Sydhavna (Sjursøya) – an area with increased risk

February 2014
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The Norwegian Directorate for Civil Protection (DSB) shall be a driving force in the work to prevent accidents, crises and other undesired incidents, and to ensure sound emergency preparedness and efficient accident and crisis management. DSB shall also maintain an overview of risk and vulnerability in society. This means, for example, that we work systematically to identify and visualising risk, vulnerability and emergency preparedness in society.

Several places in Norway, enterprises that represent a potential risk to the surroundings, are located in or near cities or densely populated areas. The transport of dangerous goods also takes place through densely populated areas. Such areas can be classified as areas with increased risk.

In 2012, DSB decided to initiate a safety review of Sydhavna and the associated fuel depot in Ekebergåsen in order to examine the societal safety challenges in and around Sydhavna with emphasis on the safety of third parties. DSB has previously conducted a similar review of warning systems in the Grenland area, due to the concentration of process industries.

Sydhavna is an important hub for many activities in Oslo, and many different enterprises are located in the area. In such an area, it is important that the enterprises have prudent safety management and that a continuous effort is made to maintain a high level of safety.

During the review process, we have had a good dialogue with both public and private actors. This has been important.

Based on an overall assessment of how the safety conditions in Sydhavna have been managed, DSB makes recommendations in this report for improvement measures for the enterprises, the City of Oslo, the Port of Oslo and central government authorities. The report is intended as a basis for all of the affected actors in the important efforts to improve safety conditions in Sydhavna.

It is the task of the individual actors to follow up within their area of responsibility. DSB will prepare an overall plan for the follow-up of the recommendations in this report. The full-scale national exercise HarbourEx15 in Oslo will be part of the follow-up.

Jon A. Lea
Director General
This report reviews safety challenges in the Sydhavna area in the southeast portion of Oslo Harbour with the aim of identifying the need for measures that can improve the overall management of safety in the area.

The activities in Sydhavna began at the end of the 1930s. Since then, the scope of activities has gradually increased. Over time, residential and urban areas have been established closer to the harbour area, which is located just three kilometres from central Oslo. Sydhavna can be regarded as a national logistic centre, and it encompasses container operations, storage and distribution of petroleum products, handling of dry bulk cargo, import of cars, general transport/forwarding etc. Sydhavna has Norway’s largest container harbour, which covers 80 per cent of the market in Eastern Norway. The fuel depot in Ekebergåsen and the oil terminal at Sjursøya supply approximately 40 per cent of Norway’s fuel consumption, as well as all of the aviation fuel for Oslo Airport Gardermoen. Altogether, this means that a large volume of dangerous goods are stored and transported in the area. In addition, the area is under continuous development, with an increased level of activity and several development projects in the immediate vicinity.

Altogether, this makes Sydhavna an area with increased risk. By this, we mean:
• A geographically limited area with several risk-prone enterprises.
• An undesired incident at an enterprise can spread to other enterprises and therefore trigger a larger accident or disaster.
• The consequences for the population in the surrounding area may be very serious.
• The area’s overall risk may be greater than the sum total of the risks of the individual enterprises.

In 2012, the Norwegian Directorate for Civil Protection (DSB) established the project “Sydhavna – an area with increased risk” with the following objective:

To review the safety conditions in Sydhavna, with the transport of dangerous goods and the handling of hazardous substances as the basis. The results of the review should point out risks and make recommendations to the authorities and other enterprises with regard to the future development of Sydhavna.

This report documents the results from the project and is based on a number of data sources, including public documents, interviews and meetings with key actors, as well as special investigations of specifically defined topics. It is primarily directed towards the actors and decision-makers who directly or indirectly influence the development of the area. It will also be of general relevance to port authorities, municipalities and governmental authorities regarding work on civil protection and emergency planning.

The study places special emphasis on activities connected to the Sjursøya oil terminal and the facilities in Ekebergåsen, including conditions related to the transport of dangerous goods by road, rail, and in the harbour basin. The proximity to vulnerable surroundings is a key factor in the review. It is based on a comprehensive perspective of risk management processes connected to Sydhavna. Many actors define conditions for and contribute to risk management. This also encompasses the various regulatory regimes and relevant governmental actors. In addition, the project seeks to identify the connection between ongoing and planned activities, and the extent to which change processes have been taken into account in the management of risks. The following questions are discussed:

• Is there an adequate overview of the risk situation and the safety challenges?
• What is the need to improve the knowledge base?
• Given our current knowledge, how are the safety challenges to be assessed?
• Are the current means of maintaining safety adequate with regard to quality, scope and accuracy?
• What should be done to improve the level of safety in the area?

Based on what we know in general about the safety challenges related to similar industrial activities and facilities, the report documents several critical factors that must be assumed to affect the level of safety.

Complex goals: Harbour activities are generally characterised by a broad and complex goal structure: navigability, efficiency, environmental considerations, port security, general safety, etc. A great number of concerns must be coordinated and managed. Production and economic considerations and harbour development shall be balanced against a range of other goals and regulatory requirements. Both the long-term and ongoing prioritisation can represent a challenge, in the handling of change processes, in planning and decision-making processes and in the day-to-day operations. The report indicates that the focus of the City of Oslo in developing the Fjord City plan, the desire for the realisation of the positive effects and development opportunities in the harbour areas has been the principal perspective. It was presumed that safety considerations would be handled within this framework.

Complexity: Sydhavna encompasses a large number of enterprises with varying degrees of interdependence and
requirements for coordination. Many risk-prone activities are concentrated in a small area, in particular the transport and storage of petroleum products. There is a possibility of domino effects. In sum, this can result in lack of oversight and consistent management, and insufficient clarification of interfaces and responsibilities.

The basis for decision-making processes will largely be limited by the individual decision-maker’s interest and knowledge. Coordination and uniformity considerations may entail challenging trade-off decisions between local versus central management of decision-making and implementation processes. It is also a challenge to ensure that the various actors have a clear understanding of each other’s roles and responsibilities.

Knowledge failure: Experience from serious incidents shows that the overall information decision-makers possess prior to (and during) the incident may often be both inadequate and difficult to understand. Essential information may be lacking, and the flow of information may make it difficult to distinguish between the relevant and the irrelevant, and between the important and the less important. The study of the activities in Sydhavna shows that the flow of information is extensive, and there is a risk that the relevant knowledge base is not always available prior to making decisions at various levels.

Knowledge of the risk situation
The report documents that a large number of risk analyses and assessments have been conducted at different times, and cover many different aspects of safety in Sydhavna. Some of the analyses have been part of larger studies in which the risk situation has only been one of several topics being considered. The analyses have primarily only addressed subtopics and specific aspects of safety.

However, there is a lack of analyses with comprehensive assessments of all relevant conditions, and which also evaluate the organisational and management-related prerequisites for proper safety in the area. It also appears unclear how the responsibility for conducting comprehensive risk assessments has been understood and followed up by key actors. The review of developments in the area in recent years indicates that there has not been a sufficiently well documented assessment of the overall risk situation and/or of the safety-related effects of the decisions at given times and during critical decision-making processes. This indicates that a system is lacking for conducting risk assessments – as part of a comprehensive risk management process. A key finding in this context is the fact that the impact assessment for Sydhavna in connection with the Fjord City land-use planning process was based on the assumption that the container operations be relocated. When this nevertheless did not take place, no new impact assessment was produced. On the contrary, the scope of these operations have increased and will continue to increase. The report also points out areas that have not been surveyed, inadequate risk assessment of the maritime traffic in the harbour basin, as well as inadequate assessments of the consequences of loss of supply.

Given the knowledge that we have, based on the existing assessments, several safety challenges have also been identified, related, for example, to inadequate maintenance in the underground storage facility, inadequate staffing around the clock at the oil terminal, and unclear emergency preparedness capacity in the event of an incident. There have also been several serious incidents in the area in recent years that reveal failures in the safety management, and they are a reminder that unforeseen things can happen. Increased activity in the area and further development in the immediate surroundings will also result in increased vulnerability.

Policy instruments and needs
A number of measures and policy instruments currently contribute to maintaining safety in Sydhavna. At the enterprise level, the report has focused on the oil companies, which have established their own safety management systems for both prevention and emergency preparedness. They essentially follow the company systems, but with local adaptations. The findings indicate nevertheless that there is a need for improvement with regard to coordination among the companies. The facilities and processes are integrated in a manner that requires cooperation, and domino effects can arise when incidents in one part of the facilities may have consequences for other parts. The Port of Oslo has a more passive role with regard to safety in Sydhavna, and it assumes that the enterprises manage these themselves in accordance with the current regulatory requirements. The working environment is primarily followed up in relation to the enterprises’ own employees, but there is active follow-up of the entire harbour area with regard to the external environment and port security. Moreover, there are no clear goals or expectations issued by the City of Oslo or the national port authorities that the port shall assume more overall responsibility for safety in the harbour areas.

Proposals and recommendations
*The oil companies should coordinate their safety work to a greater degree with regard to both prevention and emergency preparedness. More comprehensive safety management and internal control should be promoted, based on the requirements of the Norwegian Seveso Regulations, among other things. Industrial safety should be established in accordance with the regulatory requirements, and manned surveillance at the oil terminal should be reinforced with competent staffing around the clock.*

The *municipality* should integrate safety considerations to a greater extent in decision-making and management processes.
The ongoing work with the risk and vulnerability analysis of the Sydhavna area must result in an overview of the overall/actual risk situation, and it must include factors that will result in greater vulnerability and risk such as the development at Sørenga and increased maritime traffic. The municipality must to a greater extent define goals for civil protection and safety connected to the harbour activities, and follow these goals up with management directives and in the ongoing management dialogue with the Port of Oslo. There is a need for greater clarification of the duties, responsibilities and distribution of roles within the municipality and the municipal enterprises – as well as in relation to other contributing actors in an emergency situation.

The Port of Oslo should improve the follow-up of the actors in Sydhavna with regard to safety, especially in connection with the petroleum activities. As the owner, landlord and highest authority for the harbour areas, the port authorities are the natural actor for ensuring more overarching risk management.

Based on the requirements of the HSE Internal Control Regulations, this will entail that HSE goals are defined for the entire harbour area, that the organisation of HSE work includes all the actors, and that comprehensive risk assessments are made and risk-reducing measures are implemented in common for the harbour area.

Government regulation and exercise of authority

- Pursuant to the Norwegian Seveso Regulations, the authorities should cooperate in following up the oil companies’ compliance with regulatory requirements and domino decisions. This entails a special focus on the requirements for the exchange of information and cooperation on risk-reducing measures. The inspection frequency for the outdoor facilities should be increased.
- To a greater extent, the HSE agencies should inspect compliance with coordination requirements pursuant to Chapter 6 of the Internal Control Regulations; directed at both the port authority and the oil companies.
- DSB should conduct more inspections that focus on technical measures and barriers to increase the enterprises’ focus on the technical condition of the facilities and on operating procedures.
- More extensive cooperation should be considered between the authorities that regulate and supervise the ports, beyond the current cooperation schemes through the HSE agencies and the major accident authorities.
- The HSE authorities should review and evaluate the current consent and permit regime.
- The Norwegian Industrial Safety Organisation should consider a reintroduction of the industrial safety obligation to reinforce emergency preparedness work.
- National port authorities should to a greater extent follow up safety at the ports, clarify/strengthen the role of local port authorities, both through regulations, inspection and management dialogue. The implementation of the ISPS requirements should also be assessed with a view to a good balance between different safety considerations.
- The local port authority must be given an expanded and more prominent role and authority with regard to the overall management of risk in harbour areas through the regulations for ports.
- The Ministry of Petroleum and Energy (MPD) should conduct a value estimation of the petroleum activities in Sydhavna with the aim of identifying objects that are worthy of protection.
- The MPD should in accordance with the Trade and Industry Preparedness Act initiate a process with the oil companies in order to establish agreements and guidelines that secure a proper supply of petroleum products in a loss of supply situation.
Sydhavna is a harbour area that many people and several important societal functions depend upon. The area encompasses Norway’s largest container harbour, which covers 80 per cent of the market in Eastern Norway. In addition, approximately 40 per cent of Norway’s fuel consumption, as well as all of the aviation fuel for Oslo Airport Gardermoen, are supplied from the oil terminal in Sydhavna. In addition, a large volume of other bulk and general cargo is imported and forwarded from Sydhavna. In connection to the petroleum industry, there is a large fuel depot in Ekebergåsen. Altogether, this means that a large volume of dangerous goods are stored and transported in the area.

Geographically, Sydhavna is located three kilometres south of central Oslo. The area is located close to commercial and residential areas, such as the Oslo Central Station, Opera House, “Barcode”, Bekkelaget, Nordstrand, Gamle Oslo and the Opera Tunnel. Both the Østfold Line and the E18 highway are located between the harbour area and the fuel depot in Ekebergåsen.

The area around Sydhavna is under continuous development. In Ekebergåsen, there are tunnel projects linked to the construction of the Follo Line and Midgardsormen (new sewer system). In addition, a relocation of the container operations is planned, so that they will be combined at Sjursøya. Oslo Airport Gardermoen will increase its capacity by 50 per cent by the end of 2017, which will entail increased transport and the associated handling of aviation fuel from Sydhavna. There are plans to improve the approach fairway to Oslo, so that larger vessels can enter the harbour area. In summary, Sydhavna is a hub of many important activities in our society. It is a small area, marked by major changes and located close to the centre of the capital and the associated residential units and infrastructure.

Altogether, this makes Sydhavna an area with increased risk. The consequences of an undesired incident could be very serious. In 2012, the Norwegian Directorate for Civil Protection (DSB) established the project “Sydhavna (Sjursøya) – an area with increased risk” to review the safety conditions in Sydhavna and make recommendations for future development in the area.

This report documents the results from the project. The report should contribute to a better basis for decision-making regarding prevention and emergency preparedness in the future development of Sydhavna. Primarily the report is directed towards all of the actors and decision-makers that directly or indirectly influence the development of the area: Enterprises with operations in the harbour area, the Port of Oslo and the City of Oslo, as well as various government agencies that in various ways intervene through general guidelines, regulations, inspection, etc. The report will also be of general relevance to port authorities, municipalities and governmental authorities with respect to civil protection and emergency planning.
INTRODUCTION

1.1 MANDATE

The Norwegian Directorate for Civil Protection (DSB) has a broad range of duties and roles. In addition to being a regulatory and supervisory authority pursuant to the Fire and Explosion Prevention Act and several other acts, the DSB, according to the instructions, also has a coordinating role for civil protection work, especially with respect to activities, objects and operations where there is a potential for major accidents. The aim of this coordinating role is to establish the foundation for good comprehensive preventive work and good emergency planning preparations, through knowledge building, analysis of development trends and advisory services for the Ministry and other authorities with regard to the need for improvements. Viewed in the context of DSB’s primary administrative tasks, this entails the identification of issues and areas in which there may be a special need for cross-sectoral assessments. The identification of areas with increased risk is a follow-up of this task and is particularly linked to the scope of the transport of dangerous goods and stationary operations that handle hazardous substances where there is the potential for major accidents. The instructions do not specifically address the use of legal instruments and law enforcement.

The term area with an increased risk is defined as:

- A geographically limited area with several risk-prone activities or enterprises.
- An undesired incident at an enterprise can spread to other enterprises and therefore trigger a larger accident or disaster.
- The consequences for the population in the surrounding area may be very serious.
- The area’s overall risk may be greater than the sum total of the risks from the individual enterprises.

Based on the DSB’s overview of the transport and storage of hazardous substances and of the enterprises that are subject to the Norwegian Seveso Regulations, several areas that fall under the above definition have been identified in Norway. One of the common features of these areas is the fact that they are transport hubs, where hazardous substances are stored and handled. Sydhavna satisfies all the criteria for identification as an area with increased risk. From this point of departure, the aim of the project has been formulated as follows:

To review the safety conditions in Sydhavna, with the transport of dangerous goods and handling of hazardous substances as the basis. The results of the review should point out risks and make recommendations to the authorities and other enterprises with regard to the future development of Sydhavna.

The review is primarily a knowledge-building project, even though it is carried out based on DSB’s role as the competent authority in the area of civil protection and societal safety. The duty to obtain an overview and identify risk encompasses more than the exercise of authority in the form of regulation and inspection. The project is based on a number of governing documents, and it reflects the scope of DSB’s societal duties as they are defined in the instructions. The instructions stipulate a special responsibility for comprehensive and cross-sectoral perspectives and overviews, for the identification of defects and omissions in safety work, for learning and the exchange of experience between the supervisory authorities, as well as for the coordination of initiatives and measures that do not fall solely under a certain limited area of authority. This responsibility is based in part on the coordination role pursuant to the Norwegian Seveso Regulations, but it also extends beyond this and is generally aimed at activities, objects and operations where there is a potential for major accidents. As noted, the instructions do not address the exercise of legal authority, which is presumed to be handled through the established channels of authority based on relevant legislation.

1 Cf. Royal Decree of 24 June 2005 “Directorate for Civil Protection – General Coordination Responsibility and Coordination of the Inspection of Activities, Objects and Operations Where There is a Potential for Major Accidents”.
1.2 QUESTIONS AND SCOPE

The assessment is based on a comprehensive perspective of risk management processes connected to Sydhavna. The scope of the project indicates that many actors determine conditions premises for and contribute to risk management, and the review seeks to investigate the extent to which responsibilities and interfaces between the roles of the various actors are appropriate and clarified. This also encompasses the various regulatory regimes and relevant governmental actors. In addition, the project seeks to identify the connection between ongoing and planned activities, and whether change processes have been taken into account in the management of risks. In brief, the following questions will be addressed:

• Is there an adequate overview of the risk situation and the safety challenges?
• What need is there to improve the knowledge base?
• Given our current knowledge, how are the safety challenges to be assessed?
• Are the current instruments for managing safety adequate with regard to their quality, scope and accuracy?
• What should be done to improve the level of safety in the area?

The review places special emphasis on activities connected to the Sjursøya oil terminal and the activities at Ekebergåsen. In general, the traditional “safety” issues linked to fire and explosion protection are emphasised, but also “security” issues related to deliberate actions (such as protection against terrorism) has been reviewed.

The recurring themes of the review are particularly linked to managerial, organisational, technological and logistical challenges, which in various ways influence the safety conditions. The following areas and topics have been identified as critical:

• Maritime traffic and activity in the harbour basin
• Installations and activities in the underground facility in Ekebergåsen and in the oil terminal
• Issues linked to road and rail transport of dangerous goods
• Harbour infrastructure and proximity to vulnerable surroundings
• Consequences for the security of supply in the event of a loss of petroleum products from Sydhavna
• Impact and relevance of other societal circumstances (urban development, land-use planning, other development projects, threat situation, etc.)

1.3 ORGANISATION OF THE PROJECT

The project has been organised with a project group, a steering group and a reference group (see Appendix 2). The project group has been responsible for the collection of data, analysis and writing of the report. The project group consisted of a staff of four with varied academic backgrounds and from different departments at the DSB (the fields of hazardous substances and social science). In addition, a master’s degree student from the societal safety study programme at the University of Stavanger contributed to the project group, with special responsibility for questions concerning the security of supply. The steering group consisted of members from DSB’s leader group, and a County director of emergency planning. The steering group has been responsible for follow-up of the principal objectives, strategic choices, time schedule and content. The reference group consisted of four academic experts from the Foundation for Scientific and Industrial Research (SINTEF) and from the University of Stavanger. The group has contributed to the project in terms of academic and methodological perspectives, relevant theory and empirical knowledge.

DSB has conducted the review in cooperation with enterprises in Sydhavna (primarily the oil companies), the City of Oslo (Port of Oslo, Oslo Fire and Rescue Department, emergency planning unit, etc.), the County Governor of Oslo and Akershus, as well as the relevant regional and central government authorities. These actors have primarily contributed by providing documentation and their own knowledge, and they have participated in discussions about safety in the area. The methods and procedures chosen are described in detail in Chapter 2.
1.4 STRUCTURE OF THE REPORT

- **Chapter 2** describes the methodological procedure, central concepts and relevant disciplinary perspectives.
- **Chapter 3** presents the facts about Sydhavna, the activities in the area and organisational structures.
- **Chapter 4** reviews the regulatory regimes that are relevant to the activities in the area.
- **Chapter 5** reviews the planning processes up to the current layout of Sydhavna.
- **Chapter 6** addresses the risk situation and, among other things, reviews current risk and vulnerability analyses, findings from inspections, major incidents in the area and the enterprises’ own opinions on various risk issues.
- **Chapter 7** reviews the emergency planning system and focuses particularly on whether this is appropriate for handling worst-case accidents.
- **Chapter 8** focuses in particular on the loss of petroleum products from Sydhavna and discusses possible consequences for the supply of fuel.
- **Chapter 9** provides an overall assessment of the risk situation, instruments for the management of risk at different levels, and discusses the need for additional instruments and measures.
- **Chapter 10** sums up and specifies the recommendations of the review.
The project has had several phases: Project definition and scope, gathering of information, analysis and processing, final assessments and conclusions. At the start of the project, DSB initiated a meeting with selected actors and agencies to explore needs and issues related to safety in Sydhavna. A number of factors came up that indicated the need for a review and suggestions to further specify the questions raised.

To ensure a good, manageable structure the various problems were classified according to the following main categories:

1) Harbour basin around Sydhavna
2) Underground facility at Ekebergåsen
3) Harbour area including the oil terminal
4) Transport of dangerous goods from Sydhavna
5) Worst-case scenarios
6) Societal issues.

"Societal issues" include the processes related to the land-use planning for Sydhavna, major development projects connected to the activities in Sydhavna and an evaluation of the issues concerning "security".
A review of this type entails certain challenges with regard to the various roles of DSB. They are primarily related to the fact that DSB is both a regulatory and a supervisory authority with regard to important activities in Sydhavna, but also has a more broadly defined coordination role in the area of civil protection and societal safety. This may give reasons for dilemmas and possible conflicts in handling these roles. In general, role conflicts in the central government may arise when the same administrative agency has different aims and duties, and where different and perhaps conflicting interests must be weighed against each other. Uncertainties may arise concerning the mandate and role of the authority when different considerations are to be handled within the same administrative area. In some instances, such situations are resolved through organisational specialisation and splitting up. This can contribute to fragmentation, and it must be weighed against other considerations, such as the coordination of instruments, uniform conduct and coordination in relation to target groups/users and efficient utilisation of expertise and resources. The specialisation of roles must always be weighed against such competing considerations. The size of the professional communities and amount of resources may be decisive for how far one can go in separating different roles. It is usual to combine different regulatory roles (e.g. statutory standard setting and enforcement), but also to include a broader professional role, which is assumed to be a precondition for the proper and competent exercise of legal authority. This especially includes various types of knowledge-building roles. This follows to some extent from the competent authority’s duty to monitor the administrative domain and identify the need for intervention. The DSB’s mandate and assignment portfolio reflects the great importance that is attached to such concerns.

In the Sydhavna project, the scope of DSB’s roles is evident from the fact that the project is directed towards a number of actors that have different relationships to the directorate as a regulatory authority:

- The oil companies as obligated parties under the fire and explosion prevention legislation and potentially industrial safety provisions pursuant to the Civil Protection Act.
- Other enterprises in the area, especially those that have been designated as special fire objects pursuant to the Fire and Explosion Prevention Act.
- The City of Oslo, which is subject to the same legislation, as well as the Civil Protection Act and the Planning and Building Act.
- The County Governor, who is subject to DSB’s regulations, but also acts as an enforcement authority, particularly with regard to the follow-up of the municipalities.
- Other public authorities, which are both cooperation partners and encompassed by the DSB’s coordinating role, and are subject to inspection by the DSB.

The challenges surrounding the role of the DSB can thus primarily be linked to two circumstances:

- Uncertainty may arise with regard to the DSB’s coordinating roles and the role as an exerciser of authority according to sectoral regulations.
- The broad mandate of the review also entails a self-critical perspective on DSB’s own handling of issues that have affected or affect the activities in Sydhavna, directly or indirectly.

In working on the project, DSB has kept these challenges in mind, both through the collection, analysis and discussions of data, and in the formulation of proposals for further follow-up. During the collection of data, the review setting has been made explicit to the actors, for example by emphasising the fact that the investigation is not an inspection in which the findings could provide grounds for subsequent enforcement. In addition, the evaluations and following recommendations encompass the entire range of instruments, including the DSB’s own instruments. At the same time, it is important to point out that the subsequent follow-up will take place in accordance with the defined areas of responsibility for the actors concerned, also with regard to the exercise of authority. The recommendations that lie outside of the DSB’s direct area of authority will be followed up through dialogue with the relevant actors.

* A complete reference to the statutory and regulatory framework in this report is provided in Chapter 4. See also Appendix 1.
METHOD AND DISCIPLINARY APPROACH

2.2 METHODS AND DATA BASIS

The choice of methods is significant for the design of review projects. In this project, document review and conversations/interviews with important actors have been the key sources of data. In addition, a survey of the enterprises located in Sydhavna has been conducted, and a workshop on emergency preparedness for worst-case scenarios has been arranged.

All of the documentation and data have been processed according to relevant regulations. This means that classified documents have been processed accordingly. Memorandums and minutes from meetings have not been published or distributed, and they are considered to be the project’s internal documents.

To identify who could contribute relevant information, a survey was made of which actors had tasks and roles linked to Sydhavna. These were structured with reference to the six aforementioned main topics. 33 actors were considered the most important in the introductory phase. The project group has had one or more meetings and interviews with around 30 actors, see Appendix 3. These include municipal bodies and enterprises, industrial actors in Sydhavna and various public authorities.

Interviews/meetings
The agenda for the meetings has generally been the same. The project’s mandate and background, information on the methods and scope, goals, organisation and schedule have been presented to the actors. The meetings have focused on the actors’ responsibilities and roles related to the topics and the issues. Before each meeting the project group reviewed relevant documentation and made a checklist. The meetings were conducted as group interviews and lasted for an average of up to two hours. The results and findings were documented for internal use. Appendix 3 provides an overview of the meetings/interviews that were conducted.

Document studies
A significant volume of written documentation has been reviewed and analysed. This applies in particular to

- laws and regulations
- steering documents from actors
- documentation from planning processes and major development projects
- safety reports related to the requirements in the Norwegian Seveso Regulations
- inspection reports

- accident statistics and evaluations of incidents.

Questionnaire survey
In the spring of 2013, the DSB conducted a questionnaire survey aimed at 28 enterprises located in Sydhavna. The selection was made in cooperation with the Port of Oslo and sent to the CEO of the enterprise and/or the Port of Oslo’s contact person, who was asked to respond on behalf of the enterprise. The questionnaire mainly contained questions concerning the transport of dangerous goods, handling of hazardous substances and management of safety in the area. It was distributed to the respondents by e-mail. Through active follow-up, it was possible to obtain a response from all of the respondents, in other words a response rate of 100 per cent. The responses largely reflected the enterprises’ own views and discretionary judgements.

Dispersion analysis
As a basis for an evaluation of emergency preparedness for possible incidents in Sydhavna, three worst-case scenarios were developed with fires and explosions involving petroleum products. Based on these scenarios, the consulting firm GexCon was engaged to prepare dispersion models and give an evaluation of the dispersion of smoke and fire gases under various conditions (GexCon 2013).

Workshop on worst-case scenarios
On September 3rd and 4th 2013, a workshop on possible worst-case scenarios related to the activities in Sydhavna was arranged. There was broad participation in the workshop by the City of Oslo, emergency planning units and other actors who would be affected and involved in such an incident, and it was subsequently followed up by a questionnaire survey. Overall, this has provided knowledge of the capacities, roles and management capabilities in the event of serious incidents in Sydhavna.
The project group has received extensive data material, input based on existing knowledge, as well as disciplinary and methodological perspectives that are relevant to the project. Many individuals have contributed valuable information and knowledge that illuminate the problems associated with the project. The draft for the descriptive part of the report (Chapters 1–8) was distributed for review and fact checking to selected actors.

The review affects many actors and decision-making processes at various levels, and it describes and discusses the responsibilities and roles of the various actors concerning safety in Sydhavna, regarding both the instruments they have available and how they are used. A report like this is not an unequivocal result of objective findings and analyses.

In many cases, the availability of data may be inadequate. The analyses will be based to some extent on discretion. The conclusions and proposals are based on weighing various considerations against each other. Different and to some extent conflicting views from the actors have appeared during the project. In some cases, this was a finding in itself, while in other cases it contributed to more nuanced and balanced evaluations. The report seeks to explicate such issues related to data quality, differences of opinion, uncertainties in evaluations, etc.

DSB alone is responsible for the assessments and recommendations that have been made.

The primary purpose of civil protection and emergency planning is to reduce the probability of serious undesired incidents occurring, and to manage the incidents that nevertheless occur so that they do not have serious consequences for society. The term risk is used frequently in this context, and it is used in everyday speech, in public debate and as a technical term by researchers and various professional groups that work with civil protection and emergency planning. How key terms are defined establishes guidelines for how and what type of data is collected, the analysis process, presentation of results and evaluation of the associated uncertainty. In this report, risk is understood as a combination of the probability of and the consequences of undesired incidents and the associated uncertainties. The term risk management is essential in civil protection and emergency planning, and it can be defined as all measures that are implemented to obtain an overview of and manage identified risks. Risk management is a continuous process that essentially includes obtaining a knowledge base through the identification of risk factors, preparation of risk analyses, establishment of criteria for risk acceptance or risk tolerance, evaluation of the risk level against acceptance and tolerance criteria, and treatment of risk through risk-reducing measures, etc. Risk management is nevertheless not a one-sided process for the reduction of risk. The aim of risk management is also to ensure the right balance between developing and creating value, and avoiding accidents, injuries and losses. Some key terms that are included in the term risk management are reviewed below (cf. ISO 31000-2009).

Risk analysis usually includes a review of the possible causes and sources of risk, the positive and negative consequences of risks, as well as the probability that these consequences will occur. In some fields, risk analyses are based on statistics and models, while other fields have a broader and procedural approach. Quantitative analysis is based on numbers, statistics and measurable facts, while qualitative risk analysis is often based on interviews and document analysis. The analysis provides input for risk evaluation to determine the extent to which risks must be treated, and to determine the most suitable strategies and methods for treating risk.

Risk acceptance concerns the risk criteria that are used to determine an acceptable level of risk. What is considered acceptable may change over time and vary between domains. Such criteria may be expressed in words or numbers, or based on a combination of these (NS 5814:2008). The risk criteria
are the basis for determining the significance of what a risk is evaluated against. The risk criteria are based on organisational goals, and the external and internal context. The risk criteria may be derived from standards, laws, policies and other requirements (SN-ISO GUIDE 73:2009).

The criteria for an acceptable level of risk in the Fire and Explosion Prevention Act are based on the so-called ALARP principle (As Low as Reasonably Practicable). Section 20 of the Act states that “risk shall be reduced to a level that may reasonably be achieved”. The ALARP principle means that measures that are practically and economically feasible for reducing risk shall be carried out.

Risk evaluation is a process in which the results of a risk analysis are compared with risk criteria. This is done to determine the extent to which a risk and/or the scope of a risk is acceptable or not. Risk evaluation influences decisions about risk treatment (SN-ISO GUIDE 73:2009). When both a risk analysis and a risk evaluation have been carried out, a risk assessment has been made. A risk assessment is thus the overall process, which consists of planning, risk identification, risk analysis and risk evaluation.

Risk treatment is understood to be measures that are used to prevent, limit or control undesired incidents, as well as the capacity to restore a normal situation. Barriers or measures that are introduced to reduce risk may be both probability reducing and consequence reducing. This means measures that both prevent the incident from occurring and reduce the consequences of it should occur.

FIGURE 2.1 «Bow-tie model».

Preparedness encompasses all the technical, operational and organisational measures that prevent a hazardous situation that has arisen from developing into an accident situation, or that prevent or reduce the harmful effects of the incident (Aven etc., 2004; NOU 2000:24 Et sårbart samfunn [Official Norwegian Report 2000:24 A Vulnerable Society]). Vulnerability is an expression of the problems a system will face when it is exposed to an undesired incident. Vulnerability can also be understood in the context of the measures or barriers to prevent or manage incidents. Robustness is the capacity of the system to continue to function as normal when it is exposed to extraordinary stress.
There is a large body of general and research-based knowledge about why accidents occur and how they can be prevented. In the following, a small selection of (partly overlapping) perspectives on accident theory is presented. For a general summary of the knowledge in the area, see Rosness etc. (2010). The following review is based on this report, but is also supplemented by primary sources.

**Energy-barrier perspective**
Accidents occur because adequate physical barriers have not been established between the hazard or source of energy and vulnerable objects, cf. Figure 2.1 above. The barriers must be robust, reliable and satisfy performance requirements. It is necessary to have several barriers that function independently of each other to avoid that a cause/incident renders several or all ineffective at the same time, for example, through domino/cascading processes (see, for example, Reason, 1997).

**Information processing perspective**
Accidents occur because critical knowledge/information does not reach, or is not perceived or understood by the decision-makers. In part, there is too much information (information overload), which makes it difficult to distinguish what is important from what is unimportant; and, in part, the content is misunderstood (misinterpretations). The hazard signals are thus present, but they are overlooked or misunderstood (see Turner & Pidgeon, 1997).

**Decision-maker perspective**
Accidents take place because of goal conflicts between safety and other competing concerns, such as costs and time constraints, where the latter create a (natural) “drift” towards increasingly safety-critical conduct. A risk is taken (deliberately) or a risk is run (unconsciously) because competition, market considerations, operational requirements, etc., are given the greatest attention and priority in the day-to-day operations and in overarching decisions (local optimisation – sub-optimisation). "Distributed" decision-making processes in complex systems (many decision-makers who do not individually have an overview of the combined effects of individual decisions) result in an inadequate overview and increase the probability of "drift" and serious consequences (see, for example Rasmussen, 1997).

**Normal accident theory**
Accidents are often system accidents and not just component failure accidents, and they occur due to the unexpected interaction of individual errors in technological/organisational/human systems. No safety systems are able to guarantee that an accident will not occur, and technologies/activities with potentially disastrous/unacceptable consequences should/must therefore be avoided (such as the nuclear power industry). Such (many) technologies/systems will consist of (1) tight coupling between components, i.e., with requirements for logistics, timing, speed, sequence dependency, etc., and (2) complex interactions, i.e. with a high degree of interdependence between system components. While tightly coupled systems require centralised control (coordination, logistics, timing), complex interaction will require local decisions, with assessments, knowledge and expertise at the operational level. Organisations/management systems will not normally manage to handle this contradiction (Perrow, 1999).

All of these perspectives seek various types of “root cause” explanations, but reject simplified connections between individual errors/incidents with the associated indicators (such as, Lost Time Incidents – LTI) and the chance of a major accident (so-called “monocausality”). Many major accidents have taken place in enterprises with very good scores for such indicators (such as Esso Longford in 1998, BP Texas in 2005 and Deep Water Horizon in 2010; see, for example Hopkins, 2000).
2.6 RISK MANAGEMENT AND RISK GOVERNANCE

Models for risk management attempt in different ways to identify the most important causes of accidents occurring. The interactions between technological, human and organisational factors are of key importance. Earlier models often looked at the human and technological factors in isolation, based on a simplified understanding that human mistakes or technological failures were the main causes of accidents. Today’s management models look to a greater degree at the totality of factors that must be present to increase the capacity to avoid incidents or to increase the capacity to manage those that do occur. This involves all the elements in a management process, from continuous development of the knowledge base, activity and decision-making processes, adaptation to changes, to the development of a good safety culture in the enterprise – one that promotes participation, openness, flexibility, learning capacity, etc. These elements are integrated into modern risk management models, such as in the ISO standard for risk management (ISO 31000:2009).

Much of the research in recent years has been concerned with how some organisations actually manage to maintain a very high level of safety without major accidents, in spite of potentially very hazardous technologies and processes. Such enterprises have been referred to as “high-reliability organisations”. The term has been developed as a response to the theory of “Normal Accidents”. Such organisations take into account that errors may occur and acknowledge human error as natural and unavoidable, but they have developed a high level of organisational redundancy, capacity for flexible adaptation, high level of expertise, a balance between local and central decision-making processes and a good safety culture (see, for example, Weick & Sutcliffe, 2001; Roberts, 1990).

So-called “resilience engineering” develops some of these perspectives by focusing on the interaction between the management capacity and the properties of complex and dynamic technological systems with a high rate of change. The capacity to perform continuous diagnoses, problem solving and adaptation, and the capacity for rapid management of unforeseen situations are key characteristics of such systems (see Rosness, 2010).

Risk management models are often limited to a single enterprise level within a defined hierarchical structure. At the same time, it has become ever clearer that enterprise-limited management systems often do not capture the actual complexity of the actor situation, cause-and-effect chains and external framework conditions. The knowledge requirements and responsibilities vary between the different levels, from specific operational tasks to the operation of technological systems, management requirements at the enterprise level, public regulations and overall policy development at the societal level. External framework conditions influence all levels, with new technologies, adaptations to market requirements and the competitive situation, as well as changes in political priorities and focus. Different professions can dominate at different levels, and make communication and interaction in management processes difficult (Rasmussen, 1997).

Safety research has thus increasingly accepted that the management of risk must take into account the totality of factors that characterise a risk situation, which often exceed the risk and discretionary powers of a given enterprise. In recent years, the scholarly perspectives on the overall societal management of risk are often referred to as Risk Governance. Risk Governance includes the totality of actors, mechanisms and instruments – public and private – aimed at ensuring the creation of value by society that balances production considerations and protection against the loss of assets:

Risk governance includes the totality of actors, rules, conventions, processes, and mechanisms concerned with how relevant risk information is collected, analysed and communicated and management decisions are taken. Encompassing the combined risk-relevant decisions and actions of both governmental and private actors, risk governance is of particular importance in, but not restricted to, situations where there is no single authority to take a binding risk management decision but where instead the nature of the risk requires the collaboration and co-ordination between a ranges of different stakeholders. Risk governance, however, not only includes a multifaceted, multi-actor risk process, but also calls for the consideration of contextual factors, such as institutional arrangements (e.g. the regulatory and legal framework that determines the relationship, roles and responsibilities of the actors and co-ordination mechanisms, such as markets, incentives or self-imposed norms) and political culture, including different perceptions of risk (Renn, 2008).

Such a broader perspective is a necessary point of departure for a review of an area that is as complex as Sydhavna, as will be evident from this review, particularly in the overall assessment in Chapter 9.
This chapter provides a fact-oriented review of the activities in Sydhavna, including a brief history of the development of the area. The activities in Sydhavna began at the end of the 1930s. Since then, activities have gradually increased in scope and area. In addition, over the course of time residential and urban areas have been established closer to the harbour area.

Today, enterprises can be roughly divided into container activities, storage and distribution of petroleum products, handling of dry bulk cargo, import of cars and general transport/forwarding. Altogether, approximately 35 different enterprises are concentrated in the area. Sydhavna can be regarded as a national centre of logistics, with Norway’s largest container harbour and the distribution of approximately 40 per cent of Norway’s fuel consumption. Oslo Airport Gardermoen is supplied with aviation fuel from Sydhavna. The area thus has an important supply function.

The City of Oslo, represented by the Port of Oslo, owns the land. The Port of Oslo is responsible for many of the operational functions at the harbour.
3.1 HISTORY

In 1915, an international competition for the further development of the port of Oslo was announced. Sjursøya was included as an important part of this competition. Because of this, the City of Oslo purchased Sjursøya in 1920 at the expense of the port and decided to build a dock facility on the island. Prior to that, the island had been used for summer cottages by residents of the city, and had a small number of permanent residents. Integration of the island with the Port of Oslo started in 1921, when all of the houses and cottages were demolished and terrain levelling started. The work began as relief work and employed as many as 1500 people at its peak. In 1934, levelling was completed and 900,000 m³ of material had been mined out. The island received a bridge connection in 1936, and it has subsequently become completely attached to the mainland.

In 1937, Texaco established operations on Sjursøya after it had been pressured by the fire authorities to move the oil terminal of the time from the Paulsen Quay at Bispevik in Oslo. The other oil companies established activities on Sjursøya during the latter half of the 1940s. In 1939, the construction of the Sjursøya North Quay commenced. This work continued in stages until 1964. The Sjursøya North Quay and the area within was used for dry bulk cargo, such as grain, fertilizer, salt and cement. The construction of the Sjursøya South Quay took place in stages from 1940 to 1962. The area is referred to as the oil harbour, which is where Oslo’s supplies of oil and oil products are landed and stored.

During the Second World War, Sjursøya was seized by the German Air Force, which constructed camps and storage facilities of various types. During the war years, a short runway was also constructed for the German Storch aircraft.

In 1959, the port authorities started to use the workshop on the western part of Sjursøya. In addition to the workshop, a slipway was also built for the maintenance of smaller vessels. In 1962, the city gas company at the very western tip of Sjursøya began operation. These operations continued until 1978, when the buildings were demolished.

Work on the tanker pier on the southeastern portion of Sjursøya started in 1967, and this pier became operational in April 1970. Construction of the tanker pier must be viewed in the context of the construction of the tank facility at Ekebergåsen. This was built in two stages and consists of two sections, Ekeberg Oil Storage and Ekeberg Tank. Ekeberg Oil Storage became operational in 1970, while Ekeberg Tank became operational in 1979.

3.1.1 STOCKPILES

The reason for the construction of the oil storage facility was the authorities’ desire to reinforce emergency preparedness – in light of the threat level in the 1960s security policy and the authorities’ associated total defence philosophy.

