left, with two moored vessels.

Bridging the highway (top left) | The land beside Highway 73 was fissured rock and clay below the water table. To reinforce the hillside a drilling rig had to be suspended from a crane.

Sheet piling (top centre) | The clay and ground water was contained during bridge construction using temporary sheet piling.

Foundations (top right) | In principle the bridge is a square concrete pipe that the railway runs through, with the road traffic above.

Visionary view (above left) | The Highway 73 bridge runs over the railway, with a new pedestrian and cycle overpass above that.

Side walls (above right) | One side wall of the bridge is completed and the supports for the other are in place ready for casting the concrete.

Railway tunnel (top right) | The Norvikbanan railway tunnel runs through the hillside between the Alhagen wetlands and Highway 73.

New bridge (above) | The new Highway 73 pedestrian and cycle overpass, with its waveform wooden railings, is a sight that welcomes traffic to the port town of Nynäshamn.

Railway tunnel (top right) | Constructing the tunnel was complicated by two difficult regions of rock, nicknamed the Axe Cut and Sledgehammer. Swedish National Day, 6th June, 2019 was the breakthrough date for the tunnel.

The Norvikbanan railway (page 100) | The Norvikbanan railway line runs from the Nynäsbanan railway line, under Highway 73, through the tunnel in the hillside and across Alhagen alongside the road, to minimise the impact on the wetlands. The Alhagen wetlands consist of a number of ponds and canals that purifies wastewater that runs through the wetlands for nine days before draining into the Baltic Sea. During that time the vegetation takes up the nitrogen in the water, which reduces the environmental impact on the ocean. Beyond Alhagen you can see the long cut leading to the bend towards the container yard.

The railway yard (above) | The clearing accommodates a railway yard with three 750 metre-long tracks and a 100 metre-long siding. Trains can be coupled here before travelling onwards to the Nynäsbanan railway line. The end of the railway yard at Blommenstorp has a pedestrian and cycle overpass.

Station Norvik (pages 102–103) | The Norvikbanan railway ends in two 360 metre-long loading and unloading tracks in the container yard. Having the track level the same as the road surface makes it easy for trucks to load and unload goods. No heavy vehicles cross the tracks, so tarmac is enough to support the rails here.


KEMPPI

Laying the tracks (page 104) | Tracks being laid in the container yard. The steel framework of the future office building has just been erected in the background.

Welding the track (above) | The railway track is joined by thermite welding, a proven technique where a mould is placed across the joint and a container with a molten mixture of iron oxide, aluminium powder and manganese is used. When this reaches a temperature of 2,400 degrees, it fills the gap and permanently joins the two rail sections.

Premier (left image) | The first wheels to ride the rails, apart from the construction equipment, were those of the newly renovated project handcar powered by Project Manager Magnus Sjöberg on 18th June 2019.

Railway yard (pages 106–107) | An electric locomotive tests each track in the railway yard on 29th April 2019.


1
2
green cargo
3-7
3-8a


3
4
3-6
3-8

Port area

A major capacity port needs a vast area for handling cargo. The container yard at the Stockholm Norvik Port container terminal covers almost 20 hectares, with the potential to expand by a further 10 hectares. The RoRo terminal, where the traffic flows faster than at the container terminal, has a surface area of 10 hectares.

”Homes or harbours? With a joint vision the port and city developed side by side”

| Christel Wiman

11 million paving stones

A freight port needs a large area to handle cargo. Despite rapid handling and smart solutions, large volumes of goods are involved and a lot of space must be available.

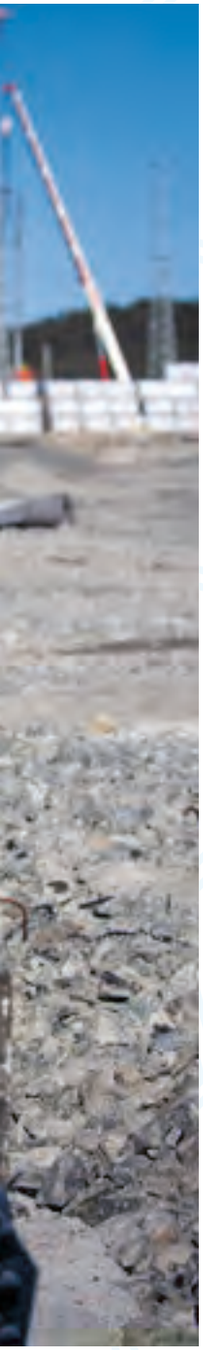
The container yard at the container terminal covers almost 20 hectares. There is also room to expand by a further 10 hectares when the rock pile is flattened. The RoRo terminal, where traffic flows faster than at the container terminal, has a surface area of 10 hectares.

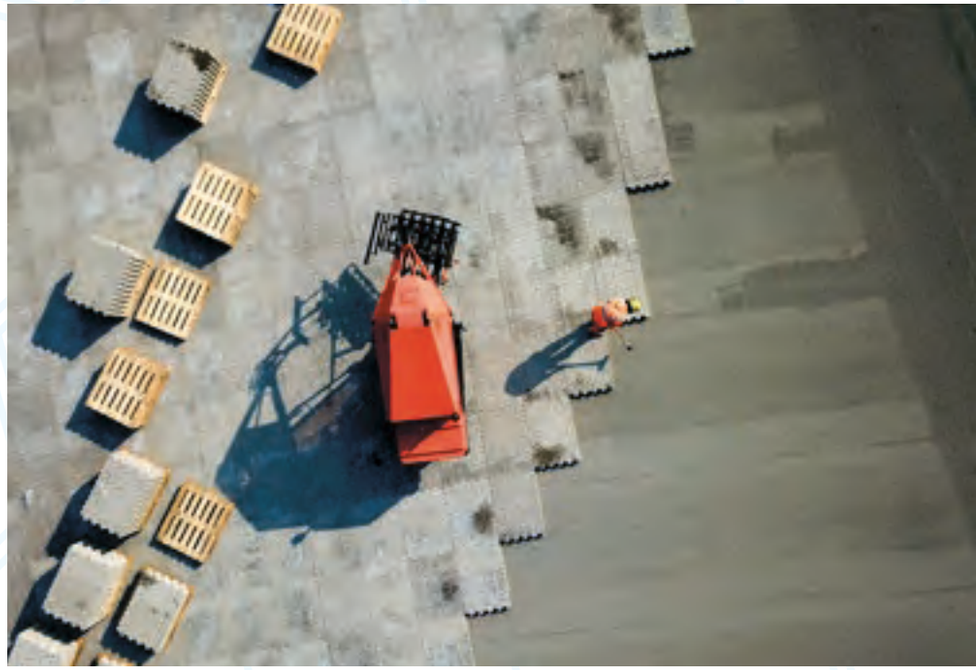
A major part of the project involved planning and constructing the port area to be as level, strong, sustainable and well designed as possible. The area needs to withstand heavy loads but must also be flexible. Under the surface run kilometres of water pipes and conduits for cables. These are all embedded in concrete to withstand heavy loads.

