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Ministry of Energy and Water Resources

N. O. P. 37 H

For Natural Gas Treatment Facilities From Natural Gas Discoveries

Environmental Impact Survey

Chapters C–E – Onshore Environment – Hagit Site

June 2013

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Abstract

The National Outline Plan for Natural Gas Treatment Facilities from Natural Gas Discoveries – NOP 37/H – is a detailed national outline plan for planning facilities for treating natural gas from discoveries at sea and transferring it to the transmission system. The plan relates to existing and future discoveries.

In accordance with preparation guidelines, the plan is enabling and flexible, and includes the possibility of applying a variety of natural gas treatment methods that combine a range of mixes for offshore and onshore treatment, in view of the fact that the plan is being promoted as an outline plan to accommodate all future offshore gas discoveries, such that they will be able to supply gas to the transmission system. This policy has been promoted and adopted by the National Board, and is reflected in its decisions. The final decision with regard to the method for developing and treating the gas will be based on the developers' development approach, and in accordance with the decision of the governing institutions by means of the Gas Authority.

In the framework of this policy, and in accordance with the decisions of the National Board, the survey relates to a number of sites that differ in character and nature, divided into three parts:

1. A survey of two areas for onshore gas treatment facilities and the pipeline route from the boundary of the territorial waters to the facilities, and from the facilities to the shore.
2. Survey of the Meretz wastewater treatment plant site – an onshore treatment facility with pressure reduction at sea, including an onshore gas treatment facility, and a pipeline from the coastal entry point to the facility, and from the facility to the transmission system.
3. Survey of the Hagit site presented in this document – an onshore treatment facility with pressure reduction at sea, including an onshore gas treatment facility, and a pipeline from the coastal entry to the facility, and from it to the transmission system.

The onshore gas treatment facility at the Hagit site essentially includes all types of possible onshore gas treatment (with pressure reduction at sea to 110 bars), with the intention of examining the maximum framework of impacts. This does not mean that the developer will necessarily present a similar plan, but the purpose is to examine the maximum possible impacts on land.

In accordance with the decision of the National Board, the Hagit treatment array will include two possible routes to the gas transmission system from the marine environment:

- **The northern route –** which passes close to the strip of the existing INGL gas line (the Dor-Hagit line).
- **The southern route** – starting adjacent to the line of the existing Dor-Hagit pipeline to the south of the Ein Ayala Quarry, passing through an open area near the Shefaya C Quarry, and continuing in a general southeasterly direction then turning north again until it connects with the present INGL alignment north of Bat Shlomo.

After examining the planning and environmental aspects as set forth at length in the beginning of Chapter C, it appears that the northern route has a certain preferability in terms of hydrological and design aspects in addition to the combining of infrastructures; nonetheless, during analysis at the detailed planning stage it appears that there is no fundamental difference from an ecological perspective. As such, the plan using the northern route is being advanced.

The representative planning for the treatment facility was drawn up by PDI Co., engineering consultants for the plan, and includes the "Quantification of Emissions & Discharges" document attached as Appendix B, and which constitutes the basis for planning and assessing impacts in this document.

The aim of Chapters C-E is to describe the actions arising from implementation of the proposed plan and to detail the assessed environmental impact from this implementation, and means of reducing them, including recommendations for the plan instructions.

The response by the planning team to remarks from the Ministry of Environmental Protection on Chapters A-B of the survey are attached as Appendix J of this document.

Chapter C - Description of Actions Resulting from Implementation of the Proposed Plan

This chapter includes a review of the main components of the onshore treatment facility, and a description of the gas treatment process from the drilling well until the end of the gas treatment process – transferring the INGL onshore transmission system. The description of the treatment process and description of the facility will incorporate the basic assumptions regarding the facility's operation, characterization of its components, the operating regime, and remarks on hazardous materials, monitoring devices, energy sources, and auxiliary infrastructures. The information presented in this chapter is a summarized review of the engineering report on the onshore treatment facility and the engineering-operational report on the pipeline, which are presented in full in Appendices B and C.

Below is a general description of the gas processing chain – The gas comes from the wellhead in raw form and must be treated before it can pass through the transmission system. Treatment of the gas depends on its characteristics gas: type and composition, the pressure at which it comes out, the percentage of hydrocarbons and quantity of gas condensate it contains, the percentage and composition of the water in it. The following is a general description of the treatment process from the wellhead until entry into the transmission system, based on the assumption that there is a high percentage of methane in the gas discoveries. The description also relates to the main elements that exist in most discoveries around the world:

- Separation of liquids from the raw gas (slug catcher facilities).
- Secondary separation in order to ensure that liquids do not cause damage to processes further along the processing chain (inlet gas separation).
- Reduce the pressure of the gas coming from the well, or raw gas compression when the gas in the reservoir starts to be depleted.
- Removal of steam from the gas flow (water dew-pointing)
- Removal of hydrocarbons that are liable to condense in liquid form in the pipeline (hydrocarbon dew-pointing)
- Removal of other substances found in the gas that are liable to be toxic.
- Diverting a small part (usually around 2%) of the gas flow for use as fuel in the facility itself (fuel gas).
- Sales gas metering and analysis.
- A system for the safe removal – in cases of a malfunction, maintenance and emergency only – of excess gas emissions by means of a ventilation pipe, with or without a flare (flare systems).
- Storage of condensate for marketing to refineries in a pipeline, or in trucks.
- Storage of antifreeze (MEG – usually glycol) for return to the wellhead in a designated pipeline.

Chapter D – Details and Assessment of the Environmental Impacts

This chapter deals with a description in principle of the potential environmental impacts of implementing the plan, and measures for reducing negative impacts.

Since there is a lack of information affecting the planning of the treatment facility (such as the composition of the gas in the reservoir, and the planned technology), the review of the best available technological means (BAT – Best Available Technology) to reduce the impact on the environment and the examination of possible environmental impacts that are not included in this document will be drawn up at the building permit stage, in accordance with the principles described in the documents of the EMMP (which also relate to the BAT) and the ENVID, attached as Appendices G and I, drawn up by Royal Haskoning DHV.

In this chapter, the impact of the facility is reviewed regarding the following aspects:

Air quality – According to an examination of the emissions from the gas treatment facility performed using AERMOD and CALPUFF emissions dispersal calculation models, it can be stated that in terms of all the pollutants examined (particulate, nitrogen oxides and sulfur dioxide), the impact of the facility in the plan area on the environment is relatively low.

It is important to note that in a number of cases examined, methods of reduction that enable compliance with the TA Luft 2002 standards were taken into account. Additionally, when implementing the plan the implementing contractor will have to comply with these emission standards, or any other up-to-date emission standards accepted by the Ministry of Environmental Protection.

Zoning, uses and activities – Throughout the design process efforts were made to choose the location of plan components such that the impact of the plan's implementation on existing and approved uses and zoning would be kept to a minimum. Therefore, there are no restrictions on approved uses and zoning, rather there is increased use of warning measures in the relevant locations. The plan's restrictions are primarily in agricultural areas (restricting the planting and growth of trees along the pipeline strip) and limitations on future zoning if they overlap the plan area. In the area planned for the treatment facility, a zoning change will be required regarding Plan MSH/43/HC, which is approved for agricultural zoning.

Appearance – This chapter includes a visual-landscape analysis of the Hagit site. The analysis includes attention to the visibility as expected from more prominent sites near the project, the landscape effect resulting from construction of the facility, on both a macro level – at the regional level, and a micro level – concerning the visual characteristics of the facilities planned in the project area. Additionally, this section presents principles and tools for minimizing the facility's landscape impact its surroundings, and various cross-sections and simulations are presented.

Antiquities and heritage – Antiquity and heritage values that are liable to be affected by the plan's implementation include antiquity and heritage sites within the work area for laying the pipeline, and antiquity sites in the coastal entry area.

In each coastal entry area the HDD method will be used, which will enable reducing the impact on offshore antiquity sites and the shore environment by passing beneath areas of declared antiquity sites. Other antiquity sites are located in active agricultural fields. In these areas as well it will be possible, should the need arise, to use underground drilling methods, horizontal drilling for relatively small distances, or HDD for greater distances.

All work will be performed under the direction of the Antiquities Authority, and naturally requires compliance with the Antiquities Law 5738-1978. Preliminary tests must be carried out prior to starting any development work, including development surveys, test cross-sections, test excavations and recovery work.

Seismology –During an earthquake, simultaneous, multi-system damage may be caused to the different facilities, and pollutants may be released into the air, land, groundwater and sea. It is important to state that the seismic design must take into account the stability of all engineering installations (non-structural components), and not only the structures themselves. In addition, this section details the measures for preventing and minimizing these risks.

Noise – Calculations were made using SoundPLAN software. Noise levels calculated from facility activities in the surrounding localities were significantly lower than the criterion levels and present noise levels measured, and do not require noise reduction measures. For purposes of occupational health and to safeguard the hearing of facility workers, the gas turbine, gas turbine-operated compressors and emergency gas generator must include full acoustic classing – by the manufacturer – as an integral part of the equipment.

Pollution of the offshore or onshore environment due to leaks – This section describes the conditions for leaks of natural gas and liquids (such as product water, oils, condensate) from system components in the offshore environment: the valves station, pipeline alignment and treatment facility.

In addition details are given of measures and procedures for monitoring leaks of natural gas and liquids, and protecting the environment in these cases.

Attention is also given to plans of action and measures to be taken in the event of a leak. The plan of action, to be prepared by the developer, will include, among other things, details regarding the stages of immediate action, preliminary response, supplementary response and rehabilitation.

Handling product water and condensate – The environmental impacts of product water condensate will be discussed at length in the Environmental Impact Survey on the offshore environment. The impacts expected on the onshore environment stem from liquids leaking from the pipeline. Additionally, during the life of the project, there is a certain probability that salt will accumulate in the product water. In this case it will be necessary to carry out additional treatment on the MEG, at the end of which the excess salts will be obtained. The salt resulting from this process will be collected in a container and will be removed by truck to a separate designated site where the excess salt will be stored in special containers. It should be emphasized that the quantity of salt will not be great, since if a well is producing large quantities of salt then pumping from that well will be stopped.

Impact on habitats and natural values – This section reviews the anticipated effects on the natural environment as a result of the plan's implementation. Impacts were surveyed with regard to all of the plan components: coastal entry array, the western and the eastern pipelines and the gas treatment facility.

Furthermore, attention was paid to hazards result from light, noise, invasive species, continuity of open spaces, and the impact on bird migration and activity.

Drainage and hydrogeology – This section examines the impact of the plan’s implementation on groundwater quality and the drainage system during the project’s construction and operation. In addition, great attention is given to means for preventing and minimizing the impacts of these aspects.

Hazardous materials – Measures are presented for reducing risk in principle (actual measures will be defined by the company that builds the facility in accordance with accepted international standards and following risk analysis processes beginning from the planning stage – HAZOP, HAZID and so on). Furthermore, included is a report on separation distances from hazardous materials for scenarios involving a natural gas leak from one of the facilities and the creation of an explosive cloud, and the distance to a fire pool resulting from a condensate leak into a secondary containment system.

Chapter E – Proposed Plan Instructions

This chapter details the proposed plan instructions for the environmental issues examined in this document, relating to all of the plan's implementation stages in the issues detailed:

- Stages of implementing the project
- Handling hazardous materials
- Preventing marine pollution and handling pollution incidents
- Preventing air pollution
- Preventing pollution of soil, surface water and groundwater
- Preventing damage to natural values, landscape, and continuity of open areas

- Control and handling of leaks
- Visual treatment of the site
- Instructions for collecting, treating and removing wastewater, brine and product water
- Earthworks and drainage systems, in facilities and the pipeline alignment
- Seismic safety of structures and installations, relating to each of the possible elements of damage
- Instructions for reducing noise, both at the construction stage and at the stage of regular operation
- Rehabilitation of the seabed environment
- Rehabilitation of the onshore pipeline alignment
- Sealing and monitoring leaks from the pipeline (gas and fuel)
- Handling auxiliary infrastructures
- Dismantling the facilities and restoring the former condition at the end of the project's life
- Antiquities and heritage sites
- Project implementation stages
- Handling hazardous materials
- Preventing marine pollution and handling pollution incidents
- Preventing air pollution
- Preventing pollution of soil, surface water and groundwater
- Preventing pollution of natural and landscape values and the continuity of open spaces

- Control and handling of leaks
- Visual treatment of the site
- Instructions for collecting, treating and removing wastewater, brine and product water
- Earthworks and drainage systems, in facilities and the pipeline alignment
- Seismic safety of structures and installations, relating to each of the possible elements of damage

- Instructions for reducing noise, both at the construction stage and at the stage of regular operation
- Rehabilitation of the onshore pipeline alignment
- Sealing and monitoring leaks from the pipeline (gas and fuel)
- Handling related infrastructures
- Dismantling the facilities and restoring to the former condition at the end of the project's life
- Antiquities and heritage sites

Instructions and guidelines are also detailed for issuing building permits. Since the plan is a detailed plan, but because of the fact that certain aspects relating to operation of the specific facility are not known, and there are still various issues in which there is a lack of information affecting the planning (such as the composition of gas in the reservoir and plans technology), a framework document for preparing an environmental management and monitoring plan (EMMP) was drawn up and is attached, detailing the issues to which the developer will be required to relate at the building permit stage for implementation of this plan.

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Description of Actions Arising From Implementation of the Proposed Plan

3. Chapter C – Description of Actions Arising From Implementation of the Proposed Plan

3.0.

The National Outline Plan for Natural Gas Treatment Facilities from Natural Gas Discoveries– NOP 37/H – is a detailed national outline plan intended to regulate the treatment and supply of natural gas from offshore finds, known and future, and its transfer to the transmission system. The National Board, in its meeting on November 27, 2012[1], decided on continued examination and planning of two onshore sites at Hagit East and Meretz Wastewater Treatment Plant, for gas treatment facilities and their accompanying pipelines. This document therefore deals with the examination and planning of the Hagit East site and accompanying pipeline, in accordance with the instructions of the Ministry of Environmental Protection to Chapters C-E of the Environmental Impact Survey of August 2, 2012, approved by the National Board, attached as Appendix A.

In accordance with preparation guidelines, the plan is enabling and flexible, and includes the possibility of applying a variety of natural gas treatment methods that combine a range of mixes for offshore and onshore treatment, in view of the fact that the plan is being promoted as an outline plan to accommodate all future offshore gas discoveries, such that they will be able to supply gas to the transmission system. This policy has been promoted and adopted by the National Board, and is reflected in its decisions. The final decision with regard to the method for developing and treating the gas will be based on the developers' development approach, and in accordance with the decision of the state institutions by means of the Gas Authority.

In the framework of this policy, and in accordance with the decisions of the National Board, the survey relates to a number of sites that differ in character and nature, divided into three parts:

1. A survey of two areas for offshore gas treatment facilities and the pipeline route from the boundary of the territorial waters to the facilities, and from the facilities to the shore.
2. Survey of the Meretz wastewater treatment plant site – an onshore treatment facility with pressure reduction at sea, including an onshore gas treatment facility, and a pipeline from the coastal entry point to the facility, and from the facility to the transmission system.

[1] http://mavat.moin.gov.il/MavatPS/Forms/SV2.aspx?tid=2

3. Survey of the Hagit site presented in this document – an onshore treatment facility with pressure reduction at sea, including an onshore gas treatment facility, and a pipeline from the coastal entry to the facility, and from it to the transmission system.

The onshore gas treatment facility at the Hagit site presented in the survey below includes, in essence, all possible types of onshore gas processing (other than facilities for reducing the pressure to 110 bar), since it contains the possibility for maximum onshore treatment, with all the components, infrastructures and facilities required for this purpose.

The onshore components for the treatment facility examined in this survey include:

The treatment facility at the Hagit site. The complex includes the possibility of two suppliers. In total, the onshore treatment facility at the Hagit site will cover an area of 150 dunams, and the plan area, including the area of the facility, will cover an area of 254 [dunams] (see details in Section 3.1.4 below).

- **The westward pipeline route** – from the coastal block valve station to the treatment facility, including a valve station (interim station).
- **The coastal entry array** – including the coastal block valve station in the area of the Moshav Dor fishponds.

In accordance with the decision of the National Board, the treatment array includes a route that splits in the area to the west of Ein Ayala Quarry, into a northern and southern route:

1. **The northern route**

11 km in length, passing close by the existing INGL gas pipeline strip (the Dor – Hagit line). The greater part of the pipeline route passes through agricultural areas (namely orchards) and along the margins of an area characterized by grassy scrub. In a few sections the corridor crosses areas of natural woodland, and an open, uncultivated, hilly area mainly used for grazing cattle.

2. **The southern route**

12 km in length. Most of the proposed route passes through agricultural areas characterized by orchards, field crops, and vineyards, and existing dirt roads. The pipeline route comes out from south of Ein Ayala Quarry, passes through an open area near the Shefaya C Quarry, and continues in a generally south-east direction, in a mainly agricultural area. For a short section, the route passes along a natural channel characterized by grassy scrub, and connects from the channel to a main dirt path passing to the north of Bat Shlomo, between the agricultural fields.

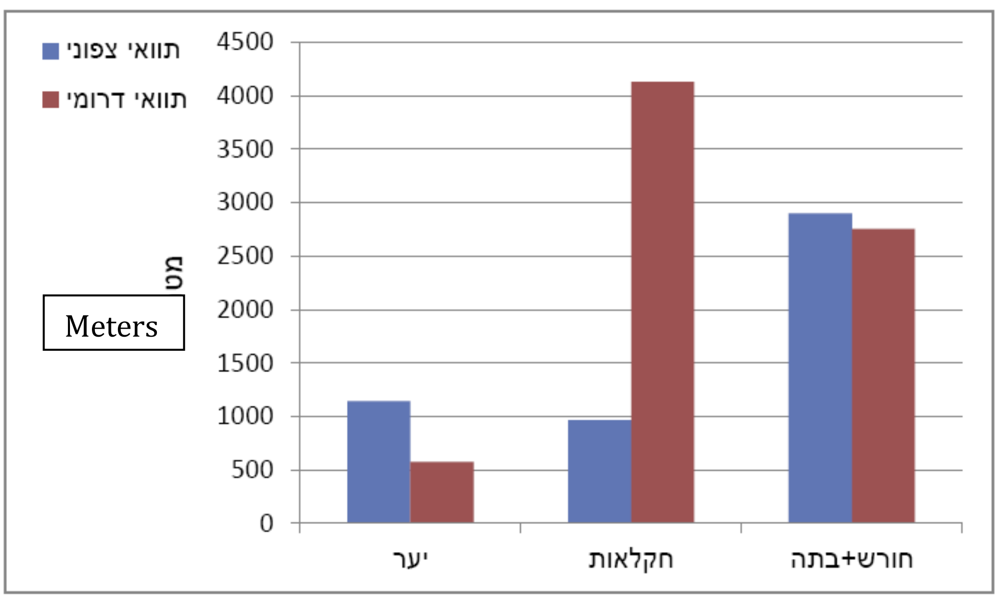
In both routes, the block valve station will be established in the area to the north of Bat Shlomo.

After examining planning and environmental issues in the detailed planning stage, it appears that the northern route has a certain advantage over the southern route, in the following respects:

- The northern route is adjacent to existing infrastructure, and its development will avoid harming and "opening up" an additional open area. According to the ecological survey carried out by Dr. Nir Har, the continuation of the route in this option passes along existing roads in an area characterized by grassy scrub and shrubs. See the response of KKL-JNF, attached as Appendix H.
- The northern route limits the damage and restrictions to agricultural fields, see Fig. 3-1.
- The southern route passes to the northwest of Bat Shlomo, and is liable to be a limiting factor for future expansion.
- The northern route is preferable in hydro-geological terms: the shorter route in the northern option makes it preferable due to the considerable hydrological sensitivity of the area, while the passage of the pipeline through a topographically high area (in part of the route) distances the potential source of contamination from the groundwater. There are also pumping bores producing potable water close to the southern route (the Tut-Tirali pumping field in Tut Stream to the southeast of Bat Shlomo), while there are no potable water wells near the northern route.
- In ecological terms:
  <u>The northern route</u> – the northern route passes close to the existing pipelines to the south, and requires the excavation of a new infrastructures strip. The route crosses a range of Mediterranean habitats of very high sensitivity, including planted forests with a developed layer of undergrowth, Mediterranean woodland, patches of garrigue, and rocky scrub. The proposed route passes mainly through natural areas, some 2900 m of it through woodland and undisturbed scrubland, and some passes through agricultural areas, approximately 965 m, and man-made forest, approximately 1145 m (Fig. 4.9.1-1). Along the length of the route are concentrations of mature trees, including impressive and mature specimens of Mt. Tabor oak, carob, and Palestine oak.
  <u>The southern route</u> – the length of the southern route, after it splits off from the northern route, is approximately 7500 m, in which it crosses some 4130 m of agricultural land, 2755 m of woodland and scrub, and 575 m of planted forests. Anticipated impacts are similar to those described for the northern

route - in those places through which the route passes, the natural area is expected to be harmed, and after rehabilitation, grassy scrubland is expected to develop, in which pioneer species and ruderal species are common, and there is a greater likelihood of the penetration of invasive species. Areas of scrubby vegetation will come at the expense of the woodland and rocky scrub that are characteristic of the area. Areas of garrigue and good quality hard rock scrubland with a wide range of vegetation are found in the section near the Shefaya C Quarry. This habitat is not relatively common in the area of the plan, and is difficult to rehabilitate and reconstruct. Along this route too, concentrations of mature trees can be found, mainly Mt. Tabor oak and carob, which will have to be transplanted. This option mainly crosses agricultural fields with low ecological sensitivity, but the passage through woodland and scrubland areas is on a similar scale to the northern option, and therefore there is no significant difference between the two options in this respect.

<u>Fig. 3-1: Breakdown of the Passage of the Pipeline Strip Between Main Habitats</u>



Blue: northern route; red: southern route
Left to right: Forest, agriculture, Woodland and scrub

It should be noted that although the northern route overlaps a greater number of trees, the damage to the trees can be limited in the course of work, among other things by the location of areas for temporary stacking.

Summarizing the aspects, it appears that in hydro-geological and planning terms the northern route is preferable to a certain extent over the southern, in addition to the proximity of infrastructures, and there is no substantial difference in ecological terms. Accordingly, the plan is being advanced according to the northern route.

Since a developer has not yet been selected to implement the plan, and at this stage there is a planning array in principle for setting up gas treatment facilities, similar to the previous chapters of the survey, in this document as well the technological options for full onshore treatment will be examined and planned in principle, in order to examine the maximum effects of the treatment facility in the onshore environment, and leave maximum planning flexibility for the future developer of the plan in terms of the mix of offshore and onshore facilities. The representative planning for the treatment facility was drawn up by PDI - the engineering consultants for the plan, and includes the document " Description & Quantification of Emissions & Discharges,," attached as Appendix B, and represents the basis for planning and assessment of impacts for this document.

Bibliographic references are attached at the end of the document, and as footnotes at the bottom of the relevant pages, and at the end of this document. It should also be noted that some of the appendices to the Environmental Impact Survey, among them affidavits, plan instructions, and so forth, will be attached to the offshore environmental impacts survey to be submitted in the framework of this plan. In addition, responses of the planning team to the comments of the Ministry of Environmental Protection on Chapters A – B of the survey are attached as Appendix J to this document.

The aims of Chapters C – E is to describe the actions arising from implementation of the proposed plan, and detail the estimated environmental impacts due to implementation of the plan, and means of reducing them.

3.0. General

This chapter includes a review of the main components of the onshore treatment facility, and a description of the gas treatment process from the drilling well until the end of the gas treatment process – transferring the INGL onshore transmission system. The description of the treatment process and description of the facility will incorporate the basic assumptions regarding the engineering facility.

The information presented in this chapter is a summarized review of the engineering report on the onshore treatment facility and the engineering-operational report on the pipeline, which are presented in full in Appendices B and C, and includes a description in principle of the treatment and production process of the gas originating in offshore finds.

In accordance with the engineering review, the conditions and requirements for building permits for the facilities detailed below will be set out in the framework of the Environmental Impact Survey. Due to the requirement to prepare an enabling and flexible plan, the guidelines of the survey will represent a planning framework under which it will be possible to issue building permits, and will include guidelines for drawing up a plan to manage and monitor the planning, establishment and maintenance (EMMP - Environmental Management and Monitoring Plan), in accordance with the instructions of the document of principles for drawing up an EMMP attached as Appendix I .

Generic description of the gas treatment chain

The gas comes from the wellhead in raw form and must be treated before it can pass through the transmission system. Treatment of the gas depends on its characteristics gas: type and composition, the pressure at which it comes out, the percentage of hydrocarbons and quantity of gas condensate it contains, the percentage and composition of the water in it. The following is a general description of the treatment process from the wellhead until entry into the transmission system, based on the assumption that there is a high percentage of methane in the gas discoveries. The description also relates to the main elements that exist in most discoveries around the world:

- Separation of liquids from the raw gas (slug catcher facilities).
- Secondary separation in order to ensure that liquids do not cause damage to processes further along the processing chain (inlet gas separation).
- Reducing the pressure of the gas coming from the well, or raw gas compression when the gas in the reservoir starts to be depleted.
- Removal of steam from the gas flow (water dew-pointing)
- Removal of hydrocarbons that are liable to condense in liquid form in the pipeline (hydrocarbon dew-pointing)
- Removal of other substances found in the gas that are liable to be toxic.

- Diverting a small part (usually around 2%) of the gas flow for use as fuel in the facility itself (fuel gas).
- Sales gas metering and analysis.
- A system for the safe removal – in cases of a malfunction, maintenance and emergency only – of excess gas emissions by means of a ventilation pipe, with or without a flare (flare systems).
- Storage of condensate for marketing to refineries in a pipeline, or in trucks.
- Storage of antifreeze (MEG – usually glycol) for return to the wellhead in a designated pipeline.

Extraction of the gas from the well can be implemented in a designated facility built for the particular well (usually for large wells), or the gas from a number of wells can be treated in one facility (sometimes an abandoned facility from a well that has been exploited and is no longer commercial). Planning a single facility that can receive gas from a number of fields at the same time presents the engineers with technical challenges, since a "common" facility of this kind has to handle differences in a number of parameters:

- **Differences in pressure and deliverability –** between different reservoirs. These differences are liable to create an advantage in deliverability (and therefore quantities) for one field over another. In such a situation, it will be necessary to make a simulation of the entire gas fields "system" as a single unit before it is possible to describe the technological options in detail.
- **Difference in extraction timing –** it is possible to extract from a number of reservoirs consecutively in a single facility, by controlling the timing and thus bringing the second field to production when the quantity of gas produced from the first field is diminishing. However, this method will affect extraction from the first reservoir and result in the need to increase the pressure of the gas extracted from it. As will be noted below, gas compression is one of the more complex and costly aspects that can occur in the treatment chain, and therefore the need for compression could have a considerable effect on its planning and characteristics. In light of the considerable complexity, the entire general description of a facility for treating gas from many, but undefined, reservoirs should be treated as a general guideline only.
- **Ability to treat different gas compositions from different finds –** each well has a different gas composition, requiring different treatment methods and affecting planning accordingly, and hence also the facilities.

The description below is for a treatment facility for generic gas, providing an optimal answer to the range of technological and commercial possibilities for treating gas onshore, in a manner describing the maximum impact of the facility on the environment and the population.

Process Flow Diagram (PFD) – description of the natural gas treatment chain, in the onshore gas treatment option

Fig. 3-1 shows a flow diagram reviewing the natural gas treatment chain for two gas fields, relating to a scenario in which most of the treatment takes place in an onshore treatment facility: from its beginnings as raw gas (untreated gas) pumped from an offshore well, until completion of the process, where the treated gas is transferred (at a transfer station) to the INGL transmission system, including treating the main additional products obtained / added in the gas treatment process.

It should be noted that the facilities included in the diagram are an example of the type of equipment and treatment process that could occur in a system of this kind. Thus in practice, when developing a gas field in practice, the equipment and processes are unique to each project and each find, and therefore may differ from those presented in the diagram below.

<u>Below is a description of the gas treatment chain:</u>

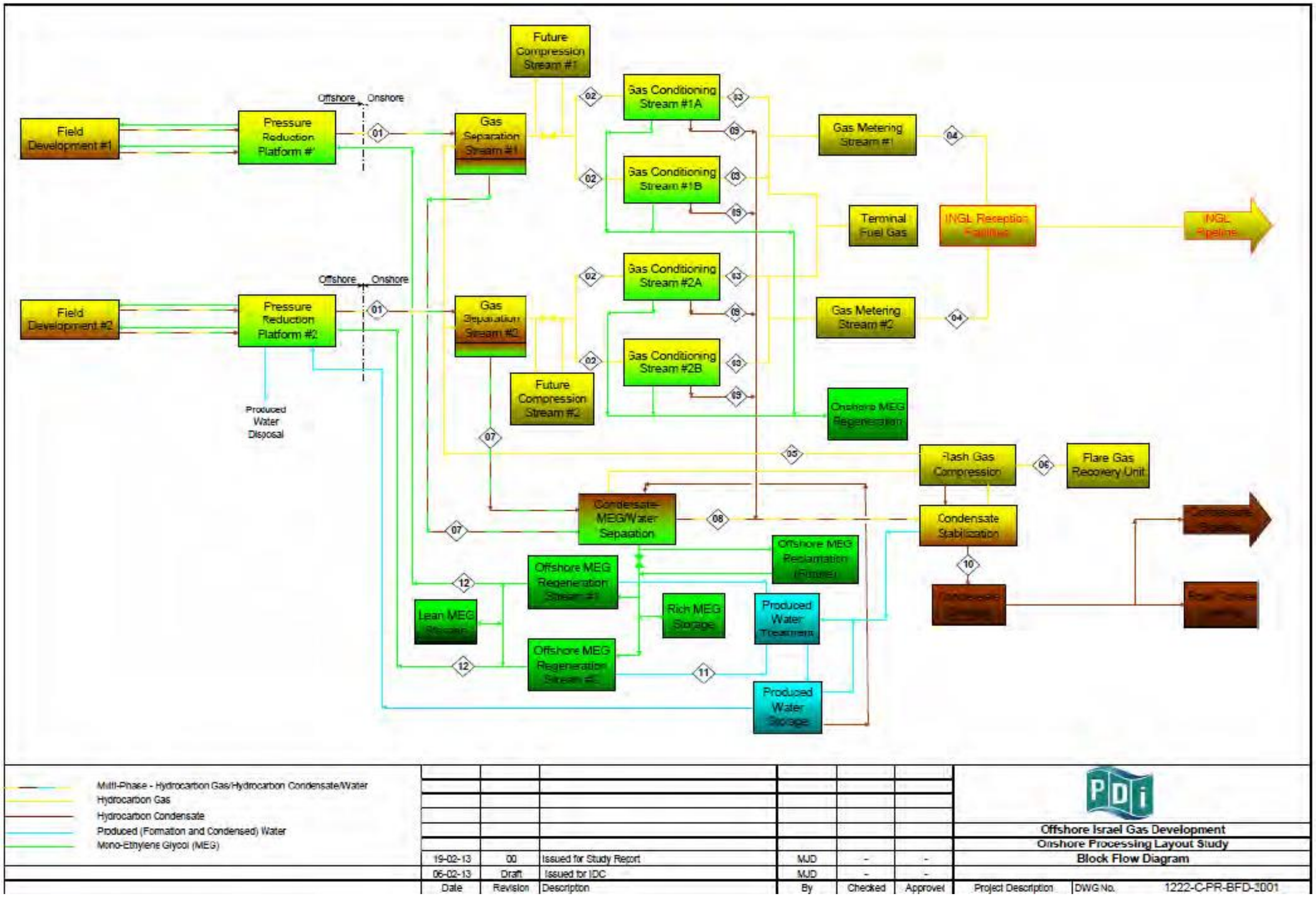
The offshore treatment process begins with pumping the gas (which is accompanied by water and condensate) from a number of wells in the same field, for example from Field 1.

The flow of gas is mixed and transferred in one pipe or two pipes, at high pressure, to the pressure reduction platform (PRP), whose purpose is to reduce the pressure of the gas (and the other components – condensate, MEG, and water) from the well pressure to a pressure of 110 bar. The pressure reduction platform is located at an offshore site, at a distance of around 7.5 km from the shore. From this facility, the MEG is pumped at high pressure and injected into the gas flow at the well, in order to prevent the formation of liquids (that will freeze in the pipeline). Afterwards, the MEG is returned to the pressure reduction platform together with the gas.

From the pressure reduction platform, the untreated gas passes through a pipeline to the block valve station on the coastal strip, and from there continues to the onshore treatment facility, at which the following processes take place:

The raw gas comes from the sea in a number of phases (2 - 3) of gas and liquids, and includes: natural gas, condensate, MEG, and water. The gas treatment process takes place according to the composition of the gas and the different phases.

Fig. 3-1: The Natural Gas Treatment Chain - Onshore Treatment process



Natural gas:

1. Untreated gas is separated from the condensate, MEG, and water in a separation unit, to separate the gas from the liquids (in the future, with changes in pressure in the well, an additional compression process will be added after this stage).
2. The gas passes through an additional cleaning and drying process (gas conditioning), which includes pressure reduction (to 80 bar, the pressure required for entering the transmission system) and cooling the gas (and additional heating later), aimed at separating other fuels from the gas (by turning them into liquefied liquids). MEG is added to the gas in this process to prevent the further formation of liquids.
3. Measuring the quantity of gas (metering) and checking its quality takes place before the gas enters the national INGL system.
4. The flow of treated gas is transferred to an INGL receiving facility. At this station, the flows of treated gas come together in a single pipeline, through which they are transferred to the INGL transmission system.

The liquids in the process – condensate, MEG and water, obtained in the process of separation from the gas as described above, are transferred to a liquid separation tank. In this tank, the liquids are physically separated (on the basis of the difference in their specific weight), and they can be transferred to designated facilities. The separated liquids go through the following processes:

- **Fuel – condensate:** the fuel goes through a process of stabilization in order to separate the remaining gas components from the fuel. After stabilization, the fuel is transferred to designated storage tanks before being transferred, in a separate pipeline, for treatment at the refineries or in a designated facility to be built close to the offshore site. The gas obtained in the stabilization process is returned to the gas flow.
- **Antifreeze – MEG (mono ethylene glycol – antifreeze coolant):**
    - Offshore MEG – the mix of MEG and produced water originating in the reservoir (and therefore liable to contain a certain concentration of salt) obtained in the liquid separation tank goes through a MEG treatment and reclamation process in a designated facility. The water in the mix is boiled, to obtain relatively clean MEG and produced water. The clean MEG is transferred to designated tanks, before being transferred in a designated pipeline to the offshore facility, and from there to the well.
    - Onshore MEG – MEG added to the gas in the gas cleaning and drying process in the gas conditioning system (stage 2), in order to prevent

further formation of liquids. The MEG it contains undergoes a treatment process that includes separating it from the water and fuel, recycling it in a separate, designated system in the treatment facility, and returning it to the offshore facility in a designated pipeline.

- **Produced water:** produced water that is obtained undergoes further treatment in a designated facility, with the aim of separating the remaining fuel components from the water before it is transferred to the offshore facility and dispersed in the sea. The water will be removed from the onshore facility to the offshore facility in a designated pipeline.

A description and details of the structures, facilities and their characteristics is included in Chapter C below.

3.1. **Structures and Facilities at the Site**

3.1.1. Maps of compounds

Figures 3.1.1-1 and 3.1.1-3 shows the internal compounds at each site, including the internal organization of the components of the facility and the different infrastructures, against the background of aerial photographs and photogrammetric mapping, respectively.

Figure 3.1.1-3 shows a cross-section of the compounds against the background of photogrammetric mapping. Data on the size and height of the components in the generic facility are presented in the simulation in **Figure 3.1.1-4**. More detailed data can be found in the engineering documents, in Appendix B.

The internal compounds and the internal organization of the treatment facilities and various infrastructures in the area of the Hagit site will be planned in accordance with the same central principles and safety rules by which the gas treatment facility will be planned and designed at the Meretz wastewater treatment plant site. At the same time, in the planning presented below (at the Hagit site) there are a number of differences in the characteristics of the compounds and components of the facility and their location, relative to the planning of the Meretz wastewater treatment plant site. These changes are mainly due to differences in the natural characteristics of the site and the surrounding area: topography, soil and rock type, and stream beds – hydrological characteristics, and also due to additional constraints resulting from proximity to the Hagit power station site and IDF training base. There is also a difference in the width of the pipeline strip. The width of the strip at Hagit does not include an additional INGL pipeline, because there is already an INGL pipeline, connecting the Hagit PRMS station to the offshore transmission system.

This section will review the main differences in planning and organization of the internal compounds of the treatment facility at the Hagit site, and will relate to the different facilities and components that have been especially adapted to the site area. It should be noted that the changes that are mentioned do not involve physical, engineering or operational changes to the facilities and components, but changes to characteristics such as depth and manner of burying concealed components, directions of entry and exit of pipelines, and so forth. These changes will be shown in the engineering cross-sections in Fig. 3.1.1-1 above, and simulations of the facility to be presented in the landscape analysis in Section 4.3.

As a rule, the engineering planning of the facility is based on a uniform generic onshore facility. Accordingly, there are no substantive differences between the different engineering components. The main differences in planning the sites are due to the location of the facilities in accordance with the local topography, and the operational and environmental limitations of the different components.

In light of the proximity to the Hagit power station site, when locating the internal compounds an attempt has been made to place the uses that are sensitive in terms of risk as far from the power station as possible. In addition, various components in the facility have been moved away in accordance with the safety principles detailed in Section 3.1.4 below. Accordingly, condensate tanks have been located in the northeastern corner of the site. The flare has also been moved away to the east. The location of the INGL receiving facility has been determined in accordance with the safety distance required from the power station, and relative to the position of the existing INGL facility within the area of the Hagit power station. Additionally, the entry and exit directions of the raw and treated gas pipeline corridor have been adjusted in accordance with the internal sites.

Other than the changed location of the various components and infrastructures, changes have been made to the way in which certain components are set up relative to the area. For example, it is proposed to bury facilities with a significant presence in the area in order to moderate their visual impact. The depth and manner of burial of these components within the Hagit site is different from the Meretz wastewater treatment plant site, because of the chalk bedrock in the area of the site, and the inclined topography. An attempt has also been made to choose the optimal location for facilities such as to reduce the area required to set them up as far as possible. An attempt has also been made to avoid removing and/or transplanting existing trees.

The condensate storage site has been removed from the treatment facility as far as possible, and located on an extension to the east of it. Condensate tanks will be partly buried in the ground. Since their location is on a slope, the depth of burial will not be identical for all the tanks, and will be between 8 – 15 m relative to the absolute surface height. When planning burial of the facilities, the greatest possible attempt has been made to reduce the excavation work required. It should also be noted that the size of the spill containment pallet required for the condensate tanks is larger at the Hagit site, and is calculated in accordance with the estimated precipitation and throughput, as well as the quantity of fuel stored in the tanks.

The loading area site is located close to the facility and access road, in an area with sparse trees. The site is removed from the required safety radius of the vent.

Components of the main treatment facility, which is in the northern part of the site (to the north of the local flow channel) will be partially buried relative to the absolute surface height. Burial depth of the MEG regeneration will be around 6 m.

The flare is located at an elevation of 187 m. In accordance with the given restrictions of the security system at the site, the permitted height of the flare is in the range of 25 to 45 m above ground.

Internal roads of the treatment facility have been planned in accordance with the hydrological characteristics and drainage plan at the site.

The INGL receiving facility has been adjusted towards the entrance and exit of the treated gas pipeline. The vent location in the area of the facility will be as far removed from the power station as possible. In addition, an adjustment has been made to the engineering planning of the facility to connect it with the existing INGL facility at the Hagit power station site.

The existing INGL facility, in the framework of NOP 37C, will be extended southwards by 1 dunam, to enable entry of the treated gas.

For details of the width of the pipeline, see Section 3.2 below.

Details of the type of fencing for the facility and the lighting are included in Section 3.4.8 below.

Figure 3.1.1-1: Hagit Site – Map of Internal Compounds – Against the Background of Aerial Photographs

Figure 3.1.1-2: Hagit Site – Map of Internal Compounds – Against the Background of Photogrammetric Mapping

Figure 3.1.1-3: Cross-sections of the Compounds

Figure 3.1.1-4: Components of the Generic Facility

3.1.2. Establishment work

General

As stated, the description of the establishment up work at this stage is a description in principle only. Planning will include details of construction of the pipeline, the facility, and the coastal entry.

As a rule, the objective is for the construction work for the pipeline and facility to be as efficient as possible, both in terms of the duration, and in terms of disturbance to the environment. Accordingly, at the building permit stage there will be an individual examination to identify the areas in which the contractor's staging areas and camps will be set up, and efforts will be made to prevent disturbance of areas of environmental and ecological sensitivity and/or impact on population, a series of measures will be taken to moderate and reduce impacts resulting from the construction work, and a work plan will be made for streamlining the work process itself.

Prior to starting implementation, the contractor must prepare to enter the area in the following manner:

a. Examine detailed plans and implementation documents
b. Become familiar with the area, by means of preliminary visits
c. Define the work site
d. Prepare at all levels for performing the work
e. Obtain preliminary approval of safety, quality and training programs
f. Obtain authorization from the relevant authorities, such as the local board, Electric Corporation, Nature and Parks Authority, etc.

Coastal entry point

For a description of the coastal entry construction work, see details in Section 3.2.2 and in Appendix C –Report on Operational and Engineering Aspects in the Marine Environment, of Bipol Energy, Section 3, "Landfall Work."

It should be noted that both the survey and the plan documents recommend and examine the use of the HDD method at the coastal entry. Should the contractor choose to use the Cofferdam method, it will be necessary to reexamine the impacts of the plan.

The pipeline

- The pipeline alignment runs alongside dirt tracks, electrical roads, and water pipes, and scarcely passes through natural areas that have not yet been disturbed by development activities. In sensitive sections, supervision by entities with legal status will sometimes be required. The purpose of this supervision is to prevent damaging natural and scenic values in the course of the work, as a result of activities accompanying the implementation (parking lots, tipping of excess earth, storing materials, etc.). At the stage of planning the lines, there is a possibility of carrying out a survey of parallelism between the gas / condensate lines and the ultra-high / high voltage electricity cables, as required by the Gas Authority. In addition, it is necessary to plan cathode protection.

– Duration of construction work in each section along the route is expected to be a few weeks (other than in cases where the Antiquities Authority inspectors require a rescue excavation in the course of the work). Every effort will be made to prevent damage, both to the area and to the existing ecological and human environment around the pipeline.

The description of the construction work of the pipeline route includes, among other things, a description in principle of the construction equipment, work site and access roads, staging areas, work strip, preventing nuisances, performance method, preparing the work strip, crossing streams, covering the area of the work strip, dealing with surplus earth, and instructions for crossing infrastructures and facilities along the route.

- **Main equipment required for construction**

The equipment required in practice will be determined during construction by the plan.

The equipment required will be determined during construction by the plan implementer of the plan.

– Semitrailers – trucks for carrying pipes to the work site.
– Cranes – used to unload pipes from the trucks and lay them close to the trenches. After welding the pipes, cranes will be used to lay the pipeline in the trench.
– Container tilters – trucks used for bringing side-walling materials to the trench and covering the pipe, and for removing the excavation surpluses.
– Excavators – mechanical tools with a front or rear shovel, used to excavate the trench.
– Loaders (tractors) – mechanical tools used mainly for loading earth and excavated material, which can be used for excavating in soft soil and for covering the trench.

- Bulldozers – tools with a front blade and rear rotor, used for preparing the work strip and pushing earth.
- Service vehicle – used for transporting workers and additional equipment such as manual excavation tools, welding equipment, food and water for the workers, and so on.

Construction equipment required for horizontal drilling:

- Horizontal drilling machine
- Equipment truck including: expanders, extension rods, stabilization and lubrication materials
- Excavators for enlarging the entrance and exit of the bore
- Equipment for exploring and locating underground infrastructures
- Equipment for monitoring the bore position

- **The work site**

The work site is the entire area that will be used for setting up the system, and includes access roads.

<u>Access roads:</u>

In order to transport and remove the work materials, equipment and personnel. A transportation plan will be drawn up, with the traffic arteries marked on the implementation plans, based as far as possible on existing statutory roads and dirt tracks.

<u>Staging area / maneuvering areas:</u>

The staging area is used by the implementation contractors for storing the pipes and their accessories, parking heavy machinery, temporary portable offices for the work and supervision teams, and welding and preparing the pipeline before installation in the field.

The staging area will be dismantled after completion of the work, and the area will be returned to its original condition. These areas will be marked on the detailed plans for implementation, and in the building permit applications.

Areas will be fenced with a temporary mesh fence (see Section 3.4.8), which will be dismantled on completion of storage.

<u>Work strip for the pipeline:</u>

The width of the work strip is 45 m, which includes 20 m for the pipeline strip and 12.5 m for working on either side (five pipes for Supplier 1). The existing pipeline strip under NOP 37/C and the future strip for Supplier B will serve as part of the work strip for Supplier A. The pipeline strip of Supplier A will later serve as part of the work strip for Supplier B. For two suppliers, a work strip of up to 60 m in total will be planned. The work strip is determined in collaboration with the environmental planners, to ensure minimum damage to the landscape. The work strip is based on the quantities of excavation surpluses within the area of the work strip. Environmentally sensitive areas have been identified by the environmental consultants, and marked on the plans in order to prevent damage to them during the work.

<u>Noise:</u>

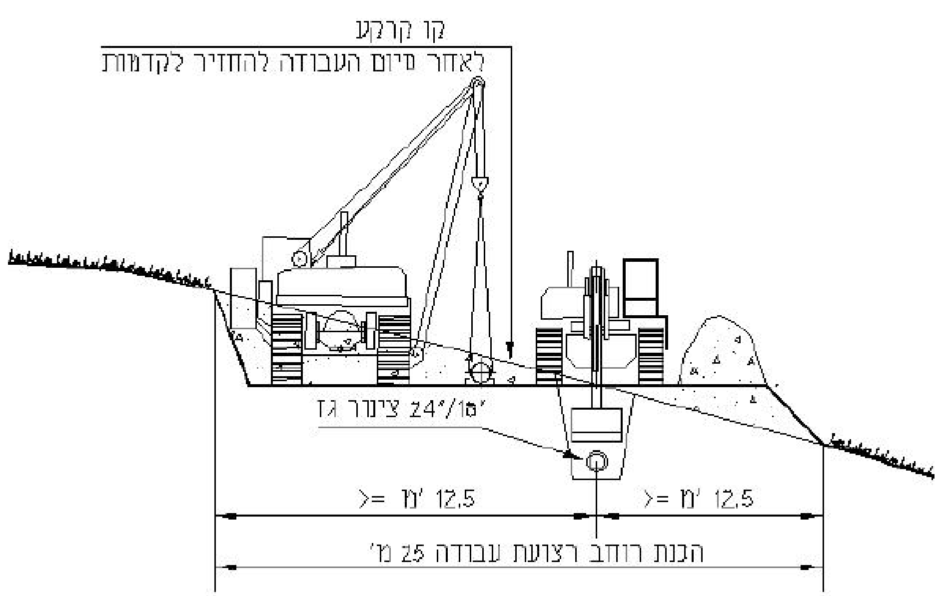
The maximum permitted noise level near to residential areas when setting up the system will be in accordance with the Abatement of Nuisances Regulations (Prevention of Noise), 1992.