During the years after the Second World War, the Civil Defence Committee for the Supply of Fuel played a central role in ensuring the supply of fuel. The Civil Defence Committee for the Supply of Fuel was established in 1949, pursuant to the Act of 31 March 1949 on the Building and Securing of Fuel Facilities. The Civil Defence Committee for the Supply of Fuel was active until 1998, when it was wound up because of the security policy situation and of the fact that the total number of secured underground facilities was satisfactory.

In the 1960s, based on the prevailing security policy assessments of the threat level of the time, a need arose to establish an oil storage facility centrally located in Eastern Norway for the purpose of emergency preparedness. The oil companies had already started to look at the possibility of underground storage at Ekebergåsen in connection with their activities at Sjursøya. However, the oil companies did not have the resources to build up stockpiles by themselves.

The oil companies at Sjursøya and the Civil Defence Committee for the Supply of Fuel therefore agreed to build a large commercially operated underground facility at Ekebergåsen. The Storting approved the Civil Defence Committee’s budget proposal, and construction started in 1967. The capacity of the underground facility corresponded to the sum of the authorities’ overall stockpile needs and the oil companies’ storage capacity needs.

The central government had the right of disposal to stockpiles of 75,000 m³ for emergency preparedness purposes. When the threat level changed in the 1990s, the central government decided to relinquish ownership of the oil stockpiles. The right of disposal to the facility was transferred free of charge to Statoil – on the condition that the storage volume could be returned to the central government, represented by the Ministry of Petroleum and Energy (MPE), if a situation should arise whereby the government needed all or portions of the original storage capacity.

The Ministry of Petroleum and Energy does not currently...
have any role in the underground facility in Ekebergåsen, it is entirely the responsibility of the oil companies. The underground storage does not have any particular role for the purpose of emergency preparedness in the event of a supply crisis. The storage facility only has a commercial role as a part of the oil companies’ supply chain. It is completely up to the oil companies to use it as they desire for commercial purposes. However, there is a requirement that they maintain a certain volume of oil products in the facility. Pursuant to the Act relating to the stockpiling of petroleum products from 2006, this level has been stipulated in the regulations as 20 days of consumption. These stockpiles comprise both refined and unrefined products. This stockpiling is considered to be at the national level, and thus there is no obligation for all or parts of these stockpiles to be in the underground facility in Ekebergåsen.

**ILLUSTRATION 3.1** Sydhavna – Oslo (Photo: Terje Løchen).

### 3.1.2 PLANNING PROCESSES

The process on which the current layout and plans for Sydhavna is based, began in the latter half of the 1990s. The background for the process was the major changes connected to Oslo’s waterfront, such as discontinuation of the shipbuilding industry and changes to the road and railway structure. This, combined with other regional and local circumstances, meant that the time was ripe for principled decision concerning the use of the city’s waterfront areas.

The Agency for Planning and Building Services in the City of Oslo prepared a background document, the “Fjord City Resolution” in 2002, which provided guidelines for the further development of the waterfront. This decision entailed concentration of all the port activities in the area between Grønlikaia and Ormsund, below Ekebergåsen in the eastern sections of the harbour basin. This area has subsequently been referred to as Sydhavna. The “Fjord City Resolution” also presupposes that the container activities be moved away from the Port of Oslo.

In 2002, an impact assessment process was initiated, which was approved by the Norwegian Coastal Administration in May 2004. The preparation of a zoning plan to combine all the container operations in Sydhavna took place in parallel to this. This was a prerequisite in order to free up areas
elsewhere in the harbour for residential housing, offices and similar uses. The zoning plan was approved by the City Council in October 2004. As part of this decision, the preparation of a separate zoning plan for new access from Mosseveien (E18) to Sydhavna was agreed on with the Public Roads Administration. Reference is made to implementation of the “Fjord City Resolution” in the municipal master plan for Oslo for 2004 to 2020, and it is evident from this plan that phasing out container traffic in the Port of Oslo is a prerequisite for implementation of the decision.

In the National Transport Plan for 2006 to 2015, the Government assumes thin Sydhavna will be the main harbour for containers in the Oslo Fjord for the time being. This view is based on the report “Utredning av alternative havneløsninger i Oslofjorden [Study of Alternative Port Solutions in the Oslo Fjord]” from Viken Havneselskap AS. The process with the zoning plan for the entire Sydhavna area started in 2005. In this plan, it is assumed that container traffic will remain in Sydhavna. This zoning plan was adopted in August 2009.

The processes behind the zone plans are discussed in Chapter 5.

### 3.2

### OVERVIEW OF CURRENT ACTIVITIES IN SYDHAVNA

#### 3.2.1

**FAIRWAY AND HARBOUR BASIN**

The Oslo Fjord is divided into two sectors. The vessel traffic service (VTS) station in Horten covers the southern sector, and the VTS station at the Port of Oslo covers the northern sector. The VTS stations are operative around the clock, and they provide important information to maritime traffic in the area by ensuring efficient traffic steering and assessing special hazards and other conditions that may impede traffic in the Oslo Fjord. The maritime VTS stations are under the Norwegian Coastal Administration, with the exception of the VTS station in Oslo, which is under the Port of Oslo.

Maritime traffic has been relatively stable in recent years. In general, an increase in maritime traffic is expected, and increasingly larger vessels are expected to call at Oslo in the coming years. In the plan “Harbour plan 2013–2030, Port of Oslo – the Gate to Norway”, the goal of the Port of Oslo is to contribute to better framework conditions for maritime transport through improving the fairway etc. This will ensure good navigability for commercial traffic into the Port of Oslo (see 5.4.4). The fairway into Oslo is one of the most highly trafficked in Norwegian waters. Approximately 15 large vessels call at the Port of Oslo every day. This means that between 5,500 and 6,000 ships call during the year.

The international ferries trafficking between Oslo and Denmark/Germany carry a significant volume of commodities and goods. It is primarily consumer goods and foodstuffs that are carried on the ferries. Provisions are being made so that cargo traffic by sea and rail will grow faster than cargo transport by road, out of consideration for the climate, local environment and capacity.
The harbour police represent the Oslo Police District’s maritime resource, under the Traffic and Maritime Service Section. In 2013, this consisted of 17 full-time positions, divided into three boat teams (four persons in each boat) and three investigators. The harbour police work on the fjord, interfacing with the wharfside, and they bear responsibility for the environment, public order and boat theft.

The harbour police have their own investigative cases, and they receive complaints from the ferries. They also assist outside of their own district and escort particularly large vessels, large military vessels and during special events such as the regatta “Færderseilasen”.

**FIGURE 3.2** Traffic in the Oslo Fjord.

Oslo Fjord traffic monitoring

The harbour police represent the Oslo Police District’s maritime resource, under the Traffic and Maritime Service Section. In 2013, this consisted of 17 full-time positions, divided into three boat teams (four persons in each boat) and three investigators. The harbour police work on the fjord, interfacing with the wharfside, and they bear responsibility for the environment, public order and boat theft.

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**FIGURE 3.2** Traffic in the Oslo Fjord.
3.2.2 SURROUNDINGS

Sydhavna is located in the Nordstrand district, with the Gamle Oslo district as its closest neighbour to the north. The Nordstrand district has a population of approximately 45,000, while the Bekkelaget subdistrict has a population of just over 10,000. The Gamle Oslo district currently has a population of over 40,000, but because of the development in Bjørvika, among others, a significant increase in the population is expected. The new Bjørvika area will encompass the Sørenga Pier, Sørenga and Grønlia, as well as Bispevika and Lohavn. When the area has been completely developed, it will have approximately 4–5 000 residential units and approximately 20,000 workplaces.

FIGURE 3.3 Sydhavna’s location in relation to the districts of Oslo.
E18/Mosseveien extends along the area (Sydhavna). It represents the main artery for private and public traffic to the south, and there is congestion during rush hours. The Central Oslo area is located within a radius of 2.5 km from Sydhavna, and the Oslo Central Station and Opera House are located within this radius. Six day-care centres and two schools are located within a radius of approximately 2 km.

3.2.3 HARBOUR AREA IN GENERAL

Sydhavna extends from Ormsund or the Ormsund Quay in the south to Gronlikaia in the north at the mouth of the Alna River. The harbour area consists of various dock areas, and the types of activity are somewhat concentrated in each area. The planning processes have entailed stricter requirements for utilisation of the area, and all of the activities located in the area are currently linked directly to port-related activities. In addition to activities at the oil terminal and container harbour, the activities include loading, unloading, storage and distribution of various products (dry bulk cargo), such as sand, salt, fertiliser, gain and cement. There are also significant car import activities (Møller bil), as well as some offices. A little more than 800 persons are in the area on a daily basis, and approximately 6–7 000 vehicles arrive at or leave the area on a weekly basis.
- Grønlia (Area A) consists of Grønlia North and Grønlia South, and it is used for the storage of barges and smaller vessels. Metal recycling import/export, container depot and service area.

- Kongshavn (Area B) is used as a container depot, reloading facilities, unloading sand for production and distribution of cement, import of Leca balls for the production of Leca blocks, Norwegian Food Safety Authority’s border inspection and Bring.

- Kongshavn North and South Quay, as well as the Sjursøy North Quay (Area C), are used for the storage, loading and unloading of salt, fertiliser, animal feed, cement, etc.

- The workshop area (Area D) is the port's service area with a workshop building, garage and boat spaces in the basin.

- The Sjursøy South Quay, Sjursøy Bay, Bekkelag South Quay and the Ormsund Quay (Area E) are used for loading and unloading containers.

- Sjursøya South Quay and Sjursøya East Quay (Area F) comprise the oil terminal; with a tanker pier, tank depot, filling-racks and office buildings for the oil companies.

- Bekkelag North Quay, Kneppeskjær, Sjursøya Bridge and the areas between the Østfold Line and Havneveien (Area G) are used for car imports, building materials and domestic coastal traffic.

- The area between the Ormsund Quay and Havneveien (Areas H and K) comprises the Bekkelaget Treatment Plant and a rigging area for the Midgardsormen Project.

- The areas south of Ormsund Quay (I and J) are the port’s service areas with an administration building and offices for crane operators and dockworkers.
<table>
<thead>
<tr>
<th>ENTERPRISE</th>
<th>BRANCH OF INDUSTRY – CHARACTERISTICS</th>
<th>Number of persons in the enterprise’s areas within/outside of ordinary working hours (average)</th>
<th>Number of passenger cars or vans that arrive at or leave the enterprise’s areas during a normal week (average)</th>
<th>Number of trucks that arrive at or leave the enterprise’s areas during a normal week (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Celsa (Grønlikaia)</td>
<td>Receipt and storage of reinforcement products that arrive by sea. Receipt and storage of scrap iron for shipment by sea.</td>
<td>8 / 0</td>
<td>1</td>
<td>150</td>
</tr>
<tr>
<td>Unifeeder Norway (Grønlikaia)</td>
<td>Container feeder and short sea shipping company.</td>
<td>9 / 0</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Mattilsynet (Grønlikaia)</td>
<td>Border inspection station. Inspection of foodstuffs in containers from countries outside of the EU/EEA area.</td>
<td>3 / 0</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Bring (Kongshavn)</td>
<td>Logistics/containers/general cargo. Warehousing, stevedoring, transport.</td>
<td>310 / 20</td>
<td>600</td>
<td>1 100</td>
</tr>
<tr>
<td>Cemex a.s (Kongshavn)</td>
<td>Import of cement, silo storage.</td>
<td>1 / 0</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Weber leca. Raelingen (Kongshavn)</td>
<td>Storage of Leca balls prior to shipment.</td>
<td>2 / 0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Unicon (Kongshavn)</td>
<td>Production of concrete. Shipped out by boat.</td>
<td>40 / 16</td>
<td>125</td>
<td>625</td>
</tr>
<tr>
<td>Norbetong (Sjursøya North Quay)</td>
<td>Production of ready-mixed concrete. Storage: sand, crushed stone, cement, fly ash, silica and additives. The concrete is transported throughout Oslo.</td>
<td>20 / 0</td>
<td>300</td>
<td>–</td>
</tr>
<tr>
<td>Norcem AS (Sjursøya North Quay)</td>
<td>Storage for bulk dry cement. Import, production.</td>
<td>50 / 20</td>
<td>50</td>
<td>500</td>
</tr>
<tr>
<td>IS Felleslager ANS (Sjursøya North Quay)*</td>
<td>Import and packaging of fertiliser from bulk to bags and distribution.</td>
<td>8 / 1</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>Strand Unikorn AS (Sjursøya North Quay)</td>
<td>Bulk handling (grain and flour), loading/unloading of boats, road transport in/out, storage.</td>
<td>12 / 0</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>GC Rieber Salt AS (Sjursøya North Quay)</td>
<td>Import of salt for industrial use, consumers, road maintenance.</td>
<td>25 / 0</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>SCT AS (Sjursøya North/South Quay)</td>
<td>Container terminal.</td>
<td>23 / 0</td>
<td>15</td>
<td>300</td>
</tr>
<tr>
<td>Itella Logistik AS (Kneppeskjær)</td>
<td>Logistics, shipping and forwarding, Storage.</td>
<td>6,4 / 0</td>
<td>5,3</td>
<td>12,8</td>
</tr>
<tr>
<td>Building material corp. AS (Kneppeskjær)</td>
<td>Receipt and storage of building materials for distribution.</td>
<td>13 / 0</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td>Norlines (Kneppeskjær)</td>
<td>Incoming and outgoing general cargo by road and sea.</td>
<td>40 / 6</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Møller Logistik (Kongshavn)</td>
<td>Receipt of cars that arrive by sea. Storage in parking garages and outdoor lots. Transport to dealers by means of an external transport company.</td>
<td>35 / 0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Oslo Container Terminal A/S (Kneppeskjær)</td>
<td>Container stevedoring. Loading/unloading of container vessels.</td>
<td>50 / 20</td>
<td>40</td>
<td>1 600</td>
</tr>
<tr>
<td>Kulde &amp; Elektro AS (Kongshavn)</td>
<td>Servicing of refrigerated and freezer containers, as well as mechanical repairs.</td>
<td>2 / 0</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>AS Ekeberg installation / Forenede gårder (Kongshavn / Bekkelag Quay)</td>
<td>Rental of storage space in the underground facility (30,000 m²) and office building (2 200 m²).</td>
<td>100 / 0</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>Mynhe Heis &amp; Elektro AS (Forenede gårder)</td>
<td>Electrical/lift installation.</td>
<td>8 / 0</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Sletten Norge as (Forenede gårder)</td>
<td>Asian seafood. Storage, sales, transport and logistics.</td>
<td>12 / 0</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Temoco as (Forenede gårder)</td>
<td>Import and sales of commercial kitchen equipment.</td>
<td>2 / 0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Tank Management AS (Forenede gårder)</td>
<td>Forwarding, transport and logistics.</td>
<td>8 / 0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Maritime Truck AS</td>
<td>Rental of fork lift trucks and terminal tractors with operators.</td>
<td>7 / 6</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>Norwegian Customs</td>
<td>Inspection of containers, storage sheds, and boats.</td>
<td>3 / 0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>MSS-Maskinell Snaservice AS</td>
<td>Snow removal.</td>
<td>0 / 0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B&amp;B Boatman (OH – building)</td>
<td>Receiving hawser from all vessels.</td>
<td>10 / 2</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>807,4 / 92</strong></td>
<td><strong>1 648,3</strong></td>
<td><strong>4 807,8</strong></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td><strong>28,8 / 3,3</strong></td>
<td><strong>57,4</strong></td>
<td><strong>171,7</strong></td>
</tr>
</tbody>
</table>
In addition to the activities in the outdoor area, there is an underground facility – AS Ekeberganlegget –, which consists of approximately 30,000 m² of storage space over two levels inside the mountain. AS Ekeberganlegget is a concession property that is managed by Forenede Gårder, which has a history that can be traced to the 1950s. The facility has 20–30 tenants and contains primarily rice and paper. It has a fire sprinkler system and is inspected by the fire service. Approximately 20 vans are inside the facility on a daily basis. No one stays or works permanently in the facility.

The container harbour is Norway’s largest, and it covers 80 per cent of the market in Eastern Norway. Nearly 450 container ships call annually, and approximately 125,000 containers are loaded and unloaded. Of the outgoing containers, 40 per cent contain cargo and the rest are empty. In contrast to most other ports, the cranes are owned/managed by the Port of Oslo (four container cranes and four stacker cranes). Containers that arrive remain at the port for an average of two days. Containers are transported in and out by road or rail.

The container operations are managed by Oslo Container Terminal AS (approximately 80 per cent) and Sjursoya Containerterminal AS (approximately 20 per cent), divided between Ormsund and Sjursoya. The companies cooperate to some extent on the operations.

There are continuous changes and reconstructions in Sydhavna, related to the traffic patterns and land use, among other things, see Chapter 5 for a more detailed outline.

3.2.4 THE OIL TERMINAL AND THE UNDERGROUND FACILITY

Petroleum activities in Sydhavna are located at the Sjursoya oil terminal and at the underground facility in Ekebergåsen. The petroleum products are unloaded from ships at the tanker pier and transported through an import pipeline to the cisterns in the underground facility. Some of the products are imported directly to and stored in outdoor tanks at the oil terminal. The products from the cisterns are shipped out from Sydhavna on tank-trucks and trains. The tank-trucks are filled at the oil terminal’s loading stations. Special trains transport aviation fuel to Oslo Airport Gardermoen.

In addition, there is a tunnel through Ekebergåsen to Ryen. There is a pipeline to a former tank-depot at Ryen in the tunnel. The intention was to use this pipeline and the former plant at Ryen in the event of a crisis, but it has not been in normal operation.
Oil terminal

The oil terminal is located at the Sjursøya East Quay and consists of a tanker pier, pipe racks, tank-depot, racks for filling tank-trucks, filling-rack for train and office buildings for the oil companies. Four oil companies have had operations at the oil terminal in recent years. Esso, Shell, Uno-X and Statoil Fuel & Retail. Only Statoil Fuel & Retail and Shell have their own operating organisation and personnel in the area. Shell manages the operation of the tank-truck filling-rack for Uno-X, while Statoil Fuel & Retail manages the operations at the tank-truck filling-rack for Esso. Uno-X manages its own fuel depot with contracted personnel.

BOX 3.1 Installations in the Sjursøya oil terminal.

The following types of installations and facilities are found at the Sjursøya oil terminal:
- A quay/pier primarily for unloading petroleum products from a maximum of two boats.
- Approximately 40 tanks of varying sizes for the storage of petroleum products and additives.
- Pipes and pipe-racks, some of these are in culverts.
- Two tank-truck filling-racks that can accommodate 13 tank-trucks.
- Vapour Recovery Unit (VRU) system for petrol vapour.
- Oil separators.
- Two large buildings for offices, laboratories and other activities.
- Traffic areas/road network.

Tankers that dock alongside the pier at Sjursøya transport petroleum products to Sydhavna. The petroleum products are pumped from the tankers into the cisterns in the underground facility through an import pipeline. There are separate pipelines between the underground facility and the filling-racks for tank-trucks, and a separate pipeline from the underground facility to the filling-rack for trains. The product is pumped out by means of submerged pumps in each of the cisterns. The product flows through pipes in tunnels and culverts in the ground to the tank-truck filling-racks. The pumps only operate when a tank-truck “requests” the product. There are separate export pipelines from each of the cisterns to the filling-racks. The barriers and safety systems are the result of cooperation between the underground facility and the tank-truck filling-racks.

Transport out takes place by means of tank-trucks that load the products from two tank-truck filling-racks that are managed by Statoil Fuel & Retail and Shell, respectively. Loading takes place around the clock, seven days a week. For tank-truck loading, a Vapour Recovery Unit (VPU) has been established to recover gasoline vapour. The return vapour from the gasoline tank-trucks is condensed and led back to the dedicated cisterns in the underground facility. For aviation fuel, the product is pumped from dedicated cisterns to the filling-rack for trains.

The product types and volumes that were transported from the oil terminal in 2012 are specified in Table 3.2.

<table>
<thead>
<tr>
<th>PRODUCT TYPE</th>
<th>VOLUME (1 000 m³)</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas oil and diesel</td>
<td>1 435</td>
<td>54</td>
</tr>
<tr>
<td>Gasoline</td>
<td>615</td>
<td>23</td>
</tr>
<tr>
<td>Aviation fuel</td>
<td>540</td>
<td>21</td>
</tr>
<tr>
<td>Other products</td>
<td>49</td>
<td>2</td>
</tr>
<tr>
<td>Total volume</td>
<td>2 640</td>
<td>100</td>
</tr>
</tbody>
</table>

The tank depot comprises the storage of category 1, 2 and 3 flammable liquids (formerly designated as A and B liquids), diesel and heating oils, as well as additives for fuels, including bioethanol (category 2 flammable liquids, formerly designated as A liquids). Additives are added to improve the properties of the fuel. The tanks are organised in groups belonging to the owner and are directly connected to the tank-truck filling-rack. When tank-trucks load fuel for distribution, the additive is added directly during the filling process through the dosing system.

Statoil Fuel & Retail established two new bioethanol tanks in 2012, each with a volume of 2 500 m³. The tanks are located at the tank-truck filling-rack belonging to Statoil Fuel & Retail, and they are designed to satisfy the overall need for ethanol at Sjursøya. In addition, Statoil Fuel & Retail has ten tanks for additives with volumes ranging from 50 to 100 m³ each. These tanks are also located at the tank-truck filling-rack. East of the tank-truck filling-rack, the company has three tanks for aviation fuel and biodiesel, with a separate tank-truck filling-rack for the distribution of aviation fuel by trucks. The tanks have an overflow collection system.
In addition to the additive tanks, Uno-X has five large and six smaller tanks in its area. The tanks contain category 3 flammable liquids (formerly designated as B fluids), as well as diesel and heating oils. The Uno-X area is located in the southern part of Sjursøya. The tanks have an overflow collection system.

Shell has nineteen tanks in its area north on Sjursøya. The tanks are designed for category 3 flammable liquids and diesel and heating oils (formerly designated B and C liquids), as well as bitumen for the production of asphalt. This tank depot also has an overflow collection system. After the upgrade, Statoil Fuel & Retail has ten tanks for additives. These tanks are located at the tank-truck filling-rack. In addition, Statoil Fuel & Retail has three tanks for aviation fuel located east of the tank-truck filling-rack. Connected with the tanks, there is a tank-truck filling-rack for the distribution of aviation fuel by tank-trucks. This facility is only used periodically. The tanks have an overflow collection system.

The underground facility
The underground facility in Ekebergåsen was built in two stages and consists of two parts that are separated by a water curtain.

The facility was blasted out from the mountain and is located below sea level. They are not cast or otherwise manufactured tanks, they are chambers carved out of naked rock. These chambers will subsequently be referred to as cisterns. These cisterns are located between 8 and 30 metres below sea level. Over the cisterns, there is a system of tunnels for access to all of the cisterns, and for pipelines and equipment.
Ekeberg Oil Storage, which was built first, consists of 17 cisterns of varying sizes. The groundwater in the mountain exerts water pressure on the cistern, and thus the oil products are held in the cistern without leaking out. Gasoline, diesel oil and paraffin are stored in this facility. Due to the storage of gasoline, this facility has been designed with a movable bottom of water. This means that the cisterns have seawater at the bottom. To avoid any volume above the surface of the liquid in the cistern, which may be very flammable, the water volume in the bottom is increased proportionally with the volume of the oil product that is pumped out. The cistern thus always has the same level of liquid. When an oil product is imported into the cistern, the corresponding volume of water is pumped out from the bottom of the cistern. The seawater passes through oil separators before it is pumped back into the harbour basin. This process is monitored continuously.
Ekeberg Tank consists of six cisterns. The construction method is the same as for Ekeberg Oil Storage, but only diesel oil, heating oil and aviation fuel are stored here. Since no gasoline is stored here, the need for the surface of the liquid to be constant is not the same here as in the case of Ekeberg Oil Storage. The products in Ekeberg Tank are also stored on a bottom of water, but it is kept at a constant level. This means that when products are pumped out from or imported into the cisterns the surface of the liquid moves up and down. The atmosphere above the surface of the liquid is ventilated out through ventilation shafts when products are imported into the cisterns.

**FIGURE 3.8** Schematic diagram for Ekeberg Tank (fixed water bottom of groundwater).

Ownership and organisation
Ekeberg Oil Storage is owned and operated jointly by Statoil Fuel & Retail (1/5 ownership interest), Esso (1/5 ownership interest), Shell (1/5 ownership interest) and Uno-X (2/5 ownership interest), with dedicated cisterns for each company. Ekeberg Tank is wholly owned by Statoil Fuel & Retail.

The cistern capacity in the underground facility is also rented out between the companies, also to external companies in some cases. Contracts have been established for this.

The oil pier is owned and maintained by the Port of Oslo.

An operating company has been established to manage the day-to-day operations of both facilities. The name of the operating company is Sisterne Drift DA (formerly Ekeberg Oljelager DA), in which each of the four oil companies have a 1/4 ownership interest. Sisterne Drift DA is responsible for the day-to-day operation of the underground facility, HSE and all operations in connection with the import of products to the underground facility. Representatives for each of the owners (owner representatives) appoint the Board of Sisterne Drift DA. The position of Board Chairman of Sisterne Drift DA rotates among the owners. The owner representatives make strategic decisions and decide investments. Decisions made by the owner representatives are according to the current statutes for Sisterne Drift DA, based on consensus. Sisterne Drift DA consists of a management team with a general manager, a HSE Manager and twelve operators working shift schedules at the facility.

Common steering documents have been introduced for both of the underground facilities. Sisterne Drift DA is responsible for carrying out maintenance and upgrading of the facilities. For Ekeberg Oil Storage, the owners of the facility share the
expenses. For Ekeberg Tank, Statoil Fuel & Retail pays for maintenance and upgrades.

The four oil companies have activities in connection with the distribution of products from the oil terminal. Nevertheless, only Statoil Fuel & Retail and Shell have personnel at the facility. Statoil Fuel & Retail owns the tank-truck filling-racks located in the southeast corner of the facility. This filling-rack is also used by Esso to fill its tank-trucks.

Esso and Statoil Fuel & Retail have separate additive tanks in connection with the filling-racks. The tank-truck filling-racks has a foam system to fight fire that was upgraded in connection with an improvement project in 2012. An ethanol storage has been established in connection with this filling-rack. Statoil Fuel & Retail was responsible for the construction of the new storage facility, and it supplies ethanol to other actors at the oil terminal through the pipe system.

The tank-truck filling-racks for Shell and Uno-X is located in the northeast corner of the oil terminal. Shell owns the filling-racks with the exception of two filling-racks that are owned by Uno-X. The entire filling operation is managed by Shell, including Uno-X’s filling-racks. Fire extinguishing systems and barriers have been installed and are managed jointly for the facility.

From the cisterns in the underground facility and out to the filling-racks, there are separate pipe systems for each product and for each tank-truck filling-rack. There are overflow collection systems around the tanks in the area. Pipe racks pass through the area with products. The pipes are pressurized by the product pumps in the underground tank facility. The barriers and safety systems are the result of cooperation between the underground tank facility and the oil terminal.

A cooperative body has been established that is referred to as the “Operation Committee”, which consists of a representative for each of the oil companies, as well as a representative from Sisterne Drift DA. The Operation Committee meets regularly and deals with matters concerning Ekeberg Oil Storage, common areas at the oil terminal and HSE. The group has a function for the mutual exchange of information and coordination. Major projects and investments at Ekeberg Oil Storage must be approved by the Board of Sisterne Drift DA or be dealt with by owner representatives, while the Operation Committee can decide on smaller projects.

Ekeberg Tank is wholly owned by Statoil Fuel & Retail. Sisterne Drift DA is responsible for the operations of Ekeberg Tank, while Statoil Fuel & Retail is otherwise responsible for the management of the facility.

The oil companies previously had a joint industrial safety organisation that also encompassed Ekeberg Oil Storage/ Ekeberg Tank (Sisterne Drift DA). The fuel depot has been subject to industrial safety requirements due to the security of supply. Sisterne Drift DA has appointed an industrial safety manager, and traditionally this person has had a background from the Oslo Fire and Rescue Department. Beyond the area of industrial safety, the companies have each been responsible for their own areas. Cooperation with other enterprises in Sydhavna has been limited to common alerts/alarms.

Because of discontinuing the industrial safety organisation, a common emergency response organisation for the oil companies is under establishment. This organisation will encompass the activities at both the oil terminal and the underground facility, and the head of this organisation will report to the Operational Committee.

3.2.5 TRANSPORT

Sydhavna is a logistics centre for transport in Norway. Norway’s largest container harbour, with an annual volume of over 200,000 TEU, is located here. The TEU unit is equivalent to a 20-foot container.

Today, container operations are located at the Bekkelaget Quay and Sjursøya South Quay. The entire container operations are planned to be combined at Sjursøya in 2015. Loading and unloading operations will take place by means of cranes (lo/lo, “lift on/ lift off”). The containers are subsequently distributed by road transport from Sydhavna. The owners of approximately two-thirds of the container cargo that passes through the Port of Oslo are in the counties of Oslo or Akershus, and the most important area for the distribution of goods is Groruddalen.

Oslo Container Terminal currently operates at Ormsund, while Sjursøya Container Terminal operates at Sjursøya. Traffic for the transport of containers encompasses approximately 1 900 vehicles per week from Sydhavna.

The Institute of Transport Economics has estimated that dangerous goods in containers represents some 50,000 tonnes, which corresponds to approximately 3.8 per cent of the volume of goods at the container harbour in 2012 (Institute of Transport Economics 2013). ADR Class 9 (various hazardous substances and objects) represents the largest volume with 48 per cent, and
then comes ADR Class 3 (flammable liquids) with 24 per cent and ADR Class 8 (corrosive substances) with 17 per cent. Refined petroleum products are distributed from Sydhavna. Tank-trucks are filled from the tank facility in Ekebergåsen from the Sjursøya Oil Terminal. Weekly, approximately 1 500 vehicles leave the filling-racks at Sjursøya. At the beginning and the end of the week, there are a few more departures than during the other days. On the weekends, the frequency is somewhat lower. Approximately one-third of all road transport of products of this type at the national level are distributed from Sydhavna. Approximately 18 per cent of all the transport of fuel from Sydhavna is to destinations within the City of Oslo. Other important destinations include the counties of Akershus, Hedmark, Buskerud, Østfold and Oppland. The volume distribution among the counties is illustrated in Figure 8.3.

Oslo Airport Gardermoen is supplied with aviation fuel from the depot in Ekebergåsen by rail. For this transport, there are specially adapted wagons that are filled at a separate filling-rack located near the filling-racks for tank-trucks. All of the aviation fuel that is used at Gardermoen comes from Sydhavna. With the current traffic volume at Gardermoen, there is an average of 9 to 10 trains a week from Sydhavna to Gardermoen. Each train carries approximately 1 150 m³ of product. This corresponds to 30 tank-trucks with a capacity of 40 m³ each. The filling operations in Sydhavna and unloading activities at Gardermoen are performed by Oslo Lufthavn Tankanlegg AS, while CargoNet is responsible for transport by rail.

The combined transport of fuel from Sydhavna in the form of gasoline, diesel oil, heating oil and aviation fuel represents approximately 40 per cent of the national consumption of fuel.

The “dry bulk” segment includes products such as cement, grain, salt and fertiliser. The outgoing traffic will vary. The concrete market, for example, will be dependent on the volume of construction activity. Based on DSB’s survey, it is assumed that the weekly average would be approximately 1 800 vehicles.

Among the other enterprises, forwarding and storage represent the most important group. Bring is the dominant actor here, with approximately 1 100 outgoing lorries and trailers per week.

### Table 3.3: Traffic from Sydhavna

The data is based on the survey conducted by the DSB in the spring of 2013. The data for fuel is based on information obtained from interviews with the oil companies. The figures are based on averages, and some variation must be expected from one week to another.

<table>
<thead>
<tr>
<th>TYPE OF ACTIVITY</th>
<th>APPROXIMATE NUMBER OF TRUCKS PER WEEK</th>
<th>PERCENTAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Containers</td>
<td>1 900</td>
<td>28</td>
</tr>
<tr>
<td>Petroleum products</td>
<td>1 500</td>
<td>22</td>
</tr>
<tr>
<td>Dry bulk</td>
<td>1 800</td>
<td>26</td>
</tr>
<tr>
<td>Logistics/shipping/forwarding</td>
<td>1 200</td>
<td>18</td>
</tr>
<tr>
<td>Others</td>
<td>400</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>6 800</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

All dangerous goods from Sydhavna must necessarily be transported through the City of Oslo. The Institute of Transport Economics (TØI) has surveyed the transport of dangerous goods from Sydhavna through Oslo. For liquid petroleum products (ADR Class 3), the transport pattern is based on the data collected for 2012 illustrated in Figure 3.9.

The figure shows that approximately 60 per cent of the transport of liquid petroleum products from Sydhavna passes either through the Ekeberg Tunnel or through the Opera Tunnel. Transport through the Ekeberg Tunnel in turn passes through either the Vålerenga Tunnel or the Svartdal Tunnel.

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1 This study was commissioned by DSB; cf. Institute of Transport Economics 2013.
3.3 CITY OF OSLO AND PORT OF OSLO

3.3.1 CITY OF OSLO

As part of the City of Oslo, Sydhavna is subject to the political and administrative management and governance of the city. The City of Oslo is the planning authority and is responsible for regulation of land-use in the municipality, within the scope of current regulations. The City of Oslo is legally the owner of most of the harbour areas, including all of Sydhavna.

Ownership is managed by the Port of Oslo, which also has the overall responsibility for operations in the area. In addition, a number of municipal agencies are involved in various ways in the operations in Sydhavna.

The City of Oslo is organised according to a so-called parliamentary governance model, with a separate City Government that is established with political support from the City Council. The City Government heads the administration.

\* The review is based here on various documents from the City of Oslo and the Port of Oslo, cf. Appendix 1
of the municipality and has eight members, including the Governing Mayor. The City Government has responsibility for recommendations and implementation in relation to the City Council and it has independent decision-making authority for a number of matters. The areas of responsibility are divided between seven specialist vice mayors who each head their own department. The vice mayors have a small political secretariat and an administrative staff under the management of a municipal executive. The central administration otherwise consists of a number of agencies under the management of agency directors who report to the various municipal executives. The municipality has a number of limited companies, and a total of six municipal undertakings are organised in accordance with the provisions of the Local Government Act (cf. Chapter 11 on local authority undertakings).

The City of Oslo has been divided into 15 city districts with direct elections and an independent political/administrative management. The city districts are essentially responsible for services in the areas of health, nursing and care, children and young people (schools, day care), social and welfare services (NAV), culture, environmental affairs and the local community.

The Port of Oslo administratively comes under the Department of Environment and Transport. In addition, the department is responsible for six specialist agencies, including the Emergency Planning Agency, the Agency for Fire and Rescue Services and the Agency for Water and Sewerage Works. The department has five units/sections.

The Port of Oslo comes under the Mobility Section, which is the specialist secretariat for the political administration and has a “corporate management function” in relation to the Port of Oslo etc. within the framework of current legislation (such as the Local Government Act and the Harbour and Fairway Act). This section is responsible for ongoing/operative management, for example through the preparation of annual letters of award.7 The City Government (department) is the recommending authority for all of the undertaking’s matters that go to the City Council, and it has corresponding responsibility for the implementation of decisions. The case documents from the Port of Oslo (recommendation and decision) shall be enclosed with the case as an attachment. In contrast to the other municipal undertakings, it is the City Government in plenum and not the specialist vice mayor that represents the Board of the Port of Oslo. The City Council has five committees that prepare cases and submit recommendations to the City Council, including a separate committee for the environment and transport.

The Emergency Planning Agency is the city’s specialist agency (‘strategic staff agency’) in the field of emergency planning, and it shall ensure that the municipality’s emergency planning duties in both war and peacetime are fulfilled in a satisfactory manner. The agency is the initiator, the internal supervisory body and an expert advisor for emergency planning issues, and it is the point of contact and coordinator between the municipality and the central government authorities. Work on risk and vulnerability analyses and emergency preparedness plans represent an important part of the agency’s duties.

The Agency for Fire and Rescue Services is responsible for emergency preparedness and rescue efforts, and it is responsible for preventive duties through inspection of special fire objects located in the harbour area.

The Agency for Water and Sewerage Works is responsible for drinkingwater and wastewater, including the operation and maintenance of treatment plants, networks and pumping stations. The Bekkelaget Treatment Plant is located in Sydhavna. The agency is also responsible for the development of the Midgardsormen Project through Ekebergåsen, which is one of Norway’s largest sewerage projects.

The Department of Urban Development is responsible for municipal planning. The Department is responsible for overall strategic planning (such as Fjord City), and for building and land-use matters. The Agency for Planning and Building Services comes under this department.

### 3.3.2 PORT OF OSLO

As a municipal undertaking, the Port of Oslo shall have its own by-laws and board of directors. Municipal undertakings are legally part of the city. The municipality is financially responsible for the undertaking and adopts the annual budgets.

The by-laws for the Port of Oslo state that the main object of the undertaking is to “...ensure efficient and rational port operations. This entails facilitating efficient and environmentally friendly maritime transport and supervising traffic in the harbour district. The Port of Oslo shall also manage the port’s property and installations in a financially and environmentally good manner.”

The Board of the undertaking has ten members, to which the City Government elects up to six, including the chairperson and deputy chairperson. The Board appoints the general manager and has been granted the authority of the municipality pursuant to the Harbour and Fairway Act (see Chapter 4). The

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7 Annual “expectation letters” were previously prepared. This system was discontinued in 2011 and replaced by letters of award.
Port of Oslo is essentially subject to all of the municipality’s agreements, instructions and regulations, including guidelines for the sale of real estate. The municipality has administrative responsibility and authority pursuant to the Harbour and Fairway Act in the area where the municipality has planning authority pursuant to the Planning and Building Act (unless otherwise stipulated in the provisions in or pursuant to the Act). The municipality shall ensure safety and navigability in harbours and the municipality’s sea areas (Section 48).

The Act has specific provisions concerning harbour capital, which encompass the assets and revenues from harbour operations and port charges. The harbour capital shall be managed in accordance with the Act and shall be kept in accounts separate from the municipality’s other funds. The harbour capital cannot be used for purposes other than harbour activities, such as operations, maintenance, improvement, construction and development, as well as exercising public authority.

Port charges should only cover the municipality’s expenses related to safety and navigability in the municipality’s sea area, as well as exercising public authority as prescribed in or pursuant to the Harbour and Fairway Act. This may include expenses for navigational devices, investments and maintenance of fairways, removal of obstacles in the fairways, supervisory functions, icebreaking and the issuance and enforcement of public order regulations. The port charges shall be calculated based on the vessel’s gross tonnage (cf. Sections 3 and 4 in the regulations for the calculation and collection of port charges). Beyond this, the Port Board itself can stipulate the prices and commercial terms, for example, for the rental and use of quays, buildings, cranes, etc.

Pursuant to the Harbour and Fairway Act, the Port of Oslo is defined as a so-called “designated port”, out of five such ports. These ports are important hubs for national and international cargo and passenger transport. Three harbours in Oslo are also defined as trunk network ports (out of 31 such ports), cf. National Transport Plan 2010 to 2019 (Report no. 16 (2008–2009) to the Storting). Sydhavna is one of these.
More about organisation, roles and priorities

The Port of Oslo is managed by a Port Director, who reports to the Port Board. The annual revenues totalled approximately NOK 280 million in 2012. In recent years, the number of employees or full-time equivalents has been approximately 175.

As of February 2014, the Port of Oslo was organised into five departments: Nautical Department; Terminal Department; Technical Department; Planning, Development and Environmental Affairs Department and Administration Department. In addition, there is an information unit and a staff directly under the Port Director. A project has been initiated to review the organisational structure. The current organisation is nevertheless briefly described below, including an overview of the enterprise’s functions and purposes.

The Nautical Department encompasses the vessel traffic service (VTS) station and maritime section. In addition, there is staff responsible for emergency planning, safety and port security in accordance with the ISPS regulations (see Chapter 4). An emergency response manager in a full-time position follows this up.

The VTS station monitors and controls the traffic in the harbour basin around the clock every single day and shall ensure safe and efficient navigation in the fairways. The Maritime Section has an operative function in the municipality’s sea areas, which includes inspection and control of vessels, lighthouses, lanterns, beacons, buoys, etc. The Terminal Department is responsible for onshore operations and contact with the customers with regard to infrastructure, traffic steering, land-use, cranes, buildings, etc. In addition to a Property Management Section and a Crane Operations Section, there are separate sections for Vesthavna and Sydhavna, respectively. The Sydhavna Section has six positions, with a district manager, three harbour inspectors and two advisors. The Technical Department is responsible for technical operations and maintenance, divided between structural and mechanical maintenance. The Planning, Development and Environmental Affairs Department is responsible for the planning, development and modernisation of port facilities and equipment. This department is also responsible for the external environment, and it has a separate environmental group and an environmental manager. The Administration Department is responsible for finance, internal control/management/planning, IT operations and personnel, the latter of which has a designated HSE advisor with primary responsibility for the working environment.

FIGURE 3.11 Organisation chart for the Port of Oslo.
More about the Port of Oslo’s roles and priorities

Private actors, such as terminal operators, consolidated shippers, line agents, forwarding agents, etc., perform all cargo-handling operations at the port. Port of Oslo only operates the port cranes. The Port of Oslo owns some buildings in the harbour area, other buildings are owned by the operators.