Christel Wiman | Ports of Stockholm CEO 2000–2009. Christel Wiman was a driving force for Port Vision 2015.

Laying the tarmac (above) | The tarmac at the port is a load-bearing surface that cushions the contact surface concrete-embedded hard paving.

Conduits (pages 112–113) | Around 140 kilometres of cables run under the surface. For these to withstand heavy loads they are embedded in concrete. Much of the conduit piping will not be in use from the start. There is provision for future installations without having to dig up the surface.





Drainage (page 114) | The port has 4,240 metres of drainage piping. Some pipes are egg-shaped for optimal flow. There is also an additional 1,500 metres of subterranean piping. The system includes eight purification stations with multiple filters before the drainage water is released into the sea. The system is dimensioned to cope with a lot of rain falling in a short period of time, for example skyfall or 100-year rain. This happens rarely, but is becoming more common due to climate change.

Laying the paving (page 115) | After the port surface was levelled, reinforced and compacted, it was height-adjusted. The drainage slope in the container area is one millimetre per metre. A more extreme angle is not good for high-sided vehicles and for stacking containers, while a shallower angle would mean water would drain more slowly. There are at least two layers of tarmac on top. On top of the tarmac is a gravel layer that forms the foundation for the paving stone surface.

Paving (above) | Concrete paving stones are the wear-bearing surface. These are more durable for the heavy loads of port operations and are more environmentally friendly than tarmac. In total, eleven million paving stones cover 260,000 m^2 of the port surface. This is the largest paved surface of its kind in Scandinavia.

December 2019 | Work is in full swing on all fronts. Laying the paving at the container terminal is halfway to completion. The 450 metre-long container quay is constructed in sections, known as monoliths. The central region is ready. The quays at the RoRo part of the port are emerging and the ground is being prepared for the port surface. The Swedish Customs border control building was the first to be completed, and the port office building is taking shape.

Container yard | The surface at the container terminal is ready and the newly arrived cranes are being taken into operation. A straddle carrier is testing out the new surface.

Access bridge (pages 120–121) | The bridge leading to the port separates the road and railway traffic. It also means there is no need to turn into, or cross, oncoming goods traffic. Traffic can flow unhindered. Four rows of pilings support the bridge erected in August 2018. One hundred metres long, five lanes wide, with a separate pedestrian and cycle overpass, the bridge needed two concrete pumping trucks and 2,200 m^3 of concrete on that single day of casting. When the concrete was in place it was watered to prevent the risk of fissures forming if it set too quickly. In total the construction of the bridge required around 3,800 m^3 of concrete.

Quays

Stockholm Norvik Port has been built to handle the very largest vessels operating in the Baltic Sea. Up to four vessels can be loaded and unloaded simultaneously. At the time of opening, the port had a combined quay-length of nearly 1,400 metres.

Modern quays for both RoRo vessels and container ships

When it opened in 2020, Stockholm Norvik Port had a combined quay-length of almost 1,400 metres. Up to four vessels can be loaded and unloaded simultaneously.

The quay at the container terminal is 450 metres long and can accommodate two smaller, or one large vessel. The quay is built on pilings and the depth at the quay is 16.5 metres, which is deeper than at any other container quay in Sweden and the rest of the Baltic Sea. There is the scope for an additional quay berth as part of a planned expansion, when all of the extracted rock mound has been removed.

The RoRo terminal at Stockholm Norvik Port has two quay-berths for RoRo vessels. One of the quay-berths has a length of 280 metres and a depth of 10.5 metres. The other quay-berth is 230 metres long, with a depth of 10 metres. Both are equipped with robust ramps dimensioned for the needs of the future, both in terms of size and capacity. Here there is capacity to accommodate the largest RoRo vessels.

Anders Peterson | Head of Ports & Terminals at Stena Line.

RoRo call | Stena Flavia at Quay 7. Many vehicles are rolling off, while others wait to roll aboard.

”The move to Stockholm Norvik Port is an important part of our expansion in the Baltic Sea”

| Anders Peterson

April 2018 (above and right) | Work to prepare the land and build the quays has started. At the bottom left you can see the barges and cranes for the quay construction. The other RoRo quay-berth appears as a line in the water, where the support wall sections are. Some sections of the wall are still on land waiting to be submerged into place. Beside these, construction of the Swedish Customs building has begun. There is overburden on some areas of the port, and on the right Mount Norvik has started to rise.

Supporting wall sections (left) | Parts of the quay are constructed of L-shaped supporting wall sections. The bottom plates are in place and the rebar supports stand upright. The concrete is added using a method called sliding-mould casting and the structure is lifted into the water.

Diving (top) | The aim was to do as much work as possible on land, but divers needed to inspect, adjust and do some of the casting on the sea bed.

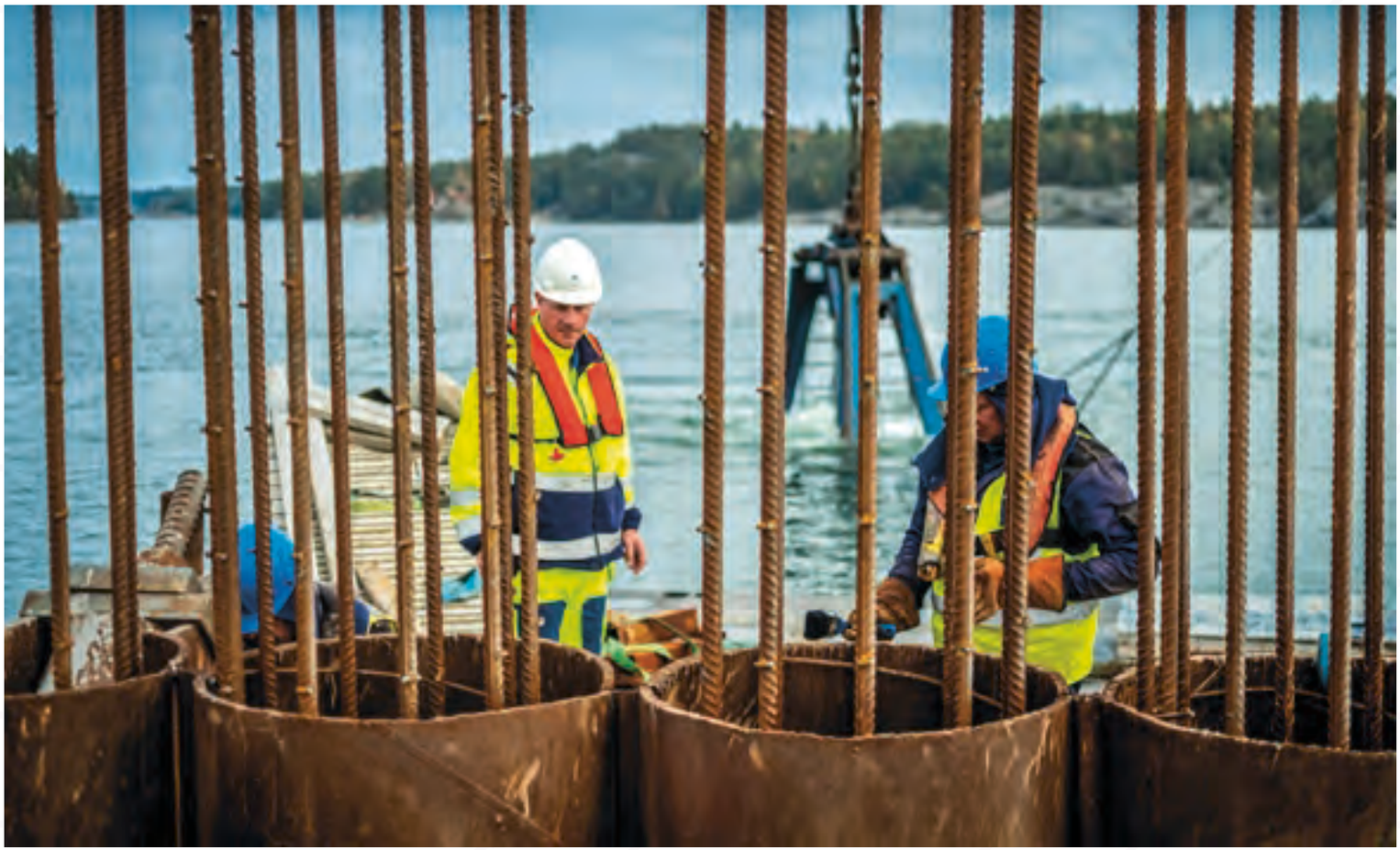
Rebar supports (above) | Concrete needs rebar support. More than 2,400 tonnes of rebar was used to cast 39 m^3 of concrete at Stockholm Norvik.