<u>Supervision to prevent hazards:</u>

It is necessary to coordinate with the Ministry of Environmental Protection, central district, to supervise the prevention of noise and dust hazards, and regulation of solid waste.

- **Description of construction along the route**

<u>Fig. 3.1.2-1: Work Strip For Laying the Pipeline (schematic only)</u>



<u>Methods of professional and safety supervision during construction:</u>

The contractor and inspection team must prepare a description of the methods of professional supervision for construction of the onshore transmission system, including, among other things a description of the composition of a typical inspection team and the tasks it will perform. The contractor must include the inspection needs as part of his QC/QA plan.

The contractor must draw up a list of tasks in the course of the project, and the entities that will supervise each of the tasks. Supervision of the safety and health of the workers engaged in the work of constructing the natural gas transmission system, and of the work arrangements, will be performed by the Inspection Department of the Ministry of Industry, Trade and Employment. Moreover, supervision of work safety will be in accordance with the Labor Inspection (Organization) Law, 5714-1954 and the Work Safety Ordinance (new version) 5730-1970.

<u>Marking the work strip and transmission system route:</u>

The width of the work strip is 45 m, which includes 20 m for the pipeline strip and 12.5 m for working on either side (five pipes for Supplier 1). The existing pipeline strip under NOP 37/C and the future strip for Supplier B will serve as part of the work strip for Supplier A. The pipeline strip of Supplier A will later serve as part of the work strip for Supplier B. For two suppliers, a work strip of up to 60 m in total will be planned. For a single pipe, the work strip can be up to 50 m in areas where storage sites or maneuvering areas are planned, or in exceptional places by reasoned application, or in areas where horizontal drilling is required in order to cross infrastructures, roads, railway lines. The work strip will be narrower in sensitive places and in accordance with the landscape rehabilitation guidelines, but no less than 15 m.

As mentioned, for a number of pipes the work strip will be 60 m wide, but could be as much as 100 m in areas where storage sites or maneuvering areas are planned, or in exceptional places by reasoned application, or in areas where horizontal drilling is required in order to cross infrastructures, roads, railway lines. The work strip will be narrower in sensitive places and in accordance with the landscape rehabilitation guidelines, but will not be less than 40 m.

Before starting the work, the work strip will be divided into sections. The strip will be marked accurately by means of pegs and marking tapes, including marking infrastructure crossings such as roads, water passages and sewage, drainage and electricity lines, and other infrastructure lines, in accordance with detailed instructions. The marking process will be conducted in coordination with the different entities whose role is to accompany the work (the Antiquities Authority, Nature and Parks Authority, KKL-JNF, etc.).

Areas of scenic sensitivity, as defined in the environmental document and landscape rehabilitation plans, will be temporarily fenced before the start of implementation to prevent the possibility of damage being caused to them in the course of the work.

Implementation method:

- Planning based on reducing damage in the area, and guaranteeing full landscape rehabilitation upon completion of implementation.
- As necessary, the contractor will fence the work strip in the sensitive areas defined in the plans with temporary fencing before the start of work. The contractor will not be permitted any movement, storage of materials or tools, or any other activity beyond the defined work area.
- Upon completion and inspection of welding the pipeline (which it is reasonable to do in sections), a trench will be dug (excavation will be carried out in parallel to preparation of the pipeline) in which the pipe will be laid. After the pipeline and the pipe for the optic fiber have been laid they will be covered with a layer of sand, over which there will be a tamped down infill. The topsoil layer will be of the exposed soil stripped from this area before the start of implementation (see Fig. 3.2.2.2-1 below).
- To reduce the earth surpluses in the project as a whole, as far as possible the infill used will be the local excavated material.
- Upon completion of implementation of the earthworks, the section will be rehabilitated in accordance with the guidelines of the environmental program.

Photography and documentation of the route:

Right from the start of work, it is necessary to photograph the route along its entire length using a video camera and stills camera, including the station areas, to ensure that the area is restored to its former state at the end of the construction work.

Exploratory excavation to reveal underground lines and obstacles:

Before starting work, the contractor must perform exploratory excavations along the estimated route, to identify fuel pipelines, water pipes, communication cables, electricity cables etc., to confirm and mark the exact location and depth of buried installations that are near to the route. A plan must be drawn up for each crossing of this kind.

All necessary measures must be taken to prevent damage to existing lines and cables when the trench is dug. As necessary, support work will be carried out for the above installations.

All work near to existing infrastructures will be in coordination with the supervisors on behalf of the owners of the installations, and under their supervision as required.

Preparing the work strip:

Preparation of the work strip will include clearing grasslands and shrubs, cleaning up solid waste such as building remains, wet waste, etc., and removing it to an organized site. In order to prepare the work strip, in places where this is required by the environmental document to be attached to the permit application, the land will be stripped, including the removal of 30 cm of topsoil at least over the width of the work strip, to be piled up in mounds along the edge of the work strip (see lateral cross-sections presented in Section 3.2.1 above).

The work strip to be prepared by the contractor will enable implementation of all actions involved in laying the line, including excavating the trench, storing the excavated earth, laying out and welding the pipes alongside the trench, and heavy machinery travelling along the length of the alignment.

Trees and vegetation:

As a condition for the building permit, a tree survey will be performed along the alignment and all trees close to the route selected in the survey will be preserved. All work around them will be performed under the close supervision of the Nature and Parks Authority and KKL-JNF, or alternatively representatives of the local board. Trees slated for uprooting / replanting – with supervision from the Forestry Commissioner.

Vegetation that is uprooted will be replanted in accordance with the landscape rehabilitation plans.

Archaeology:

Along the length of the pipeline strip there is proximity and overlap with a number of declared antiquities sites. Work will be performed in accordance with the guidelines of the Antiquities Authority, appearing in its comments on the plan, and presented in Chapter 1 of the EIS.

Integration and crossing of drainage channels and streams:

In the course of the work, the gas pipeline crosses a limited number of drainage channels and streambeds. Most of these crossings will be made by means of burying the pipeline in an open trench, over which concrete "saddles" will be laid, or another element that is acceptable to all the entities. These elements serves to protect the pipe and prevent its exposure during flooding. The width of the coverage depends on the width of the wadi or infrastructure.

In areas of crossing infrastructures such as: electricity lines, Mekorot water lines, etc., detailed planning of the crossing will be coordinated with the owner of the infrastructure, and supervisors on behalf of the owners of the infrastructures will be present during implementation to ensure that there is no damage to the infrastructure for which they are responsible.

Minimum depth of burial when crossing infrastructures:

- Underneath a paved road – 2 m
- In drainage channels and streams – 2 m, in accordance with stream throughput stream and instructions of the Drainage Authority
- Underneath infrastructure lines – 1 m

A description in principle of crossing streams is presented in Fig. 3.1.2-7.

Excavation:

Excavation will be performed in accordance with the typical cross-sections, to be determined, among other things, on the basis of the detailed soil survey providing information about the composition and properties of the subsoil, and on the basis of an examination of the state of the soil in practice during performance of the work.

During excavation, the excavator will move over the excavation strip and, using its front shovel, sweep up soil from the excavation strip and set it down in mounds along the trench bank. Material will be piled up in two mounds, the one close to the trench containing the greater part of the earth removed from the trench, and the second, further away, containing the topsoil of the excavated material. The method of preserving the soil is detailed in Section 4.9 below.

In the course of the work, it is necessary to relate to the type of soil excavated, and according to this, to determine and obtain the incline of the trench, the angles of tipping the soil onto the mounds, and the type / size of the excavator.

The minimum depth of burial above the top of the gas pipe will be 1.7 m. Other pipes will be buried at a minimum depth of 1.2 m.

The incline of the side walls of the trench, location, and data of the mound of earth will be in accordance with the instructions of the contractor's engineer, and instructions of the on-site supervisor. The on-site supervisor will take all necessary measures to prevent any damage whatsoever to existing systems.

Transporting and unloading system components:

The process of transporting and unloading will take place in parallel to preparing the strip of land. Transportation will be by means of trucks along the service route. The pipes will be lifted by cranes, and laid on supports alongside the excavation strip.

Connecting the pipeline:

Each 12 m long pipe will be connected to the next pipe by welding. After a number of pipes have been welded together, the area of the weld will be covered with a polyethylene heat-shrink sleeve. The pipes will be welded lying on supports.

After welding, the quality of the weld will be inspected.

Tests prior to laying the pipes:

All connections will be tested by x-ray or ultrasound, according to the guidelines of the standard, the project, and the instructions of the Gas Authority. The tests will be given to the supervisor, and covering the trench will only be started only after receiving his approval.

Final connection of system components:

A number of pipes connected together will be lifted all at the same time and laid carefully in the trench. The pipes will be lowered into the trench in such a way as not to cause unnecessary stress and distortion of the pipes, or damage to the covering. The entire pipeline will be connected outside the trench, other than special places where connecting the pipes will be inside the trench. In these cases the trench will be widened and deepened to allow for welding sections of the pipes inside the trench.

Covering the trench:

The following is the method of covering the pipes:

1. Natural foundation – the foundation will be tamped down in the initial stage.
2. The base of the trench will be walled with a layer of bedding of a granular material such as clean sand, bundles, or quarry sand.
3. Embedment – granular material, laid in layers of a thickness of up to 25 cm.
4. Backfill – local material from the excavation. Grain size will be no greater than 15 cm. Filling will be in the area of 0.3 m and above over the top of the pipe.
5. Top layer – containing only local material, to a height of around 20 cm (excavated and kept from the original soil surface).
6. A layer of CLSM (controlled low strength materials) where necessary – filling will be to a width that will ensure a covering of at least 30 cm around the pipe.

The excavation will be drained of high water, if this is found in the course of implementation, by means of pumping, and protected against the penetration of rainwater or other water and liquids from any other source by taking appropriate measures, such as embankments, diversion channels, and so on.

In addition, marking tapes should be extended along the length of the line, printed in Hebrew, English and Arabic with the words "Caution – hazardous materials pipeline."

Surplus earth:

Surplus earth along the length of the pipeline is not expected to exceed $3500m^3$. The area of the work is defined as a mining and quarrying area, and therefore any removal of excavation surpluses to legally authorized dry waste sites or other use, by prior coordination with the Solid Waste division in the Ministry of Environmental Protection, will be after coordination with the ILA.

If the quantity of surplus earth is significant, it will be necessary to comply with the latest procedure of the Ministry of the Interior for dealing with earth surpluses, including types of material, quantities, and destination of removal. It will also be defined in the instructions that the solutions for dealing with surplus earth will be in accordance with the following principles:

a. Suitable raw materials:

- Reuse within the project for construction, paving, moderating inclines, development and landscape rehabilitation
- Raw material will be exported for crushing and processing at an authorized and regulated quarry, or crushing on-site and marketing to other entities, or removal in an regulated manner by the developer
- Reuse outside the project in an optimal way according to a regulated and approved statutory measure according to the type of material, for example: improving and preparing agricultural soil, preparing grazing areas, used as paving and building materials, soil for gardening, landscape treatment
- Temporary storage in the plan area or interim storage site, on a limited scale for a set period of time, and for a period that does not extend beyond the project completion date

b. Unsuitable raw materials:

- Rehabilitation of damaged sites outside the project area
- Removal and burial at regulated sites, treatment at waste site

Handling surplus earth and solid waste:

In the course of construction work, there are two types of waste for removal:

Excavation surpluses: in accordance with the above procedure.

Mixed waste containing food remains, packaging, paints, coating materials, etc., produced during clearing and preparing the area and in the course of the work, will be removed to a legally approved site in coordination with the local board.

At the end of the work, temporary buildings, construction equipment, surplus materials, and dirt of any kind will be removed. Care must be taken to leave the site clean, in accordance with best professional practice.

Surplus earth and waste will be transported by mechanical tools and trucks in accordance with the needs and the route instructed by the engineer and/or proposed by the contractor (and approved by the engineer). Transportation will be in compliance with traffic and safety laws, and as necessary, in coordination with the Israel Police.

<u>Waste requiring special treatment:</u>

If hazardous materials, unexploded ordinance, or any other special garbage is found in the course of the construction work, the contractor will immediately alert the IDF and Ministry of Environmental Protection, and act in accordance with their instructions only.

<u>Dispersion of dust:</u>

During the work of laying the pipeline, heavy machinery will be present at the work site. This machinery, travelling along dirt tracks and during the excavation work, is liable to cause a dust hazard and change in air quality in the immediate environs of the work site. In principle, in areas where work machines and trucks exit and enter close to residential areas, the contractor will ensure that the wheels of the vehicles are damped in order to remove dust and particles before exiting the site (if there are such areas).

It is prohibited to damp the area with seawater or salty water.

In addition, care must be taken to cover trucks leaving or entering the site that are carrying material that is liable to cause dust particles to be dispersed into the environment.

<u>Guidelines for the crossing and proximity of the gas pipeline to infrastructures and other installations[2]</u>

1. Location of pipe relative to the railway / road strip

a. A crossing pipe has to cross a railway strip at an angle of between 90° and 60° to the axis of the railway line, and at an angle of 90° relative to the axis of the road.

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[2] Typical cross-sections for crossing a railway line / road and protecting excavations are attached at the end of this section.

b. A new crossing pipe should not be laid in a railway embankment and/or road embankment structure.

c. In an area of railway bridges or structures, a pipe carrying flammable material should be planned at a distance of no less than 30 m from any part of the railway bridge or structure. In exceptional cases, special planning is required.

d. Planning a crossing within the horizontal radius of the track should be avoided. Crossing is permitted only in straight sections of the track. In exceptional cases, special planning is required.

e. Implementation by horizontal drilling.

2. Covering a crossing pipe for transmission of gas

A pipe that crosses a railway strip / Israel Highways road and carries gas must be protected by a sleeve or by other means.

a. The covering of a crossing pipe / sleeve will be no less than 3 m between an embankment infrastructure under gravel and the top of the sleeve if crossing underneath a railway track is implemented by the drilling method (other than flexible / integral drilling). The minimal depths for flexible drilling - 4.0 m from the elevation of the railway track.

b. The covering of a pipe crossing under a road will be no less than 1.5 m from the base of the drainage ditch or from the height of the asphalt surface (the more stringent of the two).

c. The covering of a protective sleeve over a gas pipeline that does not cross a railway track but is within the railway strip will be no less than 1.8 m above the top of the fleet.

d. The covering of a protective sleeve / concrete plate over a gas line that does not cross a PWD road but is within the road strip will be no less than 2.0 m above the top of the sleeve / pipe.

3. Covering a pipe / sleeve in a borehole

a. The covering of a crossing pipe / sleeve will be no less than 3 m between an embankment infrastructure under gravel and the top of the sleeve if crossing underneath a railway track is implemented by the drilling method (other than flexible / integral drilling). The minimal depths for flexible drilling - 4.0 m from the elevation of the railway track.

b. The covering of a pipe crossing under a road will be no less than 1.5 m from the base of the drainage ditch or from the height of the asphalt surface (the more stringent of the two).

c. Cathode protection will be implemented for the crossing sleeve, in accordance with the consultant's instructions.

4. Minimum thickness of cover according to soil type using the jacking method

a. In the case of pipe jacking, the minimum thickness of cover under a surface structure of the railway / road will be greater than the values appearing in the table attached, depending on the type of soil (the higher of the values between Section 2 and Section 3).

Table 3.1.2: Minimum Thickness of Cover Depending on Pipe Diameter

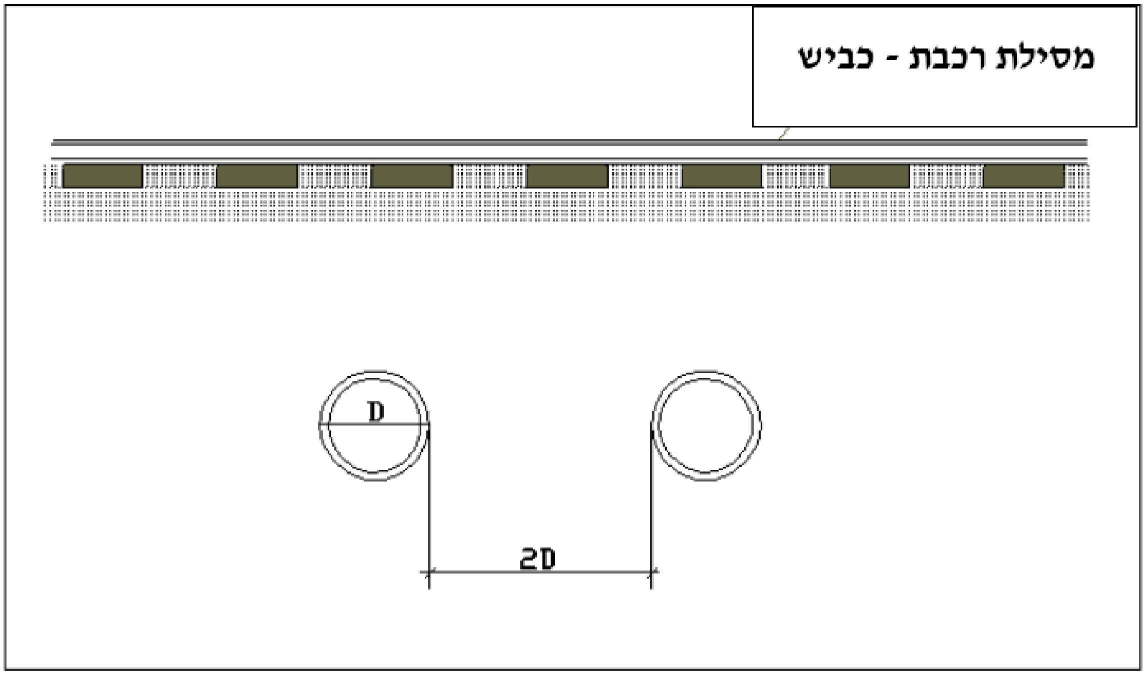
Type of soil	Thickness of cover depending on pipe diameter
Rock	1 pipe diameter
Clay	1.5 pipe diameter
Clayey sand	2 pipe diameter
Pure sand	2.5 pipe diameter

b. In any event the foundation consultant is required to relate to the subject of the minimum thickness of the cover.

5. Distance between drilling and/or jacking pipes

a. Horizontal distances between the drilling / jacking pipes will be no less than twice the diameter of the largest sleeve.

b. In any event, the distance between the sleeves will be no less than 0.70 m.



6. **Pipe crossing the road at meeting points between railway and road**

    a. In the area of the meeting between railway and road, the pipe crossing the road must meet all requirements for a pipe parallel to a railway strip.

    b. All work in the area of the meeting point must be coordinated and approved by Israel Railways.

7. **Cathode protection and protection against leaks**

    a. Underground pipelines for carrying fuels, gases, hazardous materials, and main water pipes must be connected to a cathode protection system by the pipe owners.

    b. All lines within the railway strip, intersecting / crossing / adjacent, must be connected to a cathode protection measurement point in order to check impact between the lines.

    c. Planning will take into account parallel and crossing underground lines, and there will be reciprocal coordination between the cathode protection consultants of all the owners of the lines.

8. **Entrance and exit pits for the borehole**

    a. The pit must be outside the railway strip or at a distance of at least 15 m from the axis of the railway track, measured perpendicular to the track. In any event, authorization of the location of the pit must be received from Israel Railways.

b. In the event that the lower part of the pit crosses the theoretical line of the incline of a road/railway embankment, a metal leaf wall (piling wall) must be used to protect the stability of the track / road, or other preventive actions must be taken to protect the soil. Calculation of the piling wall must take into account the loads of the forces on the soil, the railway, and any other force.

c. After implementation of the drilling, the piling wall should be removed and the pit must be covered over. If the pit is within less than 15 m from the axis of the railway track, the piling wall must be taken down to beneath the final ground level, and left this way.

9. Horizontal directional drilling

a. Horizontal directional drilling (HDD) is a method of installing an underground pipeline along the length of an underground track, with minimal disturbance to the environment. The length of pipeline installed can be up to 2,220 m, and its diameter can be up to 120 cm – with regard to installations of a shorter length.

b. Horizontal directional drilling is performed for potable water pipes, gas pipes, oil pipes, industrial pipelines, and sewage pipes.

c. Most HDD machines use a drilling liquid (mud). The drilling liquid is usually mixed with bitumen and water, and with additives to improve the machine's performance. When drilling in soft earth, the high pressure jet of liquid cuts through the sand by means of the sharp-edged grains that are in the drilling liquid.

d. In addition, the machine injects a liquid into the drilling shaft, and the cutting grains are pumped back out of the drilling shaft together with the drilling earth, or are mechanically separated in a cleaning system. Drilling liquid is classified as non-toxic and can be used accordingly, that is, it does not have to be disposed of as toxic waste.

e. In soft soils, an angular drill is used to change the direction of the bore – to change the route of the bore, the motor is stopped and the directional drill is guided in the direction required.

f. In cases of unstable soil – in certain systems use is made of a double pipe that prevents the sidewalls collapsing into the drilling shaft. After completion of drilling to the destination point, the drill is removed and the inserted pipe is attached to the drilling rod.

g. HDD will be implemented by a skilled and qualified contractor only, with experience in similar work.

10. Paralleling electricity lines

Intersections where the route of the pipeline runs parallel to an electricity line, a parallelism survey will be implemented in coordination with the Electric Corporation.

Fig. 3.1.2-2: Location of Pipe Relative to Road / Railway Strip

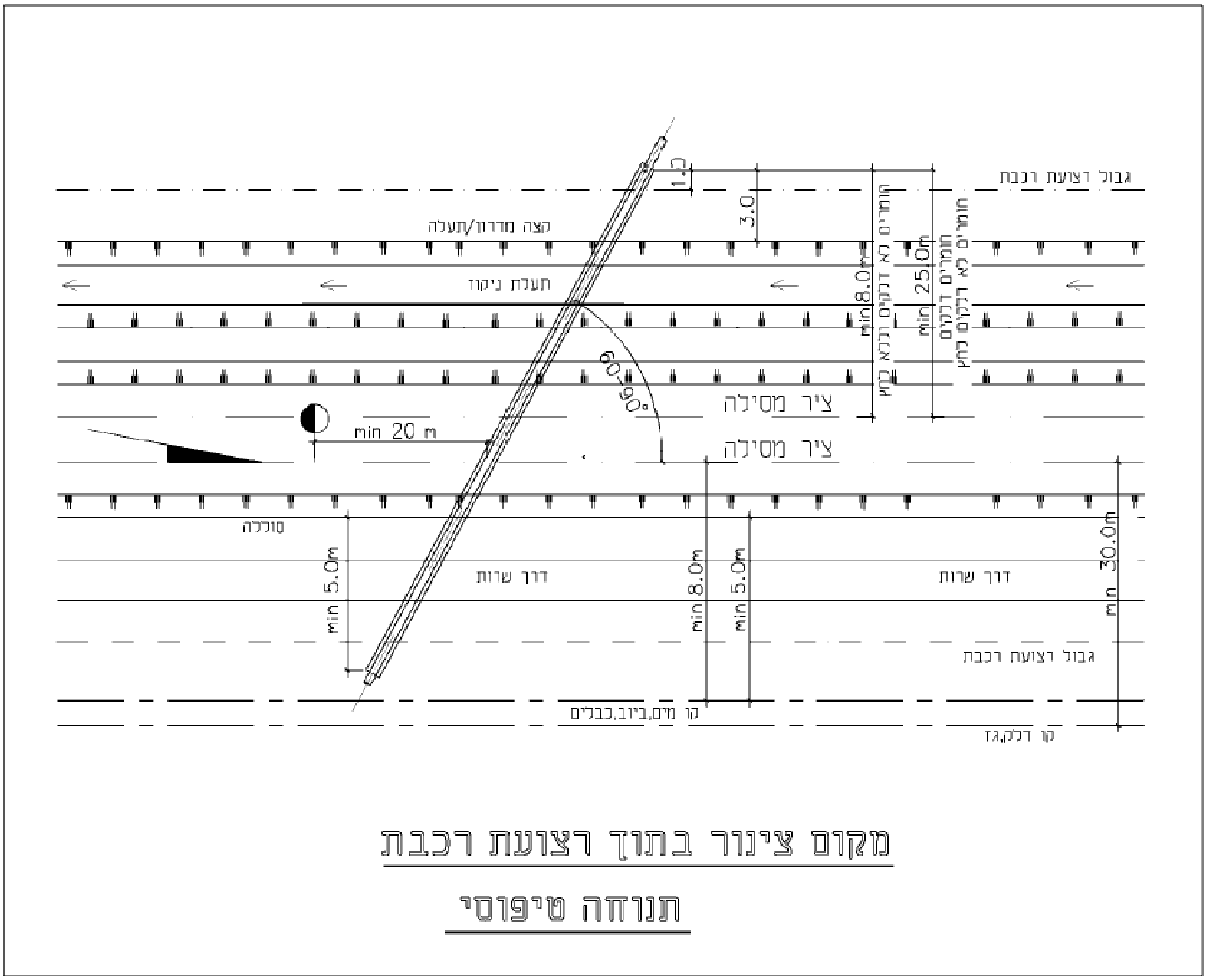
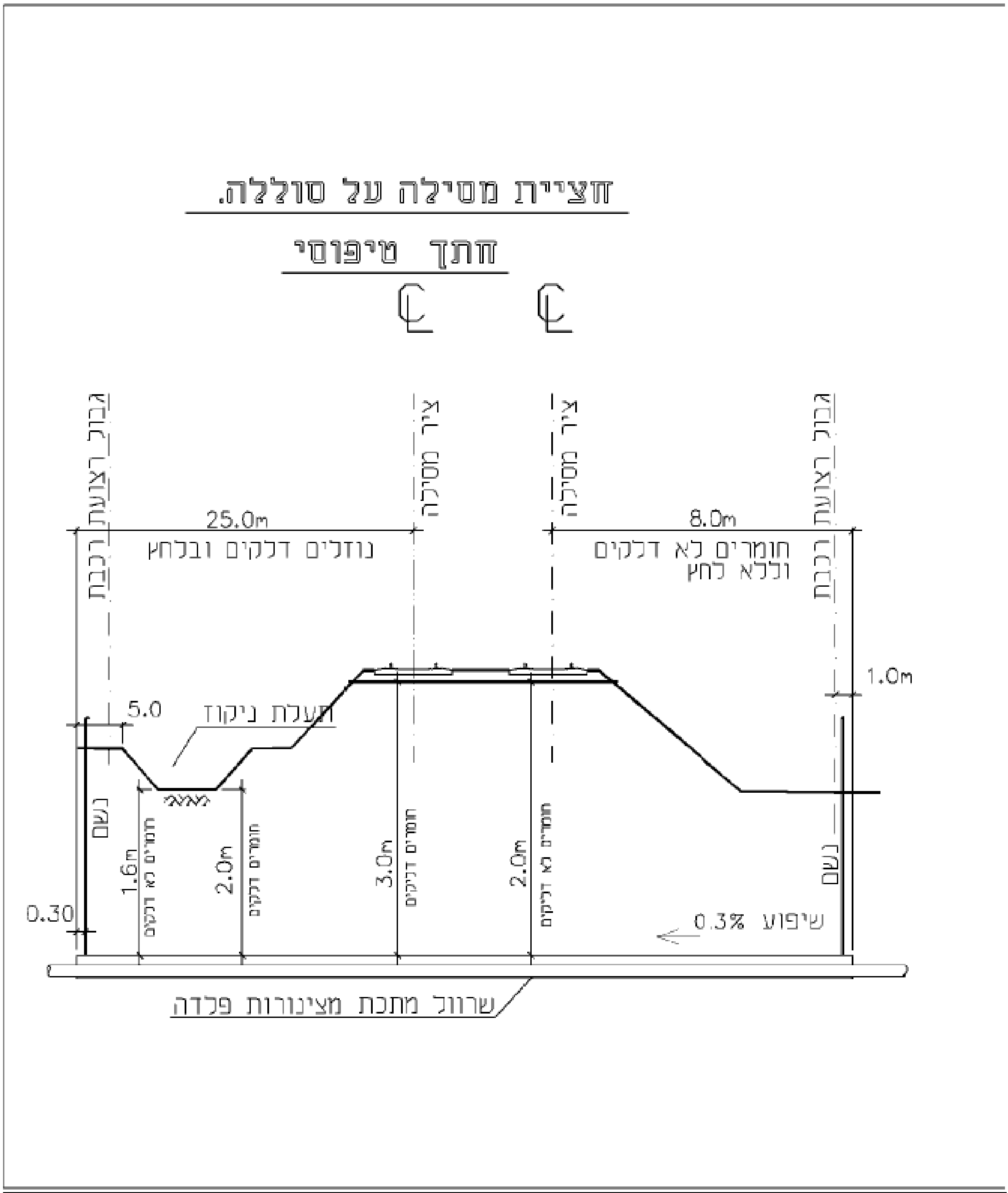


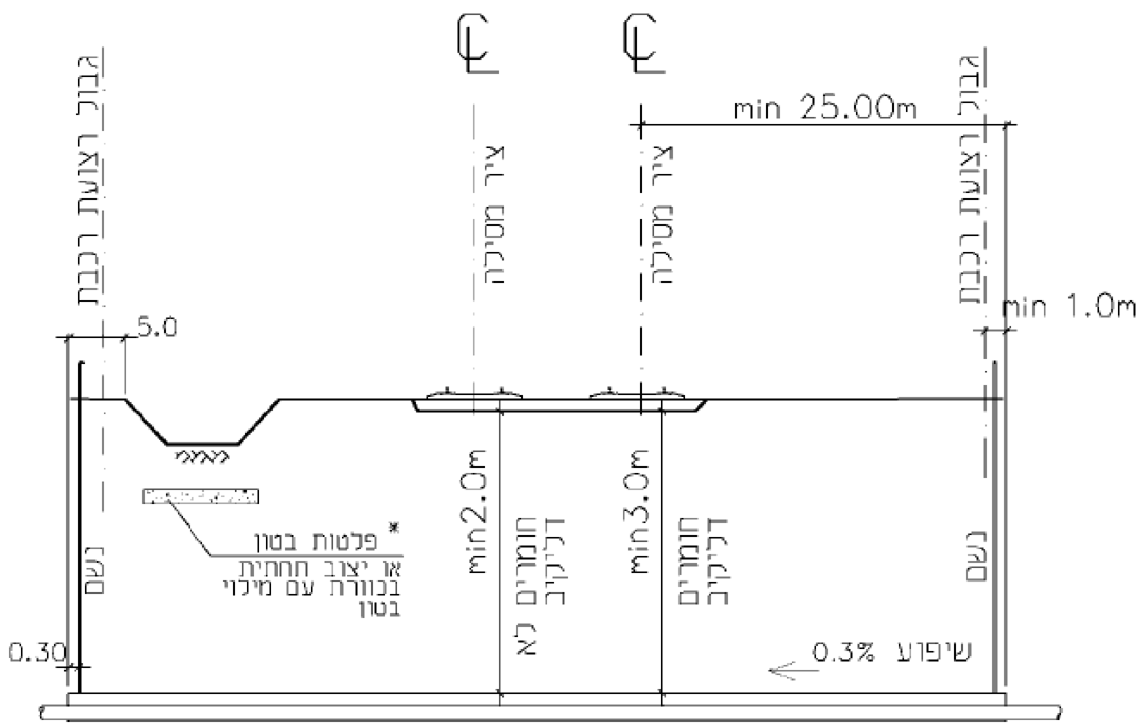
Fig. 3.1.2-3: Crossing a Track Underneath an Embankment With Infill



<u>Fig. 3.1.2-4: Crossing a Railway Track at Ground Level</u>

<u>חציית מסילה במפלס פני השטח.</u>

<u>חתך טיפוסי</u>



* התקנת פלטות בטון במקרה שמרווח בין תחתית התעלה ובין השרוול פחות מ-1.6

Fig. 3.1.2-5: Crossing a Railway Track in a Cross-Section of an Excavation Trench

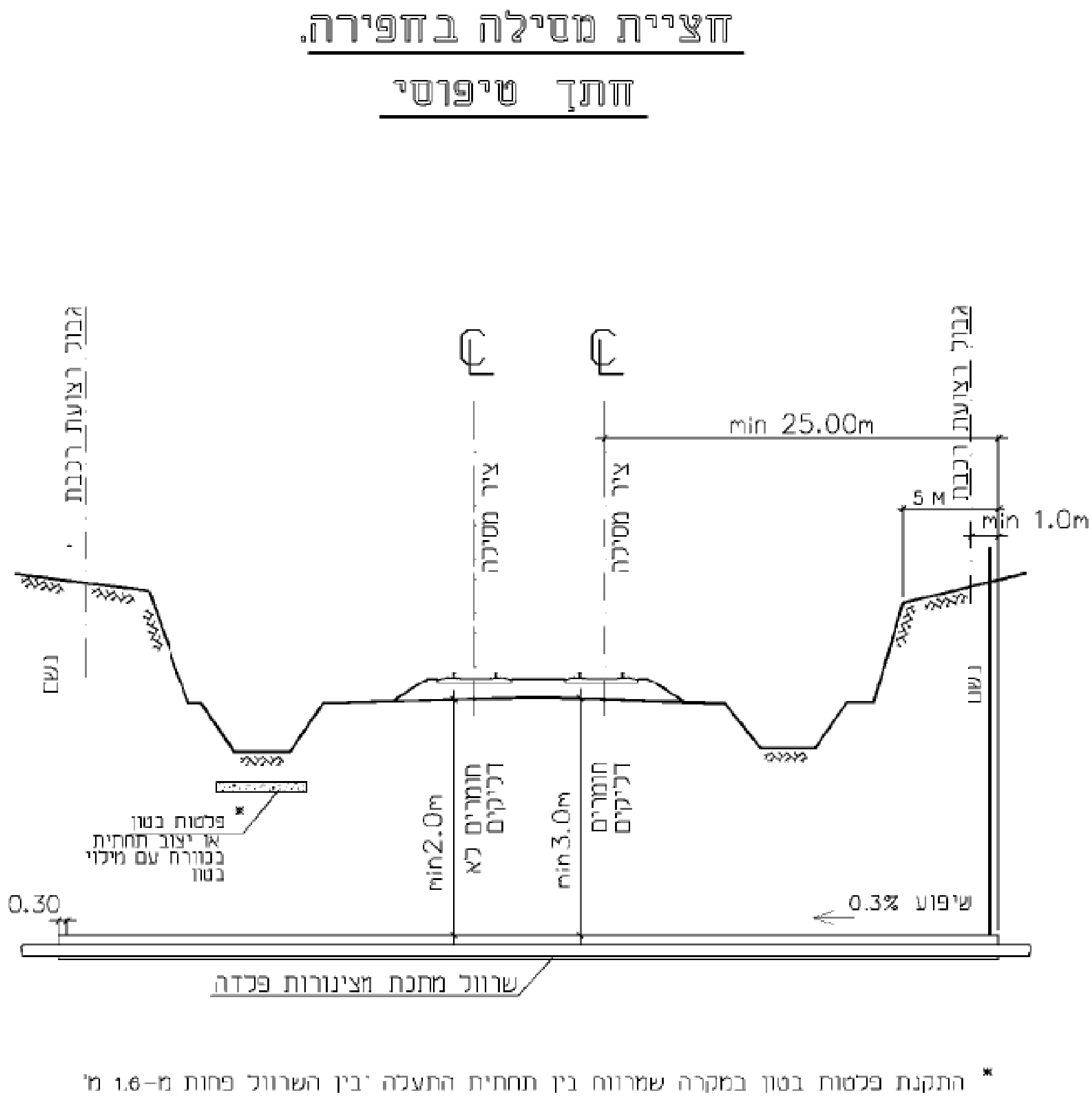
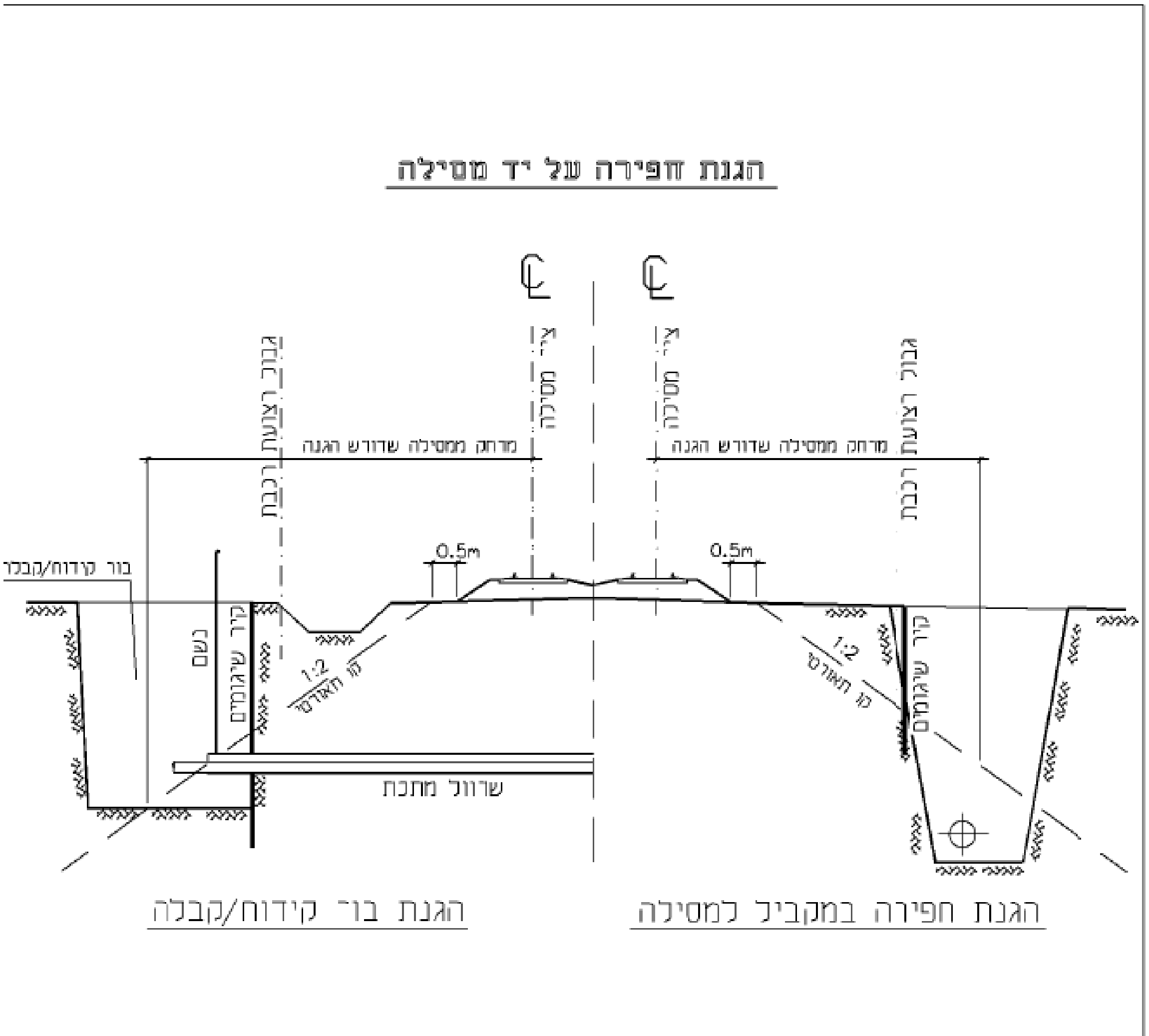


Fig. 3.1.2-6: Protecting an Excavation in Proximity to a Road / Railway Track Embankment



- **Treatment facility**

Areas will be allocated to the contractor for staging and setting up camp for both stages of construction – the contractor's work for the first supplier will be carried out in the area that is intended to be used at a later stage for the additional supplier. The contractor's work for the second supplier will be carried out in the area of the facility to be established at later stages of operation (areas for compressors), and the areas enclosed between the facility and the Hagit power station site, staying as close as possible to the west – the power station, by the access road.

The contractor's camps will be set up with an effort to minimize the disturbed area, and their location will be chosen, as far as possible, in areas that are not of environmental sensitivity. At the start of use, the layer of fertile soil will be removed and arranged in heaps near to the staging site and contractor's camps. Upon completion of the work, after the area is cleaned and the layer of fertile soil returned, the area will undergo rehabilitation but will not return to its original use, because grazing will not be permitted to continue in the area of the facility. (For issues of land regulation, rehabilitation of habitats and landscape rehabilitation, see details in Sections 4.3.4 and 4.9.1 below.)

Construction work in the area of the facility at the Hagit site will be performed according to the following order of actions / principles:

- Utilize the existing access road to the Hagit site, and arrange continuation of the road to the planned facility
- Re-site infrastructures from the site area (electricity infrastructures, treated effluent, and so forth)
- Demolish existing buildings and facilities
- General stripping and leveling of the site area – remove fertile topsoil and assemble in heaps alongside the site. Remove and keep geophytes until the rehabilitation stage, or transplant and bury them in an alternate location near the site
- Perform earthworks, to the level of "road format," in the area of the central facility and all its components at the initial development stage, including excavating areas intended for buried installations
- Regulate the local flow channel and adjust it to the development work required for the project
- Prepare infrastructure for underground systems: excavating trenches, laying pipes and sleeves (including reserve sleeves), and so forth
- Cast foundations for structures and facilities, retaining walls, and so on
- Build retaining walls and peripheral fences

- Initial paving of the system of internal and external roads
- Complete ground surfacing of all development areas
- Set up and build the facilities, including the raw gas pipeline and set of pipes returning to the bore, and connection to the treated gas transmission pipeline
- Connect the raw gas treatment facility to the INGL receiving facility
- Complete the connection of the INGL facility to the national transmission system
- Complete development work such as: truck loading and unloading area, visitor parking area, etc.
- Complete the security system - peripheral fences, lighting, cameras, etc.
- Check final receipt of the systems and receive authorization from the Gas Authority for operation of the plant

Construction work for the facility will take place around the clock.

Additional comments on the construction work are included in Section 17.1 of the engineering document, Appendix B. For comments on the subject of infrastructures, drainage, installation, and wastewater treatment, see Section 4.10 below.

3.1.3. Changes to the existing situation

Construction of an onshore gas treatment facility will lead to changes to the existing situation. These changes will occur within the site area, along the pipeline alignment, in the staging areas, and in all areas required for constructing the facility during the setting up stages and at the permanent stage. It should be noted that in the areas identified for construction and organization purposes (not for the permanent facilities), the main changes will be purely local, and an effort will be made as far as possible to return the area to its original function, other than cases where there are restrictions for maintaining safety distances from the facilities and/or infrastructures, in which case these uses / activities will be moved to a distance throughout the period of operation of the facility.

The proposed changes are detailed in Table 3.1.3-1 below.

Table 3.1.3-1: Proposed Changes at the Facility Relative to the Existing Situation

Use / activity	Existing situation	Proposed change	Comments
Livestock facilities	Part of the area is used for breeding livestock at a farm that is within the site area, and grazing areas around it.	The farm will be evacuated from the site area, and in light of the safety restrictions, an area will be fenced up to which cattle can graze.	On termination of operation of the facility, the land will be able to be used again for grazing.
Re-siting infrastructures	Treated effluent and electricity infrastructure lines pass through the area of the facility.	The infrastructures will be re-sited outside the area of the facility.	
Access road	Today, there is an access road to the site used as an access road to the Hagit power station.	Arranging a continuation of the access road to the Hagit site.	

Fig. 3.1.1-3 above shows cross sections in principle of the facility, representing the proposed changes relative to the existing situation.

Figs. 4.3.1-1 and 4.3.2-1 below show cross-sections and simulations of the proposed facilities against the background of their surroundings.

3.1.4. Characterization of facilities

This section includes a brief review of the main components of the treatment facility and their characteristics. A full characterization of the facilities is given in detail in the engineering document – Appendix B. The characterization appearing below is of an onshore gas treatment facility, where the gas pressure in the pipes feeding the facility will not exceed 110 bar. This is on the assumption that at least a pressure reduction facility will be established offshore.

In total, the onshore treatment facility at the Hagit site will cover an area of 150 dunams, and the plan area, including the area of the facility, will cover an area of 254 dunams, made up of:

1. 108 dunams for the treatment facility for two suppliers (the area has been enlarged in accordance with the surrounding conditions, topography, and constraints of adjacent facilities)
2. 17 dunams for the transmission license holder (INGL)

3. 27 dunams for condensate tanks
4. A 4-dunam area to be allocated to unloading and loading of trucks for filling fuel, waste, hazardous materials and toxins, and to be used for removing toxic waste and condensate in case of a problem with the pipeline. In addition, loading will be carried out in this area for removal of waste, hazardous materials and other toxins accumulating in the facilities, which have to be removed to approved sites for handling or varying his materials. Close to this area, a visitors' parking lot will be made.
5. 28 dunams for the access road to the site.
6. An additional area of around 60 dunams will be a sterile area around the flame.
7. 1 dunam for expansion of the existing Hagit PRMS station.
8. A unit of area for a water treatment system, approximately 11 dunams.

All components detailed above are presented in Section 3.1.1 above.

An infrastructure of raw gas pipeline, condensate, MEG, reduced water and umbilical will reach the facilities of each of the suppliers, connecting the offshore facilities with the onshore facilities, as well as the treated gas pipeline of the holder of the transmission license between the facility and the Hagit power station.

Below are details of the main operations that will take place in each of the facility components:

- **Treatment facility:**

Gas from the well, including untreated gas, will pass through an offshore pressure reduction facility to the onshore treatment facility along an onshore pipeline strip as described in Section 3.2 below.