There are different models for the types of agreements/contracts that various enterprises have with the Port of Oslo:

- Container harbour: Actors rent ground. Port of Oslo owns and rents out the cranes. Port of Oslo operates the cranes.
- Passenger ferries: Port of Oslo owns the terminals, rents out space for Color Line’s facilities.
- Cruise ships: Front side of the quay and some land is rented out for each call by a vessel. Agreed on an ongoing basis.
- Sydhavna (bulk section): Rented out for calls by vessels. Actors invoiced for ground rent.
- Sydhavna (oil terminal): The oil companies each rent their share of the ground. The fire lane between the container harbour and tank storage is not included in the leases, it is used as a communication artery.

The role of the Port of Oslo in relation to the tenants and users is described in the Annual Report for 2012 as that of a landlord and property administrator. Through interviews with the actors and other findings, it is evident that the enterprises themselves are held responsible for their own operations, and it is assumed that the operations take place in accordance with the current limits, regulations and inspections by the relevant regulatory authorities. The “shopping centre” concept is also used as an illustration of the division of responsibility between the Port of Oslo as the owner and the other enterprises in the harbour area. The leases with the oil companies are characterised by being written at the time when the contracts were originally entered into (where it is stated as a condition, for example, that the relevant authorities have granted the necessary permits). No system has been established to follow up whether the requirements of the authorities have been complied with.

The Port of Oslo has established its own system for HSE, quality and financial management, which is referred to as the “written rules”. This contains goals, rules, procedures and a monitoring system. The ongoing operation of the system essentially follows three tracks. One for the environment, one for safety and security and one for the working environment. This is reflected in the organisational allocation of tasks as described above.

As for occupational health and safety (working environment), a system has been established with so-called coordination meetings with users and tenants. These are held every quarter, but are limited to terminals and users/tenants that have the greatest assumed risk. In Sydhavna this encompasses the three terminals (Sjursoya, Ormsund and Kneppesjær) and the six tenants/users, divided into two groups/meetings (OCT, SCT, Møller, Norline, Itella, BMC and the Oslo Loading and Unloading Office). Participants from the Port of Oslo vary somewhat among the terminals, but the HSE advisor and the district manager or inspector from the Sydhavna district are always present. The environmental manager take part in the meetings on request. The oil terminal is not included in this system, but there is a desire to establish closer cooperation. The topics discussed at the meetings include accidents, injuries, etc., and the enterprises are encouraged to report such incidents. Reporting is not mandatory, and it is assumed that there is some underreporting.

Even if the various HSE fields are parts of the same steering and documentation system, in practice they are relatively separate systems, with the responsibility for follow-up placed in three different departments.

The Port of Oslo has an explicitly stated environmental policy, and has been certified in accordance to the ISO 14001 environmental standard. The environmental policy states, for example, that through continuous improvement the Port of Oslo shall ensure an environmentally friendly harbour for the surroundings, the city and the customers. The management shall ensure that responsibilities and duties in relation to the external environmental have been defined and are followed up. The external environment shall be integrated into strategic assessments and operational decisions, and it shall be safeguarded in the planning, development and operations in accordance with defined goals and relevant statutory requirements. The more specific goals state among other things that a greater supply of goods to the city by sea shall be facilitated, noise shall be reduced, air pollution and greenhouse gas emissions shall be reduced, less waste shall be produced and more shall be recycled.

The environmental goals from 2012 have been presented as overarching environmental and HSE goals. Only one point addresses HSE in a broader sense, in which it is stated that the Port of Oslo shall be a “safe and good workplace in which a focus on job satisfaction, health and employee participation is maintained”.

The steering dialogue between the Port of Oslo and the City of Oslo, as is evident in the letters of award and annual reports, has, in addition to finance, a particular focus on environmental goals. It is evident from the letter of award for 2013 that more environmentally friendly transport, the supply of onshore power and a focus on green distribution of goods are priority areas. This includes increasing the proportion of goods that are transported by sea. The security requirements pursuant to the harbour regulations are also described (Moreover, a number of particular areas are thoroughly outlined in the governing documents: Working environment, equal opportunities, social inclusion, procurement, etc.). The prioritisation of environmental goals is also reflected in the Annual Plan for 2013, in that the responsibility for following up the goals is specified for all of the organisational units.
The activities in Sydhavna are in sum subject to a number of different regulatory regimes, with somewhat differing purposes and focus, several supervisory authorities and various objects of regulations/control, cf. Table 4.1. The various enterprises in the harbour area are regulated in the usual way under the HSE rules and regulations, in addition to being under special rules concerned with harbour activities. This chapter provides a brief overview of the various regulatory regimes.
4.1
FIRE AND EXPLOSION PROTECTION

4.1.1 FIRE AND EXPLOSION PREVENTION ACT

The purpose of the Act is to protect life, health, the environment and material assets against fire and explosions, against accidents with hazardous substances or dangerous goods, or other acute accidents, as well as undesired deliberate incidents. The Act focuses on the public in general, but in particular on the municipalities (fire service), owners and users of buildings and enterprises/installations that handle hazardous substances and transport dangerous goods.

Pursuant to the Fire and Explosion Prevention Act, enterprises are obligated to ensure that any handling of hazardous substances or goods takes place in a manner such that human life, the environment and surroundings are adequately secured (cf. Section 20). The risk shall be reduced to a level that can reasonably be achieved (ALARP principle). The level of safety shall be established through technical and organisational measures in the enterprises, or possibly in combination with

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8 Due to reasons of capacity, the electrical safety regime has not been reviewed in this report.
9 Act no. 20 of 14 June 2002 relating to the prevention of fire, explosions and accidents involving hazardous substances and the fire services' duties connected with rescue operations.
Area-related restrictions in the surrounding area, and it shall be documented to the central supervisory authority.

Area-related restrictions are stipulated pursuant to the provisions of the Planning and Building Act. A statement shall be obtained from the central supervisory authority before any area-related restrictions are established, see Section 16 of the Regulations relating to the handling of hazardous substances\(^{10}\). The area-related restrictions surrounding hazardous enterprises shall be defined as special consultation zones with the associated provisions pursuant to the Planning and Building Act to prevent activities involving hazardous substances being placed too close to areas of public use and public traffic. There are also restrictions with regard to the establishment of residential areas and/or institutions such as schools and hospitals etc. in areas with existing hazardous activities. Municipalities shall have knowledge available about the relevant enterprises and installations, through information from DSB, among others, to be used as a basis for land-use planning.

DSB’s guide on civil protection in land-use planning points out that it is important to clarify any potential risk inherent in the enterprises and that this shall be taken into consideration in the preparation of risk and vulnerability analyses for the planning areas in question, and that this is followed up in the planning. In connection with the municipality’s overall risk and vulnerability analysis pursuant to the Act and Regulations relating to the emergency preparedness duty, these enterprises are important private actors that the municipality should invite to participate in the task. The guide further specifies the duty of the municipality to ensure against the loss of critical infrastructure and societal functions, and to be a driving force in relation to other actors to ensure that they provide robust services to the municipality and to those who live and spend time there.

Both the underground facility in Ekebergåsen and activities at the oil terminal are subject to the Fire and Explosion Prevention Act. The installations are subject to the Regulations relating to the handling of hazardous substances. In addition, the Regulations relating to explosive atmospheres\(^{11}\) apply to the installations, with the exception of the Ekeberg Tank.

Due to the capacities of the storage facilities, the installation is subject to the provisions of the Norwegian Seveso Regulations, see below.

Several of the enterprises in Sydhavna are defined as special fire objects and are supervised by the municipal fire service. Section 13 of the Act concerning special fire objects requires that the municipality identify and maintain a list of the buildings, stores, areas, tunnels, activities, etc., where fire may entail the loss of many lives or major damage or injury to health, the environment or material assets. This inspection shall encompass any conditions of importance to fire safety, including structural, technical, equipment-related or organisational fire protection measures and conditions of importance to fire fighting and other rescue efforts.

Table 4.2 shows which objects are registered as special fire objects in Sydhavna. It is evident from the list that the oil terminal is not registered as a special fire object. For this reason, there is no inspection by the Fire and Rescue Department in the municipality of Oslo.

\(^{10}\) Regulations no. 602 of 8 June 2009 relating to the handling of flammable, reactive and pressurised substances including requisite equipment and installations.

\(^{11}\) Regulations no. 911 of 30 June 2003 relating to health and safety in explosive atmospheres.
4.1.2
THE NORWEGIAN SEVESO REGULATION

The provisions of the Seveso II Directive have been implemented in Norway through the Norwegian Seveso Regulation and are administered by five following authorities:

- Norwegian Labour Inspection Authority,
- Norwegian Environment Agency (formerly the Norwegian Pollution Control Authority and the Climate and Pollution Agency),
- Norwegian Industrial Safety and Security Organisation (NSO),
- Petroleum Safety Authority Norway (Ptil) and
- Norwegian Directorate for Civil Protection (DSB).

DSB is the coordinating authority.

The purpose of the regulations is to prevent major accidents that involve hazardous chemicals, and to limit the consequences that major accidents may have on humans, the environment and material assets and thus ensure a high level of protection in a uniform and efficient manner. The type of chemical and the volume that is stored determines which enterprises are encompassed by the Norwegian Seveso Regulation.

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The establishments Ekeberg Oil Storage and Ekeberg Tank are required to submit safety reports due to their storage volumes (covered by section 9 of the Norwegian Seveso Regulation), while Shell and Statoil Fuel & Retail at the Sjursøya Oil Terminal are required to submit notifications (covered by section 6 of the Norwegian Seveso Regulation). The Seveso II Directive includes requirements for the authorities with regard to following up the requirements of the Directive for established enterprises covered by the Norwegian Seveso Regulation. It is stated here that establishments required submitting safety reports shall be subjected to annual inspections, while the inspection interval for establishments required to submit notifications is a maximum of four years.

The regulations have a special provision for “Risk of a domino effect for enterprises that are located close to each other” (Section 8). This requires that the enterprise must describe its surroundings such that the supervisory authorities can identify establishments or groups of establishments where the likelihood and the possibility or consequence of a major accident may be increased because of the location and the proximity of such establishments, and their inventories of hazardous substances. Both Ekeberg Oil Storage and Ekeberg Tank, as well as Statoil Fuel & Retail Norway and Shell (in the oil terminal) are subject to this provision by means of a separate administrative decision. This entails a requirement that they must

a) exchange relevant information between themselves in an appropriate manner, to ensure that the enterprises collectively take the overall risk for a major accident into account in their systematic efforts to prevent or limit the consequences of a major accident, in their safety reports and in their internal emergency preparedness plans,

b) cooperate on the dissemination of information addressed to 3rd persons who may be affected by a major accident and
c) cooperate on the submission of adequate information to the relevant local authorities, so that external emergency preparedness plans can also be developed.

The decision to identify the four aforementioned enterprises as domino enterprises is justified by the possibility that a cascading incident at any of the four enterprises could result in an incident at one of the other installations. According to the cartographic information and information provided in a notice or safety report from each of the four enterprises, it is evident that they are in immediate proximity of each other and that to some extent they are integrated with each other through joint activities. In the decision, reference is made to the fact that the notices and safety reports submitted describe several scenarios that can result in consequential events at the other nearby enterprises. A ship collision at the quay with a subsequent discharge and ignition is one of the incidents that could escalate to the neighbouring enterprises.

The authorities’ cooperation on the follow-up of the Norwegian Seveso Regulation takes place through a coordination group, the purpose of which is to be responsible for ensuring that the safety reports are dealt with, annual distribution of inspection tasks between the authorities and establishment of inspection plans for the individual enterprises.

The coordination group also provides guidelines for the topics for the annual inspections to ensure the greatest possible uniformity of inspections. The Seveso II Directive requires that the Norwegian authorities conduct annual inspections of

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12 Regulations no. 672 of 17 June 2005 on measures to prevent and limit the consequences of major accidents in enterprises in which hazardous chemicals are present.
13 Cf. decision of 20 December 2010.
the enterprises that handle the largest volumes of hazardous chemicals (major accident enterprises subject to safety reporting).

If the authorities do not conduct annual inspections at the enterprises subject to safety reporting, the Seveso II Directive requires the authorities to be able to document the reasons for not doing so. The authorities’ coordination group therefore conducts separate assessments of enterprises that are regarded as qualified for inspection at intervals greater than one year.

The Norwegian Seveso Regulation is currently under revision to implement the requirements in the Seveso III Directive. It is expected that a revised version of the Norwegian Seveso Regulation will enter into force on June 1st 2015.

4.1.3 TRANSPORT OF DANGEROUS GOODS

The regulations relating to the road transport of dangerous goods14 (Road Transport Regulations) are administered by DSB. The main purpose of the Road Transport Regulations is to prevent accidents and undesired deliberate incidents during the transport of dangerous goods. The regulations stipulate general safety requirements that must be met for any transport of dangerous goods. These provisions are expanded upon in appendices to the Road Transport Regulations such as ADR (The European Agreement concerning the International Carriage of Dangerous Goods by Road) and RID (International Rules for Transport of Dangerous Goods by Railway). Here requirements are stipulated for any actor in the transport chain, which encompass those who classify, pack, load, unload, send, receive or are otherwise involved in the transport of dangerous goods. Detailed requirements are also stipulated for the equipment that is to be used for the various transport tasks, as well as requirements for regular inspection of the equipment.

DSB supervises compliance with provisions of the Road Transport Regulations. The Norwegian Radiation Protection Authority is the regulatory and supervisory authority for radioactive materials (Class 7). In addition to DSB, the Public Roads Administration, police and customs can inspect dangerous goods transported by road.

The ADR agreement is an international agreement that specifies binding rules for how the road transport of dangerous goods should take place in the states that have signed the agreement, while RID is the international regulation for the international transport of dangerous goods by rail. This regulation is part of a European agreement on international rail transport in general. ADR and RID apply in principle only to international transport between states. Because of the EEA Agreement and obligations to implement EU directives for the transport of dangerous goods, the international regulations from 1 January 1997 were also made applicable to domestic transport in Norway.

The UN expert committee has prepared criteria on which the classification of dangerous goods is based and has divided the chemicals into 13 different hazard classes. Each class has a danger label that is to display the dangers of the chemical. In each class, a product list of chemicals that fall under the given criteria has been prepared. Substances that are not found on the product lists are classified based on the criteria.

The Opera Tunnel (E18 and E6), Vålerenga Tunnel (Rv 190), Hammersborg Tunnel (Rv 162) and Vaterland Tunnel (Rv 162) are subjected to restrictions for the transport of dangerous goods in the local regulations for the transport of dangerous goods in Oslo15.

The restrictions concern, for example, a ban on the transport of flammable liquids from 7:00 to 9:00 in the morning and from 2:00 to 6:00 in the afternoon. These restrictions have not been signposted nor have they been enforced. A project has been initiated related to the requirements in these regulations based on new signposting requirements. “Risikoanalyse for transport av farlig gods i tunneler i Osloområdet [Risk analysis for the transport of dangerous goods in tunnels in the Oslo area]” (2012) was prepared under the direction of the Public Roads Administration, together with the emergency services in Oslo. In subsequent work, there is agreement between the Norwegian Public Roads Administration and the emergency services that the restriction requirements in the regulations should be withdrawn when the recommended risk-reducing measures from the analysis have been implemented. The risk-reducing measures concern topics such as:

- gas detection
- making the electrical installations in the tunnels explosion proof
- minimising the risks related to protruding objects in the tunnels
- ensuring the flow of traffic in the tunnels.

The requirements for the signposting of road tunnels for dangerous goods restrictions was introduced in the ADR as of 1 July 2007. Before this, the traffic signs announcing restrictions on dangerous goods had been introduced in the annexes to the Vienna Convention concerning traffic signs and traffic light signals (Norway observes this).

14 Regulations no. 384 of 1 April 2009 relating to the road transport of dangerous goods.
15 Regulations no. 625 of 8 June 1994 relating to restrictions on the transport of dangerous goods in certain road tunnels in Oslo.
REGULATION AND INSPECTION

4.2 ENVIRONMENT AND POLLUTION

Based on environmental and pollution considerations, there is a threefold regulation of the activities at Sjursøya:

• The Norwegian Seveso Regulation regulate Ekeberg Tank and Ekeberg Oil Storage, as well as Statoil Fuel & Retail and Shell at the oil terminal.
• Ekeberg Tank and Ekeberg Oil Storage have a discharge permit pursuant to the Pollution Control Act in connection with the discharge of (oil-contaminated) water (approximately 1–2 million tonnes of water annually).
• Special emergency preparedness requirements apply to the oil companies pursuant to Chapter 6 of the Pollution Control Act (Sections 40 and 41), and they involve requirements for risk analysis and emergency preparedness plans or measures.

The Norwegian Environment Agency (formerly the Norwegian Pollution Control Authority and the Climate and Pollution Agency) informs that they visit the underground facility annually and the outdoor facilities approximately every 3 to 6 years.

4.3 INDUSTRIAL SAFETY

The industrial safety requirement is founded on the Civil Protection Act (see 4.7) and applies in principle to enterprises with 40 or more employees (average for the year, encompassing both permanent/temporary and contract employees). In accordance with the new Industrial Safety Regulations, other enterprises can also be subjected to industrial safety requirements based on their level of risk or location. The industrial safety obligation encompasses, for example, risk assessment, organisation, emergency preparedness plans, equipment, qualifications, exercises and coordination. For enterprises where there is a potential for incidents with serious consequences, enhanced industrial safety requirements apply, with additional requirements for organisation, exercises, equipment and qualifications.

There is also relatively frequent follow-up in connection with the amendment of permits. Inspection also takes place at the corporate level, and the installations at Sjursøya may be included as part of several possible companies.

The Norwegian Environment Agency is in contact with the enterprises in Sydhavna at least once a year on average. Experience shows that there are special challenges related to multiple companies being responsible for the activities. While the use of policy instruments is normally aimed at a single company/installation at a time, in such “industrial parks” there will be many overlapping situations that involve more than one company. This can create a situation where cooperation, responsibilities and roles become unclear:

• Different internal control systems (such as Statoil Fuel & Retail versus Sisterne Drift DA)
• Common emergency preparedness scheme
• Operating company for the underground facility
• Filling-racks

The oil companies’ workforce was estimated to be 38 persons in 2005. In 2007, an application was submitted for exemption from the industrial safety obligation on grounds of changes to the areas, activities and staffing. The exemption was not to entail any reduction in the level of self-protection. Nonetheless, the industrial safety obligation was expanded in 2008 from emergency preparedness class I to class II (corresponding to enhanced industrial safety).

However, the industrial safety obligation ceased in 2012 on the grounds that the enterprise no longer had 40 employees. At the same time, a reservation was made that the obligation could be reassessed based on the level of risk and/or location.

15 Act no. 6 of 11 March 1981 relating to protection against pollution and relating to waste (Pollution Control Act).
16 Act no. 45 of 25 June 2010 relating to municipal emergency preparedness, civil protection and the Norwegian Civil Defence.
17 Regulations no. 1434 of 20 December 2011 relating to industrial safety.
4.4  WORKING ENVIRONMENT

The Working Environment Act previously had separate regulations relating to work in ports. As of 1 January 2012, these regulations (and all of the more specialised regulations) were replaced by six generic regulations. Individual provisions in these regulations will in varying degrees be relevant for enterprises in harbours or oil terminals. This applies in particular to regulations relating to the performance of work. Chapter 29 on Work in or on tanks, pipelines, spaces, etc., where there may be a flammable product or hazardous substance contains a special provision (Section 29-1) on Work where there may be risk of fire or explosion. This provision states that in performing such work (in or on tanks, spaces, pipelines, etc., where a flammable product or hazardous substance is found or may have accumulated) the enterprise shall implement the necessary measures so that the work can be performed without any risk to life or health. In this connection, competent personnel shall perform the necessary inspections and measurements to ensure that the working atmosphere is risk-free and a work permit shall be granted in writing.

The Norwegian Labour Inspection Authority has no particular focus on ports as such. Inspection of the enterprises in Sydhavna has been connected to special warnings or incidents. In recent years, inspections have been conducted in connection with overfilling in Ekeberg Tank, the rail accident and a workplace accident at Rieber Salt (cf. Chapter 6). Risk-based inspection at the Norwegian Labour Inspection Authority is linked to industry-specific initiatives. The Norwegian Labour Inspection Authority conducted an inspection of Sisterne Drift DA in 2012.

4.5  HSE – INTERNAL CONTROL REGULATIONS

The purpose of these regulations is to promote systematics and improvement of health, safety and the environment in enterprises such that the goals of the relevant legislation can be achieved, including the Fire and Explosion Prevention Act and the Civil Protection Act. The regulations entail a requirement for systematic risk management through planning, organising, performing and maintaining activities in accordance with the current requirements. In this connection, the enterprises shall:

- define their own HSE goals
- have an overview of the relevant regulatory requirements
- ensure that the employees have adequate knowledge and skills and that they are utilized through active participation
- have an overview of their own organisation and responsibilities
- conduct risk assessments and implement risk-reducing measures
- have routines for the prevention and handling of regulatory violations
- follow up that the internal control functions as intended.

The regulations have a special coordination provision (Section 6). This requires that enterprises that perform work at the same workplace agree in writing, if necessary, which enterprise will be responsible for the coordination of internal control for common activities or areas. The supervisory authorities may, if necessary, determine where the responsibility shall lie. Section 6 has also provisions on the relationship between the commissioning enterprises and contractors – which correspondingly aim to regulate coordination between the various actors.

The review has not uncovered any decision by the authorities related to the coordination provision, even though it is clearly relevant to these types of activities.

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51 Act no. 62 of 17 June 2005 relating to the working environment, working hours and employment protection, etc.
52 Regulations no. 1357 of 6 December 2011 on the performance of work, use of equipment and associated technical requirements.
53 Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises. The regulations apply to enterprises that are encompassed by a total of eight acts.
The Planning and Building Act requires that statutory plans promote civil protection by preventing risk for the loss of life, injury or damage to health, the environment and important infrastructure, material assets, etc. (cf. Section 3-1). When development plans are prepared, the planning authority shall ensure that a risk and vulnerability analysis is conducted for the planning area, or conduct such an analysis itself (cf. Section 4-3). The analysis shall illustrate all of the risk and vulnerability factors of importance to whether the area is suitable for development purposes, and any changes to such factors as a result of the planned development. Areas with hazards, risks or vulnerabilities shall be labelled as special consultation zones in the plan, cf. Sections 11-8 and 12-6. In the land-use plans, the planning authority shall approve such provisions on development in the zone, including bans, which are necessary to prevent damage, injuries or losses.

For regional or municipal plans with guidelines or limits for future development and land use plans that may have significant impacts on the environment and community, the planning description shall provide a special assessment and description – impact assessment – of the plan’s impact on the environment and community (cf. Impact Assessment Regulations).

The purpose of the Civil Protection Act is to protect life, health, the environment, material assets and critical infrastructure in the event of undesired incidents in peacetime. The Act has two important provisions concerning the municipality’s obligations. Section 14 requires the municipality to prepare risk and vulnerability analyses, and Section 15 requires the preparation of an emergency preparedness plan. These requirements are elaborated in the Regulations relating to municipal emergency preparedness. Overall, these provisions entail that the municipalities shall work systematically with civil protection and integrate this work into their normal planning and budget processes. The risk and vulnerability analyses shall encompass undesired incidents that may occur in the municipality related to critical societal functions and critical infrastructure. The municipality shall also prepare a comprehensive risk analysis to be the basis for the goals, strategies and priorities for civil protection and emergency planning work. Factors that should be integrated with the plans and processes in accordance with the Planning and Building Act shall be assessed, and the municipality can use the authority provided in the Planning and Building Act or sectoral legislation to implement risk-reducing measures. Emergency planning shall be based on risk assessments and be coordinated with other relevant public and private plans. The emergency preparedness plan shall include crisis organisation, warning and evacuation plans, resource overviews and a plan for crisis communications. The emergency preparedness plan shall be updated and revised at least once a year, and exercises shall be conducted every other year.

Up to now, the municipality’s risk and vulnerability analyses have not had a particular focus on the activities in Sydhavna, but such an analysis is now being worked on.
4.8
THE ROLE OF THE COUNTY GOVERNOR

In accordance with instructions\(^{25}\), the County Governor shall coordinate civil protection and emergency planning in the county and fulfil a role as a driving force and advisor in this task. The County Governor shall have an overview of the risks and vulnerabilities in the county, prepare a risk and vulnerability analysis, an overview of the authorities’ requirements and expectations for the municipalities’ civil protection and emergency planning, and cooperate with important civil protection actors regionally. In addition, the County Governor supervises the municipality’s compliance with its emergency preparedness duty (cf. the Civil Protection Act) and the requirements for civil protection in land-use planning pursuant to the Planning and Building Act.

The County Governor shall participate in the entire planning process to ensure that civil protection is taken into account. The County Governor shall focus on whether the municipalities have adequate knowledge of the areas under planning, through following up the requirement for risk and vulnerability analyses and impact studies, and on how the municipality ensures that current and future land-use planning will be ensured based on this knowledge.

4.9
HARBOUR REGULATIONS

The overall framework for harbours is stipulated in the Harbour Act\(^{26}\). The purpose of the Act is to facilitate good navigability, safe traffic and responsible use and management of the fairways, as well as safe and efficient harbour activities. The harbour activities encompass the provision of services, exercise of authority and other public administration aimed at vessels, cargo or passengers in the harbour. The port facilities encompass areas, buildings, installations and other infrastructure that are used in harbour activities, including quays, terminal buildings, loading, unloading and reloading installations, as well as warehouse and administration buildings. A number of regulations have been issued pursuant to the Act relating to taxes/fees/finances, protection against terrorism and safety; see Appendix 1 for an overview. The most important regulations are mentioned below.

The municipality’s responsibility is defined in Section 9 and entails ensuring safety and navigability in harbours and the municipality’s sea area. This provision is specified in Sections 15 and 40. Section 15 stipulates an obligation for the municipality to keep its sea area passable by responding when obstacles or nuisances arise that create difficulties for maritime

\(^{25}\) Instructions of 18 April 2008 for civil protection and emergency planning for the County Governor and District Governor of Svalbard (County Governor’s Civil Protection and Emergency Planning Instructions).

\(^{26}\) Act no. 19 of 17 April 2009 relating to harbours and fairways.
traffic. To a certain extent, this entails monitoring/inspecting and responding as required, and an obligation to respond to circumstances that can impede or make travel difficult, such as providing icebreaking services, removing drifting objects or moving anchored vessels.

Section 40 is aimed at the municipality. It shall ensure that the port facilities are in “proper condition”, and it entails a requirement to respond to circumstances that are in violation of the Act, in accordance with a general standard of reliability that is supplemented by more specific obligations in the regulations. The owner’s responsibility entails a requirement that the harbour owners and terminal owners shall safeguard the needs of the users for safety and efficiency in the operation and maintenance of the port facilities. With regard to the requirement that the port facilities shall be maintained and operated in a manner that is safe for the users, this refers primarily to safety for life and health. In addition, it can also be interpreted to mean safety from material damage: that it must be possible for the users to use the port facilities without any material damage arising. The responsibility of the port authorities for tenants/users follows otherwise from Section 40, third paragraph, which states that they shall ensure that the installations and chattels used in harbour activities are in proper condition.

Section 41 stipulates a general requirement that the activities in harbours with passenger traffic shall be safe. The first paragraph states that harbours and port terminals that have passenger traffic shall be managed in a manner that maintains safety for life and health, and that the terminal building shall be properly equipped. An important consideration of whether safety is maintained will be whether there is a proper distinction between installations for passenger traffic and for cargo handling. Pursuant to the second paragraph, the Ministry may issue more detailed regulations relating to requirements for the handling of passenger traffic in the harbour, including requirements for the terminal building. The authority to issue regulations has not been used.

Extensive guidelines have been prepared for the Act. They do not contain any detailed discussion of what the control duty in relation to the users and tenants entails with regard to safety related to hazardous substances.

### 4.9.1 Hazardous Substances and Safety at Harbours

The Harbour and Fairway Act (Section 40) authorises special regulations for hazardous substances in the municipality’s sea area. The purpose of the regulations is to improve safety for persons, property and the environment during the unloading, loading, storage and transport of dangerous goods. There is a general duty of care aimed at anyone working with dangerous goods or who has supervisory or control duties related to handling dangerous cargo. There is a separate section on the “Unloading and loading of vessels with hazardous liquid substances in bulk” that stipulates requirements for valid documentation and/or a permit for loading and unloading from the port authorities. In addition, there are certain operational requirements with regard to control procedures and warnings in connection with loading and unloading operations, and special requirements for ship-to-ship transfers.

Revision of these regulations is planned, with a view to their structure, content and a cleanup of the interfaces with other regulations (shipping and fire/explosion protection). There are also uncertainties with regard to obligations and obligated parties. The expectation of the Norwegian Coastal Administration is that the port authorities show a general duty of care corresponding to that of other forms of transport. No inspection has been conducted pursuant to the regulations in recent years.

The Regulations relating to the safe loading and unloading of bulk carriers implemented Directive 2001/96/EC “Establishing harmonized requirements and procedures for the safe loading and unloading of bulk carriers”. Article 11 of the Directive states that Member States shall regularly verify that port terminals comply with the requirements of Article 5(1), Article 7(2) and Article 8. This entails performing unannounced inspections during loading or unloading operations. In addition, Article 11(2) of the Directive obligates Norway to submit a report to the ESA every third year on the results of this work.

Two local regulations have been applicable concerning safety, especially connected to petroleum activities:

- Regulations for the oil terminal at Sjursøya, City of Oslo, Oslo and Akershus (1965)
- Regulations for tankers calling at the tanker pier at Sjursøya, City of Oslo, Oslo and Akershus (1972)
PORT SECURITY – INTERNATIONAL SHIP AND PORT FACILITY SECURITY CODE (ISPS)

The Norwegian Coastal Administration follows up the security of harbours, specifically through the follow-up and implementation of international regulations for the security of harbours. IMO and EU have prepared the international regulations for maritime security, respectively, and they consist of:

- SOLAS Chapter XI-2 and the ISPS Code,
- EU Regulation 725/2004 on enhancing ship and port facility security,
- EU Directive 2005/65 on enhancing port security and
- EU Regulation 324/2008 laying down revised procedures for conducting Commission inspections in the field of maritime security.

The responsibility for implementing international regulations for maritime security is divided among several ministries. The former Ministry of Fisheries and Coastal Affairs delegated authority and responsibility for all matters involving the harbours and port facilities to the Norwegian Coastal Administration. The former Ministry of Trade and Industry delegated responsibility for all matters on board ships to the Norwegian Maritime Authority.

In the Norwegian Port Security Regulations, ships that have an International Ship Security Certificate (ISSC) are regarded as being in international trade at all times. This means that all of the port terminals that receive vessels with an ISSC must be ISPS approved in accordance with the Port Security Regulations. It would be a violation of the regulations if a port terminal without a valid ISPS approval receives ships in international trade. This could entail criminal liability.

The ISPS Code was introduced in 2003–2004, and its purpose is to prevent malicious actions. ISPS encompasses security and emergency preparedness for ships that may be affected by or used for terrorist actions, also in connection with loading and unloading. The regulations and security measures apply to ships over 500 gross tonnes in international trade and the harbours that receive such ships. Passengers and crewmembers are also encompassed by the rules. The ISPS Code is an addendum to Chapter XI-2 of the International Convention for the Safety of Life at Sea (SOLAS Convention), which stipulates a minimum of measures to enhance the security for ships in international trade and the port terminals that service such ships.

The ISPS Regulation assigns certain inspection duties to the EU Commission in connection with the verification of the Member States’ implementation of security measures in accordance the Regulation. A new Regulation that regulates these inspections in detail was adopted on 10 June 2005. The Regulation implements the IMO’s ISPS Code in the EU legislation, but it goes further than the IMO Regulations, since it also encompasses parts of the domestic trade and makes several of the optional provisions in the ISPS Code binding.

The Port of Oslo is Norway’s first EU security-approved port, and its overall port security plan was already in place in 2007. This means that both national Port Security Regulations and the EU Directive are observed. It is the vulnerability assessments and port security plan that secured approval for the Port of Oslo, the so-called Statement of Compliance.

An important task assigned to the Norwegian Coastal Administration is to determine the current maritime security level. Security level 1 is the normal level, the level at which a minimum of security measures are to be maintained at all times. If there is an increased risk of a security incident, the level can be raised to security level 2. If a security incident is imminent or probable, the security level can be raised to level three.

Raising the security level may be determined based on an actual incident or based on information from the Norwegian Police Security Service, for example. If the maritime security level is raised, additional security measures will be implemented at the harbour or port facility. Typically, access control will be stricter and surveillance at the harbour or port facility will increase. Raising the security level will thus contribute to making a terrorist attack more difficult.

Sydhavna has ten terminals that have been designated as ISPS terminals. The Norwegian Coastal Administration is responsible for implementation of the ISPS Code and the port security regulations at all Norwegian harbours and port terminals encompassed by these regulations. On application, the Norwegian Coastal Administration can approve enterprises as Recognised Security Organisations (RSOs), so that they can perform vulnerability assessments and issue security plans in accordance with the Port Security Regulations. An RSO approval is valid for five years, if the enterprise at all times maintains the competence on which the approval was based.

The ISPS Code takes into account the great range of activities from quays to port terminals, and it stipulates vulnerability assessments as the most important tool. The use of vulnerability assessments has, however, been discussed for...
a long time. The Code includes extensive analysis processes and assessments, and it requires a uniform comprehension of how the tool should be used. The use of RSOs is a challenge that many have spoken about in a public debate on the practice of the ISPS regime. Several parties have maintained that the principle of subsidiarity is not adequately observed, and they are concerned that the RSOs have acquired a great deal of influence under the current regime. In Denmark and Sweden, for example, the harbours themselves are responsible for preparation of the vulnerability assessments.

The Port Security Regulations have been the subject of debate, since the requirements are extensive and in some areas. They are seen as difficult to combine with practical operations, and with measures resembling the regulations relating to aviation security. Claims made during the public consultation process on port security indicate that measures such as barbed wire fences around the harbour area may be counter-productive, since this may prevent the fire service and other rescue agencies from quickly gaining access to the area. Furthermore, there are no clear procedures for preventing terror from the sea into the harbour areas. Of the passengers or vehicles that arrive by sea, there is little or no control.

4.9.3 COMPULSORY PILOTAGE

Compulsory Pilotage is regulated by the Compulsory Pilotage Regulations. The compulsory pilotage requirement can be fulfilled either by using a pilot or a pilot exemption certificate. The vessels that are subject to compulsory pilotage are defined in Section 6 of the Compulsory Pilotage Regulations, which also states that certain vessels are exempt. Vessels of 70 metres or more in length, and passenger vessels of 24 metres or more in length, are subject to compulsory pilotage for navigation within the sea boundary. For vessels that carry dangerous or polluting cargo, the length limits are shorter.

### 4.10 SECURITY ACT

The purpose of the Security Act is to

1) facilitate the ability to effectively counteract threats against the independence and security of the national state and other vital national security interests,
2) maintain the legal safeguards of individuals
3) assure confidence in and simplify the basis for control of preventive security services.

The Security Act and the associated regulations specify the minimum requirements for the protection of information and objects of importance to security of the national state or its allies, or other vital national security interests. The regulations stipulate preventive measures against preparation for, attempts at and the carrying out of espionage, sabotage or terrorist actions.

The Act applies to all of the administrative agencies that are in possession of information or objects worthy of protection. In addition, the Act applies to suppliers to administrative agencies when the supplier can gain access to information or objects worthy of protection.

The Regulations relating to object security require that enterprises propose what objects are worthy of protection pursuant to the Security Act to their supervisory ministry. The various ministries must follow up the object owners that are outside of the ministries’ steering line individually. In accordance with the same regulations, the ministries are required to point out objects in their area of authority, based on the given criteria.

Objects worthy of protection shall be classified as important, critical or very critical, depending on the damage potential. Based on the classification, the objects shall be protected by security measures, which shall consist of a combination of barriers, detection, verification and reaction, which in sum are to fulfil the requirements for the classification in question.

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30 Act no. 10 of 20 March 1998 relating to preventive security services.
31 Regulations no. 1362 of 22 October 2010 relating to object security.
An object worthy of protection may be property, areas, installations or means of transport that may damage the independence or security of the state, or other vital national security interests, if exposed to a terrorist attack or sabotage. Typical objects that may be worthy of protection include production plants, infrastructure nodes, data centres, command centres, archives, places where people congregate or means of transport for key personnel or symbolic personnel.

The Security Act and associated regulations stipulate requirements that enterprises that own objects worthy of protection shall carry out risk treatment. This means that the enterprises shall define and implement security measures based on a risk assessment. The minimum requirements in the Act and regulations have been set based on an overall national risk assessment. In addition, the enterprises are obligated to carry out a risk assessment based on local conditions. Risk treatment is a process of continuous improvement. Society shall survey its assets for the purpose of establishing appropriate basic security measures through the Object Security Regulations. This means that the specialist ministries must continuously evaluate their assets and vulnerabilities and treat the risk.

Important objects must maintain their activities and functionality during times of peace, crisis and war. Precisely because the objects are important to civilian and/or military purposes, they must be secured against criminal actions or military attacks, respectively. Whoever owns the object, such as a building, is responsible for preventive security of the object. The police have the primary responsibility for securing objects against criminal acts. This applies in principle during times of peace, crisis and war. Securing important objects (such as buildings, facilities, installations and areas) against security threats can be divided into two main categories: object owner’s self-protection by preventive, defensive security measures and protection by the police or the Norwegian Armed Forces.

With regard to the protection of objects by security forces, the regime of the police is aimed to protect securing objects against criminal acts. In August 2012, instructions were adopted related to the regulations. This clarifies who is responsible for securing what objects, what the police and what the military are responsible for, particularly in a crisis. The instructions also stipulate requirements for coordination and cooperation between the police and the Norwegian Armed Forces. There are principles for the designation, classification and securing of objects by protection forces.

The Norwegian National Security Authority (NSM) is responsible for preparing and administering these relatively new regulations, which are to enhance the protection of buildings, facilities and installations against espionage, sabotage and terrorism. In accordance with the new regulations, all of the ministries shall report the most critical objects in their sectors to the NSM. The Ministry of Petroleum and Energy (MPE) has not reported objects worthy of protection to the NSM. In cooperation with the Ministry of Labour, the Ministry of Petroleum and Energy has assessed objects within the Ministry’s area of responsibility in accordance with the regulations, and this assessment was submitted to the NSM in June 2013. This assessment concludes that there are no grounds for designating objects worthy of protection in the Norwegian oil and gas industry.

In various contexts, the NSM has been critical of the ministry not desiring to point out important infrastructure and objects worthy of protection on the Norwegian continental shelf and in onshore activities. In the opinion of the NSM, Norway’s oil and gas installations are clearly vital national infrastructure that should be protected: “The Storting has determined that vital national infrastructure shall be protected, through, for example, use of the protection forces of the police and the Norwegian Armed Forces. And the oil and gas industry represents significant assets that require protection”[32].

4.11
INTERNATIONAL AGREEMENTS, STANDARDS AND GUIDELINES FOR HARBOURS

There are various international standards for safety in harbours and harbour areas. The review below does not provide an assessment of how they oblige countries or private actors. They nevertheless express technical and normative standards that should be of importance to how safety is maintained at harbours, with special focus on the role of the port authorities33.

4.11.1
ILO

Occupational Safety and Health (Dock Work) Convention, 1979
The convention has been ratified by 26 countries, including Norway. Reference is made to the convention in the former regulations pursuant to the Working Environment Act concerning dock work, cf. Section 4.4.

It primarily encompasses requirements for the working environment and safety of dockworkers with regard to loading, unloading, lifting operations, cranes, etc., as well as to fire, explosions and hazardous substances. There are also special provisions for emergency preparedness procedures.

Safety and health in ports. ILO code of practice, Geneva, International Labour Office, 2005
The standard is a comprehensive document of over 500 pages, including appendices. Primarily it is aimed at employers, but also discusses the role of the port authorities independently of this (cf. Section 2.4.1 Organisation):

The port authority, even if not directly involved in port operations, should have the overall control of the operation of safe systems of work, the promotion of a safety culture and the development of safety and health in the port. The port authority should set up a central port safety and health committee with the help of employers and portworkers for fostering the necessary cooperation between all bodies involved in port work.

4.11.2
IMO

Recommendations on the safe transport of dangerous cargoes and related activities in port areas, MSC.1/Circ.1216, 2007

The recommendations do not encompass storage over time, only transport/handling. They deal in particular with the role of the port authorities and the responsibilities related to the control of the receipt and handling of hazardous substances, including responsibility for emergency preparedness plans (Chapter 6). Delegation of the exercise of authority to the port authorities is recommended.

A separate section (Chapter 9) concerns Liquid bulk dangerous cargoes and encompasses all aspects of the loading and unloading of dangerous substances, including petroleum products (pipes, pumps, steam, ignition sources, etc.). The responsibility is assigned primarily to the dock operator and captain.

The port authority is defined as follows (Section 2.2):

Port authority means any person or body of persons empowered to exercise effective control in a port area. It should be recognised that in some countries the effective control referred to is exercised by more than one authority, which may not necessarily include the port authority in the common sense of that phrase e.g., Captain of the Port. The control should encompass safety, security and environmental protection.

The responsibilities of the port authorities are described in detail in Section 6.2 Role of port authorities:

6.2.1 The port authority should exercise control over the movement of shipping through the port area and should establish systems for the receipt of prior notification and the conditions under which dangerous cargoes may enter the port area.