L-sections (left) | Altogether there were 35 supporting wall sections, 12 metres high, weighing 280 tonnes each. These were cast on land and then submerged into the water.

Setting the L-sections in place (above and page 132) | The supporting wall sections are lifted into place and submerged to form the edge of the new quay. The area behind the sections is then filled with crushed rock and gravel. This forms a strong, solid quay that can withstand the forces the RoRo ships generate when approaching the quayside.

High pressure (top) | Pre-cast filigree concrete slabs for the pile-supported deck are power-washed before temporary storage.

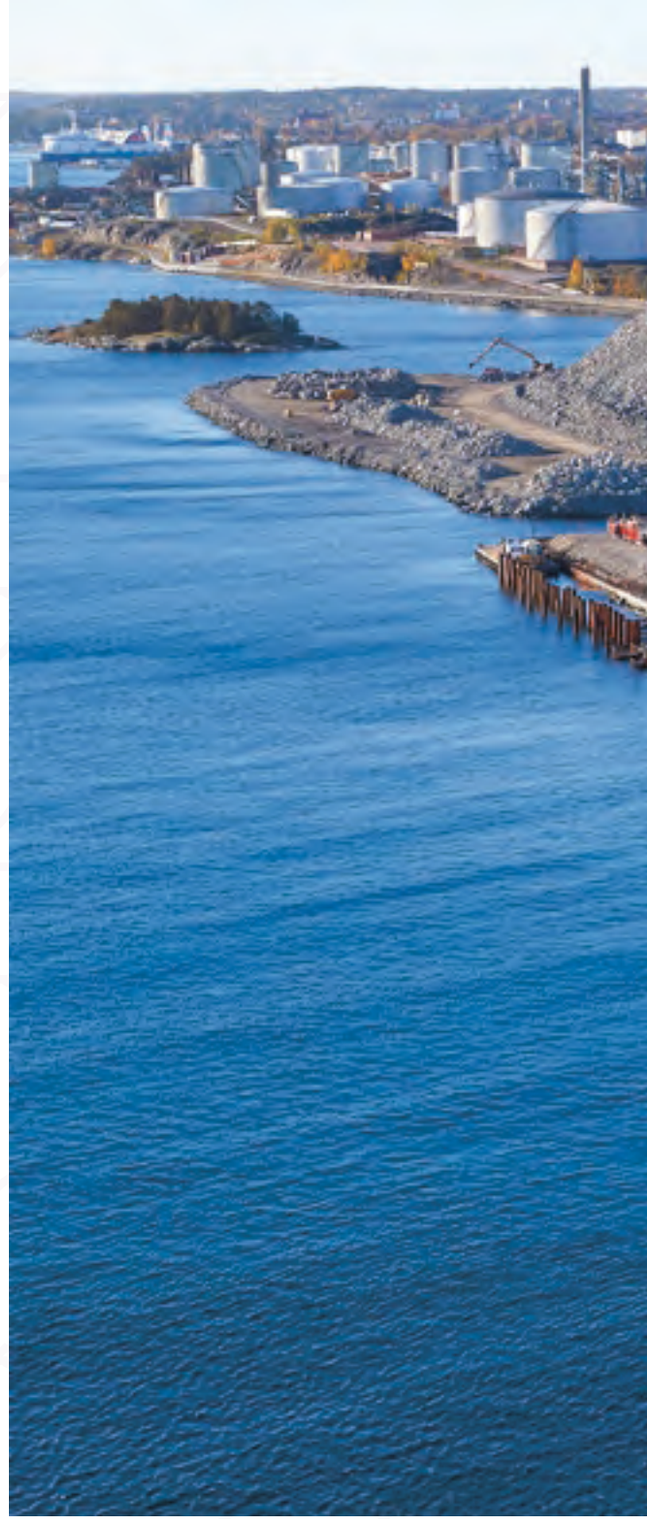
Quay reinforcement (above) | Rebar supports for casting parts of the RoRo quays. The highest parts are for storm bollards that the vessels can tie up to at a better angle than the bollards closest to the quay.



Sheet-pile (above) | A sheet-pile wall for the quay is prepared. The sheet-pile has reinforcing steel bars drilled into the rock and then concrete is added.

Adjustment (right) | Different methods were used for the quay wall in the overpass between RoRo Quay 5 and 7. Support wall sections on the left, the pilings at the corner, and then the rest of the quayside is concrete and pilings, alternately, depending on the characteristics of the sea bed. The small quay area between the RoRo quays was named Quay 6.

Preparing for pile-driving (page 135) | Pilings for the internal part of the container quay are lifted and driven into place.