Main operations taking place in the central treatment facility:

- Initial separation of gases and liquids
- Drying the gas
- Transfer of treated gas to the transmission license holder
- Stabilization and accumulation of condensate before marketing to refineries or to a designated offshore treatment facility for commercial utilization onshore in a pipeline
- Treatment and separation of remaining liquids
- Collection of antifreeze (MEG), treatment and reclamation before returning to the wellhead in a designated pipeline. There may be another type of MEG treatment in the future (for example, antifreeze of similar composition,

should the need arise if the produced water is particularly saline), if space is kept at the facility

- System for recycling methane emissions back into the treatment process (flare recovery system), intended for collecting the gas emitted from the treatment process in order to prevent its emission into the air
- Treatment of water to bring it to a level at which it can be discharged into the sea at a designated exit point representing part of this plan
- Systems for treating and removing hazardous materials (mercury, NORM, trimethyl amine, BTEX, and others) that are liable to accumulate in the various treatment facilities, and ensuring that they are not emitted into the air or the soil
- Area for compressors to increase the pressure of gas flowing to the facility (in the future, pressure that will not exceed 110 bar)
- High pressure and low pressure return system by flare – for safe removal of excess gas volumes by means of a ventilation pipe with / without flare (flare systems), for use in emergencies and maintenance only
- Measuring and analyzing the gas for sale at a designated facility of the transmission license holder

In addition, the facility will include the following components:

- Workshop building
- Offices
- Area for generators to operate the facility
- Peripheral road
- Peripheral fence
- Safety system, fire sensors and signs
- Control room
- Electricity room
- Machine room

A brief review of the treatment facility components are presented below. A more detailed description of the components is included in the engineering document in Appendix B. Each onshore facility will have a capacity of up to 2 MCM per hour (in the current scenario it has been assumed that the treatment facility will include two suppliers, each supplier being responsible for 50% of the gas treatment at the plant, such that the rate of flow of the gas of each supplier will be 1 MCM per hour. In total, at the two facilities, Meretz Wastewater Treatment Plant and Hagit, the overall gas flows and treatment capacity of the facilities will be 4 MMC per hour.

This is in a situation where part of the facilities are shared and part are specific to each supplier, according to the customary policy of coordination and separation between suppliers, intended to save on land area and allow continuous and safe operation by each of the suppliers.

Each of the suppliers expected to bring raw gas from a different find with a different gas composition will separately develop the following facilities:

1. Main liquids and solids collection and separation of liquids
2. Additional treatment of the gas (gas conditioning), separation of liquids, and adjusting the temperature to the needs of the transmission system
3. Measuring the gas sent to the transmission system
4. Compressors
5. Condensate storage tanks

The other treatment facilities will be shared:

1. Stabilization of the condensate
2. Collection of the condensate and directing it to consumers in a pipeline (according to the chemical composition of the liquid from the two suppliers)
3. Adjusting the pressure to the transmission system – recompression
4. All types of MEG reclamation, and a system for returning the gas emitted from the MEG back to the treatment array
5. System for recycling methane emissions to the gas treatment system to prevent emissions into the air

In addition, there will be joint treatment support systems:

1. Heating system
2. Air cooling system
3. Return system
4. Collection of chemicals from the production process in order to remove them to designated facilities at authorized sites, by truck
5. Fuel for operating generators in emergency (malfunction of the electricity or gas supply to the generators)
6. Produced water treatment systems

Additional support systems in the facility that will be shared:

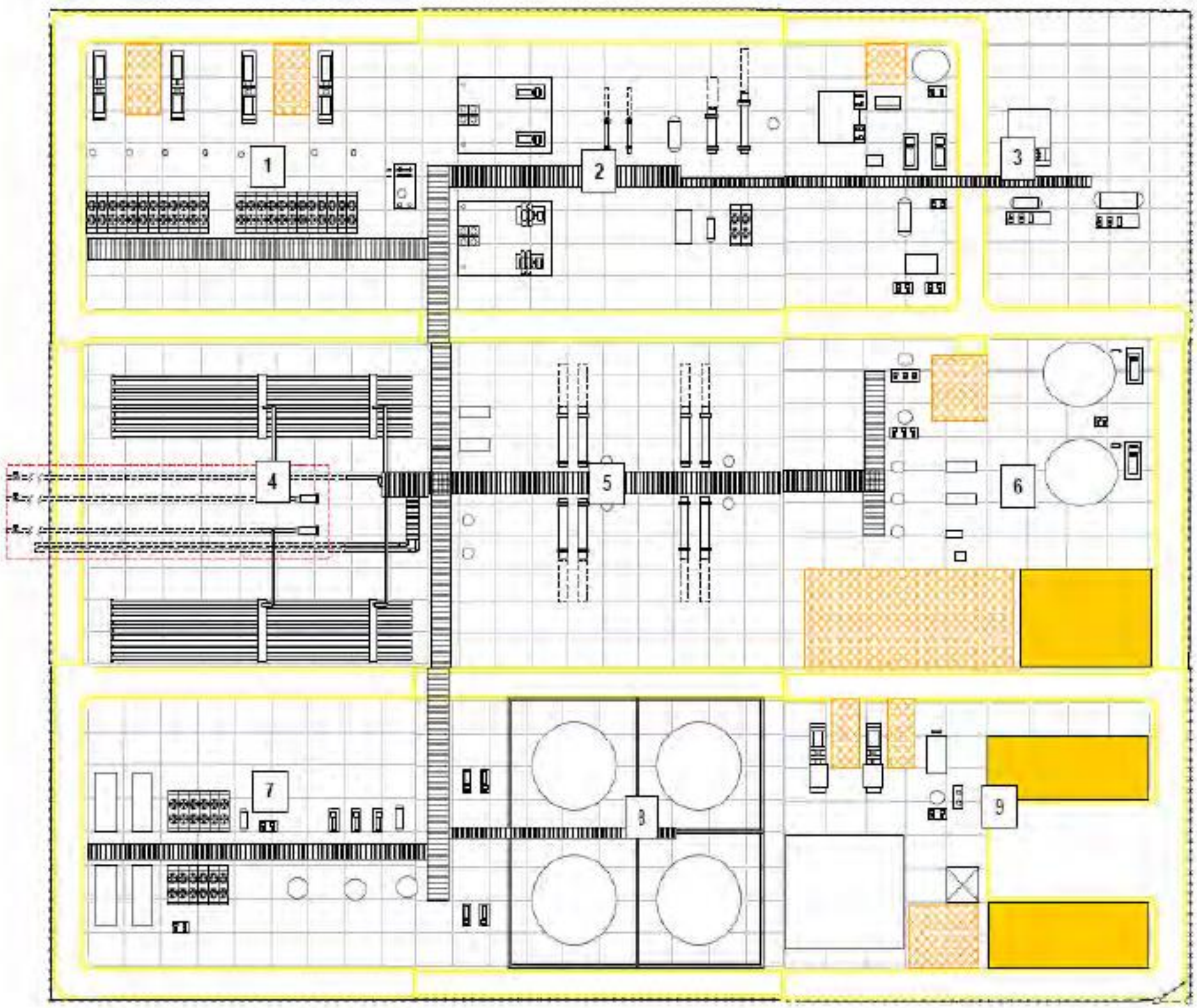
1. Offices and workshops
2. Surface run-off water collection systems

3. Potable water and water for washing devices
4. Water for firefighting
5. Compressed air system
6. Nitrogen
7. Diesel
8. Sewage
9. Electricity production for the facility's requirements

The greater part of the gas treatment processes described above exist in every gas treatment facility, while some are specific to the different types of reservoir, but are possible in future scenarios of finds off the coast of Israel.

Fig. 3.1.4-1 (included in the engineering document – Appendix B) presents the generic planning of the main treatment facility, and all its components. The main treatment area, as presented below, is spread across an area of 97 dunams. In the table attached to the diagram are details of all the components of the main facility, according to the numbering in the diagram.

Fig. 3.1.4-1: Generic Plan of Main Facility for Onshore Treatment of Natural Gas



List of Reference Drawings

Area	Drawing	Description
1	1222-C-PR-LAD-2011	Feed Gas Compression Area
2	1222-C-PR-LAD-2012	Condensate Handling and Flash Gas Compression
3	1222-C-PR-LAD-2013	Flare Gas Handling and Produced Water
4	1222-C-PR-LAD-2021	Slug Catcher Area
5	1222-C-PR-LAD-2022	Gas Processing Area
6	1222-C-PR-LAD-2023	Utilities, Firewater and Workshop
7	1222-C-PR-LAD-2031	MEG Regeneration and Reclamation (Future)
8	1222-C-PR-LAD-2032	MEG Storage Area
9	1222-C-PR-LAD-2033	Power Generation and Buildings

Table 3.1.4-1 below contains a description of the main installations and components included in the main treatment facility. It also includes other installations and components of importance in the area of the treatment facility.

Table 3.1.4-1: Description of the Main Installations in the Treatment Facility

Installation	Component	Description
Main treatment facility	Slug catcher (4)	The slug catcher is a device with a large capacity for collecting liquids that may appear in the offshore and onshore pipeline as a result of non-continuous flow of gas due to obstacles and malfunctions. The purpose of the device is to trap the liquids obtained (if any) in the pipeline, so as to prevent a situation in which a large quantity of liquid comes into the gas treatment system all at once. In this device, the gas is separated from the liquids and transferred directly to the gas treatment facility.
	Gas processing area (5)	In this area there is continuous separation of the liquids from the gas. The gas that continues on from the slug catcher is passed to 2 separation facilities. This process gets rid of all the liquids that may still remain in the gas after separation in the slug catcher. Separation is carried out by means of a physical heating and cooling system. In the future, when an additional compression process is required, the gas will pass through the separation process first before undergoing compression.
	Condensate handling and flash gas compression (2)	The liquids (MEG, condensate and water) coming from the slug catchers passes through a heating system, and is then mixed before being transferred to a tank for separation of liquids. The condensate obtained in the separation process undergoes a process of stabilization (so that if any gas remains it is emitted). The fuel is cooled after stabilization, and then transferred to designated storage reservoirs. The gas emitted from the stabilization process is recompressed into the system. This area also includes a recycling facility for onshore MEG that helps prevent the formation of liquids in the cleaning and drying process in the gas conditioning system.
	Flare gas handling and produced water (3)	<u>Flare recovery system</u> – this unit allows the reduction of gas emissions from the facility by enabling the gases (which otherwise would go on to the flare system, at the head of the stack, at high and low pressure, and be burned) to be compressed and returned to the gas treatment system. Liquids obtained in the flare system are also pumped back into the liquids treatment system. When it is necessary to dispose of gas, when it comes at rates that are greater than the capacity of the emissions reduction unit, the gas is directed to the flare system, to high or low pressure stacks. <u>Produced water treatment system</u> – produced water obtained from the onshore and offshore MRG recycling facilities is transferred to a designated treatment facility for produced water. In this facility

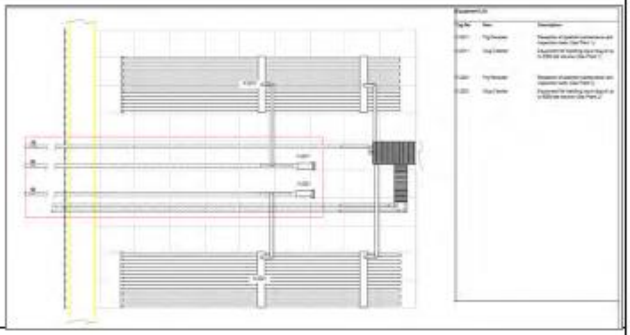
Installation	Component	Description
		there is an additional separation of all remaining fuel in the water. After this, the water (in accordance with the defined level) is transferred to the offshore facility, from which it is dispersed in the sea.
	MEG regeneration and reclamation (7)	Designated system for regeneration of the "offshore" MEG (mixed with produced water). The MEG comes to the offshore facility after undergoing treatment to separate liquids. In this facility, the MEG is separated from the water by boiling the water. The water goes through a process of condensation before being transferred to a designated treatment facility. The regeneration facility includes heating systems, similar to other installations at the site. In the future, in the event that the produced water coming in to the facility is more saline, additional treatment of the MEG will be required for its reclamation, including separating the salt from it. Space has been left in the area for this activity, if required in the future.
Main treatment facility	MEG storage (8)	In this area the MEG (onshore and offshore) will be stored in four designated tanks before transfer to the offshore facility. As far as possible the tanks will be buried in the ground.
	Feed gas compression area (1)	This component will be set up at a later stage of the project, and is intended for a future stage when the gas pressure in the drilling well is reduced, and it becomes necessary to add pressure to the system in order to pump the gas from the well to the onshore treatment facility (in order to meet the pressure specification required by the INGL transmission system). At this stage, before the gas enters the cleaning and drying process in the gas conditioning system, it will undergo compression. For each gas flow there are two compressors, with a planned total of four compressors. At first the compressors will be powered by gas turbines and machines. In later stages, it may be necessary to have multi-stage compressors. It appears that the compressors will be roofed, in order to reduce the noise and protect the equipment. The gas obtained in the separation processes will pass through another installation in which all the liquids remaining in the gas are trapped. In the compression process the gas is heated, and therefore, before it can be transferred to the gas conditioning system, it will be cooled by fans. It appears that the equipment included in this area will not be installed in the initial years, other than the gas and fuel merging system that it includes.
	Utilities, firewater, workshops (6)	This area is intended for the most part for related equipment and firefighting array, together with the workshops, equipment storage, and general storage. Related equipment includes: nitrogen tanks, compressed air system, methanol tanks, pumps, and anticorrosion stores. The firefighting array includes water tanks for extinguishing four hours of fire, pumps, foam, and more.

Installation	Component	Description
	Power generation and building (9)	This area includes the power station building, together with the offices and control room. It also contains emergency power station units, and a system for storing and transferring diesel to firefighting pumps and to the emergency generator. The electricity supply could be by connecting the facility with the local electricity grid, but there is also an option to set up a power station within the facility in case of emergency, by means of two 10 MW turbines. For this purpose, it is also necessary to have a diesel engine with a 1 MW capacity. The diesel is stored in designated tanks.
INGL facility		**INGL facility – gas transmission and receiving system** including Assembly No. 8 - monitoring at the point of entry to the transmission system - connection point and fiscal or custody transfer to NGTS, whose function is control and measurement of the quality of the gas and its characteristics before it enters the national transmission system at a pressure of 80 bar. This system is set up by INGL, in accordance with its customary planning procedures. The area of the INGL receiving facility will be planned as close as possible to the receiving and supplementary treatment facility, and will allow entry of the facility including the following components: – Pipeline from the gas receiving treatment facility – Block valve station – Command and control room – Pipeline from INGL receiving facility to the national transmission system – Vent – for gas return – PRMS and boiler room + possibility of connection to a future pipeline to consumers – Area for compressors – Operation and maintenance area
Condensate storage (10)		**Storage and condensate tanks** including three tanks with a total capacity of 20,000m^3, a quantity that allows the storage of fuel for seven days continuous production process. Tanks are intended to provide a temporary storage response in case it is not possible to transfer the fuel through the designated pipeline (another solution to a malfunction in the fuel pipe is removal by means of trucks). Tanks are located at a relative distance from the other facility installations. Storage of the fuel in three separate tanks enables better quality of control in order to distinguish the type of fuel and continue treating it. Since the fuel is a hazardous material, a spill containment pallet is located close to the tanks that is intended to provide a response in the event of a leak or malfunction in the storage tanks.

Installation	Component	Description
Loading and unloading area:		For loading and unloading byproducts of the treatment process (that are not transferred by designated pipeline), among other things surplus condensate, a designated area is required for loading and unloading trucks. This site is set on an area of 4 dunams.
Emergency flare:		System for the safe removal of excess gas volumes by means of a pipe and ventilation with/without a flare, in the event of a malfunction. During a significant malfunction at the gas treatment facility, in a situation in which the best solution is to release the gas, during combustion it will be necessary to return all the gas existing in the gas pipeline (in the range between the nearest block valve station to the facility and the treatment facility itself), and in the treatment facility. The flare system includes two types of stack, one for high pressure (greater than 10 barg) and another for low pressure (less than 10 barg). These can be side-by-side, or in the same installation itself, with two separate stacks. There is flexibility in choosing the height of the stack, according to the radiation radius that needs to be maintained. The flare will rise to a height of at least 25 m and up to 100 m, in accordance with the existing restrictions in the facility and the surrounding area. An area needs to be created around the flare that contains no sources of ignition (a sterile area) with a minimum radius of 111 m for a strength of radiation of 4.73 kW/m^2 [3]attributed to the area of operation of the facility staff, even in an emergency, when they are equipped with the appropriate equipment. Around this area there will be a fence, and it will be included in the area of the site. Another safety space to be calculated according to a heat radiation strength of 1.6kW/m^2 dictates a radius of 200 m around the flare. In this area, in the event of a gas release, a PA system will warn passers-by not to enter the area, which will be marked with signs, but not fenced. In this area agricultural cultivation will be permitted, as well as the passage of passers-by.

[3] According to standard API std. 521

Slugcatcher (4)



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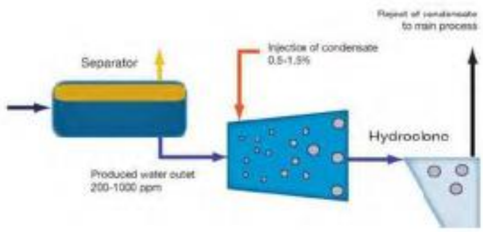
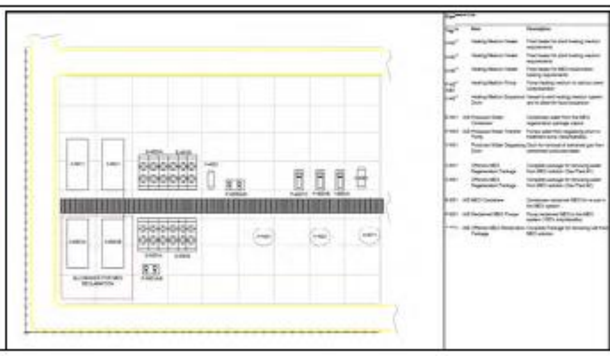
Produced water system (3)

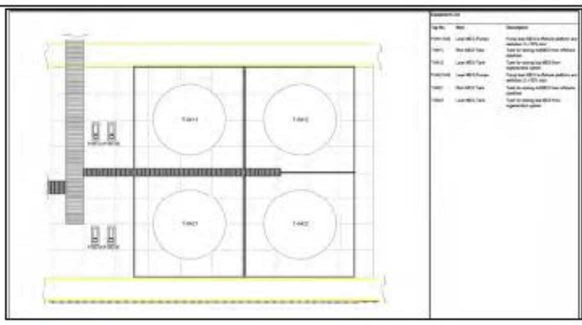
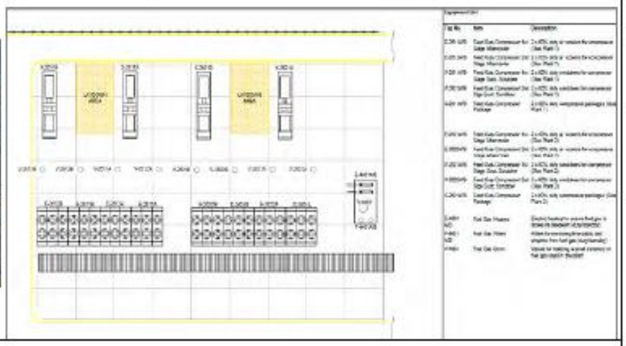
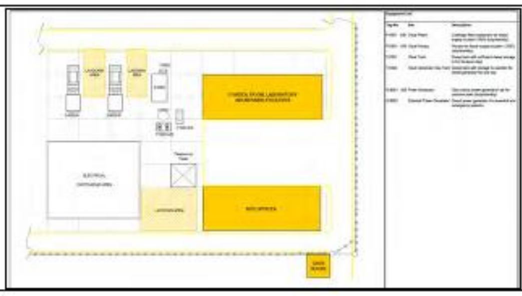


*http:// canadiansatwork.ca/2011/ctour-produced-water-treatment-system – 8/4/2013
*http://www.alderleygroup.com/product_category.asp – 8/4/2013

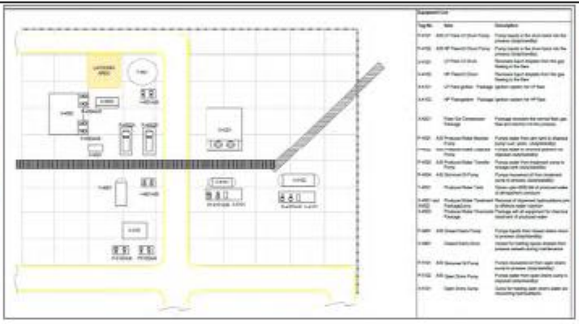
Meg regeneration and reclaimanation (7)



*http://www.prosemat.com – 8/4/2013
*http://www.akersolutions.com/Documents- 20/4/2013

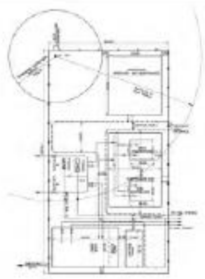
MEG Storage (8)
 
*http://reports.shell.com/investors-handbook/2011/downstream/chemicals.html – 8/4/2013
Feed gas compression area (1)
  
*http://www.greenstreamuby.com/en/pages/photo-gallery/photo – 8/4/2013
Utilities, firewater, workshops (6)

*

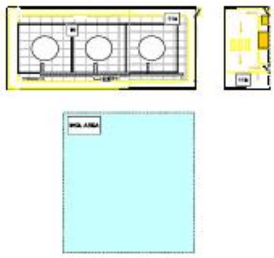
Flare recovery system



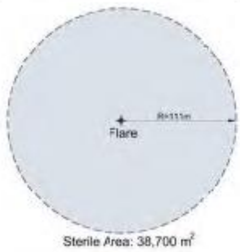
*http://www.zeeco.com/ - 20/4/2013

Condensate storage and INGL Station





Flare – Sterile area



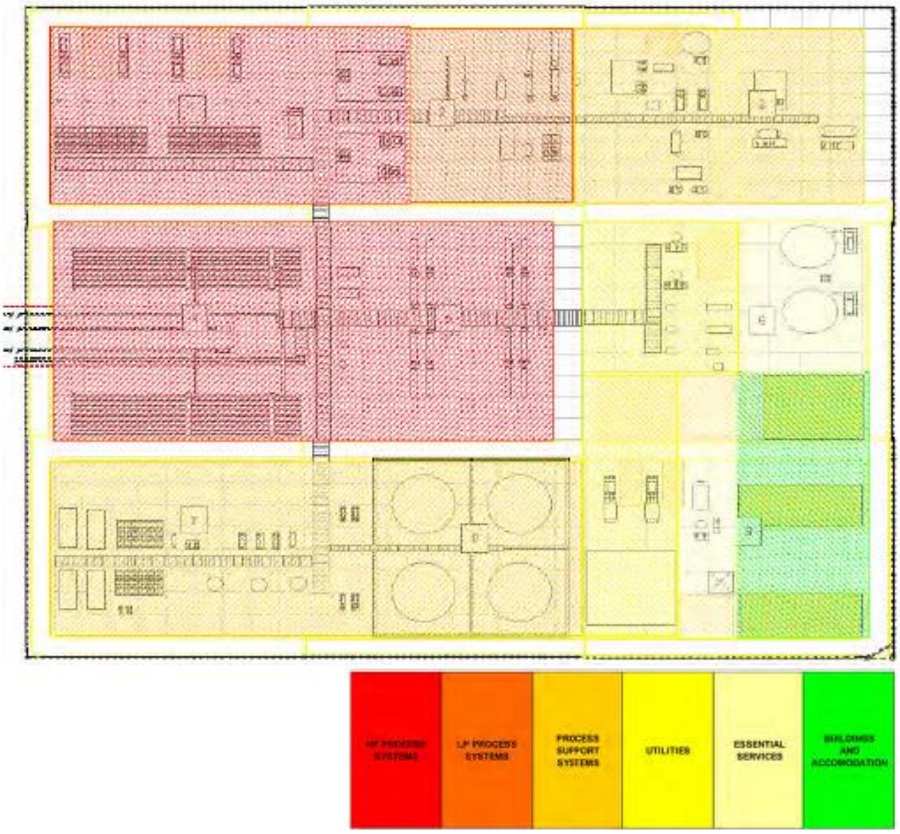
Analysis of risk areas:

Within the main facility, and between the other components of the site, an analysis in principle of the level of risk of each of the components of the facility was performed, based mainly on the levels of pressure existing in the components, high pressure – high risk, low pressure – low risk. See Fig. 3.1.4-10 below.

Planning and design of the site was obtained according to an analysis of the safety and risk ratings, and is expressed in the way in which the facility components with a high risk rating are located at a distance (as far as possible within the site) from low-risk components, in order to minimize as far as possible the risk of future harm to the more sensitive components. For example, offices are away from the area of compressors and slug catchers. On the same principle, condensate tanks are kept away from the areas staffed by the majority of employees at the facility.

At the same time, it is important to note that the analysis of risk areas is a guideline and it is not mandatory to locate the different installations and components accordingly.

<u>Fig. 3.1.4-2: Analysis of Risk Areas in the Treatment Facility</u>



Area of high risk – red; area of moderate risk – dark orange; area of low risk – yellow and green.

<u>Pipeline infrastructures at the treatment site:</u>

In this stage of the planning, the assumption is that within the entire area of the onshore treatment facility there are overland pipeline infrastructures that will be used for the process of gas treatment and for connecting the system to the various installations. Moreover, a pipe is also planned to connect between the condensate containers and the loading and unloading areas, as well as a pipe to connect the facility with the INGL receiving facility. All these infrastructures do not constitute a separate part of the designated piping to and from the facility. Pipes will be planned over piping bridges and within dedicated piping channels.

In addition, guidelines and restrictions for the dedicated piping within the treatment site area will be included within the reference to the treatment of wastewater and the prevention of soil and groundwater contamination, in Sections 3.4.9, 4.7 and 4.10, below.

The measures for protection against hazardous substance events, and the measures for the prevention and mitigation of air pollution, soil contamination, groundwater contamination and pollution of the shore environment, will be detailed in Chapter D of the survey.

Measures for the prevention of marine pollution will be detailed in the Environmental Impact Survey for the offshore part of the plan.

3.1.5. Characterization of products

All processes and home and industrial activities create discharges and wastewater. This also applies to the processing and treatment of natural gas. In this process, the following products are obtained: natural gas, condensate – fuels obtained from the condensation of the gas stream, combustion products that are obtained in the process of creating heat and electricity, chemical additives that aid in the production process (at the wellhead or within the treatment facility), chemicals that assist the process of treating discharges and wastewater, additional chemicals that are used for the purpose of maintaining equipment and instrumentation in facilities, as well as produced water.

This section will include a brief survey of the main products of the treatment facility and their characteristics. A full characterization of the products is given in the Engineering Document, **Appendix B**. Moreover, a description of the materials obtained in discharges and wastewater will be included in the air quality and wastewater sections below. A general explanation regarding the process products is included in the description of the gas treatment chain, in Section No. 3.0 above.

Main products of the gas treatment process:

- **Natural gas:** The maximum gas throughput rate will be 48 MSm3/d (millions of standard cubic meters (per day)) in two pipelines. The characteristics of the gas based on existing drill site characteristics offshore within Israel's territorial waters, are those of a sweet gas with a very high concentration of methane. Two important principles assumed in the evaluation of the gas composition and the products are:

- A concentration of 8 H_2S (mol) ppm has been assumed for the untreated gas stream, which is the maximum allowed concentration within the INGL transmission network. All the various sulfuric compounds exceeding the concentration will be treated before entering the gas treatment facilities.
- The gas composition comprises a very low concentration of CO_2, at a concentration that is also allowed for use within the INGL national transmission system (of up to 3% mol), and for this reason no additional dedicated installations for treating it is necessary.

Table 3.1.5-1 below details the natural gas composition characterizing the discoveries found along Israel's shores:

Table 3.1.5-1: Gas Composition Typical of Discoveries Along Israel's Shores

Component	Mole %
Carbon Dioxide	0.1192
Nitrogen	0.2146
Methane	98.9021
Ethane	0.3365
Propane	0.1631
i-Butane	0.0412
n-Butane	0.0421
i-Pentane	0.0245
n-Pentane	0.0096
C6+ 47/35/17	0.1471
Total	100.0000

- **Fuel – Condensate:** As noted above, fuels are obtained through condensation of the gas stream. At this stage, there is no information regarding the composition of the condensate and it is therefore assumed that the composition is a typical one of C5, C2 and C6+ for evaluating the condensate. According to the gas treatment rate, the throughput rate of the fuel supply can be as high as 7,630 barrels/day.
- **Produced water:** Produced water comprises all the water obtained on the surface that is derived from the well along with the natural gas. Usually, below the gas layer within the reservoir there is a layer of water that blocks it. At the point of equilibrium between the gas layer and the water phase,

the water mixes in with the gas. Produced water received from gas fields comprise two sources: condensed water (water derived from the water saturated gas layer which is condensed within the installations on the surface and within either underground or subsea pipelines) and produced water – water that is present under the gas layer that reaches the drilling when the pressure within the drill hole is reduced. The water composition according to the above detailed sources changes throughout the life of the project.

The composition of produced water is specific to each gas field and sometimes may even be different from one drill hole to another within the same reservoir. For this reason, it is impossible to evaluate the composition without this specific information. Nevertheless, there are materials that may be characterized as typical/common materials within produced water, and these are detailed in Table 3.1.5-2 below (the table is derived from the Engineering Document presented in Appendix B). The produced water reaching the treatment facility will contain various elements of natural gas, as well as chemicals that are used within the well and the pipeline. Some of these materials are also used for the pressure reducing installation and for the produced water treatment facility. It should be noted that it is not always possible to mix produced water from different sources, and it is therefore possible that a need will arise to establish separate systems for transmission and treatment.

In the context of the conceptual planning of the onshore treatment facility, it has been estimated that the storage capacity of produced water within the facility will be about 1,140 m^3 per day.

Table 3.1.5-2: Examples of Typical Chemicals within the Produced Water

Component	Source
Natural Gas	
Trace hydrocarbons and gases	Gaseous hydrocarbons with low solubility in water – e.g. methane, ethane, propane, butanes, nitrogen
Soluble Hydrocarbons and Volatile Organic Compounds (VOCs)	Hydrocarbons soluble in water – e.g. BTEX, PAH, NPD and hydrocarbon components that are soluble in water at pressure but vaporize at low (atmospheric) pressure
Dispersed Hydrocarbons	Hydrocarbons insoluble in water but mixed with the produced water stream
Hydrogen Sulphide (H_2S)	Gaseous component soluble in water
Sulphur Compounds	Gaseous components soluble in water
Carbon Dioxide	Gaseous component soluble in water
Produced Water	
Sand	Fine sand particles
Dissolved solids and ions	Soluble salts, rare metal ions
Heavy metals	Can be present in produced water
Wellhead and Facilities Production Chemicals	
MEG	Used for hydrate inhibition, sales gas water and hydrocarbon dew-point control, carrying corrosion inhibitor
TEG	Used for sales gas water dew-point control
Methanol	Used for hydrate inhibition and pressure balancing at well start-up
Kinetic Hydrate Inhibitors	Used for hydrate inhibition
Corrosion inhibitors	Used to prevent corrosion in pipelines
Corrosion and Erosion Products	For example: due to CO_2 in the gas stream and sand particles
Scale Inhibitors	Sometimes used to prevent scale formation in process equipment from the produced water
Antifoaming agents	Sometimes used to prevent/reduce foaming in gas-liquid/water separators
Demulsifier	Sometimes used to enhance separation of produced water from hydrocarbon condensate
Reverse Emulsion Breakers	Sometimes used to enhance separation of hydrocarbon condensate from produced water

As noted above, details of the above products and additional materials are included in the Engineering Document, in Appendix B. As stated, the solution of the produced water treatment comprises: treatment of the water within the treatment facility and disposal via a dedicated pipeline to the pressure reduction facility offshore. The location of the flow of produced water is determined at the offshore pressure reduction facility and a dispersion model within the water was applied to this location, and will be presented and explained at length in the Environmental Impact Survey for Offshore Facilities.

3.1.6. Fuels

The fuel (condensate) reaches the treatment facility through the onshore pipeline corridor, and from the facility it is transferred via dedicated infrastructure in accordance with the treatment solution to be selected.

The fuel (condensate) obtained from the treatment process at the two onshore facilities, the Meretz and Hagit Wastewater Treatment Facilities, is concentrated at the Hagit site:

- Fuel derived from gas treatment products at the Meretz Wastewater Treatment Facility, is included in the pipeline strip extending from the treatment facility at the Meretz Wastewater Treatment Facility up to its connection with the INGL national transmission line (at the Gezer-Hagit line). Along the Gezer-Hagit line a fuel pipeline will be laid, to be promoted within a separate NOP 37/b/8 plan, and up to the INGL facility adjacent to the planned treatment facility at Hagit.
- Fuel obtained via the treatment process of the crude gas at the Hagit site.

Two main solutions are proposed for the process of treating fuel products derived from the treatment facilities:

1. Offshore treatment using a dedicated treatment facility (FSO) – for this purpose the fuel will be conveyed from the treatment facility at Hagit to a dedicated offshore treatment facility via the onshore pipeline corridor (from which it reached the facility). An extensive survey of the solution for treating fuels using the FSO will be included in the Environmental Impact Survey for offshore facilities.
2. Treatment of fuels onshore in refineries – this solution requires that a dedicated pipeline be arranged for the fuel that will remove the fuel from the treatment facility and convey it up to the Haifa refineries. In this context, first priority is given to evacuating condensate from the Hagit/Meretz Wastewater Treatment Facility site using a dedicated pipeline adjacent to the pipeline alignment of the IPC that already exists, to the Hagit-Elroi-Haifa refineries within the statutory strip of INGL or the gas piping strip in the Hagit-Haifa refineries line (according to NOP 37/b) – in coordination with the relevant infrastructure owners where it will be treated. To this end, it is possible that statutory regulation will be required for the existing pipeline strip alignment and its point expansion where necessary, including surveys that may be required according to the requirements of the Ministry of Environmental Protection.

Figures No. 3.1.6-1/2 present the alignment of the IPC pipeline proposed for removal of fuels from the Hagit site and their transfer to the Haifa refineries.

- In emergencies, fuel removal will be carried out directly from the facility via trucks conveying it to the selected treatment facility, in accordance with the two alternatives described above. This solution requires a loading and unloading area to be included within the facility area.

<u>Figure 3.1.6-1: IPC Pipeline Alignment Proposed for the Removal of Condensate from the Hagit Site and its Transfer to the Refineries, on the Background of a Background Map</u>

<u>Figure 3.1.6-2: IPC Pipeline Alignment Proposed for the Removal of Condensate from the Hagit Site to the Refineries, on the Background of an Aerial Photograph</u>

3.2. Structures and Facilities within the Pipeline Corridor and Accompanying Infrastructures

The Environmental Impact Survey for the Meretz Wastewater Treatment Facility will include a survey of the aspects relating to the onshore pipeline corridor from the coastal entry point up to the connection with the onshore treatment facility, including pipeline characteristics, the staging and construction process, as well as a description of the way in which streams are crossed, infrastructures, a description of the facilities accompanying the pipeline: venting systems and block valve stations: both at the shore and intermediate, as well as a description of the staging process for construction of the stations and performance of HDD drilling. These components and installations are essentially similar in nature for the two onshore treatment facilities for the Hagit site and the Meretz Wastewater Treatment Facility, yet the infrastructures, processes and/or installations included in the treatment array of the Hagit facility have different and/or unique characteristics typical of the site, that will be presented in the present section.

Below is a description of the main components along the pipeline corridor and accompanying infrastructures:

<u>Onshore pipeline corridor</u> – The pipeline corridor from the coastal entry array to the receiving facility constitutes a strip with a variable width of 40-60 meters, that includes the option of burying a parallel array of pipelines for two suppliers including burial at various stages, so that for each supplier a strip of 20 meters is reserved. The pipeline corridor in accordance with the various engineering technologies, comprises a number of pipelines, including:

- Crude gas line arriving from offshore (from the pressure reduction facility) for final treatment at the receiving facility, with a diameter of up to 36".
- Pipe for the removal of water surpluses with a diameter of up to 10".
- Pipe for the removal of condensate surpluses with a diameter of up to 8".
- Pipe for the MEG cycle with a diameter of up to 6".
- Maintenance and control line, extending between the offshore facility and the onshore facility – umbilical control cable with a diameter of up to 4".

Treated gas will be transferred from the receiving facility to the INGL national transmission system, with a single pipe of 42" leading to the existing Hagit PRMS station, with an option for future expansion.

All in all, for 2 suppliers the pipeline corridor will include 10 pipes at the most. The building lines of the pipeline corridor are 45 meters on each side.

The following are details regarding changes in the pipeline width:

The width of the strip from the Dor onshore station up to the INGL block valve station existing at Dor, within the context of NOP 37C, will be 60 meters, because of the addition of a future option to the INGL pipeline from offshore.

The width of the pipeline strip from the existing Dor block valve station up to the receiving facility is 40 meters (in addition to the existing INGL strip that is 20 meters wide).

From the receiving station, an extension of the pipeline strip is planned northwards by 10 meters, up to the connection with the IBC strip, in order to delineate a dedicated pipeline for the removal of condensate surpluses with a diameter of up to 8", leading to the Haifa refineries (see details in Section 3.16 above).

From the INGL station planned as part of NOP 37H, and up to the existing INGL PRMS station by force of NOP 37/B/C, to the west of the Hagit power station, the strip will delineate a pipeline extending over a width of 20 meters, in which a treated gas pipe with a diameter of up to 42" is planned. The strip connects to the strip approved by NOP 37B/8.

Pipeline sections are presented in Section 3.2.1 below:

<u>Onshore block valve station – connection to the offshore pipeline (terminal station)</u>– The block valve station at the coastal strip is an underground station and its components are not exposed (except for taps and electrical rooms for each of the suppliers and for INGL, if necessary) and with exception of the peripheral fence required for the facility. The station comprises control valves for the flow of crude gas obtained from offshore in the direction of the onshore receiving facility from two suppliers and comprises the station, the existing INGL line by force of NOP 37/C from offshore with a diameter of 30". In addition, in the event that the gas received is single phase (if the technological alternative to be selected will include location of gas main treatment offshore) the station will comprise a venting array for emergency cases, wherein it becomes necessary to release all of the gas immediately as well as an option for locating the INGL vent within this station (see details in Section 4.1 below). The release of gas is a self-initiated activity. This station is located at a distance greater than 300 meters to the east of the shoreline and its surface area is approximately 5 dunams. Building lines from the station refer to a distance of 109 meters that must be maintained from the vent (see Figure 3.2.2-2) in order to prevent fire within the buildings (house burning distance - HBD). Details regarding separation distances are presented in Section 4.1.1 below.

The Dor onshore block valve station also comprises the existing INGL line as part of NOP 37C.

A drawing of the block valve station along the shore strip is presented in **Figure 3.2.1-5**.

Block valve station (interim station) – This is an underground station that will be located at a distance of 11 kilometers from the onshore block valve station. The purpose of the station is to provide an additional safety mechanism in the event of a malfunction in the system that requires an immediate stop of the gas flow within the onshore pipeline. The station area is approximately 40m X 30m and is included within the pipeline corridor area. The station comprises taps, an electricity room and a control room (aboveground) for each of the suppliers and for INGL and does not comprise a vent array. The station will be enclosed within a concrete wall topped by a fence. This station has identical building lines to those of the pipeline corridor extending to 45 meters on each side. A figure of the block valve station – interim station is presented **in Figure No. 3.2.1-6**.

Block valve station – INGL connection to the receiving facility is intended to connect the facility and the INGL national transmission system – An additional block valve station is located at the connection of the INGL pipeline (which includes a pipe for treated gas, after the treatment of the gas at the onshore facility) with the INGL national transmission system and the existing Hagit PRMS station (by force of NOP 37/C). In the context of NOP 37H, the station is to be extended southwards by about 1 dunam.

3.2.1. Mapping and sections

Mapping of the onshore piping system on the background of an aerial photograph with elevation lines is presented in **Figure No. 3.2.1-1**.

Mapping of the onshore piping system on the background of an aerial photograph with elevation lines over infrastructures is presented in **Figure No. 3.2.1-2**.

A typical section of the pipeline corridor is presented in **Figure No. 3.2.1-3**.

Typical sections of the laying of pipelines are presented in **Figure No. 3.2.1-4**.

Typical sections of the works involved in laying the pipeline corridor vis-à-vis the environment of the pipeline are presented in **Figure 3.2.2-1 A.**

Figures 3.2.1-5-7 present a conceptual scheme for the block valve stations at the coastal entry array, interim stations and terminal stations in connection with the existing Hagit PRMS station (the INGL system).

Figure **3.2.1-7** presents a conceptual scheme for the expansion of the existing Hagit PRMS station by force of NOP 37C.

Figure 3.2.1-1: Hagit Site and the Onshore Pipeline on the Background of an Aerial Photograph and Elevation Lines

Figure 3.2.1-2: Mapping the Onshore Treatment Array over Infrastructures

Figure 3.2.1-3: Typical Section of the Pipeline Corridor for Two Suppliers

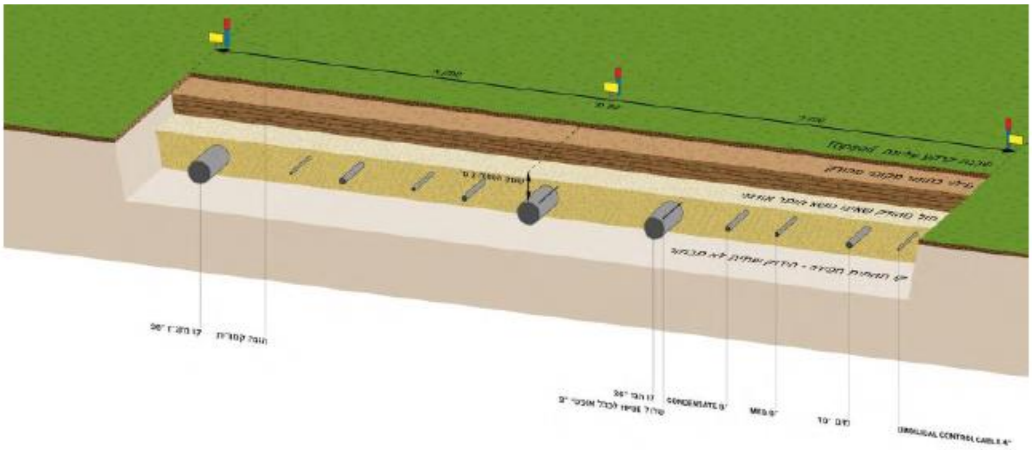


Figure 3.2.1-4: Typical Sections for Laying the Pipeline

Figure 3.2.1-5: Conceptual Scheme of the Shore Block Valve Station

Figure 3.2.1-6: Conceptual Scheme of Interim Block Valve Station

Figure 3.2.1-7: Conceptual Scheme of the Expansion of the Existing Hagit PRMS Station by force of NOP 37c

3.2.2. Description of the work area

This section comprises a survey of the construction work and staging areas required for the purpose of building the pipeline corridor and installations along it.

Description of the construction works for laying the pipeline along the infrastructure corridor and within staging areas

The following is a description of the main stages:

- Mark out the work strip, pipeline strip and locate crossing infrastructures
- Remove topsoil and store it within the work strip
- Disperse pipes along the alignment (stringing)
- Pipe welding
- Excavate channel for laying the pipeline
- Lay the pipeline within the channel
- Inspect the pipeline
- Connect cathode protection
- Fill soil over the pipeline
- Install signage and marking
- Rehabilitate and reconstruct the terrain

Work stages in construction of the staging area:

- Set up entrance and exit axes
- Mark out the area
- Remove topsoil
- Level the area and disperse beds
- Temporary fencing
- Establish mobile structures and equipment for the purpose of the work and temporary storage
- Install signage and marking
- Dismantle structures and equipment once the work is complete
- Rehabilitate and restore the condition to its previous state

Landscape rehabilitation of the pipeline strip

The construction work process and principles guiding the landscape reconstruction of the pipeline strip are essentially identical to the principles presented in the Environmental Impact Survey for the Meretz Wastewater

Treatment Facility. Nevertheless, a certain adjustment of these principles is required in accordance with the fact that a considerable part of the pipeline alignment within the north alternative passes through a natural mountainous terrain characterized by natural forest, ancient trees and dense scrublands, as well as JNF forests. These characteristics require adjustment of the work method and establishing additional guidelines for performing construction works and landscape rehabilitation works in a way that will take the necessary sensitivity into account.

In accordance with the characteristics of the pipeline alignment, the landscape treatment addresses soil rehabilitation in a number of typical segments:

- Natural area – coastal environment
- Natural area – herbaceous shrublands
- Developed natural woods – mature trees
- Existing human-planted forest – pine tree plantings by the JNF
- Agricultural lands – field crops
- Agricultural lands – orchards and vineyards

The pipeline's passage along each type of alignment has different types of impacts stemming from the characteristics of the terrain, and especially from the limitations arising from the distance required between trees and the gas pipeline alignment, which does not allow the natural terrain to be restored, neither through the replanting of trees within the forest/wooded areas nor through the replanting of fruit trees in orchards. Within natural areas such as sandy areas or herbaceous shrub lands, there is an option to create the appropriate conditions for the terrain's self-rehabilitation. Within natural woods or forest areas, it will be necessary to uproot or transplant trees located within the pipeline strip area, and it will only be possible to rehabilitate geophytes and low-lying vegetation. Within agricultural lands characterized by field crops, it will be possible to restore the cultivated agricultural landscape to its previous condition. Within agricultural lands characterized by intensive agricultural crops – orchards and vineyards – damage is expected to agricultural, economic and cultural values.

1. **Construction works** – At this stage emphasis will be placed on principles aimed at minimizing any damage within the pipeline strip and its environment during the work stages, and the preservation of the topsoil layer will be addressed as this is a fertile layer that comprises a seed bank within the natural soil.
2. **Regulation** – interim stage – the pipeline strip undergoes a partial/temporary rehabilitation process, after completion of the pipeline construction works by the first supplier.

3. **Rehabilitation** – final stage – rehabilitation of the pipeline strip and restoration of the terrain to its previous characteristics in a way that will ensure the least damage possible to the surrounding landscape, once the construction works and the laying of the pipeline by the second supplier are complete.

A description of the landscape rehabilitation at each stage, in accordance with the characteristics of the pipeline alignment is presented in Table 3.2.1-2 below:

Table 3.2.2-1: Description of Landscape Rehabilitation

Rehabilitation Stage/Alignment Characteristics	Construction Works	Regulation	Rehabilitation
Natural area – coastal environment	- Survey of the unique flora along the alignment. Collection of geophytes and unique flora in accordance with the survey before exposing the soil. - Transfer/temporary moving of geophytes and unique flora in accordance with the Nature and Parks Authority's instructions in relevant areas.[10] - Preliminary handling of invasive flora, uprooting and removal of invasive flora in accordance to the Nature and Parks Authority's guidelines.	The temporary rehabilitation procedure will not be carried out in natural areas. Rehabilitation of flora will take place by means of self-renewal or by means of initiated rehabilitation, until the final rehabilitation is achieved, and the landscape obtained is mainly a result of the rehabilitation of the ecological system.	Restoring topsoil and replanting geophytes and unique flora, only in the event that such are present. Restoration of the soil appearance texture.
Natural woods	- Performing a detailed geophyte survey and collection of geophytes before exposure. - Performing a detailed trees survey according to which the trees intended for transfer and those for cutting down will be determined and arrangements made accordingly. - Heaping of topsoil layer and protecting it during the execution of the works.	- Restoration of geophytes. - Restoration of the topsoil layer to its previous state (where excavation has taken place, original material will not be restored). - Transfer of trees outside the range of the pipeline strip at a distance of 5 meters on both sides.	Restoration of the topsoil layer to its previous state (wherever excavation works took place, original material will not be restored). Replanting of geophytes only, close to the place where they have been uprooted. - Transfer of protected trees while maintaining a distance of 5 meters on each side of the pipeline strip for the

[10] See Section 4.9 on the issue of ecological rehabilitation.