33 See the full references in Appendix 1.
6.2.2 The port authority should exercise control over the shore side entry of dangerous cargoes into the port area and should establish systems for the receipt of prior notification and the conditions under which dangerous cargoes may enter the port area.
6.2.3 The port authority, where it has been empowered to do so, should make provisions to enforce the relevant part of the national legal requirements.
6.2.4 Where appropriate, the port authority should develop and enforce local port rules (by-laws) covering dangerous cargoes in the port area.
6.2.5 The port authority should, when it is within the scope of its responsibility, develop, maintain, publicize and practice, as appropriate, plans for any foreseeable emergency concerning dangerous cargoes in the port area.

4.11.3 OECD

Guidance concerning chemical safety in port areas.
Guidance for the Establishment of Programmes and Policies Related to Prevention of, Preparedness for, and Response to Accidents Involving Hazardous Substances, OECD Environment Monograph No. 118; OCDE/GD (96)39

The guidance has been developed in cooperation with the IMO, and it encompasses preventive and emergency preparedness measures, land-use planning, the environment and third-party interests. It describes responsibilities, training, steering systems, reporting, etc.

The following executive summary has been provided for the port authorities’ responsibilities:

A.2.9 Port authorities should develop and enforce local port rules, where appropriate, to address the safety of hazardous substances in port areas.
A.2.10 Port authorities should establish procedures for the transport and handling of hazardous substances within the port area, and for proper maintenance and repair operations on ships. Port authorities should be empowered to refuse cargo involving hazardous substances if it is considered to endanger health and environment, including property.
A.2.11 Port authorities should make available special facilities for handling damaged cargoes containing hazardous substances.
A.2.12 Port authorities should ensure that all users of their ports (such as berth operators) establish operational procedures for activities and events which could affect the risk of an accident involving hazardous substances.
A.2.13 Port authorities should maintain within their organisations expertise relating to the safe handling of hazardous substances.
A.2.14 Port authorities should establish control and monitoring systems to gain reasonable assurance that there is compliance with national law and with port requirements related to chemical safety, and that tampering with containers has not occurred in transit.
A.2.15 Port authorities should make regular inspections to ensure the safe transport and handling of hazardous substances in their ports.

4.11.4 ISGOTT


Industry standard/guide recommended by the IMO and prepared by:

• International Chamber of Shipping
• Oil Companies International Marine Forum
• International Association of Ports and Harbours

The document is over 400 pages long and encompasses a number of operational and managerial matters, primarily aimed at shipping activities and operators in harbour areas. Part I contains general information on the risk related to petroleum, and more in-depth information on ships and terminals/harbours. A short section on ISPS (2 pages) is included here. Part II concerns security related to ships, Part III concerns terminals/harbours and Part IV concerns management of the ship/terminal interface.

The document discusses the actual activities more than the responsibilities, and the guidelines related to harbour activities are generally aimed at the terminals without delving into the roles of the various actors (such as the port authority) particularly. Section 15 states that:

15.1 (...) Terminals should have a steering system in place, which is able to demonstrate and document proof of compliance with regulatory requirements and company policy and procedures. Terminal management should designate a person to be responsible for ensuring compliance with the regulations, company policy and procedures.
Based on the “Fjord City Resolution”, this chapter discusses the planning processes and associated assessment of risk related to the expansion and development of Sydhavna. Four major development projects of importance to Sydhavna are also discussed. The development projects are part of the national infrastructure.
PLANNING PROCESSES AND ASSOCIATED PROJECTS

5.1 FJORD CITY RESOLUTION

In December 1997, the Agency for Planning and Building Services in the City of Oslo, on behalf of the City Government, published a study on how Oslo’s harbour and waterfront could be developed in the long strategic view. During the past few decades, there had been several changes around the harbour basin that have made the time ripe for a principle decision on the use of the waterfront areas in the City of Oslo.

The study presented two different future scenarios for the development of the city’s waterfront. One of the alternatives, designated “Fjord City”, is based on a regional harbour solution, in which the cargo port will be moved out of Oslo and the waterfront areas will be freed up for urban development. The bulk cargo, ferry and cruise traffic will remain in Oslo. The other alternative, designated the “Harbour City”, is based on filling in the then existing Østhavna (East Port) and combining all of the port functions there.

In deciding between the two alternatives, Fjord City and Harbour City, the Agency for Planning and Building Services concluded the following:

«...the interests of the city and region are best protected if the City of Oslo decides to realise the Fjord City alternative, and takes the necessary initiatives relative to the central government, the affected county and municipal authorities to establish the optimal harbour solution for the region. This means that Oslo’s cargo port will be moved out of the municipality and established elsewhere in the region. Cruise and ferry traffic, as well as bulk cargo, will remain within Oslo’s boundaries. Wet bulk cargo will be moved into the underground facility. The harbour areas that are freed up will be used for urban development...».

On January 19th 2000, the City Council of Oslo adopted what was subsequently referred to as the “Fjord City Resolution”, see text box 5.1. The decision establishes future guidelines for the development of Oslo’s harbour. The decision states, among other things, that the City Council envisions phasing out container operations from the Port of Oslo (see item 2 in the decision).

The Agency for Planning and Building Services prepared a "Follow-up Programme for the Fjord City", which includes descriptions of certain sections as a point of departure for further planning, among other things. The City Council of Oslo at the meeting on May 9th 2001 adopted the follow-up plan.

The port authority’s plan of action of September 18th 2000 specifies how the harbour areas in the Port of Oslo District should be freed up for urban development or modernised for temporary relief of the existing harbour. Financing of the necessary restructuring measures is based on the sale of real estate and property development financing the necessary restructuring measures for the Port of Oslo. Sales revenue from Tjuvholmen, for example, will contribute to the modernisation of Sydhavna.

In March 2003, the Ministry of Fisheries established the company Viken Havneselskap AS, which consisted of ports around the Oslo Fjord. Viken Havneselskap AS was tasked with studying alternative harbour solutions for cargo to be transported to or from the inner parts of the Oslo Fjord. It was concluded that there should be three hubs for container traffic in the Oslo Fjord, one of which should be in inner Oslo Fjord. Sydhavna was then to be the main port for containers in the Oslo Fjord for the time being, based, for example, on the following factors:

• The owners of two-thirds of the container cargo passing through the Port of Oslo are located in Oslo or Akershus.
• The most important area for the distribution of goods is Groruddalen.
• For the near future, Sydhavna cannot be used for any purposes other than industrial and port activities due to the safety zones surrounding the existing oil terminal.

In March 2004, the Government published the National Transport Plan for the period from 2006 to 2015. The Ministry of Transport and Communications mentioned the harbour structure in the Oslo Fjord (Section 4.4.3), where reference is made, for example, to the Fjord City Resolution by the City of Oslo. Reference is also made to the study from Viken Havneselskap AS, and the identified costs of relocating the container operations. The report accordingly finds thin Sydhavna will be the main container harbour in the Oslo Fjord for the time being. In addition, the Government desires that a greater degree of cooperation to be established between the harbours in the Oslo Fjord region. It is also stated that the City of Oslo and Port of Oslo should seek good solutions for port users who want to move their operations out of Oslo.
PLANNING PROCESSES AND ASSOCIATED PROJECTS

On 19 January 2000, the City Council of Oslo adopted what has become known as the ”Fjord City Resolution”:

1. Urban development
   The City of Oslo will base its strategy for the development of the harbour and waterfront of Oslo on the Fjord City alternative. The municipality desires to free up as much of the harbour areas as possible for urban development for residential, commercial and recreational purposes.

2. Harbour development
   a. The City of Oslo finds that harbour activities and cargo handling must been viewed in a regional perspective. The municipality desires to establish cooperation with the central government, county administrations and relevant municipalities to develop a long-term strategy for regional harbour solutions. The legal foundation for such a solution should be assessed at the same time.
   b. Further development of areas linked to the handling of general cargo at the Port of Oslo beyond the current zoning plans is not desired.
   c. The municipality will facilitate continued harbour activities connected with cruise and ferry traffic, as well as for wet and dry bulk cargo operations within the boundaries of Oslo. The location of the terminal for international ferries must be studied.
   d. The Port of Oslo is requested to prepare a strategy to phase out lo-lo (crane-based) container operations at Oslo’s port.

3. Planning will be initiated for regulating the existing outdoor area of the Bekkelaget Treatment Plant for urban development purposes.

4. The City Government is requested to publish plans for the sequence and schedule for freeing up current harbour areas.

5. The City Government is requested to consider the possibility that areas, including future harbour areas that are filled in, are cleared, beautified and planted while awaiting a future use.

6. In the short term, the areas east of Akershus should be freed up. The City Government is therefore requested to intensify the efforts to free up these areas.

7. A high residential share must be ensured for Oslo’s future waterfront. The City of Oslo will pursue a focused policy to ensure that a certain share of the new residential units will be reserved for young and financially disadvantaged people.

5.2
FJORD CITY RESOLUTION AND SYDHAVNA

5.2.1
IMPACT ASSESSMENT FOR SYDHAVNA

The Fjord City Resolution entails a significant restructuring of the harbour area in Oslo in order to combine the harbour activities in Sydhavna. Sydhavna consists of the mouth of the Alna River, Kongshavn, Sjursøya, Bekkelaget and Ormsund. Ekebergåsen and the E18 motorway bind it to the east. The harbour could be a concentrated and efficient port using less area than previously. This concentration will take place by the establishment of a harbour solution with, for example, a temporary container harbour at Sjursøya, which will take of operations that previously took place at Filipstad. According to the plan, in 2015 the container harbour at Sjursøya shall also take over the container traffic that goes through Ormsund.

The handling of wet bulk cargo (petroleum products), dry bulk cargo and coastal traffic are to continue in Sydhavna. An assumption for the realisation of Fjord City is a regional harbour solution in which crane-based container traffic is moved out of Oslo.

In January 2003, the Port of Oslo as the owner prepared a report on the study programme for Sydhavna in accordance with the regulations for impact assessments. Norconsult was engaged, and the Norwegian Coastal Administration was the responsible authority. The largest planned changes consisted of rebuilding the existing oil terminal so that it would be concentrated within a significantly smaller area, and clearing vacant land in order to utilise this area as a container terminal on a temporary basis. The initiative encompasses the following major development projects within Sydhavna:
PLANNING PROCESSES AND ASSOCIATED PROJECTS

- Building a new quay front on the south side of Sjursøya
- Clearing the area within the existing quay front on the south side of Sjursøya, and making it available for a new container terminal
- Filling in between Sjursøya East Quay and Bekkelag North Quay to establish an access zone and depot for empty containers
- Cleaning up and redeveloping the Sjursøya southern terminal area.

The “Impact assessment for Sydhavna” was published in November 2003. New road access to Mosseveien is mentioned as within the scope of the initiative, in addition to the four initiatives mentioned above in the report on the impact assessment. A zoning plan for the area is being worked on, parallel to the impact assessment. In these planning documents, it is emphasised that the Norwegian Coastal Administration as the responsible authority shall approve the impact assessment, before the City Council has an opportunity to adopt the proposed regulation of the area.

In the impact assessment, a separate section discusses risk and vulnerability. It appears that there is no updated comprehensive risk analysis for the area. The risk situation in the impact assessment is based on a risk assessment of maritime transport and quay operations conducted in connection with the implementation of ISPS, while, for the operations at the oil terminal, the risk situation is based on a risk analysis conducted based on two alternative assessments of the location of the oil terminal at Sjursøya. For inland transport and activities during the construction phases, a “rough qualitative assessment of risk based on physical circumstances and expected activities” has been used.

When a comparison is made between the consequences connected to the study topic of “risk and vulnerability”, it is pointed out that the increased level of activity and the increased nearness between activities in Sydhavna will increase the vulnerability of the area. On the other hand, risk and vulnerability will be reduced in other parts of the Oslo harbour if the initiative is carried out. The discharge of oil cargo as the result of a collision between vessels has been assessed as potentially having major consequences. The study topic of “risk and vulnerability” has been assessed overall as having average negative consequences. It is worth noting that the topic of “risk and vulnerability” has been assessed as having the most negative change out of the 14 topics that have been studied, if the initiative is carried out. In other words, the impact assessment points out that risk and vulnerability will increase if the initiative is carried out.

With regard to a further investigations of risk and vulnerability, the impact assessment states that there will be a need for detailed risk and vulnerability assessments as an integral part of the planning and realisation of the initiative, and that such analyses must be included as part of the internal control of the projects (each individual project).

On May 19th 2004, the Norwegian Coastal Administration signed the final document for the impact assessment. It is evident from the final document that the Agency for Fire and Rescue Services and the Agency for Planning and Building Services believe that there is a need for a better assessment of risk and vulnerability. The Norwegian Coastal Administration refers to a dialogue that has started and must be continued in future planning, and particularly mentions the issues of access for emergency vehicles and facilitation of fire extinguishing efforts.

In the Norwegian Coastal Administration summary, it is stated that the Norwegian Public Roads Administration has undertaken to conduct a study for a new access road to Sydhavna.

Work continues based on a solution whereby the zoning plan is divided into two parts that can be dealt with separately. One part will be under the direction of the Port of Oslo and encompass Sydhavna, while the other part will encompass a new access road to Sydhavna and will be under the direction of the Public Roads Administration.

With regard to relocating the container harbour to Sydhavna, the Norwegian Coastal Administration says the following:

... Part of the reasoning for moving container operations to Sydhavna has been to free up areas near the water for urban development. This includes areas south of and north of the area of the initiative. The Norwegian Coastal Administration is somewhat concerned that this can contribute to the port being squeezed in between areas for urban development. Such a situation may place restrictions on both the port and the surrounding buildings. For the harbour, there may be restrictions on the type of cargo that can be transported through the port section, as well as restrictions stemming from new safety directives. For the surrounding buildings, if they are located too close to the harbour there may be restrictions on what areas can be built on at all, and possibly on what type of buildings can be permitted.

The Norwegian Coastal Administration approved the impact assessment on the condition that the Port of Oslo follow up the guidelines for mitigating measures and the requirements for follow-up investigations. These are described in detail in Section 5.3. It is specified that the impact assessment and the final document shall be used as the basis for dealing with matters pursuant to the Planning and Building Act and other special laws.
In order to contribute to the national goal of shifting a greater part of cargo from road to sea and rail transport, Sydhavna shall be further developed on a permanent basis as Norway’s largest national port. The intention is to establish Sydhavna as Oslo’s permanent port, and to transfer all of the container operations to Sydhavna. A new access road from the main road network would be dealt with in a separate plan with its own impact assessment. The Norwegian Coastal Administration concluded that the new proposed regulation did not trigger a requirement for an impact assessment.

Four alternative zoning plans were prepared for Sydhavna during the process. There were two separate consultation processes for Alternative 1 (from the Port of Oslo) and 2 (from the Agency for Planning and Building Services), as well as Alternative 3 (from the Port of Oslo) and 4 (from Department of Urban Development). Alternative 3 was adopted by the City Council. This alternative consisted of the following main elements:

- In the northern section near the mouth of the Alna River, parts of the area will be regulated for residential housing, some commercial activities and some public functions. The buildings in Bjørvika – Bispevika – Lohavn will end in the section north of the mouth of the Alna River. This area will also be regulated for recreational activities, culture and maritime activities for smaller boats (charter boats and service vessels).
- In the area between the mouth of the Alna River and Kongshavn, some of the area will be set aside for the development of a heating plant.
- Further south, the Kongshavn area will be regulated for port activities with a potential for a significant expansion of the quay.
- Sjursøya will be regulated primarily for port activities, with expansion of the quay on the northern side. The zoning plan, "Sydhavna, a new container terminal", adopted on 13 October 2004, is included as part of the proposed plan.
- Provisions will be made for a 360 m long rail terminal with a double track for the handling of container cargo at the Bekkelag South Quay.

The City Council adopted Alternative 3 on 26 August 2009 as the current zoning plan for Sydhavna. In connection with the decision, the City of Oslo stated that Sydhavna would be Oslo’s permanent industrial port.

The Port of Oslo’s "Harbour Plan for 2013 to 2030, Port of Oslo – Gateway to Norway" (Havneplan 2013–2030, Oslo Havn – porten til Norge) makes provisions for increasing the capacity of the container harbour in Sydhavna. One of the initiatives in the strategy to meet the increasing volume of cargo is to "Expand the container harbour at Sjursøya to a capacity of up to 450,000 TEUs, more than double the current volume".

**ZONING PLANS FOR SYDHAVNA**

Parallel to the work on the impact assessment for Sydhavna, the Port of Oslo distributed proposed a zoning plan, “Sydhavna, a new container terminal”, for public hearing. The proposal entailed the construction of a new quay on the south side of Sjursøya, filling in the bay between Sjursøya and Bekkelag North Quay, and some filling in on the far west end of Sjursøya. These initiatives resulted from the Fjord City Resolution to free up centrally located harbour areas for urban development. The container operations at Filipstad and Ormsund were to be transferred temporarily to Sjursøya until a regional solution was established. In addition, the proposal contained a new exit from Mosseveien to Sydhavna. A new station for filling aviation fuel was proposed on a separate sidetack along the new port track, without crossing Havneveien.

During consultation of the proposal, the Public Roads Administration and County Governor of Oslo and Akershus concerning the exit from Mosseveien to Sydhavna voiced objections. Based on these objections, the Agency for Planning and Building Services in the City of Oslo prepared a proposal that only facilitates filling in on Sjursøya as an intermediate solution until the exit to Sydhavna has been clarified. The proposal was designated Alternative two.

Alternative two was presented to the Public Roads Administration and the County Governor of Oslo and Akershus, and they accepted this proposal on the condition that a new access solution to Sydhavna had to be regulated and established before a new container harbour could be implemented at Sjursøya. The City Government concurred with these prerequisites and formulated an Alternative 3, which took into account the wishes of the Public Roads Administration and County Governor. Alternative 3 in the proposed regulation for “Sydhavna, a new container terminal” was approved separately as a zoning plan with associated planning regulations on October 13th 2004.

Work on the zoning plan for Sydhavna commenced in 2005. The zoning plan, “Sydhavna, a new container terminal”, which was approved in 2004, was limited to developments on Sjursøya. It became apparent that there was a need for one comprehensive zoning plan for all of Sydhavna. The purpose of the new zoning plan under preparation was to facilitate:

- sufficient harbour areas
- quays of a satisfactory standard, depth and length
- buffer zones in the northern and southern parts of the harbour area
- modern, uniform planning regulations.
5.3
RISK AND VULNERABILITY ANALYSES CONNECTED TO THE PLANNING

5.3.1
IMPACT ASSESSMENT’S RISK AND VULNERABILITY ANALYSIS

In connection with the preparation of a zoning plan for Sydhavna, the Norwegian Coastal Administration decided that there was a need to prepare an impact assessment. The report, “Impact assessment for Sydhavna” has been divided into 15 different topics concerning the consequences of carrying out the initiative.

The consequences related to the oil terminal are discussed as part of the topic “Consequences for urban development and development pattern”. The restrictions concerning the safety zones around the oil terminal are pointed out here. This means that it will not be permitted “(...) to build near the oil terminal without demonstration of specific needs, risk analysis and cost/benefit analysis. In practice, this will mean that Sjursøya, the southern part of Kongshavn and parts of the Bekkelag Quays/Kneppesjær may only be used for port purposes or certain forms of commercial activity as long as the oil terminal is located there”. The oil companies have an agreement to use the oil terminal until 2064, and no political decision has been made or signals given to relocate the terminal.

The topic of “risk and vulnerability” is discussed in a separate section: “Risk and vulnerability assessment”. The methodology that has been used is based on an analysis of six different incidents that can result in loss of health, environment and societal assets. Changes to the risk and vulnerability situation if the initiative is carried out are studied. The changes are subject to assessment. Change is defined as the difference in risk between the zero alternative (maintaining the handling of cargo and containers at both Filipstad and Sydhavna extrapolated to 2011) and risk in carrying out the proposed initiative. The assessments are based on a set of quantified assumptions.

The following six incidents have been assessed:

- Injury to persons because of a collision between a large ship and a leisure boat.
- Discharge of oil cargo as the result of a collision between vessels.
- Discharge of gas from a tank container because of a handling error on the quay.
- Acute discharge of steam from a tank container because of a transport accident, ignition.
- Acute oil pollution as the result of an accident during the construction period.
- Collision between heavy vehicles and trains with ignition of the cargo (during the construction period).

Due to increased maritime traffic on the stretch between Sydhavna and Nesodden, the scenario “discharge of oil cargo as the result of a collision between vessels” has been assessed as the scenario that entails the greatest risk if the initiative is carried out. The scenario is considered to have potentially major consequences for society, while the probability was assumed moderate.

Based on the risk analysis, the following risk-reducing measures have been proposed as relevant:

- Steering of the traffic in the Sjursøya South area. The nearness of the tanker pier and new container terminal creates a need for revision of the port regulations. The establishment of special routines for vessels carrying dangerous goods, and manoeuvring in the nearness of vessels carrying dangerous goods, should be considered.
- Traffic monitoring measures that ensure good, safe traffic monitoring in Sydhavna, new tools and procedures for the VTS (vessel traffic service) station adapted to the new traffic conditions in the area.
- Environmental monitoring, such as IR-based or radar-based detection of oil pollution at sea, regardless of the light and visibility. Can also be used for traffic steering purposes.
- New navigation beacons and changes to the existing navigation seamarks – this particularly applies to Tangflua, Langskejfareflua and Nordre Langøygraben.
- Permanent tugboat preparedness in Sydhavna.
- Adjustment of the level of preparedness for acute pollution, both with regard to the change in risk, organisation and planning work, as well as the localisation and dimensioning of emergency preparedness equipment. The emergency preparedness plans should include undesired incidents that entail acute contamination of the ground, air or water, as well as fire and explosions.
- Risk-reducing measures during the construction phase have been identified by means of a separate analysis.
- HSE and risk management as part of the planning and implementation of the initiative.
- Regular emergency preparedness exercises.
With regard to "undesired incidents", it is said that moving activities from other parts of the Port of Oslo and concentrating them in Sydhavna will entail a greater intensity in activities and increased nearness between activities. These conditions will increase the vulnerability in Sydhavna: "Important governing factors with regard to vulnerability in Sydhavna include the proximity to important transport arteries and large population concentrations, the oil terminal’s strategic role in the supply of energy to the capital and the region, as well as the fact that activities that involve dangerous goods take place in the immediate proximity of other port activities”.

In the "Impact assessment for Sydhavna" 15 different topics are studied. One of these topics is “risk and vulnerability”. The study concludes that if the initiative is carried out (in other words development as proposed for Sydhavna), the consequences related to "vulnerability and risk" represent the greatest negative consequences of the 15 topics that have been studied. "Risk and vulnerability" will in other words be worse after the development of Sydhavna.

5.3.2 ZONING PLANS’ RISK AND VULNERABILITY ANALYSES

In the proposed zoning plan, “Sydhavna, a new container terminal” adopted in 2004, reference is made to the impact assessment prepared by the Port of Oslo as the owner. Work on the impact assessment took place in parallel with the proposed zoning plan. Most of the topics and consequences that are mentioned in the impact assessment will also be consequences that apply to the planning proposal. Some of the consequences are accounted for in particular in the planning proposal.

The proposed zoning plan “Sydhavna” adopted in 2009 also refers to the impact assessment prepared in 2003. In addition, topics concerning the mouth of the Alma River are included in the planning proposal. Reference is also made to “Evaluation of the Domino Effects between the Container Harbour and Oil Terminal at Sjursøya” prepared in 2006 and “Risk Analysis of Sjursøya Oil Terminal” from June 2007. These risk analyses are discussed in Chapter 6.

The planning regulations adopted for “Sydhavna” include requirements for

• Water and surface water: Together with the application for a permit, a plan shall be submitted for the handling of surface water to prevent any undesired incidents on the quays or storage areas resulting in contamination of the sea.
• Documentation requirements in the building development plan: A safety analysis shall be conducted for ship collisions, and mitigating measures shall be described. If these measures are performed locally, they shall be included in the building development plan.

In the northern part of the development area that borders on Bjørvika, a ship impact wall shall be built to protect the buildings located within.
ASSOCIATED PROJECTS OF IMPORTANCE TO SYDHAVNA

5.4
THE FOLLO LINE PROJECT

“The Follo Line Project” involves the construction of a new 22 km double railway track from Oslo Central Station to Ski. A majority of the stretch will be inside a 19.5 km long tunnel with two separate tunnel bores to achieve safe and efficient traffic steering. In addition, the project will also encompass significant construction work at the Oslo Central Station and construction of a new station at Ski. The technology that is to be used to bore the tunnels is so-called TBM technology. This technology entails boring by means of a tunnel-boring machine, lining the tunnel with prefabricated concrete elements, and injection of a cement mixture between the concrete elements and the rock face to secure the rock, provide water and frost protection. In addition to the actual boring with TBM, escape routes will be blasted between the two tunnels bores every 500 metres.

The reason for the “Follo Line” development project is the fact that the Østfold Line is already operating at full capacity. At the same time, population growth of at least 30 per cent is expected in the area by 2025. To create positive development in the region, there is a need to better connect the residential and working areas together. In addition, there is a political desire to shift the transport of cargo from road to rail transport. The project is Norway’s largest transport project. The main work is scheduled to commence in 2015, and it is scheduled for completion in 2020.

An impact assessment has been conducted with the Norwegian National Rail Administration as the owner. This was approved by the Ministry of Transport and Communications in March 2012. The City Council of Oslo approved the zoning plan for the part of the Follo Line that is in the City of Oslo on 28 August 2013. The planning regulations require, for example, the establishment of a 12 m safety zone around the tunnel.

With regard to the activities related to Sydhavna, the fuel depot in Ekebergåsen is affected in particular by the project. One of the tracks of the Follo Line will pass very close to some of the cisterns in the fuel depot. There is some uncertainty concerning the exact location of the cisterns. The exact distances between the existing cisterns and the planned tunnel bores are therefore uncertain. There is a tunnel between the tank depot and Ryen current acts as an escape route for the fuel depots. In the tunnel, there is also a pipeline and supply of water to a water curtain that prevents the migration of petrol vapour between the cisterns. For safety reasons, it is especially important to maintain the water curtain in particular. Structural measures have been planed to maintain the current functions in the tunnel to Ryen.

In addition to the routes for the railway tracks to Follo, there will be a need to place parts of the existing tracks for the existing Østfold Line in a tunnel at the northern part of Sydhavna. Conventional blasting technology will be used here. This tunnel will be located very close to three of the access tunnels to the fuel depot.

Both the Norwegian National Rail Administration and the oil companies have conducted risk analyses to determine the risk associated with the fuel depot when accomplishing the project. The identified critical risk is linked, among other things, to:

• Product pipes and water pipes to and from the cisterns
• Installations for monitoring and operations, including power supply, control room equipment, pumps and technical equipment
• Maintenance of the water curtain and satisfactory groundwater regime around the storage halls.

Between the Norwegian National Rail Administration and the oil companies, there is a dialog to find solutions that ensure the treatment of risk in a satisfactory manner.

During the construction period, there will be a need to remove significant volumes of rock material. In this connection, a rigging and construction area will be established at Sjursøya and Bekkelaget. It is uncertain whether there will be a need to use the area at Bekkelaget. The removal of rock material during the construction period will entail a major traffic impact in the area. It is estimated that this period will last up to 3 ½ years.
The development at Bjørvika and the need to improve the capacity to handle and treat wastewater in the central eastern districts of Oslo is the starting point for the City of Oslo’s “Midgardsormen” project, which is under the Agency for Water and Sewerage Works. It is expected that the development will result in improved water quality in the Akerselva River, in the inner harbour basin and in the Oslo Fjord. The project consists of constructing a new deep main sewer line for the collection of wastewater that is led from the central eastern districts of Oslo to Gamlebyen and further in a two-kilometre long inlet tunnel to the Bekkelaget Treatment Plant. The wastewater is pumped up to the Bekkelaget Treatment Plant for treatment. Treated wastewater is led out at a depth of 50 metres into the Bekkelag basin. In addition to acting as a transport tunnel, the tunnel through Ekebergåsen will also act as a 50,000-m² retention basin to even out the load for the treatment facility at Bekkelaget in the event of high rates of flow, in connection with periods of high rainfall, for example.

The City Council of Oslo adopted the zoning plan for the sewerage tunnel from Gamlebyen to Bekkelaget on 29 January 2010. In connection with the tunnel to Ekebergåsen, the establishment of a safety zone with a distance of ten metres in all directions around the tunnel has been adopted in the zoning plan.

The tunnel through Ekebergåsen from Gamlebyen to Bekkelaget is approximately two kilometres long, has a cross section of 37 m² and transports the wastewater by gravity. The oil depots in Ekebergåsen are located approximately 70 metres west of the sewerage tunnel. A rough risk analysis was prepared prior to the start, in which the two scenarios “damage to the oil depot as a result of a lowering of the ground water” and “damage to an oil pipe not in use as a result of blasting (vibration)” were discussed with regard to their probability and consequences. The probability of damaging the oil pipe was found to be very high since a distance of 1 meter was calculated in advance. In connection with the construction work, there was contact with the tunnel between Ryen and the oil depot. In one instance, the work had to be stopped when vibrations arose in the pipes connected to the fuel depot. Changes in the groundwater have not been observed after the tunnel was established.

Development in connection with Midgardsormen is scheduled to commence during 2014.

The Bekkelaget Treatment Plant handles the wastewater that arrives through the tunnel in Ekebergåsen. The designed capacity of the treatment facility is 270,000 population equivalents. When Midgardsormen is introduced, this capacity will increase to 490,000 population equivalents. This need is expected to arise in 2030. Biogas is produced as part of the treatment process. Biogas production is currently 3.5 MNm³/yr, and this capacity is expected to increase in step with the future expansion of the treatment facility. Starting in 2010, biogas produced at the Bekkelaget Treatment Plant was treated and upgraded to biomethane. This is currently used as fuel for buses in the Oslo region. Biogas corresponding to 8-10,000 litres of diesel oil per day is supplied by the facility.

Since the opening of Oslo Airport Gardermoen in 1997, there has been strong growth in air traffic. In 2010, 19 million passengers passed through the airport and then exceeded the traffic volume that it was originally dimensioned for. In January 2011, Avinor approved the expansion of Gardermoen to a capacity of 28 million passengers per year, and this expansion is scheduled for completion in 2017. A Phase 2 is being planned, with a further expansion to 35 million passengers per year, and this phase is expected to commence around 2023 based on the current traffic forecasts.

All of the aviation fuel that is used at Gardermoen is transported from Sydhavna by rail. The train has a set of custom-built tank wagons. CargoNet is responsible for the operation of the train. Oslo Lufthavn Tankanlegg is responsible for the loading operations in Sydhavna and the unloading operations at Gardermoen. DSB previously granted permits for these two transfer operations. Norske Shell, Statoil, Esso, Total and SAS Oil own Oslo Lufthavn Tankanlegg in equal interests. Before the establishment of a new main airport at Gardermoen, the alternatives pipeline, train and road transport were considered for the transport of aviation fuel. After a closer assessment of the costs and technical feasibility, the choice was between transport by train or road. Based on environmental and safety concerns, transport by train was chosen.

With the current consumption at Gardermoen, an average of nine trains a week go from Sydhavna to Gardermoen. A capacity increase from 20 million passengers in 2012 to 28 million passengers in 2017 entails a corresponding increase in the number of trains, which means an increase to approximately 13 trains on average, with the associated variations with regard to periods with a higher frequency.

Today the loading takes place near the filling-rack for tank-trucks in Sydhavna. The zoning plan “Sydhavna, a new
PLANNING PROCESSES AND ASSOCIATED PROJECTS

FIGURE 5.1 Improvement of the fairway in the Oslo Fjord, Søndre Langåra.
container terminal” from 2004 included the construction of a new filling-rack for the transport of aviation fuel by rail to Gardermoen. The construction of the new filling-rack was envisioned to be placed further north than the current filling-rack. This has a safety advantage, since the filling operation can take place on a separate track. Operationally, it will also be an advantage since there will be a greater degree of flexibility and independence relative to the other activities in Sydhavna.

The establishment of a new filling-rack has been postponed, pending completion of the Public Roads Administration’s project “New Access Road to Sydhavna”. The area intended for a new filling-rack is planned to be used for the rigging and construction area for the establishment of a new access road to Sydhavna, and thereafter used as the rigging and construction area for the Follo Line. The project for the new filling-rack for the aviation fuel train has therefore been postponed and is estimated now to commence in 2020–2021, after the Follo Line no longer has any need for a rigging and construction area.

5.4.4 UPGRADE OF FAIRWAY TO OSLO

The fairway for commercial traffic to Oslo is one of the most trafficked fairways here in Norway. There are ships on their way in or out on this fairway at any given time. There is extensive local ferry traffic here, particularly between Nesoddtangen and the quay by Oslo City Hall. Especially in the summer months there are many sightseeing boats and a large number of cruising boats that traffic this fairway. A simple and clear lane for commercial traffic is important to maintain the highest level of safety at sea. The fairway that is involved in the proposed improvements affects the City of Oslo and the municipalities of Nesodden and Bærum.

There is a tendency for increased size of ships. This means that the number of calls will decrease somewhat, while the tonnage remains quite stable. Today, some ships with larger draughts must follow a different fairway than smaller ships use to the Port of Oslo due to the depth conditions. This may entail a greater risk of conflicts between ships.

The approach to Oslo requires a great deal of knowledge about the fairway. Larger ships that sit deeper in the water must take into account the depth restrictions in the fjord, and therefore they must navigate more turns. Larger vessels can also be exposed to strong side winds in certain locations. The Navigation Regulations regulate navigation, including with regard to oncoming traffic, visibility, daylight and pilot requirements, and the possible use of tugboats.

The planned area for improvement of the fairway stretches from Langåra in the south, along Nesodlandet and into the Port of Oslo. North of Nesoddtangen the fairway divides toward the relevant facilities for passenger and cargo ships in the Port of Oslo.

The large cruise ships have the greatest length and breadth, while the tankers to Sydhavna have the greatest draught. Cruise ships can have a length of 360 metres and a breadth of 45 metres, with a draught that is normally up to 10 metres. The largest tankers have a draught of up to 12 metres.

From Langåra in the south to Nesoddtangen in the north, all these ships share the same fairway. After passing Nesoddtangen, the passenger ships go approximately straight ahead and into Dynaløpet, while the cargo ships turn towards the northeast and pass between Rambergoya and northern Langoya into the various port facilities in Sydhavna. At present, no exact calculation has been made of the dimensioning of the fairway after improvement. However, a general improvement has been proposed with a minimum depth of 14 metres and a minimum breadth of 180 metres for the common fairway west of Nesodden and the fairway for cargo traffic to Sydhavna. A maximum depth of 12 metres will be required through Dynaløpet to the passenger terminals.

In addition, to making the fairways deeper, the improvements will also straighten the fairways so that there is lesser need for course changes.

The properties of the seabed vary. The improvement work will therefore encompass both blasting work and dredging. The improvement of the fairway will result in simpler, safer and more predictable navigation than at present. This applies primarily to the largest ships. It will also entail that all the ships going in the same direction will consistently follow the same fairway, and that the separation zones will function consistently for all vessels over a certain size. Improvement of the fairway will also encompass new navigation beacons.
5.5
SUMMARY

When the development of the waterfront in Oslo was chosen, it was essentially a choice between the two scenarios the “Fjord City alternative” and the “Harbour alternative”. In 2000, the City Council of Oslo adopted a direction based on the “Fjord City alternative”; provided that a regional solution for the container operations could be found with a view to move these operations out of the harbour area. This was not possible, and Sydhavna will be the container harbour for inner Oslo Fjord for the foreseeable future. The ambition is to double this capacity during the period from 2013 to 2030. The earlier container operations at Filipstad, current container operations at Ormsund and future growth will be concentrated at Sjursøya. The impact assessment of 2003 that addressed the development of Sydhavna was based on temporary container operations in Sydhavna. The impact assessment’s risk and vulnerability analysis was based on assumptions other than what has been realised.

In the impact assessment, “risk and vulnerability” was assessed as being the topic where the effect of the concentration of container operations in Sydhavna would have the greatest negative effect. In the impact assessment’s risk and vulnerability assessment, the scenario “discharge of oil cargo as the result of a collision between vessels” was assessed as being the most critical scenario. An increase in container operations will increase the risk of this scenario. No overall assessment has been made of the impact assessment’s proposed risk-reducing measures, which was one of the requirements when the Norwegian Coastal Administration approved the impact assessment for Sydhavna in 2004.

Major national infrastructure projects are being carried out that will have consequences for Sydhavna. In particular, the establishment of the “Follo Line” will entail traffic-related challenges for Sydhavna in connection with the construction of the railway tunnel through Ekebergåsen during the construction period from 2014 to 2020.
Sydhavna consists of various types of enterprises that have different risk potentials. The activities connected with the petroleum activities at the oil terminal and underground storage facility are regarded as representing the main point with regard to risk. The petroleum activities in Sydhavna are characterised by being oriented towards logistics and the flow of materials. There is no process-related treatment of products at high pressure or high temperatures. Operations related to the unloading of ships, filling of tank-trucks, filling trains with aviation fuel and transport in pipelines represent operations that experience has shown to be risky.

This chapter reviews relevant documentation that overall provides a picture of the risk factors in Sydhavna as the port stands today. It encompasses various risk assessments/analyses that have been conducted in various contexts and are fully or partially relevant to the activities in Sydhavna. Only the analyses that are considered the most relevant are discussed. In addition, findings from audits, incident statistics, some selected serious incidents, and views on risk factors from actors located in Sydhavna are discussed.
ASSESSMENTS OF RISK AND RISK MANAGEMENT

6.1 RISK ANALYSES CONDUCTED

6.1.1 RISK AND VULNERABILITY ANALYSES: COUNTY GOVERNOR OF OSLO AND AKERSHUS AND THE CITY OF OSLO

The risk and vulnerability analysis conducted by the County Governor of Oslo and Akershus (revision of 2010) is based on general thinkable incidents that may arise. None of the incidents mentions Sydhavna in particular. The types of incidents that are the most relevant to Sydhavna/Sjursøya are the “maritime accident”, “railway accident” and “accidents involving dangerous goods” scenarios.

The risk and vulnerability analysis conducted by the City of Oslo (version 2.2-2013) is correspondingly based on incident categories. The main categories are “fire”, “explosions” and “health/environment: Dangerous goods discharges” are the incidents that are considered the most relevant for the activities in Sydhavna. Challenges related to the storage of hazardous substances at Sjursøya, transport of dangerous goods through central Oslo, maritime traffic to Sydhavna and the transport of aviation fuel to Oslo Airport Gardermoen are factors that are included in the analysis.

The City of Oslo has informed that the project “Sydhavna (Sjursøya) – an area with increased risk” may provide additional input to the risk and vulnerability analysis for the City of Oslo.

6.1.2 RISK ANALYSES IN CONNECTION WITH THE PETROLEUM ACTIVITIES

Many risk analyses have been prepared for the petroleum activities in Sydhavna. Most of them have been prepared in connection with the process when preparing applications for storage of hazardous substances.

The criteria for risk related to fire and explosion protection are in accordance with the Norwegian regulations, based on the ALARP principle (As Low As Reasonably Practicable). For the petroleum activities in Sydhavna, two quantitative risk analyses have been prepared. Criteria that are commonly used in the Norwegian oil and process industry are used as acceptance criteria for risk. Reference is made to Statoil’s and Norsk Hydro’s maximum limit for individual risk (death) to third parties (persons outside the company’s facility that can be affected by the company’s activities) of $1 \times 10^{-6}$ per year. When the risk lies between $1 \times 10^{-6}$ per year and $1 \times 10^{-7}$ per year, it is within the ALARP range. All the possible risk-reducing measures shall be identified within this range, and implementation shall be considered after a cost benefit evaluation (See Chapter 2).

Scandpower AS and A-Tek AS on behalf of the Port of Oslo have prepared the New Sjursøya Oil Terminal Risk Evaluation of August 2000. The analysis addresses risk related to localisation of the oil terminal on the western or eastern part of Sjursøya. The two alternatives are evaluated against each other in a quantitative risk analysis. The report concludes that localisation of the oil terminal on the western part of Sjursøya gives the lowest level of risk to third parties, with pipelines placed in a culvert between the oil terminal and the underground storage facility.

The risk analyses were conducted based on the assumption that the risk-reducing measures were implemented in this process section. Laying the pipelines between an oil terminal on western part of Sjursøya and the underground storage facility represented a significant risk factor, but an effective risk-reducing measure would be to put the pipelines in a culvert. The risk evaluation also showed that there was a very high level of risk associated with the operations at the tank-truck filling-racks. The current oil terminal is located on the eastern part of Sjursøya, and the western part has been closed down.

The Risk Analysis of Sjursøya Oil Terminal of June 2007 prepared by Scandpower AS on behalf of the companies Statoil, Shell and YX Energi covers all of the installations in connection with the oil companies’ outdoor fuel depot, filling-racks for tank-trucks and the associated pier. This analysis was prepared on the orders of DSB. Nine scenarios at the pier, fuel depot, vapour recovery unit for petrol vapour, pipelines to and from the underground storage facility and the tank-truck filling-rack were analysed with regard to their probability and consequences. Collisions between tank-trucks were also evaluated.

The following incidents are regarded as implying the highest risk for the death of a third party:

- rupture of an unloading arm on the oil pier
- leaks from tank-truck filling-rack
- leaks from tank-truck filling-rack manifold
- leaks from the import pipeline between the oil pier and fuel depot in Ekebergåsen
- explosion in a tank-truck during filling
A plot of various risk contours (death risk for third parties) has been prepared; see figure 6.1. The risk analysis concludes that the risk is acceptable compared with the acceptance criteria.