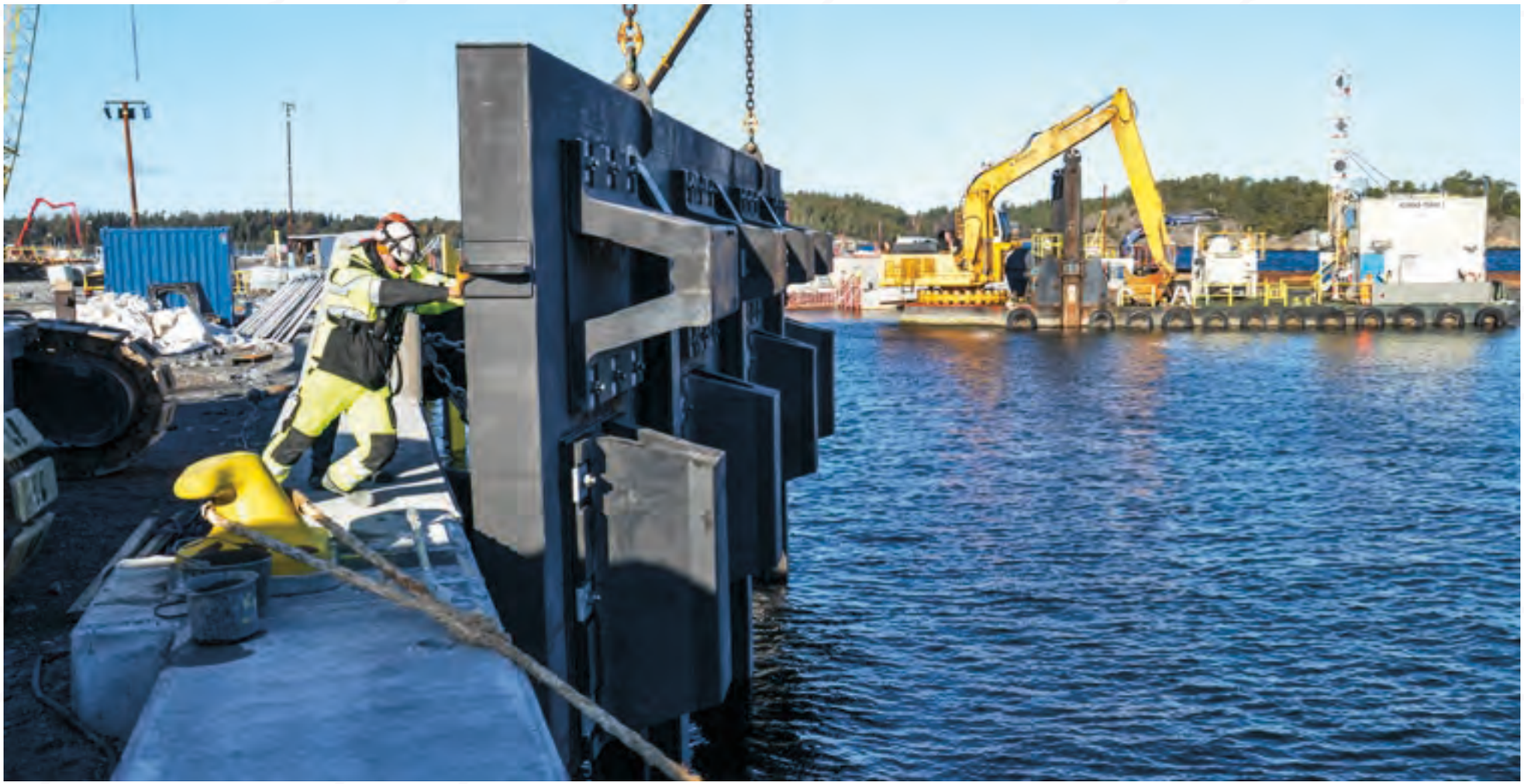


Monoliths (top) | The outer part of the 450-metre long container quay has a pile-supported deck with 240 piling supports. It was built using monoliths. These are 15 free-standing sections joined by four longitudinal beams.

Filigree slabs (above left) | Prefabricated concrete sheets, known as filigree slabs, were used under parts of the pile-supported deck. Similar slabs were laid on top of the deck, and a concrete deck surface was cast above that. In the cavities between the slabs there is space for culverts for drainage of the port surface, fresh water pipes, sewerage pipes and electrical power supply for the vessels.

Quay walls (above right) | Different methods were used to construct the quays. Here you can see a wall of tubular sheet-pile, used among other things where the internal part of the pile-supported deck at the container quay is directly adjacent to the rock face.

Container quay (right) | Pile-supported deck is taking shape. The container quay has four huge longitudinal beams. Farthest away is the crown beam, three metres away from the sea-side crane beam that supports the outer crane track. A further 17 metres away from that is the land-side beam, and a further 15 metres away from that is the land-side crane track beam. The crane track gauge is 30 metres.



Fenders (top, and bottom left on page 138) | Fenders are fixed along the length of the quay to absorb impacts between the vessel and quayside. They consist of rubber bellows fixed onto the quay wall, with a metal plate and an outer wear-resistant plastic layer. Robust chains hold the fenders in place when they absorb the collision. Every fifth fender is yellow, to assist in judging approach distance to the quayside. In total there are 32 individual fenders, each weighing five tonnes, ranged along the container quay. The pressure generated by the RoRo vessels can be greater, so there are 19 double fenders at that quay, each weighing twelve tonnes.

Container quay (bottom centre on page 138) | The container quay is cleaned before the fenders are installed.

Bollards (bottom right on page 138) | Vessels wrap hawsers around the bollards at the quay. The container quay has 32 bollards. Each has a 200-tonne pull pressure tolerance. Each bollard is held in place by eight 58 mm bolts screwed 1.2 metres into the quay's deck. In the image you can also see the overshoot barrier and stopping buffers at the end of the tracks for the quay's cranes.

Bulb protector (above and left) | There are bulb protectors under the ramps at the RoRo quays. These protect the ramp if a vessel gets too close. The protector consists of a 70-tonne steel plate, fixed to the wall of the quay by thick rubber fenders. When installed only the top edge of the protector will be seen above water.

Cranes and ramps

Stockholm Norvik Port is equipped with two super-post-Panamax container cranes. These are among the largest cranes in all of the Baltic Sea and can handle the very largest vessels. The ramps at the RoRo berths are designed for the future, both in terms of size and capacity.


ZPMC


DUNKERQUE

”The biggest challenge in converting a deserted headland into a state-of-the-art port was handling the enormous volumes of rocks and gravel in a limited amount of space”

| Kristian Martti

Crane arrival (pages 142–143) | On 18th March 2020 the two super-post-Panamax cranes and six straddle carriers arrived from Shanghai aboard the Zhen Hua 32. There were also two other cranes on deck bound for another destination. Such high loads make vessels more vulnerable to high waves and strong winds, and the voyage took a little longer than planned. At the same time as the cranes were transported, the new Stockholm Slussen Bridge was also on the way, aboard the Zhen Hua 33. With the more famous bridge involved, the arrival of the ships turned into a race in the media.

Kristian Martti (left) | Project manager in charge of dealing with the excavated rock and clay. Kristian Martti was the first project manager on site. He began with the removal of the overgrown vegetation and was still involved in the project when the first vessel called at the completed port.

Jump for joy (right) | Ports of Stockholm personnel celebrate the long-awaited arrival of the cranes.


RCQC 02
HUTCHISON PORTS
STOCKHOLM

Most modern port in the Baltic Sea

Stockholm Norvik Port's two container cranes are super-post-Panamax-sized cranes. These are among the largest cranes in Sweden and the whole of the Baltic Sea, enabling the port to handle the very largest vessels. The cranes arrived from China, fully assembled, on the deck of a cargo ship. Standing at a height of 120 metres above sea level, the cranes have become a new landmark in the southern part of the Stockholm archipelago.