Rehabilitation Stage/Alignment Characteristics	Construction Works	Regulation	Rehabilitation
	- Guidelines regarding activity along the service routes in order to avoid damage to soil and trees. Temporary planting of trees intended for restoration to the work areas required for laying the piping.		planting of trees and while maintaining the service road.
Existing human-planted forest	- Performing a detailed geophyte survey and collection of geophytes before exposure. - Performing a detailed trees survey according to which the trees intended for cutting down will be determined and arrangements made accordingly. - Heaping of topsoil layer and protecting it during performance of the works. - Guidelines regarding activity along the service routes in order to avoid damage to soil and trees.	- Restoration of geophytes. - Restoration of the topsoil layer to its previous state (where excavation has taken place, original material will not be restored). - Natural rehabilitation of shrub land.	- Restoration of the topsoil layer to its previous state (wherever excavation works took place, original material will not be restored). Replanting of geophytes only, close to the place where they have been uprooted. - Restoration of plantings while maintaining a distance of 5 meters on each side of the pipeline strip for planting trees, while maintaining the service road. - Natural rehabilitation of the shrub land.
Agricultural land – field crops	- Heaping of topsoil layer and protecting it during performance of the works. - Guidelines regarding activity along the service routes in order to avoid damage to soil.	- Restoration of topsoil layer to its previous state (where excavation has taken place, original material will not be restored). - Restoration of agricultural activity, except in the alignment of the intended service road.	- Restoration of topsoil layer to its previous state (wherever excavation works took place, original material will not be restored). - Restoration of agricultural activity, except in the alignment of the intended service road.

Rehabilitation Stage/Alignment Characteristics	Construction Works	Regulation	Rehabilitation
Agricultural soil – orchards / vineyards	- Heaping of topsoil layer and protecting it during performance of the works. - Guidelines regarding activity along service routes in order to avoid damage to soil. - Make it possible to maneuver in the specific locations by determining the work strip in accordance with whole orchard rows (rather than in accordance with individual trees). Temporary planting of fruit trees intended for restoration to the work areas required for laying the pipeline.	- Restoration of the topsoil layer to its previous state (where excavation has taken place, the original material will not be restored). - Restoration of agricultural activity, while maintaining a distance of 5 meters on each side of the pipeline strip for planting trees while maintaining the service road.	- Restoration of topsoil layer to its previous state (wherever excavation works took place, original material will not be restored). - Restoration of agricultural activity, while maintaining a distance of 5 meters on each side of the pipeline strip for planting trees while maintaining the service road.

Figure No. 3.2.2-1 a below presents a schematic drawing of the rehabilitation of the pipeline strip in accordance with the alignment characteristics in herbaceous shrub lands, in natural woods and forests, the natural area in the shore environment and in orchard areas.

General guidelines for minimizing damage during the work stages:

- Any operation including operations performed by vehicles, equipment storage, etc., will only be allowed within the width of the pipeline corridor – which lies in the range of 20-60 meters. Nevertheless, the plan will allow local flexibility on each side for the purpose of the work strip in order to achieve localized adjustments and for the purpose of rescuing unique trees.
- During the first stage (laying of the pipeline by the first supplier) there will be an uprooting process (in the event that there are natural trees, pine trees and/or fruit trees) only within the area of the pipeline strip and the work strip intended for the first supplier.
- Localized maneuvering of vehicles will take place as much as possible within the temporary staging areas.

- Natural trees – to the extent possible, an effort will be made to make localized bypasses in order to avoid the need to move a tree and in coordination with the relevant bodies. Preference will be given to moving trees close to the strip boundary. In areas where the soil is to be heaped, it is possible to make a bypass of the heap itself or to allow a limited amount of overflow in the event that there is a tree intended for uprooting/transfer within the area.
- The entire course of the establishment works will be accompanied by the control and supervision of landscape and ecological aspects.
- Since the technological alternative for the treatment process is to be selected at a later stage and the width of the pipeline strip may change considerably accordingly, a survey of mature trees and a detailed survey of geophytes for the pipeline corridor will be performed at the building permit application stage at the time that the alignment is marked in practice in situ, including the establishment of staging areas, contractor camps, etc..
- In temporary service roads, 20 cm of the topsoil layer must first be removed and placed in a dedicated heap. Once the works are complete, the contractor is obligated to evacuate all of the bedding materials from the strip and place the topsoil in its proper location. Guidelines for handling and heaping the topsoil layer will also accord with the ecological instructions.
- Preference will be given to performing pipeline laying works during the summer season as far as possible, in order to avoid damage to the fertile layers of the soil.
- Construction works will be performed, as far as possible, using caterpillar heavy mechanical equipment rather than wheeled equipment, in order to avoid excessive compacting of the soil.

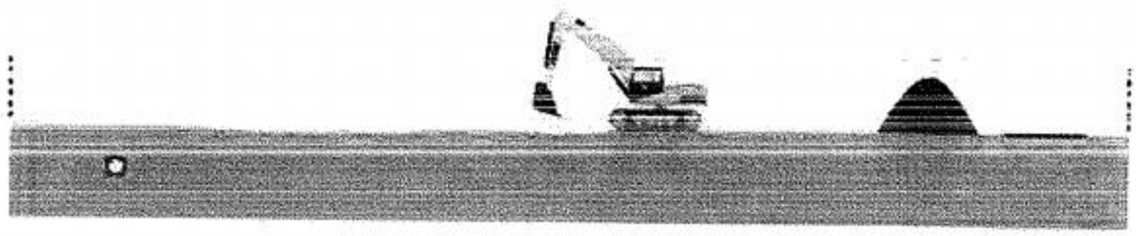
Staging areas along the pipeline strip alignment are temporary and will only be maintained during the performance period. Staging areas serve for parking heavy engineering equipment, storing pipes and for field offices of the project administration and contractors. For a pipeline corridor alignment exceeding 10 km in length, 2-3 staging areas will be required (including staging areas at the coastal entrance array and onshore facility). Staging areas along the pipeline as well as access routes leading to them will be located and planned during the planning stage, and will require the submission of an application for a temporary building permit to the local board, and undertaking the rehabilitation of the strip once the work is complete. Areas used for construction works aimed at laying pipes and required work equipment will be found and located as far as possible in disturbed areas that are not sensitive from a landscape and environmental point of view. The location and pipeline laying for operation and rehabilitation will be coordinated with local authorities and relevant environmental bodies.

Staging areas for the pipeline intended for the Hagit site will be included within the staging areas of the coastal entry array and onshore treatment site.

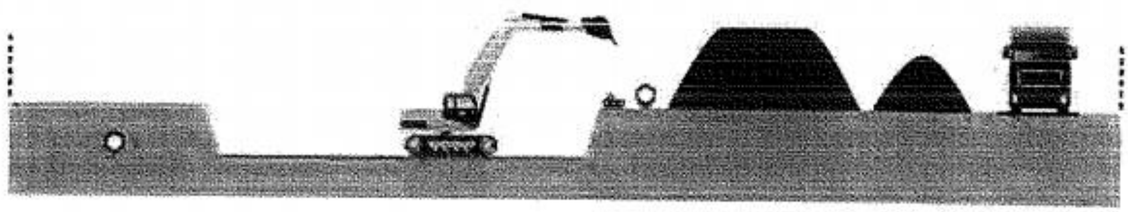
Figures 3.2.2-1 and 3.2.2-1a, presented below, present the stages of the construction works and pipeline laying in the pipeline corridor adjacent to the INGL strip approved within the context of the NOP 37/C, with a width of 40 meters.

Figure 3.2.2-1: Construction Work Stages and Pipeline Laying in the Pipeline Corridor

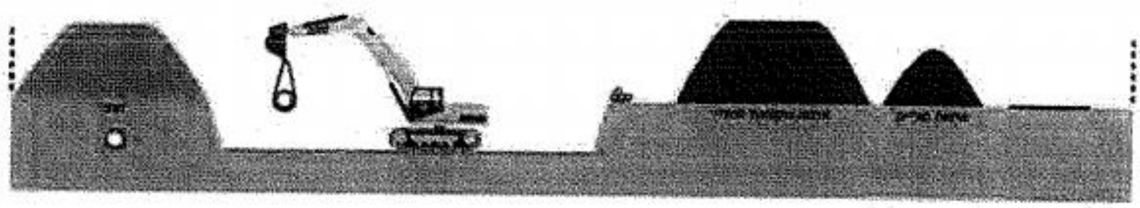
1) Preparation of work strip, removal of fertile soil



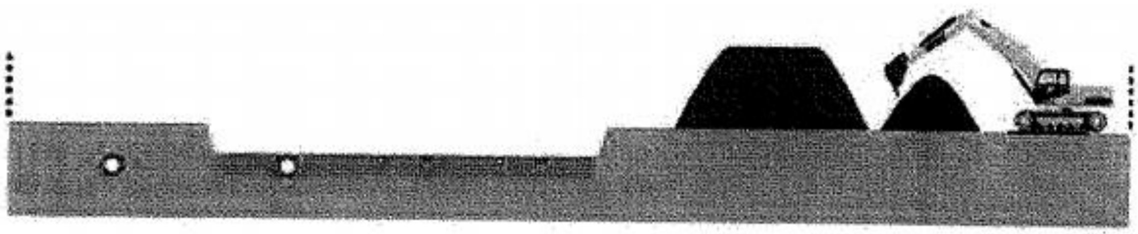
2) Excavation of the strip and dispersion of pipes along it



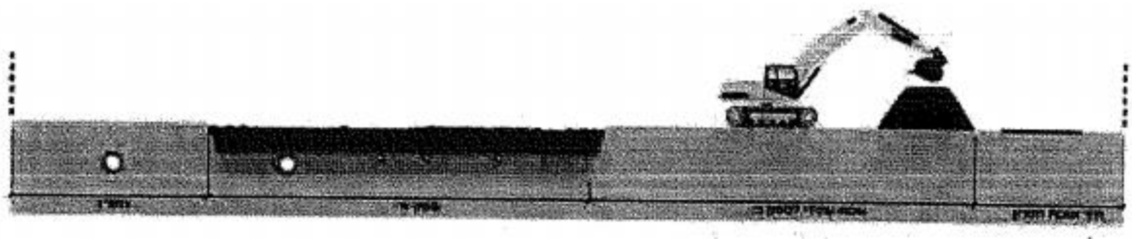
3) Burial and welding of the pipes



4) Filling the excavation strip



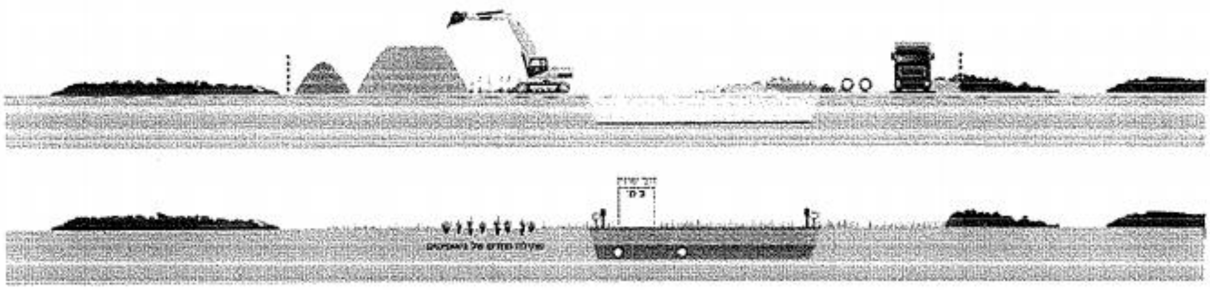
5) Restoration of fertile soil



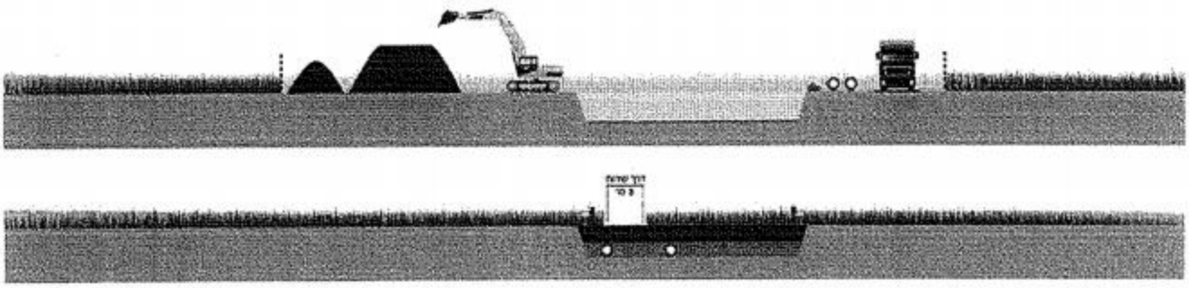
6) Landscape restoration and restoration of agricultural activity

Figure 3.2.2-1a: Types of Rehabilitation of the Pipeline Strip in accordance with the Pipeline Corridor

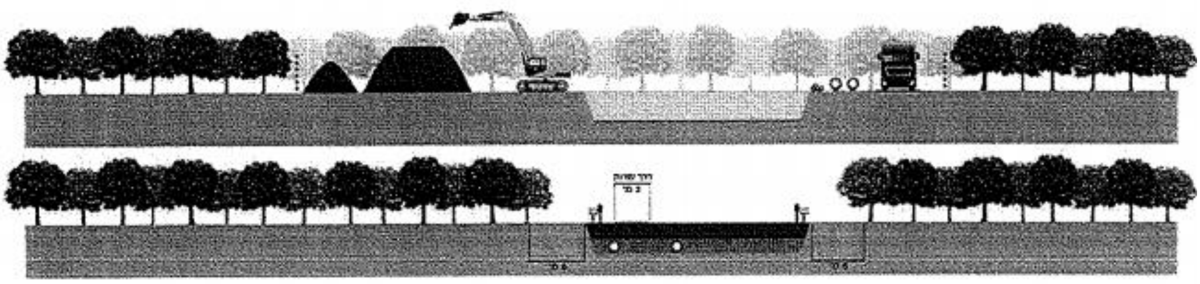
Rehabilitation of the pipeline strip within the natural alignment



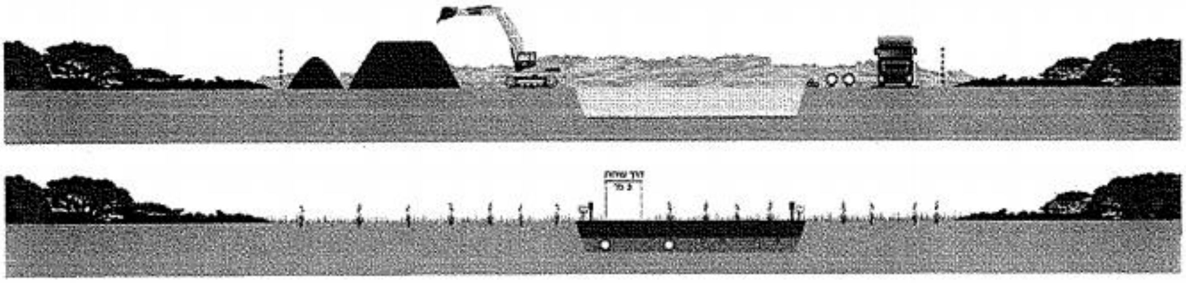
Rehabilitation of the pipeline strip in an agricultural alignment – field crops



Rehabilitation of the pipeline strip in an agricultural alignment – orchards



Rehabilitation of the pipeline strip in a natural alignment – natural woods and forests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Description of construction works within the staging areas of the pipeline strip and the staging areas of the block valve stations and the HDD drilling in the coastal strip:

Description of construction works for staging areas for block valve stations (terminal and interim)

Stages of the construction works for the staging areas for block valve stations are essentially similar to the construction stages for staging areas for laying pipes, as described above. The following is a description of the main stages involved in the construction of block valve stations:

- Marking the area
- Performing earthworks for the required elevations
- Constructing a peripheral concrete fence and internal structures as required (electrical rooms, lavatories, etc.)
- Casting concrete bases for taps and piping
- Installing underground piping, valves and upper piping
- Covering the piping, installing electrical infrastructures and underground low voltage systems
- Installing a peripheral wire fence on top of the concrete fence and installing gates
- Installing security, electrical, control and cathode protection systems
- Final area development

Construction works will be performed during daylight hours only.

Figure No. 3.2.2-2, presents the staging areas for the HDD drilling. **Figure No. 3.2.2-3** presents a representative section of the HDD drilling relative to the Dor shoreline. **Figure No. 3.2.2-4** presents a view of a representative section of the HDD drilling at Dor.

Description of construction works at the staging areas for the HDD drillings

Additional staging areas are required at the HDD execution point for the purpose of connecting the offshore line to the onshore line. The staging area for the HDD drilling requires a minimum area of 2 dunams at the drill starting point (rig side). The drilling point is located about 100 meters from the shoreline (in the east direction). It should be noted that for the purpose of performing the HDD drilling, an area equal at least to the HDD length is required. The area required for staging for the purpose of the HDD drilling is established according to a balance between safety needs, the required duration and environmental and coastal values. The greater the disturbed area, the greater the costs for earthworks, rehabilitation etc..

The staging area includes areas for: the drill, a pipe heaping area, an equipment area for mud drillings, an area for heaping materials and mud derived during the drilling, an area for loading and unloading trucks, a parking area, work tools etc..

The main activities to be performed in this area are: preparation of the site and its preparation for HDD drilling, construction and installation of facilities, drilling, laying of pipes, pressure tests, evacuation of installations and rehabilitation of the site. A detailed description of the preparatory works required for drilling and the central activities to take place at the site, materials stored at the staging area, required tests, etc. are all included in **Appendix C** – Operation and Engineering Aspects in the Marine Environment of Bipol Energy, Section 3.

Figure No. 3.2.2-2, presents the staging areas for the HDD drilling. **Figure No. 3.2.2-3** presents a representative section of the HDD drilling relative to the Michmoret shore. **Figure No. 3.2.2-4** presents a view of a representative section of the HDD drilling at Michmoret.

Figure No. 3.2.2-2: Staging Areas and Coastal Block Valve Station – Michmoret Coastal Entry Array

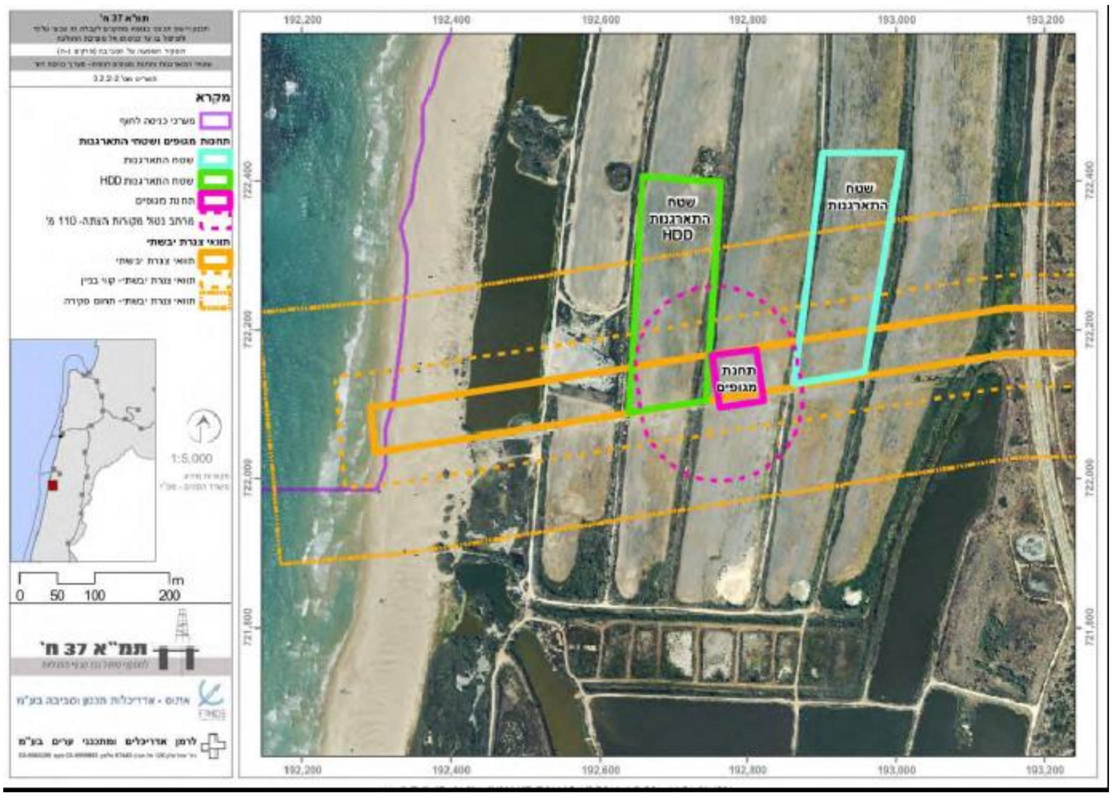
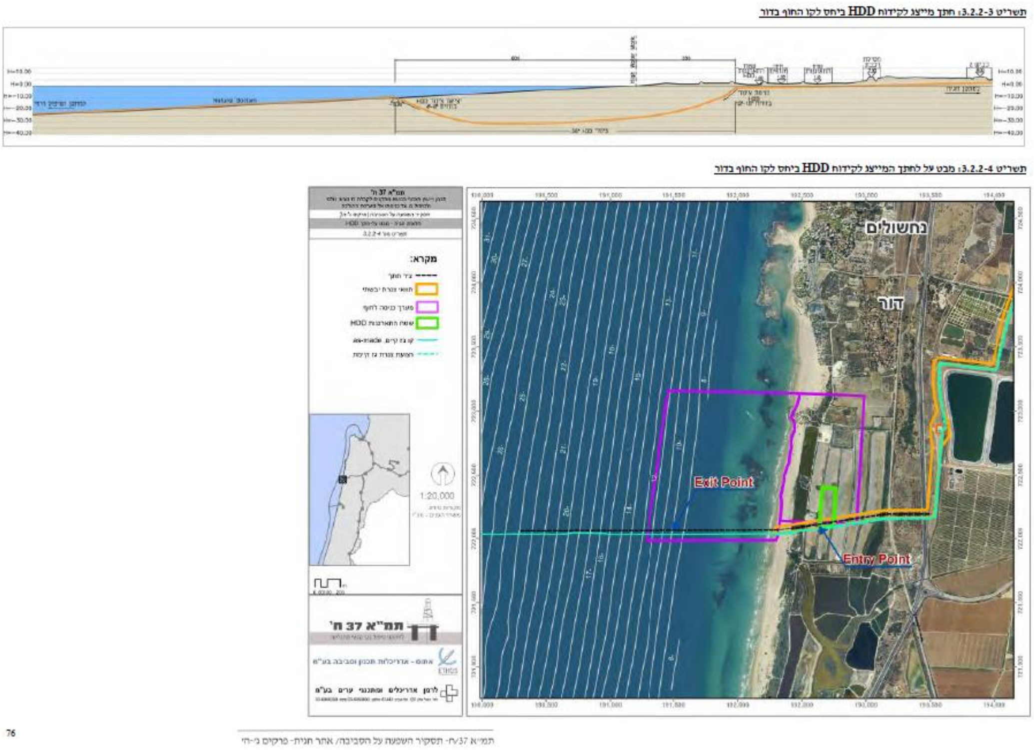


Figure No. 3.2.2-3: Representative Section of the HDD Drilling Relative to the Michmoret Shore

Figure No. 3.2.2-4: Overview of a Representative Section of the HDD Relative to the Michmoret Shore

3.3. Operating Regime



3.3.1. Description of operating principles

A detailed description of the operating principles of the gas facilities is included in the Engineering Document, in **Appendix B**, with an emphasis on Sections 7, 10.4, 10.5 and 11. The Engineering Document includes details according to the various components as well as in accordance with the various materials and products. Moreover, a description of the operating principles of the offshore components will be included in the context of the Environmental Impact Survey for offshore facilities.

Table 3.3.1-1 below provides details of the main design principles of the onshore treatment facility based on the Engineering Document.

<u>Table 3.3.1-1: Main Design Principles of the Onshore Treatment Facility</u>

Item	Value
Manning	Typically 30 operators and crew plus administration staff.
Helipad / dock facilities	Assumed not required – local helipad or airport and berthing/docks available.
Incoming Pipelines	2 x buried pipelines approaching from the beach with design maximum pressure of 110 barg
Outgoing Pipelines	1 x gas pipeline to the INGL grid 1 x condensate pipeline 1 (or 2) x produced water pipeline to the PRP(s) 2 x MEG make-up pipelines to the PRPs
Gas Processing	2 x gas processing plants each capable of processing 24.0 MSm^3/d (850 MMscfd) of gas in 2 x 50% capacity gas processing trains
Condensate Handling	Single train facilities for processing and delivery capable of handling the condensate from both gas processing plants.
Produced Water Handling	Single train facilities for processing and discharge of handling the produced water from both gas processing plants.
MEG Regeneration	Common plant area with trains dedicated to each gas processing plant.
MEG Reclamation	Space for MEG reclamation equipment to be reserved.
Electricity Supply	Onsite power generation with supply from power station to be considered
Communications	Line of sight communications tower
Mains water and sewage	Assumed to be available
Air Temperature	35°C for air cooler design 30°C for gas turbine selection
Flare Radiation	➢ 1.58 kW/m^2 for boundary fence line: **limiting value** ➢ 4.7 kW/m^2 for personnel exposure ➢ 15.8 kW/m^2 for equipment exposure NB: 1.04 kW/m^2 has been included for solar radiation.

3.3.2. Description of the operating regime

Section 3.1.4 above provides details of the proposed facilities to be developed by each developer separately, as well as installations and components within the site that are proposed for joint development and management. Beyond this, the design and development of the site must include division into areas that will allow continued treatment of the gas, even at the second supplier entry stage.

The first supplier to enter the site is required to prove as a precondition to the awarding of a building permit, the feasibility of the entry of an additional supplier in such a way that the entire facility will make it possible to supply gas at a maximum hourly throughput of 2 million m^3 per hour. In the event that the requirement for approving the feasibility of the entry of an additional supplier requires the development of joint installations, that supplier is obliged to present possible solutions that will allow parallel activity by two suppliers within the same facility, in accordance with the above guidelines. Construction of joint installations, as well as the passage of routes, piping, electrical supply and the movement of employees, will be possible throughout the facility area in a way that will ensure the safe operation of both suppliers within separation distances, the required safety and security measures, in mutual coordination as required by law. The first supplier will be required to show that it is possible to transfer piping as well as move vehicles and employees, both during routine and emergency situations, through the installations dedicated to his needs.

The rest of the areas not marked by the supplier will be deducted from the plan areas.

The outline plan for treatment facilities at the Hagit and Meretz Wastewater Treatment Facility sites assumes that the supply of crude natural gas at each facility will be received from two different gas fields under different ownership. The crude gas will undergo a process of treatment and measurement before entering the transmission system held by the owner of a transmission license. Each onshore facility will have a capacity of up to 2 million m^3 per hour (under the present scenario it has been assumed that the treatment facility will comprise two suppliers, wherein each supplier will be responsible for 50% of the treatment of the gas within the facility, so that the rate of the gas flow of each supplier will be 1 million m^3 per hour). In total, in both facilities, the Meretz Wastewater Treatment Facility and Hagit, 4 gas streams will be treated and the total treatment capacity of the facilities will be 4 million m^3 per hour.

It is important to recognize that at this stage, there is a great deal of uncertainty regarding the gas suppliers, the offshore reservoirs and the circumstances under which the facility is to operate.

In order to promote and determine the discussion of the operating principles, a number of basic assumptions have been made:

- Each facility may be operated by a different organization, but the fact that the facility receives gas from two different sources (and two different owners) does not require each of the owners to have a direct influence on the current activities within the facility. In the event that there are a number of companies interested in the project, it is proposed that they reach an arrangement that will determine that in actual practice, only one company shall be responsible for operation of the site.
- The company responsible for planning, building and operation will be a competent organization with knowledge and experience in the design, construction and operation of similar facilities. These parties may be the developers or parties performing the work on behalf of the developer, but it has been assumed that the developers shall bear legal responsibility for all works performed throughout the project's life.
- All persons involved in the design and operation of the facility will be personally authorized to perform such tasks.
- The body responsible for management and supervision of the facility's operating process will be experienced.
- A workforce not having experience in operation of these types of facilities will be provided appropriate training and will operate under supervision.

- The designer will provide a comprehensive library of operating procedures and dedicated manuals.

The facility will operate throughout the day and night all year long, and will be constantly staffed. In particular, the control room is to be permanently staffed. The facility team will work in shifts that allow staffing the facility throughout the 24-hour period. It is reasonable to assume that the facility will have more staff present during daytime hours or during the weekends, and for this reason the performance of regular maintenance and other non-critical work will be performed during the day.

Moreover, it has been assumed that the manufacturers of the instrumentation will have an agency in Israel and that other experts will have immediate access to Israel.

The facility will have an emergency firefighting system (it seems that this will comprise three stages) along with procedures for emergency firefighting. The facility personnel must be well-versed in such processes. Planning for emergencies must include coordination with emergency services and with the operators of adjacent facilities. Facility operators must coordinate with the local authorities regarding the facility's operation, and will give warning for any activity that is liable to create a disruption, such as the release of gas in the event of malfunction or the movement of massive parts.

In accordance with the above, reference to control methods of the treatment facility's components will be included in the building permits.

Procedures for **emergency situations** and the measures to mitigate risks will be addressed in Sections 4.7 and 4.11 below.

Detailed guidelines will be prepared for the facility describing conduct in cases of environmental pollution and will be detailed in a plan for environmental management and monitoring to be prepared for the facility operations stage.

Safety limitations –Safety limitations in the facility are addressed in the Engineering Document provided in **Appendix B**. Moreover, the facility safety limitations aspect will be expanded and detailed in the building permits.

In addition, the plan maintains a range of 600 meters between the facility and public receptors, and for this reason there is no risk of harm to the population. Within the treatment site, safety limitations for employees and for the nearby vicinity will be established in accordance with the findings of a detailed risks survey to be performed during the building permit stage. At the same time, the plan does define a safety space by defining a sterile area around the flare with reference to the expected heat radiation intensity at the flare under cases of emergency and/or malfunction; see reference to this issue in Section 3.1.4 above.

3.3.3. Monitoring measures

Onshore facilities will be controlled by an automated system based on supervisory control and data acquisition (SCADA). The safety system will include an emergency disconnection system (ESD), and a gas leaks and fire control and monitoring system (F&G). The ESD and F&G systems in the facility will be connected to the control rooms.

A large number of automated valves will be available, which may be closed from the control room. In addition, a large number of sensors are available in the facility for measuring such parameters as pressure and temperature. This information is transferred to the main control room.

In the main control room, a process operations computer is programmed for a high-high (HH) and/or low-low (LL) alarm, and emergency disconnection functions in the event of pressure, temperature, level and throughput deviations. The system receives signals from all system parts.

The source of the signals for the gas and fire sensors will activate alarms, regional insulating systems and/or pressure blowdown, in accordance with the event taking place.

3.3.4. Malfunctions

Malfunctions in the pipeline and facilities and measures for protecting the environment from such events will be considered in the context of Chapter D below.

3.4. Infrastructures

3.4.1. Description of related infrastructures

This section will include a survey of the main related infrastructures for the project – supply lines and lines for the removal of facility products. Additional details regarding related infrastructures in the onshore treatment facility are included in the Engineering Document in Appendix B. In addition, it will be necessary to move existing infrastructures within the facility area to a new location nearby, in order to enable regular maintenance of these lines in future.

<u>Gas lines</u> – In addition to the details provided in Section 3.2, a crude gas line (untreated) will be included within the onshore pipeline corridor in a 36" pipe leading to the facility. After treatment, the treated gas will be conveyed in 36" INGL pipelines within the west onshore pipeline corridor, in order to connect the gas pipe with the pipeline to the offshore national transmission system and within the east offshore pipeline corridor to connect with the onshore national transmission system.

<u>Voltage lines for energy input – electricity lines</u> – The facility will be planned to allow self-supply of energy for the purpose of facility operations via gas turbines

(required for operation of equipment such as pumps, air conditioners, mixers within the facility, as well as the structures themselves). The total installed capacity required is 20 MW (10 for operation and an additional 10 for backup) and for future consumption for the purpose of operating compressors. The installed capacity required will be as high as 40 MW. In parallel, there is a possibility for a supply of electricity from the adjacent grid at the Hagit power station. At this stage, priority is given to the self-production of electricity over the supply of electricity from the grid, since at present the electrical grid is mostly based on coal. Nevertheless, in future, once the conversion to electricity production on a gas basis is completed, it is possible that preference will be given to an electricity supply from the grid because of environmental concerns. In such a case, the developer will have to arrange this connection vis-à-vis the IEC. In any case, energy production at the facility will not exceed 50 MW. In the event that additional energy will be required to operate the installations, it will be derived from the electrical grid. In addition, take into account the possibility that in future it will be necessary to erect a substation at the facility if it is decided that electricity should be supplied to the compressors from the grid rather than powering them on gas. In that event, the option of connecting the facility continuously to the Hagit site power station or connecting it to an existing substation to the northeast of the Hagit station for the purpose of receiving a regular supply of electricity from the grid will be considered.

More details regarding the supply of energy to the facility are included in the Engineering Document in **Appendix B**.

<u>Fuel – condensate lines</u> – Fuel reaches the treatment facility through the onshore pipeline corridor and through the pipeline strip intended for the removal of fuels along the Gezer-Hagit line, and from the facility it passes along a dedicated infrastructure in accordance with the selected treatment solution. Two main solutions are available (see details in Section 3.1.6 above):

1. Treating fuels in the offshore site by means of a dedicated treatment facility (FSO).
2. Treating fuels onshore at the refineries.

The onshore solution for treating fuels and the accompanying infrastructures that will be required for removal of fuels have been surveyed in Section 3.1.6 above. In the context of the Environmental Impact Survey for offshore facilities, the solution for treating fuel by means of a dedicated FSO facility will be considered.

<u>Sewage lines</u> – Sanitary wastewater from the treatment facility will be connected to the sewage system lines located within the area of the Hagit power station. Water should be prevented from entering the sewage system with fuels.

<u>Produced water</u> – Due to the fact that produced water is polluted (see details in Section 3.1.5 above), water purification treatment is required at a pre-agreed

quality level before the water is discharged, in a way that will minimize the environmental impact. There are a number of accepted solutions for removing produced water from the onshore gas treatment facility. From among the existing solutions, and in order to avoid any pollution in the vicinity of the facility the conceptual design assumes that all produced water that will be treated and cleaned in the onshore facility will be discharged into the sea through an outlet located at the foot of the pressure reduction facility. For this purpose, a dedicated pipeline alignment is required for the discharge of produced water from the onshore facility to the offshore pressure reduction facility. Since the solution for evacuation of produced water is to be carried out within the offshore area, the subject will be surveyed within the context of the Environmental Impact Survey for offshore treatment facilities. In the event that the produced water will have to be purified at a higher level than is presently customary, we should consider the option of constructing a produced water treatment facility onshore, close to the gas treatment facility, and avoid their discharge into the sea.

<u>MEG lines</u> – Within a gas transmission system characterized by high pressures and long pipes, the water equilibrium temperature is usually reduced and therefore the use of thermodynamic inhibitors such as MEG or methanol is needed. In this facility, it is assumed that MEG will be used since it is commonly used in similar facilities in the Mediterranean area. Methanol is used for operation and for dosing hydrogen inhibitors within the treatment facility, since it is more efficient than MEG under such conditions. The onshore pipeline corridor includes a dedicated pipe for the flow of MEG from the pressure reduction facility to the onshore treatment facility, and restoring the recycled MEG back into the sea.

<u>Access routes</u> – The access route to the treatment facility is based on the existing access route leading to the Hagit power station and continues in a northeasterly direction. The plan for the treatment facility at the Hagit site will include regulation of the entire road as a statutory road. Figure No. 3.4.1-1 presents the position of the access road and a typical section.

<u>Treatment of flows discharged from the facility</u> – All liquid systems within the facility are closed systems, conforming to construction and production standards, and the operation and maintenance of such systems will be carried out in accordance with the provisions of law, preventing any leak of polluting liquids from system components to the environment. Nevertheless, in order to address failure scenarios or defective maintenance scenarios liable to lead to the leakage of polluting liquids from facility systems to the surface, guidelines are proposed for the planning of the drainage system required in order to handle liquids suspected of pollution; see Section 4.11.3 below.

Figure 3.4.1-1: Access Road to the Facility – Typical Position and Section

3.4.2. Wastewater

Details regarding the quantities and types of wastewater that are expected to form in each part of the project, the pre-treatment method applied to them and the byproducts from the gas treatment system, as well as the way in which the facility is to be connected to an approved end solution, are included in the Engineering Document in Appendix B. This excludes wastewater to be treated offshore that will be addressed in the context of the Environmental Impact Survey for offshore facilities.

The main types of wastewater received at the treatment site are:

- Sanitary wastewater – wastewater originating from human activity at the site. This will be transferred to the regional sewage system adjacent to the site. See reference to this issue in Section 3.4.1 above.
- Industrial wastewater – produced water received in the context of the natural gas treatment process. This water will be treated as needed at the onshore treatment facility before discharge into the sea.
- Winter runoff from operational areas will be treated in the effluent treatment system and discharged into the regional drainage system (see details in Section 4.10.3).
- Effluent arising from maintenance operations and various other effluents, such as firefighting water, that will be directed into the system of emergency containers and will be evacuated to an approved site (see details in Section 4.10.3 as an example).
- During initial operation of the system (startup), it will be necessary to remove a one-time volume of pressure test water (about 2,900 m^3 per kilometer of gas pipe). The water source may be seawater or system water, and it is possible that this water will contain various polluting components arising from installation of the pipes (metals, oils etc.). In the context of the design it will be necessary to provide details of the expected composition of the water and receive a permit to discharge the water into the sea in accordance with the Law for the Prevention of Sea Pollution from Onshore Sources and its regulations.

3.4.3. Produced water

The source of produced water is three components involved in the gas production process: 1. Formation water extracted from the reservoir rocks along with the natural gas; 2. Condensed water that condensates on the surface from the water saturated gas phase; and 3. Eruption water with increased pressure as a consequence of the decrease in the pressure of the reservoir during production. The salinity of produced water is unknown at this stage and is estimated as equal to the salinity of seawater.[11] Moreover, produced water may contain condensate hydrocarbons at concentrations of up to 100 ppm and glycol at concentrations of up to 10-50 ppm.

According to the contents of Section 3.4.1 above, treatment of produced water will take place in the onshore treatment facility, at a level required to allow its discharge back into the sea at a distance of 7.5 km from the shore, in the pressure reduction offshore facility. The main treatment of produced water required is control of the concentrations of fuel in the water. The plan assumes that it is possible to perform this treatment within the area of the onshore facility via dedicated installations. In the pressure reduction facility, treated produced water will be dispersed using dedicated tools. The issue of treatment, removal and dispersion of produced water will be described at length in the context of the Environmental Impact Survey for offshore facilities, including reference to the process and treatment method, quantities and composition of the wastewater, required equipment and the like. More on the subject of produced water is presented in Section 3.4.6 below.

Over the life of the project, it is possible that salt may accumulate in the produced water. This type of situation occurs only when the produced water becomes mixed with brackish formation water. In such a case, it will be necessary to provide the MEG with an additional treatment, at the end of which salt surpluses will be produced. Salt resulting from this process will be collected in a container and removed via a truck to a separate dedicated site where salt surpluses will be stored in dedicated containers. The amount of salt depends on the MEG treatment amount, which cannot be estimated at this stage. Nevertheless, it should be emphasized that this is not a large quantity of salt, since if a well produces a large quantity of salt, pumping from it will probably be terminated.

3.4.4. Preventing the penetration of runoff into the facility

The drainage appendix is presented in Figure 3.4.4 below. The planned site is isolated from the existing external drainage system in order to prevent flooding the site with external upper runoff, using the following measures:

- The planned level of the site will be established above the maximum water elevation at a probability range of 1%
- Protective channels are planned around the site
- Establishing the site's elevation above the maximum flooding elevation

Runoff from the protective channels will be channeled into Nahal Tut in order to avoid the entrance of external runoff into the site, and is not expected to

[11] As a stringent scenario for the purpose of examining the impact on the onshore environment.

significantly change the quantities that arrive at the stream under rainy conditions.

Figure 3.4.4: Drainage Appendix

3.4.5. Flooding

This section describes the measures for preventing flooding at the facility and the environment following flooding events.

The planned drainage system includes:

- Drainage channel along the road
- Protective channel around the site
- Establishing the site's elevation above the maximum flooding elevation
- Water conduits
- Drainage system within the site

For the location of these measures, see Figure 3.4.4 above.

Preventing damage to the facility

See details in Section 3.4.4 above.

Preventing damage to the environment

An independent drainage system is planned for the site, which includes:

- Sealing the site area by means of asphalt or bituminous membranes under the infrastructures in order to prevent the penetration of runoff water into the soil within the site area.
- The drainage system is a sealed underground system for the transmission of runoff (receiving cells, manholes, drainage pipes etc.).
- The winter top runoff treatment system for channeling rainwater from site areas into the stream / local drainage system.
- Sumps for tanks and for service installations that are liable to create pollution, such as pumps, unloading points etc., and the redirection of the rainwater collected in these sumps to a treatment facility. See details in Section 4.10 below.

3.4.6. Monitoring systems

This section addresses monitoring systems for leaks of produced water, condensed hydrocarbons and glycol within pipes and containers. For details regarding gas leaks, see Sections 3.3.3 and 4.1.8 of this document.

- Produced water – in order to protect the environment from a possible leak of produced water that is expected to be discharged through the treatment facility pipe into the sea in throughputs and with a composition as described in Table 3.4.6, a plan will be prepared for the detection of leaks using continuous measurement of engineering parameters within the pipe (throughputs, pressures, etc.). The plan will include methods for periodic testing of pipe integrity, measures for discovering leaks and the means to be taken when a leak is discovered. No containers for produced water are planned in the treatment facility.

- Condensed hydrocarbons – containers and piping at the treatment facility, defined as a tank farm, will be monitored and protected against leaks in accordance with the proposals of the Water Regulations (the Prevention of Water Pollution) (Fuel Tank Farm), 2004. The pipeline extending from the treatment facility to the sea and/or to the Gezer-Hagit line will be protected and monitored in accordance with the Water Regulations (the Prevention of Water Pollution) (Fuel Lines). 2006.

  Additional recommendations for the monitoring system will be received in the context of a survey for the evaluation of the pollution potential for water sources from fuels that will be appended by the submitter of the permit application, in accordance with the proposed Water Regulations (Prevention of Water Pollution) (Fuel Tank Farms), 2004, third addendum.

- Mono-Ethyl Glycol – since glycol is defined by the Hazardous Substances Law as toxic, a toxic permit will be required. In order to define the facilities for construction of the pipes and containers and the protection and monitoring instructions, it is recommended to make use of the American Department of Transportation (DOT) standard for pipes that convey hazardous substances.

Table 3.4.6: Composition and Flow Data[12]

	Throughput (m^3/day)	Estimated composition	Line length (km)	Diameter (inch)	No. of lines	Pipe flow regime	Total volume (m^3)
Condensate-condensed hydrocarbons	2802-2159	Mainly decanes, heptanes, hexanes & octanes	16	8	1	Full	519
MEG- Mono-Ethyl Glycol	437	72% glycol, 28% water	16	4	2	Full	259
Produced water	1138-1146	100ppm, condensate, 0.6 ppm aromatic hydrocarbons, 50 ppm glycol and 1474 ppm BTEX	16	8	1	Full	519

[12] The composition of condensed hydrocarbons and glycol was taken from Tables 1222-C-PR-HMB-2001/2, and the composition of produced water was taken from Table 15-8, which are included in Appendix B.

3.4.7. Emissions or gas system

As part of the natural gas treatment process it will be necessary, in certain cases, to remove the surplus gas from the overpressure protection system, and to this end it will be necessary to establish a gas removal system within the plan area. These gas surpluses, in the context of NOP 37/H, will be removed via a flare (see at greater length in Section 14 of Appendix B).

The flare system comprises the following installations:

- HP flare
- LP flare
- Atmospheric flare
- Flare gas recovery unit (FGRU)

Details and explanations regarding each of the facilities may be seen in Sections 14.5-14.9 of Appendix B.

Under routine operating conditions, exhaust gases from the flare will be returned to the system via flare gas recycling technology (flare gas recovery unit – FGRU) as detailed in Sections 14.9 and 15.6.6 of Appendix B. Therefore, under routine operating conditions, we may expect almost no discharges at all from the HP flare and the LP flare (discharges that are liable to be discharged under routine conditions are considered negligible). However, in cases of malfunction, surplus discharge gases may be discharged through the HP flare and/or LP flare, depending on the type of malfunction.

The types of malfunction that are liable to lead to the discharge of gases from the HP flare are:

- Operational malfunction
- Blowdown one gas process stream
- Blowdown LTS train
- Blowdown pipeline
- PVS lift
- During future operations (the year 2025+) another malfunction may occur that will require emptying the gas that is within the compressor (blowdown compressor)

The type of malfunction expected to occur at the LP flare is:

- Release of gas from the pressure vent (PSV lift)

A sterile area with a radius of 111 meters will be marked around the flare and in the relevant drawings, an area of 200 meters radius will be marked around the flare where, in the event of gas release (gas release is elective), the PA system will warn passersby from entering the area marked by signage. Agricultural cultivation and passage of people will be allowed within this area.

For details of the discharges from the flare and additional sources of discharge within the plan area, as well as data regarding discharges, and installations (height etc.), see Section 4.1.1 of this survey.

3.4.8. Signage and fencing

There are differences in the performance of fencing operations, signage, etc. during the temporary construction stage and the project operating stage and their different parts.

Construction period

Staging areas – planned at the coastal entry area (including the HDD drilling) and the treatment facility area.