The report indicates ten measures for the further reduction of risk.

Based on the feedback from Shell and Statoil, it appears that most of the proposed measures have been accepted.

Some of the measures have been implemented, while the implementation of other measures has been planned.

Scandpower AS on behalf of Statoil Norge AS prepared the Risk Analysis of Ekeberg Tank for Statoil Norge AS of April 2010. It addresses Statoil’s activities within the actual underground storage facility in the part that is controlled by Statoil, as well as the oil separator that is located at Sjursøya. This is a qualitative analysis based on a guide prepared by Scandpower.
for Statoil with associated acceptance criteria and probability and consequence criteria. Here an analysis was conducted of 24 identified risks, which were in turn divided into 47 different scenarios. These scenarios were assessed with regard to their probability and consequences. Risk-reducing measures were proposed for 22 out of the 24 identified risks. None of the 47 scenarios was in the red zone, and seven were in the yellow zone. This means that a cost benefit evaluation should be made.

The following were in the yellow zone:
- personnel exposed to oil splatter when taking samples
- acute illness of personnel who are alone inside the facility
- incident at the facility resulting from inadequate maintenance
- incident at the facility resulting from low staffing, personnel are exposed to vapour and/or oil splatter when replacing/repairing pumps in the cisterns
- faulty low level sensor for the leakage water pump in one of the cisterns resulting in a discharge into the sea
- small leak in the pipeline inside the facility

Scandpower AS prepared the Risk Analysis of Ekeberg Oil Storage of February 2011 for Ekeberg Oljelager DA. Like the “Risk Analysis of Ekeberg Tank”, this is also a qualitative analysis, and the same methodology has been used. This analysis is also based on Scandpower’s guide with stipulation of acceptance criteria and consequence and probability categories, prepared for Statoil. A total of 22 risks and 38 associated scenarios were identified. None of the scenarios were in the red zone, 13 of the scenarios were in the yellow zone, with a need to assess risk-reducing measures based on a cost benefit evaluation. The following scenarios were assessed as entailing the highest risk:

- Rupture of A-liquid pipeline inside the facility resulting in a leak that ignites
- Acute illness of personnel who are alone inside the facility
- Uncontrolled water penetration in the facility resulting in overfilling of the cisterns: Overfilling of a cistern that results in a leak and fire
- Fastening device that fails due to material fatigue, and this entails leakage of A-liquid from an import pipe inside the facility
- Small leak in an A-liquid pipeline inside the facility
- Small leak in an B/C-liquid pipeline inside the facility
- Overfilling of cisterns that results in a leak that ignites
- Level too low in a cistern
- Expansion of a pipeline results in a rupture/leak in the pipeline inside the facility: Rupture of A-liquid pipeline inside the facility resulting in a leak that ignites
- Loss of air pressure resulting in leaks in the form of overfilling, for example, due to valves that remain in the non-safe position
- Unauthorised individuals who again access to the administration building and tamper with the PLC-system
- Rock blasting that results in a rupture/leak in the pipeline inside the facility: Rupture of A-liquid pipeline inside the facility resulting in a leak that ignites
- Earthquake that results in a rupture/leak in the pipeline inside the facility: Rupture of A-liquid pipeline inside the facility resulting in a leak that ignites

Scandpower AS on behalf of Oslo Lufthavn Tankanlegg prepared Risk Associated with Loading and prepared Unloading Aviation Fuel from Railway Wagons on the Gardermoen Line of February 1997. The analysis is a supporting document for the establishment of a loading station on Bekkelag Quay. The results from the analysis show that only the discharge of aviation fuel to the ground has been identified as a scenario with a significant risk level. The analysis showed that due to ground conditions, a discharge would reach the groundwater, the seawater level, and measures must be implemented to keep the oil within a small area. Then it can be collected and removed, either on the surface or within a limited area of the fill material.

CargoNet prepared Risk Analysis of Extended Operating Hours for the Port of Oslo – Sjursøya of February 2007. The analysis addresses the challenges of the increase from one to two trains full of aviation fuel from Sydhavna to Oslo Airport Gardermoen on weekdays. This is a qualitative analysis using CargoNet’s acceptance criteria. Five scenarios were assessed, and three risk-reducing measures are recommended. The risk has been assessed as consisting of collisions between trains and vehicles if the train runs a red light, or if the vehicle has run a red light and the booms are down.

Evaluation of the Domino Effects between the Container Harbour and Oil Terminal at Sjursøya of September 2006, prepared by Scandpower AS and A-TEK AS on behalf of the Port of Oslo. The goal of the analysis is to identify whether there are incidents at the container harbour that can affect the oil terminal. The analysis is qualitative. Here the guide prepared for Statoil by Scandpower also was used to identify the consequence and probability categories. Eleven scenarios that include dangerous goods were assessed. Six scenarios are in the yellow zone, and the others are in the green zone. The scenarios in the yellow zone have been assessed more thoroughly with regard to their consequences. The analysis concludes that accidents related to explosives may represent a threat to the oil terminal. In addition, it concludes that a gas leak from the container harbour will not result in material damage that will escalate the incident and result in a domino effect. The report made four recommendations. The establishment of a common warning and response system for the enterprises at Sjursøya was one of the recommendations. The following scenarios were assessed as entailing risk:
• bulk container falling during unloading from a ship
• class 1 goods (explosive substances and objects) fall from a crane during unloading
• collision between two trailers resulting in leakage
• crane knocks over a bulk container that is stored
• fire (flames) cause a neighbouring tank to heat up and explode (BLEVE), because it cannot be cooled down.

6.1.3
OBJECT SECURITY AND RISK ANALYSES – INTERNATIONAL SHIP AND PORT FACILITY SECURITY (ISPS)

Vulnerability analyses: Recognised Security Organisations (RSO) prepare vulnerability assessments and security plans in accordance with the Port Security Regulations. Port of Oslo has ordered new risk and vulnerability assessments from NorConsult, which is an approved RSO. These assessments have been submitted to the Norwegian Coastal Administration for approval. The assessments are classified and will not be subjected to review in this report.

In addition, regular threat assessments concerning the maritime threat are prepared. These threat assessments are limited to assessing the threat from terrorists, and they are assessments that address terrorist organisations that are known to aim at attacking oil installations, etc. The Norwegian Police Security Service (PST) writes general threat assessments for onshore facilities, oil installations and harbour areas (maritime assessment).

Most of the emergency preparedness plans for the various actors in Sydhavna include protection and implementation of measures for their own protection against terrorist actions. These plans are classified pursuant to the Security Act. The Disaster Planning and Emergency Preparedness Unit of the Oslo Police District has emergency preparedness plans for Sydhavna. These plans are included in the planning for key objects – in which what is critical and vulnerable is defined and planning is based on what is the most critical to protect.

A threat assessment concerns the intentions and capacity of various actors. An intention is defined as the willingness and motivation terrorists may have to carry out an attack. Capacity refers to the ability of terrorists to carry out an attack. The current threat assessments, which are prepared by the Norwegian Police Security Service (PST) and the police, often concern who represents a threat and what these actors seek to attack. At present there is no assessment of any threat against Sydhavna in particular. In addition, no imminent or specific threat against Sydhavna has been identified either.

Object security: Deliberate, malicious actions, such as industrial espionage, theft, terrorism or sabotage, nevertheless represent genuine threats and new security challenges. Cost-effective measures require risk-based approaches through effective management of security work. Good risk assessments are the foundation of good security. The basic questions are what security is intended to protect, why, against whom and how. Value estimations are often of great importance to this work. A value estimation is a systematic assessment of the consequences of the resources (assets) being negatively affected by undesired deliberate actions. This is accomplished through surveying and ranking the assets of the enterprise in order to identify which are so important that they must be protected. When an object or enterprise is defined as being worthy of protection, it falls under the Object Security Regulations.

Since no objects in the Norwegian petroleum industry have been reported as worthy of protection, there is no value estimation of Sydhavna either. As mentioned in Section 4.10, there are reasons to question why this has not taken place.

Both the Norwegian National Security Authority (NSM) and actors in the sector generally express that the risk to objects in this sector indicate that they should be assessed as worthy of protection.
### 6.1.4 RISK ANALYSES: OVERVIEW AND ORGANISATION

Table 6.1 provides an overview of the activities in Sydhavna and Ekebergåsen that are encompassed by the risk analyses that have been referred to.

**Table 6.1** The risk analyses that have been referred to, and the activities in Sydhavna and Ekebergåsen that they deal with.

<table>
<thead>
<tr>
<th>TITLE: RISK AND VULNERABILITY ANALYSIS</th>
<th>Harbour basin/anchoring area</th>
<th>Grønlia</th>
<th>Kongshavn</th>
<th>Sjursøya North</th>
<th>Sjursøya</th>
<th>Tanker pier</th>
<th>Container quay</th>
<th>Pipelines from oil pier</th>
<th>Underground facility/ET</th>
<th>Underground facility/EO</th>
<th>Oil separator</th>
<th>Pipeline to Sjursøya tank depot</th>
<th>Fuel depot</th>
<th>Pipeline to Sjursøya tank depot</th>
<th>Fuel depot</th>
<th>Vehicle/transport</th>
<th>Rail transport of petroleum products by road transport</th>
<th>Rail transport of aviation fuel</th>
<th>Filling trains for aviation fuel</th>
<th>Container terminal/handling</th>
<th>Knepeskjær</th>
<th>Ormsund</th>
<th>Accidents during construction period</th>
</tr>
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<tbody>
<tr>
<td>Impact assessment for Sydhavna</td>
<td>X</td>
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<tr>
<td>Risk and Vulnerability Analysis in Connection with the zoning plan “New Access Road to Sydhavna”</td>
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<td>Vulnerability Assessment for the Port of Oslo, ISPS</td>
<td>X</td>
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<td>Risk Assessment for the New Sjursøya Oil Terminal</td>
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<td>Risk Analysis of Sjursøya Oil Terminal</td>
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<td>Risk Analysis of Ekeberg Tank for Statol Fuel &amp; Retail Norge AS</td>
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<td>Risk Analysis of Ekeberg Oil Storage</td>
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<tr>
<td>Risk Associated with Loading and Unloading Aviation Fuel from Railway Wagons on the Gardermoen Line</td>
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<tr>
<td>Risk Analysis of Extended Operating hours for the Port of Oslo – Sjursøya</td>
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<tr>
<td>Evaluation of the Domino Effects between the Container Harbour and Oil Terminal at Sjursøya</td>
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</tbody>
</table>
Table 6.2 shows the relationship between the commissioning enterprises and the actors who have conducted the risk analyses mentioned in this chapter. As the table shows, the basis for the preparation of the analyses, with one exception, has been either a requirement connected to the administration of the regulations for permit applications, for example, or consent or requirements from the authorities in other contexts. Table 6.2 also shows that one actor has been quite dominant with regard to the preparation of risk analyses.

**TABLE 6.2** Summary of risk analyses.

<table>
<thead>
<tr>
<th>DATE</th>
<th>TITLE</th>
<th>ORDERED BY</th>
<th>PERFORMED BY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 10</td>
<td>Draft Risk and Vulnerability Analysis for Oslo and Akershus</td>
<td>County Governor of Oslo and Akershus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013 05</td>
<td>Overall Risk and Vulnerability Analysis for the City of Oslo</td>
<td>City of Oslo, Emergency Planning Agency</td>
<td></td>
<td>Requirements in the Regulations of relating to municipal emergency preparedness.</td>
</tr>
<tr>
<td>2003 11</td>
<td>Impact assessment for Sydhavna</td>
<td>City of Oslo, Port Authority</td>
<td>Norconsult AS</td>
<td>Requirements pursuant to the Regulations on impact assessments.</td>
</tr>
<tr>
<td>2008 08</td>
<td>Risk and Vulnerability Analysis in Connection with the Zoning Plan &quot;New Access Road to Sydhavna&quot;</td>
<td>Port of Oslo and Eastern Region of the Public Roads Administration</td>
<td>Asplan Viak AS</td>
<td>Requirements pursuant to the Regulations on impact assessments.</td>
</tr>
<tr>
<td>2010 10</td>
<td>Vulnerability Assessment for the Port of Oslo, ISPS</td>
<td>Port of Oslo</td>
<td>Nordic Crisis Management Maritime AS</td>
<td>Requirements pursuant to the Port Security Regulations.</td>
</tr>
<tr>
<td>2007 06</td>
<td>Risk Analysis of Sjursøya Oil Terminal</td>
<td>Statoil Fuel &amp; Retail, Shell, YX Energi</td>
<td>Scandpower AS</td>
<td>As instructed by DSB.</td>
</tr>
<tr>
<td>2010 04</td>
<td>Risk analysis of Ekeberg Tank for Statoil Fuel &amp; Retail Norge AS</td>
<td>Statoil Fuel &amp; Retail Norge AS</td>
<td>Scandpower AS</td>
<td>Part of the requirements in the Norwegian Seveso Regulation relating to safety reports.</td>
</tr>
<tr>
<td>2011 02</td>
<td>Risk analysis of Ekeberg Oil Storage</td>
<td>Ekeberg Oljelager DA</td>
<td>Scandpower AS</td>
<td>Part of the requirements in the Norwegian Seveso Regulation relating to safety reports.</td>
</tr>
<tr>
<td>1997 02</td>
<td>Risk Associated with Loading and Unloading Aviation Fuel from Railway Wagons on the Gardermoen Line</td>
<td>Oslo Lufthavn Tankanlegg AS</td>
<td>Scandpower AS</td>
<td>Part of the application to DSB in connection with a permit application.</td>
</tr>
<tr>
<td>2007 02</td>
<td>Risk Analysis of Extended Operating Hours for the Port of Oslo - Sjursøya</td>
<td>CargoNet</td>
<td>CargoNet</td>
<td>Part of the application to DSB in connection with a permit application.</td>
</tr>
<tr>
<td>2006 09</td>
<td>Evaluation of the Domino Effects between the Container Harbour and Oil Terminal at Sjursøya</td>
<td>Port of Oslo</td>
<td>Scandpower AS</td>
<td>As instructed by DSB.</td>
</tr>
</tbody>
</table>
**ASSESSMENTS OF RISK AND RISK MANAGEMENT**

## 6.2 FINDINGS FROM INSPECTIONS

### 6.2.1 INSPECTIONS RELATED TO THE FOLLOW-UP OF THE NORWEGIAN SEVESO REGULATION

Inspections pursuant to the Norwegian Seveso Regulations are conducted by:
- Norwegian Directorate for Civil Protection (DSB).
- Norwegian Labour Inspection Authority.
- Norwegian Industrial Safety and Security Organisation.
- Petroleum Safety Authority Norway.
- Norwegian Environment Agency (formerly the Norwegian Pollution Control Authority and the Climate and Pollution Agency).

The fuel depot facilities in Ekebergåsen are so-called “upper tier” facilities, which entails annual inspections. Over the last seven years, the following authorities have conducted inspections with the following results:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>AUTHORITY</th>
<th>NON-CONFORMITIES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>NORWEGIAN POLLUTION CONTROL AUTHORITY</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2007</td>
<td>DSB</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2008</td>
<td>NORWEGIAN POLLUTION CONTROL AUTHORITY</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>NORWEGIAN POLLUTION CONTROL AUTHORITY, DSB</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>2010</td>
<td>DSB*</td>
<td></td>
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</tr>
<tr>
<td>2011</td>
<td>DSB</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>AT</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2013</td>
<td>Norwegian Environment Agency</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

* DSB surveyed the status of improvements regarding the schedule for corrective measures after an accident in 2009.

The inspection in 2009 encompassed both the fuel depot facilities in Ekebergåsen and the Sjursøya Oil Terminal. Two of the six remarks given were related to the activities at the oil terminal.

Most inspections in the petroleum area have been conducted on Ekeberg Tank and Ekeberg Oil Storage. Very few inspections have been conducted on the petroleum activities at the oil terminal. This is based on the requirements for annual inspection of so-called “upper tier” facilities (cf. Norwegian Seveso Regulations). The facilities at the oil terminal are classified as so-called “lower tier” facilities that do not require annual inspections. The difference between “upper tier” facilities and “lower tier” facilities is the fact that the “upper tier” facilities store a higher volume of flammable goods. According to the Norwegian Seveso Regulations, the boundary between the two categories is set at an available tank volume of 25,000 tonnes of flammable material.

In Appendix 5, the type of non-conformity and remarks given in connection with the inspections have been categorised. Non-conformities and remarks related to technical maintenance is a recurring area. If the number of findings and remarks from the inspections of the fuel depot facilities at Ekebergåsen are compared with the results of inspections of other enterprises encompassed by the Norwegian Seveso Regulations, we see that the level lies at the average for other facilities encompassed by the Norwegian Seveso Regulations, cf. Table 6.4. This indicates that with regard to safety, the facilities in Ekebergåsen do not distinguish themselves significantly from other facilities that are encompassed by the Norwegian Seveso Regulations.
TABLE 6.4 Comparison of inspection findings in relation to averages.

<table>
<thead>
<tr>
<th></th>
<th>FUEL DEPOT FACILITIES IN EKEBERGÅSEN</th>
<th>ENTERPRISES ENCOMPASSED BY THE NORWEGIAN SEVESO REGULATIONS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-conformities per inspection</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Remarks per inspection</td>
<td>2.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Total non-conformities and remarks per inspection</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>Non-conformities/remarks</td>
<td>0.6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

* Based on inspections at enterprises encompassed by the Norwegian Seveso Regulations during the period from 2008 through 2012 (Source: Coordination Group for the Norwegian Seveso Regulations: Annual Report 2012.).

6.2.2 INSPECTIONS CONDUCTED BY THE OSLO FIRE AND RESCUE DEPARTMENT

The preventive unit of the Oslo Fire and Rescue Department has conducted 14 inspections of the enterprises in Sydhavna from 2005 to 2011. Inspections have been conducted by the enterprises listed in Table 6.5.

TABLE 6.5 Inspection by the Agency for Fire and Rescue Services, City of Oslo.

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>NUMBER OF INSPECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forenede Gårder AS</td>
<td>6</td>
</tr>
<tr>
<td>Ekeberg Oil Storage (Currently Sisterne Drift DA)</td>
<td>5</td>
</tr>
<tr>
<td>Strand Unikorn</td>
<td>3</td>
</tr>
<tr>
<td>Oslo Container Terminal</td>
<td>3</td>
</tr>
<tr>
<td>Ford Motor/Møller Logistik</td>
<td>3</td>
</tr>
</tbody>
</table>

These companies have been chosen because they have been classified as special fire objects (see Section 13 of the Fire and Explosion Prevention Act and the Regulations relating to fire prevention).

The inspection results concerning identified non-conformities and remarks for the individual enterprises, are shown in Appendix 6.

These companies vary regarding the type of activity. This must be taken into consideration when comparing the inspection results. In addition, different topics may have been focused on when the individual inspections were carried out. When the inspection results are summed up, 11 non-conformities and 23 remarks were given. None of the companies distinguishes themselves by having especially many or few non-conformities or remarks. In addition, there is no clear trend or pattern with regard to the type of non-conformities and remarks given.

In 2007, the Oslo Fire and Rescue Department arranged an information meeting that addressed the key acts and regulations that apply to industrial and warehouse buildings. This meeting accounted for the fire inspection of 2007 for two of the enterprises called in in Sydhavna.
ASSESSMENTS OF RISK AND RISK MANAGEMENT

6.2.3
INSPECTIONS RELATED TO INTERNATIONAL SHIP AND PORT FACILITY SECURITY (ISPS)

The EFTA Surveillance Authority (ESA) follows up the extent to which the Norwegian Coastal Administration ensures that ISPS harbours in Norway meet the requirements of the ISPS regulations (see Section 4.9). The ESA conducted inspections of various port sections encompassed by ISPS requirements in Sydhavna in 2008 and in 2012. A relatively large number of non-conformities/remarks were given during both of these inspections. Results from the inspections conducted by the ESA are classified and will not be discussed further in this review. However, there were significantly more non-conformities in 2012 than in the ESA inspection of 2008.

The Norwegian Coastal Administration conducted 13 inspections at the various ISPS terminals in Sydhavna during the period from November 2008 to September 2013. The following four areas accounted for half of the identified non-conformities and remarks:

- planning needs to be updated and adjusted
- physical security is inadequate
- internal audits and associated reports are missing
- drills and exercises are missing

The Norwegian Coastal Administration has fewer non-conformities/remarks in their inspections than were identified in the ESA inspections. The results of inspections conducted by the Norwegian Coastal Administration are also classified, and will not be subjected to further discussion in this review.

6.2.4
OTHER INSPECTIONS

In December 2009, the former Norwegian Pollution Control Authority conducted an inspection based on an overfilling incident on 13 June 2009 (see Section 6.4). The inspection report addressed only one assessment related to the risk of discharge to the sea or ground. The incident was not assessed with regard to the risk of fire and explosions. One non-conformity was identified during the inspection.

<table>
<thead>
<tr>
<th>NON-CONFORMITIES</th>
<th>No documented risk assessment of the underground storage facility and associated installations and activities has been made regarding the risk of discharge to the sea via the oil separator.</th>
</tr>
</thead>
</table>

In January 2013, DSB conducted an inspection of Shell’s fuel depot at the Sjursøya Oil Terminal. This inspection was conducted based on an incident on 27 December 2012 involving the discharge of a large volume (approximately 335 m³) of diesel oil and paraffin (see Section 6.4). The following three non-conformities and one remark were given pursuant to the Regulations relating to the handling of hazardous substances:

<table>
<thead>
<tr>
<th>NON-CONFORMITY 1</th>
<th>The enterprise steering systems have insufficient procedures for managing changes.</th>
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<tbody>
<tr>
<td>NON-CONFORMITY 2</td>
<td>The enterprise has not ensured that the facility is in proper condition so that the level of safety is maintained.</td>
</tr>
<tr>
<td>NON-CONFORMITY 3</td>
<td>Labelling is missing on pipes and equipment.</td>
</tr>
<tr>
<td>REMARKS</td>
<td>Some stored materials, pallets, etc. are observed in the area that are not related to the storage of petroleum products.</td>
</tr>
</tbody>
</table>
The former Climate and Pollution Agency also conducted an inspection after the discharge from the Shell facility on Sjursøya in January 2013. The following two non-conformities pursuant to the Pollution Control Act were identified:

| NON-CONFORMITY 1 | AS Norske Shell Depot has during the period of 26 to 27 December 2012 had a large acute discharge estimated at 334,476 litres of diesel oil and paraffin. |
| NON-CONFORMITY 2 | AS Norske Shell Depot’s riskassessments with regard to the external environment are insufficient. |

### 6.3 STATISTICS AND INCIDENT DATA

The incidents registered in the Port of Oslo’s reporting system comprise 35 incidents registered during the period from 2007 to 2013. These primarily concern the working environment and personal injury of the Port of Oslo’s own employees. The incidents are generally registered as near accidents, in some cases with minor personal injuries. The incidents are especially related to cranes and container operations, and to some extent to traffic-related conditions.

It is difficult to obtain additional statistics about incidents at the oil terminal and harbour basin. The Norwegian Maritime Authority’s accident database shows a decline in the number of personal accidents on ships since 2003, but an increase in the number of maritime accidents since 2006, and a sharp increase in the number of navigation accidents. This development must be viewed in the context of the goal of increasing both passenger traffic and other maritime traffic. The most common accident category for ships in Norwegian waters is grounding and collision. In 2011, the Icelandic container ship Godafoss ran aground of Hvaler in Østfold. This resulted in an oil spill of approximately 112 m³ discharged into the sea, and oil slicks were observed as far west as Kristiansand. In 2009, the Full City ran aground of Langesund. The discharge after this grounding resulted in oil contamination along the coast in Telemark, Vestfold and Aust-Agder.34

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34 National Risk Assessment 2013.
6.4
DESCRIPTION OF SOME LARGER INCIDENTS AND ACCIDENTS

6.4.1
EXPLOSION IN THE UNDERGROUND FACILITY IN 1990

On 14 August 1990, a fire and subsequent explosion arose in Cistern 12 at Ekeberg Oil Storage. The accident occurred when the cistern was being cleaned. The top level in the cisterns during the cleaning operation was approximately three metres lower than the normal level. It is believed that petrol from one or both of the neighbouring cisterns leaked in due to the change in pressure conditions as a result of the changed level in Cistern 12. The petrol that had leaked in spread across the surface and formed an explosive atmosphere in the cisterns’ airspace. The ignition source for the explosion was determined to be a short circuit in a portable lamp. There was a powerful explosion in the cistern and a subsequent pressure wave that propagated throughout the entire facility.

An operator was close to the cistern when the portable lamp short-circuited, but he managed to escape and was only exposed to the pressure and heat wave. No health injuries were ascertained. The extent of the damage, which consisted primarily of some destroyed mechanical equipment, was considered quite small, according to the report that was prepared by an investigative committee appointed by the operational committee for Ekeberg Oil Storage.

6.4.2
COLLISION BETWEEN A TRAIN AND TANK-TRUCK IN 2003

At the entrance to Sydhavna, a roundabout makes the traffic situation complicated. This roundabout has four approach roads, as well as a north-south intersection railway track. There are also buildings near the roundabout that reduce the visibility when coming from the oil terminal. The investigation that was conducted by the Accident Investigation Board Norway identified, moreover, that this is one of Norway’s most trafficked roundabouts with road transport of dangerous goods. The roundabout is moreover a shunting area for railway wagons.

On 17 February 2003, a train collided with a tank-truck at the Sjursøya Oil Terminal. In connection with the fact that shunting was taking place to put the wagons in a special order, there was a need to cross the roundabout. A tank-truck loaded with 20 m³ of petrol and 18 m³ of diesel oil in a trailer drove onto the roundabout. The train hit the tank-truck’s trailer, which resulted in leaks and subsequent ignition. The fire developed quickly and became intense. No persons were injured in the accident.

Several causes of a technical/operative nature were identified, as well as systemic causal factors. The systemic causal factors that were identified at the time of the accident were:
- Inadequate systemic planning, steering and follow-up of the transport operations.
- The railway operations took place in the area without the required permits and approvals, and thus there was inadequate inspection by the authorities.

The Port of Oslo was given two security recommendations, one short-term and one long-term, related to the roundabout, while the Norwegian Railway Authority was given a security recommendation related to the regulations for shunting movements.

Moreover, the commission pointed out in its report that it was unfortunate that neither an operator nor a public authority has been assigned overarching coordination responsibility for security for the area.

6.4.3
OVERFILLING IN 2009

On 13 June 2009 while unloading from a ship, 390 m³ of diesel oil was unintentionally filled into one of the cisterns in the part of the underground storage facility that belongs to Ekeberg Tank and is owned by Statoil Fuel & Retail. The cistern already contained aviation fuel. This resulted in contaminated product. Later that same day more product (diesel oil) was filled in the same cistern. This entailed overfilling and flooding of a mixture of diesel oil and aviation fuel in the walkway in that part of the underground storage facility. No persons were injured, but significant material damage arose in the form of handling contaminated product.

Statoil’s investigative report identified the triggering causes of the incorrect filling and the subsequent overfilling as the results of a combination of multiple technical and operational errors. Statoil’s investigative report recommended 22 measures related to management and steering, HSE and emergency
ASSESSMENTS OF RISK AND RISK MANAGEMENT

preparedness, as well as installation integrity.

Moreover, Statoil’s investigation identified inadequate maintenance in general (inadequate strategy for maintenance and performance of maintenance) for the underground storage facility. Another item that was pointed out was the inadequate follow-up of the routines related to cooperation between the oil companies for the operations of Ekeberg Oil Storage and Ekeberg Tank. The Norwegian National Authority for Investigation and Prosecution of Economic and Environmental Crime (OKOKRIM) fined Statoil and Ekeberg Oljelager DA, NOK 800,000 and NOK 700,000, respectively, and they both accepted the fine.

6.4.4 RAILWAY ACCIDENT IN 2010

On 24 March 2010, a set of wagons 207 metres long, consisting of empty container wagons, rolled uncontrolled from Alnabru to Sydhavna. In Sydhavna these seven wagons, weighing a total of 194 tonnes, rolled at high speed past the area where the filling-rack for the transport of aviation fuel to Oslo Airport Gardermoen is located. The speed was estimated to be 125 km/h at Loenga. The wagons rolled on towards the Bekkelag Quay, where they continued through the office building near the entrance and exit to/from the container terminal. Two wagons ended up in the harbour basin. The accident caused the death of three persons and four persons were injured. There was extensive material damage to the buildings, vehicles and infrastructure. The accident took place at 113 p.m., a time when the train for the transport of aviation fuel to Oslo Airport Gardermoen was parked at another line. At the time of the accident, the traffic in the harbour area was considered to be moderate.

The cause of the accident was the result of a combination of misunderstandings between the personnel who were responsible for the operations at Alnabru, as well as a lack of barriers on the goods line between Alnabru and Loenga/Sydhavna, which could have stopped the set of wagons in a controlled manner.

The Accident Investigation Board Norway (SHT) pointed out in its report after the accident that there were several triggering and underlying causal factors, which among other things included:

- No common understanding had been established for preventing a communication failure between the train supervising personnel and shunting personnel at Alnabru. The regulations that could have potentially stopped the course of events in question were “dormant” and unknown among the operating personnel.
- There was no possibility by means of diverting routes to stop the set of wagons before it left Alnabru. In addition, there were no barriers on the goods train line between Alnabru and Loenga/Sydhavna that could stop the set of wagons in a controlled manner. The accident is a breach of the single point of failure principle, which states that railway operations shall be planned, organised and performed in such a manner that a single point of failure does not entail the loss of human life or serious personal injury.

- The basic assumption for how the accident could occur, in the opinion of the Accident Investigation Board Norway (SHT), is that Alnabru was used in a manner for which it was not originally intended. Maintaining efficiency and productivity on a worn-out and outdated terminal, without adaptation of safe work practices, had reduced the safety margins. Both political priorities and the Norwegian National Rail Administration’s own prioritisation of goods traffic has been significant to why no rebuilding or expansion was carried out.

- The lack of a system for handling safety-critical information was a common characteristic of both the Norwegian National Rail Administration and of CargoNet AS. There was a lack of tradition for reporting incidents, inadequate distribution and implementation of steering documentation, inadequate and fragmented risk assessments, as well as the lack of a system to identify and process safety-critical information from the operative sections of the organisations. Because of this, both the Norwegian National Rail Administration and CargoNet AS were unaware, until the accident, that Alnabru had fundamental faults and defects with regard to operative and technical safety barriers.

- The Norwegian National Rail Administration has not adequately followed up its responsibility as the infrastructure administrator and the main operator through comprehensive risk surveys. In a complex and intricate system like Alnabru, it is especially important that all of the involved organisations contribute to the establishment of barriers against single points of failure. Alnabru lacked comprehensive safety management that would identify the risk, which resulted from the many changes that had been made over time.

- The Accident Investigation Board Norway also pointed out defects in follow-up by the Norwegian Railway Authority. Even if responsibility for safety lies with the railway operators, a more proactive role is nevertheless sought in the inspection, especially with regard to the control of the major accident risk in complex and intricate areas.

The Oslo District Court fined the Norwegian National Rail Administration NOK 15 million, while CargoNet was fined NOK 6 million.

6.4.5
6.5
THE ENTERPRISES’ OWN ASSESSMENTS OF RISK AND RISK MANAGEMENT

The DSB survey (cf. Section 2.2) conducted among 28 enterprises in Sydhavna (excluding the oil companies) show that most of those who operate in the area perceive there is little risk associated with the activities there. The answers reflect the enterprises’ own views, and are based largely on discretionary judgements. It must also be mentioned that the respondents represent many different enterprises, and have different roles with respect to safety and emergency planning in the harbour area.

The survey includes questions related to the transport of dangerous goods and the handling of hazardous substances in particular, but also questions concerning a broader assessment of safety in the area. The assessments are related in part to the risk associated with their own activities, and in part to the perceived risk associated with being located in the area.

6.5.1 THE ENTERPRISES’ OWN RISK

The enterprises were asked about the scope of risk associated with five different activities within their own enterprise: Storage of hazardous substances, handling/use of hazardous substances, production of hazardous substances and the transport of dangerous goods, cf. figure 6.2. In the question, hazardous substances are defined as flammable substances, explosive substances, pressurised substances or reactive substances (with reference to Section 4 of the Fire and Explosion Prevention Act).

The enterprises experience the risk related to these activities as small. With regard to the storage of hazardous substances, one enterprise answered “high risk”. A supplementary comment shows that this applies to the storage of consumer gas containers (approximately 20) and alcohol of technical grade (approximately 50 litres).

Another enterprise answers “medium risk” related to the storage of hazardous substances. The same enterprise also answers “medium risk” for the “handling and use of hazardous substances” as well as for the “transport of dangerous goods”. The enterprise elaborates in a comment that this applies to the use and storage of welding equipment, acetylene and oxygen, as well as the use of pressurised HFC coolants (for the replenishment of container machinery).

Apart from these two enterprises, the other respondents answered, “low risk”, “no risk/not relevant” or “do not know/no opinion” for all of the questions.

DISCHARGES IN 2012

On 26 and 27 December 2012, there was a discharge of approximately 340 m³ of diesel oil and some paraffin from Shell’s fuel depot at the oil terminal. The discharge took place at night and was discovered early in the morning by a driver who had arrived to fill his tank-truck. The triggering cause of the leak was frost burst due to condensation water that had collected in a valve connected to a “dead leg”. The valve was part of process equipment that had been decommissioned, but was still connected to the operational part of the facility. The inspection conducted by DSB shortly after the accident, identified defects in the procedures related to change control and inadequate maintenance of the technical equipment. Shell’s internal investigation report confirmed DSB’s findings. Shell’s internal investigation also pointed out several other factors as the cause of the incident.

The police conducted an investigation and fined Shell NOK 2.5 million, which Shell accepted.
The enterprises were also asked to give a more general assessment of how much risk their activities represent for various actors, including for their own enterprise (see Figure 6.3).

Two enterprises respond that their own activities represent a "medium risk" to themselves.

Three enterprises answer that their own activities represent a "medium risk" to other actors. The same three enterprises answer that their own activities represent a risk to road users/vehicles in the area. Overall, however, the answers give the impression that the enterprises perceive that they create low or no risk for nearby actors/enterprises.

Two comments state that if there is any risk, it is associated with driving in the area:

“In my opinion, the greatest risk is associated with driving in the area, which is the greatest risk to our own employees, and this applies correspondingly where our driving may be a risk to others.”

“Only traffic risk, which is considered a low risk.”

### FIGURE 6.3 How much risk does your enterprise represent for the following actors?

<table>
<thead>
<tr>
<th>The enterprise itself</th>
<th>7</th>
<th>36</th>
<th>54</th>
<th>4</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other enterprises in Sydhavna</td>
<td>11</td>
<td>30</td>
<td>52</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>Road users/vehicles in the Sydhavna area</td>
<td>11</td>
<td>61</td>
<td>52</td>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>Road users/vehicles outside the Sydhavna area</td>
<td>4</td>
<td>36</td>
<td>57</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>Persons who live or visit the area around Sydhavna</td>
<td>4</td>
<td>61</td>
<td>63</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>Other actors, specify in the comment field</td>
<td>11</td>
<td>63</td>
<td>26</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>
6.5.2 PERCEIVED RISK ASSOCIATED WITH BEING LOCATED IN THE SYDHAVNA AREA

The enterprises were asked: “To what extent is the enterprise exposed to risk from other activities/enterprises in Sydhavna?” (See Figure 6.4). Two respondents answer “to a great extent”, twelve answer “to some extent”, eleven answer “to a limited extent”, while three enterprises answer “do not know/no opinion”.

FIGURE 6.4 “To what extent is the enterprise exposed to risk from other activities/enterprises in Sydhavna?”

In the next question, the enterprises were given an opportunity to specify the degree of risk associated with various types of activities (see Figure 6.5). The answers here contribute to adding detail to the general picture above. It is important to point out that only those who have answered that they are exposed to risk largely or to some extent in the preceding questions are included in the following answers, i.e. half of the enterprises.

Maritime traffic is not regarded as producing any risk.

The three activities that the majority regard as producing risk are the container operations (10 out of 11 enterprises answer “to a great extent” or “to some extent”), motor traffic in the area (9 out of 13 enterprises answer “to a great extent” or “to some extent”), and the transport of dangerous goods in the area (6 out of 14 enterprises answer “to a great extent” or “to some extent”). A relatively large percentage of the enterprises are uncertain as to the extent to which aforementioned other listed activities represent risk.

FIGURE 6.5 To what extent do these activities represent a risk to the enterprises in Sydhavna?
When asked, “Overall, how much risk do you think is associated with the activities and enterprises in Sydhavna?” (see Figure 6.6), 20 enterprises answer “low”, “very low”, “none” or “don’t know”. Six enterprises answer “medium risk”, while two answer “high risk”. Among those who answer “medium risk” there are two comments:

“We are dependent on driving service vehicles in the area; this entails a risk in relation to forklifts etc.”

“We are located on the first floor, and we will probably be more exposed than in the floors higher up. We assume that the installations are secured in accordance with the prevailing provisions and that these provisions are relevant.”

The enterprises that perceive there to be a “high risk” do not provide any comments. These enterprises are engaged in the import of cement and hawser handling for ships. No enterprises feel that there is a “very high risk” associated with the activities in Sydhavna.

The general picture is thus that the enterprises experience a limited extent of risk in Sydhavna. However, the answers vary considerably. The open formulation also allows the question to be interpreted in different ways. One enterprise commented that they were “a little uncertain what is meant”. Another enterprise points out that it is “difficult to know when we know so little about what activities other than tanker/petroleum transport take place at the port.”

The respondents in the questionnaire survey were also asked to give their opinion on six different statements concerning the control and management of risk in the Sydhavna area (see Figure 6.7). Almost all of the enterprises believe that they have well-functioning internal control and management of their own risk. Only two enterprises disagree with the statement. The viewpoints on the general management of risk in Sydhavna (statement 2) is also overwhelmingly positive. One enterprise “completely disagrees” with all of the statements.

The last three statements concern perceptions of emergency preparedness plans, how safety work is organised and overview of responsibilities in Sydhavna. Approximately half of the enterprises give positive, replies, while the other half answer “do not know/no opinion”. The comments by some of the enterprises who answer “do not know/no opinion” indicate that there is inadequate knowledge in these areas:

“We know the meeting place in the event of a disaster; otherwise we haven’t got much information.”

“We lease our premises, and we focus very little on the rest of the area.”

[...] We would like to see posters at the main entrance showing the recommended escape routes and/or measures that should be implemented in connection with various scenarios.”

The results indicate that knowledge of the emergency preparedness and safety measures is somewhat unevenly distributed. Approximately half of the enterprises have inadequate knowledge of the emergency preparedness plans, the distribution of responsibilities in the event of possible incidents and the organisation of the safety work.

In surveys in general, there is a common tendency for dissatisfaction to be commented on more frequently than satisfaction. It must thus be taken into account that positive attitudes may be underreported. An enterprise that “completely agrees” with all of the statements related to the control of risk states that:

“Regular HSE meetings are held in which the enterprises in Sydhavna participate together with the Port of Oslo.”
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6.5.4 PERCEPTIONS OF ISPS

The enterprises in the survey were asked to give their views on how the ISPS regime functions, both regarding the primary purpose of the regime (protection against terrorism) and for other security considerations. Fifteen enterprises are themselves located at an ISPS terminal. The answers depict a primarily positive picture of the ISPS regime. Just over half of the enterprises agree completely or partially that the regime provides adequate protection against the risk of terror, and that it is properly dimensioned in relation to the risk situation more generally. Two-thirds of the enterprises also believe that it contributes to better safety in other areas as well.

FIGURE 6.7 Management of risk. Do you agree or disagree with the following statements?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percentage Agree</th>
<th>Percentage Partially Agree</th>
<th>Percentage Neither/nor</th>
<th>Percentage Partially Disagree</th>
<th>Percentage Completely Disagree</th>
<th>Percentage Do not know or no opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our enterprise has well-functioning internal control and good management of our own risk</td>
<td>75</td>
<td>11</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>There is good management of risk in general in Sydhavna</td>
<td>46</td>
<td>21</td>
<td>7</td>
<td>4</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Well-functioning cooperation has been established for common preventive tasks in Sydhavna</td>
<td>36</td>
<td>21</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>Adequate emergency preparedness plans and measures have been established in Sydhavna</td>
<td>21</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>4</td>
<td>46</td>
</tr>
<tr>
<td>Safety work in Sydhavna is well organised</td>
<td>25</td>
<td>18</td>
<td>4</td>
<td>4</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Responsibilities for potential incidents in Sydhavna are adequately clarified</td>
<td>23</td>
<td>19</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>42</td>
</tr>
</tbody>
</table>

FIGURE 6.8 Enterprises’ view of the ISPS regime.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percentage Agree</th>
<th>Percentage Partially Agree</th>
<th>Percentage Neither/nor</th>
<th>Percentage Partially Disagree</th>
<th>Percentage Completely Disagree</th>
<th>Percentage Do not know or unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you agree with the following statements concerning the ISPS regime? - The ISPS regime contributes to an improvement in safety even in areas other than the risk of terror</td>
<td>35</td>
<td>31</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Do you agree or disagree with the following statements concerning the ISPS regime? - The ISPS regime is correctly dimensioned in relation to the risks in the harbour area</td>
<td>12</td>
<td>42</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>31</td>
</tr>
<tr>
<td>Do you agree or disagree with the following statements concerning the ISPS regime? - The ISPS regime provides an adequate focus on the risk of terror</td>
<td>12</td>
<td>42</td>
<td>19</td>
<td>8</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>
With regard to the petroleum activities, which are assumed to be the most dangerous activities in Sydhavna, the relevant surroundings include both the enterprises in the Sydhavna area, nearby residential areas and institutions, as well as traffic areas. No broad survey of the risk perceptions in these other surroundings has been conducted, for example among residents in the nearby areas.