The ramps at the two RoRo quays are 29 metres wide and weigh 150 tonnes each. One of the quay-berths is also prepared for the addition of an upper ramp that will further increase loading and unloading capacities when the need arises. The ramps are hydraulically controlled and can withstand a load equivalent to three juggernauts travelling side-by-side.

The ramps are the final two of nine that Ports of Stockholm purchased in the 2010s. Two of the ramps were installed at Port of Kapellskär when the port was expanded, and five were installed at Värtahamnen Port when the new pier was built there. Similarly to the cranes, the ramps are built to be able to handle the largest vessels calling at Ports of Stockholm.

Straddle carriers (left) | Eight 16 metre-high straddle carriers, built by the same manufacturer as the cranes, roll over the container yard to move containers from the cranes at the quay to the railway or haulage vehicles. These are electrical hybrid vehicles running on battery power, augmented with Volvo Penta diesel engines.

Cranes (right)| The largest vessels built today are container ships. As ships have increased in size, so have the cranes at the quays. The cranes at Stockholm Norvik Port can handle the largest ships that exist today. Size classification includes the reach capacity of the cranes. The Stockholm Norvik cranes have a span of 22 containers in width, which corresponds to the largest vessels able to operate in the Baltic Sea. The cranes were built in China and are operated using an ABB-system developed and produced in Sweden.

Unloading the cranes (pages 148–149) | The quay cranes were transported on deck, welded in place with support beams and lashed down with cables. Temporary tracks were laid between the vessel and the quay, diagonally across the tracks at the quayside. When the cranes were unleashed they were lifted onto bogies (small carts with powerful jacks). Then they were winched on shore and installed on their home tracks. Each crane took around 12 hours to roll into place.


ZPMC
HUTCHISONPORTS
STOCKHOLM RCQC 01
RCQC 01

Home | Each crane weighs around 2,000 tonnes and upright measures 120 metres. They share the tracks on the 450 metre-long quay, and their track gauge is 30 metres.

Ramp arrival (page 152) | Stockholm Norvik Port's two RoRo ramps arrived by sea. Each weighs around 150 tonnes, has a width of 29 metres and the capacity to handle the largest RoRo ships. The ramps were lifted into place by the pontoon crane Lodbrok, a faithful workhorse commissioned by Ports of Stockholm in the mid-1950s. Lodbrok is most famous for having transported the Swedish royal warship Vasa in 1961. Lodbrok now sails under another flag, but regularly carries out work in the region.

Test call (above) | The first real test of the RoRo port was on 10th July 2020, when the Stena Flavia called at Quay 7 for the first time. The container port had at the time already been in operation since May. After the call, adjustments were made and there were several more test calls before RoRo services began in November.

Buildings

Six major buildings have been built at Stockholm Norvik Port. There is a main office building for Ports of Stockholm and Hutchison Ports, a terminal building, a workshop, a building for the inspection of food, a Swedish Customs port border control building and a goods warehouse.

”After following the project for years, I am so pleased that the sustainable supply of goods to the rapidly growing capital city is assured”

| Joakim Larsson

Functional and efficient buildings

There are six major buildings at Stockholm Norvik Port. The people working at the port, and those who visit, are met by an obvious, clustered layout of buildings that enables flexible use of the area for port operations. The architectural design is stylish, with dark frontage and distinctive accent colours at the main entrance. The main building is a natural and welcoming focal point with its colourful sun screens.

At the entrance to the RoRo port there is easy access for drivers to the terminal building for check in with the respective shipping companies. At the exit they pass the large Swedish Customs inspection hall for cars and haulage vehicles.

The Swedish National Food Agency (Livsmedelsverket) also has a border control station at Stockholm Norvik Port. Imported food and grain is inspected there, in collaboration with the Swedish Board of Agriculture (Jordbruksverket). The largest building is an uninsulated storage warehouse for handling goods at the RoRo terminal.

The main building and the workshop for the straddle carriers are almost the same height. The difference is that the main building has five floors. With its door height of 18 metres, the straddle carriers can be serviced in the workshop to ensure efficient container handling.

Joakim Larsson | Vice Mayor of City Planning (M) City of Stockholm and City Commissioner responsible for Ports of Stockholm.

Swedish Customs building (page 158 and left) | Port planning meant that the Swedish Customs inspection building was ready before the other buildings at the port. The large image on the left side includes JM's Jonas ”Jonken” Sundin and project manager Peder Oreskär working together. All of the buildings have a steel framework, and this particular red framework can be clearly seen inside the vehicle hall.

Swedish National Food Agency (above) | The Swedish National Food Agency building was completed in March 2020. The architectural design with metal frontage, the bottom floor expanded metal cladding, curved corners and accent colours at the entrances give the buildings at the port a distinctive identity.

Workshop (above) | The building is designed around a steel framework, where the highest beams allow space for the tall straddle carriers. The highest supports are 18 metres and weigh 9 tonnes each.

Main building (see also pages 162–163) | The building was erected over the period September 2018 to May 2020, and was the second building project to start at Stockholm Norvik. The building is five floors high, three of which are office premises. The bottom floor has communal areas and technology solutions, with the top floor housing the building ventilation fans and an exhibition area. The roof has a terrace with a panoramic view over the port.