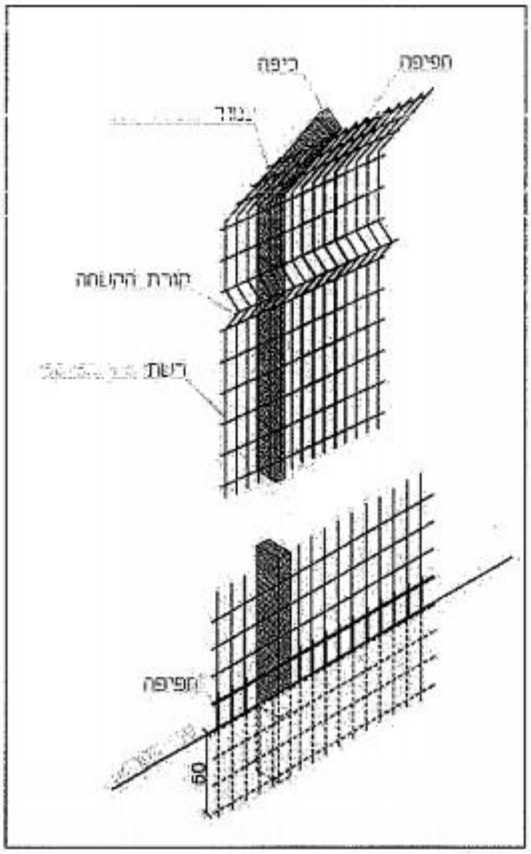
- ► Signage and fencing – the purpose of signing and fencing of work areas is to direct persons performing the work to areas required for performance of the work only, while preventing unnecessary damage and sometimes unintentional damage to surrounding areas. During the construction stage, access routes from staging areas to work areas will be marked.

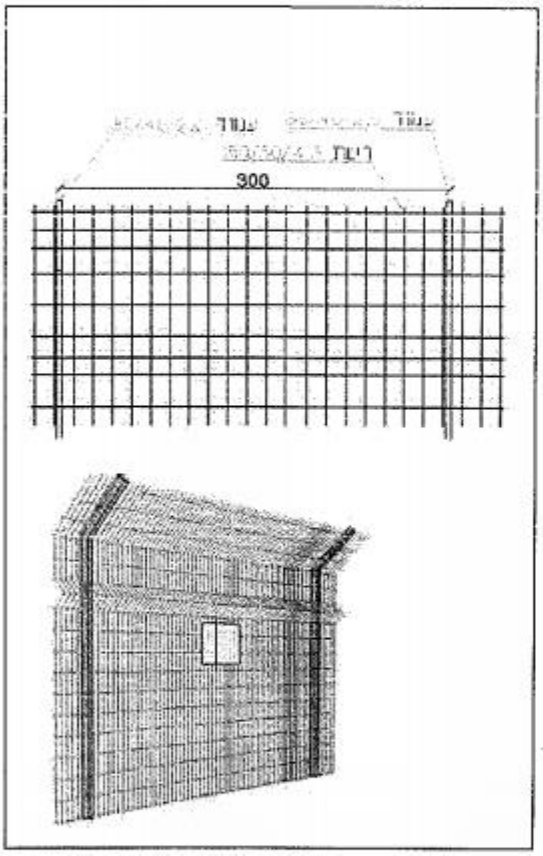
As a matter of principle the site fence, means of protection and lighting will conform to the following instructions:

- ► The site will be fenced off with a peripheral fence in accordance with the guidelines of the Ministry of Energy and Water Resources and the Nature and Parks Authority.
- ► Local lighting will be implemented in accordance and in coordination with the Ministry of Energy and Water Resources and the Nature and Parks Authority with preference for limiting lighting to the gate area leading to the site only, signage that includes details of the company and details of the site's operating manager.
- ► Peripheral lighting, if required, will be directed locally towards the ground in order to prevent light pollution and creating glare for animals, and will be planned in accordance with the guidelines of the Nature and Parks Authority during the building and permit stage. It is recommended to build the peripheral fence without any fixed lighting in areas defined as sensitive by the Nature and Parks Authority.

The following are conceptual specifications for a peripheral fence for the contractor's camp:

Figure 3.4.8-1: Conceptual Specifications for Fencing the Contractor's Camp





<u>During regular operations</u>

<u>Along the gas transmission pipeline</u>

Along the gas pipeline alignment signs will be posted that will conform to the following requirements or to the relevant regulations at the time of performance:

- Signs will be posted within visual distance of each other, and in no case will the distance between two adjacent signs exceed 500 meters.
- When crossing streams, roads and railway tracks, prominent signs will be posted on both sides of the crossing.
- Signs will be clear, legible and resistant to weather conditions. They will be written in Hebrew and Arabic and will include the following details:
  - "Underground pipeline – excavation is prohibited"
  - Details of the license owner
  - Telephone number for clarifications and reports
- At the gas facility and block valve station gates, additional signs will be posted in addition to the above that also provides details of the site.

- ► In addition, marking tapes should be spread along the line printed in Hebrew, English and Arabic with the words "Caution hazardous substances pipeline."

Gas treatment facility and block valve station

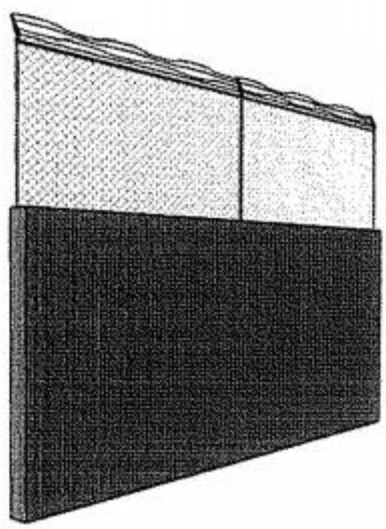
- ► Fencing and signage – the facility's fencing and signage will conform to the security guidelines of natural gas facilities, in accordance with the Level A standard of the Israeli Police and in coordination with the Nature and Parks Authority.

  During the building permit stage, in coordination with the Ministry of Environmental Protection, detailed instructions will be given with the aim of minimizing the scope of damage to the landscape and the environment caused by the fence.

- ► Lighting –
  - Local lighting will be coordinated in accordance with the guidelines of the Ministry of Energy and Water Resources and the Nature and Parks Authority, with preference given to limiting lighting only to the site's gate area.
  - Peripheral lighting, if required, will be directed locally towards the ground in order to prevent light pollution and creating glare for animals, and will be planned in accordance with the guidelines of the Nature and Parks Authority during the building and permit stage. It is recommended to build the peripheral fence without any fixed lighting in areas defined as sensitive by the Nature and Parks Authority.

Below is a conceptual illustration of a peripheral fence for the treatment facility and block valve station:

Figure 3.4.8-2: Illustration of a Fence for the Treatment Facility and Block Valve Station



3.4.9. Protection of groundwater

This section presents the measures required for the following subjects:

1. Protection of groundwater from surface pollution in accordance with the relevant water regulations.
2. Preservation of natural groundwater balance with an emphasis on stream throughput.
3. Maintenance of protective areas for drilling potable water in accordance with public health regulations.
4. Prevention of damage to existing drilling infrastructures.

It should be noted that in order to validate the recommendations, it is important to conduct tests for the protected areas and for the drilling infrastructures just prior to the plan's performance stage (during the building permit stage).

Protecting groundwater

In the course of the regular operation of the facility and the pipeline, no unmonitored leaks are expected. Small leaks within the facility originating in maintenance operations via lubricating oils, hydraulic liquids and detergents will be collected in sumps and removed in a controlled fashion outside the site. The measures required to protect groundwater against possible contamination by fuel from the facility components and the pipeline are detailed in the proposed Water Regulations (Prevention of Water Pollution) (Fuel Tank Farm) 2004 and in the Water Regulations (Prevention of Water Contamination) (Fuel Lines) 2006. The regulations provide details, *inter alia*, of the following measures for protecting groundwater:

- Use of production and installation standards for pipes and containers
- Addition of a safety coefficient in accordance with hydrological sensitivity (see Figure 3.4.9-1)
- Performance of integrity tests
- Guidelines for the depth of burial of pipes when crossing natural and artificial elements
- Buffering valves
- Use of sumps for containers and various components
- Leak control system
- Instructions in the event of a leak

Additional instructions include, *inter alia*, definitions for the capacity of sumps in accordance with the type of petroleum, specifications for the sump wall, distances between containers and sumps, and the way in which the sump is drained, all of which are detailed in the Licensing Regulations (Storage of Petroleum), 1976, concrete floors for sumps and a runoff drainage system for the separation container (for example, the system presented in Section 4.10 below).

According to the Water Regulations proposal (Prevention of Water Pollution) (Fuel Tank Farm), 2004, the party submitting the plan is required to attach an up-to-date survey (last three years) for a quantitative evaluation of the pollution potential. This survey will be performed in the context of the building permit by the developer.

During the permit stages, a geological survey will be conducted along the pipeline alignment and will include, *inter alia*, dedicated drillings aimed at locating perched groundwater levels. In the event of a crossing between the piping alignment and perched water, it will be necessary to present solutions for preventing the drainage of the perched water and their depletion. Additional measures are described in Section 4.10 below.

Groundwater balance

As described in Chapters A–B of the survey (Section 1.7.2.4.1), about half of the pipeline alignment is located above a section of the Mount Scopus group which is impervious, and the second half above units of the Judea group where the groundwater level is dozens of meters underground. At the same time, pipeline segments at the entrance to the treatment facility (approximately 500 meters) and the treatment facility itself are located within aquiferal rocks belonging to the Eocene Adulam formation at the head of the underground drainage basin of the Nahal Tut springs. The groundwater level in this unit reaches the surface at certain locations (Bar, 2004).

Construction of a drainage channel around the facility and separation of the upper runoff from the facility and its discharge into the natural drainage system will ensure that the natural water balance between the upper runoff and the penetration into the aquifer will be maintained to a great extent, thereby ensuring the continued feeding of Ein Tut.

Because of the shallow depth of the groundwater level and the nature of its flow inside cracks during construction of the facility and excavation of the pipeline alignment, there is a chance that natural water conduits in the subsoil may be damaged and the water balance in the aquifer may also be damaged. In order to minimize the extent of such damage, drillings will be performed in order to identify local water elevations under the treatment facility and the pipeline alignment, but it is not possible to avoid with certainty damage to water conduits, in view of the discreet nature of the flow array (flow in cracks). Since the aquifer is not used for drawing potable water, it is proposed that monitoring the Ein Tut springs throughput and topping off of the water in an artificial way will prevent additional damage to the environment following damage to the aquifer's water balance.

Protective areas

Protective areas for the drilling of potable water as received from the Ministry of Health for the Haifa District are presented in Figure 3.4.9-2. It may be seen that the drilling of Mekorot for Carmel Shore 2, is close to the pipeline alignment and that that pipeline alignment along about three kilometers is within the protective radius C of the drilling. According to the information available to us, drilling is not active, but there is an intention to make use of it in future and we should therefore address its protective areas in accordance with the limitations included in the Public Health Regulations (Sanitary Conditions for the Drilling of Potable Water), 1995:

Limitations in protective areas (amendments: 2003, 2011)	(A) In protected areas as detailed below, the following is prohibited – 1) In protective area A – all construction except for buildings used to operate the drilling and improve its waters; 2) In protective area B – all construction, installation or activity liable to pollute the drilling, such as residential buildings, commercial buildings or public buildings; 3) In protective area C – all construction, installation or activity liable to cause severe pollution to the drilling, such as a sewage installation, main sewage line, waste disposal site, industrial zone or area where irrigation is carried out with treated wastewater. (B) The health authority is entitled, if requested, to permit deviation from the provisions of sub-regulation A above, as detailed below: 1) In protective area B, construction of types that are usually prohibited, in special cases detailed within the application and subject to the adoption of special measures proposed by the party submitting the application, to prevent pollution of the drilling, and approved by the health authority; 2) In protective area C – laying of sewage lines, under special circumstances and subject to the adoption of special measures to the authority's satisfaction that will ensure the prevention of leaks from said sewage lines;

Despite the risk for pollution from condensate piping or very low glycol, since contamination with fuel can be considered as severe pollution (as regards the above regulations), it is recommended to define special protections in the subsoil in the protected area (membranes, double pipe, etc.) in coordination with the Ministry of Health, the Water Authority and the Ministry of Environmental Protection. This, in the absence of the option of adjusting the plan alignment so that it does not overlap the protected areas. Alternatively, we may consider relocation of the drilling to another location.

Up-to-date data regarding this section will be obtained in the context of a survey to evaluate the pollution potential to water sources from fuels that the contractor will enclose with the plan, in accordance with the Water Regulations Proposal (Water Pollution Prevention) (Fuel Tanks Farm), 2004, third addendum.

Existing drillings

In order to prevent damage to existing drilling infrastructures, existing drillings have been mapped within the work area (Figure 3.4.9-2). Table 3.4.9-1 presents summary data for drillings that overlap the plan area, in accordance with the overlap area. It may be seen that there are three drillings that overlap the pipeline strip alignment, and one drilling that overlaps the survey inspection area. In the course of the detailed planning, we should coordinate the works with the drilling owners (Mekorot, the Water Authority or private ownership) and, where necessary, agree on relocation of the drilling to an alternative location. Should it be decided to relocate a drilling, the hole will be filled up in order to avoid direct contact between the works and pollution sources on the surface and the aquifer.

Table 3.4.9-1: The Relationship between Drillings and the Pipeline Alignment and the Facility

Name of Drilling	X	Y	Located Within the Area
P Dor B Hamidgeh	193520	723400	Onshore pipeline building lines and the survey inspection area
P Dor C	193540	722690	Onshore pipeline alignment strip
P Hof HaCarmel Waters S/1	193500	722330	Onshore pipeline alignment strip
P Hof HaCarmel Waters S/2	193510	722800	Onshore pipeline alignment strip
P Dor B Hamidgeh	193520	723400	Onshore pipeline building lines and the survey inspection area
P Dor C	193540	722690	Onshore pipeline alignment strip

Figure 3.4.9-1: Risk Areas for Water Sources as a Consequence of Fuel Pollution

Figure 3.4.9-2: Drillings and Protective Radii

3.5. Hazardous Materials

The following is a forecast of hazardous materials for use in a gas treatment plant. This forecast is based on the PDI report – Onshore Gas Plant Description & Quantification of Emissions & Discharges for the conceptual design enclosed in Appendix B.

Table 3.5: Hazardous Materials

Name of Material	Expected Quantity at the Site
Natural gas	Throughput of 2 million m^3 standard per hour that passes within the site
Condensate	20,000 m^3 of hydrocarbons
Mono Ethylene Glycol – MEG	20,000 m^3
Corrosion inhibitor	10 m^3
Diesel fuel	10 m^3 in storage + a daily container of 1 m^3
Methanol	30 m^3
Nitrogen	5 m^3

3.6. Energy

3.6.1. Energy facilities

Energy production facilities in the first operating stage include:

- Two gas turbines with a total throughput of 20MW – one in continuous operation and one for emergency.
- Diesel engine 1MW for emergencies – for backup of basic operations in the event of a malfunction.

Detailed description of energy sources in Section 7.5.8 and the table *Onshore Processing Layout Study – Hagit and Meretz Facilities – Major Equipment List – 2 x 24 MSm/d (847 MMscfd) Process Streams – C-PR-LST-2001* on Page 116 in Appendix B below.

In future, once it is necessary to increase the pressure in order to pump gas from the sea, 4 additional compressors will be added. At this stage, in order to operate the compressors, turbines will also be added to the facility, each of which will have a capacity of up to 10 MW. See Section 15.7.4 in Appendix B for more details.

3.6.2. Fuels

The main fuels present at the treatment site are diesel oil and condensate. Beyond this, it is not possible at this stage to estimate what additional types of fuels may be derived during the gas treatment process. At the same time, Section 13 of the Engineering Document (Appendix B) presents a list of typical materials that may be found in this type of facility.

Most materials obtained in the facility will be oils and lubricating materials in small quantities, and they will be stored in dedicated containers.

Additional details regarding the types of fuels and the quantities that will be used for the various processes in the facility are included in the Engineering Document in **Appendix B.**

Chapter D

Details and Evaluation of Environmental Impacts

4. Chapter D – Details and Evaluation of Environmental Impacts

4.0. General

4.1. Air Quality

4.1.1. Itemization of emissions

4.1.2. Impact of emissions

4.1.3. Means planned to reduce emissions

4.1.4. Calculations of pollutant dispersion

4.1.5. Run results

4.1.6. Malfunctions or system failure

4.1.7. Description of the state of air quality in the case of a malfunction

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4.2. Zoning, Uses and Activities

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4.5.1. Expected consequences following seismic events

4.5.2. Means for preventing and handling pollution

4.6. Noise

4.6.1. Expected noise level

4. Chapter D – Details and Evaluation of Environmental Impacts

4.0. General

This chapter deals with a conceptual description of the potential environmental impacts of carrying out the plan and the means for reducing negative impacts. The technical data specifications are based on the engineering document Onshore Gas Plant Description & Quantification of Emissions & Discharges, Project Development International prepared by the PDI company and enclosed as Appendix B.

As noted in Chapter C above, since at this stage there is no developer for the plan and there is an absence of information that may impact the planning (such as the composition of the gas in the reservoir and the planned technology) of the treatment facility, a survey of the best technological means (BAT - Best Available Technology) in order to minimize the impact on the environment, and an examination of the possible environmental impacts that are not included in this document, will all be conducted at the building licensing stage according to the principles described in the ENVID documents and the Document of Principles for the Preparation of the EMMP (Environmental Management and Monitoring Plan), which addresses the examination and selection of the BAT in the next stages, as prepared by the Royal Haskoning DHV company and are enclosed as Appendices 7 and 9 of the document.

4.1. Air Quality

Operation of a natural gas treatment facility demands energy for the operation of various types of support equipment, such as gas turbines, fired heater etc.. Consumption of this energy gives rise to polluting emissions in the air. Air polluting emissions include point source and fugitive emissions. Point source emissions do not include emissions from the flare stack under normal operating conditions (an explanation will be supplied below). During routine operations there may be cases where the facilities will be operated by means of diesel engines. These include the emergency generator and the water pumps. When calculating the impact of the facility's operation on the environment, a stringent assumption was used according to which facilities operated by means of natural gas as well as facilities operated by means of diesel engines are discharging emissions.

During the first years of the facility's operation (about 8 years) gas will be arriving at maximum pressures, as described in Table 4-1 in the Engineering Document enclosed as Appendix B. After this initial operating period, gas will arrive onshore at lower pressures, as detailed in Table 4-3 of the plan documents (see Appendix B). Therefore, starting from the year 2025 or thereabouts, it will be necessary to add pressure in order to raise the rate at which the gas arrives onshore. This added gas compression involves additional energy and additional environmental emissions. Total emissions during routine operations, future routine operations (after the year 2025) and during malfunctions, are detailed in this section. All information presented below is derived from the plan documents, except for the performance of pollutant dispersion calculations made by means of the AERMOD[13] and CALPUFF models and the emissions data from a facility belonging to INGL (Israel National Gas Lines) that were provided by the plan's engineers.

At the building licensing request stage, a request will be submitted for an emissions license in accordance with 2008 Clean Air Law requirements as updated for the period at which the request is to be submitted.

4.1.1. Itemization of emissions

This chapter will itemize the emission sources and pollutants emitted from each source during routine operations, during future routine operations (the year 2025+) and during malfunctions.

The following is a list of emission sources into the air:

1. Two gas turbines of 10MW each (2x Power Generation)
2. Two heating facilities based on combustion (2x Fired Heater)
3. Atmospheric Flare
4. Diesel Engines:
   - One Emergency Power Generator of 1MW
   - Two Fire Water Pumps of 0.8MW each
5. Flare Stack

   There will be three flare stacks in the treatment facility (for details regarding each of the flares, see Appendix B):

   - HP (High Pressure) Flare
   - Limited Partnership (Low Pressure) Flare
   - Atmospheric Flare
6. INGL Facility

   The INGL Facility includes a block valve station and PRMS and an option for compressors.

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[13] Because of the restrictions of the AERMOD model, maximum emission velocities input into the model is up to 05 m/sec, i.e. any speed higher than 05 m/sec was input as 05 m/sec.

The facility includes both point source and fugitive emissions. Point source emissions from the vent in the valves area and another vent located in the block valve yard at Dor. And fugitive emissions from flanges and valves.

The following is an itemization of each emission source and emissions discharged from each and every one of them according to its operating state (routine, future routine, the year 2025+, and malfunction). A detailed explanation for each source of emission is presented in Section 15.6 in Appendix B.

1. *Sources of emission during routine operations (during the first years of operation, about 8 years) comprise:*

1.1 Two gas turbines of 10MW each (Power Generation)

In the context of the examination of the impact of emissions from the treatment facility on the environment, it was assumed that these two turbines will be discharging emissions. This assumption is a stringent one made according to the instructions of the Ministry of Environment Protection. In actual practice, one gas turbine will be in operation while the other will be held in reserve, or both turbines will be operated in parallel at a maximum capacity of 50% each. These gas turbines will operate on natural gas.

1.2 Fired heater

Two fired heaters will be operated by means of natural gas.

1.3 Atmospheric flare

In addition to the HP and LP flares, an atmospheric flare is also planned within the plan site. The purpose of the atmospheric flare is to remove condensate fumes stored in containers.

1.4 Vent

In the valves yard located within a facility belonging to INGL, there is a vent that discharges emissions only in cases of elective gas release. An additional vent is located at the Dor block valve station.

1.5 Fugitive emissions

At the natural gas treatment site, as described in the plan documents enclosed as Appendix B, fugitive emissions may be expected. Such emissions are undesirable and we must adopt the required means in order to minimize their discharge. Fugitive emissions are expected to be discharged as a consequence of leaks in valves and flanges. Based on Appendix B, the number of fugitive emissions sources is:

- Estimated number of valves - 100
- Estimated number of flanges - 1500

- Estimated number of pumps - 20

The total amount of emissions amounts to about 10-100 kg/year. The main gas emitted into the atmosphere is methane.

In addition, there may be fugitive emissions from flanges at the PRMS and the valves (about 200 flanges). Additional emissions sources that are operated in special cases include the emergency generator and the water pumps that are operated by means of diesel engines.

1.6 Emissions from diesel engines

In certain cases in the course of treating the natural gas, there may be a need to operate an emergency generator and firewater pumps that are all operated via diesel engines. The diesel engines work on diesel fuel. The emergency generator will be mainly operated in cases where the natural gas supply to the gas turbine is interrupted. Firewater pumps will serve for pumping water from fire-extinguishing containers, and will be mainly operated in cases of fire (Sections 7.5.5 to 7.5.8 in Appendix B).

Two firewater pumps will be placed at the site with 0.8MW of power each and one emergency generator with 1MW of power. According to Appendix B, the total number of days that one may expect to operate the emergency generator are 15 days a year and the total number of days expected for the operation of the firewater pumps are about 4.5 days.

2. *Future emissions (in the years 2025+) (See Section 15.7 in Appendix B):*

In future, about eight years after the beginning of operations in the gas treatment facility, we may expect a slowdown in the rate of gas arrival at the facility. It will therefore be necessary to add compressors that will increase the rate of gas reception. To this end, during these years compressors will be allocated to supply this demand. Therefore, commencing from the year 2025+ (according to estimations) the emergency consumption array at the facility is expected to change and as a consequence the rate at which pollutants are emitted is also expected to change. Nevertheless, no change is reported regarding the emission rate from the diesel engines.

2.1 Gas compressors (feed gas compression)

In future years (2025+) it seems that 4 compressors with 10MW of power each will be allocated, and these will be added to the existing emission sources. Gas compressors will be operated by means of natural gas. The gas compression process comprises emissions from the four Trains[14] (see Section 15.7.2 in Appendix B).

[14] A segment of the gas treatment process

3. *Emissions in case of malfunctions:*

During routine operations, gases emitted from the flare will be returned to the system using a flare gas recycling technology (Flare Gas Recovery Unit - FGRU) as detailed in Section 15.6.6 in Appendix B. Therefore, during routine operations, almost no emissions are expected from the HP and LP flares (emissions liable to be discharged during routine operations are considered negligible). However, in cases of malfunction the surplus emission gases discharged through the HP flare and/or the LP flare depend on the type of malfunction.

Types of malfunctions that may be expected in the HP flare are:

- Operational malfunction
- Blowdown One Gas Process stream
- Blowdown LTS Train at low temperatures
- Blowdown Pipeline
- PSV Lift
- During future operations (the year 2025+) there may be a malfunction that will require evacuating the gas present within the compressor (Blowdown Compressor).

Types of malfunctions that may be expected in the LP flare are:

- PSV Lift

An additional case of malfunction is when it is necessary to evacuate the gas through the vents of the INGL facility.

Tables 4.1.1-1 to 4.1.1-13 presented below, based on the plan documents (Appendix B), specify the pollutants discharged from emission sources during various states of operation (routine, future, in the years 2025+, and malfunction). In cases where the emission rates, according to Appendix B, exceed the emission rates recommended by TA Luft 2002, then the emission rates appearing in TA Luft 2002 were taken.

- Tables 4.1.1-1 to 4.1.1-8 describe the emission sources and the pollutants expected to be emitted from them during the period 2016-2024 under routine operating conditions. This operating state includes emissions sources from diesel engines (emergency generator and firewater pumps).
- Tables 4.1.1-9 to 4.1.1-10 describe the emissions and pollutants expected to be emitted from them in future years (2025+).

- Tables 4.1.1-11 to 4.1.1-12 describe the emission sources and pollutants expected from them under various conditions of malfunction.

The following are the tables in order:

- **<u>Emissions expected during the period 2016-2024 during routine operating conditions</u>**

Point source emissions:

<u>Table 4.1.1-1: Emissions from Power Stations (Power Generation)</u>

Pollutant	Power Station 1 [kg/hour]	Power Station [kg/hour]
NO_X	0.74	0.74
SO_2	0.03	0.03
UHC (as C)	0.01	0.01
Methane	0.01	0.01
VOC	0.01	0.01
CO	0.04	0.04
N_2O	0.01	0.01
CO_2	3085	3085

<u>Table 4.1.1-2: Power Station Stacks Data</u>

Parameter	Units	Power Station 1	Power Station 2
Temperature	°C	493.1	493.1
Stack height	M	20	20
Stack diameter	M	0.8	0.8
Emission velocity	m/s	130.7	130.7

<u>Table 4.1.1-3: Emissions from Heaters</u>

Pollutant	Heater 1 [kg/hour]	Heater 2 [kg/hour]
NO_X[15]	1.8	1.8
SO_2	0.07	0.07
CO_2	6120	6120

Table 4.1.1-4: Heater Data

Parameter	Units	Heater 1	Heater 2
Temperature	°C	213.8	213.8
Stack height	M	40	40
Stack diameter	M	0.5	0.5
Emission velocity	m/s	57.0	57.0

Table 4.1.1-5: Emissions from the Atmospheric Flare

Pollutant	Emission Rate [kg/hour]
NO_X	0.1
SO_2	0.001
Methane	1.1
VOC	1.1
CO	0.7
N_2O	0.01
CO_2	308

Table 4.1.1-6: Atmospheric Flare Data

Parameter	Units	
Temperature	°C	~1200[16]
Stack height	M	10

[15] According to the TALUFT 2002 guidelines - a fourth category for general guidelines for the limiting of emissions of inorganic gases (Section 0.2.5).

[16] Estimated temperature

Stack diameter	M	0.1
Emission velocity	m/s	15.6

Table 4.1.1-7: Emissions from Diesel Engines

Pollutant	Emergency Generator [kg/hour]	Firewater Pump 1 [kg/hour]	Firewater Pump 1 [kg/hour]
NO_X[17]	1.8	1.8	1.8
SO_2	0.02	0.02	0.02
UHC (as C)	1.0	0.8	0.8
VOC	0.38	0.30	0.30
CO	33.0	26.4	26.4
N_2O	7.90	6.32	6.32
Particulates[18]	0.2	0.2	0.2
CO_2	698.5	558.8	558.8

Table 4.1.1-8: Diesel Engine Data[19]

Parameter	Units	Emergency Generator	Firewater Pump 1	Firewater Pump 1
Power	kW	1000	800	800
Number of workdays per year	Days	15	4.5	4.5
Temperature	°C	405.5	412.4	412.4
Stack height	M	3	6	6

[17] According to the TALUFT 2002 guidelines - a fourth category for general guidelines for the limiting of emissions of inorganic gases (Section 0.2.5).

[18] According to the TALUFT 2002 guidelines - for general guidelines for the limitation of the emission of particulates in emission gases (Section 0.2.5).

[19] Emission velocity according to estimated values.

Temperature data, height and diameter of the stack were taken from:

Ship Modeling Analysis Report, Evaluation of Air Quality Impacts Oregon LNG Terminal and Marine Operations, Appendix 9, CH2M Hill, 2008.

Stack diameter	M	0.1	0.2	0.2
Emission velocity	m/s	25	25	25

Fugitive emissions:

The expected fugitive emissions under routine operating conditions are:

26 kg/hour methane gas from the gas treatment facility.

About 3.5 kg/hour methane from the PRMS.

- **Emissions expected in future during the years 2025+ under routine operating conditions**

Point source emissions:

Table 4.1.1-9: Emissions in the Years 2025+

Pollutant	Heating Process			Gas Compression Process				Power Station 1 [kg/hr]	Power Station 2 [kg/hr]
	Heater 3 [kg/hr]	Heater 2 [kg/hr]	Heater 1 [kg/hr]	Train 2B [kg/hr]	Train 2A [kg/hr]	Train 1B [kg/hr]	Train 1A [kg/hr]		
NO_X	4.51	4.51	4.51	1.19	1.19	1.19	1.19	0.94	0.94
SO_2	0.07	0.07	0.07	0.05	0.05	0.05	0.05	0.04	0.04
UHC (as C)	0	0	0	0.02	0.02	0.02	0.02	0.02	0.02
Methane	0	0	0	0.01	0.01	0.01	0.01	0.01	0.01
VOC	0	0	0	0.01	0.01	0.01	0.01	0.01	0.01
CO	0	0	0	0.06	0.06	0.06	0.06	0.05	0.05
N_2O	0	0	0	0.02	0.02	0.02	0.02	0.02	0.02
Particulates	0	0	0	0	0	0	0	0	0
CO_2	5638.94	5638.94	5639	4955	4955	4955	4955	3904	3904

Table 4.1.1-10: Emission Sources Data in Future Years (2025+)

Parameter	Heater 3	Heater 2	Heater 1	Train 2B	Train 2A	Train 1B	Train 1A	Power Station 1	Power Station 2
Stack height (m)	40	40	40	20	20	20	20	20	20
Stack diameter (m)	0.5	0.5	0.5	0.9	0.9	0.9	0.9	0.8	0.8

Emission velocity (m/s)	51.1	51.1	51.1	108.1	108.1	108.1	108.1	130.5	130.5
Temperature (°C)	203.0	203.0	203.0	489.9	489.9	489.9	489.9	491.6	491.6

Emissions from the atmospheric flare:

Emissions from the atmospheric flare will remain identical to those expected to be emitted during the first operating years (about 8 years).

Fugitive emissions:

38 kg/hour methane gas.

- **Emissions expected in cases of malfunction**

Table 4.1.1-11: Emission Data from HP and LP Flares in Cases of Malfunction

	LP Flare	HP Flare							
Type of Malfunction	**Release of gas from blow-off valve**	**Release of gas from blow-off valve**	**Evacuation of pipeline**		**Release of gas from low temperature train**		**Single-phase gas evacuation**		**Operational Malfunction**
Number of times per year	3	6	2		4		2		2
Rate of gas emission	Constant emissions	Constant emissions	Variable emissions		Variable emissions		Variable emissions		Constant emissions
Point in time			3 days	Up to 3 days	15 minutes	Up to 15 minutes	15 minutes	Up to 15 minutes	Up to 10 days
Duration of emission (days)	0.08	0.08							10
CO_2 [kg/hour]	48413	1613775	8057	46009	8069	177515	72620	1161918	387306
CO [kg/hour]	116	3862	19	110	19	425	174	2780	927
NO_X [kg/hour]	3	692	3	20	3	76	31	498	166

	LP Flare	HP Flare							
Type of Malfunction	**Release of gas from blow-off valve**	**Release of gas from blow-off valve**	**Evacuation of pipeline**		**Release of gas from low temperature train**		**Single-phase gas evacuation**		**Operational Malfunction**
N_2O [kg/hour]	1	47	0	1	0	5	2	34	11
SO_2 [kg/hour]	0	7	0	0	0	1	0	5	2
CH_4 [kg/hour]	173	5763	29	164	29	634	259	4150	1383
VOC [kg/hour]	173	5763	29	164	29	634	259	4150	1383

During a malfunction the emissions of natural gas will usually be from one of the vents located in the valve yards at the INGL facility up to the onshore valve block station (very rarely can an emission occur from a number of vents, but the total amount emitted is identical should the emission occur from one of the vents or all of them simultaneously).

Malfunctions that may lead to emissions from the vents:

- Emissions following the release of gas because of an emergency condition – the release of gas following emergency condition, including the evacuation of the entire line. Such emissions are extremely rare and it is doubtful if they may occur at all. The amount of gas released in such a case, according to the plan's engineers, is the amount of gas to be released from a 30-inch diameter pipe (with a walled thickness of 12 mm), along a line of about 10 km under pressure of 80 bar, and is estimated at about 350,000m^3 (240,000 kg), expected to be released within an hour.
- Emissions arising from non-routine operations – emissions arising from non-routine operations are emissions wherein the quantity of gas released is estimated at about 0.1% of the amount of gas released in an emergency, and is estimated at about 350m^3 (240 kg) of methane gas, such a quantity is expected to be emitted within about one minute.

- In the years 2025+, in addition to all of the malfunction cases listed in Table 4.1.1-11, there may also be a malfunction that will require evacuating the gas inside the compressor (blowdown compressor), through the HP flare as detailed in Table 4.1.1-12.

<u>Table 4.1.1-12: HP Flare Emission Data in the Event of a Blowdown Compressor Malfunction in the Years 2025+</u>

Type of Malfunction	Blowdown Compressor	
Number of times per year	2	
Rate of gas emission	Variable	
Point in time	15 minutes	Up to 15 minutes
CO_2 [kg/hour]	6980	165418
CO [kg/hour]	19	396
NO_X [kg/hour]	3	71
N_2O [kg/hour]	0	5
SO_2 [kg/hour]	0	1

CH_4 [kg/hour]	29	591
VOC [kg/hour]	29	591

Table 4.1.1-13: Emission Data from HP and LP Flares According to Type of Malfunctions

	LP Flare	HP Flare								
Type of Parameter	Release of gas from blow-off valve	Release of gas from blow-off valve	Evacuation of pipeline		Emptying of gas from the compressor	Release of gas from low temperature train		Single-phase gas evacuation		Operational Malfunction
Flare diameter (m)	0.3	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Emission velocity (m/second)	90	225.0	1.1	6.4	1.1	6.4	24.8	10.1	162.0	54.0
Temperature (°C)	0111	0111	0111	0111	0111	0111	0111	0111	0111	0111
Stack height (m)	55	55	55	55	55	55	55	55	55	55

Figure 4.1.1-1 illustrates the sources of emission according to the type of gas treatment facility operations. The extreme malfunction cases presented in the figure are the most extreme malfunction cases among all the malfunction cases described in Table 4.4.4-11. These malfunction cases were the only ones taken into consideration when examining the impact of a malfunction state on the environment. This examination was performed using models for the dispersion of pollutants and their results will be presented below.

Figure 4.1.1-1: Emission Sources According to Type of Natural Gas Treatment Facility Operations

Routine Operations During the period 2016-2024				
Power Station	Heaters	Flare	Diesel Engines	Fugitive Emissions
Two power stations of 10MW power each	Two heaters	Atmospheric flare	Emergency generator and two water pumps	Emissions from flanges and valves

Routine Operations Future years 2025+					
Power Station	Heaters	Flare	Diesel Engines	Fugitive Emissions	Compressors
Two power stations of 10MW power each	Two heaters	Atmospheric flare	Emergency generator and two water pumps	Emissions from flanges and valves	Four compressors of 10MW power each

Extreme Malfunction Cases	
Operational Malfunction	Gas Release from Blow-off valve
- HP Flare - LP Flare - Diesel Engines	- HP Flare - LP Flare - Diesel Engines

4.1.2. Impact of emissions

The impact of the emissions on the quality of the air in the vicinity of the Hagit site under regular operating conditions and the results of the run of the model are described in Section 4.1.4 below.

4.1.3. Means planned to reduce emissions

At this stage of the plan it is not possible to recommend the best technologies for decreasing emissions into the environment, for it is not possible to foresee what technologies may be available in 3 to 4 years' time, since optimum available technologies that exist today may be quite obsolete in the future. Nevertheless, we may recommend conceptual means for the reduction of emissions rather than any specific technologies.

The following are conceptual guidelines for reducing emissions from a natural gas treatment facility:

- *Conceptual technology for reducing emissions from flares*

Use technology that restores the emission gases back into the system (Flare Gas Recovery Unit - FGRU) as described in Sections 7.3.7 and 10.4 of Appendix B. This technology almost completely prevents any emissions through the flare, whereas by operating FGRU technology emissions may still be discharged through the flare (however such emissions are considered negligible).

- *Conceptual technologies for reducing emissions from facilities utilizing the burning of fuels (either liquid or gas)*

Emission rates from all facilities that emit combustion gases must be adjusted for the emission rates quoted in TALUFT 2002 or any other up-to-date standard that will be adopted by the Ministry of Environmental Protection. In addition to the guideline requiring compliance with the standards and requirements, we must also install in such facilities the means for reducing emissions that work on the basis of the best available technology.

- *Conceptual technologies for reducing fugitive emissions*

As part of the routine operation of the emission gases treatment facility, fugitive emissions may occur from the equipment and flanges between the pipes, as described in Section 4.1.8 below. In order to minimize such emissions, the following means should be adopted:

- Reduce the number of flanges as far as possible (for example through welding).
- Regular maintenance of flanges and valves.

- Implement control systems for the detection of leaks. Implementation of such systems and the frequency of their use will be performed in accordance with the guidelines included in the relevant BREF[20] documents.

4.1.4. Calculations of pollutant dispersion

Calculations of pollutant dispersion for routine emissions are performed by means of the AERMOD software programs at a range of 10 km according to the settings defined in Section 1.4.4 for the Hagit power station area.

Pollutants for which the pollutant dispersion model was run are:

- Nitrous oxides NO_X
- Sulfur dioxide SO_2
- PM particles

The model was run only for the pollutants specified above since there are no air quality regulations pertaining to the rest of the emitted pollutants.

Model run methodologies:

The purpose of a model run is to examine the impact of emissions on the environment when the natural gas treatment facility is in operation. Therefore, the model was run in accordance with a number of scenarios for each pollutant separately, once from the natural gas treatment facility itself and once from the facility and from the background (the emission of pollutants from the environment without the operation of the facility) together.

The model run was performed for the most stringent condition wherein the treatment facilities are run on both gas and diesel engines.

Background emissions

Background emissions were run in two scenarios:

- Emissions from plants and vehicles at a radius of 10 km surrounding the plan.
- Emissions from plants only (point source emissions).

It was found that in a model run of background emissions from plants (point source emissions) and from vehicles, in the case of a model run for the pollutant NO_X, vehicles exert a great deal of influence on the concentration of the pollutants. For this reason, in order to compare the results of the model run for the pollutants emitted from the natural gas treatment facility without the background and with the background, in the case of a model run for the pollutant NO_X, the emissions from vehicles were not introduced into the model. In the rest of the cases (the

[20] Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for Mineral Oil and Gas Refineries, February, 2003.

model run for the particulates pollutant) the concentrations for the pollutants emitted from the natural gas treatment facility and the background in the two scenarios were calculated, one scenario for emissions from the natural gas treatment facility and the background with vehicles, and a second scenario with emissions from the natural gas treatment facility and the background without vehicles.

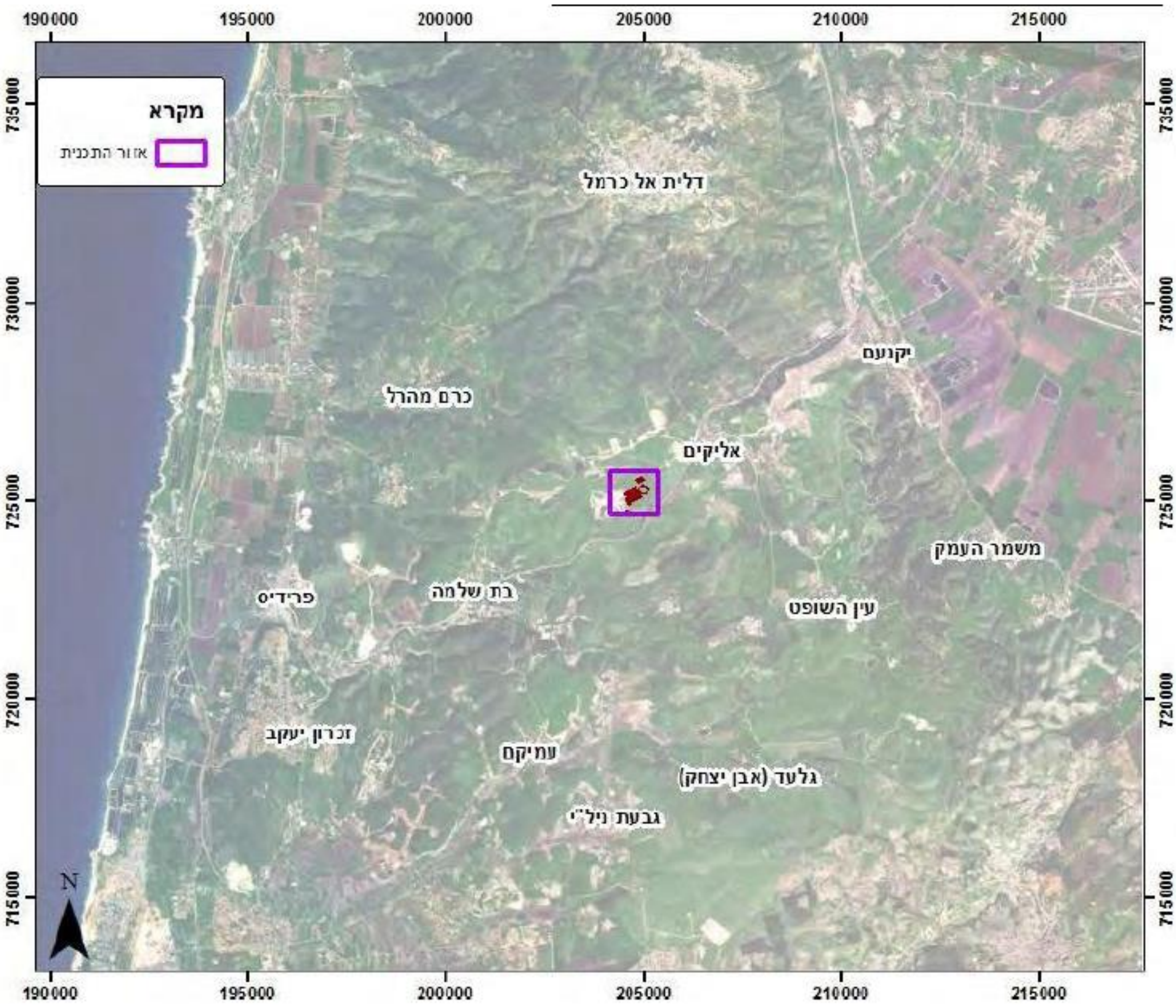
In the future state (the years 2025+) gas compressors, that will be added to the emissions into the air, were added to the gas treatment facilities. In order to examine the impact of this addition, various emission scenarios from the facilities operated on natural gas after the year 2025 were run. Under this operating condition as well, the most stringent case in which the treatment facilities are operated on both gas and diesel engines, were taken into consideration.

The results of the model run are presented in the tables below, which demonstrate the maximum values for that run and the maximum values for each receptor for different averaging times, and their rate as compared with threshold values that appear in the 2011 Air Quality Values regulations. The values that exceed these threshold values and the percentage of their deviation are emphasized in red.

Figure 4.1.4-1 presents the location of the receptors[21].

[21] The results of the run received for Givat Haim and Ein HaHoresh are similar, and for this reason only the run results for Givat Haim are presented as a point that is representative of both settlements.

Figure 4.1.4-1: Location of Receptors and the Natural Gas Treatment Plan



Map translation clockwise from 12 o'clock: Daliyat al-Karmel, Yokneam, Mishmar HaEmek, Ein HaShofet, Gilad (Even Yitzhak), Givat Nili, Amikam, Zichron Yaakov, Fureidis, Bat Shlomo, Elyakim, Kerem Maharal. Legend: Plan area.

Scenarios according to which the model was run are:

1. Existing state scenario (background)
   - 1.1 Emissions from plants and vehicles at a radius of 10 km surrounding the plan.
   - 1.2 Emissions from plants only (point source emissions).
2. Future scenario (the years 2016-2024)
   - 2.1 Emissions from natural gas treatment facilities and from diesel engines.
   - 2.2 Background (point source emissions) and emissions from facilities operating on natural gas and from diesel engines.

3. Future state scenario for the years 2025+
    3.1 Emissions from facilities operating on natural gas and from diesel engines.

Tables 4.1.4-1 to 4.1.4-11 present the results of the model runs.

1. **<u>Existing state scenario – background</u>**

   Results of the model run for the pollutant NO_X - may be seen in Chapter 1, Section 1.4.4 in Tables 1.4.4-37 and 1.4.4-38 of this survey.

   Results of the model run for the pollutant SO_2 - may be seen in Chapter 1, Section 1.4.4 in Table 1.4.4-40 of this survey.