The Gamle Oslo District has not had many issues related to the activities in Sydhavna. After the train accident in 2010, the District Council discussed the level of safety related to the transport of aviation fuel, and a request was sent to the Ministry of Transport and Communications to conduct a study of alternatives to the current transport by rail (pipeline), among other things. The District was also involved in an exercise in Oslo in which one scenario was an incident in Sydhavna. The Nordstrand District was responsible, but Gamle Oslo was involved as a "cooperating district". Beyond this, there have not been any issues related to the activities in Sydhavna. In addition, there has not been any dialogue with the residents of the district concerning Sydhavna or any initiatives taken by the residents.

The Nordstrand District, on the other hand, has had many issues, but these have been primarily related to noise and to some extent traffic. No issues or concerns have been registered in connection with petroleum-related activities or the risk of fire/explosions, neither from the population nor from the political milieu. The District Council pass a resolution to conduct a study of alternative locations and the possible relocation of industrial activities from Sydhavna.

The responsibility of the city district is primarily related to the Public Health Act/environmental health care and disease control. In this context, they are responsible for inspection of port activities. The Port of Oslo has dispensation to engage in noisy activities, and on average complies with the stipulated noise limits. The limits are nevertheless exceeded for shorter periods. The Port of Oslo has a special complaint form for noise, and the district receives a copy of the complaints submitted. Thus far, it has been the population in the Grønsund area that have been exposed to the greatest nuisance. When the container operations move to Sjursøya and as Sørenga is developed, the problems will also move there. There have also been complaints and issues related to traffic and traffic safety, e.g. from the school and day care centre at Nedre Bekkelaget.

The city district has no regular meetings or cooperation with the Port of Oslo, there are only meetings based on concrete initiatives. In the administration there have been discussions and concern related to risk, such as a possible terrorist attack. The city district has an apparatus and plans for emergency preparedness. This is limited to certain functions related to the district’s own population. The police and central agencies in the municipality have the main responsibility, and the city district will assist with resources, such as shelter in connection with evacuation.
6.7 SUMMARY

Many risk analyses have been conducted that encompass parts of the activities in Sydhavna. Based on assessments of the worst-case scenarios (scenarios at the oil terminal versus scenarios in the underground storage facility), the operations at the oil terminal are considered to be the most risky for third parties. Based on the risk analyses conducted, the operations connected to the unloading of ships and the loading of tank-trucks are regarded as the most risky operations.

However, there is no comprehensive analysis of the overall risk situation in Sydhavna. Some of the analyses are of an older date, such as the risk analysis “Risk Associated with Loading and Unloading Aviation Fuel from Railway Wagons on the Gardermoen Line” from 1997. It is generally important that the knowledge base, in the form of risk analyses on which decisions are based, is updated. The same external consulting firms have conducted many of the analyses related to petroleum activities.

Few inspections of the petroleum activities at the oil terminal have been conducted in accordance with the Norwegian Seveso Regulations, while the underground tank storage has been subject to annual inspections. The inspections have identified weaknesses associated with technical maintenance. This has been confirmed by the internal investigations after the two major accidents/incidents in Sydhavna. For inspections in the security area, many non-conformities with the ISPS requirements have been identified, of both a systemic nature, as well as the capacity to comply with new routines.

There have been some major incidents with a potential for greater consequences than the actual outcome:

- The train accident in 2010; what could have happened if the train for the transport of aviation fuel had been in a filling operation for jet fuel, or if loose wagons had continued into the oil terminal and hit critical installations (such as the VRU)?
- Discharges in 2012; what would have happened if petrol had leaked instead of diesel oil and paraffin?

With regard to the risk perceptions of enterprises located in Sydhavna, it appears that two out of three believe that there is little or no risk associated with the activities there. To the extent that the enterprises perceive that they themselves produce risk, or that others represent a risk to them, this is often associated with traffic in the area. Nevertheless, it is important to point out that the survey gives a picture of the Sydhavna enterprises’ own subjective assessment of risk in the area.
This chapter reviews the established emergency preparedness functions that are to take effect in the event of an incident in Sydhavna. In order to make a critical assessment of how the emergency preparedness functions, three worst-case scenarios involving fire and the explosion of petroleum products have been prepared. The purpose is to assess emergency preparedness relative to very serious consequences. Based on the scenarios a separate workshop was held with the relevant actors at which emergency preparedness and management capabilities were reviewed step by step. The results from this workshop are included in this chapter.
The rescue services (land, sea and air rescue) are defined as the publicly organised activities that are exercised as immediate rescue to save people from death or injury resulting from acute accident or hazardous situations, and which require coordination. The rescue service is not an organization, but a function, that is exercised through cooperation between public agencies, voluntary relief organizations and private companies that have suitable resources. The rescue service is a priority task for the emergency services (fire, police and health), even if they perform other tasks on a day-to-day basis. The rescue service has limited responsibility with regard to other incidents, such as acute pollution or nuclear accidents.

At the central level, the Joint Rescue Coordination Centres of Northern Norway (Bodo) or Southern Norway (Sola, Stavanger) have an overarching operative responsibility for rescue operations. The Local Rescue Centre is responsible for leading and coordinating rescue operations in its own district, unless the Joint Rescue Coordination Centre determines otherwise. Its own district is defined as the land and possibly sea area within the police district. The Local Rescue Centre normally leads all the rescue operations on land, while the Joint Rescue Coordination Centre normally leads all rescue operations at sea. Regardless of the type of operation and responsibility, the Joint Rescue Coordination Centre and Local Rescue Centre will assist each other. The role of the Local Rescue Centre is fulfilled on a day-to-day basis by the police operations centre (operative level). Correspondingly, the police lead the work in the operative area (tactical level). Rescue management (strategic management) at the Local Rescue Centre consists of representatives from the relevant authorities, agencies and voluntary organisations, headed by the chief of police.  

The police operations centre has direct communication with the fire service centre (110) and EMCC (Emergency Medical Communications Centre (113)). For any incident, mutual alert and coordination between the centres (triplex alert) is carried out. The operations centre/Local Rescue Centre also has direct lines to a number of other experts and communications centres, such as the Train Traffic Controller (Norwegian National Rail Administration), Norwegian Joint Headquarters (Norwegian Armed Forces), Road Traffic Centres (Public Roads Administration), Air Traffic Control (Avinor) and the supply of power (Norwegian Water Resources and Energy Directorate). The police operations supervisor is in command of the police forces in the police district and authority to initiate rescue operations. After triple alert and primary alert for a particular incident has been carried out, the operations supervisor will contact the rescue manager on duty at the Joint Rescue Coordination Centre as required, and consider the need to notify the chief of police, call in the operative staff of the police etc.

If needed, depending on the scope and complexity of the incident, the operations centre/Local Rescue Centre will expand the operation with police personnel, the police’s operative staff and/or call in advisors or members of the rescue management (strategic level), and notify and communicate with the crisis management in the municipality where the incident has taken place – especially with a view to take care of relatives and evacuees.

The fire service is responsible for fighting fire and is often assigned responsibility for safety in the danger area. The fire service will also engage in life saving efforts in the operative area. The Civil Defence can also be called in as a reinforcement resource to provide operative support to the emergency service and planning agencies. In addition, every member of the civil population is obligated, on certain conditions, to participate in the effort and make property and assets available in the event of an acute risk when this is necessary.

Responsibility for health-related efforts, including medical assessment, prioritisation, treatment and patient transport lies with the health service. The municipality is responsible for providing the necessary primary health services, and the regional health authority is responsible for specialist health services, including hospitals and ambulance service.

The municipality is responsible for important local emergency preparedness resources, and it has the basic responsibility for ensuring the safety and security of the population. This includes the establishment and operation of centres for evacuees and next of kin, and for psychosocial care and support, as well as provisions for evacuees and next of kin.

Emergency preparedness resources, such as the fire service, 110 emergency fire number and the primary health service, including causality clinics and centres for evacuees and next of kin, etc., are all under the responsibility of the municipalities. Through the primary health service, the municipality also has an important responsibility for the long-term, physical and psychosocial follow-up.

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7.1 EMERGENCY PREPAREDNESS IN GENERAL

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The Police Instructions (regulations) and the Organisation Chart for the Rescue Service, Royal decree of 4 June 1980, prescribes further provisions concerning responsibilities, duties and authority. (The decree is under revision).
It has become common to make use of scenario methodology in both the public and private sectors. Scenarios are descriptions of events that may occur in the future and of the causal chains that can result in a desired or undesired condition. Scenario simulation is a tool to create participation and dialogue in strategy work. Through such simulation, existing plans can be improved. Scenarios can also put those involved on the track of completely new strategic alternatives. Scenarios create learning and make it easier to see “the big picture”.

In connection with the discussion of emergency preparedness for incidents in Sydhavna, three worst-case scenarios involving fires and explosions of petroleum products were prepared. To obtain an assessment of the dispersion of smoke and fire gases, GexCon was engaged to prepare dispersion models with a view to obtaining a better understanding of the consequences related to the three worst-case scenarios (GexCon 2013).

It must be emphasised that the scenarios are worst-case scenarios, in which the aim is to assess emergency preparedness relative to the consequences. There is uncertainty associated with the course of events in the chosen scenarios, but they are considered to be appropriate for the assessment of emergency preparedness for worst-case incidents. Given the barriers that have been established at the oil terminal, the probability of these scenarios occurring is considered to be very low. Therefore, they are not included in the existing risk analyses concerning the activities in Sydhavna.

The criteria for the various degrees of health risk used in the dispersion models are based on guidelines prepared by the American Industrial Hygiene Association.

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GexCon is a consulting firm specialising in explosion safety for both land-based facilities and offshore installations. They have substantial modelling experience in connection with fire and explosions, and they worked with the investigation after the explosion at the Buncefield oil storage terminal outside of London in the autumn of 2005, among other things.
EMERGENCY PREPAREDNESS FOR INCIDENTS

7.2.1 THE SJURSØYA SCENARIO

This scenario is an adaptation of the scenario “Fire at an Oil Terminal in a City” from DSB’s “National Risk Assessment 2013”.

The scenario is a substantial leak of petrol at the oil terminal that is not stopped. Over time, a fire and explosion occur that damages nearby tanks at Sjursøya. The fire gradually spreads to the surrounding tanks. The fire reaches the maximum extent after 30 minutes. When discussing emergency preparedness in relation to handling such a worst-case scenario, the accident at the Buncefield oil storage terminal in 2005 and at the Jaipur oil storage terminal were used as reference incidents to estimate the course of events.

The dispersion of smoke and fire gases will depend, among other things, on the wind direction and speed. The most predominant wind direction in the area is southerly at a speed of 2 m/s. If these parameters are used in the dispersion model, the dispersion will be as illustrated in Figure 7.1. Depending on the direction of the wind, the consequences will be that parts of the residential areas around Sydhavna will be affected. The blue area in Figure 7.1 indicates a zone in which the population cannot stay for more than an hour without experiencing temporary adverse health effects or noticing an unpleasant smell. In the red zone, it is assumed that a stay of more than an hour may result in life-threatening health effects. The circular form of the relevant affected areas indicates that the dispersion will vary with the changing wind direction.

It is assumed that a fire with strong heat radiation will develop. The need for evacuation will depend on how long it takes before the fire can be extinguished. According to the Agency for Fire and Rescue Services of the City of Oslo, it could take days depending on whether the fire must burn out in a controlled manner.

As mentioned in the introduction, the wind direction is a very important parameter for modelling the dispersion of fire and smoke gases. Figure 7.1 shows the dispersion with a wind speed of 2 m/s. A strong wind will be the most unfavourable with regard to the dispersion of smoke and smoke gases, and in the analysis such conditions are represented by a wind speed of 8 m/s. Dispersion will then be greater, and central urban and residential areas will be exposed to hazardous smoke and smoke gases. Consequently, a large number of institutions will also be affected.
FIGURE 7.1 Dispersion of fire and smoke gases in the event of a theoretical fire at the Sjursøya Oil Terminal.
THE BJØRVika SCENARIO

This scenario has been discussed in the Operative Leadership Forum, which is a group consisting of the ambulance service at Ullevål University Hospital, the City of Oslo’s Agency for Fire and Rescue Services and the police in Oslo.

This scenario is a theoretical incident in which petrol leaks from a tanker in the area north of Sjursøya. A slick consisting of petrol drifts towards Bjørvika and is ignited. Over time, a major fire develops on the surface of the sea and on board the vessel. Smoke and fire gases will develop with the fire, which, based on the direction of the wind and its changes, may affect the area from the Akershus Fortress to Bjørvika and continuing on to Ekeberg and Bekkelaget.

A ship collision in New York Harbour in 1973 was used as a reference incident in the workshop arranged to assess emergency preparedness.

Figure 7.2 shows a southerly wind speed of 2 m/s. In the same way as in the Sjursøya scenario, the blue area indicates a zone in which the population cannot stay for more than an hour without experiencing temporary adverse health effects or an unpleasant smell. In the red zone, a stay of more than an hour is assumed to result in life-threatening health effects. The circular form indicates that the dispersion will vary with the changing direction of the wind.

Based on the dispersion analyses prepared by GexCon and data received from the City of Oslo, in this scenario there will also be institutions within the concentration limits in which evacuation must be considered. The number of affected institutions will depend on the stability of the wind direction.

In the same manner as in the Sjursøya scenario, the wind speed will be of great importance to the dispersion of smoke and fire gases. The dispersion of fire and smoke gases is estimated to be the most extensive at a wind speed of 8 m/s. The consequences will then be that a significantly larger area of central Oslo will be affected. The number of institutions affected will thus also be considerable.
FIGURE 7.2 Dispersion of fire and smoke gasses in the event of a theoretical leak of petrol and subsequent ignition after a collision at sea or grounding at Hovedøya/Bleikøya.
7.2.3 LEAKAGE AND IGNITION IN THE UNDERGROUND STORAGE FACILITY

The scenario “Leakage and Ignition in the Underground Storage Facility” is a qualitative assessment of an incident in the underground facility in Ekebergåsen. The assessment is based on GexCon’s discretionary judgement and experience from similar tunnel facilities for hydroelectric power production is used as a reference.

The starting point for the scenario is the leakage of petrol in the underground storage facility, for example as the result of overfilling a cistern. A petrol leak will result in an explosive mixture of petrol vapours and air. The ignition of such a mixture could entail an explosion and potential fire. Even if the circumstances are assumed to be extremely unfortunate, it is difficult to see that an explosion will have significant consequences outside the actual underground storage facility. Even there the damage is expected to be moderate. Damage to the electrical wiring and steering systems may entail a shutdown of the supply. The consequences to third parties connected to this scenario are therefore dramatically smaller than is the case for the “Sjursøya Scenario” and the “Bjørvika Scenario”.

7.3 WORKSHOP ON EMERGENCY PREPAREDNESS FOR WORST-CASE SCENARIOS

On 4th and 5th September 2013, DSB’s project group arranged a two-day workshop on the Sjursøya Scenario and the Bjørvika Scenario in cooperation with the Norwegian Industrial Safety and Security Organisation (NSO). The purpose was to review and discuss how the emergency preparedness plans will function when a worst-case incident is encountered, and to acquire an understanding of the emergency response authorities’ emergency preparedness capacity and identify possible areas for improvement. The invited participants included:

- Oslo Fire and Rescue Department
- Oslo Police District
- EMCC/Oslo University Hospital
- Sisterne Drift DA/Statoil Fuel & Retail
- Port of Oslo
- City of Oslo’s Emergency Planning Agency
- Agency for Health and Social and Welfare Services in the City of Oslo
- Nordstrand District
- Norwegian Coastal Administration
- County Governor of Oslo
- Norwegian National Rail Administration
- Oslo T-banedrift AS.

The workshop was organised as a systematic review of the two different scenarios. A timeline was drawn up for each of the scenarios, in which the course of events was specified and the roles and contributions of the various actors were reviewed for each step in the process. The trigger incident was set at Friday afternoon at 4:00 p.m., during the last half of July.

The course of events and key topics in both of the scenarios can be roughly divided as follows:

- trigger incident
- discover and provide notification of the incident
- local handling
- initial emergency response – emergency services
- survey of the situation – measures/handling
- further notification
- bringing in expertise, extra resources
- evacuation
- health services
- information to the general public
- crisis organisation

Of the critical factors, the following were identified and discussed:

- There is uncertainty surrounding the security surveillance and presence at the oil terminal. This can result in delayed notification and inadequate information to the emergency services and others about the situation and risk factors. Local handling capabilities were also unclear. The police and...
fire service in particular would like to see more permanent security surveillance and a “local guide function”, which could function as a permanent point of contact in the event of incidents.

- With regard to notification, there are many different notification regimes, and there is some uncertainty regarding who notifies whom about what. For the emergency services, the triple notification system and coordination is well established, but there is nevertheless a risk of overloading the emergency number system. Several actors notify many, but there may be some that do not receive adequate or early enough notification.

- All of the actors have an independent responsibility to act based on their own observations, assessments and plans. They should not just wait for notification from others. At the same time, the distribution of roles and responsibilities are somewhat unclear – apparently with the exception of in the emergency services.

- Many actors are responsible in connection with evacuation and the divide of work or overview of the needs and capacity has not been adequately clarified. Navigability.

- Given the point of time for the incidents, the ability to navigate could be a problem for the emergency services. There will be a lot of traffic on Mosseveien, probably with queues.

- Evacuation involves a coordinated effort by both the local companies, the police and the municipality. The scope of evacuation will depend on how the incidents develop with a view to the dispersion of different types of smoke/gas, for example. Continuously updated situation status and the availability of expertise are critical factors. Many people may potentially be affected: people on the road, in outdoor areas and in their own residences.

- Information is provided to the public and media through several channels, and the media play an important role with regard to information to the public and those that are affected. There are many who notify the media, but coordinated, unambiguous and correct information to the general public and in particular the population affected can be a challenge.

- Overall management and organisation may be a challenge. They “all” appoint a staff – but coordination and responsibilities among the actors may be questioned. The need for liaison functions was suggested as an instrument for improving the exchange of knowledge.

An evaluation/questionnaire survey conducted after the workshop showed that the objective had essentially been met37. Approximately two-thirds of the participants agreed completely or partially that the workshop had provided a useful review and good comprehension of emergency preparedness, and that important area for improvement was identified. The participants were also asked to take a stand on certain statements based on their experiences from the workshop, concerning capacities, interaction, role comprehension and notification, among other things, see Figure 7.3. The main impression here is that the emergency services’ efforts and interaction are assessed as very well functioning. There was greater uncertainty about the oil companies’ emergency preparedness and more generally about whether the notification routines are adequately clear and appropriate, and whether the roles of the various actors are defined in a manner that is adequately clear and understood. The main impression from the workshop is that the notification system for the emergency services is well established and integrated. Notification and further communication with other relevant actors, such as municipal agencies/district areas, central government agencies and various centres of expertise, emerged as less well established and planned.

A specific result after the workshop is the fact that the oil companies, the Port of Oslo and the emergency services have initiated a process to clarify critical functions and cooperation schemes with a view to improving the handling of potential incidents.

37 Out of 27 questionnaires distributed, 24 were returned, i.e. a response rate of 89 per cent. However it involves a small number, so that percentage distributions are of limited value (4 per cent = one respondent). The respondents also answered from different points of view, roles and levels of knowledge. For some respondents, their answers will only be based on an interpretation of the information disseminated at the workshop, for others their answers will be based on broader knowledge of actual emergency preparedness. In this situation, each individual answer will thus not count “equally”. In addition, common answers were given for the three participants from the police, a key actor, which will only count as one of 24 respondents here.
EMERGENCY PREPAREDNESS FOR INCIDENTS

It is evident from figure 7.4 that the notification routines are among the topics the participants feel it is necessary to include in the continuing follow-up. There are also challenges with regard to access to relevant expertise and resources. Quick and updated knowledge of meteorological conditions, as well as the dispersion pattern and characteristics of the smoke/gas that develops are critical factors. Several of the respondents pointed out that there will always be a scarcity of resources in the event of such serious incidents. The possibility of advance planning is limited, and rapid management capabilities based on immediate assessments of the situation will be necessary. The police point out, for example, that planning can take place even if the course of an incident will be unpredictable, in that the plans take into account alternatives and the need for flexibility.

An overwhelming majority of the respondents expressed that it will be necessary to follow up emergency preparedness with further clarifications and measures regarding responsibilities, roles, evacuation, the traffic situation and access to expertise, cf. Figure 7.4. With regard to the question of clarity of the roles and duties, the answers here are somewhat in contrast to the participants/respondents’ perceptions of their own enterprises. More than nine out of ten believed that the duties and roles for their own enterprise are to a large or to some extent clearly defined, and correspondingly that their own efforts will be well coordinated with other actors. There may therefore be reason to ask whether the lack of clarity concerning roles and duties is because the participants do not have good enough insight into how emergency preparedness is organised for other actors, that is to say actors that they do not have direct contact with or knowledge of. Some of the comments and views that have been expressed during the process and in the evaluation confirm this impression.

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The evaluation was carried out a few weeks after the workshop, because it also included questions concerning the planning or implementation of possible follow-up measures afterwards. Several respondents state that they are reviewing emergency preparedness plans and notification routines, and in some cases, they are taking an initiative in relation to other emergency preparedness actors in order to clarify roles and cooperation during incidents. The most important individual measure here is an initiative for closer cooperation between the oil companies, the Port of Oslo and the emergency services (particularly the fire service and police). The first cooperation meeting was held in November 2013, and a working group was appointed to follow up various problems related to notification and surveillance.

### FIGURE 7.4 The response distribution for this statement "In the follow-up, it is very necessary for further work to be done on the following topics"

<table>
<thead>
<tr>
<th>Topic</th>
<th>0%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notification routines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clarification of roles between the emergency services</td>
<td>74</td>
<td>14</td>
<td>23</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>Clarification of roles between actors</td>
<td>14</td>
<td>45</td>
<td>65</td>
<td>52</td>
<td>45</td>
</tr>
<tr>
<td>Evacuation of the population</td>
<td>14</td>
<td>18</td>
<td>41</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Evacuation of Sjursøya</td>
<td>26</td>
<td>41</td>
<td>9</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Navigability – traffic steering</td>
<td>26</td>
<td>26</td>
<td>4</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Access to relevant competence in decision-making situations</td>
<td>26</td>
<td>26</td>
<td>4</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

- Completely agree
- Partially agree
- Neither/nor
- Partially disagree
- Completely disagree
- Do not know
Beyond the incidents described in Section 6.4, there have been few incidents indicating that Sydhavna can be disrupted in the long term. Nevertheless, the incidents indicate that accidents may occur that can potentially have major consequences.

The purpose of this chapter is to review the societal vulnerability if the supply of petroleum products from Sydhavna is lost, the consequences such a loss may have, and the instruments that can reduce the consequences.
Energy consumption in Norway has been relatively stable in recent years. Of total energy consumption in Norway, 50 per cent is from electricity and 37 per cent from oil. Even though Norway differs from other countries by its large consumption of electricity, and the fact that the consumption of oil products is declining a little every year, oil is still important to the stability of society. Of the overall consumption of petroleum in Norway, approximately 29 per cent comes from Sydhavna. That means that distribution from Sydhavna accounts for approximately 11 per cent of total energy consumption (see Figure 8.1).

Primary diesel oil, petrol, aviation fuel and some heating oil are transported from Sydhavna. Other dangerous goods that are transported by road in smaller quantities include ethanol, paraffin and liquid tar for the production of asphalt etc. Diesel oil, gasoline and heating oil are transported by road, while aviation fuel is transported by rail. A smaller volume of aviation fuel is transported by road. Figure 8.2 shows the distribution of the various products leaving the oil terminal.

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FIGURE 8.1 Energy consumption in Norway. The left sector shows total energy consumption, while the right sector shows the percentage of total energy consumption that Sydhavna is responsible for in Norway (Statistics Norway 2013).

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8 Statistics Norway 2013: Energy accounts and energy balance.
If the supply of fuel from Sydhavna was to fail, Østfold, Akershus, Oslo, Hedmark, Oppland and Buskerud (see Figure 8.3) are the counties that will be the most vulnerable. These counties have over 40 per cent of Norway’s population and account for approximately 40 per cent of the consumption of gasoline and auto diesel. Over half of the petrol stations in Norway are located in these counties.

**FIGURE 8.2** Dangerous goods from Sjursøya Oil Terminal (by volume in m³ in 2012), by type.

**FIGURE 8.3** Dangerous goods by road from Sjursøya Oil Terminal, distributed by receiving counties – as m³ of product in 2012.

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\[9\] Institute of Transport Economics (2013), Survey of the Transport of Dangerous Goods in Norway and data received from Oslo Lufthavn Tankanlegg AS.


Security of supply

Security of supply concerns how the need for goods and services can be met without any particular delays, both in normal situations and during crises. Regulation of the security of supply has gone from being detail-oriented to being defined in general terms and based on cooperation between the relevant actors. The new regulatory regime takes into account the fact that society is constantly changing, and it assumes that purpose and function-based regulations are more appropriate than specific provisions. Regulations with open formulations give the decision-making actors greater leeway in the event of a crisis, and allow them to use discretionary judgement in decisions on how to best handle an undesired incident.

The Supply Act that was adopted in 1917 has played an important role in supply preparedness. Due to inadequate specification, among other things, this Act was amended in 1956. The background to the new Supply Act was experience from the interwar period and the Second World War, as well as assessments of the security situation of the time. Crises were primarily regarded as long-term, such as a war situation, and the possibility that Norway would have to be self-sufficient over a longer period was highly possible. The requirements for securing the supply of fuel were very detailed.

The oil crisis in the early 1970s showed that a failure in supply could arise even if there is no war. As a result, the scope of the Supply Act was expanded to encompass crises during times of peace. After the cold war and the diminishing threat of the use of nuclear weapons, the prerequisites for emergency planning changed. The nature of the risk situation has changed, and it is now more unpredictable and complex than it was. Crisis management is based largely on flexible solutions and the ability to change.

Today the Trade and Industry Preparedness Act regulates the supply of goods and services in crises (Sections 1 and 2). The Act is based on public authorities and businesses cooperating on relevant solutions and measures in crises that have significant consequences for the supply of goods and services. In areas where cooperation is inadequate, regulations and other measures that secure supplies can nevertheless be adopted. The Regulations concerning the stockpiling of petroleum products are to secure the supply of petroleum products if the supply is inadequate (Sections 1 and 11).

Security in the electricity supply.

In the electricity supply, reference is often made to the n-1 criterion as a requirement for how secure a grid and production system should be. The criterion states that the supply should be maintained even if there is one fault in the system. Since the criterion does not say anything about the scope of a fault that affects supply, and the consequences of a fault may be very great, the n-2 criterion is often used in large cities. This means that the system must withstand two faults at the same time before given areas lose their supply.

All actors that are encompassed by the Energy Act must report an assessment of the security of supply. The n-1 criterion is to be used in the assessment, which must also include a description of potential accidents and associated impacts (with special emphasis on long-term impacts), an overview of where in the system the n-1 criterion has not been met, and of which measures can fulfil the requirement. In addition, a simple cost-benefit assessment of the measures must be made (cf. Sections 13 and 14 in the Regulations relating to energy reports). Statnett uses this criterion in its grid development plans and as a decision-making basis for investment.

A similar requirement may be appropriate to better secure the supply of petroleum products.

Actors that import or produce 10,000 m³ or more of petrol, auto diesel or heavy oil products are obligated to maintain a stockpile corresponding to 20 days of consumption (Sections 2 and 3).

The Ministry of Petroleum and Energy (MPE) has the overall responsibility for emergency preparedness, financing and crisis management connected with the supply of fuel. The findings in the study indicate that the Ministry of Petroleum and Energy does not have established procedures for handling incidents that can disrupt large portions of the supply of petroleum for a greater length of time. Specific emergency preparedness measures are lacking, including an assessment and a plan for prioritisation in a situation of scarcity.


46 The Act no. 5 of 14 May 1917 relating to measures to secure and organise the nation’s supplies of vital necessities and other goods; Act of 14 December 1955 relating to supply and civil defence measures.

47 Act no. 65 of 16 December 2011 relating to trade and industry preparedness replaced Act no. 7 of 14 December 1955 relating to supply and civil defence measures. The Act relating to supply and civil defence measures replaced the Supply Act of 1917.

48 Regulation no. 1019 of 1 September 2009 relating to the stockpiling of petroleum products.
This report discusses the importance of the oil terminal to the security of the supply of petroleum products to Eastern Norway. In this context, the security of the supply of petroleum products is related to undesired incidents that can affect Sydhavna. Other factors that may affect the security of supply, but are geographically located outside of Sydhavna, have not been included in the assessments.

Sydhavna’s geographic location
The oil terminal in Sydhavna has a central location that can have both a reinforcing and diminishing effect on the risk situation. A short transport route and less driving time between the fuel depot and distribution sites increases the security of supply. At the same time, the geographic nearness to the surrounding population and infrastructure can make the consequences of undesired incidents greater. There is an inherent conflict between securing the supply of fuel and securing the population.

Among the oil companies that distribute petroleum products from Sydhavna, there are varying opinions on the location of Sydhavna. One of the actors views the increased risk related to the location as more important than the geographic advantages. In the opinion of this actor, the nearness to Oslo and the roads and train lines that cross Sydhavna are the greatest factors that affect the risk of loss of the oil terminal. In the opinion of the other actors, the short distance to customers represents greater advantages than the safety challenges associated with the location.

When asked whether it would be relevant to move the activities of the oil companies in Sydhavna, three out of four oil companies answered that the advantages of building up the facility in Sydhavna are greater than building a new oil terminal at another location. The location, economic advantages and low risk of undesired incidents in the underground storage facility were used as arguments.

The oil companies’ perception of undesired incidents that can affect the supply of petroleum from Sydhavna
All of the oil companies that operate in Sydhavna consider the risk of loss to be genuine in the sense that unforeseen incidents can occur that would result in a failure of the fuel supply. The oil companies mention fire at the tank-truck filling-rack that possibly spreads, and a collision between a train and tank-truck as possible incidents.

All of the companies believe that the supply of fuel to Oslo Airport Gardermoen will be the greatest problem if Sydhavna is lost.

The oil companies have divergent opinions on the risk situation in Sydhavna. One actor believes that the risk of an undesired incident occurring at the oil terminal is significant, but that the risk that the supply of fuel can be lost is low, since it is possible to establish good back-up solutions. The other oil companies have the opposite opinion: that the probability of an undesired incident is very low, but they regard the consequences of a long-term loss as serious for the supply of fuel.

The companies that view a possible loss as serious believe that major consequences will occur quickly, and that the situation will be especially critical during the first three months. The perceptions appear to be linked to how dependent the actors are on Sydhavna in order to supply fuel. Few alternative storage sites, little capacity at the petrol stations and limited possibility to change the existing supply pattern will make the potential consequences greater.
8.3 CONSEQUENCES OF LOSS

The loss of the oil terminal in Sydhavna may potentially have consequences for all of Eastern Norway. Both Oslo Airport Gardermoen and the transport sector may potentially be hard hit by a loss, and therefore the loss of supply problem has been given special attention.

Scarcity of petroleum products
With the exception of Sydhavna, few fuel depots supply petroleum products to Eastern Norway. The fuel depots that are located in or close to the counties most affected (Oslo, Akershus, Østfold, Hedmark, Oppland and Buskerud) are small and only meet a small portion of the overall demand for fuel. The fuel depots located in the surrounding counties (see Figure 8.4) have a greater capacity, but they normally only supply a small percentage of the consumption of petroleum products in the aforementioned counties.

All of the oil companies point out that if Sydhavna is lost, the fuel depots located in Eastern Norway will be depleted after a few days. This is a result of the fact that the fuel depots are normally not full due to the associated financial costs. Another factor that must be taken into account is the fact that vulnerable consumer groups, such as the emergency services and nursing homes, must be given priority. In addition, an incident that disrupts Sydhavna will most likely create uncertainty and fear in the population. One result of this is that the population may start to hoard fuel, which may in turn make the social consequences even greater.

Conversations with the oil companies give an astounding picture of how the loss of supply situation will develop. Since the fuel depots other than Sydhavna that are used in Eastern Norway are small, the companies believe that there will be an extreme scarcity of fuel after a few days. Several oil companies express that it will take at least three months to establish solutions that can ensure the supply of petroleum products to Eastern Norway. In the event of a total and immediate loss of Sydhavna, there will therefore be a high level of scarcity for the first three months.

Several of the oil companies point out that emergency preparedness plans should exist, but no one can point to any specific plans or procedures. One of the oil companies referred to a plan that regulates the supply of oil products if there is a risk to life and health.

A plan for the prioritisation of air traffic and critical infrastructure is also mentioned at the same time. However, the informant does not know where these plans come from or if they are still valid.

Consequences for the transport sector
Transport accounts for 51 per cent of total oil consumption in Norway49, and oil is at present the most important source of energy for the transport industry. In other words, the transport sector uses the greatest amount of petroleum products, and has few other alternatives. Thirty two per cent of all fuel for road transport in Norway comes from Sydhavna. In sum, this makes the transport sector particularly vulnerable to the loss of the oil terminal in Sydhavna.

The supply of fuel and transport are interdependent. A scarcity of fuel affects the transport industry, and a failure in the transport industry affects the supply of fuel and other goods. If the transport of fuel is impeded, it will quickly have consequences for other sectors of society. A study conducted by the Norwegian Defence Research Establishment (FFI) shows that it will take approximately one week before the consequences of a failure in the transport industry are noticeable. The societal functions that will be affected first are industry and goods trade, supply of food, health, police and the fire and rescue service. The financial consequences will be quickly noticed. Fewer production sites and a reduced number of depots mean that we will be more dependent on continuous transport. FFI writes in its report that ”[in] a situation in which a scarcity of transport resources arises, this can result in those who pay the most will have their transport needs met, and, as an extreme consequence, it may result in goods of financial interest being given priority over ‘life necessities’, such as food and medicines50.”

Annually over 200,000 TEU of container cargo is handled in Sydhavna. If Sjursøya is lost, the transport of goods will be affected in several ways. Since one of the two container terminals in Sydhavna is located on the outside of the oil terminal, it will be affected directly if an incident disrupts

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50 Norwegian Defence Research Establishment 2003:21
RISK CONNECTED TO THE LOSS OF THE SUPPLY OF FUEL FROM SYDHAVNA

According to the Norwegian Petroleum Institute, there are 17 main facilities for petroleum products in Norway, as well as several distribution facilities. There are some distribution depots in Eastern Norway, but they are small and, according to the oil companies that operate from Sydhavna, they will quickly be depleted. In recent years, the number of fuel depots has been reduced.

The fact that large portions of the cargo traffic go from one place, in addition to all being transported by road, make this transport particularly vulnerable. Since 80 per cent of the cargo traffic in Eastern Norway comes from Sydhavna, blocking this traffic will have particularly severe consequences. This vulnerability is partly a result of the fact that major portions of the same activity are being concentrated in one single location.

Consequences for Oslo Airport Gardermoen.
All of the fuel to Oslo Airport Gardermoen is supplied from Sydhavna. Storage capacity at the airport is limited, and corresponds to approximately two to four days of consumption. By 2017, the airport’s capacity will be increased by approximately 40–50 per cent, which implies 8-10 million more passengers annually. In light of the sharp increase in passenger traffic at Gardermoen, the airport is particularly vulnerable.

The consequences, if Oslo Airport loses its supply of fuel, will be cancelled departures and changes in air traffic. For the aviation companies this will mean major financial losses, while for the passengers it will entail major delays and inconveniences. There are no other airports nearby that have enough capacity to be able to replace Gardermoen. The distance to alternative fuel depots that can supply Gardermoen are considered too far away to completely replace the supply of fuel from Sydhavna. The greatest practical problem will be the availability of tank-trucks that can transport aviation fuel.

8.4 EXISTING ALTERNATIVES

According to the Norwegian Petroleum Institute, there are 17 main facilities for petroleum products in Norway, as well as several distribution facilities. There are some distribution depots in Eastern Norway, but they are small and, according to the oil companies that operate from Sydhavna, they will quickly be depleted. In recent years, the number of fuel depots has been reduced.

Alternative solutions according to the oil companies can be to build filling-rack at other fuel depots, expand the supply pattern to fuel depots in the surrounding counties, and to obtain more tank-trucks and drivers. The oil companies also have agreements that allow them to transport fuel from each other’s depots. The oil companies believe that they can replace some of the supply that originally comes from Sydhavna, but it appears uncertain how long it will take before alternative solutions are operative and how much can be replaced.

The refinery at Slagentangen outside of Tønsberg distinguishes itself as the most obvious alternative for the supply of fuel in Eastern Norway. Even if the companies use each other’s fuel depots, this solution will probably favour the oil companies unevenly, since Esso owns the refinery. The fuel depot at Fredrikstad can also be used to supply parts of the market covered by Sydhavna, but it will have little effect due to the size of the facility. Overall, there is only a limited portion of the loss that can be replaced.

Other fuel depots that may be relevant to varying degrees in replacing the supply from Sydhavna are Fagervika and Hørvingen in Trondheim, Mongstad and Skålevik in Bergen, Kolsalsodden and Kroodden in Kristiansand and Larsgården in Ålesund. By increasing the capacity of these facilities, and concentrating the facilities around the Oslo Fjord to supply the most critical areas, the supply areas can be extended. In this way, the loss of the fuel supply can be somewhat mitigated. It should be noted that the use of alternative fuel depots will increase the amount of traffic, since much of the volume that will be replaced has a short transport route (from Sydhavna to Oslo, Akershus and Østfold).
According to AVINOR, the closest facility that can supply Gardermoen with aviation fuel is Larkollen in Østfold. With some modifications, it would be able to deliver aviation fuel by tank-trucks on the road. The challenge is to obtain an adequate number of tank-trucks and drivers that are suitable for the transport of aviation fuel to Oslo Airport Gardermoen. Another measure that reduces the consequences is that aircraft fill up with fuel at other airports to cover the return trip. This can be done by flights that have a flying time of approximately one hour to/from Gardermoen. Furthermore, fuel rationing will be introduced at Gardermoen. Due to the high daily consumption, these alternatives will not allow the airport to maintain normal operations.
8.5 SUMMARY

The probability of the loss of the oil terminal in Sydhavna is low, but the consequences will be great. This is due to the scarcity of available products, capacity problems at alternative fuel depots, scarcity of available tank-trucks and drivers, and increased traffic on certain parts of the public road network. If the oil terminal is lost, major parts of Eastern Norway will lose their supply of petroleum products. The scarcity of fuel may result in a failure in cargo transport, which will in turn impede and delay the supply of goods. In addition, delays and cancellations at Oslo Airport will affect a very high number of passengers and inflict major expenses and losses for the airlines.

The instruments that are used to control the risk of a loss are emergency preparedness plans and a regulation of supply in crises, which encompass flexibility in the system, alternative fuel depots and storage facilities, etc. The Ministry of Petroleum and Energy (MPE) has the ultimate responsibility for emergency preparedness, financing and crisis management connected with the supply of fuel. The findings in the review indicate that the Ministry of Petroleum and Energy does not have established procedures for handling incidents that can disrupt large portions of the supply of petroleum for a greater length of time. Specific emergency preparedness measures are lacking, including an assessment and a plan for prioritisation in a situation of scarcity.
This chapter provides an overall assessment of how the safety conditions in Sydhavna are maintained, seen in light of ongoing change processes, and identifies the need for improvements and new measures. The following questions are the starting point for the assessments; cf. Chapter 1:

- Is there an adequate overview of the risk situation and the safety challenges?
- What is the need for improving the knowledge base?
- Given our current knowledge, how are the safety challenges to be assessed?
- Are the current means of maintaining safety adequate with regard to quality, scope and accuracy?
- What should be done to improve the level of safety in the area?

The premises for assessments in this chapter are:
Regardless of the probability of serious incidents connected with the activities in Sydhavna in general, and the petroleum-related activities in particular, there are potentially major consequences if an accident should occur. The probability calculations cannot “compensate for” the uncertainty factors that will always be present when risk is to be assessed and managed. Uncertainty is increasingly addressed in safety research, at the expense of traditional “probability times consequence” assessments. Unforeseen things can take place – and have also taken place in recent years, such as the train accident in 2010.

Many decisions have been made in recent years based on the continued location of the petroleum activities at Sjursøya, including municipal planning decisions and consent from public authorities. Over many years, extensive infrastructure has been built up in the underground facility and at the oil terminal, which cannot be replaced without extensive investments and assessments of alternative solutions.

This report finds that the location of the petroleum activities in Sydhavna should be maintained. Given this point of departure and the fact that the location of the activities must be regarded as challenging based on their proximity to vulnerable surroundings, it is even more important that the safety management is fully satisfactory and also contributes to continuous improvement of the level of safety. This must entail a clarification of responsibilities, clear goals and priorities at all levels and specific measures with regard to both prevention and emergency preparedness.