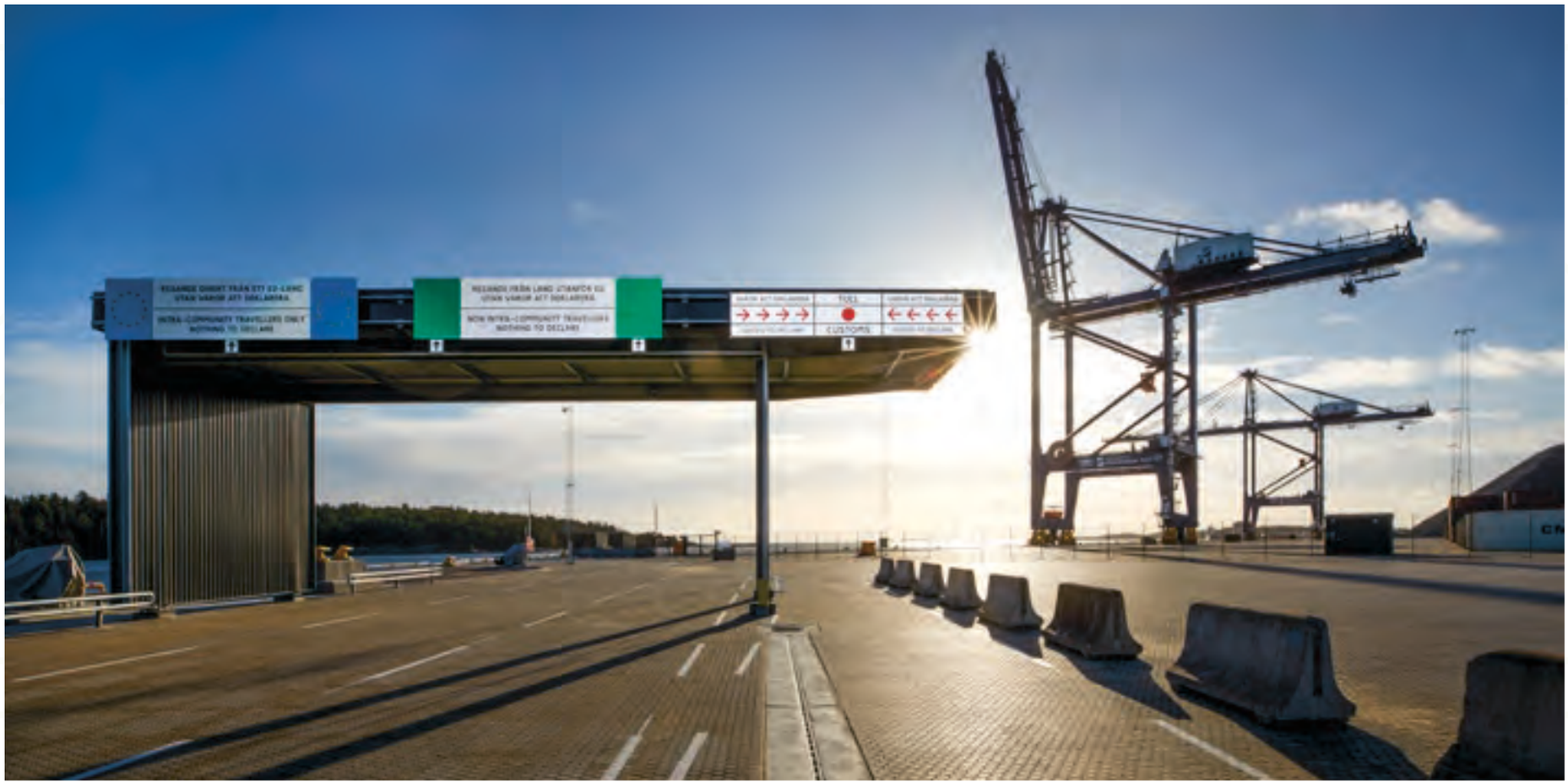
Another type of framework was chosen for this building. Instead of the quicker construction method with steel/paroc, the building has a steel and concrete framework with curtain walls built on site. The frontage is clad in aluminium sheeting.

Four almost ready (page 164) | The Swedish Customs building can be seen in the distance. This building was ready in 2018. Closer you can see the Swedish National Food Agency and Swedish Board of Agriculture building. On the left, the main building is waiting for its colourful window screens, and a closed workshop can be seen in the foreground.

Hangar doors (above left) | The high doors of the workshop are the same as those of aircraft hangars, only narrower. They have a height of 18 metres so that the straddle carriers can enter.

Hall (above right) | The 3,700 m^2 warehouse hall was a late addition to the plans. It is uninsulated but provides protection for goods that are weather-sensitive, such as paper and building materials.

Design | The vibrant colours at the entrances are a recurring theme. Yellow, orange and red provide a contrast to the dark frontage, tarmac, stone, concrete and paving slabs predominant at the port. The red portals with carved text and reflective screens guide visitors to the main building.



Border control (above and right) | All of the vehicles leaving the RoRo port pass through border control. The port area is ISPS-classed, with high security. Goods and vehicle trailers can also be automatically inspected for damage as they drive through the automatic scanners that film the condition of the loads.

Solar cells (left) | The warehouse roof has a solar cell system. When fully completed the system will be 3,500 m^2 and will cover almost all of the roof. The completed system will be able to produce up to 570 MWh of solar electricity annually.

Twenty four seven (pages 168–169) | Stockholm Norvik Port must be able to operate every hour of the day, every day of the year. The port area therefore has ten 40 metre-high and thirty-one 25 metre-high lighting stanchions, where all of the LED cells can be controlled individually for optimal function and minimal power use.


20

From project to port

The COVID-19 pandemic meant that Stockholm Norvik Port was completed under very unusual circumstances. Despite this, the container terminal opened according to plan in May 2020, and the RoRo terminal opened in November 2020.


Stena Line

Open on time and on budget in the midst of a pandemic

Exactly on schedule and pretty much on budget, the container terminal at Stockholm Norvik Port came into operation in May, and the RoRo terminal in November 2020. The port was completed and opened under very unusual circumstances, the COVID-19 pandemic.

Investment in the port infrastructure was made so that transport needs for the next 100 years are met, regardless of temporary global and financial situations. It was a great feat to open despite the challenges of having the essential skills physically on site in the final phases of the project.

Opening the RoRo port | The first scheduled call at the RoRo terminal was on 30th November 2020, when Stena Line relocated services from the Port of Nynäshamn to Stockholm Norvik Port. Stena Flavia was the first ship to make Quay 7 at Stockholm Norvik her home. Captain Sergej Pilnikovs was presented with a commemorative plaque by Ports of Stockholm CCO, Johan Wallén, using a boat hook to ensure social distancing.

Fredrik Lindstål | Also present as the opening was Fredrik Lindstål (C), Chair of the Board of Ports of Stockholm, and member of City of Stockholm Municipal Council.

”Building the infrastructure of the future takes courage and patience. Now we are ready to welcome the sustainable transport of tomorrow”

| Fredrik Lindstål

Navigation markers (top) | The new fairway to Stockholm Norvik has permanent channel markers. These are illuminated using solar cells and each can be controlled remotely. The fairway is part of the Intelligent Sea EU project to improve safety and simplify operations.

Reaching new heights (above) | Six of the eight 16 metre-high straddle carriers that handle containers at the port arrived at the same time as the cranes.

Terminus (right) | The Norvikbanan railway starts in the container yard with two 360 metre-long tracks for transferring goods to and from vessels and vehicles to the railway. No pneumatics can be used in the area, so the wagons are shunted along the port tracks by the locomotive. Trains up to 750 metres long can be coupled together at the railway yard a kilometre away.


MA CGM

”The Baltic Sea is a market with strong growth and great potential. That is why Stockholm and the Mälaren Valley region is of great strategic import-ance for Hutchison Ports”

| Lawrence Yam

Lawrence Yam | CEO Hutchison Ports Stockholm. The container terminal at Stockholm Norvik Port is run by Hutchison Ports, one of the biggest terminal operators in the world, operating 53 ports in 27 countries. The collaboration with Hutchison Ports integrates Stockholm into global freight routes.


StenaLine

”The Årets Bygge 2021 is proof that we systematically did things right. A resounding heartfelt thank you to everyone involved!”

| Karl Lagerlöf

Proud winner of the prestigious Årets Bygge 2021 construction prize!

The most important prize in the Swedish public construction sector, the Årets Bygge 2021 prize for construction of the year was awarded by construction sector magazine Byggindustrin in March 2021. Stockholm Norvik Port won the prize in the Infrastructure category and was also announced the 2021 overall winner.

The jury issued the following statement. "The overall winner of Årets Bygge 2021 is not a single construction – but several complex constructions in one. Roads, bridges and buildings have been connected together with a railway line, tunnel and world class cargo terminal. The budget and time planning was impeccable, the collaboration of the 40 different contractors was impressive and the injury statistics were incredibly exemplary. The ship has come in! What has it brought? Winner of the Årets Bygge 2021 construction prize: Stockholm Norvik Port. Many congratulations!"