1.1 Emissions from plants (without the natural gas treatment facility) and from vehicles at a radius of 10 km around the plant

Table 4.1.4-1: Results of the Model Run for the Particulates Pollutant (PM) – Background (Point Source Emissions and Vehicles)

Standard					Target/ Environ-ment 300		Target/ Environ-ment 300		Target/ Environ-ment 200		Target/ Environ-ment 200		Target/ Environ-ment 75
Serial No.	Location	X	Y	Concentration 3 hours - mcg/m³	% of the 3-hour value %	Concentration 3 hours - Second concentration mcg/m³	% of the 3-hour value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for all averaging times	208959	728686	338.9	113.0	316.1	105.4	83.0	41.5	77.9	38.9	21.7	28.9
1	Elyakim	206500	726500	4.6	1.5	4.4	1.5	1.2	0.6	1.1	0.6	0.4	0.5
2	Zichron Yaakov	195900	719900	6.1	2.0	6.0	2.0	1.1	0.5	1.0	0.5	0.1	0.2
3	Kerem Maharal	199100	728400	4.8	1.6	4.8	1.6	1.4	0.7	1.1	0.6	0.1	0.1
4	Daliyat al-Karmel	206900	731900	27.7	9.2	22.5	7.5	5.5	2.8	5.3	2.6	0.5	0.7
5	Amikam	202200	719100	9.5	3.2	7.8	2.6	1.7	0.8	1.6	0.8	0.4	0.5
6	Ein HaShofet	209300	723300	5.6	1.9	4.3	1.4	1.3	0.6	1.1	0.6	0.2	0.3
7	Yokneam	211097	728548	14.4	4.8	12.6	4.2	3.3	1.7	3.1	1.5	0.7	0.9

Standard					Target/ Environ-ment 300		Target/ Environ-ment 300		Target/ Environ-ment 200		Target/ Environ-ment 200		Target/ Environ-ment 75
Serial No.	**Location**	**X**	**Y**	**Concentration 3 hours - mcg/m³**	**% of the 3-hour value %**	**Concentration 3 hours - Second concentration mcg/m³**	**% of the 3-hour value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Second maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Maximum annual concentration mcg/m³**	**% of annual environmental value %**
8	El-Fureidis	195776	722763	7.8	2.6	5.8	1.9	1.3	0.7	1.3	0.7	0.4	0.5
9	Bat Shlomo	200558	722939	9.0	3.0	8.9	3.0	2.8	1.4	2.5	1.2	0.5	0.6
10	Even Yitzhak	207558	717994	18.8	6.3	17.3	5.8	3.4	1.7	3.3	1.7	0.2	0.3
11	Givat Nili	204047	717167	6.2	2.1	5.0	1.7	1.2	0.6	1.1	0.6	0.2	0.3
12	Mishmar HaEmek	213758	724165	15.3	5.1	12.4	4.1	2.4	1.2	2.4	1.2	0.5	0.6

1.2 Emissions from plants only (without the natural gas treatment facility) – point source emissions

Table 4.1.4-2: Results of the Model Run for the Particulates Pollutant (PM) – Background (Point Source Emissions)

Standard					Target/ Environ-ment 300		Target/ Environ-ment 300		Target/ Environ-ment 200		Target/ Environ-ment 200		Target/ Environ-ment 75
Serial No.	Location	X	Y	Concentration 3 hours - mcg/m³	% of the 3-hour value %	Concentration 3 hours - Second concentration mcg/m³	% of the 3-hour value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for all averaging times	208959	728686	44.3	14.8	37.7	12.6	10.0	5.0	7.7	3.9	1.2	1.6
1	Elyakim	206500	726500	1.9	0.6	1.8	0.6	0.7	0.4	0.5	0.2	0.1	0.1
2	Zichron Yaakov	195900	719900	4.3	1.4	4.1	1.4	1.0	0.5	0.9	0.4	0.1	0.1
3	Kerem Maharal	199100	728400	2.4	0.8	2.4	0.8	0.6	0.3	0.5	0.3	0.1	0.1

Standard					Target/ Environ-ment 300		Target/ Environ-ment 300		Target/ Environ-ment 200		Target/ Environ-ment 200		Target/ Environ-ment 75
Serial No.	Location	X	Y	Concentration 3 hours - mcg/m³	% of the 3-hour value %	Concentration 3 hours - Second concentration mcg/m³	% of the 3-hour value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual environmental value %
4	Daliyat al-Karmel	206900	731900	24.7	8.2	20.0	6.7	4.5	2.3	4.3	2.1	0.3	0.5
5	Amikam	202200	719100	4.1	1.4	4.0	1.3	1.1	0.5	0.8	0.4	0.1	0.2
6	Ein HaShofet	209300	723300	14.3	4.8	11.6	3.9	2.3	1.1	2.1	1.1	0.3	0.4
7	Yokneam	211097	728548	2.0	0.7	1.9	0.6	0.4	0.2	0.4	0.2	0.1	0.1
8	El-Fureidis	195776	722763	7.4	2.5	6.6	2.2	1.8	0.9	1.4	0.7	0.1	0.1
9	Bat Shlomo	200558	722939	9.2	3.1	9.0	3.0	2.2	1.1	1.6	0.8	0.3	0.3
10	Even Yitzhak	207558	717994	1.1	0.4	1.0	0.3	0.3	0.1	0.2	0.1	0.0	0.0

2. Future state scenario (years 2016-2024) – Emissions from natural gas treatment facilities and from diesel engines

2.1 Emissions from natural gas treatment facilities and from diesel engines

Table 4.1.4-3: Results of the Model Run for the Nitrous Oxides Pollutant NO_X (Emissions from Natural Gas Treatment Facilities and from Diesel Engines)

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	Location of maximum values for annual averaging time	204959	725186									8.1	26.9
	Location of maximum values for 24-hour averaging time	204459	725686							70.8	12.6		

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	Location of maximum values for both hourly and 24-hourly averaging times	204459	725686	672.2	71.5	671.7	71.5	95.45	17.0				
1	Elyakim	206500	726500	35.8	3.8	35.4	3.8	3.41	0.6	3.0	.05	0.3	1.0
2	Zichron Yaakov	195900	719900	16.0	1.7	16.0	1.7	3.84	0.7	3.4	.06	0.3	1.1
3	Kerem Maharal	199100	728400	21.1	2.2	21.1	2.2	1.42	0.3	1.1	.02	0.0	0.1
4	Daliyat al-Karmel	206900	731900	8.3	0.9	8.2	0.9	0.34	0.1	0.3	0.1	0.0	0.1
5	Amikam	202200	719100	21.3	2.3	21.2	2.3	2.63	0.5	2.3	0.4	0.1	0.3

Standard					Environ ment 940		Environ ment 940		Environ ment 560		Environ ment 560		Target 30
Serial No.	**Location**	**X**	**Y**	**Maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Second maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Second maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Maximum annual concentration mcg/m³**	**% of annual target value %**
6	Ein HaShofet	209300	723300	13.6	1.4	12.7	1.4	1.73	0.3	1.7	0.3	0.2	0.7
7	Yokneam	211097	728548	25.2	2.7	25.1	2.7	2.62	0.5	2.3	0.4	0.3	0.9
8	El-Fureidis	195776	722763	17.1	1.8	17.1	1.8	3.72	0.7	3.3	0.6	0.2	0.9
9	Bat Shlomo	200558	722939	27.0	.29	27.0	.29	7.39	1.3	6.9	1.2	0.7	2.3
10	Even Yitzhak	207558	717994	49.9	5.3	49.9	5.3	4.57	0.8	4.2	0.7	0.2	0.6
11	Givat Nili	204047	717167	19.1	.20	19.1	.20	1.93	0.3	1.8	0.3	0.1	0.2
12	Mishmar HaEmek	213758	724165	20.7	2.2	20.7	2.2	3.25	0.6	2.6	0.5	0.3	0.9

Table 4.1.4-4: Results of the Model Run for the Sulfur Dioxide Pollutant SO_2 (Emissions from Natural Gas Treatment Facilities and from Diesel Engines)

Standard					Target - 500		Target - 500		Environ ment 350		Environ ment 350		Environ ment 350		Environ ment 125	Target 20		Environ ment 125	Target 20		Environ ment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentration mcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for both hourly and 24-hourly averaging times	204459	725686					6.5	1.9	6.5	1.9	5.5	1.6	1.1	0.8	5.3					
	Location of maximum values for annual averaging time	204959	725186																	0.1	0.2
	Location of maximum values for second 24-hour	204459	725186														0.8	0.7	4.1		

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentrationmcg/m^3	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m^3	% of 10-minute environmental value %	Maximum hourly concentration mcg/m^3	% of hourly environmental value %	Second maximum hourly concentration mcg/m^3	% of hourly environmental value %	Hourly percentile 99.9 mcg/m^3	% of hourly environmental value %	Maximum 24-hour concentration mcg/m^3	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m^3	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m^3	% of annual environmental value %
	averaging time																				
1.	Elyakim	206500	726500	0.5	0.1	0.5	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.1	0.0	0.3	0.0	0.0	0.2	0.0	0.0
2.	Zichron Yaakov	195900	719900	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0
3.	Kerem Maharal	199100	728400	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
4.	Daliyat al-Karmel	206900	731900	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.	Amikam	202200	719100	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
6.	Atlit	209300	723300	0.6	0.1	0.6	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.1	0.0	0.3	0.1	0.0	0.3	0.0	0.0
7.	Ein Ayala	211097	728548	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
8.	Fureidis	195776	722763	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0
9.	Binyamina	200558	722939	0.4	0.1	0.4	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.4	0.1	0.1	0.4	0.0	0.0
10.	Bat Shlomo	207558	717994	0.7	0.1	0.7	0.1	0.5	0.1	0.5	0.1	0.4	0.1	0.1	0.0	0.3	0.0	0.0	0.2	0.0	0.0
11.	Ramot Menashe	204047	717167	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0
12.	Migdal HaEmek	213758	724165	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0

Table 4.1.4-5: Results of the Model Run for the PM Particulates Pollutant (Emissions from Diesel Engines Only[22])

Standard					Target/ Environ-ment 300		Target/ Environ-ment 300		Target/ Environ-ment 200		Target/ Environ-ment 200		Target/ Environ-ment 75
Serial No.	Location	X	Y	Concentration 3 hours - mcg/m³	% of the 3-hour value %	Concentration 3 hours - Second concentration mcg/m³	% of the 3-hour value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for annual averaging time	204959	725186									0.8	1.1
	Location of maximum values for second 24-hour averaging time	204459	725186							7.7	3.8		
	Location of maximum values for 3-hour and maximum 24-hour	204459	725686	57.93	19.3	43.8	14.6	10.50	5.2				

[22] From the natural gas treatment facility there are particulate emissions only from diesel engines

	averaging times												
1	Elyakim	206500	726500	1.28	0.4	1.3	0.4	0.31	0.2	0.3	0.1	0.0	0.0
2	Zichron Yaakov	195900	719900	1.29	0.4	1.2	0.4	0.41	0.2	0.4	0.2	0.0	0.0
3	Kerem Maharal	199100	728400	1.01	0.3	0.7	0.2	0.15	0.1	0.1	0.1	0.0	0.0
4	Daliyat al-Karmel	206900	731900	0.22	0.1	0.2	0.1	0.03	0.0	0.0	0.0	0.0	0.0
5	Amikam	202200	719100	1.18	0.4	1.0	0.3	0.28	0.1	0.2	0.1	0.0	0.0
6	Ein HaShofet	209300	723300	0.50	0.2	0.4	0.1	0.08	0.0	0.1	0.0	0.0	0.0
7	Yokneam	211097	728548	1.68	0.6	1.4	0.5	0.28	0.1	0.2	0.1	0.0	0.0
8	El-Fureidis	195776	722763	1.21	0.4	1.2	0.4	0.39	0.2	0.4	0.2	0.0	0.0
9	Bat Shlomo	200558	722939	2.27	0.8	2.1	0.7	0.79	0.4	0.7	0.4	0.1	0.1
10	Even Yitzhak	207558	717994	2.40	0.8	2.4	0.8	0.49	0.2	0.5	0.2	0.0	0.0
11	Givat Nili	204047	717167	1.14	0.4	1.1	0.4	0.21	0.1	0.2	0.1	0.0	0.0
12	Mishmar HaEmek	213758	724165	1.68	0.6	1.5	0.5	0.35	0.2	0.3	0.1	0.0	0.0

2.2 Future scenario (years 2016-2024) – Background emissions and emissions from natural gas treatment facilities and from diesel engines

Table 4.1.4-6: Results of the Model Run for the Nitrous Oxides Pollutant NO_X (Background Emissions (Point Source Emissions) from Natural Gas Treatment Facilities and from Diesel Engines)

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	Location of maximum values for annual averaging time	204959	725186									8.06024	26.86747
	Location of maximum values for second 24-hour averaging time	204459	725686							70.79581	12.6		
	Location of maximum values for	204459	725686	672.2	71.5	671.7	71.5	95.45	17.0				

	both half-hourly and 24-hourly averaging times												
1	Elyakim	206500	726500	35.8	3.8	35.4	3.8	3.41	0.6	3.04886	.05	0.29389	10.979633
2	Zichron Yaakov	195900	719900	16.0	1.7	16.0	1.7	3.84	0.7	3.39616	.06	0.32416	1.080533
3	Kerem Maharal	199100	728400	21.1	2.2	21.1	2.2	1.42	0.3	1.05853	.02	0.03421	0.114033
4	Daliyat al-Karmel	206900	731900	8.3	0.9	8.2	0.9	0.34	0.1	0.3294	0.1	0.02024	0.067467
5	Amikam	202200	719100	21.3	2.3	21.2	2.3	2.63	0.5	2.30942	0.4	0.07849	0.261633
6	Ein HaShofet	209300	723300	13.6	1.4	12.7	1.4	1.73	0.3	1.69645	0.3	0.21638	0.721267
7	Yokneam	211097	728548	25.2	2.7	25.1	2.7	2.62	0.5	2.25723	0.4	0.26356	0.878533
8	El-Fureidis	195776	722763	17.1	1.8	17.1	1.8	3.72	0.7	3.29541	0.6	0.21815	0.727167
9	Bat Shlomo	200558	722939	27.0	.29	27.0	.29	7.39	1.3	6.8959	1.2	0.68014	2.267133
10	Even Yitzhak	207558	717994	49.9	5.3	49.9	5.3	4.57	0.8	4.16248	0.7	0.18958	0.631933
11	Givat Nili	204047	717167	19.1	.20	19.1	.20	1.93	0.3	1.77858	0.3	0.05168	0.172267
12	Mishmar HaEmek	213758	724165	20.7	2.2	20.7	2.2	3.25	0.6	2.63958	0.5	0.27043	0.901433

Table 4.1.4-7: Results of the Model Run for the Sulfur Dioxide Pollutant SO_2 (Background Emissions (Point Source) Emissions from Natural Gas Treatment Facilities and from Diesel Engines)

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentration mcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for all averaging times	196959	731686	1222.7	244.5	1207.0	241.4	854.5	244.1	843.5	241.0	654.3	186.9	166.5	133.2	832.6	128.4	102.7	641.8	19.0	31.7
1.	Elyakim	206500	726500	30.3	6.1	27.8	5.6	21.2	6.1	19.4	5.6	6.4	1.8	1.1	0.9	5.3	1.0	0.8	5.2	0.1	0.2
2.	Zichron Yaakov	195900	719900	35.1	7.0	34.9	7.0	24.5	7.0	24.4	7.0	11.7	3.3	2.7	2.2	13.6	2.5	2.0	12.5	0.3	0.5
3.	Kerem Maharal	199100	728400	41.7	8.3	40.6	8.1	29.2	8.3	28.3	8.1	16.2	4.6	3.3	2.6	16.3	2.0	1.6	9.8	0.1	0.2
4.	Daliyat al-Karmel	206900	731900	46.6	9.3	46.5	9.3	32.6	9.3	32.5	9.3	30.7	8.8	5.1	4.1	25.7	5.1	4.1	25.5	0.4	0.7
5.	Amikam	202200	719100	27.3	5.5	27.2	5.4	19.1	5.4	19.0	5.4	17.4	5.0	5.3	4.2	26.3	4.6	3.6	22.8	0.4	0.7
6.	Atlit	209300	723300	266.2	53.2	265.9	53.2	186.0	53.1	185.8	53.1	169.9	48.5	25.7	20.6	128.6	23.1	18.5	115.4	2.6	4.3
7.	Ein Ayala	211097	728548	40.9	8.2	38.2	7.6	28.6	8.2	26.7	7.6	15.5	4.4	2.7	2.1	13.3	2.6	2.1	13.0	0.4	0.7

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentration mcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
8.	Fureidis	195 776	722 763	36.3	7.3	36.0	7.2	25.3	7.2	25.1	7.2	17.1	4.9	2.7	2.2	13.7	2.7	2.2	13.7	0.2	0.4
9.	Binyamina	200 558	722 939	28.2	5.6	27.7	5.5	19.7	5.6	19.3	5.5	13.2	3.8	2.0	1.6	9.9	1.9	1.5	9.5	0.3	0.4
10.	Bat Shlomo	207 558	717 994	32.4	6.5	31.6	6.3	22.7	6.5	22.1	6.3	10.7	3.0	3.2	2.5	15.9	2.0	1.6	9.8	0.1	0.1
11.	Ramot Menashe	204 047	717 167	26.1	5.2	25.2	5.0	18.2	5.2	17.6	5.0	14.1	4.0	2.9	2.3	14.4	2.6	2.1	13.1	0.1	0.2
12.	Migdal HaEmek	213 758	724 165	27.1	5.4	25.6	5.1	18.9	5.4	17.9	5.1	15.1	4.3	2.8	2.2	13.9	2.5	2.0	12.5	0.3	0.5

Table 4.1.4-8: Results of the Model Run for the PM Particulates Pollutant (Background Emissions (Point Source) and from Diesel Engines)

Standard					Target/ Environment 300		Target/ Environment 300		Target/ Environment 200		Target/ Environment 200		Target/ Environment 75
Serial No.	**Location**	**X**	**Y**	**Concentration 3 hours - mcg/m³**	**% of the 3-hour value %**	**Concentration 3 hours - Second concentration mcg/m³**	**% of the 3-hour value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Second maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Maximum annual concentration mcg/m³**	**% of annual environmental value %**
	Location of maximum values for annual and second 24-hour averaging time	196959	731686							7.7	3.9	1.2	1.6
	Location of maximum values for 3-hour and maximum 24-hour averaging times	204459	725686	57.9	19.3	43.8	14.6	10.5	5.3				
1	Elyakim	206500	726500	2.2	0.7	2.2	0.7	0.8	0.4	0.5	0.3	0.1	0.1
2	Zichron Yaakov	195900	719900	4.5	1.5	4.2	1.4	1.1	0.5	1.0	0.5	0.1	0.2
3	Kerem Maharal	199100	728400	2.4	0.8	2.4	0.8	0.6	0.3	0.5	0.3	0.1	0.1

4	Daliyat al-Karmel	206900	731900	24.7	8.2	20.0	6.7	4.5	2.3	4.3	2.1	0.4	0.5
5	Amikam	202200	719100	4.1	1.4	4.0	1.3	1.1	0.5	0.8	0.4	0.1	0.2
6	Ein HaShofet	209300	723300	14.3	4.8	11.6	3.9	2.3	1.1	2.1	1.1	0.3	0.4
7	Yokneam	211097	728548	2.0	0.7	1.9	0.6	0.5	0.2	0.4	0.2	0.1	0.1
8	El-Fureidis	195776	722763	7.4	2.5	6.6	2.2	1.8	0.9	1.4	0.7	0.1	0.2
9	Bat Shlomo	200558	722939	9.2	3.1	9.0	3.0	2.2	1.1	1.7	0.9	0.3	0.4
10	Even Yitzhak	207558	717994	2.4	0.8	2.4	0.8	0.6	0.3	0.5	0.3	0.0	0.0
11	Givat Nili	204047	717167	1.2	0.4	1.2	0.4	0.4	0.2	0.4	0.2	0.0	0.0
12	Mishmar HaEmek	213758	724165	1.7	0.6	1.5	0.5	0.4	0.2	0.4	0.2	0.1	0.2

Table 4.1.4-9: Results of the Model Run for the PM Particulates Pollutant (Background Emissions (Point Source and Vehicles) and from Diesel Engines)

Standard					Target/Environment 300		Target/Environment 300		Target/Environment 200		Target/Environment 200		Target/Environment 75
Serial No.	Location	X	Y	Concentration 3 hours - mcg/m³	% of the 3-hour value %	Concentration 3 hours - Second concentration mcg/m³	% of the 3-hour value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for all averaging times	208959	728686	338.9	113.0	316.1	105.4	83.0	41.5	77.9	38.9	21.7	28.9
1	Elyakim	206500	726500	4.6	1.5	4.4	1.5	1.2	0.6	1.2	0.6	0.41771	0.6
2	Zichron Yaakov	195900	719900	6.3	2.1	6.2	2.1	1.2	0.6	1.2	0.6	0.17509	0.2
3	Kerem Maharal	199100	728400	4.8	1.6	4.8	1.6	1.5	0.7	1.2	0.6	0.1156	0.2
4	Daliyat al-Karmel	206900	731900	27.7	9.2	22.5	7.5	5.5	2.8	5.3	2.6	0.50057	0.7
5	Amikam	202200	719100	9.5	3.2	7.8	2.6	1.7	0.9	1.7	0.8	0.36134	0.5
6	Ein HaShofet	209300	723300	5.7	1.9	4.3	1.4	1.3	0.6	1.1	0.6	0.22084	0.3
7	Yokneam	211097	728548	14.4	4.8	12.6	4.2	3.3	1.7	3.1	1.5	0.70765	0.9

Standard					Target/Environment 300		Target/Environment 300		Target/Environment 200		Target/Environment 200		Target/Environment 75
Serial No.	**Location**	**X**	**Y**	**Concentration 3 hours - mcg/m³**	**% of the 3-hour value %**	**Concentration 3 hours - Second concentration mcg/m³**	**% of the 3-hour value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Second maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Maximum annual concentration mcg/m³**	**% of annual environmental value %**
8	El-Fureidis	195776	722763	7.8	2.6	6.2	2.1	1.4	0.7	1.4	0.7	0.39597	0.5
9	Bat Shlomo	200558	722939	9.3	3.1	8.9	3.0	2.9	1.4	2.6	1.3	0.54893	0.7
10	Even Yitzhak	207558	717994	18.8	6.3	17.3	5.8	3.4	1.7	3.4	1.7	0.23047	0.3
11	Givat Nili	204047	717167	6.3	2.1	5.3	1.8	1.2	0.6	1.1	0.6	0.23452	0.3
12	Mishmar HaEmek	213758	724165	15.3	5.1	12.4	4.1	2.4	1.2	2.4	1.2	0.49723	0.7

3. Future planned status scenario (the year 2025+)

3.1 Emissions from facilities operating on natural gas and from diesel engines

Table 4.1.4-10: Results of the Model Run for the Nitrous Oxides Pollutant NO_X (Emissions from Natural Gas Treatment Facilities and from Diesel Engines) Year 2025+

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X Coordinate	Y Coordinate	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	Location of maximum values for annual averaging time	204959	725186									8.3	27.8
	Location of maximum values for second 24-hour averaging time	204459	725686							71.9	12.8		
	Location of maximum values for both half-hourly and 24-hourly	204459	725686	672.3	71.5	671.7	71.5	95.5	17.0				

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X Coordinate	Y Coordinate	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	averaging times												
1	Elyakim	206500	726500	35.9	3.8	35.5	3.8	3.9	0.7	3.6	0.6	0.4	1.5
2	Zichron Yaakov	195900	719900	16.0	1.7	16.0	1.7	3.9	0.7	3.5	0.6	0.3	1.2
3	Kerem Maharal	199100	728400	21.1	2.2	21.1	2.2	1.4	0.3	1.1	0.2	0.0	0.1
4	Daliyat al-Karmel	206900	731900	10.3	1.1	10.2	1.1	0.4	0.1	0.4	0.1	0.0	0.1
5	Amikam	202200	719100	21.3	2.3	21.2	2.3	2.7	0.5	2.3	0.4	0.1	0.3
6	Ein HaShofet	209300	723300	29.1	3.1	29.1	3.1	3.5	0.6	3.5	0.6	0.4	1.4
7	Yokneam	211097	728548	25.2	2.7	25.1	2.7	2.6	0.5	2.3	0.4	0.3	0.9
8	El-Fureidis	195776	722763	17.1	1.8	17.1	1.8	3.8	0.7	3.3	0.6	0.2	0.8
9	Bat Shlomo	200558	722939	27.0	2.9	27.0	2.9	7.5	1.3	7.0	1.2	0.7	2.4
10	Even Yitzhak	207558	717994	50.0	5.3	49.9	5.3	4.6	0.8	4.2	0.7	0.2	0.6
11	Givat Nili	204047	717167	19.1	2.0	19.1	2.0	1.9	0.3	1.8	0.3	0.1	0.2
12	Mishmar HaEmek	213758	724165	20.7	2.2	20.7	2.2	3.3	0.6	2.7	0.5	0.3	1.0

Table 4.1.4-11: Results of the Model Run for the Sulfur Dioxide Pollutant SO_2 (Emissions from Natural Gas Treatment Facilities and from Diesel Engines) - Year 2025+

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for the maximum 24-hour, 10 minutes and hourly averaging times	204459	725686	9.3	1.9	9.3	1.9	6.5	1.9	6.5	1.9	4.9	1.4	1.0	0.8	5.0		Location of maximum values for the maximum 24-hour, 10 minutes and hourly averaging times	204459	725686	9.3
	Location of maximum values for annual averaging time	204459	725186															Location of maximum values for annual averaging time	204459	725186	
	Location of maximum	204959	725186															Location of maximum values	204959	725186	

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	values for annual averaging time																	for annual averaging time			
1.	Elyakim	206500	726500	0.6	0.1	0.6	0.1	0.4	0.1	0.4	0.1	0.4	0.1	0.1	0.1	0.4	1	Elyakim	206500	726500	0.6
2.	Zichron Yaakov	195900	719900	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.2	2	Zichron Yaakov	195900	719900	0.2
3.	Kerem Maharal	199100	728400	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	3	Kerem Maharal	199100	728400	0.3
4.	Daliyat al-Karmel	206900	731900	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	4	Daliyat al-Karmel	206900	731900	0.3
5.	Amikam	202200	719100	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.1	5	Amikam	202200	719100	0.3
6.	Atlit	209300	723300	1.4	0.3	1.4	0.3	1.0	0.3	1.0	0.3	0.9	0.2	0.1	0.1	0.7	6	Atlit	209300	723300	1.4
7.	Ein Ayala	211097	728548	0.4	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.1	7	Ein Ayala	211097	728548	0.4
8.	Fureidis	195776	722763	0.3	0.1	0.2	0.0	0.2	0.1	0.2	0.0	0.2	0.0	0.0	0.0	0.2	8	Fureidis	195776	722763	0.3
9.	Binyamina	200558	722939	0.4	0.1	0.4	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.1	0.1	0.4	9	Binyamina	200558	722939	0.4
10.	Bat Shlomo	207558	717994	0.7	0.1	0.7	0.1	0.5	0.1	0.5	0.1	0.3	0.1	0.0	0.0	0.2	10	Bat Shlomo	207558	717994	0.7

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
11.	Ramot Menashe	204047	717167	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	11	Ramot Menashe	204047	717167	0.3
12.	Migdal HaEmek	213758	724165	0.3	0.1	0.3	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.0	0.0	0.2	12	Migdal HaEmek	213758	724165	0.3

4.1.5. Run results

Discussion of results:

Review of the model run results (Tables 4.1.4-1 to 4.1.4-11) for operation of the facility in the Hagit region leads to the following conclusions for each of the pollutants, and according to the scenarios defined above:

Particulates

Existing status

Particulate emissions – background

Particulate emissions were not run in the air quality tests for the existing status in Chapter A of the survey, and for this reason in this section, in order to examine the quality of the air before construction of the natural gas treatment facility, particulate emissions were run for plants and for vehicles at a radius of 10 km around the plan (Table 4.1.4-1 presents the results of the model run for point source emissions and for vehicle emissions, while Table 4.1.4-2 presents the results of the model run for point source emissions only). According to the model run results, when the model was run for emissions from point sources and from vehicles (Table 4.1.4-1) there are deviations in the maximum values of the average concentrations for 3 hours maximum and for the second 3 hours averaging relating to environmental and target values by 13% and by 6% respectively. When the model was run for point source emissions only (Table 4.1.4-2) no deviations were found (the maximum value results found were less than 15% of the target and environmental values).

Particulate emissions from diesel engines

According to the model run results for particulate emissions from diesel engines (Table 4.1.4-5) no deviations were found from the threshold values. The maximum value results were only up to 20% of the environmental and target values.

Background particulate emissions (point source emissions) and emissions from facilities operating on diesel engines

According to the results of the model run for background particulate emissions (point source emissions only) and from facilities operating on diesel engines (Table 4.1.4-8), (similar to the results of the model run without emissions from the facility and from the diesel engines) no deviations were found, whereas the maximum value results were less than 20% of the target and environmental values.

Background particulate emissions (point source emissions and vehicle emissions) and emissions from facilities operating on diesel engines

According to the model run results for background particulate emissions (point source emissions and vehicle emissions) and from facilities operating on diesel engines, it was found that similar to the results of the model run without emissions from the facility and from diesel engines, there are deviations in the maximum values at the average concentration of maximum 3 hours and at the second 3 hour averaging periods from the environmental values and the target values by about 13% and 6%, respectively. However, according to the run from the facility itself, there is no deviation at all.

Under the future operational state (the year 2025+) no change has been reported for the future in particulate emissions, and therefore this pollutant was not examined for this period.

Summary of particulates

According to the results of the model run, it may be concluded that the future impact of the particulates pollutant emitted from the natural gas treatment facility only (without any background emissions) is low.

Nitrous Oxides NO_X

Emissions under routine operating conditions (the years 2016-2024)

Nitrous oxide emissions from the facility and from diesel engines

According to the model run results for the emissions of nitrous oxides from the facility and from diesel engines (Table 4.1.4-3), no deviations were found from the threshold values. The maximum value found was for a half-hour concentration, which reached 72% of the environmental threshold value. The area in which the maximum values were found is located at a distance of about 500 meters and is spread over an area of approximately 30 dunams.

Emission of background nitrous oxides (point source emissions only) from facilities operating on natural gas and from diesel engines

According to the results of the model run for nitrous oxide emissions from the facility and from the background (point source emissions only) (Table 4.1.4-6) it may be seen that the results are similar to the results without the background. According to the model run results, similar to the results of the model run without the facilities operating on natural gas, the area in which the maximum values were found is located at a distance of about 500 meters and is spread over a region of about 18 dunams.

Emissions under future routine operating conditions (the years 2025+)

Emissions of nitrous oxides from facilities operating on natural gas

According to the results of the model run for the emissions of the nitrous oxides pollutant from the natural gas treatment facility according to the future scenario

(Table 4.1.4-10), it may be seen that the results are similar to those of the first years of the treatment facility operation (the first 8 years) during which the compressors will not be activated.

Summary of NO_X

According to the model run results it may be concluded that the impact of the emissions of the NO_X pollutant from the natural gas treatment facility during the period 2016-2024 and from its future operation after the year 2025, is moderate.

Sulfur Dioxide SO_2

Emissions under routine operating conditions (the years 2016-2024)

Sulfur dioxide emissions from the facility and from diesel engines

According to the model run results for the emissions of sulfur dioxide from the facility and from diesel engines (Table 4.1.4-4), no deviations were found from the threshold values and the results of maximum values are also very low (lower than 7% of the threshold values).

Emission of background sulfur dioxide from facilities operating on natural gas and from diesel engines

Results of the model run for sulfur dioxide emissions from the facility and from diesel engines and the background emissions (Table 4.1.4-7) indicate that there are a number of deviations from the environment and target values. Despite this, however, the run from the facility itself did not indicate any deviation. Accordingly, we may determine that the impact of the facility's operation is very low.

Emissions under future routine operating conditions (the years 2025+)

Emissions of sulfur dioxide from facilities operating on natural gas

According to the results of the model run for the emissions of the sulfur dioxide pollutant from the natural gas treatment facility according to the future scenario (Table 4.1.4-11) no deviations were found from the threshold values and the results of the maximum values were also very low (less than 2% of the environmental value).

Summary of SO_2

According to the model run results it may be concluded that the impact of the emissions of the SO_2 pollutant from the natural gas treatment facility during the period 2016-2024 and from its future operation after the year 2025, is very low.

Summary

It may be concluded and stated that the impact of facilities operating on natural gas and the operation of gas engines as regards all of the pollutants examined (particulates, nitrous oxides and sulfur dioxide) in the plan area on the environment is very low to moderate.

It is important to note that in a number of cases that were examined, various attenuation means that will make it possible to conform to the TA Luft 2002 standards were taken into consideration. Moreover, when implementing the plan the contractor will be required to conform to these emission standards or to any other up-to-date emissions standard that will be acceptable to the Ministry of Environmental Protection and will be required to consider the use of the best attenuation technology available (BAT).

Results of the AERMOD model run for routine operating conditions are presented also by means of isopleths and lattices in Appendix F.

4.1.6. Malfunctions or system failure

Malfunctions are defined as events in which one increased emission of pollutants through the flare into the atmosphere may be expected. In such cases, the Flare Gas Recovery Unit (FGRU) will not be operated and the emissions will be discharged directly into the atmosphere. Details of the FGRU facility may be seen in Appendix B.

Most cases of malfunction will end in increased emissions of flue gases through the flare in a process involving increased pressure release (over-pressure relief) or the emptying of gas from the piping (blowdown). The removal of the gas and its combustion through the flare is a safe way for removing gases from the facility. Details regarding cases of malfunction may be seen in Section 15.6.6 of Appendix B.

4.1.7. Description of the state of air quality in the case of a malfunction

As stated above, cases of malfunctions that may occur are listed in Table 4.1.1-11 and described in the plan documents in Section 15.6.6 of Appendix B. Out of all these malfunction scenarios, the Ministry of Environmental Protection has selected and approved the worst cases of malfunction. The cases of malfunction selected and examined in this chapter are:

- **Release of gas from the pressure vent in the HP flare and the LP flare (LP Flare PSV Lift and HP Flare PSV Lift)**

  In the event of gas release from the HP flare blow-off valve, the emission rate is the highest among all malfunction cases. However, since in addition malfunction case it is possible that pollutants may be emitted simultaneously from the LP flare as well, emissions from this flare as well were taken into consideration.

- **Operational malfunction**

  In the event of an operational malfunction, the duration of pollutant emissions is the longest from among all malfunction cases (extending over 10 days) and for this reason it may be assumed that the quantity of emissions in such a case will be the highest from among all the malfunction scenarios. For this reason, this malfunction case was selected.

As stated above, an operational malfunction is one in which the emission rate is constant but continues over a time period exceeding two hours (for example, over 10 days – see Table 4.1.1-11). For this reason, in order to examine the dispersion of pollutants emitted in a malfunction of this type, the model that is most appropriate is that of AERMOD and CALPUFF. In order to model the pollutants emitted during an operational malfunction, both the AERMOD model and the CALPUFF model were used as will be explained below.

Malfunctions of a type involving the release of gas from the HP flare blow-off valve and from the LP Flare blow-off valve (HP Flare PSV Lift and LP Flare PSV Lift) are malfunctions that are characterized by high quantities of emissions over a short time (up to two hours – see Table 4.1.1-11). Increased emissions for short time periods are usually characterized by a cloud that advances with the direction of the wind (puff). In order to examine the dispersion of pollutants in malfunction cases of this type, the most appropriate model is that of the CALPUFF.

Input data for the CALPUFF model

Meteorological data:

The meteorological file (WRF) for the worst day (worst case scenario) was input into the model as taken from the pollutants dispersion that occurred on July 18, 2008. Also input were meteorological data for July 18, 2008 taken from the stations of Ein HaShofet and Elyakim.

Land uses

A land uses file taken from the following website was also input into the model: http://edc2.usgs.gov/glcc/tablambert_euras_eur.php

Topography:

Topography files from the following website were also input into the model: http://dds.cr.usgs.gov/srtm/verstion2_1/SRTM3/Africa/

Scenarios on which the models will be run

In cases of malfunction, no emissions are expected from facilities operating on natural gas, but there is a possibility of emissions from diesel engines. For this reason, the scenarios that will be examined for a case of malfunction (via the AERMOD model) are:

Scenarios for operational malfunction:

- Emissions from a natural gas treatment facility (from the HP flare and diesel engines) during the malfunction only.
- Emissions from a natural gas treatment facility (from the HP flare and diesel engines) during the malfunction and from the background (point source emissions).

The scenarios to be run on the CALPUFF model for malfunctions of gas release from the blow-off valves of the HP and LP flares are:

- Emissions from the natural gas treatment facility (from the LP and HP flares and from the diesel engines) during the malfunction only.
- Emissions from the natural gas treatment facility (from the LP and HP flares and from the diesel engines) during the malfunction and background emissions (point source emissions).

Results of the model runs for the operational malfunction scenarios (which were run using the AERMOD model) are presented in Tables 4.1.7-1 to 4.1.7-4 and the results of the model runs for the malfunction scenarios of gas release from the blow-out valves of the HP and LP flares (which were run using the CALPUFF model) are presented in Tables 4.1.7-5 to 4.1.7-8. Moreover, an operational malfunction scenario was also run for the NO_x pollutant using the CALPUFF program and its results are presented in Tables 4.1.7-9 to 4.1.7-10.

Results of the model run for the nitrous oxides NO_X pollutant in a state of operational malfunction

Table 4.1.7-1: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a State of Malfunction – from the Flare and Diesel Engines Only

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
	Location of maximum values for half-hourly averaging time	204459	728186	1719.4	182.9	1718.4	182.8						
	Location of maximum values for 24-hour averaging time	206959	728186					219.0	39.1	192.8	34.4		
	Location of maximum values for annual averaging times	205459	725186									25.5	85.0
1	Elyakim	206500	726500	219.9	23.4	219.7	23.4	32.7	5.8	29.4	5.3	3.1	10.2

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
2	Zichron Yaakov	195900	719900	46.3	4.9	44.8	4.8	10.5	1.9	9.7	1.7	0.9	3.0
3	Kerem Maharal	199100	728400	50.7	5.4	49.2	5.2	2.9	0.5	2.5	0.4	0.1	0.4
4	Daliyat al-Karmel	206900	731900	83.2	8.8	83.0	8.8	4.2	0.7	3.9	0.7	0.3	0.9
5	Amikam	202200	719100	60.3	6.4	57.2	6.1	4.3	0.8	4.2	0.8	0.2	0.6
6	Ein HaShofet	209300	723300	490.0	52.1	489.5	52.1	60.9	10.9	59.2	10.6	5.8	19.5
7	Yokneam	211097	728548	50.1	5.3	50.0	5.3	6.4	1.1	5.6	1.0	0.7	2.3
8	El-Fureidis	195776	722763	50.3	5.3	49.9	5.3	8.1	1.5	7.6	1.4	0.8	2.8
9	Bat Shlomo	200558	722939	67.1	7.1	66.8	7.1	13.3	2.4	13.3	2.4	1.6	5.4
10	Even Yitzhak	207558	717994	57.3	6.1	51.1	5.4	6.0	1.1	5.0	0.9	0.3	0.9
11	Givat Nili	204047	717167	48.2	5.1	39.1	4.2	3.8	0.7	2.8	0.5	0.1	0.4
12	Mishmar HaEmek	213758	724165	47.3	5.0	46.9	5.0	8.2	1.5	6.4	1.1	0.7	2.5

Table 4.1.7-2: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a State of Malfunction - from the Flare, Diesel Engines and Background (Point Source Emissions)

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	**Location**	**X**	**Y**	**Maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Second maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Second maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**Maximum annual concentration mcg/m³**	**% of annual target value %**
	Location of maximum values for half-hourly averaging time	204459	728186	.17195	182.9	.17185	182.8						
	Location of maximum values for 24-hour averaging time	206959	728186					220.2	39.3	194.0	34.6		
	Location of maximum values for annual averaging times	205459	725186									27.0	90.1

Standard					Environment 940		Environment 940		Environment 560		Environment 560		Target 30
Serial No.	Location	X	Y	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Second maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	Maximum annual concentration mcg/m³	% of annual target value %
1	Elyakim	206500	726500	219.9	23.4	219.7	23.4	33.6	6.0	30.5	5.4	3.6	12.0
2	Zichron Yaakov	195900	719900	53.9	5.7	52.9	5.6	11.1	2.0	11.1	2.0	1.2	4.1
3	Kerem Maharal	199100	728400	52.1	5.5	50.3	5.4	4.0	0.7	3.2	0.6	0.2	0.8
4	Daliyat al-Karmel	206900	731900	239.5	25.5	238.8	25.4	35.9	6.4	33.2	5.9	2.9	9.8
5	Amikam	202200	719100	60.7	6.5	57.9	6.2	5.5	1.0	5.2	0.9	0.3	1.1
6	Ein HaShofet	209300	723300	490.0	52.1	489.5	52.1	62.5	11.2	62.0	11.1	7.0	23.2
7	Yokneam	211097	728548	55.3	5.9	55.1	5.9	6.8	1.2	6.7	1.2	1.1	3.7
8	El-Fureidis	195776	722763	51.1	5.4	50.8	5.4	10.0	1.8	9.0	1.6	1.2	4.0
9	Bat Shlomo	200558	722939	68.2	7.3	67.8	7.2	15.0	2.7	14.7	2.6	2.1	6.9
10	Even Yitzhak	207558	717994	58.5	6.2	57.7	6.1	6.7	1.2	6.0	1.1	0.4	1.2
11	Givat Nili	204047	717167	48.3	5.1	40.7	4.3	4.1	0.7	3.4	0.6	0.2	0.7
12	Mishmar HaEmek	213758	724165	52.9	5.6	48.7	5.2	9.1	1.6	7.5	1.3	1.2	3.9

Results of the model run for the nitrous oxides SO_2 pollutant in a state of operational malfunction

Table 4.1.7-3: Results of the Model Run for the Sulfur Dioxide SO_2 Pollutant in a State of Malfunction - from the Flare and Diesel Engines Only

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values 10 minutes and hourly averaging times	204459	728186	26.0	5.2	26.0	5.2	18.2	5.2	18.2	5.2										
	Location of maximum values for annual averaging time	205459	725186																	0.3	0.1
	Location of maximum values for 24-hour and hourly and 99.9	206959	728186									15.3	4.4	2.7	2.1	13.3	2.3	1.9	11.7		

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	percentiles averaging time																				
1.	Elyakim	206500	726500	3.3	0.7	3.3	0.7	2.3	0.7	2.3	0.7	2.0	0.6	0.4	0.3	2.0	0.4	0.3	1.8	0.0	0.1
2.	Zichron Yaakov	195900	719900	0.7	0.1	0.7	0.1	0.5	0.1	0.5	0.1	0.4	0.1	0.1	0.1	0.6	0.1	0.1	0.6	0.0	0.0
3.	Kerem Maharal	199100	728400	0.8	0.2	0.7	0.1	0.5	0.2	0.5	0.1	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0
4.	Daliyat al-Karmel	206900	731900	1.3	0.3	1.2	0.2	0.9	0.2	0.9	0.2	0.4	0.1	0.1	0.0	0.3	0.0	0.0	0.2	0.0	0.0
5.	Amikam	202200	719100	0.9	0.2	0.9	0.2	0.6	0.2	0.6	0.2	0.2	0.2	0.1	0.0	0.3	0.0	0.0	0.2	0.0	0.0
6.	Atlit	209300	723300	7.4	1.5	7.4	1.5	5.2	1.5	5.2	1.5	4.5	2.3	0.7	0.6	3.7	0.7	0.6	3.6	0.1	0.1
7.	Ein Ayala	211097	728548	0.8	0.2	0.8	0.2	0.5	0.2	0.5	0.1	0.3	0.1	0.1	0.1	0.4	0.1	0.1	0.3	0.0	0.0
8.	Fureidis	195776	722763	0.8	0.2	0.7	0.1	0.5	0.2	0.5	0.1	0.4	0.1	0.1	0.1	0.5	0.1	0.1	0.5	0.0	0.0
9.	Binyamina	200558	722939	1.0	0.2	1.0	0.2	0.7	0.2	0.7	0.2	0.4	0.1	0.2	0.1	0.8	0.2	0.1	0.8	0.0	0.0
10.	Bat Shlomo	207558	717994	0.9	0.2	0.8	0.2	0.6	0.2	0.5	0.2	0.4	0.1	0.1	0.1	0.3	0.1	0.0	0.3	0.0	0.0
11.	Ramot Menashe	204047	717167	0.7	0.1	0.6	0.1	0.5	0.1	0.4	0.1	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
12.	Migdal HaEmek	213758	724165	0.7	0.1	0.7	0.1	0.5	0.1	0.5	0.1	0.3	0.1	0.1	0.1	0.5	0.1	0.1	0.4	0.0	0.0

Table 4.1.7-4: Results of the Model Run for the Sulfur Dioxide SO_2 Pollutant in a State of Malfunction - from the Flare, Diesel Engines and Background (Point Source Emissions Only)

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentrationmcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m³	% of annual environmental value %
	Location of maximum values for all averaging times	196959	731686	1222.7	244.5	1207.0	241.4	854.5	244.1	843.5	241.0	654.3	186.9	166.5	133.2	832.6	128.4	102.7	641.8	19.0	31.7
1.	Elyakim	206500	726500	30.3	6.1	27.8	5.6	21.2	6.1	19.4	5.6	6.4	1.8	1.1	0.9	5.7	1.1	0.9	5.7	0.2	0.3
2.	Zichron Yaakov	195900	719900	35.1	7.0	34.9	7.0	24.5	7.0	24.4	7.0	11.7	3.3	2.7	2.2	13.6	2.5	2.0	12.6	0.3	0.5
3.	Kerem Maharal	199100	728400	41.7	8.3	40.6	8.1	29.2	8.3	28.3	8.1	16.2	4.6	3.3	2.6	16.3	2.0	1.6	9.8	0.1	0.2
4.	Daliyat al-Karmel	206900	731900	46.6	9.3	46.5	9.3	32.6	9.3	32.5	9.3	30.7	8.8	5.2	4.1	25.8	5.1	4.1	25.6	0.4	0.7
5.	Amikam	202200	719100	27.3	5.5	27.2	5.4	19.1	5.4	19.0	5.4	17.4	5.0	5.3	4.2	26.3	4.6	3.6	22.8	0.4	0.7
6.	Atlit	209300	723300	266.2	53.2	265.9	53.2	186.0	53.1	185.8	53.1	169.9	48.5	25.9	20.7	129.3	23.1	18.5	115.4	2.6	4.4
7.	Ein Ayala	211097	728548	40.9	8.2	38.2	7.6	28.6	8.2	26.7	7.6	15.5	4.4	2.7	2.1	13.3	2.6	2.1	13.0	0.4	0.7
8.	Fureidis	195776	722763	36.3	7.3	36.0	7.2	25.3	7.2	25.1	7.2	17.1	4.9	2.7	2.2	13.7	2.7	2.2	13.7	0.2	0.4
9.	Binyamina	200558	722939	28.2	5.6	27.7	5.5	19.7	5.6	19.3	5.5	13.2	3.8	2.0	1.6	10.1	1.9	1.5	9.6	0.3	0.5

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 350		Environment 125	Target 20		Environment 125	Target 20		Environment 60
Serial No.	Location	X	Y	Maximum 10-minute concentrationmcg/m^3	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m^3	% of 10-minute environmental value %	Maximum hourly concentration mcg/m^3	% of hourly environmental value %	Second maximum hourly concentration mcg/m^3	% of hourly environmental value %	Hourly Percentile 99.9 mcg/m^3	% of hourly environmental value %	Maximum 24-hour concentration mcg/m^3	% of 24-hour environmental value %	% of 24-hour target value %	Second concentration 24 hours - mcg/m^3	% of 24-hour environmental value %	% of 24-hour target value %	Maximum annual concentration mcg/m^3	% of annual environmental value %
10.	Bat Shlomo	207558	717994	32.4	6.5	31.6	6.3	22.7	6.5	22.1	6.3	10.7	3.0	3.2	2.5	15.9	2.0	1.6	9.8	0.1	0.1
11.	Ramot Menashe	204047	717167	26.1	5.2	25.2	5.0	18.2	5.2	17.6	5.0	14.1	4.0	2.9	2.3	14.5	2.6	2.1	13.2	0.1	0.2
12.	Migdal HaEmek	213758	724165	27.1	5.4	25.6	5.1	18.9	5.4	17.9	5.1	15.1	4.3	2.8	2.2	13.9	2.5	2.0	12.5	0.3	0.5