The main purpose of this chapter is to justify and elaborate on the needs for improvements in safety management that have been identified in this report. It must be emphasised that the management perspective in this context encompasses instruments and actors at all levels, from the individual enterprise to the overarching regulations and the interactions between them, cf. the risk governance perspective presented in Chapter 2.
OVERALL ASSESSMENT OF STATUS AND NEEDS

9.1 PREAMISES FOR THE ASSESSMENTS

A prerequisite for well-functioning risk management is that decision-makers at various levels have correct and relevant information on risk factors, and that effective measures are being implemented to reduce risk to an acceptable level within the framework of the actors’ responsibility.

In assessing the activities in Sydhavna, we must take as the starting point that many actors at various levels have duties and roles that affect the level of safety. The concept of risk management is often related to the responsibility that lies with the enterprise in question and/or the “risk producer”, as this has been defined in various regulations or standards. What characterises the regulation of an area such as Sydhavna is the fact that it is subject to several regulatory regimes – with somewhat different purposes, including areas where (parts of) the exercise of authority has been assigned to municipal bodies. In addition, enterprise responsibilities are divided among several companies, with the port authority in a role as the owner and “landlord”. The port authority is in turn subject to both national (and supranational) regulations for ports and to the municipality’s management – within the framework of regulations for municipal enterprises. In addition, parallel processes are taking place that involve additional actors and regimes, which directly or indirectly affect the safety situation, such as the infrastructure projects described in Chapter 5. In sum, a range of actors, technologies, tasks, decision-making processes and framework conditions are involved, including:

- the specific operational processes related to the performance of hazardous activities (such as the handling of hazardous substances and dangerous goods)
- procedures and plans at the enterprise level
- technological solutions and design of the facilities
- logistics and interaction of activities that also involve multiple actors (such as transport and traffic)
- prioritisation, policy and management by key decision-makers
- external framework conditions and market conditions
- overarching government regulation and inspection.

To ensure proper activities, there must be coordination and a common understanding in which the different regimes/actors have a clear understanding of their own contribution and the contributions of others in an optimally comprehensive risk management process. Taking account of this complex picture, risk management cannot be limited to a process with clearly defined responsibilities related only to the management of a single enterprise. Objectives, priorities, perspectives and competence vary according to the actor’s perspective and role.

Since this is also often the case in many other areas, several attempts to develop terminology and scholarly perspectives that reflect the actual complexity in risk management processes, cf. Chapter 2. The assessments in this chapter are thus in addition to findings from the review, also based on relevant knowledge of what experience has shown to contribute to inadequate safety and undesired incidents related to risk-prone industrial activities (cf. Section 2.5). Various critical factors often prove to be part of the underlying causal chains. When these factors are present, it indicates the presence of vulnerabilities that can be recognised to varying degrees also in the review of the Sydhavna area.

> Goal conflicts
Harbour activities are generally characterised by a broad and complex goal structure. This is reflected in the purpose provisions of the Harbour and Fairway Act and by legislation otherwise: navigability, effectiveness, environment, port security, general safety, etc. For the Port of Oslo in particular, it is also evident that there are several considerations that must be taken into account concurrently. Production and economic considerations and harbour development (Fjord City plan, etc.) shall be balanced against a range of other internal goals and regulatory requirements. The chance is all the greater that a direct conflict between various interests may arise.

> Prioritisation and focus
Having many aims and purposes may also cause challenges with respect to both long-term and ongoing prioritisation. In addition to the general challenges associated with the prioritisation of safety considerations versus production considerations, which require a daily focus and effort, there are other considerations that must be safeguarded, as well as all the change processes that the port – and Sydhavna in particular – must handle, including planning and decision-making processes and day-to-day operations.

The focus of the City of Oslo in developing and implementing the Fjord City plan indicates that the realisation of the positive effects and development opportunities in the harbour areas was the principal – and natural – perspective. It was presumed that safety considerations would be handled within this framework.

> Information and knowledge base
Accidents and poor safety conditions are often related to the fact that decisions are made on the basis of limited knowledge/information. Experience from serious incidents shows that
the information that decision-makers possess prior to (and during) the incident may often be both inadequate and difficult to understand. Essential information may be lacking, and the flow of information may make it difficult to distinguish between what is relevant and what is not, and between what is important and what is not. The review of the activities in Sydhavna shows that the flow of information is extensive, and there is a risk that relevant knowledge is not always available prior to decision-making at different levels.

Many actors, interdependencies and complexity

Sydhavna encompasses a large number of enterprises with varying degrees of interdependence and coordination needs. Many risk-prone activities are concentrated in a small area, particularly related to the transport and storage of petroleum products. There is also a possibility of domino effects. In sum, this can result in excessive complexity and a lack of consistent management and clarification of interfaces and responsibilities. The basis for decision-making processes will to a great extent be limited by the individual decision-maker’s interest and knowledge, with the risk of local optimisation/suboptimisation in both time and space, cf. the discussion of the planning processes and coordination at the oil terminal. Overall considerations may entail challenging trade-offs between local versus central decision-making and implementation processes. It is also a challenge to ensure that the various actors have a clear understanding of each other’s roles and responsibilities. There is a chance of a “vacuum” in the management processes, as when unfounded or incorrect assumptions are made with regard to what the “others will take care of”.

The Port of Oslo’s “shopping centre model” entails, for example, that safety matters to a great extent are left to the tenants, and it is assumed that government regulations are complied with and that this is controlled by the relevant authorities. However, the role of the authorities is primarily to prepare appropriate, functional and observable regulations that address the significant risk factors, and to prioritise policy instruments in a purposeful manner within the framework of allocated resources. The latter especially entails an expectation that inspections are risk-based. The standard-setting and controlling functions of the authorities are not meant to replace enterprise responsibility, nor are they dimensioned for such a role. The range of responsibilities is also complex with regard to regulations. The actors have duties pursuant to the various regulations, and public inspection is assigned to various government bodies with limited degrees of coordination. As mentioned in Section 6.4, the former Railway and Aircraft Accident Investigation Board of Norway pointed out already in its report on the train and tank-truck collision in 2003 that it was unfortunate that neither an operator nor a public authority was assigned overarching responsibility for coordination of safety in the area.

9.2 RISK SITUATION AND KNOWLEDGE BASE

9.2.1 KNOWLEDGE OF THE RISK SITUATION

The review documents that a large number of risk analyses have been conducted at different times, and cover many different aspects of safety in Sydhavna. Some of the analyses have been part of larger studies in which the risk situation has only been one of several topics being considered. The majority of the analyses have addressed only subtopics and individual aspects of safety.

This review does not include any critical analysis of the quality of the existing assessments. Recognised methods have been used for the analyses. In general, all risk analyses will nevertheless be influenced by the selection of assumptions and scenarios, etc.

The summary in Chapter 6 shows that the same firm (Scandpower) conducted many of the analyses concerning operations at the underground storage facility and at the oil terminal. Generally, it can be an advantage to use analysts who are familiar with the area (the technologies, facilities, processes, etc.). At the same time, there may be risks related to reuse of experts. This is partly because there may be a need for a fresh view and new perspectives, but also to reduce the possibility that the analyses are not sufficiently critical and independent.

With regard to findings from inspections as part of the risk  

51 Cf. governing documents for the supervisory authorities.
picture, it is important to point out that inspections do not involve a risk assessment, but rather a review of the internal control and systematic HSE work. Failure to comply with the regulatory framework will be pointed out, and such failures provide indications of failure in risk management. Experience shows that investigations made after incidents have occurred more thoroughly reveal underlying causes that may also indicate system failure.

However, there are no analyses and assessments that take a comprehensive look at all the relevant conditions, and which evaluate the organisational and management-related prerequisites for proper safety in the area. It also appears unclear how the responsibility for conducting comprehensive risk assessments has been understood and followed up by key actors. The review of developments in the area in recent years indicates that there has not been any adequately documented assessment of the overall risk situation and/or of the safety-related effects of the decisions at given times and during critical decision-making processes. This indicates that a system is lacking for conducting risk assessments – as part of a comprehensive risk management process.

Relevant findings in this connection are:

> **No overall risk analysis**

Reviews of the existing risk and vulnerability analyses show that there is no overall risk and vulnerability analysis that encompasses all of the activities in Sydhavna, cf. Chapter 6. The lack of a overall risk and vulnerability analysis was already pointed out in the “Impact assessment for Sydhavna” from 2003 (Section 20.4 in the impact assessment).

In their work with the risk and vulnerability analysis for the Port of Oslo, as part of the municipal risk and vulnerability analysis (“Overall Risk and Vulnerability Analysis for the City of Oslo” of 2013), the City of Oslo has made clear that the findings and assessments from the DSB project (“Sydhavna (Sjursøya) – an area with increased risk”) are to be included. In this context, the City of Oslo has contributed supporting documentation and input for the project.

> **The analyses that address interfaces between the enterprises and domino effects have been initiated/required by external authorities.**

It is evident from Table 6.2 in Chapter 6 that the analyses that to some extent address the overall picture (“Risk Analysis of Sjursøya Oil Terminal” of 2007) and domino effects (“Evaluation of the Domino Effects between the Container Harbour and Oil Terminal at Sjursøya of 2006), have been ordered by external authorities. This indicates a failure in risk management since this is a responsibility that shall naturally lie with the responsible enterprise.

> **Assumptions made in a key impact assessment have changed**

The impact assessment for Sydhavna from 2003 was based on the assumption that the container harbour in Sydhavna was temporary, and that all of the container operations would be phased out by 2011. An important assumption in the impact assessment was thus changed when the container operations were not moved after all. On the contrary, current plans assume a considerable increase in the capacity of the container harbour at Sjursøya.

It is unclear to what extent the proposal for corrective measures in the Norwegian Coastal Administration’s final document has been followed up (see Chapter 5). Regardless of the status of this work, the recommended and required measures were aimed at handling a different risk situation – and lower risk – than what actually resulted from the decision. This particularly applies to the scope of maritime traffic.

It is reasonable to interpret these findings as an indication that the focus in the planning process was primarily aimed at the realisation of the Fjord City.

> **Areas that have not been surveyed**

Even though there is a lot of documentation of facilities and infrastructure there are also some critical areas where this is lacking. This applies to general overviews of installations in the area such as the facilities in Ekebergåsen; see Section 3.2. An overview of the installations in the ground is also lacking for Sydhavna. In this context, it must be mentioned that the municipal Agency for Planning and Building Services has an ongoing project to survey the installations in the ground on a general basis. The lack of such documentation makes it challenging to assess the risk factors.

> **Inadequate risk assessment of maritime traffic**

The vessel traffic service centres log, organise and control maritime traffic, in order to avoid dangerous and undesired situations, and to ensure efficient traffic steering. It is, however, difficult to find assessments that consider the overall risk in the harbour basin using accident statistics and empirical data from the logs.

In connection with ISPS (cf. Section 4.9), threat assessments have been prepared that concern the risk of deliberate undesired actions against ships in the harbour area, but analyses that show the importance of the relationship between the amount of maritime traffic and the number of accidents – and thus the need for preventive safety measures – are lacking. Ships with petroleum products represent a special risk in this respect.

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> Inadequate value estimation
Activities that may be worthy of protection and are of importance to national security or vital national security interests, shall be subject to regulations that stipulate preventive measures against preparation for, attempts at and perpetrations of espionage, sabotage or terrorist actions. In cooperation with the Ministry of Labour, the Ministry of Petroleum and Energy has assessed objects within the Ministry’s area of responsibility in accordance with regulations, and this was submitted to the NSM in June 2013.

This assessment concludes that there are no grounds for designating objects worthy of protection in the Norwegian oil and gas industry, cf. Section 4.10.

> Delivery capacity/consequences in the event of a loss of supply
There are several uncertainties associated with the loss of supply problem. Firstly, none of the oil companies has established procedures or plans for how to handle the loss of Sjursøya. The companies have great confidence in their own ability to improvise to handle the loss, but they do not provide any clear accounts as to what they specifically can or will do to maintain the supply of fuel. In addition, there are no assessments of risk related to a loss of supply, and or of what measures can reduce possible consequences. This results in a great deal of uncertainty as to whether, and to what extent, the oil companies are able to handle a large loss of supply situation in a safe and effective manner. The analysis of Sjursøya shows that more knowledge is required on how the system will act in the event of undesired incidents, on what emergency measures exist, on what can be improvised in the case of an accident, and on what measures can be implemented to limit the damage.

9.2.2 RISK SITUATION – GIVEN THE EXISTING ASSESSMENTS

Based on the existing analyses and assessments, cf. Chapter 6, there are no clear indications of serious failures of safety. At the same time, it must be pointed out that this review does not provide any systematic investigation of whether or to what extent risk-reducing recommendations and measures from the existing assessments have been followed up. Given the deficiencies that have been pointed out with regard to an overview of the current risk situation – which reveal primarily a failure of overall risk management – the review has nevertheless identified significant safety challenges:

> Inadequate maintenance in the underground storage facilities
The underground storage facilities were built in the 1970s, and the ageing of the facilities is a challenge. After the accident involving overfilling in Ekeberg Tank (cf. Section 6.4), an extensive technical upgrade of this part of the underground storage facility was carried out. The other part of the fuel depot, Ekeberg Oil Storage, is somewhat older; it contains a larger range of products and is technologically somewhat more complex than Ekeberg Tank. No upgrade corresponding to that in Ekeberg Tank has been carried out at Ekeberg Oil Storage. The age of the facility, type of products and complexity indicate that there would be a corresponding need for an upgrade at Ekeberg Oil Storage. Ekeberg Oil Storage is co-owned by four oil companies, so the decision-making process is more challenging regarding measures and investments.

> Incidents that reveal failures
The incidents discussed in Section 6.4 have been subject to subsequent investigation. The Accident Investigation Board Norway has been responsible for investigating the railway accidents, while the oil companies have investigated the incidents at Ekeberg Tank (former StatOilHydro) and the oil terminal (Shell) on their own initiative. The investigations have revealed weaknesses in the technological and, indeed, the administrative area, and have depicted a more comprehensive and critical picture than has been obtained after the inspections conducted by the authorities (which do not go in depth with respect to the specific incidents).

There is also a potential for major incidents. The leak that occurred between Christmas and New Year’s Eve in 2012 would for example have had very different consequences if there had been gasolin in the pipes. Moreover, the train accident in 2010 could have had a much more serious outcome if the train with aviation fuel had been at the filling-rack, or if the runaway railway wagons had continued on to the oil terminal. The latter incident also shows that accidents can take place in unforeseen ways, and that there can be a large degree of uncertainty and unpredictability related to the assessments of risk and potential damage. This applies to an even greater degree to enterprises with identified domino effects, such as the oil companies.

> Increased vulnerability due to further development – Sørenga
The risk associated with the activities in Sydhavna have increased in recent years due to the development at Bjørvika and will continue to increase as developments towards Sørenga are completed. An ever-increasing number of people will potentially be affected by an incident that results, for example, in smoke/vapour dispersion in the area.

> Oil terminal staffing / security surveillance
The oil terminal is currently unmanned outside of working hours on the daytime. The underground storage facility is staffed around the clock. The operators, normally two people, stay inside the underground storage facility unless products are being imported from a ship. In that case, one of the operators will be located on the import pier. The staffing of the fuel
depots has gradually been reduced. Previously, the gatekeeper checked all the vehicles entering the area. A card reader and code system have now replaced the gatekeeper. There is activity at the tank-truck filling-rack around the clock, and the drivers will provide some surveillance of the facilities. A truckdriver detected and alerted the incident between Christmas and New Year’s Eve in 2012, several hours after the leak had started. This indicates a random and unsatisfactory surveillance of the facilities.

> Planning and dimensioning of emergency preparedness
The worst-case scenarios outlined in the “Sjursøya Scenario” and the “Bjørvika Scenario” in Section 7.2 describe consequences that would entail significant challenges with regard to saving lives and evacuating the population. It will probably not be possible to extinguish a major fire in the petroleum facilities or in the harbour basin and it will have to burn out in a manner that is as controlled as possible.

The workshop that was arranged in connection with these scenarios (see Section 7.3) revealed uncertainties as to the extent to which current emergency preparedness is adequate for carrying out a controlled and managed evacuation. Furthermore, uncertainties concerning the effectiveness of warning- and notification procedures and the rapid mobilisation of necessary resources were revealed.

9.3 ASSESSMENT OF THE CURRENT INSTRUMENTS

An assessment is given below of how current instruments at various levels are suitable for meeting the safety challenges as they appear in this review, with a focus on:

- The enterprises’ management and coordination (particularly the oil companies’ risk management/ internal control).
- The Port of Oslo as the actor responsible for ownership administration, leasing, operations, ongoing dialogue and follow-up.
- Municipal steering (planning processes, regulation, corporate governance and emergency preparedness).
- Regulatory frameworks and administration of the regulations through inspection and other ongoing follow-up from central government (and municipal) authorities.

9.3.1 RISK TREATMENT – INSTRUMENTS AND MEASURES AT THE ENTERPRISE LEVEL

In general, the enterprises will themselves be responsible for preventive measures and emergency preparedness. As mentioned, the authorities shall inspect compliance with the regulatory requirements at certain intervals, but this is not to be regarded as a replacement for enterprise responsibility. The regulatory framework, including the internal control requirement and (other) management requirements place a clear responsibility directly on the enterprise. In general, it is also the case that the risk treatment takes place within the framework of the individual enterprise’s management and decision-making systems.

For petroleum activities seen in isolation, the interest in safe operations is considerable, since the petroleum facilities are critical for deliveries to customers, and there are few alternatives for effective distribution (cf. Chapter 8). At the same time, the ownership structure, contractual matters and different incentives/priorities appear as key challenges. The coordination of activities, preventive work and emergency preparedness emerge too often as the result of individual initiatives without any clear, contractual guidelines.

The fact that the more comprehensive risk assessments have only been conducted on the initiative of the authorities indicates a lack of focus on the overall effects of and interaction between the activities.

The oil companies largely have separate steering systems for HSE, which encompass both prevention and emergency preparedness. They are also linked to the company systems that the enterprises are required to follow, but with room for necessary local adaptations. Cooperation on safety at the oil terminal is largely linked to emergency preparedness, through the establishment of a common emergency protection plan. Organisationally, the cooperation is linked to the joint ownership of the underground storage facility through Sisterne Drift and the common operational committee (cf. Section 3.2).

With regard to the operations in the underground storage facility, these are coordinated to some extent through the establishment of the operating organisation (Sisterne Drift). At the oil terminal,
the companies operate more independently. However, also with regard to the underground storage facility, findings indicate that it can be demanding to carry out the necessary maintenance and upgrades. It has not been possible to clarify what resources each oil company has invested in maintenance and upgrading of the underground facilities and outdoor areas in recent years. Even though Statoil Fuel & Retail has done a major upgrade of Ekeberg Tank, there is a significant backlog with regard to technical maintenance at Ekeberg Oil Storage.

This is considered to be serious, since the facility is more complex and contains petrol, among other things, with a significantly higher risk potential than at Ekeberg Tank. Ekeberg Oil Storage, which was established as a joint property by the four oil companies, has a more cumbersome process with regard to making decisions to carry out major maintenance tasks. This is largely attributed to the fact that the ownership structure and agreements/contracts between the companies complicate the decision-making processes and implementation capacity. The companies have different interests connected to the facility, the willingness/capacity to carry out measures varies, but decisions require a consensus in the group of owners. The system of contracts for the operation of this part of the underground storage facility therefore emerges as a barrier to systematic and continuous maintenance.

It was easier to carry out the extensive upgrade of Ekeberg Tank with StatOil Fuel & Retail being the sole owner.

The incident between Christmas and New Year’s Eve in 2012 (cf. Section 6.4), gives reasons for examining whether the barriers are adequate to prevent major discharges, and whether documentation and responsibilities related to maintenance have been clarified. The incident revealed that the supply pipe that supplied diesel oil to Shell’s tank-truck filling-rack was owned by Statoil Fuel & Retail. This means that responsibility for maintenance of the pipeline is not clearly defined. The incident revealed that several modifications were performed on the pipe system without this being updated in the description of the facility, which is an important basis for the performance of systematic maintenance. At the same time, the inspection after the incident showed that there was deficient and in some cases misleading labelling of pipe racks.

Cooperation between the oil companies at the oil terminal is organised through the operational committee, where safety issues are also addressed. Based on findings from the inspection after the discharge at Shell’s facility in December 2012, it nevertheless appears that the committee is not functioning optimally with regard to clarification of the technical and organisational interfaces at the oil terminal. There is no clear mandate clarifying the role of the committee in relation to the need for a more comprehensive management of risk at the oil terminal.

As mentioned, the oil terminal does not have surveillance service around the clock. The discharge/leak between Christmas and New Year’s Eve in 2012 took place outside of working hours, and was accidentally discovered by a tank truck driver. A tank truck driver does not in any case have a complete overview of the facility, and will to a limited extent be able to be of benefit to the emergency services that arrive in the area. With the current staffing situation in Sydhavna there are many hours during a 24 hours period when there are no personnel at the facility with such important local knowledge. There is a need to review and reinforce manned surveillance at the oil terminal. Local knowledge is important for handling incidents at the oil terminal facilities. The enterprises that operate in the area must have updated operating procedures, drawings and diagrams of the facility that show the actual conditions. The personnel must have sufficient competence, and be familiar with the substances, the facilities, and the area as such. In addition to local knowledge, external resources that are to contribute in an emergency must also have knowledge of the facilities. This implies a high degree of cooperation, and that exercises are conducted with the relevant actors.

Until December 2012, the oil terminal was subject to specific industrial safety regulations (see Section 4.3). For some time, the oil companies have wanted to reduce the emergency preparedness scheme, through, for example, applying for exemption from the industrial safety requirement. More than two years have passed since this was repealed, without a new emergency preparedness scheme being clearly described. The emergency protection plan has not been updated. The oil companies at the oil terminal have participated in a process to establish a common emergency response organisation that has yet to be realised. Plans and outlines for the organisation exist, but it has not been implemented. The task/emergency response manager works in a 20 per cent position. The oil companies should consider on their own initiative how their emergency response organisation could be re-established based on the industrial safety requirements.

The Norwegian Seveso Regulations specify that domino enterprises shall exchange relevant information among themselves in a suitable manner to ensure that the enterprises collectively take into account the overall risk of a major accident in their systematic efforts to prevent and limit the consequences of a major accident, cf. Section 4.1. The guidelines for the regulations state that the enterprises should coordinate measures to reduce the risk of a domino effect and limit the consequences if an accident with a domino effect should nevertheless occur. Of the key documents that should be exchanged, risk analyses, safety reports, emergency preparedness plans and information on near misses are mentioned. The exchange of information shall be documented, while coordination measures should also be available in writing. The requirements pursuant to Section 6 of the HSE Internal Control Regulations concerning coordination (cf. Section 4.5) may also apply to petroleum activities in the
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port; see the next section for a more detailed discussion. In sum, several requirements exist for systematic and documented coordination of preventive and emergency preparedness measures. The findings described above give reason to question whether these requirements have been met. There is reason to assume that the oil companies have an improvement potential with regard to the degree of systematisation and cooperation in the safety management of the petroleum-related activities.

9.3.2 RESPONSIBILITY AND MANAGEMENT AT THE MUNICIPAL LEVEL

Given the high risk and the lack of incentives for coordination at the enterprise level, the role of the municipality and port authority is all the more critical. The role of the municipality is multi-sectional:

- Through direct management dialogue with the Port of Oslo
- Through land-use planning processes and decisions pursuant to the Planning and Building Act
- Through the follow-up of the municipal preparedness duty
- Through follow-up of the Fire and Explosion Prevention Act (Oslo Fire and Rescue Department)

The municipality has – based on the findings in this review – not taken a sufficiently active role with regard to safety in Sydhavna. The planning processes in connection with the Fjord City Resolution have primarily been guided by a desire to free up harbour areas for urban development purposes, partly by concentrating industrial activities in Sydhavna.

The municipality’s management dialogue and follow-up of the Port of Oslo

In recent years, safety considerations have not been discussed in the management dialogue with the Port of Oslo, with the exception of emergency preparedness plans and a brief note on the internal control of HSE. The main impression is that safety related to hazardous activities at the Port of Oslo in general and Sydhavna in particular, have not received much attention in the municipality's management dialogue. However, environmental considerations have been high on the agenda and (terror) security measures pursuant to the port legislation (ISPS) have been discussed regularly. Safety related to the storage, transport and handling of hazardous substances is treated primarily through planning processes. There is a need for the municipality in greater extent to place safety on the agenda in the steering documents and in its ongoing management dialogue with the Port of Oslo.

Follow-up of planning processes and decisions

Many decisions and subsequent development plans have been made with varying degrees of importance to Sydhavna.

The Fjord City Resolution of 19 January 2000 is key to the design of Oslo’s harbour and waterfront, cf. Section 5.2. An important element of the decision and in the “Fjord City alternative” is the phasing out of the crane-based container operations at the Port of Oslo and a continuation of cruise and ferry traffic, as well as wet and dry bulk cargo within the boundaries of Oslo. In the “Fjord City plan” adopted on 27 February 2008, the City of Oslo has subsequently confirmed that all the container operations shall be moved to Sydhavna, which will be established as Oslo’s permanent port. The item in the Fjord City Resolution concerning phasing out the crane-based container operations has thus been abandoned.

The impact assessment for Sydhavna of 26 November 2003 is based on the Fjord City Resolution to phase out the container operations in the long term and only have such operations at Sjursøya during a transitional phase. The risk and vulnerability assessment is based on this assumption, which was being in the process of abandoned at the time. The Norwegian Coastal Administration’s final document in connection with the impact assessment is based on the City of Oslo statement that container operations will be phased out by 2011, and that the municipality efforts to find alternatives to the Port of Oslo as a container harbour is to be continued. The zoning plans “Sydhavna, a new container terminal” of 13 October 2004 and “Sydhavna” of 26 August 2009 are based primarily on risk and vulnerability analyses conducted in the impact assessment under the assumption that the container operation is temporary.

In the impact assessment for Sydhavna, a set of 9 corrective measures (see Section 5.4.1.a) have been proposed, which the Norwegian Coastal Administration assumes in its final document that the owner (Port of Oslo) and municipality (City of Oslo) will follow up in the future. There is no document that comprehensively describes the follow-up of the “guidelines for corrective measures” that are mentioned in Section 7 of the Norwegian Coastal Administration’s final document for the impact assessment “Sydhavna”. It is unclear to what extent the mitigating measures have been followed up. Appendix 4 describes the status of the proposed measures.

In connection with the risk and vulnerability analyses related to the zoning plans “Sydhavna, a new container terminal” and “Sydhavna”, reference is made, for example, to the risk and
vulnerability assessments conducted in the impact assessment “Sydhavna”. It is not evident from the documentation related to these zoning plans that an assessment has been made of whether the risk and vulnerability analyses from the impact assessment are still relevant. This assessment should have been made exclusively in connection with the zoning plan “Sydhavna”, which was made available 5 years after the final document from the Norwegian Coastal Administration concerning the impact assessment “Sydhavna” was available.

As mentioned, the efforts to survey the risk picture in Sydhavna revealed a need for a complete overview of the facilities/installations in Ekebergåsen. Through its area maps related to the municipal master plan, the municipal Agency for Planning and Building Services only has an overview of the installations at ground level, including where openings and boring to underground installations and facilities have taken place. One reason for the inadequate overview of the facilities in Ekebergåsen may be unclear regulations with regard to underground installations and facilities. In addition, the fuel depot in Ekebergåsen was previously associated with the national emergency preparedness plan, which meant that information on the facility has been confidential.

Currently the safety zone around the oil terminal at Sjursøya (see Figure 6.1, Chapter 6) is not specified in the municipal documents. In the municipal master plan under preparation, the oil terminal’s safety zone will be incorporated as a precautionary zone in the municipal master plan maps. This means that there must be a dialogue with the Agency for Planning and Building Services before any new activities can be established within the zone. A precautionary zone does not entail a ban on building, but provisions for measures and activities shall be adopted (cf. Section 11.8 of the Planning and Building Act).

For future planning processes, the municipality must ensure that impact assessments are prepared that adequately address civil protection and societal safety considerations.

**Follow-up of the municipal preparedness duty**

Pursuant to the Civil Protection Act, the municipality is required to survey undesired incidents that may occur; assess the probability of these incidents, and assess how their possible occurrence may affect the municipality. The results of this work shall be presented and compiled in a comprehensive risk and vulnerability analysis, and in an emergency preparedness plan.

None of the municipality’s risk and vulnerability analyses gives any in-depth review of the safety conditions in Sydhavna. A more detailed review of safety in Sydhavna is now being carried out now in an ongoing risk and vulnerability analysis process.

It is important that this ongoing work result in an overview of the overall and actual risk situation, and that it also includes factors that will increase vulnerability and risk; such as the development at Sørensa and increased maritime traffic.

**The duties of the municipality pursuant to the Fire and Explosion Prevention Act**

According to the Fire and Explosion Prevention Act, the City of Oslo is responsible for identifying special fire objects. The municipality (fire service) shall also inspect these objects.

Based on the criteria used in the Fire and Explosion Prevention Act – concerning circumstances where fire may entail the loss of many lives or major damage or injury to health, the environment or material assets – it may be questioned whether the companies at the oil terminal should be classified as special fire objects, and have the associated inspections conducted. There may also be a need to review the list of such objects with a view to ensuring that it provides an updated and correct picture of the identified objects.

**Port of Oslo**

No findings in this report indicate that the Port of Oslo has any proactive role in the follow-up of the safety conditions related to the petroleum activities in Sydhavna. Neither do the oil companies involve the Port of Oslo in ongoing safety management processes. There is no established common arena for the discussion of safety-related questions and measures, even though HSE is included as a topic at the annual customer meetings. Contact between the Port of Oslo and the enterprises in this area is mainly related to questions concerning land-use and infrastructure (such as traffic and the supply of water). The Port of Oslo facilitates land-use allocations, common infrastructure, etc., and fulfils its safety duties primarily related to its own facilities, buildings, etc., and its own employees. This is clearly evident from the fact that the Port of Oslo only follows up the pier with regard to maintenance and technical condition, and also that coordination within the HSE area is limited to terminals and areas in which the Port of Oslo has its own employees. The oil terminal is not encompassed by the scheme. Safety regulations (on hazardous substances) pursuant to the port legislation are old, outdated and apparently not very well known to the actors. They are also largely related to loading/unloading operations from vessel to vessel, or from vessels to shore, and focuses on permits, notification and technical equipment.

The Port of Oslo has organised and regulated its relationship to the users and tenants based on a “shopping centre model”. In the contract with the tenants/users, it is stipulated that the current regulatory framework must be ensured, but no systematic schemes have been established in which the Port of Oslo follows up whether this condition has been met. In this review, only the contracts with the oil companies have been
examine. These are, as is evident from Section 3.3, of an older date and entered into in connection with the establishment of the oil terminal (1965-70), and have formulations characteristic of the regulatory framework of that time. The regulatory regime for this type of enterprise has changed significantly in recent years, with a lesser degree of direct government approval and far greater emphasis on the enterprises’ own responsibility for risk management and internal control.

The HSE area is fragmented in the current organisation, with issues related to the environment, the working environment and safety/security divided into three different departments. A common management system for HSE, quality and finance has been established, but the various areas are followed up by different departments and in some cases by different individuals at sub-department level. The findings indicate that the focus on risk factors is mainly related to the external environment and protection against terrorism in accordance with the ISPS regulations. This has only to a limited extent any impact on safety related to hazardous substances and activities at the oil terminal. The oil terminal is not an ISPS terminal, so to the extent that protection against terrorism is assumed to have an effect on fire and explosion safety, this will nevertheless not be of any significance to the activities in the terminal. The HSE system encompasses a scheme of quarterly coordination meetings with selected actors in Sydhavna. The enterprises at the oil terminal have not yet been included in this scheme. The selection of the actors to be included is based on risk, but apparently related primarily to the working environment and occupational safety, and thus typically includes the crane operations. An HSE advisor in the personnel section administers the scheme with responsibility for the working environment part of the HSE system. The emergency response manager and the environmental manager do not normally participate at the meetings. There is now an organisational development process in which the organisation of HSE and the port security/safety functions, among others, are being assessed.

As discussed in Section 6.5, the enterprises located in Sydhavna generally perceive that there is only medium or low risk associated with the activities there. At the same time, there is a lack of knowledge on the risks of other enterprises, and a great deal of uncertainty related to the organisation of safety and emergency preparedness work. Most of the enterprises have a great deal of confidence in the management of their own risk, but there is greater variation in the responses with regard to management in general and common preventive tasks. The responses probably reflect the fact that only some of the enterprises are integrated in the Port of Oslo’s HSE coordination system.

The main impression in other words is that follow-up of safety is mainly related to protection against terrorism according to the harbour regulations, while safety otherwise is related to questions of land-use and (common) infrastructure. The activities at the oil terminal are entrusted to the oil companies. With regard to port security, clear guidelines have been issued for the port authorities’ overall responsibility, with dedicated functions for follow-up in their own organisation. In some areas, the Port of Oslo also chooses to assume an expanded role that is not limited by the “shopping centre model”. This is partly a result of municipal prioritisations and reputational considerations, and is particularly evident with respect to environmental issues.

In relation to neighbours and other surroundings, noise abatement measures are the dominant topic, while safety is not often on the agenda. These priority areas are directly followed up in relation to tenants and users, with clear expectations and managed processes (such as “the management’s review”). Given the risk situation that is depicted in Sydhavna, it can be questioned whether these are the areas/topics that provide the strongest reasons for deviating from the more passive “shopping centre model”.

In sum, there is reason to question the coordination, especially with regard to follow-up of duties pursuant to the HSE Internal Control Regulations. As mentioned in Section 4.5, the regulations have a separate provision on coordination that requires that enterprises that perform work at the same workplace agree in writing, if necessary, which enterprise will be responsible for the coordination of internal control for common activities or areas. If necessary, the supervisory authorities may determine where this responsibility shall lie. Section 6 also includes provisions concerning the relationship between commissioning enterprises and contractors – which correspondingly aim to regulate the coordination between various enterprises, but where the key aim is nevertheless to ensure that the interfaces and overall risk management concerns are safeguarded, see Box 9.1 for a more detailed discussion.

Explanatory comments on the regulations refer to “the obvious need that someone has responsibility for, and an overview of, the overall health, environmental and safety situation at such workplaces”. Reference is made in particular to the Working Environment Act and the Construction Client Regulations, but the requirement applies in principle to all enterprises that are encompassed by the regulations. In the comments, reference is made, for example, to “activities that are operating at e.g. shopping centres, industrial parks, and the like” and it is pointed out that here it “may be natural for the operating company or holding company to assume coordination.
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responsibility. The enterprise in question must in all cases have the necessary overview, competence and authority”.

This report shows that there is a need for a stronger and more comprehensive follow-up of the safety conditions in Sydhavna based on a risk management perspective in accordance with the requirements of the HSE Internal Control Regulations. Even though the regulations are aimed primarily at individual enterprises, the safety challenges in Sydhavna indicate that additional measures beyond the individual enterprise’s internal control are necessary. The coordination provision in the regulations clearly expresses the necessity of more coordinated and comprehensive management in cases where several enterprises are located within a limited area. The Port of Oslo’s “shopping centre model” does not provide an adequate basis for addressing the overall safety challenges. It is based on overstated expectations of the effect of the sectoral and area-specific regulations for the area, assumes that the enterprises follow the current regulations and coordinate safety efforts, and further that the supervisory authorities also follow up that safety is maintained. As the owner, landlord and highest authority for the harbour areas, the port authorities are the natural actor to ensure more overarching risk management. In this regard, attention should be paid to the international regulations and standards mentioned in Section 4.11, which in sum require that local port authorities take comprehensive responsibility for safety in their harbour areas. Based on the requirements in the HSE Internal Control Regulations, this will entail that

• HSE goals are defined for the entire harbour area, as has already been done for the external environment
• a summary is prepared of all the relevant regulatory requirements that apply to the actors in the area
• the organisation of HSE work includes all of the actors, with clarification of responsibilities, descriptions of key activities and routines in the systematic HSE work, and follow-up of non-conformity with internal routines and regulatory requirements.
• a common system is established for the registration of all relevant incidents, and that comprehensive risk assessments are conducted and risk-reducing measures are implemented in common for the harbour area
• schemes are established to follow up that the internal control functions as intended

A greater responsibility for safety at the port would entail increased use of resources, further development of competence and probably a more coordinated organisation of HSE work. Only one position for follow-up of both port security pursuant to the Harbour and Fairway Act and other safety tasks appears to be insufficient in this respect, especially due to the assumed use of resources on and prioritisation of the former. However, this report does not espouse a more detailed control of the enterprises, but rather a more systematic follow-up based on the need for more comprehensive management in accordance with internal control requirements.

As mentioned, it is difficult to find assessments that analyse the overall risk in the harbour basin. Empirical data from the logs of the VTS (vessel traffic service) station should be more thoroughly analysed and include near misses. The correlation between the scope of maritime traffic and the risk of accidents should be assessed, also based on general knowledge of safety at sea. Ships with petroleum products represent an extraordinary risk, and, seen in light of an expected increase in maritime traffic, there is a need for a continuous assessment of the risk situation and preventive measures.
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BOX 9.1 Regulation of the relationship between commissioning enterprises and contractors.

Even if the relationship between the port authority and users/tenants in the harbour area is not directly regarded as a relationship between the commissioning enterprise and contractor, there are nevertheless common characteristics that make it relevant to point out the regulations that apply in such cases. They express a clear need to address the relationships between several enterprises that are interdependent, but where direct regulation of each actor individually is not regarded as adequate to safeguard the overall safety challenges. In the comments on Section 6 of the Internal Control Regulations, this concern is expressed as follows:

The basis is that an enterprise performing on activities connected with a physical installation etc., is obliged to ensure that all activities on the site are encompassed by internal control, regardless of whether or not those performing the activities are employed by the commissioning enterprise. The reason for this is that it is often immaterial whether the persons exposed to risk while working are employed by the enterprise or not. The same will naturally apply where there is a risk of polluting the external environment, and otherwise in connection with safety and protection measures needed to prevent dangerous or harmful situations from arising because of an enterprise’s own activities.

According to the regulations, coordination shall be based on the contractor’s internal control. Of key importance in this context is the fact that the client – the one that is responsible for the activities – must investigate whether the contractors that the enterprise hires have adequate internal control. The main purpose in any case is to ensure that the overall management is satisfactory, beyond the responsibility that lies with an individual enterprise – and expresses therefore an overall perspective, including cases where multiple actors are involved but are influenced by each other’s activities and management systems.

Regulation of coordination and overall management in such relationships is perhaps most clearly expressed in the HSE regulations for petroleum activities, especially through the so-called “supervisory duty.” This duty is defined as the statutory responsibility that licensees and operating companies have to have a management system that ensures that the overall activities take place in accordance with the requirements of the regulatory framework concerning health, environment and safety (Report no. 7 (2001–2001) to the Storting). The supervisory duty for licensees follows from Section 10-6, 2nd paragraph (formerly Section 58), which states that The licensee shall see to that anyone performing work for him, either personally, through employees or through contractors or subcontractors, shall comply with the provisions laid down in or pursuant to the Act. The operator’s control duty follows from Section 7 of the Framework Regulations, 2nd paragraph: The operator shall see to that everyone who carries out work on its behalf, either personally, through employees, contractors or subcontractors, complies with requirements stipulated in the health, safety and environment legislation.

The operator’s supervisory duty is the most extensive. In the guidelines for the Framework Regulations, it is specified that the operator’s supervisory duty requires active measures, while the responsibility of the licensees is largely fulfilled through the overarching supervisory duty. The operator’s follow-up duty entails the establishment of a management system and conducting inspections to follow up that the actors are complying with the regulatory framework. It is not sufficient to control that the contractor has a management system in place. As is evident from the legislative background to Section 10-6 of the Petroleum Act, the supervisory duty entails that the operator shall verify that contract partners are competent and qualified before and during the execution of a contract and during the performance of activities (Proposition no. 43 (1995–1996) to the Odelsting, page 62). The operator must formulate both the tender documents and contracts with the clearest possible requirements for products and services with regard to health, safety and the environment (cf. Report no. 7 (2001–2002) to the Storting).

This responsibility is nevertheless limited to what the operator has control and instruction authority over. It is emphasised here that it is difficult to ascribe any responsibility to a participant for violation of a regulatory requirement if the actor in question does not have any practical control and instruction opportunities with regard to the duties concerned.
The operative emergency preparedness is provided by the emergency services, and it appears to be well functioning and well coordinated. A critical challenge for the police and fire service in relation to actual responses in emergencies concerns the need for local knowledge at Sjursøya, including ongoing and updated knowledge of the specific incidents. A permanent guard scheme has been requested and desired, to ensure immediate, coordinated and informed/knowledge-based notification, as well as continuous updating on the details of the course of events (cf. Section 7.3). There is also a need for a closer review of warning routines and emergency preparedness – beyond the functions of the emergency services. There is a need for greater clarification of the duties, responsibilities and distribution of roles within the municipality and the municipal enterprises – as well as in relation to other contributing actors in an emergency.

9.3.4 LOSS OF SUPPLY AND SECURITY OF SUPPLY

The companies that deliver oil products from Sjursøya have differing opinions of risk with regard to both the oil terminal and the challenges regarding loss of supply. This may be a possible explanation for the lack of emergency preparedness, and it is also a weakness in the overall risk management of the oil terminal. The review shows that there is generally little knowledge of the distribution of responsibilities, prioritisation and emergency preparedness in the event of a loss of supplies from Sjursøya. Overall, this means that it is uncertain how a loss of supply situation would emerge, and what consequences a loss may entail.