The prize, which has been awarded annually since 1991, is for building projects completed during the previous year that have performed outstandingly in the categories of working environment, sustainability, time/quality/budget, technology/innovation and collaboration. Pride in the project and job satisfaction are also taken into consideration.

Karl Lagerlöf | COO at Ports of Stockholm. Karl Lagerlöf has had a leading role in all three major Ports of Stockholm development projects – the Värtahamnen Port, Port of Kapellskär and Stockholm Norvik Port projects.

Construction of the year | The prestigious diploma "Overall winner of Årets Bygge 2021 construction prize – Stockholm Norvik Port."


22

Stockholm Norvik Port takes shape between 2016 and 2020

October 2007, Norvik before construction start

February 2016

September 2016

February 2018

August 2018

November 2018

November 2016

September 2017

October 2017

March 2019

December 2019

May 2020

Stockholm Norvik Port | November 2020.


StenaLine
Connecting Europe

One era ends as a new one begins

The history of Stockholm is not a tale of a city that built a port. It is a tale of a port that gave rise to a city. What a city it is too! The sea and city are closely integrated. Many of us have come here over the years, attracted by the remarkable beauty, commerce and power in the city. A remarkable place that over the years has had the honour of being the residential and financial heart of the country, but also a place of exquisite beauty. Our mandate is clear – just as it was in the 1200s, the focus is trade and securing the goods supply to our region. Previously the focus was mostly export, but today it is import.

For those of us working daily at the port, our new state-of-the-art facilities at Kapellskär, at Stockholm Norvik Port in Nynäshamn, and at the Värtahamnen Port in Stockholm give us the prerequisites to be groundbreaking; to create new business. We seek out collaborative partners to jointly provide solutions to the climate challenges we face – perhaps the biggest challenge of our era. Our contribution is to assure that import and export, trade in our region, is as sustainable and secure as it can be.

The Baltic Sea is our home. The interactions with our neighbours across the water, where the sun rises every morning, are ancient. Together we care for the sea that binds us together. Our customers are also customers of Port of Tallinn and Port of Helsinki. We are joined by the bridges our operations create. Regardless of the storms of autumn or the spring promise of the summer sun to come, every day our facilities stand ready to welcome ships safely into port.

I arrived late in the process, and the ability to turn the political decisions into the practical reality never ceases to impress me. This includes the industrious work of planning and permit application that demanded knowledgeable and skilled colleagues, as well as the work that has happened on time and on budget in all of our projects.

This is something that doesn't happen in comparative projects. Our progress has happened in parallel with exceptional communication efforts that have included our neighbours, residents in different cities, suppliers, collaborative partners and of course our employees, colleagues and friends.

After these far-reaching efforts, Ports of Stockholm is looking to the future. Our work to contribute to trade and exchange across the Baltic Sea continues. Now we also have the ability to contribute to trade by being able to welcome vessels from farther afield. After decades of planning, a new chapter in our history is complete. Now we will focus on making the best use of our fine new additions, while finding new ways to interact – city and port. We have managed this excellently for the past 900 years, and there is no reason to believe that the future will bring anything other than new ways for the city and port to benefit each other, in the north, centre and south of the greater Stockholm area.

Thomas Andersson | Ports of Stockholm CEO

Facts

Stockholm Norvik Port facts

STOCKHOLM NORVIK PORT

Construction period: 2016 to 2020

Cost: Approx. SEK 3.8 billion

Total port area: 440,000 m^2

Total increase in Sweden's land area: 138,431 m^2

Rise in land height from water level: 141,244 m^2

Drop in land height from water level: 2,913 m^2

QUAYS

Quay 3–4: Container quay 450 metres, with room for the largest vessels, or two smaller vessels.

Quay 5: RoRo quay 286 metres

Quay 6: Service quay 33 metres

Quay 7: RoRo quay 233 metres

Quay 8: Service quay 52 metres

Quay 1–2: Potential future container quay 350 metres

14 stations along the quays for offload of black and grey water and supply of fresh water.

7 lifesaving equipment stations along the quays, three with small lifeboat.

Manilla rope at water level for emergency rescue.

Rescue ladders every fifty metres.

Backfill of harbour basin: 400,000 m^3

Dredging: 800,000 m^3

CONTAINER QUAYS

Pile-deck: 8,000 m^2

- Number of pilings: 240
- Diameter: 611–813 mm
- Wall thickness: 16–20 mm
- Average weight: 350 kg/m
- Average length: 18 metres

Sheet-pile walls: 200 tubular pilings (RD walls, diameter 813 mm), crest measurement 160 metres.

QUAY CRANES

2 size-class super-post-Panamax.

Weight: 2,000 tonnes each

Height: 80 metres, in upright position 120 metres.

Lifting capacity: 80 tonnes

Lifting height: 48 metres

Span: 65 metres, equates to 22 containers in width.

Operated remotely from the main building, majority of lifting is automated.

450 metre track for quay cranes, track gauge 30 metres.

RORO QUAYS

Number of L-supports: 35

- Height: 12 metres
- Weight: approx. 280 tonnes each

Sheet-pile walls: 300 tubular pilings (RD walls, diameter 813 mm), crest measurement 240 metres.

Free standing pilings: 30, diameter 611–813 mm.

Bottom plate for erosion protection at the RoRo quays: 6,000 m^3

PORT AREA

Total port surface area: 280,000 m^2

Container area portion: 160,000 m^2 and

RoRo area portion: 120,000 m^2

At quay level the port surface is +3.00 i RH 00, i.e., +3.5 RH 2000.

11 million paving stones – the largest concrete paved area in Scandinavia.

5,800 metres of drainage pipes, 4,240 metres of which are surface water drainage pipes, all are encased in concrete.

8 purification stations for drainage water, with multiple filters and the possibility to shut off flow in case of accident or for sampling.

4 pumping stations for sewage.

1 water reservoir of 400 m^3 capacity.

1 pumping station for fresh water.

250,000 metres of cable protection pipes, type SRS, dimensions 50, 110 and 160 mm cast in concrete according to OPI standards.

10 lighting masts, 40 metres high.

31 lighting masts, 25 metres high.

40 lighting masts, 13 metres high.

All lighting units can be controlled individually for optimal use.

142 other lamp posts.

Stockholm Norvik Port | Illustrations of the newly built port.

1. Entrance to the container terminal
2. Railway
3. Port office
4. Visitor parking
5. Terminal building RoRo
6. Entrance to RoRo terminal
7. Hall for container handling
8. Mount Norvik
9. Container area
10. Refrigerated containers
11. Trailer standing area
12. Quay 3–4
13. Quay 5
14. Quay 7


1
2
3
4
5
6
7
8
9
10
11
12
13
14

PORT AREA (continued)

1 mobile mast, 54 metres high.

ISPS fencing, 2,200 metres.

Other fencing, 1,850 metres.

23 electrically operated gates.

7 manually operated gates.

7 pedestrian gates.