Results of the model run for the nitrous oxides NO_X pollutant in a malfunction state of gas discharge from the blow-out valve in the HP and LP Flares

Table 4.1.7-5: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a State of Malfunction - from the HP and LP Flares and Diesel Engines Only

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X Coordinate	Y Coordinate	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
	Location of maximum values for the second half-hourly and 24-hourly averaging time	692625	3611125			726.0	77.2	149.2	26.7
	Location of maximum values for the maximum half-hourly averaging time	692625	3611375	792.5	84.3				
1	Elyakim	693852	3612473	130.0	13.8	112.3	12.0	12.37	2.2

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X Coordinate	Y Coordinate	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
2	Zichron Yaakov	683390	3605654	0.0	0.0	0.0	0.0	0.00	0.0
3	Kerem Maharal	686413	3614219	0.0	0.0	0.0	0.0	0.00	0.0
4	Daliyat al-Karmel	694139	3617880	0.0	0.0	0.0	0.0	0.00	0.0
5	Amikam	689706	3604985	0.0	0.0	0.0	0.0	0.00	0.0
6	Ein HaShofet	696718	3609332	38.3	4.1	26.8	2.9	4.41	0.8
7	Yokneam	698406	3614616	29.4	3.1	28.7	3.1	4.95	0.9
8	El-Fureidis	683208	3608514	0.0	0.0	0.0	0.0	0.00	0.0
9	Bat Shlomo	687984	3608789	0.0	0.0	0.0	0.0	0.00	0.0
10	Even Yitzhak	695086	3603991	0.0	0.0	0.0	0.0	0.00	0.0
11	Givat Nili	691593	3603091	0.0	0.0	0.0	0.0	0.00	0.0
12	Mishmar HaEmek	701157	3610289	20.7	2.2	16.7	1.8	3.46	0.6

Table 4.1.7-6: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a State of Malfunction - from the HP and LP Flares, Diesel Engines and from the Background Emissions (Point Source Emissions)

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X Coordinate	Y Coordinate	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
	Location of maximum values for the second half-hourly and 24-hourly averaging time	692625	3611125			726.0	77.2	150.9	26.9
	Location of maximum values for the maximum half-hourly averaging time	692625	3611375	823.3	87.6				
1	Elyakim	693852	3612473	163.4	17.4	136.5	14.5	17.5	3.1
2	Zichron Yaakov	683390	3605654	0.0	0.0	0.0	0.0	0.0	0.0
3	Kerem Maharal	686413	3614219	6.8	0.7	2.6	0.3	0.4	0.1
4	Daliyat al-Karmel	694139	3617880	0.1	0.0	0.0	0.0	0.0	0.0

Standard					Environment 940		Environment 940		Environment 560
Serial No.	**Location**	**X Coordinate**	**Y Coordinate**	**Maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Second maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**
5	Amikam	689706	3604985	0.0	0.0	0.0	0.0	0.0	0.0
6	Ein HaShofet	696718	3609332	53.9	5.7	39.2	4.2	7.2	1.3
7	Yokneam	698406	3614616	41.1	4.4	35.3	3.8	7.4	1.3
8	El-Fureidis	683208	3608514	0.0	0.0	0.0	0.0	0.0	0.0
9	Bat Shlomo	687984	3608789	0.1	0.0	0.0	0.0	0.0	0.0
10	Even Yitzhak	695086	3603991	0.2	0.0	0.2	0.0	0.0	0.0
11	Givat Nili	691593	3603091	0.0	0.0	0.0	0.0	0.0	0.0
12	Mishmar HaEmek	701157	3610289	24.0	2.6	22.9	2.4	5.0	0.9

Table 4.1.7-7: Results of the Model Run for the Sulfur Dioxide SO_2 Pollutant in a State of Malfunction - from the HP and LP Flares and Diesel Engines Only

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 125	Target 20
Serial No.	Location	X	Y	Maximum 10-minute concentrationmcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %
	Location of maximum values of second 10 minutes, second hourly and daily averaging times	692625	3611125			9.1	1.8			6.4	1.8	1.5	1.2	7.6
	Location of maximum values for maximum hourly and 10-minute averaging time	692625	3611375	9.9	2.0			6.9	2.0					
1.	Elyakim	693852	3612473	1.6	0.3	1.3	0.3	1.1	0.3	0.9	0.3	0.1	0.1	0.6
2.	Zichron Yaakov	683390	3605654	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.	Kerem Maharal	686413	3614219	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.	Daliyat al-Karmel	694139	3617880	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 125	Target 20
Serial No.	Location	X	Y	Maximum 10-minute concentrationmcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentrationmcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %
5.	Amikam	689706	3604985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.	Atlit	696718	3609332	0.5	0.1	0.3	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.2
7.	Ein Ayala	698406	3614616	0.4	0.1	0.4	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.2
8.	Fureidis	683208	3608514	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.	Binyamina	687984	3608789	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	Bat Shlomo	695086	3603991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.	Ramot Menashe	691593	3603091	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.	Migdal HaEmek	701157	3610289	0.2	0.0	0.2	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2

Table 4.1.7-8: Results of the Model Run for the Sulfur Dioxide SO_2 Pollutant in a State of Malfunction - from the HP and LP Flares, Diesel Engines and the Background (Point Source Emissions

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 125	Target 20
Serial No.	Location	X	Y	Maximum 10-minute concentration mcg/m³	% of 10-minute target value %	Second concentration - Maximum 10-minute concentration mcg/m³	% of 10-minute environmental value %	Maximum hourly concentration mcg/m³	% of hourly environmental value %	Second maximum hourly concentration mcg/m³	% of hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %	% of 24-hour target value %
	Location of maximum values of second 10 minutes, second hourly and daily averaging times	697625	3615625			163.2	32.6			114.0	32.6			
	Location of maximum values for maximum hourly and 10-minute averaging time	684375	3617625	264.2	52.8			184.7	52.8					
1.	Elyakim	693852	3612473	10.1	2.0	8.2	1.6	7.0	2.0	5.7	1.6	1.2	0.9	5.9

Standard					Target - 500		Target - 500		Environment 350		Environment 350		Environment 125	Target 20
Serial No.	**Location**	**X**	**Y**	**Maximum 10-minute concentration mcg/m³**	**% of 10-minute target value %**	**Second concentration - Maximum 10-minute concentration mcg/m³**	**% of 10-minute environmental value %**	**Maximum hourly concentration mcg/m³**	**% of hourly environmental value %**	**Second maximum hourly concentration mcg/m³**	**% of hourly environmental value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**	**% of 24-hour target value %**
2.	Zichron Yaakov	683390	3605654	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.	Kerem Maharal	686413	3614219	20.1	4.0	7.9	1.6	14.1	4.0	5.5	1.6	0.9	0.7	4.3
4.	Daliyat al-Karmel	694139	3617880	0.2	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1
5.	Amikam	689706	3604985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.	Atlit	696718	3609332	24.9	5.0	5.4	1.1	17.4	5.0	3.7	1.1	2.1	1.6	10.3
7.	Ein Ayala	698406	3614616	11.7	2.3	7.0	1.4	8.2	2.3	4.9	1.4	1.3	1.1	6.6
8.	Fureidis	683208	3608514	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.	Binyamina	687984	3608789	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.	Bat Shlomo	695086	3603991	0.6	0.1	0.5	0.1	0.4	0.1	0.4	0.1	0.0	0.0	0.2
11.	Ramot Menashe	691593	3603091	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.	Migdal HaEmek	701157	3610289	3.3	0.7	2.7	0.5	2.3	0.7	1.9	0.5	0.6	0.5	3.0

Results of the model run for the nitrous oxides NO_X pollutant in a state of operational malfunction by running the CALPUFF model

<u>Table 4.1.7-9: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a state of Operational Malfunction - from the Flare and Diesel Engines Only</u>

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X (UTM)	Y (UTM)	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
	Location of maximum values for the maximum half-hourly and daily averaging time	692125	3611125	215.8	23.0			47.4	8.5
	Location of maximum values for the second half-hourly averaging time	692625	3611125			176.8	18.8		
1	Beit Eliezer	693852	3612473	31.8	3.4	26.7	2.8	3.7	0.7
2	Hadera	683390	3605654	0.0	0.0	0.0	0.0	0.0	0.0
3	Hadera-Association	686413	3614219	0.0	0.0	0.0	0.0	0.0	0.0

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X (UTM)	Y (UTM)	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
4	Netanya	694139	3617880	0.0	0.0	0.0	0.0	0.0	0.0
5	Pardes Hanna	689706	3604985	0.0	0.0	0.0	0.0	0.0	0.0
6	Elyachin	696718	3609332	9.4	1.0	8.9	1.0	1.7	0.3
7	Gan Shmuel	698406	3614616	7.2	0.8	6.8	0.7	1.3	0.2
8	HaMa'apil	683208	3608514	0.0	0.0	0.0	0.0	0.0	0.0
9	Magal	687984	3608789	0.0	0.0	0.0	0.0	0.0	0.0
10	Givat Haim	695086	3603991	0.0	0.0	0.0	0.0	0.0	0.0
11	Sdeh Yitzhak	691593	3603091	0.0	0.0	0.0	0.0	0.0	0.0
12	Sha'ar Menashe	701157	3610289	4.0	0.4	4.0	0.4	0.9	0.2

Table 4.1.7-10: Results of the Model Run for the Nitrous Oxides NO_X Pollutant in a state of Operational Malfunction - from the Flare, Diesel Engines and Background (Point Source Emissions)

Standard					Environment 940		Environment 940		Environment 560
Serial No.	Location	X (UTM)	Y (UTM)	Maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Second maximum half-hourly concentration mcg/m³	% of half-hourly environmental value %	Maximum 24-hour concentration mcg/m³	% of 24-hour environmental value %
	Location of maximum values for the maximum half-hourly averaging time	692625	3611375	381.7	40.6				
	Location of maximum values for the 24-hourly and second half-hourly averaging time	692625	3611125			350.1	37.2	76.9	13.7
1	Elyakim	693852	3612473	62.7	6.7	50.4	5.4	6.4	1.1

Standard					Environment 940		Environment 940		Environment 560
Serial No.	**Location**	**X (UTM)**	**Y (UTM)**	**Maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Second maximum half-hourly concentration mcg/m³**	**% of half-hourly environmental value %**	**Maximum 24-hour concentration mcg/m³**	**% of 24-hour environmental value %**
2	Zichron Yaakov	683390	3605654	0.0	0.0	0.0	0.0	0.0	0.0
3	Kerem Maharal	686413	3614219	0.0	0.0	0.0	0.0	0.0	0.0
4	Daliyat al-Karmel	694139	3617880	0.0	0.0	0.0	0.0	0.0	0.0
5	Amikam	689706	3604985	0.0	0.0	0.0	0.0	0.0	0.0
6	Atlit	696718	3609332	18.4	2.0	12.6	1.3	2.5	0.5
7	Ein Ayala	698406	3614616	14.1	1.5	13.5	1.4	2.5	0.4
8	Fureidis	683208	3608514	0.0	0.0	0.0	0.0	0.0	0.0
9	Binyamina	687984	3608789	0.0	0.0	0.0	0.0	0.0	0.0
10	Bat Shlomo	695086	3603991	0.0	0.0	0.0	0.0	0.0	0.0
11	Ramot Menashe	691593	3603091	0.0	0.0	0.0	0.0	0.0	0.0
12	Migdal HaEmek	701157	3610289	7.9	0.8	7.9	0.8	1.7	0.3

Results of the model run during a state of operational malfunction

- **Emissions of nitrous oxides during an operational malfunction**

Emissions of nitrous oxides from the flare and the facilities operating on diesel engines

According to the results of the model run for emissions of nitrous oxides from the flare and from the facilities operating on diesel engines (Table 4.1.7-1), there are deviations in the maximum values. The deviations found are in the maximum values of the maximum half-hourly time intervals and the second maximum half-hourly time intervals and are 83% of the threshold values.

The area of the deviation spreads between the northwest of Yokneam Illit (1.5 km northwest of Yokneam) and to the south of Daliyat al-Karmel (2.5 km to the south of Daliyat al-Karmel), and therefore we may state that the deviations from nitrous oxides pollutant are high.

Nitrous oxide emissions from the flare, diesel engines and background

Results of the model run for emissions of nitrous oxides from the flare, diesel engines and background, the results of which are presented in Table 4.1.7-2, are similar to those of the background (point source emissions) when the facility is not operating (about 83% of the half-hourly threshold value).

As stated above, it may be concluded from the results of the model run for the case of an operational malfunction that the impact of the emission of nitrous oxides on the environment is high.

In view of the results for emissions of the nitrous oxides pollutant during an operational malfunction derived from the AERMOD model, this scenario was also run using the CALPUFF model and its results are presented in Tables 4.1.7-9 and 4.1.7-10. According to the CALPUFF model results, no deviations from the threshold values were found and even the maximum values did not exceed 23% of the threshold values in the scenario involving emissions from the flare and diesel engines only, and 41% in the scenario of emissions from the flare, diesel engines and the background (point source emissions only). Therefore, according to the CALPUFF model the nitrous oxide pollutant has a low impact on the environment.

Possible explanations for the difference in the results include the following:

- The AERMOD can be fed with a flare emissions speed of up to 50 m/sec while there is no such limitation in the CALPUFF program.
- The topography of the area under examination is a complex topography, for which the AERMOD program is less appropriate as compared with the CALPUFF program, which is more suitable for areas with a complex topography.

Therefore, in our estimation the CALPUFF program results may be adopted, and we may conclude that the impact of the NO_X pollutant emissions on the environment during an operational malfunction is low.

- **Emissions of sulfur dioxide during an operational malfunction**

According to the results of the model run for sulfur dioxide during an operational malfunction (Tables 4.1.7-2 to 4.1.7-4) there were no deviations in the run of emissions from the flare and diesel engines (the maximum result was 5.2% of the hourly threshold value and of the 10-minute time interval value). By comparison, when the model was run for sulfur dioxide emissions from the flare, diesel engines and the background, deviations were found in all maximum values. When the model was run for emissions of sulfur dioxide from the background only, similar or even higher deviations were found. Therefore, the conclusion to be drawn is that the impact of emissions during an operational malfunction as regards the sulfur dioxide pollutant from the natural gas treatment facility only, is very low.

Results of the model run for the malfunction of gas release from the blow-out valves of the HP and LP flares

- **Emissions of nitrous oxides during a malfunction of gas release from the blow-out valves of the HP and LP flares**

Emissions of nitrous oxides from the HP and LP flares and from the facilities operating on diesel engines

According to the model run results for the malfunction of gas release from the blow-out valve of the HP and LP flares from the flare and the diesel engines as presented in Table 4.1.7-5, no deviations were found in the nitrous oxides pollutant. The maximum results found were for the maximum half-hourly time averages and the second half-hourly time average, where the results were 84% and 77% of the environmental half-hourly threshold value, respectively. According to the model run results maximum half-hourly values exceeding 50% of threshold values are spread over an area of approximately 13 dunams at a distance of about 700 meters east of the plan area. The deviation area is spread over a few dunams.

Emissions of nitrous oxides from the HP and LP flares and from the facilities operating on diesel engines and background emissions (point source emissions)

According to the model run results for the malfunction of gas release from the blow-out valve of the HP and LP flares from the flare and the diesel engines and the background emissions (point source emissions), as presented in Table 4.1.7-6, the result were similar to those found without the background. The maximum results found were for the maximum half-hourly time averages and the second half-hourly time average, where the results were 88% and 77% of the environmental half-hourly threshold value, respectively. According to the model run results maximum half-hourly values exceeding 50% of threshold values are spread over an area of approximately 15 dunams at a distance of about 600 meters east of the plan area.

It may therefore be stated that the impact of nitrous oxide emissions during a malfunction involving the release of gas from a blow-out valve in the HP and LP flares is higher, but is only spread over an area of a few dunams.

Emissions of sulfur dioxide from the HP and LP flares and from the facilities operating on diesel engines

According to the results of the model run for the malfunction of gas release from a blow-out valve in the HP and LP flares, from the flare and from diesel engines as listed in Table 4.1.7-7, no deviations were found in the sulfur dioxide pollutant and the results also indicated negligible values (maximum values of up to 2% of the threshold values).

Emissions of sulfur dioxide from the HP and LP flares and from the facilities operating on diesel engines and background emissions (point source emissions)

According to the CALPUFF model run for the sulfur dioxide pollutant from the HP and LP flares, from facilities operating on diesel engines and from background emissions (point source emissions) as listed in Table 4.1.7-8, no deviant results were found. The maximum values found were up to 53% from the threshold values. As stated above, according to the results of the model run based on the plan only, in a state of malfunction and the background results only in Chapter A of this survey, we may conclude that the impact of the sulfur dioxide pollutant on the environment from the natural gas treatment facility during a malfunction is low.

Summary of malfunction cases

The following is a summary of the malfunction cases for the various states:

Operational malfunction

- In the event of an operational malfunction, the pollutant sulfur dioxide and the pollutant nitrous oxides have a low impact on the environment.
- In the event of a malfunction involving the release of gas from a blow-out valve in the HP and LP flares, the pollutant sulfur dioxide has a low impact on the environment, while the pollutant nitrous oxide has a high impact on the environment, in an area spread over just a few dunams, and a medium impact in an area spread over about 15 dunams, at a distance of about 600-700 meters from the plan area.

Results of running the AERMOD and CALPUFF models for malfunction states are presented by means of isopleths and lattices as well in Appendix F.

4.1.8. Means of preventing leaks and control systems

As part of the routine operation of the facility for the treatment of emission gases, fugitive emissions may occur from equipment and from the connections between pipes. These leaks are emitted from microscopic apertures through which the natural gas in the system is emitted, and may also occur in valves and flanges. The amount of such leaks is estimated at about 10-100 kg per year. These leaks are non-threatening from a safety point of view, but the contractor must adopt the best technologies (BAT) in order to minimize such fugitive emissions. The means for preventing leaks and the control systems involved in their prevention include:

1. Minimizing fugitive emission sources via welding connections instead of using flanges, and thereby reducing the number of flanges. However, it should be noted that this approach does not make it possible to open the piping for maintenance purposes (see an extended discussion in Section 15.6.8 of Appendix B). Therefore, the future supplier must decide the quantity of connectors and the quantity of welds that should be used on the basis of design considerations.
2. Current maintenance of connectors and valves.
3. Implementation of control systems capable of identifying leaks. Such systems and the frequency of their use will be guided by the guidelines included in the relevant BREF[23] documents.

In addition, various means for preventing leaks and control systems are detailed in Sections 3.3.3 and 4.11.1 below.

4.1.9. Gas combustion system

As part of the treatment of natural gas, it will be necessary in certain cases to remove surplus gas from the overpressure protection system. For this reason, it is necessary to establish a gas removal system within the plan area. Gas surpluses may be removed by means of a vent or a flare (see at length in Section 14.1 of Appendix B).

In the intended gas treatment facility, surplus gases generated by the treatment process will be returned to the system via FGRU technology (which constitutes part of the flare system). Increased gas surpluses emitted in cases of malfunction (as detailed in Table 4.1.1-11) will be removed via the flare. This decision mainly arises from environmental reasons. When using a vent most of the emissions are methane gas, while when using the flare the emissions are combustion products and therefore the main gas emitted is carbon dioxide. Methane is liable to

[23] Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for Mineral Oil and Gas Refineries, February, 2003.

contribute to the greenhouse effect 25 to 75 times more than carbon dioxide (see detailed explanation in Section 14.3 of Appendix B). As regards the safety restrictions and the specifications proposed for the flare, see details in Section 3.4.7 above.

In the past, the flare included a small burner where a flame was always burning so that when needed, when the gas was released through the flare (blowdown event) it ignited. One of the drawbacks of this ignition method is the appearance of the constantly burning flame that can be seen at a great distance. It should be noted that we can consider a pilot in this context. There are means for concealing the fire during routine working conditions.

In the intended facility the flare will be utilized with an on-demand ignition system. According to this method, the flare does not burn except in cases where gas is released through the flare (blowdown event).

The flare system comprises the following facilities:

- HP Flare
- LP Flare
- Atmospheric Flare
- Flare Gas Recycling Unit (FGRU)

  Details and explanations regarding each of the facilities may be seen in Sections 14.5 to 14.9 of Appendix B.

4.1.10. Magnetic media

Magnetic media data comprising the input data of calculations, calculation results and the meteorological data files are enclosed separately with this document and are enclosed as digital files (see Appendix E).

4.2. Zoning, Uses and Activities

4.2.1. Damage to land uses and zoning

A survey of land uses and zoning within the plan area and the detailed survey area is provided at length in Chapter A of the Impact Survey. Reference to activities and land uses and zoning that are liable to be harmed as a consequence of the plan's implementation was made vis-à-vis land uses and zoning in approved detailed plans, master plans and plans in preparation. The restrictions arising from the various facility parts are detailed below:

- **Block valve stations**
- **Gas piping**
- **Gas treatment facility (including the INGL facility)**

The following is a survey of uses and zoning within the plan area and the impact of plan implementation on them:

Table 4.2.1-1: Impact of the Plan on Land Uses

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
Coastal entry array			
Bathing beach	Undeclared and unorganized bathing beach	Within the coastal entry array	No impact expected on condition that the plan developer will conform to the criteria for personal and group risk and will perform a statistical risks survey if needed, as required in IS 5664 Part 2.
Fish pools	Fish pools	Within the coastal entry array	- The valve block station premises will be detracted from the pool. - Temporary interruption is expected during construction work.
Path and hiking tracks	Israel path by bike - planned	In the eastern part of the coastal entry array area	It is possible that a diversion/change in times will be required during construction work.
Gas Pipeline to the Treatment Facility			
Agriculture	Cultivated areas and fish pools	Within the alignment area and the survey area to the west of the coastal entry array and to the east of Road 2	Temporary disturbance during construction work. In addition, along the pipeline strip cultivation of crops and planting of trees will not be permitted.
Roads	0. Road 2 5. Road 4	Within the alignment area	No changes are expected during implementation and operation.
	3. Earth roads and agricultural paths in agricultural areas		Changes are possible in the road system, in particular in agricultural areas in the course of performing the work.
Railroad	The Haifa-Tel Aviv railway	Crosses the alignment to the east of Road 2	The line must be placed in coordination with Israel Railways and keeping the relevant guidelines. For example, in the document "Planning Guidelines for Systems within the Railway Strip - 2010"[24] and also

[24] http://iroads.co.il/sites/default/files/02syco3_10.10_hynkhyvt_tknvnyvt_lmrkvt_brtsvt_rkbt.pdf

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
			take care of the emergency procedure in the event that the line is damaged and leaks, in coordination with Israel Railways.
Nature reserves and national parks	Natural areas - the Carmel shore kurkar	Within the range of the alignment and within the survey area, in the region of the Maayan Tzvi reservoir	Temporary harm to nature values in the reserve during performance of the works, due to laying the pipeline and the contractors' staging areas. After the works, both landscape and ecological reconstruction will be required. As regards the risks, the plan developer must conform to the criteria for personal and group risks, and perform a statistical risks survey if necessary (QRA) as required in IS 5664 Part 2.
Wastewater treatment facility and reservoir	Wastewater treatment facility and reservoir, Maayan Tzvi	Within the area of the alignment	It is possible that it will be necessary to build a concrete wall instead of the western earth embankment of the reservoir.
Infrastructures	Gas - the INGL line Dor-Hagit	Adjacent to the proposed alignment from the wastewater treatment facility Maayan Tzvi area up to the search area	No impact expected.
Forest	Mixed natural and planned forest	Within the survey area and the survey area from Road 4 up to the Hagit power station	Damage to flora (including forest trees) and fauna is expected during the laying of the pipeline alignment. Means for minimizing the damage to the landscape and the environment, see details in Sections 3.2 and 4.9 of this document.
Agricultural land	Agricultural fields, plantations and field crops	From the western part of the alignment up to the Hagit power station area	Temporary disturbance during construction work. In addition, along the pipeline strip, the growing of crops and the planting of trees will be prohibited.

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
Paths and hiking tracks	1. Israel path 2. Bike path - part of the Carmel path array 3. Bike path - single Hagit	1. Within the alignment area and the survey area to the west of the Moshav Ofer 2. Within the alignment area and the survey area, from the Ofer area, a bike path overlaps the pipeline alignment eastwards up to the Bat Shlomo area, and from there it branches to the south and north 3. In the eastern part of the alignment	It is possible that temporary diversions/changes will be required during the construction work.
Military area	Firing range	Within the alignment area	The plan's restrictions should be maintained as specified in IS 5664 Part 2 and in the event that it is necessary as detailed in the standard, we should perform a statistical risks survey. An emergency procedure should be formulated for the eventuality of a leak that will immediately terminate all military activities being carried out at a distance smaller than 600 m from the alignment. In addition to the risks survey, it is also required to coordinate vis-à-vis the relevant parties within the Ministry of Defense.
Infrastructures	1. Gas - the Dor-Hagit INGL line	1. Adjacent to the alignment proposed from the Maayan-Tzvi wastewater treatment facility area up to its arrival within the search area at Hagit	No impact expected. It will be necessary to coordinate between the parties.

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
	2. Voltage lines - 161/400 kW	2. The alignment crosses 161 kW voltage lines from the west to Fureidis and from the north to Bat Shlomo. The alignment crosses a 400 kW line in its eastern part, close to the Hagit power station	No impact expected. It will be necessary to coordinate between the parties, including parallels survey.
	3. Mekorot Line	3. Crosses the alignment in its eastern part	No impact expected. It will be necessary to coordinate between parties.
	4. Petroleum and Energy Infrastructures Ltd. pipeline	4. Crosses the alignment in its eastern part	No impact expected. It will be necessary to coordinate between parties.
Garrigue forest and uncultivated and pasture areas	Dwarf shrub formation areas, garrigue and natural forest in the central-east part of the alignment	Alignment area and survey area	Damage is expected to flora and fauna during the construction work. Means for minimizing the damage to the landscape and the environment, see details in Sections 3.2 and 4.9 of this document.
Roads	Earth roads and agricultural paths	Within the alignment area and the survey area along the entire alignment	Changes are possible in the road system, in particular in agricultural areas during performance of the works.
Treatment Facility			
Military areas and facilities of the security system	1. Military area - Elyakim 2. Firing ranges	Over 600 meters	No impact expected (due to maintenance of a distance greater than 600 meters).
Nature reserves, national parks and streams	Natural area - Nahal Tut	About 350 m to the south	Damage is possible to the reserve, in particular impact on the flow regime within the reserve (the Ein Tut spring). The means for minimizing damage are detailed in Sections 4.9 and 4.10 below. It will be necessary to coordinate between parties during the performance stage.

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
Roads	1. Roads 6/70 and the interchange (Ein Tut Interchange) 2. Earth roads and agricultural paths	1. About 250 m to the southeast. 2. Within the premises and survey area	1. Impact is possible from the point of view of risks - in case of an emergency scenario such as a massive leak and an explosion or a fire jet, means should be taken to halt transportation at a distance of 1 km from the facility in case of an emergency event, such as a stoplight and a barrier. 2. It is possible that changes may be required in the road system, mainly in agricultural areas, in the course of performance of the works.
Paths and hiking tracks	Biking path - Hagit single	Within the survey area	No impact expected.
Agricultural background	Agricultural buildings and cultivated areas	Within the premises of the treatment facility	The facility is expected to be built on the area of the buildings already present in the field in order to minimize the damage to natural areas which are more vulnerable, and in accordance with the principle of linking infrastructures to each other.
Infrastructure facilities	1. Hagit power station 2. Switching station	Adjacent to the site area to the west	During routine operations and during emergency release from the vent, no impact is expected on the power station. In emergency events liable to cause severe damage to the pipeline and impact the power station, conform to the following relevant standards. For example: 1. Conforming to the relevant standards for the prevention of damage to the facility following an earthquake - seismic risk management by the Ministry of Environmental Protection 2. The developer should plan and build the facility in such a way as to meet the criteria and prevent damage by sabotage, terrorist activity or

Use	Description	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
			wartime activity, including protection according to the Home Front Command guidelines. 3. It is necessary to coordinate between the parties at the planning, execution and operational stages of the facility.
	3. Gas and fuel pipelines strip	1. About 450 m from the northwest	No impact expected. It will be necessary to coordinate between the relevant parties.
Forest and uncultivated and pasture areas	Dwarf shrub formation areas, garrigue and natural forest along the slopes of the Carmel	Area of the facility and its environment	Open spaces will be damaged as a consequence of building the facility - the means to be taken in order to minimize damage to the landscape and ecology are detailed in Sections 4.3 and 4.9 below.
Plantings	Plantings area of the JNF	About 200 m to the north and the east of the facility area	No impact expected.

Table 4.2.1-2: Impact of the Plan on Land Zoning

Plan	Zoning	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
Coastal entry array			
MSH/2	Primary zoning as agricultural lands, as well as for tourism and leisure	Within the area of the coastal entry array	- Damage is expected to agricultural activity - The block valve station premises will be detracted from the agricultural area - Temporary disruption is expected during construction work
Gas Pipeline to the Treatment Facility			
MSH/2	Agricultural land, tourism and leisure	Within the alignment area	Temporary disruption of agricultural land during construction of the work area. In addition, along the pipeline strip no raising of crops or planting of trees will be permitted.
HC/12f	Engineering facility (reservoir and wastewater treatment facility)	Within the alignment area	No impact is expected on the existing zoning land. Nevertheless, it is possible that it will be necessary to construct a concrete wall instead of the west embankment of the reservoir.
MSH/7	Agricultural land	Within the alignment area	Temporary disruption of agricultural land during construction within the work area. In addition, along the pipeline strip no raising of crops or planting of trees will be permitted.
MSH/8	Agricultural land	Within the alignment area	Temporary disruption of agricultural land during construction within the work area. In addition, along the pipeline strip no raising of crops or planting of trees will be permitted.

Plan	Zoning	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
HPAG/d/1167	Transportation (railway)	Crosses the pipeline alignment	The line must be placed in coordination with Israel Railways and keeping the relevant guidelines. For example, in the document "Planning Guidelines for Systems within the Railway Strip - 2010"[25] and also take care of the emergency procedure in the event that the line is damaged and leaks, in coordination with Israel Railways.
HC/78b	Plan for the Ein Ayala quarry	Partial overlap with the alignment	No excavation explosions permitted within a distance of at least 100 m from the pipeline strip. In addition, formulate an emergency procedure that will immediately terminate all quarry activities in the event of a gas leak or damage to the pipeline at a distance less than 600 m from the quarry.
C/400	Agricultural area and pasture	Within the alignment area	Temporary disruption of agricultural land during construction within the work area. In addition, along the pipeline strip no raising of crops or planting of trees will be permitted.
MSH/43/hc	Plan for Moshav Bat Shlomo.	Within the alignment area	Temporary disruption of agricultural land during construction within the work area. In addition, along the pipeline strip no raising of crops or planting of trees will be permitted.

[25] http://iroads.co.il/sites/default/files/02syco3_10.10_hynkhyvt_tknvnyvt_lmrkvt_brtsvt_rkbt.pdf

Plan	Zoning	Location and Minimum Distance from Plan Boundaries	Impact/Restrictions on Realization of the Plan
	The alignment passes through areas zoned for agriculture and road.		
Treatment Facility			
MSH/43/hc	Plan for Moshav Bat Shlomo. The facility is within areas that were zoned for agriculture.	Within the treatment facility area	Zoning of the agricultural area must be changed.
C/400	Agricultural land	On the west boundary of the west side	No impact expected.
HC/200	Nature reserve - Nahal Tut and agricultural land	About 350 m to the south of the facility area	No impact is expected on the land zoning. For a possible impact on the spring in the Ein Tut reserve, see details in Table 4.2.1-1 above.
C/12635	Nature reserve, agricultural land and road	To the south of the facility	No impact expected.
C/4889	Agricultural land	Further than 600 m from the treatment facility	No impact expected.
C/4252	Agricultural land	Further than 600 m from the treatment facility	No impact expected.

Plans in Preparation and Master Plans:

The treatment array area overlaps the plan for the Hof Carmel forest area, the Fureidis master plan and detailed plans of the JNF for the zoning of forest, agriculture and open areas. Except for the premises of the treatment facility, there are no restrictions on these plans.

In addition, a detailed plan (in preparation) is being promoted for an employment area to the north of Fureidis (see details in Chapter A of the Onshore Environmental Impact Survey for NOP 37/h). In this area it is possible that zoning restrictions will be required, or coordination between the planners of the detailed plan and the gas authority, and/or performing a risk survey by the plan developer in order to meet the criteria for separation distances in accordance with the guidelines for the Ministry of Environmental Protection and the criteria for personal and group risk, as required in IS 5664 Part 2.

4.2.2. Zoning changes and establishing restrictions

Zoning changes and restrictions on zonings of land uses as a consequence of implementation of the plan are detailed in Section 4.2.1 above.

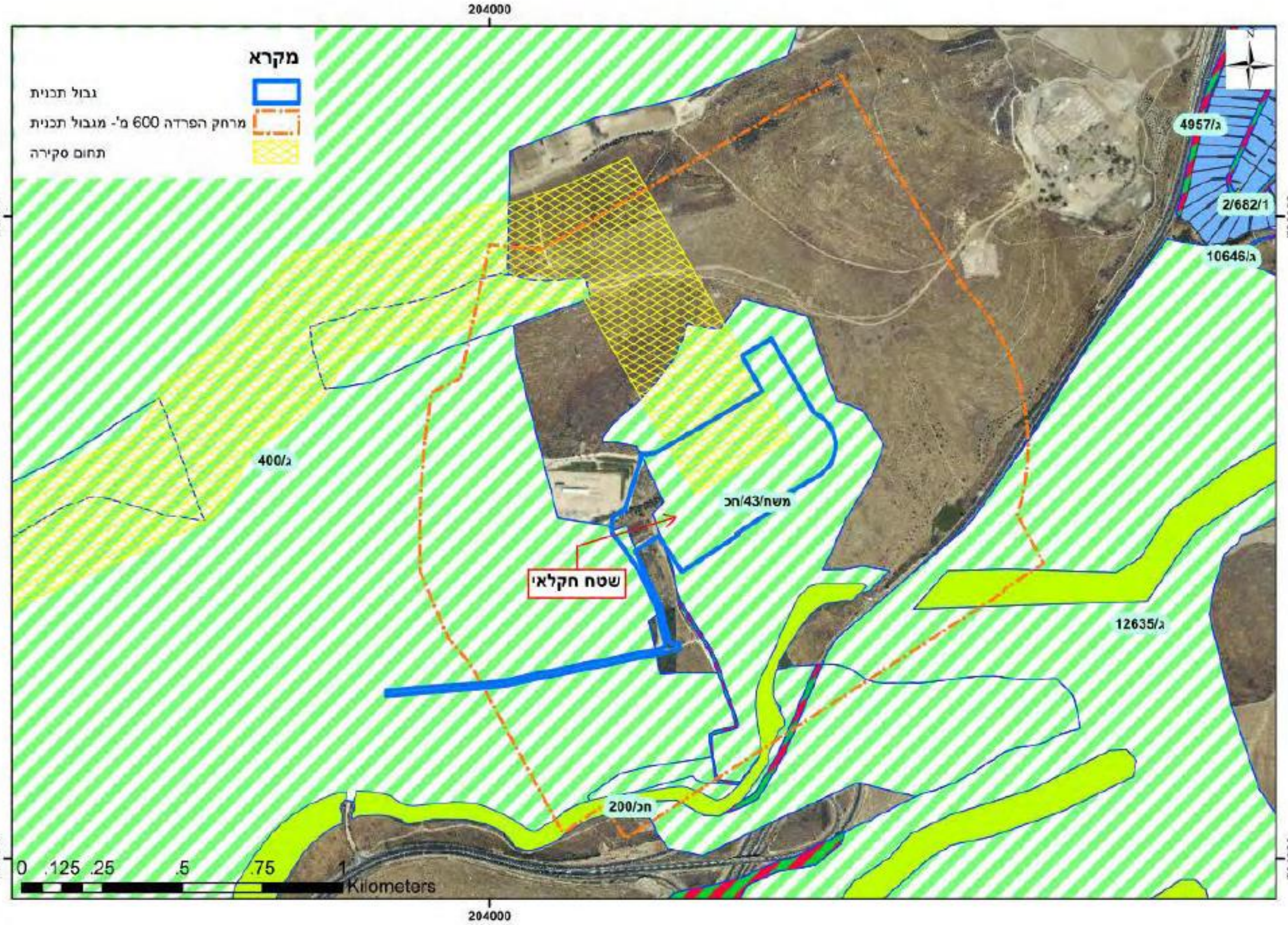
4.2.3. Figures

Throughout the planning process, an effort was made to choose the location of plan elements so that the impact of implementing the plan on uses and zonings already existing and approved will be minimal. Therefore, there are no special restrictions on approved uses and zonings, but mainly the adoption of warning means and safety means in the event of malfunction (see details in Section 4.2.1 above). The plan's restrictions are mainly in agricultural areas (limitation on planting and growing trees within the pipeline strip) and restrictions on future zonings to the extent that they overlap the plan area.

Within the treatment facility area

Within the treatment facility area it will be necessary to change the zoning of the agricultural area in Plan MSH/48/hc, see Figure 4.2.3-1 below:

Figure 4.2.3-1: Hagit Site on the Background of Detailed Plans



4.3. Appearance

This section includes an appearance/landscape analysis for the gas treatment facility at the Hagit site, as well as the block valve stations – both the onshore one and the intermediate station along the pipeline. The analysis includes reference to expected visibility from sites and roads surrounding the project, the landscape impact created by construction of the facility, both on the regional and local level, as regards the visual features of facilities planned within the area of the project. Moreover, principles and tools for minimizing the landscape impact of the facility on its environment are presented and demonstrated in various sections and simulations.

4.3.1. Visual analysis

The visual and landscape analysis for the Hagit facility is presented in **Figure 4.3.1-1**. The analysis includes perspectives, landscape sections and simulations of the planned treatment facility on the background of the existing environment. Engineering sections (that include measures and volumes) are presented in Chapter C, in Section 3.1 above. Details of the features of the generic facility elements and simulations that demonstrate their visual significance are presented in the survey of Section 3.1 above.

Figure 4.3.1-1: Landscape and Visibility Analysis of the Facility

4.3.2. Description of findings

The landscape analysis of the planned facility and its expected impact on the environment was performed out on two levels: a regional analysis that refers to the facility's visibility and landscape significance at a distance, and a local analysis that addresses the facility's landscape significance in its proximate environment. The regional analysis will address features of the general environment – the landscape array in which the site is located, as well as a reference to sites and important observation points and/or points that are visible within the project environment – visibility from roads, localities and population centers, from nature sites, and from leisure and recreation sites. The local analysis will address the facility's impact vis-à-vis the existing landscape elements and features at the Hagit site, and in accordance with the extent to which the facility is integrated with these features.

As a general rule, it should be noted that despite the fact that the site is located at a relatively high topographic elevation as compared to its environment and is located in a natural and valuable environment with landscape values, in view of its adjacency to the Hagit power station site, construction of the facility constitutes an addition to an existing landscape nuisance, but does not constitute a new landscape hazard and disruption. Moreover, the power station facilities – structures, embankments and especially stacks that protrude into their environment – all minimize to a certain extent the facility's visual impact on the background of its environment.

A detailed survey and analysis of the landscape unit and its regional significance, as well as an examination of the extent of visibility for the Hagit alternative were performed and presented extensively in the context of the onshore environmental impact survey, Chapters A and B. Analysis of visibility conducted using computerized imaging tools based on a three-dimensional model are presented in the visibility map shown in Chapters A-B. Since the analysis is a large-scale one, it is based on the national GIS (natural topography - elevation lines every 10 m) and on built volumes estimated on a rough basis. Beyond this, the map does not take into account coverage within the area of the site and its environment, which includes embankments, flora and plantations, rural building, etc. – these elements are highly significant in concealing facility elements. Moreover, since the area that the visibility map addresses is extremely extensive, the most appropriate professional tool for a more detailed examination of the visibility and landscape analysis is via sections and simulations as presented in Section 4.3.1 above.

Regional analysis

The site plan for the Hagit facility is located within a continuum of open natural areas that constitute a connection between two landscape units that are also biospheric areas – the Carmel and Ramot Menashe. The dwarf shrubbery is characterized by low, herbaceous vegetation and a wild population of flora and fauna - yellowing in the summer and greening in winter, flowering in spring and autumn with wildflowers and geophytes such as squills and lupines.

From a topographic point of view, the site itself lies over two ranges covered with herbaceous dwarf shrubbery, between which a local flow channel passes. Today some of the natural area is disrupted by animal farms (industrial chicken farms and a cattle farm) that are located close to the power station.

The site's main visibility is from the nearby national road system, Road 6 (Trans-Israel Highway) and Road 70 (Wadi Milek). The plan site is relatively distant from existing localities (about 1.5-2 km) characterized by rural settlement, Moshav Elyakim and Kibbutz Ramot Menashe, but is visible, both from Kibbutz Ramot Menashe and from the future employment zone, Mevo Carmel, which is currently being developed, as well as from a number of nearby nature and leisure sites. At the same time, it should be noted that adjacent to the planned site to the west, is the Hagit power station, which constitutes, with all of its elements, a significant landscape component in its environment. The facility's high stacks tower beyond the landscape embankment that surrounds it and are clearly visible in the entire region, as well as some of the facilities of the power station. Therefore, in actual practice, the impact of the plan site only accompanies the already-existing visual impact of the power station and does not create a new visual nuisance within the open landscape.

In accordance with the environmental features and main foci in its area, the landscape analysis refers to three types of visibility:

1. Visibility from highways – maximum exposure to the passing population, but the duration of exposure to the site is brief.
2. Localities and employment centers – relatively limited population concentrations, but the duration of exposure to the site is longer and even permanent.
3. Hiking, visiting and leisure sites and trails – passing population, the duration of exposure varies.

From tours in the area, analysis of the visibility using computerized tools and the preparation of landscape sections and simulations presented in Figure 4.3.1-1 and Figure 3.1.1-3 indicate that as a rule, the facility's general visibility, even when it is high, is usually mitigated by its location in the "shadow" of the Hagit power station. Beyond this, the proposed detailed planning for the facility elements offers maximum utilization of the topographic conditions prevailing in the project site as described below, and thereby also help in minimizing the facility's visibility.

Roads - The landscape analysis of this section addresses the site's visibility site from Road 6 which is defined as a national highway, and Road 70 which is defined as a national road, with landscape features (in some of the planning documents) and is illustrated by the sections and simulations.

Road 6 - From Road 6 the plan site is visible from a number of points:

In travelling over Road 6 to the north, from the direction of the Iron Interchange in the direction of the Ein Tut Interchange, immediately after the exit from the north tunnel in the Nahal Dalya area, travelers will be able to see, even if at a distance and brief length of travel time, within their field of vision the stacks and structures of the power station. The gas receiving facility will be seen to the east at the right part of the field of vision and at a distance of about 2.7 km, and will constitute a nuisance even though it will not be the most prominent nuisance in the field of vision. As the fast travel proceeds and the vehicle approaches the site, the topographic elevation of the road descends until it passes under a bridge on Road 70 which comes from the west, so that the area of the gas facility site is concealed behind the range and is not observed at all, even though it is closer.

An additional road segment that has landscape significance is the segment of the 6/70 road interchange for those coming from the west. The road rises over its environment in a way that allows the intertwining of Road 6 from the south and curves to the north. When travelling in the north-east direction after the curve, the power station and the plan site are highly visible and located within the center of the field of vision. The visibility obtained at this point is mainly of the higher elements of the plan facility. In this direction of travel, after crossing the interchange the site is visible but it is more concealed because of the embankment that surrounds the power station. Moreover, this visibility requires the driver and/or the passengers to divert their gaze from the direction of travel towards the west, so that in actual practice there is no direct visibility.

Road 70 - From Road 70 towards the east, there is visibility towards the facility area as far back as the Bat Shlomo region, but since the planned facility and its various elements are in the shadow of the Hagit power station stacks, the landscape addition stemming from its construction is not significant from this point.

From Road 70 towards the west, the gas facility site area, as well as the power station premises, are hidden from travelers along the road behind an herbaceous dwarf shrubbery range that includes young saplings. Immediately after crossing the range line, the site is slightly visible but requires diversion of the gaze from the direction of travel, and is obtained for a very brief period because of its proximity and relatively high speed of travel along the road. Because of the proximity to the site, the visibility obtained will be of more elements of the planned facility.

Localities and employment centers – The landscape analysis referred to four main foci, all distant hundreds and even thousands of meters from the area of the intended site. The foci are:

1. Bat Shlomo at a distance of about 4000 m
2. Elyakim at a distance of about 1400 m
3. Ramot Menashe at a distance of about 2000 m and more
4. Mevo Carmel Industrial Zone at a distance of about 2000 m

Bat Shlomo - One of the most prominent resources of Bat Shlomo is its landscape resource. The building pattern exploits the value of the landscape surrounding the locality, so that homes are scattered over a number of hills that face the mountainous landscape. The visibility obtained at the front row of buildings in the locality facing in an easterly and north-easterly direction only, wherein the features that are visible from these rows of houses are those of the power station stacks, which have the most salient appearance in their environment, and the planned site is mainly hidden behind them.

Elyakim - Visibility of the facility obtained from a number of buildings located in the outermost row of houses among the locality's houses, faces in the south-westerly direction – in the direction of the existing Hagit site. Today, the site area is completely concealed behind a range, and only the upper part of the power station stacks is visible. The elements of the facility that will be visible will be only those whose height will be higher than the topographic elevation of the northern range of the facility, i.e. the flare, but in view of its characteristics and measurements it will have no landscape significance, especially not in proximity to the stacks.

Ramot Menashe - A kibbutz currently in stages of development and expansion. It features the characteristics of the historical kibbutz layout – low buildings (either one or two stories) on their own plots and surrounded by mature vegetation. Therefore, from these houses and from the kibbutz's public space, the facility is almost invisible. At the same time, high visibility is expected even though at a distance in the center of the field of vision, as derived both from the location of the buildings and the nature of the building, both in the row of new buildings currently being built in the north direction and from the yards that are planned to cover areas in the western part of the kibbutz. As opposed to the historical layout of the kibbutz, the new construction is characterized by low and staggered structures that rely on the landscape as a resource, and are facing the open landscape of Ramot Menashe and the Carmel, including in the north direction – where the Hagit power station is located. Accordingly, visibility is expected from the houses on the western side towards the planned site. It should be added that the treatment facility and its elements will not be visible from the area of the kibbutz swimming pool and the eastern extension, which faces south.