The lack of plans and routines for handling a loss of supplies may be seen in the context of changes in the regulatory regime. The requirements for supply preparedness have gone from being detailed to becoming more general. Previously, actors were required to have specific plans and surplus storage capacity, while the current regulatory framework is based on cooperation and situational crisis management. The regime that regulates the security of supply is still under development and is not yet firmly implemented in the organisations that are to ensure a secure supply of fuel during crises. It appears that systems to ensure that plans are available is left in a vacuum between old and new.

The consequences of a loss of the supply of petroleum products from Sjursøya will be apparent after a few days. At the same time, it is difficult to assess the best way to handle this, and the time it will take before a normal supply of fuel is in place. There is a great deal of uncertainty related to the available instruments on the part of both the oil companies and the authorities.

Various instruments should be considered. Rationing and prioritisation immediately after a loss may be a measure for controlling the consumption of fuel. Today the oil companies consider rationing as a measure that should not be implemented before it is necessary. Together with rationing, a prioritised supply seems sensible, where fuel for a certain period is secured for emergency services and other functions important to the society.

Emergency preparedness plans for reducing the consequences in terms of alternative methods of supply should be considered. Both prioritisation of the supply of fuel, for example to emergency services and the transport industry, and prioritisation of the delivery points should be included in the emergency preparedness plans.

Risk analyses focusing on a loss will contribute to reducing societal vulnerability and strengthening the management capabilities of emergency preparedness actors. Risk analyses should address dependencies and focus on extraordinary incidents. Important actors in society are dependent on petroleum products, but this dependence is not taken into account in planning, for example, the dependence between the transport industry and the fuel supply, and the dependence of the emergency services and hospitals on petroleum products.

To ensure supply preparedness, the responsible authority should develop a regulatory regime that is appropriate to the current system, and enables the actors to handle a loss. The requirements for the security of supply for petroleum products, and fuel in particular, may reduce the consequences of a loss by means of greater redundancy in the system (cf. n-1 criterion, see Chapter 8). The challenges that have been identified in the review of a loss of Sjursøya are probably of a general nature, and the security of supply should therefore be addressed on a general basis.

9.3.5 GOVERNMENT REGULATION AND INSPECTION

The regulatory regimes affect the activities in Sydhavna in different ways. This is evident in part through the regulatory framework and normative decisions that apply directly to the groups of actors and through inspection aimed at them (fire, major accident, environment, etc.). In addition, the regimes are meant to have an indirect effect via requirements aimed at the municipality (civil protection, land-use planning) where the effects will depend on further follow-up by the municipality, for example through risk and vulnerability analyses and
emergency preparedness plans. In addition, there is the regime related to the harbour and fairway legislation, which is aimed at both the municipality, directly at the port authority and at the actors who use the harbour. The responsibility of public authorities varies somewhat. In the former case, responsibility is as noted limited to quality and effectiveness with regard to the regulatory frameworks/norms and risk-based inspection. Regulation and inspection in relation to the municipalities is based largely on dialogue and active follow-up. The harbour and fairway regime also emerges as more direct and dialogue-based (with, for example, approval schemes – and arenas/forums for cooperation/follow-up).

Some regulations attempt to take the complexity of the actor structure into account and specify responsibility accordingly, such as in Section 6 of the HSE Internal Control Regulations concerning coordination and in Section 8 of the Norwegian Seveso Regulations concerning domino effects. It can be challenging to regulate/control such cases, which require well-functioning interaction between the enterprises’ own responsibility and government intervention.

**Governmental inspection of the municipalities**

Regulation and inspection of the municipality covers primarily the requirements in the Planning and Building Act and in the Civil Protection Act. At the governmental level, the County Governor has the supervisory and follow-up responsibility pursuant to this legislation.

As mentioned in Section 4.6, the Planning and Building Act requires that statutory plans promote civil protection. Accordingly, the planning authority shall ensure that risk and vulnerability analysis are carried out that examine all of the risk and vulnerability factors of importance to whether the area is suitable for development purposes, and any changes to such factors as a result of the planned development. The Impact Assessment Regulations require that plans that may have significant effects on the environment shall provide a special assessment and description of such effects. The County Governor shall participate in the planning process to ensure that civil protection is ensured and focus on whether the municipalities have adequate knowledge of the areas under planning. The County Governor follows up the requirement for risk and vulnerability analyses and impact, and on how the municipality ensures that current and future land-use planning will be taken into account based on this knowledge. As mentioned in Section 4.8, the County Governor’s capacity to follow up the planning processes in the harbour area has been limited, and it has been made difficult due to the high level of activity, scope and complexity. Planning processes also involve goal conflicts and challenging balancing that require ongoing participation and follow-up during the process. In addition, the role as advisor and contributing actor shall be balanced against the role as authority, including the handling of complaints.

The role of the authorities – especially related to the municipal preparedness duty – is under development as the result of new legislation. The review illustrates the challenges associated with combining these roles and concerns given the available resources. At the same time it is important to emphasise that inspection is first and foremost a periodic monitoring of the municipality’s duties – which does not change the legal responsibilities.

It can be questioned whether the County Governor should have intervened in connection with changes during the planning process, which resulted in the final plan for Sydhavna lacking an impact assessment, cf. Section 9.2.1 above.

**Safety regulation and inspection of the enterprises in Sydhavna**

In this context, safety regulation includes the requirements pursuant to the Fire and Explosion Prevention Act and the Civil Protection Act (industrial safety), as well as the Norwegian Seveso Regulations and the Internal Control Regulations pursuant to both these acts. Altogether, this provides a good basis for regulation of the activities in Sydhavna, in this case with a special focus on the petroleum-related activities.

It is nevertheless worth pointing out three matters where a clarification of the basis for the regulatory framework may be necessary:

- The coordination provision in the HSE Internal Control Regulations has until now not been enforced in relation to the risk of fire and explosions in areas with several enterprises, and which would come under what is defined in this report as areas of increased risk (industrial parks, harbours, etc.). A further clarification for the requirements may be necessary.
- The criteria for the identification of special fire objects have not provided grounds for the inclusion of the enterprises at the oil terminal in a sufficiently clear manner. As mentioned in Section 4.1, the Sjursøya Oil Terminal is not classified as a special fire object. As far as we know, the municipality has not conducted any inspections of the petroleum activities at the oil terminal in recent years.
- As mentioned, the oil companies are no longer subject to an industrial safety obligation, primarily because they no longer have more than 40 employees. There is a need to clarify that this is no longer the only criterion for an industrial safety obligation, and a corresponding clarification that an industrial safety obligation may be imposed if it is regarded as necessary based on the risk or location of the enterprise. In the guidelines for the Industrial Safety Regulations, it is stated that this may include enterprises that handle hazardous chemicals or engage in other activities entailing an increased risk. In addition, enterprises with low risk, which may be exposed to incidents that take place in nearby
enterprises, such as industrial parks, may be subject to an industrial safety obligation. The same applies to enterprises in densely populated areas or near other surroundings that are vulnerable to the effects of possible undesired incidents at the enterprise.

Given such clarification, there are still reasons for following up these regulatory requirements through government intervention. This means that:

- The coordination provision in the HSE Internal Control Regulations is regarded as applicable to the Port of Oslo’s follow-up of the enterprises in Sydhavna, including the oil companies.
- The enterprises at the oil terminal are identified as special fire objects subject to inspection by the fire service.
- The Norwegian Industrial Safety Organisation (NSO) reassesses the industrial safety obligation based on the location and potential for serious incidents. The current status of emergency preparedness work may indicate that clearer obligations and follow-up by the supervisory authorities are necessary.

With regard to the Norwegian Seveso Regulation, there are reasons, as mentioned above, to consider a clearer follow-up of the requirements for the oil companies – especially due to the regulations’ requirements for enterprises with domino effects. Furthermore, there are reasons to reconsider the prioritisation of the supervisory activities aimed at the actors and facilities in Sydhavna.

As stated in Section 4.1, Ekeberg Oil Storage and Ekeberg Tank are required to submit safety reports due to their storage volumes (covered by Section 9 of the Norwegian Seveso Regulations), while Shell and Statoil Fuel & Retail at the Sjursøya Oil Terminal are required to submit notifications (covered by Section 6 of the Norwegian Seveso Regulations). The minimum requirements for the inspection of establishments prone to major accidents are stipulated in the Seveso II Directive. Establishments required to submit safety reports shall be subjected to annual inspections or inspections based on a defined schedule. The inspection interval for establishments required to submit notifications is a minimum of four years. The requirements in the Norwegian Seveso Regulations concerning storage volume as a criterion for inspection frequency thus entails that the establishments at the oil terminal are rarely inspected.

Based on a technical assessment, location in relation to infrastructure, and location in relation to central Oslo, there are nevertheless good reasons for claiming that the facilities at the Sjursøya Oil Terminal represent a far greater risk to the population (third party) than the facilities in Ekebergåsen. Inspection activities at the Sjursøya Oil Terminal have been less frequent than at the underground storage facility. There is therefore a need to consider the extent to which the current inspection of the facilities in Sydhavna is given priority in accordance with the principles of risk-based inspection. The review shows that there is a clear need to strengthen inspection of the activities at the oil terminal.

**Harbour regulations and ISPS**

The regulatory regime for harbours and port activities includes a broad range of purposes: navigability, safe traffic, responsible use and management of fairways in accordance with public and commercial interests (such as fisheries), safe and efficient harbour activities, as well as competitive transport by sea. Safety is included here as one of many, and to some extent competing, purposes. In addition, safety is predominantly related to protection against terrorism. An extensive regime has been developed for this purpose, which is also monitored by the ESA. Other safety requirements are pursuant to Section 40 of the Harbour and Fairway Act, without any clarification of emphasis, prioritisation or expected follow-up. The Regulations relating to hazardous substances in the municipality’s sea area are only sparsely followed up, and the Norwegian Coastal Administration’s guidelines for the Harbour and Fairway Act do not specifically discuss safety.

There are good reasons to ask whether follow-up at the national level reflects the requirements and expectations that are communicated through international regulations and safety standards cf. Section 4.9.2. Even if the strong prioritisation of security and protection against terrorism largely follows from obligations in accordance with EU regulations, the public consultations and the public debate on the topic show that it is unclear whether these efforts are reasonably proportional to the risk situation – seen in light of local conditions and challenges.

Future analyses and assessments that discuss the relationship between security and safety may add detail and promote a more balanced risk philosophy, so that protective measures in both areas are proportionate to each other. This may also have consequences for the Recognized Security Organisations’ somewhat strong regulatory position related to some of the physical protective measures in Sydhavna.

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OVERALL ASSESSMENT OF STATUS AND NEEDS

Value estimation and protection of objects
Based on the guidance and advice of the Norwegian National Security Authority (NSM) concerning what assessments should be made to determine whether an enterprise is worthy of protection, the question is raised of whether the Ministry of Petroleum and Energy should have carried out a more thorough evaluation of Sydhavna as a whole. There are several factors related to security policy, foreign relations, life and health, the environment and the economy that, when combined, indicate that the activities in Sydhavna should have been considered worthy of protection.

The overview of the objects that are worthy of protection is important so that both the police and the Norwegian Armed Forces can plan according to the needs and know where to deploy protection forces in the event of a terrorist attack.

Coordination of government regulation and exercise of authority
At present, there is extensive cooperation between various authorities, especially within the HSE area and with regard to the inspection of Seveso enterprises. Major accident inspection is coordinated through a coordination group led by DSB, and it is a well-established scheme stipulated by instructions. The need for reinforcing the inspection of the outdoor facilities at the oil terminal should be addressed by the coordination group with a view to achieving an agreed understanding between the authorities in accordance with the principles of risk-based inspection. A clearer follow-up of the domino decisions and possibly also of Section 6 of the Internal Control Regulations should also be reviewed and anchored in this coordination group. The group should also take the initiative to review the findings and assessments in this report with the aim of identifying any improvements that can reinforce the overall effect of current regulations and inspection efforts. The various authorities will focus individually on preventing incidents with specific outcomes (fire, discharges, etc.), but both the triggering and underlying causes may be related to the same factors, such as inadequate maintenance or management failure.

Broader cooperation between the authorities that regulate and supervise the ports, beyond the current cooperation schemes for the HSE agencies and the major accident authorities should also be considered. The report illustrates the scope of the government regulation of ports, and there is a need for a closer review of the interfaces, overlap and coordination challenges. This should take place through dialogue between the affected authorities, and may include issues such as:

- the establishment of more permanent forums for the discussion of problems related to the regulation of harbours
- the need for better exchange of information and experience
- the need for better coordination of instruments aimed at harbours
- the relative strength and scope of various regulatory purposes in relation to risk (for example, between safety and security).
The review of the activities in Sydhavna reveals a complex and intricate picture of risk factors, actors, planning and decision-making processes, responsibilities, steering and regulations. Several risky activities are localised in a small geographic area, without any overall assessment of how they affect each other or any coordinated steering. This fragmentation is reflected at different levels, which include the private, municipal and central government levels. As illustrated in the previous section, there is a need for improvements in a number of areas where different actors at all levels should contribute.

This chapter provides an overview of proposals for improvements and measures based on the findings documented in the review.
CONCLUSION AND RECOMMENDATIONS

10.1 THE ENTERPRISES IN SYDHAVNA

With regard to needs for improvement and recommendations directed at the enterprises in Sydhavna, the scope of this review is limited to the petroleum-related activities.

> The oil companies have a potential for improvement regarding the structuring and coordination of safety management. Relevant information must be exchanged and followed up as part of the systematic work to prevent accidents according to the requirements of the Norwegian Seveso Regulation. The enterprises should coordinate measures to a greater degree to reduce the risk of a domino effect, and to limit the consequences if an accident with a domino effect should nevertheless occur. Key documents that should be exchanged include risk analyses, safety reports, emergency preparedness plans and information on near misses. A more comprehensive coordination and steering of prevention and emergency preparedness will require a clearer distribution of responsibility and roles, which should also be documented in writing. Coordinated internal control should be developed as far as possible in accordance with the requirements in Section 6 of the HSE Internal Control Regulations.

> The oil companies should, on their own initiative, consider how their own emergency response organisation can be re-established in accordance with the industrial safety requirements.

> Security surveillance at the oil terminal should be improved. Round-the-clock staffing, with regular rounds through the facility should be reintroduced, manned with personnel who are familiar with the facility and the safety conditions, and who can respond adequately at the onset of incidents and provide correct and full information to the emergency services and reinforcement forces if necessary.

> Based on the risk analyses and in cooperation with the relevant authorities, the oil companies should establish emergency preparedness plans and procedures that secure necessary and prioritised supply of petroleum products in the event of a loss of supply.

10.2 THE MUNICIPALITY AND THE PORT AUTHORITY

The municipality should integrate safety considerations largely into decision-making and management processes.

> For future planning processes, the municipality must ensure that impact assessments are prepared that adequately address civil protection and societal safety considerations.

> The ongoing work with the risk and vulnerability analysis of the Sydhavna area must result in an overview of the overall/actual risk situation, and it must include factors that will result in greater vulnerability and risk such as the development at Sørenga and increased maritime traffic.

> The municipality must define goals for societal safety related to the harbour activities and follow these goals up with management directives and in the ongoing management dialogue with the Port of Oslo.

> There is a need for greater clarification of the duties, responsibilities and distribution of roles within the municipality and the municipal enterprises – as well as in relation to other contributing actors in an emergency situation.

> The Agency for Fire and Rescue Services should register the facilities connected to petroleum activities as special fire objects, and conduct inspections in accordance with this.

> The Agency for Planning and Building Services should ensure that a documented overview of installations and facilities under ground is obtained.

> The Port of Oslo should improve the follow-up of the actors in Sydhavna with regard to safety, especially in connection with the petroleum activities. This should primarily take
CONCLUSION AND RECOMMENDATIONS

place through the overall management and the establishment of forums for follow-up and dialogue, not through detailed control.

As the owner, landlord and highest authority for the harbour areas, the port authority is the naturally and logical actor for ensuring the overall risk management. In this respect, reference can be made to the international regulations and standards mentioned in Section 4.11, which in sum require that the local port authorities take comprehensive responsibility for safety in their harbour areas.

Based on the requirements of the HSE Internal Control Regulations, this will entail that:

- HSE goals are defined for the entire harbour area, as has already been done for the external environment
- a summary of all of the regulatory requirements that apply to the actors in the area is prepared
- the organisation of the HSE work includes all the actors, with clarification of responsibilities, descriptions of key activities and routines in the systematic HSE work, and the follow-up of non-conformity with the internal routines and regulatory requirements
- a common system is established for the registration of all relevant incidents, and that comprehensive risk assessments are conducted and risk-reducing measures are implemented in common for the harbour area
- schemes are established to follow up that the internal control functions as intended

10.3 GOVERNMENT REGULATION AND EXERCISE OF AUTHORITY

- Enhanced inspection based on the Norwegian Seveso Regulation and the HSE Internal Control Regulations
  - Pursuant to the Norwegian Seveso Regulations, the authorities should follow up the oil companies’ compliance with regulatory requirements and domino decisions. This entails a special focus on the requirements for the exchange of information and cooperation and risk-reducing measures.
  - To a greater extent, the HSE agencies should supervise the requirements for coordination pursuant to Section 6 of the Internal Control Regulations, directed at both the port authority and the oil companies.
  - The analyses have uncovered relatively few inspections of the outdoor facilities in accordance with the Norwegian Seveso Regulation. Only some of these have in turn been conducted by DSB, focusing on fire and explosion protection. The inspection frequency for the outdoor facilities (Section 6) should therefore be increased.

- Conduct more inspection in accordance with the Regulations on the handling of hazardous materials and the regulations relating to explosive atmospheres.
  - Through inspections, focus more on technical measures and barriers than what follows from the Norwegian Seveso Regulations or Internal Control Regulations.

The inspections should contribute to increasing the enterprises’ focus on the technical condition of the facilities and the operating procedures.

- Enhance coordination between various authorities.
  - Review the assessments and proposals in this report in the coordination group for major accident enterprises in order to identify the need for improvements in current inspection.
  - Consider broader cooperation between the authorities that regulate and supervise the ports, beyond the current cooperation schemes through the HSE agencies and the major accident authorities.

- Review the appropriateness of the permit regime
  - Permits are given individually to each enterprise. This is in spite of extensive cooperation and use of the same equipment and facilities. An assessment should be made of whether the current permition regime is appropriate in relation to ensuring safety at the oil terminal.

- The industrial safety obligation should be reintroduced to improve emergency preparedness and promote a greater degree of cooperation in connection with emergency planning.
- Clearer management and regulation of the port authority’s
CONCLUSION AND RECOMMENDATIONS

This report is based on the premise that the location of petroleum activities in Sydhavna is maintained. The location of the activities must nevertheless be considered unfortunate due to the proximity of vulnerable surroundings, and would probably not have been chosen as a solution in the current situation if the map were to be redrawn. In future long-term planning for the harbour areas, alternatives to Sjursøya as an oil terminal should be assessed.

Within the scope of this review, no extensive socio-economic analysis of the effects of the proposed measures has been conducted. The question can also be raised of whether it would be possible to give any well-justified quantification of the overall benefits in terms of reduced risk for the area. On the contrary, the review reveals that the risk situation is characterised by major uncertainties. The measures that have been proposed will first and foremost be a contribution to reducing the uncertainties associated with having so many hazardous activities and facilities concentrated in the immediate vicinity of vulnerable surroundings. In addition, risk must be expected to increase because of increased activity and increased vulnerability in connection with developments in the surrounding areas.

The measures that are proposed here will primarily be of an administrative nature, and may require somewhat increased use of resources for the oil companies and Port of Oslo, and to some extent the City of Oslo. Several measures also entail only a marginal increase in the use of resources in the form of better organisation and coordination of the safety work. These additional efforts appear rather marginal compared to the alternative costs associated with relocating petroleum activities out of the Port of Oslo – or even more so compared to the costs of a potential major accident. They also appear to be marginal in relation to an expected reduction of the uncertainties connected to the activities and an overall improvement of the level of safety for humans, the environment and material assets.

The proposals for improvements and measures affect many actors, including DSB. DSB will follow these up based on

1. Its role as the national regulatory authority for specifically defined regulatory areas – which entails ordinary follow-up pursuant to the relevant legislation.

2. The ministerial instructions for DSB’s general responsibility to maintain a cross-sectoral perspective in its civil protection work, and the Directorate’s coordinating role related to the safety of activities, objects and enterprises with a potential for major accidents – which entails the follow-up of relevant actors through dialogue and cooperation.

10.4 FINANCIAL AND ADMINISTRATIVE CONSEQUENCES

- National port authorities (Ministry of Transport and Communications and Norwegian Coastal Administration) must to a greater extent follow up safety at the ports, clarify/strengthen the role of local port authorities, both through regulations, inspection and other management initiatives.
- The local port authority must be given an expanded and more prominent role/authority with regard to the overall management of risk in harbour areas through the regulations for ports.
- Review and assess the implementation and practice of the ISPS requirements.

> Value estimation and protection of objects

- The Ministry of Petroleum and Energy should conduct a value estimation of the petroleum activities in Sydhavna with the aim of identifying objects that are worthy of protection.

> Security of supply
- The Ministry of Petroleum and Energy (and/or others) should initiate a process together with the oil companies in accordance with the Trade and Industry Preparedness Act for establishing agreements and guidelines that secure the supply of petroleum products in a loss of supply situation. These must take into account the need for prioritisation, among other things.
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**Public documents**
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Laws, regulations, etc.
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• Regulations no. 602 of 8 June 2009 relating to the handling of flammable, reactive and pressurised substances, as well as equipment and installations used for handling such substances (Regulations relating to the handling of hazardous materials)
• Regulations no. 384 of 1 April 2009 relating to the road transport of dangerous goods
• Regulations of 17 June 2005 on measures to prevent and limit the consequences of major accidents in enterprises in which hazardous chemicals are present (Norwegian Seveso Regulations)
• Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises (Internal Control Regulations)

Act no. 19 of 17 April 2009 relating to harbours and fairways (Harbour and Fairway Act)

• Regulations no. 1129 of 23 December 1994 on the duty to use a pilot in Norwegian waters (Compulsory Pilotage Regulations)
• Regulations no. 1114 of 29 August 2003 relating to the safe loading and unloading of bulk carriers
• Regulations no. 1543 of 15 December 2009 relating to unloading, loading, storage and transport in the municipality’s sea area and harbours within the same area of hazardous substances and dangerous goods (Regulations relating to hazardous substances in the municipality’s sea area)
• Regulations no. 1760 of 20 December 2010 relating to administrative fees pursuant to the Act relating to ports and fairways etc.
• Regulations no. 1761 of 20 December 2010 relating to the publication of information that may be of importance to actors who use or are at sea
• Regulations no. 1762 of 20 December 2010 relating to the municipality’s calculation and collection of port charges
• Regulations no. 538 of 29 May 2013 relating to securing port facilities
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- Regulations no. 539 of 29 May 2013 relating to securing port facilities

Local regulations:
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- Regulations no. 1684 of 15 December 2009 relating to maritime traffic in specific waters
- Regulations no. 43 of 22 January 1996 relating to the use of and order in the Port of Oslo District, City of Oslo
- Regulations no. 1181 of 15 June 1995 relating to speed limits at sea in the Port of Oslo District, marine charts no. 4 and 452, City of Oslo

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- Regulations no. 1434 of 20 December 2011 relating to industrial safety
- Regulations no. 894 of 22 August 2011 relating to the municipal preparedness duty
- Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises (Internal Control Regulations)
- Regulations of 17 June 2005 on measures to prevent and limit the consequences of major accidents in enterprises in which hazardous chemicals are present (Norwegian Seveso Regulations)

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- Regulations of 17 June 2005 on measures to prevent and limit the consequences of major accidents in enterprises in which hazardous chemicals are present (Norwegian Seveso Regulations)
- Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises (Internal Control Regulations)

Act no. 4 of 18 June 1965 relating to road traffic (Road Traffic Act)
- Regulations no. 625 of 8 June 1994 relating to restrictions on the transport of dangerous goods in certain road tunnels in Oslo

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- Regulations no. 1019 of 1 September 2006 relating to stockpiling of petroleum

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- Regulations no. 1158 of 7 July 2007 relating to energy reports

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- Regulations of 17 June 2005 on measures to prevent and limit the consequences of major accidents in enterprises in which hazardous chemicals are present (Norwegian Seveso Regulations)
- Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises (Internal Control Regulations)

Act no. 79 of 11 June 1976 relating to the control of products and consumer services (Product Control Act)
- Regulations no. 922 of 1 June 2004 relating to limitation of the use of chemicals that are hazardous to health or the environment and other products (Product Regulations)
- Regulations no. 911 of 30 June 2003 relating to health and safety in explosive atmospheres (User Regulations)
- Regulations no. 1127 of 6 December 1996 relating to systematic health, safety and environmental work in enterprises (Internal Control Regulations)

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- Regulations no. 855 of 26 June 2009 relating to impact assessments
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Act no. 65 of 16 December 2011 relating to trade and industry preparedness (Trade and Industry Preparedness Act)
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http://www.isgott.co.uk/
APPENDIX 2: COMPOSITION OF THE STEERING GROUP, PROJECT GROUP AND REFERENCE GROUP

Steering group:
Torill Tandberg, DSB, director, project owner.
Per K. Brekke, DSB, director
Torbjørn Hoffstad, DSB, director (from November 2012)
Anita R. Kronlund, DSB, director
Hans K. Madsen, DSB, head of section
Gunnhild Rui, DSB, head of section
Thor Suhrke, DSB, director (until November 2012)
Johan Løberg Tofte, County Governor of Oslo and Akershus, county emergency planning director

Project group:
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Trond Carlsen, DSB, senior principal engineer
Jacob Kringen, DSB, senior advisor
Elisabeth Næss, DSB, senior advisor
Lise Knudsen, student at the University of Stavanger

Reference group:
Ranveig Kviseth Tinmannvik, SINTEF, senior researcher
Preben H. Lindoe, University of Stavanger, Professor
Ove Njaa, University of Stavanger, Professor
Ragnar Rosness, SINTEF, senior researcher
### APPENDIX 3: MEETINGS WITH INFORMANTS/ACTORS

<table>
<thead>
<tr>
<th>DATE</th>
<th>ACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 February 2012</td>
<td>Information meeting</td>
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<tr>
<td>6 June</td>
<td>Port of Oslo</td>
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<tr>
<td>24 August</td>
<td>Port of Oslo</td>
</tr>
<tr>
<td>27 August</td>
<td>Agency for Fire and Rescue Services, City of Oslo</td>
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<tr>
<td>19 September</td>
<td>Emergency Planning Agency, City of Oslo</td>
</tr>
<tr>
<td>20 September</td>
<td>Agency for Planning and Building Services, City of Oslo</td>
</tr>
<tr>
<td>2 October</td>
<td>Emergency Preparedness Department, County Governor of Oslo and Akershus</td>
</tr>
<tr>
<td>2 October</td>
<td>Department of Environment and Transport, City of Oslo</td>
</tr>
<tr>
<td>25 October</td>
<td>Ministry of Petroleum and Energy</td>
</tr>
<tr>
<td>9 November</td>
<td>Agency for Water and Sewerage Works, City of Oslo</td>
</tr>
<tr>
<td>15 November</td>
<td>Oslo Police District</td>
</tr>
<tr>
<td>16 November</td>
<td>Statoil Fuel &amp; Retail, Sjursøya</td>
</tr>
<tr>
<td>16 November</td>
<td>Norske Shell, Sjursøya</td>
</tr>
<tr>
<td>4 December</td>
<td>Oslo Container Terminal and Sjursøya Container Terminal</td>
</tr>
<tr>
<td>6 December</td>
<td>Sisterne Drift</td>
</tr>
<tr>
<td>10 January 2013</td>
<td>Norske Esso, Slagentangen</td>
</tr>
<tr>
<td>17 January</td>
<td>Norwegian Coastal Administration</td>
</tr>
<tr>
<td>28 January</td>
<td>Norwegian National Rail Administration, Greater Oslo</td>
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<tr>
<td>28 January</td>
<td>Eastern Region of the Norwegian Public Roads Administration</td>
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<tr>
<td>15 February</td>
<td>Norwegian Industrial Safety and Security Organisation (NSO)</td>
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<tr>
<td>20 March</td>
<td>Nordstrand District, City of Oslo</td>
</tr>
<tr>
<td>6 May</td>
<td>Norwegian Police Security Service (PST) and Norwegian National Security Authority (NSM)</td>
</tr>
<tr>
<td>6 May</td>
<td>Ministry of Petroleum and Energy</td>
</tr>
<tr>
<td>27 May</td>
<td>UNO-X</td>
</tr>
<tr>
<td>27 May</td>
<td>Oslo Lufthavn Tankanlegg, Gardermoen Fuelling Service</td>
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<tr>
<td>3 June</td>
<td>Port of Oslo and Emergency Planning Agency, City of Oslo</td>
</tr>
<tr>
<td>13 August</td>
<td>Agency for Fire and Rescue Services, City of Oslo</td>
</tr>
<tr>
<td>13 August</td>
<td>Emergency Planning Agency, City of Oslo</td>
</tr>
<tr>
<td>14 August</td>
<td>Port of Oslo and Emergency Planning Agency, City of Oslo</td>
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<td>28 August</td>
<td>Information meeting</td>
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<tr>
<td>3 and 4 September</td>
<td>Workshop</td>
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<td>13 November</td>
<td>Norske Shell, Sjursøya</td>
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<tr>
<td>14 November</td>
<td>Statoil Fuel &amp; Retail, Sjursøya</td>
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<td>29 November</td>
<td>Port of Oslo</td>
</tr>
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### APPENDIX 4: CORRECTIVE ACTIONS AFTER THE IMPACT ASSESSMENT FOR SYDHAVNA 2003


<table>
<thead>
<tr>
<th>REF</th>
<th>PROPOSED &quot;CORRECTIVE ACTIONS&quot;</th>
<th>IMPLEMENTED &quot;CORRECTIVE ACTIONS&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Management of the traffic in the Sjursøya South area. The nearness of the tanker pier and new container terminal creates a need for revision of the port regulations. The establishment of special routines for vessels carrying dangerous goods and manoeuvring in the proximity of vessels carrying dangerous goods should be considered.</td>
<td>The port regulations have not been updated. A project has been initiated to revise the port regulations by the end of 2014. The “Regulations for the oil terminal at Sjursøya” of 1965 have been replaced by the &quot;Contractual terms and conditions for calling at the tanker pier&quot; in 2012. The contractual terms and conditions apply only to tankers.</td>
</tr>
<tr>
<td>2</td>
<td>Traffic monitoring measures that ensure good, safe traffic steering in Sydhavna, new tools and procedures for the vessel traffic service centre adapted to the new traffic conditions in the area.</td>
<td>HAV has invested in new equipment such as radar and maritime VHF. The Port of Oslo’s vessel traffic service centre operates in accordance with the same principles as other vessel traffic service centres under the Norwegian Coastal Administration.</td>
</tr>
<tr>
<td>3</td>
<td>Environmental monitoring, such as IR-based or radar-based detection of oil pollution at sea, which is not dependent on the light and visibility. Can also be used for traffic steering purposes.</td>
<td>Not established, based on visual monitoring from the Port of Oslo’s vessel, the &quot;Pelican&quot;, which makes regular rounds in the harbour basin. The oil spill scenario will be part of the Port of Oslo’s enterprise risk and vulnerability analysis as part of the City of Oslo’s risk and vulnerability analysis.</td>
</tr>
<tr>
<td>4</td>
<td>New navigation beacons and changes to the existing navigation beacons - this particularly applies to Tangenflu, Langskjærflu and Nordre Langøygrabben.</td>
<td>Responsibility of the Norwegian Coastal Administration, and the Port of Oslo does not have the status for this. The Port of Oslo performs the operative maintenance of navigation beacons by agreement with the Norwegian Coastal Administration.</td>
</tr>
<tr>
<td>5</td>
<td>Permanent tugboat preparedness in Sydhavna.</td>
<td>Permanent tugboat is stationed in Sydhavna.</td>
</tr>
<tr>
<td>6</td>
<td>Adjustment of the level of preparedness for acute pollution, both with regard to the change in risk, organisation and planning work, as well as the localisation and dimensioning of emergency preparedness equipment. The emergency preparedness plans should include undesired incidents that entail acute contamination of the ground, air or water, as well as fire and explosions.</td>
<td>There is a dialogue with the actors in Sydhavna (primarily the oil companies) concerning a coordinated emergency preparedness plan. The oil companies have the primary responsibility, but the Port of Oslo has notification responsibility and can contribute resources. Responsibility for the Inter-Municipal Acute Pollution Committee (IUA) was transferred from the Port of Oslo to the Oslo Fire and Rescue Department in 2005. Oil protection equipment in the form of oil booms is permanently stationed in Sydhavna (located at the Kneppeskjær Pier and on the shore side of the oil pier).</td>
</tr>
<tr>
<td>7</td>
<td>Risk-reducing measures during the construction phase have been identified by means of a separate analysis.</td>
<td>Will be implemented.</td>
</tr>
<tr>
<td>8</td>
<td>HSE and risk management as part of the planning and implementation of the initiative.</td>
<td>Will be implemented.</td>
</tr>
<tr>
<td>9</td>
<td>Regular emergency preparedness exercises.</td>
<td>Will be implemented.</td>
</tr>
</tbody>
</table>

Comments:
- The status of "mitigating measures" is based on a conversation with representatives from the Port of Oslo.
- There is no document that comprehensively describes the follow-up of the "guidelines for mitigating measures" that are mentioned in Section 7 of the Norwegian Coastal Administration’s final document for the impact assessment “Sydhavna”.

APPENDIX
APPENDIX 5: NON-CONFORMITIES AND REMARKS PURSUANT TO THE NORWEGIAN SEVESO REGULATIONS BY TOPIC

The table below illustrates non-conformities and remarks for inspections in accordance with the Norwegian Seveso Regulations during the period from 2005 to 2013 sorted by topic.

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>NON-CONFORMITY</th>
<th>REMARK</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>Documentation/system</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Technical and practical conditions, misc.</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Inadequate maintenance/control</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Issues related to assessment and documentation of risk</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Explosion protection document</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Unclear responsibilities and organisation</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Daily HSE-related routines</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Internal inspections/reviews, systematic monitoring and review</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Exercises</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Safety report</td>
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<td></td>
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<tr>
<td>Internal control system</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
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<td></td>
<td>1</td>
</tr>
<tr>
<td>Grand total</td>
<td>9</td>
<td>16</td>
<td>25</td>
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</table>
## APPENDIX 6: CORRECTIVE ACTIONS CONDUCTED IN SYDHAVNA BY THE CITY OF OSLO’S AGENCY FOR FIRE AND RESCUE SERVICES

The table below illustrates the results from the inspections the City of Oslo's Agency for Fire and Rescue Services have conducted in Sydhavna during the period from 2005 to 2011.

<table>
<thead>
<tr>
<th>ENTERPRISE</th>
<th>YEAR</th>
<th>NON-CONFORMITIES/REMARKS</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2005</td>
<td>Non-conformity 1</td>
<td>Fire safety manager could not produce documentation/routines for the internal control concerning the fire safety for the oil companies.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2005</td>
<td>Non-conformity 2</td>
<td>Exercises and training are not satisfactory in relation to the risk inherent to the object.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2005</td>
<td>Remark 1</td>
<td>The risk analysis that has been prepared is too old.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2005</td>
<td>Remark 2</td>
<td>The fire safety organisation must obtain a better overview of the neighbour’s fire manholes.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2007</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2009</td>
<td>None</td>
<td>Comments: The Oslo Fire and Rescue Department recommended a common review of how the fire safety work should be organised in the future with all of the enterprises/owners.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2010</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2011</td>
<td>Non-conformity 1</td>
<td>Ekeberg Oil Storage has not revised the rules and instructions regulating fire fighting measures.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2011</td>
<td>Remark 1</td>
<td>Oslo Lufthavn Tankanlegg should have its own line to the 110 emergency number.</td>
</tr>
<tr>
<td>Ekeberg Oljelager DA</td>
<td>2011</td>
<td>Remark 2</td>
<td>Ekeberg Oljelager DA should obtain an overview of the routines used by Oslo Lufthavn Tankanlegg with regard to training etc.</td>
</tr>
<tr>
<td>Unikorn</td>
<td>2006</td>
<td>Remark 1</td>
<td>Documentation that the annual inspection of the emergency lighting systems could not be produced.</td>
</tr>
<tr>
<td>Unikorn</td>
<td>2006</td>
<td>Remark 2</td>
<td>The fire binder was disorderly.</td>
</tr>
<tr>
<td>Unikorn</td>
<td>2009</td>
<td>Remark 1</td>
<td>D4: Doors that do not function as intended.</td>
</tr>
<tr>
<td>Unikorn</td>
<td>2009</td>
<td>Remark 2</td>
<td>DS: Unsealed lead-throughs in fire cell limiting structural components.</td>
</tr>
<tr>
<td>Unikorn</td>
<td>2010</td>
<td>Remark 1</td>
<td>A4: Is the indoor water supply good enough?</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2006</td>
<td>Non-conformity 1</td>
<td>Possible sprinkler system does not work satisfactory.</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2006</td>
<td>Non-conformity 2</td>
<td>Weaknesses in the internal control routines.</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2006</td>
<td>Non-conformity 3</td>
<td>The fire safety of the object has not been surveyed or assessed.</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2009</td>
<td>Remark 1</td>
<td>A user binder has been sent from the owner to the enterprise that did not find its way to the right persons, and there is little feedback from the enterprise to the owner. This may indicate that there is a need to revise the description of the organisation for the object along with the duties and authority, including the internal distribution of responsibility between the owner and enterprise in accordance with the agreement.</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2009</td>
<td>Remark 2</td>
<td>It was uncertain whether the load-bearing system in the object was adequately insulated against fire, even though it appeared to be painted with fire retardant paint. This should be clarified, so that the safety of the extinguishing crews is maintained during a fire.</td>
</tr>
<tr>
<td>Company</td>
<td>Year</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ford Motor Norge AS</td>
<td>2009</td>
<td>Remark 3</td>
<td>Area responsibility should be designated to persons who have an overview of who has gotten out of their area.</td>
</tr>
<tr>
<td>Møller Logistikk</td>
<td>2011</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2006</td>
<td>Non-conformity 1</td>
<td>The enterprise/user had not made arrangements so that fire safety measures and other safety measures were not degraded.</td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2006</td>
<td>Remark 1</td>
<td>Coordination within the objects was inadequate.</td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2009</td>
<td>Remark 1</td>
<td>B2: Does the personnel receive fire safety training, and is this followed up by fire drills? Fire drills shall be held at least every other year.</td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2009</td>
<td>Remark 2</td>
<td>C2: Are qualified inspections of the technical fire installations and other safety measures conducted? Check whether the powder extinguishers have been checked in the entire building.</td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2011</td>
<td>Remark 1</td>
<td>A3: Is the outdoor water supply good enough? The owner does not have an overview of the situation, and the tenants were not present. No access to manholes out towards the quay.</td>
</tr>
<tr>
<td>Oslo Containerterminal</td>
<td>2011</td>
<td>Remark 2</td>
<td>C1: Has the storage of hazardous substances been reported to DSB?</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2005</td>
<td>Non-conformity 1</td>
<td>It could not be documented that the object was built, equipped and maintained in accordance with the relevant laws and regulations concerning fire prevention.</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2005</td>
<td>Non-conformity 2</td>
<td>The internal control does not function satisfactorily.</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2007</td>
<td>Remark 1</td>
<td>B2: Does the personnel receive fire safety training and is this followed up by fire drills?</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2008</td>
<td></td>
<td>Topical inspection in which BRE received a report after an inspection of the sprinkler system performed by Kontroll og Rådgivning AS. The report included 68 items, 55 of which had a high degree of severity.</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2010</td>
<td>Remark 1</td>
<td>A3: Is the outdoor water supply good enough? (Agency for Fire and Rescue Services in the City of Oslo did not find the manhole).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2010</td>
<td>Remark 2</td>
<td>A5: Is there a layout plan that contains the necessary information on fire walls, escape and attack paths, extinguishing equipment, technical fire installations and important personnel, as well as an overview of special risks associated with fire and accidents, at the entrance to the main attack path. (Layout plan was missing).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2010</td>
<td>Remark 3</td>
<td>A5: Is there a layout plan that contains the necessary information on fire walls, escape and attack paths, extinguishing equipment, technical fire installations and important personnel, as well as an overview of special risks associated with fire and accidents, at the entrance to the main attack path. (Gas forklift trucks are parked inside).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2010</td>
<td>Remark 4</td>
<td>E1: Have non-conformities in last year’s inspection report been closed satisfactorily? (Sprinkler system, non-conformity not repaired).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2011</td>
<td>Non-conformity 1</td>
<td>C2: Have regular fire drills been held? (Drills must be planned and documented).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2011</td>
<td>Non-conformity 2</td>
<td>D2: Are qualified inspections of the technical fire installations and other safety measures conducted? (The owner must create a plan of action and give priority to the non-conformities in the sprinkler report).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2011</td>
<td>Remark 1</td>
<td>F1: Er det lagt til rette for at rednings- og evakueringssmannskaper kan gjennomføre nødvendig insats? (Merke inn sprinkelventiler op 0-plan samt kontaktperson).</td>
</tr>
<tr>
<td>Forenede Gårder AS</td>
<td>2012</td>
<td></td>
<td>Digital self inspection.</td>
</tr>
</tbody>
</table>