15 portals, the longest is 150 metres.

Overspill area, entrance to RoRo terminal: 19 lanes x 90 metres.

Overspill area at the RoRo terminal: 38 lanes, average length 115 metres.

144 parking bays for trailers.

Container area with room for 3,000 TEUs (20-foot containers).

Prepared for 130 reefers (refrigerated containers).

ITS, Intelligent Traffic System, RoRo terminal. The system uses cameras at the entrance to read registration numbers, measure vehicle heights and lengths, and electronic signs and traffic light steer the traffic to the correct gates. The ITS also functions to separate hazardous loads and documents damage to trailers.

- 19 VMS signs
- 1 manoeuvring post at the entrance to the overspill area
- 5 barriers
- 1 gate
- 1 tailgating sluice
- 1 damage inspection portal at the entrance
- 1 two-way damage inspection portal
- Traffic lights at barriers, sluices and exit
- Computers in all carriers

BUILDINGS

There are five major buildings at the port, designed by Wåhlin Arkitekter, as well as a large cargo transfer hall.

Main building
Building area: 477 m^2
Office premises, communal areas and technology solutions.

Swedish Customs Building
Building area: 960 m^2
Workshop, administrative and technology solutions area.

Workshop, containers
Building area: 1,341 m^2
22 metres high with three 19 metre-high doors.

Swedish National Food Agency border control station
Building area: 568 m^2
The building is for inspection of food by the Swedish National Food Agency.

Terminal building, RoRo
Building area: 535 m^2
Swedish National Food Agency border control station.

Storage warehouse
Building area: 3,700 m^2
Uninsulated warehouse beside the RoRo port for storage and transfer of cargo.

ELECTRICAL INSTALLATIONS

Distribution stations:

1 receiving station 22 kV.

6 sub stations 400 V.

2 sub stations 11 kV for onshore power supply to vessels.

1 sub station 11 kV for container crane power supply.

There are two alternative electricity connection points at each quay, 8 in total.

65 control cabinets, combined electricity, IT and safety located in the lighting masts.

3 transformers 1.25 MVA (400 V).

3 transformers 2 MVA (400 V).

5 transformers 4 MVA (11 kV).

201 LED spotlights on masts.

241 LED cells on lamp posts and portals.

Full coverage loudspeaker system for the entire port, with preprogrammed evacuation messages and microphone for announcements in the main building.

Large number of cameras for monitoring and security.

ENVIRONMENT

Sustainable energy use:

3,500 m^2 solar cell facility on the roof of the storage warehouse. Capacity will be up to 570 MWh per year when fully developed. All buildings at the port are designed for solar cells on the roof.

42 energy bore holes for geothermal heating and cooling in all major buildings.

Energy efficient buildings. Estimated primary energy rating for the main building is 43.4 kWh/m^2 annually.

All of the office buildings at Stockholm Norvik are built to Silver environmental standards.

The LEDs in the lighting masts can be controlled individually for optimal energy use and minimal energy waste.

Possibilities for onshore power connection for vessels at every quay-berth.

Environmental certified electricity in port.

Charging points for electric vehicles.

Sustainable transport:

Transport of pilings and other material by sea during the project to reduce emissions and movement of vehicles on roads. Environmental requirements for vehicles during the project according to common standards, including those set by the City of Stockholm City Council.

The railway connections mean less goods transported by road and fewer emissions.

Responsible choice of materials:

The SundaHus database was used to support the choice of environmentally friendly construction materials. Around 5,000 products were assessed, and more than 80 percent had top ratings.

Waste and chemicals:

Vessels can offload black and grey water at all quay-berths.

100 percent of constructing waste in the project has been sorted at source, and only one percent has gone to landfill.

At Stockholm Norvik vessel waste is offloaded and recycling stations also manage the waste produced at the port.

Much of the landmass, 887,000 tonnes, was able to be repurposed in the Valsjö nature area.

Adapting to climate change:

The water drains collect, divert and retain runoff and are dimensioned to cope with a factor of 1.2 in increased rainfall amounts.

The water purification facilities are dimensioned to cope with intense rainfall falling over a short period can handle skyfall, 10-year and 100-year rainfalls.

S*pecial environmental measures*:

Piles of timber have been placed in the forest behind the port to provide habitat for red-listed insects.

Underwater, seaweed has been relocated and playgrounds for fish have been created under the quay decks.

CONTRACTORS

- Broby Spår
- Elektrotjänst AB
- Grytec
- Hantverksjouren AB
- Hercules grundläggning
- Heving & Hägglund
- Holtab
- Implenia
- JM
- MVB Öst
- NCC
- Nordomatic
- Peab Marin
- RA Bygg
- Reservkraftsbyggarna
- Sebab
- Swarco
- Terramare
- Veidekke


Stena Line

PRODUCED BY

Ports of Stockholm and Hurra!

GRAPHIC DESIGN

Hurra! (www.hurra.se)

MAIN PHOTOGRAPHER

Per-Erik Adamsson, cover and images on pages 6, 12, 13, 14, 18, 22, 23, 25, 26, 28, 32, 38, 52, 54, 55, 62, 63, 74, 80, 82, 83, 88, 92, 94, 95, 97, 100, 101, 102, 103, 106, 112, 113, 114, 115, 116, 118, 120, 121, 124, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 142, 145, 146, 147, 149, 150, 152, 153, 158, 159, 160, 162, 163, 164, 165, 166, 172, 174, 177, 179, 180, 182, 183, 184, 186, 194

ADDITIONAL PHOTOGRAPHERS

Camilla Strümpel, page 17

Fredrik Hjerling, pages 17, 44, 47, 48, 51, 52, 70, 76, 79, 84, 98, 104, 114, 133, 145, 162, 165, 167, 168

Niklas Björling, pages 25, 41, 61, 64, 66, 72, 73, 78, 82, 138, 158, 179, 187

Atelier Ekegren/Nynäshamns bildarkiv, page 37

Fredrik Wennerlund, page 37

Sam Victorin, pages 52, 79, 96, 105, 115, 139, 147, 148, 162, 164, 165, 176, 180

Lars Petré, pages 54, 55

NCC, page 58

Gösta Rising/HG-bild/Nynäshamns bildarkiv, page 62

Joakim Kröger, page 63

Joakim Kröger/Hercules grundläggning, page 63

Anna Molander/Region Stockholm, page 90

Victor Brott, page 111

Patrik Olsson/Stena Line, page 124

Margareta B Sande/Moderaterna, page 157

VISIONARY IMAGES/DRAWINGS

Illustrations, artist unknown, page 19

Aaro Designsystem, SWECO, page 20

City of Stockholm, page 27

Swedish Maritime Administration © 20-05071, page 39

Zoning plan excerpt, page 49

Kenji Schönberg, page 62

SWECO, page 90, 95

Wåhlin arkitekter, page 191

PRINTER

Larsson Offsettryck AB.
Larsson Offsettryck AB is environmentally certified according to ISO 14001 and the Swedish eco-friendly Swan mark.

EDITION

First edition, 350 copies Swedish, 350 copies English.