Mevo Carmel employment area – Today, the employment area is in stages of land development only. Since the area directly overlooks the direction of the planned site, it may be estimated that the facility will have considerable landscape significance. At the same time, the visual impact obtained will be impacted to a great extent from the image of the future employment zone and the uses that will be developed there (offices/plants/storage, etc.), and the construction features that will be derived from it, and it is therefore not yet possible to complete the visibility analysis from this focus.

Hiking, visiting and leisure paths and sites

Since the planned site is located in an environment of open areas with environmental and landscape values, we find in both its proximate and more distant environs a number of hiking, visiting and leisure paths and sites. Even though these foci only provide a limited and non-constant visibility of the facility, the duration of exposure to the facility is greater and the exposure itself impairs the experience of the hiker/visitor. The foci where the facility is visible are:

- Hagit bicycle path – there are two cycling paths around the Hagit power station: one covering 7 km and the second extending along 15 km. Both paths provide visibility of the existing Hagit site, but construction of the treatment facility is expected to intensify the existing landscape nuisance of the power station.
- Har Horshan – a dense forest site with hiking paths to the south of Bat Shlomo. It will be possible to see the power station site and in its shadow also the facility from a number of observation points and open segments along walking paths at the peak of Har Horshan, such as "the forester's house." However, this visibility is very distant (about 5 km) and does not have a significant impact on the image of the region.
- It is also possible that the vent that protrudes over the line of the ridge will be visible to observers from prominent sites in the south of the Carmel (to the north of the site), such as Hirbet Sumaka and Hirbet al-Daraj, however this is very distant visibility of a limited element and does not impact the image of the area.

Detailed local analysis

This analysis addresses both the conditions that exist within the site area and its environment – terrain features, local coverage, etc., and the elements of the facility itself, focusing on elements with prominent landscape significance as regards the facility's visibility.

The Hagit site is located on hilly terrain that slopes towards the south. The planned gas treatment facility is intended to merge within open areas to the east of the power station, to the north of the chicken farm structure and the area of the existing pasture farm, on top of two local ranges between which a local flowing channel exists. According to the proposed plan, extensive earthworks are to be carried out, in the context of which the flow channel will be covered with the project soil surplus in order to create a level area in the northern part of the facility. The typical rock coverage in this area is chalky and impacts, as described below, the options available for concealing facility elements, in particular where the landscape hazard aspect is concerned.

The Hagit power station site operates in the vicinity of the planned facility. This site is surrounded by a wide and protective embankment which is mostly an entrenched embankment that is elevated in its upper part. This embankment minimizes the presence of existing facility elements, and in future, once the gas facility is built, will have a certain role in concealing the lower elements and installations of the facility from observers in the south and west directions. Moreover, the facility's surrounding concrete fences may conceal these elements to a considerable extent and constitute a significant element in visibility from close at hand. However, there are a number of elements with high presence in the area that will not be concealed by means of an embankment/fence. This presence arises both from the nature of the installations (high-volume tanks) and from the height of these installations relative to their environment. These elements impact the facility's visibility and general appearance that will be created once it is built.

Elements with salient landscape significance in the treatment facility (see Figure No. 3.1.1-4):

- Heating installations – at a height of about 25 m
- Condensate tanks – at a height of about 14-15 m
- Facilities for the purpose of MEG regeneration – at a height of about 12 m
- Office buildings – at a height of about 12 m
- Facility fence – a concrete wall only a few meters high (the fence that is located at the front of the facility mainly hides the low elements of the facility). On top of this fence there will be a mesh fence which has no landscape significance from a distance, but has some presence for proximate visibility, such as from nearby roads. This fence is one of the most significant elements impacting visibility from close at hand for those who pass along the nearby Roads 6/70.

* The facility flare, even though it towers to the highest height from among the facility elements, at least 25 m, because of its narrow structure, does not have a prominent presence in the area, contrary to other installations. From the point of view of visibility, it is perceived as a "needle" in the landscape. Moreover, as explained in this document, the flare will not be burning except in emergency cases.

In addition, adjacent to every one of the heating installations, there is a 40 m stack with a diameter of 0.5 m. In view of the narrow diameter of the stack relative to the diameter of the installations, its landscape impact is minimal despite its height.

Nevertheless, it is proposed to consider during the detailed planning stage the option of limiting its height to the minimum required.

Another aspect that should be considered as regards visibility of the facility is the earth and soil works that will be needed in order to develop the facility. Any damage to the chalky soil creates a bright exposed rock face that protrudes at a great distance, as well as a bright fill which is highly visible. Moreover, the chalky soil remains exposed and is not covered with a patina and reintegrated into its environment for many more years, so that the options for obscuring the extent of the landscape impact via vegetation that is typical of herbaceous dwarf shrubbery is complex, both from a landscape and an ecological point of view.

These features lead to a situation where the potential landscape impact created as a consequence of preparing the area and arranging it is high. Moreover, these features constitute a limiting factor for the options of burying the elements that have a significant landscape impact, since their burial will be accompanied by an increase of the line of damage and landscape hazard.

Figure 4.3.2-1: Example of Bright Chalky Exposed Rock Faces that Constitute a Landscape Hazard

In summary – Elements of the landscape disruption are divided into significant installations, facility fence and landscape disruption arising from the arrangement and leveling of the surface. The site area intended for construction of the gas facility is a visible area, both from nearby and from afar, mainly from the main roads and from a number of localities and employment points. The site will be exposed and visible both from nearby and from afar, to a large number of passing populations, but for a relatively brief time period of fast travel, and in a number of specific road segments where the site has full visibility and great landscape significance, since it occupies the center of the field of vision. Moreover, the site will be visible for a small segment of the population and employed people, mainly in the new neighborhood of Kibbutz Ramot Menashe and in the Mevo Carmel employment zone, whose nature and image have not yet been determined.

On the one hand – despite the site's features and high visibility, in view of the fact that it is adjacent to the Hagit power station, its construction constitutes an addition to an existing landscape hazard but does not constitute new landscape damage and disruption. Moreover, the power station installations – structures, embankments and especially the stacks that protrude into the environment – all these minimize the gas facility's visual impact to some extent. On the other hand, the presence of the gas treatment facility along with the power station has a cumulative impact that influences the image of the area cell as having an industrial character, and this constitutes damage to the image of the area, in natural and spatial areas that are visible to those who pass along the roads in this region.

<u>The Shore Block Valve Station</u>

[Site for the Shore Block Valve Station]

The block valve station along the shore strip is a mainly underground station located at a distance greater than 300 m from the shoreline, and its present area is about 5 dunams. A full description of the station and its elements is presented in Section 3.2 and a figure of the block valve station along the shore strip is presented in **Figure No. 3.2.1-5**.

Nevertheless, the block valve station will also include above-ground elements that have landscape significance, the main among them an electrical room (at a height of 2.5 m) for each of the providers and for INGL, if necessary, as well as a peripheral fence for the facility, made out of concrete and wire mesh. In accordance with the technological alternative that will be selected, the station may comprise a vent array that will be higher and more visible, although because of its narrow width it will not constitute a significant element in the landscape.

The following picture presents the existing block valve station, that comprises an above-ground electricity room and a peripheral fence, as well as valve faucets.

Figure 4.3.2-2: Existing Block Valve Station

The onshore block valve station will be located within the areas of the deserted agricultural pools of Moshav Dor, along the existing pipeline, to the north of the natural pool of HaDipla Reserve. The fish pools are lower than ground level and are surrounded by embankments covered with dense vegetation, mainly of reeds and tamarisks. The area cell is not observable from the nearby seashore from the west, is not visible from the north or from the south (except for farmers working in the pools area), and is slightly visible from a distance of about 600 m from the direction of the Zichron Interchange on Road 2 (Coastal Road). Since the pools are lower than ground level and surrounded by vegetation, the facility itself will not have any significant visibility except for the vents that will seem like antennae and impair the typical open view from the Zichron Yaakov Interchange to the west – to the sea and the horizon line that is studded with the silos of the fishing pools that constitute part of the region's landscape.

The simulation attached in Figure 4.3.2-1 is in its final state (two suppliers or maximum production of gas), after all pipelines have been laid. It is important to note that up to that stage there will be intermediate stages during which the station area will be smaller.

Figure 4.3.2-1: Simulation of the Dor Shore Block Valve Station

Block Valve Station – Intermediate Station

This is an underground station that will be located at a distance of about 11 km from the onshore block valve station. The purpose of this station is to provide an additional safety mechanism in the event of a malfunction in the system requiring immediate stopping of the flow of gas in the onshore pipeline. The station area is about 40 m X 30 m and it is included within the area of the pipeline corridor. The station comprises faucets, an electricity room and a control room (aboveground) for each of the suppliers and for INGL, and does not comprise a venting array. The station will be fenced with a concrete wall and fence above it. This station has identical building lines as the pipeline corridor, which is 45 m on each side.

Figure of the block valve station – the intermediate station is presented in Figure No. 3.2.1-6.

[Site for Intermediate Station]

The intermediate station will be located alongside the pipeline, within an agricultural area to the north of Moshav Bat Shlomo, in the south of the Carmel, in the heart of an agricultural valley surrounded by natural areas. The area is not visible from any main road, locality or activity focus, except for anyone moving along the agricultural roads in the region. At the same time, the facility will constitute a significant infrastructure facility – a point source landscape disruption in an undisturbed open area, which damages its image, and therefore the plan will allow flexibility for coordinating the block valve station should it be constructed.

Figure 4.3.3-1: Simulation of Block Valve Stations – Onshore and Intermediate

4.3.3. Landscape description

The visual-landscape analysis was presented in detail in Section 4.3.2 above.

4.3.4. Means for minimizing the visual impact

This section will survey the landscape means and tools proposed in order to mitigate and minimize the expected landscape impact following construction of the treatment facility, the onshore block valve station and the intermediate station. Among the proposed means a distinction is made between means that include delineating and locating installations using natural topography and existing coverage within the site and its environment, and landscape elements that may be added to the project. The description below refers both to the mitigation of landscape impact of all project elements and to the reduction of the landscape impact of specific engineering installations.

Gas treatment facility

As a general rule, it should be noted that the use of local topography constitutes the basis for the landscape planning of the facility, by identifying prominent elements, delineating and locating them in a reasoned way. Use is made of the local wavy topography and of point ground folds in order to minimize the impact of prominent elements. In addition, an attempt is made to ameliorate the landscape impact through the relationship between elements of the facility and existing power station installations. As specified above, existing facilities have a prominent presence in the area. Placing the planned facilities alongside existing facilities as far as possible helps to a certain extent to minimize the prominence of the new elements vis-à-vis their environment. Moreover, for those looking from the direction of the west, the existing installations constitute a kind of partial visual obstacle concealing the planned installations to the east of them.

From the point of view of specific treatment of elements in the planned facility, a number of different landscape means are proposed as detailed below:

- **Establishing a height limitation** on various installations to the greatest extent possible. With the aim of avoiding damage to the openness of the wide landscape, an advantage is given to low elements, even at the price of making them wider. It is therefore proposed that in installations where there is flexibility in determining height, we should limit the permitted height in advance. Thus, for example, it is proposed that the height of the flare, which can be in the range of 25 to 100 m, should be limited to a height of up to 40 m.
- **Burial** – there are a number of elements whose presence may be mitigated by burying them underground. The depth of burial is in the range of a partial to a full burial and is usually established in accordance with operational and environmental restrictions. Thus, for example, the possibility of partially burying condensate tanks which have great

landscape prominence helps considerably in limiting their appearance on the surface (see Figure No. 3.1.1-4). At the same time, we should find the optimum burial depth that will mask the landscape presence of installations without creating more significant damage by exposing the chalk face.

- **Finishing materials** – at the detailed planning stage, it is proposed to use flexibility when considering finishing materials for the design of structures, installations and fences so that they may merge into the environment and not be prominent and obtrusive relative to the environment.
- **Chalky rock faces** – we should examine the optimum means for masking the damage arising from the white exposed chalky rock faces by using finishing materials that will enable the development of a natural patina at an accelerated pace; the use of finishing materials (paint/plaster) that will allow integration of the rock face in its environment; the use of technologies for rehabilitation of excavated walls by spraying the seeds of local wild flora and the design of the excavated wall in gradients that would be appropriate for this purpose.
- **Landscape concealment** – the use of means for concealing the facility's visibility is limited and problematic in this case. From specific and relatively distant points such as Road 6 in the Nahal Dalya area, Kibbutz Ramot Menashe or Mevo Carmel, it is possible to examine various means for landscape concealment by adding landscape elements that are proximate to areas for which there is visibility, which will constitute visual barriers. At the same time, we should consider that these elements may constitute damage in their own right to the region's image, in its wide horizon line, natural waviness and sense of space that it provides.

  The use of landscape means in order to conceal visibility from nearby signifies a change in the region's image and the attainment of a different landscape result than the infrastructure facility, which is not necessarily better, such as soil embankments. In the course of the work the option of concealing the facility by means of an embankment was considered, but such an embankment will have to be very wide in order to attain the required height for achieving significant concealment (about 8 m). It will be difficult to integrate such an embankment in the area's natural wavy topography, and also the need to cultivate it in a way that will be different from the herbaceous dwarf shrubbery in its environment will make it the dominant element in the landscape.

<u>Onshore block valve station</u>

The landscape means and tools proposed for reducing the landscape impact of a block valve station are similar to those proposed for the facility, even though they are distinct from each other, both because of the nature of the installations and their dimensions, and because of differences arising from visibility from afar as compared with visibility from close at hand.

Landscape means proposed for minimizing the landscape impact of the onshore block valve station:

- Identifying a location, which as surveyed is only expected to accommodate light traffic on a nearby unpaved road. An additional means already implemented in planning the station is to bury as many elements as possible.
- Minimizing the station area and fencing it off at the minimum required for that stage, which signifies a smaller station during the intermediate stages, and therefore having a lesser landscape impact.
- Use of finishing materials capable of limiting the facility's landscape impact. The intention is for cladding of the electricity room and provide proper finishing materials for the fence. While where visibility from afar is concerned, just as in the case of the facility itself, a mesh fence has a lower landscape significance than a concrete fence, this does not hold true for a facility observed from close at hand. The mesh fence makes it possible to see the inside of the facility, which creates a greater visual disruption than a high concrete fence when it is coated with paint and faced with finishing materials that are capable of becoming integrated in the environment.
- Another means for obscuring the landscape significance, even though not to the point of fully concealing it, is to plant vegetation that integrates within the environment, such as a boulevard of tamarisks or some natural local flora, such as Pistacias and oak trees in the intermediate station.

4.3.5. Means for Reducing the Environmental/Landscape Damage

See description in Section 4.3.4 above.

4.4. Antiquities and Heritage

4.4.1. Values of antiquities and heritage

Antiquities and heritage values that may be impacted by implementation of the plan include antiquities and heritage sites that have been officially declared and are located within or adjacent to the work area for laying the pipeline. In addition, antiquities sites are located in the coastal entry area – including in the shallow sea.

The following are details of sites within the work area from west to east.

Table 4.4.1: Antiquities and Heritage Sites within the Pipeline Area

Serial No.	Site Name	Number	Site Location
1.	Nahal Dalya estuary, submarine site	4403/0	Within the offshore area of the coastal entry array
2.	Nahal Dalya, submarine site, north	26766/0	Within the offshore area of the coastal entry array
3.	Dor, submarine site	4336/0	Within the offshore area of the coastal entry array
4.	Triangulation Point K-60 (north)	25269/0	Partially overlaps the offshore area of the coastal entry array
5.	Triangulation Point K-60	1447/0	Partially overlaps the offshore area of the coastal entry array
6.	Nahal Dalya estuary, submarine site, east	27628/0	Within the area of the coastal entry array with a partial overlap of the staging area for HDD and the piping
7.	Maayan Tzvi	5930/0	Within the area of the coastal entry array with a partial overlap of the staging area and the piping
8.	Tefet, H (east)	39285/0	Within the pipeline alignment
9.	Tefet, H (north)	6887/0	Within the pipeline alignment
10.	Darkhemon, H (south)	25267/0	Within the pipeline alignment
11.	Adlan	1588/0	Within the pipeline alignment
12.	Wadi Ma'atzidi	1739/0	Within the pipeline alignment
13.	Triangulation Point N-560 D	7172/0	Within the pipeline alignment
14.	Katina, H	2152/0	Within the pipeline alignment
15.	Bir Katina	7158/0	Within the pipeline alignment
16.	Nahal Hagit and Ein Hagit	6300/0	Within the facility area and the access road and within the area of the connection to the existing INGL station

17.	Triangulation Point N-565	7175/0	Within the access road area and the area of the connection to the existing INGL station
18.	Yo'ach, H (west-south-west)	7162/0	Partial overlap with the facility area

4.4.2. Means for minimizing the consequences of plan implementation

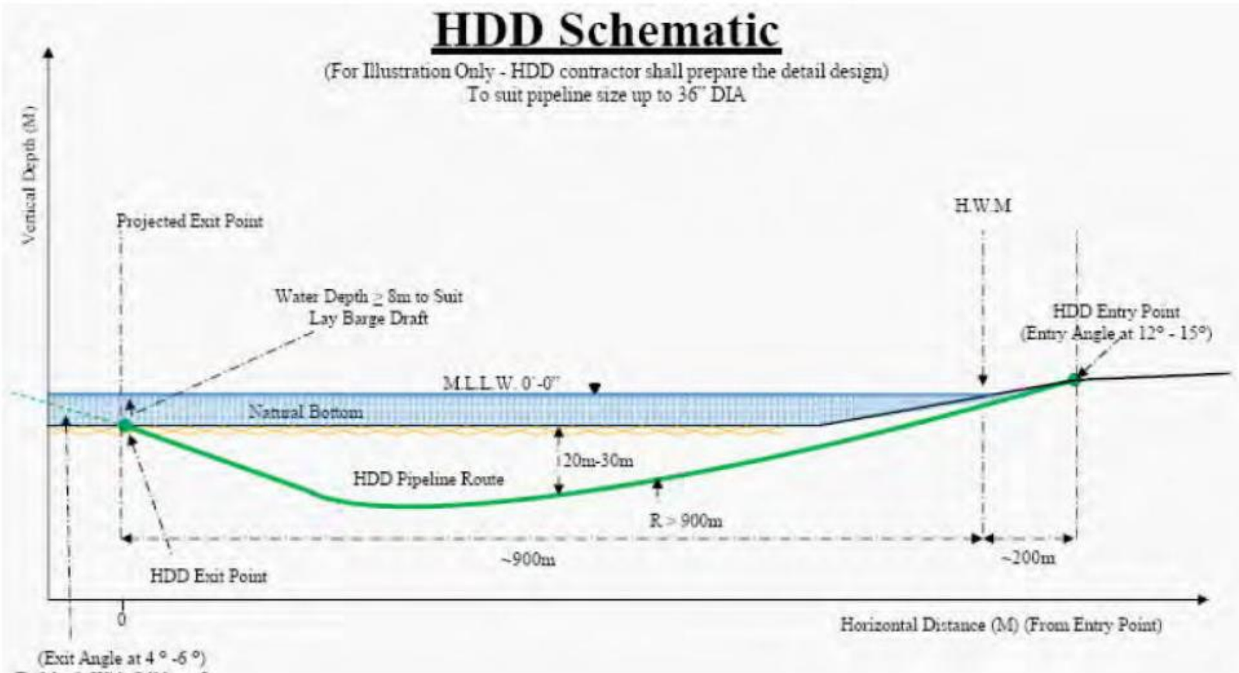
The means for minimizing the consequences of the plan depend on the location of the sites detailed in Section 4.1.1.

Within the coastal entry area, use will be made of the HDD method as detailed at length in the enclosed Appendix C, which was prepared by the engineering consultants for the offshore area of the plan, the Bipol Energy Company, Section 3.1.

Using this method it is possible to minimize the impact on antiquities sites both offshore and on the coastal environment by creating an underground passage under the declared antiquities sites areas.

The following is a schematic description of the HDD drilling:

Figure 4.2.2: Schematic Description of HDD Drilling



The rest of the sites are located within cultivated agricultural areas. In these areas, too, it is possible to adopt, if necessary, the use of underground drillings using horizontal drilling methods for relatively short distances, or using HDD for greater distances.

All works shall be performed in accordance with the instructions of the Antiquities Authority as received in the course of August 2012 (see details in Chapter A of the Survey, Section 1.9). Therefore, it is necessary to comply with the 1978 Antiquities Law, and preliminary tests must be carried out before performing development works, including development surveys, inspection sections, test and rescue pits.

4.5. Seismology

In the event of an earthquake, multisystem simultaneous damage may occur in different installations with risk for human lives and for the development of a pollution event. Although it is reasonable that significant damage may only be caused in the event of earthquakes that are stronger than the design quake for which each installation has been planned, damage is also possible in the event of weaker earthquakes. Both on the level of prevention and the level of treatment, we must take into account that it is possible that vital systems such as electrical, water and communication systems may collapse and that this will impair the efforts to save human lives and minimize damage. Moreover, an earthquake will impact the entire region and it is possible that a significant delay may occur until the arrival of outside assistance parties. In terms of damage prevention, beyond planning installations in accordance with an appropriate earthquake design, we must also install an earthquake warning system that is capable of identifying ground movement and thereby provide an auditory warning within the facility and initiate a series of automatic actions aimed at reducing hazards – closing valves, switches and other systems that control processes within the facility. In terms of actually handling an emergency – it is recommended to define emergency procedures for the facility staff covering a possible scenario in which they are required to act on their own to save human lives and to reduce the damage for a number of hours and perhaps even more, until additional forces arrive.

Possible consequences of a medium to large earthquake ($\sim M \geq 5$): fire, explosion, collapse, falling of objects and equipment, detachment of pipelines and release of hazardous materials into the air, soil, groundwater and the sea. It may be assumed that any object/equipment that is not anchored constitutes a risk to human lives – even in the event of a minor earthquake.

It is important to note that seismic design must take into consideration the stability of all engineering installations (non-structural component) and not only that of the structures themselves. An important aspect of a project of this type is to protect pipeline systems that are particularly vulnerable at connecting and curving points, as well as vulnerable to differential movements over distances, such as a pipeline connecting two buildings within the facility or the pipeline leading to and from the facility.

4.5.1. Expected consequences following seismic events

Analysis of possible technical malfunctions with regard to seismic events and means of prevention

Damage factors in a seismic event are the movements of the ground themselves as the seismic waves pass through it (wave propagation damage). Ground liquefaction and landslides can also cause soil deformation followed by damage to the installations. The risks for the offshore platform arising from tsunami waves will be discussed in the Survey for the Offshore Facility. In this plan, the phenomenon of surface disruption is not plausible, since no active faults bisecting the various facilities are known (see details in Chapter A of the Survey). Many examples of engineering structural failure as well as positive examples of cases of resistance to large earthquakes may be followed in the document entitled DEMA-E74 (2011)[26]. The main failures that may be expected during a large earthquake, beyond damage to structures, are:

Damage to pipelines – damages to pipeline systems as a consequence of earthquake includes bending of pipes, release of anchor points, pipe punctures and ruptures. Failures mainly occur at connection or welding points along the pipes. Within structures and facilities, the relevant damage factor is the seismic

[26] http://www.fema.gov/library/viewRecord/do?id=4626

vibrations themselves and the durability of the pipes is determined by the way they are anchored, their tensile and bending strength and the resistance of other elements to which they are connected, such as walls, pumps, tanks, etc. Buried pipelines (or pipelines placed aboveground), such as the pipeline system from the shore to the onshore treatment facility, can be damaged by constant soil deformation as a consequence of soil liquefaction or a tsunami wave. In fact, based on testimonies of earthquake damage from the US, it seems that buried pipes are mainly damaged by constant soil deformations, including liquefaction, and not by the seismic vibrations themselves (FEMA-233, 1992). Moreover, it was found that most pipelines were resistant to the vibrations themselves, except for a few cases in which there was corrosion or it was found that the quality of the welding works in the pipelines was low.

Means of prevention include standard anchoring, the use of pipelines resistant to tensile stresses and corrosion, and appropriate planning and close supervision of welding works. In the event of a tsunami, it is possible to protect the piping and the block valves station in the shore region by burying the pipelines at a sufficient depth.

Damage to containers – Earthquake damages include swelling and rupture of the container base ("elephant's foot"), dragging of the container, vertical cracks and punctures at connection points with the piping. Containers with higher height to diameter ratios are more vulnerable to overturning. Means of prevention include standard foundations and anchoring, sumps and flexible pipeline connections.

Environmental consequences and treatment methods

Should a pollution event develop as a consequence of failure during an earthquake, the most important thing is to provide rapid detection of the pollution and handle the pollution source immediately – in the event of a fire or leak. A mechanism for detecting leaks in the pipelines between the shore and the treatment facility should be planned; see details in Section 3.4.6 above.

- **Air pollution**

Failures that have occurred as a consequence of an earthquake are liable to release polluting materials into the air and damage the quality of the air at a certain distance from the facility. Pollution in this case is the result of the release of gases from pipelines and containers, the evaporation of liquid substances that leaked and cover a large area, and products formed following a fire within the facility. The potential emission of materials into the air following an earthquake includes the emission of gas from methane and MEG pipes, from the condensate containers, and from methanol containers. Emissions as a consequence of the combustion processes of the above-mentioned materials will mainly include nitrous oxides, sulfur oxides, particulates and volatile substances. Should an air polluting event develop as a consequence of failure during an earthquake, the most important thing is to immediately handle the source of the pollution – stop or reduce the leak, for example by closing off valves.

- **Soil and groundwater pollution**

The volumes of polluting liquids that may find their way into the aquifer in a scenario of pipeline rupture are described in Section 4.10.2. Planning a monitoring system according to the standards as detailed in Section 3.3.3 and its connection to the system to allow immediate interruption of the flow within the damaged pipeline and by means of remotely controlled valves will ensure that the volume of the polluting liquids will be no greater than the volume of the pipeline. Such volumes, as estimated in Chapter 4.10.2 (up to hundreds m^3 of glycol, product water or condensed hydrocarbons), are liable to lead to severe groundwater pollution, depending on the location of the pollution focus, its scope and extent of dispersion, damage to water quality is possible, which may find expression in the pollution of fountainhead waters of the adjacent spring Ein Tut. Handling of a polluting event in groundwater is extremely complex and includes the use of advanced technologies that require many resources. The options for handling such pollution events include, inter alia, pumping and treatment of surface water and treatment in situ by inserting neutralizing chemical substances into the groundwater, depending on the nature of the contamination. The discreet flow within cracks that characterizes groundwater in the shallow aquifer is expected to make it difficult to restore the aquifer.

- **Hazardous substances**

During an earthquake, containment may be lost as a consequence of damage to pipelines, containers and tanks. Possible scenarios in such cases include damage to the pipeline and eruption of gas at high pressure, as well as loss of containment of hydrocarbon containers, followed by ignition of flammable liquids and formation of a fire pool.

Such cases are liable to increase the ranges of the risk (see details in Section 4.11 below), but it is important to note that the probability for such cases is very low and the present risk ranges were calculated in accordance with stringent conditions. In addition, there are means of protection and for minimizing risks, even in such extreme cases as will be noted below in the present section.

4.5.2. Means for preventing and handling pollution

Local warning system for earthquakes

A local warning system is comprised of one or more sensors installed at the site itself and capable of identifying the first waves (P waves) reaching the site as a consequence of an earthquake. This system is capable of analyzing the frequency of the P waves and deciding if this is an earthquake or some other event, such as a blast in the quarry (Hyman, 2007[27]). Waves generally capable of destruction in an earthquake (S waves and surface waves) arrive with a slight delay and one can therefore obtain a short-term warning (usually just a few seconds), the length of which depends on the distance to the quake focus. The main source for future strong earthquakes is the Dead Sea Transform located at a distance of 80 km and more from the planned offshore facilities, a distance that will provide a minimum warning interval of about 10 seconds. In the event of even more distant earthquakes along the Dead Sea Transform, such as in the Arava/Eilat and Emek HaHula/Lebanon, the possible warning interval is 15 seconds and more. These values are gross values and are based on the difference in the accelerations between P waves and S waves (Hyman 2007; Figure 4) and they do not take other time losses into account such as the time required by the system to conduct its calculations and reach a decision.

Connection to a future national warning system

A national warning system for earthquakes ("Teruah") and against tsunami ("Mayim Adirim") is being discussed by the Committee of Ministers for Preparation to Handle Earthquakes, and is attached to the minutes of the government resolutions and received the force of a government resolution on June 7, 2012[28]. As of now, the system is planned to become operational in 2016. The future national system is expected to be comprised of a network of sensors deployed in space that will together provide a short-term warning of an earthquake (effective warning of 1-30 seconds). Its advantage, compared with a local warning system, is a certain increase in the time interval between identification and alarm, and the arrival of the destructive waves and a reduction in the risk of non-identification or a false positive for an earthquake. The government resolution notes that until the national system is installed: *"Local warning systems will be installed in plants and facilities that, if damaged, could constitute a source of risk for the population and in which it is possible to install automatic systems that will prevent the development of a malfunction in the facility. The warning signal will automatically activate a process that will prevent the development of malfunctions, for example closing valves, releasing locks, channeling the flow of chemical substances, interruption or slowdown of processes and the like."*

In any case, future suppliers must establish contact with the soil sciences manager in charge of planning, construction and operation of the system in future as regards its implementation when it becomes operational. In the first stage, the warning is planned to be carried out using wireless communications with terminal units that will provide audio indication ("Beeper Kurzit"), mainly in educational institutions. As far as is known from publications of the Kurzit manufacturer (the

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[27] Hyman, A. 2552. Short-term Warning in Israel. Report of the Geological Institute GSI/06/2007

[28] Decision No. 5274 or RAD/22

beeper company), it is possible to also activate emergency facilities by remote control with the aid of this device. Coordination of warning reception is carried out vis-à-vis the Home Front Command and the National Emergency Authority. In future, it may be possible to distribute a warning by other means, such as computers, radio and television communications and cellular telephony.

Emergency system – fire control and fire extinguishing

Since emergency systems have an important role in the prevention and reduction of damage during an earthquake, they should be planned in accordance with stringent seismic standards. These include, for example, anchoring vital control systems and backing up their electrical systems, constructing fire water tanks and fire water piping that is resistant to earthquakes as defined in the Seismic Risks Management Document issued by the Ministry of Environmental Protection, and installing an option for connecting flexible piping (hoses) to tanks.

Hazardous substances

The facility must conform to the requirements of the Ministry of Environmental Protection as presented in "Guide to the Management of Seismic Risks Arising from Non-Mobile Sources Vis-à-Vis Hazardous Substances Events" that was distributed by the Ministry. These requirements refer to the durability required in structures that contain and make use of hazardous substances, including piping and structures that are liable to collapse on top of containers and piping, so that they can sustain the level of earthquake defined in the document. According to the document guidelines, hazardous substances installations and structures that carry hazardous substance installations should be planned for an earthquake with a recurring period of 2,500 years. An additional requirement is the installation of disconnect valves in the hazardous substances containers and fire water in the event of an earthquake, so as to prevent the flow of materials out of the containers – seismic shutoff valve. It is also recommended to examine the option of having a safety valve on the gas line itself close down in the event of an earthquake warning received from the gas treatment facility.

Moreover, the sumps for hazardous substances containers will be planned to sustain such an earthquake.

Standards

<u>Israeli Standard 413</u>

This standard provides data for the development of a response spectrum for structures subject to this standard, as presented in Chapter A of the survey on the basis of the results of the seismotectonic analysis. Given the facility's importance and uniqueness, the engineering definitions of the standard seem to be irrelevant but the response spectrum that it provides has been adjusted for the Israeli seismotectonic environment and should be used or an alternative seismotectonic analysis based on up-to-date information relevant to our region. The present standard document provides information only for a recurrence cycle of 475 years. Information on longer recurrence cycles is included in the appendices to the standard that have been posted on the Standards Institute website (http://www.sii.org.il/655-HE/SII-Israel.aspx) and also in Amendment 5 to the standard, which was still not in force at the time the survey was written, but which may be used. Because of the facility's importance, a site response survey should be carried out as detailed in Appendix E of Amendment 5 of Standard IS 413 (for elements subject to the standard).

In addition to the facility structure, there are other nonstructural components that must withstand expected seismic loads. *Design for Earthquake Durability: Nonstructural Components – General* and its standards address four types of nonstructural components: steel storage shelves (2.1), containers standing on the ground (2.2), elevated containers (2.3) and on-ground pipelines in industrial facilities (2.4). Israeli standards for additional engineering facilities are planned in future but are not available at the moment, so that it is necessary to rely on non-Israeli standards and guidelines as detailed in IS 413 and additional ones as given below.

Guidelines and examples for additional nonstructural components may be found in document FEMA E-74 of the American Federal Emergency Management Agency:

Reducing the Risks of Nonstructural Earthquake Damage – A Practical Guide

This document refers in detail to three groups of components – architectural components (windows, staircases, facings...), mechanical components, electricity and piping and equipment parts, other fixed elements and furniture. The document also includes information regarding standards that should be used and in particular American Standard ASCE/SEI 7-10, which includes reference to nonstructural components such as the ASME B31 Process Piping standard for piping systems in particular. The seismic design of gas facilities must conform to the requirements in these standards. The seismic design of components that are not within the jurisdiction of the abovementioned standards will be established on the basis of other international standards.

4.6. Noise

Offshore segment

Sections related to noise in the offshore environment will be addressed in the context of the impact survey of the offshore environment, which is submitted as part of this plan.

4.6.1. Expected noise level

Will be described in the context of the offshore environmental impact survey.

4.6.2. Noise levels

Will be described in the context of the offshore environmental impact survey.

4.6.3. Acoustic protection

Will be described in the context of the offshore environmental impact survey.

<u>Onshore segment</u>

4.6.4. Noise sources

The onshore facility contains many compressors, pumps and generators. In Figure No. 4.6.4-1 the location of noise sources is marked on the facility's construction plan.

In order to characterize the future noise emitted from the facility, 58 point source noise sources were defined at varying heights – within a range of 1-3 meters over ground surface, in accordance with the planner's definition, as follows:

- 2 gas turbines for electrical supply, 10 MW each, where one is working and the other serves as backup.
- 4 compressors powered by the gas turbine marked with a pink rhombus.
- 24 compressors powered by electrical motors marked with a light blue square.
- 28 pumps powered by electrical motors marked with a red circle.
- 1 diesel generator for emergencies marked with a green trapezoid.

It should be noted that an additional source of noise in the facility is from "unusual activities" – such as self-initiated release of gas through the flare, which are not part of the current operations of the station but are only carried out in special cases. As stated above, the duration of such operations is relatively short and they may be carried out during daylight hours only. In the event that unusual actions are required from the acoustic point of view during construction of the power station and its initial commissioning, they will be conducted during daylight hours only.

Figure 4.6.4-1: Location of Noise Sources

4.6.5. Volume of existing and expected noise

The noise volumes of various machines are unknown at this planning stage. For the purpose of calculating environmental noise, we relied on data provided by various OEMs that manufacture similar machines to the machines planned for the facility.

Analysis of the data provided by different OEMs indicated that the equivalent noise levels at a distance of 1 m from each of the noise sources does not exceed 85 dB using A weighting. This limitation is also applicable to the demands of noise regulations in workplaces that are customary in Israel and in the countries of Western Europe and the US.

The spectrum of audio volume from the sources was defined in accordance with the noise of typical equipment units.

It should be emphasized that these assumptions are stringent ones, and therefore the environmental noise levels that were calculated are higher than those actually expected.

Noise characteristics from these types of facilities at distances exceeding 1,000 m – the location of the nearby noise recipients – does not include a prominent tone as defined by the regulations. According to the information currently available to us at this stage of the planning, activity in the facility will not create any offensive noise.

4.6.6. Location of noise recipients

The Hagit East alternative is planned to be built adjacent to the Hagit power station. Any area beyond the power station at a distance of 1 km from the boundaries of the plan is a pasture area and cultivated areas. The closest residential buildings to the plan are at Moshav Elyakim located to the northeast of the site at a distance of about 1.2 km from the plan boundary. Buildings at the Elyakim military base are located at a distance of 1 km to the southeast of the plan boundary. The location of noise recipients is presented in Figures No. 4.6.7-1 below.

4.6.7. Predicting noise levels

4.6.7.1. Methods and calculation software

Calculation of noise dispersion was made in accordance with noise dispersion calculation standard ISO 9613-2.

Calculations were made using the SoundPLAN software Version 7.2 – the most up-to-date version of the software. The SoundPLAN software is a program for the calculation of noise that incorporates many models for the calculation of noise from various sources, such as roads, railroads and industry. The software makes it possible to analyze noise levels from various noise sources with consideration for the specific topography of a site and takes into consideration concealment by buildings or concealment of lines of vision in the path of sound dispersion between the noise source and noise recipient.

The main variables required in order to calculate the noise according to the model are:

- Ground alignment in the area of the noise source, in the area of the noise recipients and what lies between them
- The spectrum of sound volume level of the noise sources
- Location and elevation of noise sources
- Location and elevation of noise recipients
- Qualities of sound absorption in areas between the noise sources and noise recipients
- Geometric data of various structures, walls or embankments that block noise dispersion

The software makes it possible to calculate the noise level at the noise recipient, or for a number of noise recipients, as well as the construction of equivalent noise curves for a specific area.

The result obtained from the model is the equivalent noise level using the A weighting (marked as LAeq) at the point selected for analysis in dB units.

4.6.7.2. Assumptions guiding the calculation of noise emitted from the facility

At this stage of the planning, detailed design parameters that will make it possible to calculate the expected noise in a detailed way have not been established. In view of this, the approach that calculation of the noise will refer to the worst case scenario was adopted, and the calculation was performed under the following stringent assumptions:

- Gas turbines will be of Solar manufacture or equivalent with 10 MW of power and will include a full acoustic canopy produced by the OEM. In this state, according to the OEM's data, the noise level at a distance of 1 m from the canopy will be LAeq=85dB.
- Compressors are powered by gas turbines and will also be of Solar manufacture with a full acoustic canopy as above. The noise level at a distance of 1 m from the canopy will be LAeq=85dB.
- The emergency diesel generator will also be provided with an acoustic canopy that will ensure that the noise level at a distance of 1 m from the canopy will not exceed LAeq=85dB.

- The rest of the 52 compressors and pumps will be ordered from manufacturers with the above requirements so as to ensure that the noise level at a distance of 1 m from the units will not exceed LAeq=85dB. For the purpose of the calculation it has been assumed that all 52 machines are working simultaneously.

4.6.7.3. Regulations for the prevention of hazards (Unreasonable Noise), 1990

The issue of the maximum allowed noise levels within structures is regulated via the Regulations for the Prevention of Hazards (Unreasonable Noise), 1990 ("Unreasonable Noise Regulations"). The regulations establish maximum allowed noise levels within residential buildings or structures when their windows are open, in accordance with the number of activity hours of the noise source as divided into day (between the hours of 06:00-22:00) and night (between the hours of 22:01 until 05:59 the next day).

These regulations are reception regulations, i.e. they address the noise as received within the buildings, as it is measured in accordance with the procedures established in the regulations, regardless of the source of the noise (except, as stated in Section 9 of the regulations, because they apply to noise from planes, trains, vehicles and building equipment).

The regulations distinguish between different types of buildings where the definition of "B structure" – "a building within a residential area in accordance with a plan made according to the Planning and Building' Law" corresponds to the definition of the residential buildings in Elyakim.

The Hagit power station structures and the military base structures correspond, to the best of our understanding, to the definition of an "E structure" – "a building used for the purpose of industry, commerce and workshops in a region where the land is used for the purpose of industry, commerce or workshops."

In accordance with Section 3 of the regulations, we should compare the noise level permitted by the regulations (as noted in the above table) with the noise level calculated in accordance with the provisions of said regulations in the following way:

"(A) The noise level for the purpose of Regulation 2(1) and (2) is one of the following:

(1) An equivalent noise level, with consideration for the contribution of background noise as described in Regulation 6;

(2) An equivalent noise level, as provided by Section (1), plus 5dB of noise with a prominent tone or an offensive noise;"

Moreover, in the definitions provided by the regulations, we find:

"A noise with a prominent tone" – noise that has prominent tones and when measured in dB(L) at central frequencies of 1/3 octave indicates that the noise level measured in band i exceeds the arithmetical average of the noise levels measured in adjacent bands i-1 and i+1 in the following amounts:

15dB - within the range of 25 to 125 Hertz;

8 dB - within the range of 160 to 400 Hertz;

5dB - within the range of 500 to 10,000 Hertz;

So long as the level measured on band i exceeds the two levels in adjacent bands i-1 and i+1, each one separately."

Table 4.6.7-1 presents the maximum allowed noise levels in accordance with the regulations in B type structures, whose definition is compatible with the residential buildings at Elyakim.

Table 4.6.7-1: Maximum Allowed Noise Levels of the Day and Night Hours in B Type Structures, in dB, in accordance with the Regulations for the Prevention of Hazards (Unreasonable Noise), 1990

Noise Duration	B Structure	
	Day	Night
Exceeds 9 hours	50	-
Exceeds 3 hours but does not exceed 9 hours	55	-
Exceeds 1 hour but does not exceed 3 hours	60	-
Exceeds 30 minutes	-	40
Exceeds 15 minutes but does not exceed 1 hour	65	-
Exceeds 10 minutes but does not exceed 30 minutes	-	45
Exceeds 5 minutes but does not exceed 15 minutes	70	-
Exceeds 2 minutes but does not exceed 5 minutes	75	-
Does not exceed 10 minutes	-	50
Does not exceed 2 minutes	80	

For residential buildings, the most stringent requirements in the regulations address noise levels during the nighttime for noises with a duration exceeding 30 minutes and noise levels during the daylight hours with a duration exceeding 9 hours.

For the power station buildings and the military base, the most stringent requirements in the regulations are uniform for the daylight hours for noises with a duration exceeding 9 hours and for nighttime for noises with a duration exceeding 30 minutes.

As stated above, for the purpose of conducting the calculations an assumption was made that the station will be activated in a uniform fashion during the day and the night, and therefore the maximum allowed noise levels within residential buildings according to the regulations is LAeq=40dB, and in the buildings of the power station and the military base they are LAeq=70dB.

Noise, when passing from the outside into a building through an open window, loses its power. Noise attenuation is in the range of 5-12 dB depending on the size of the aperture, its orientation vis-à-vis the noise sources, and the sound absorption coefficient of the space under consideration. For the purpose of the calculations, a conservative assumption will be made that for residential buildings, noise is attenuated at a rate of 5 dB when passing from the outside of the structure to the inside.

Therefore, the noise criterion outside residential buildings will be LAeq=45 dB and outside the power station buildings and the military base it will be LAeq=75 dB.

4.6.7.4. Hours of activity

For the purpose of calculating total noise from the facility it was assumed, as stated above, that all of the installations will operate at the same time for 100% of the time and therefore the noise levels during the daylight hours and the nighttime hours will be identical, and the decisive criterion will be the criterion for the nighttime hours.

4.6.7.5. Impact of meteorological conditions

Here too, calculations of the noise were conducted for the worst case scenario in which the wind blows from the direction of each noise source to the recipient, at an intensity of 1-5 meters per second, in accordance with the standard ISO 9613-2.

4.6.7.6. Results of noise calculations

3.1.1.1 Results of Noise Calculations

Figure No. 4.6.7-1 presents a map of curves for equivalent noise that represents the noise within the area impacted by the facility. The noise map was calculated for a height on 2 m - the height where there are people or a window on ground level. From a review of the map it may be seen that:

- Noise levels within the plan boundaries are in the range of LAeq=65-45 dB.
- Because of the complex topography, noise levels within the power station boundaries do not exceed LAeq=45 dB.
- At a distance of about 500 m from the plan boundaries, noise levels are lower than LAeq=35 dB and significantly lower than the criterion level for residential buildings, which is LAeq=45 dB as presented above in Section 4.6.7.2.

Figure 4.6.7-1: Map of Equivalent Noise Curves

4.6.8. Solutions

As stated above, noise levels that were calculated from the facility's activity in the surrounding localities are significantly lower than the criterion level, as well as from noise levels measured under existing conditions, and do not require means for noise attenuation. For the purpose of occupational hygiene and the preservation of the hearing of employees within the gas turbine facility, the compressors powered by the gas turbine and the emergency generator will be provided with a full acoustic canopy by the OEM as an integral part of the equipment. According to the OEM's data, the noise level from all of these sources will not exceed LAeq=85dB at a distance of 1 meter from the equipment.

As regards the rest of the noisy equipment within the facility – there will be an explicit requirement from equipment manufacturers to conform to said noise level. It should be noted that it is possible to place some of the equipment into noise hoods, and this solution is a routine one, especially where turbines and various types of gas compressors are concerned.

4.7. Pollution of the Offshore or Onshore Environment Following Leaks

A description of the impact on the offshore environment will be examined in the context of the offshore environmental impact survey that is submitted as part of this plan's documents. The following is reference to the onshore environment at the Hagit site.

4.7.1. Description of the conditions for a leak

This section describes the conditions for gas and liquid leaks (such as product waters, oils, condensate) from system components as detailed below:

- **Block valve station** – The block valve station is planned as a closed and protected area (by means of a fence and other means) and only authorized persons will be permitted access. In addition, no flange connections are expected at the block valve station, but only weld connections, and therefore no particular gas or liquid leaks are expected for this component. A possible source of leakage is the valves through the stem. Possible leaks in the pipeline as well are described below.
- **Pipeline alignment** – Since it is assumed that the pipeline will be examined before it is covered with soil, possible leaks in cases of malfunction such as a pirate excavation or an excavation conducted without coordination, in particular in cases where there is a problem with cathode protection that is liable to weaken the pipe wall.
- **Treatment facility** – Leakage from pipeline connections, valves and surrounding equipment, spills of substances and leaks from current

maintenance works and during emergencies, may all lead to leaks of liquids and gases.

4.7.2. Means and procedures for monitoring leaks

Means and procedures for monitoring leaks will include the following:

Means of detecting gas leaks:

- Pressure-controlled systems on the pipeline and instruments within the facility that give warning about unplanned pressure drops.
- Gas detectors at the facility with two levels of warning – warning for leakage at Action Level - 10% LEL and for operating level, where engineering means are activated in order to take control of the leakage.

Means of detecting liquid leaks:

- The contents of the plan for detection of leaks via continuous measurement of engineering parameters within the pipeline (throughput, pressures etc.).
- Containers and pipelines will be protected and monitored in accordance with the relevant regulations.

In addition, there will be a large number of automatic shutoff valves that may be shut off from the control room in order to minimize the leaks, in accordance with the event taking place.

Means and procedures for monitoring leaks are detailed in Sections 3.3.4, 3.4.6 and 4.11.1.

4.7.3. Means and procedures for preventing environmental pollution

Means for taking control of a gas leak:

- Emergency shutdown valve – ESD
- Release of gas into flare and/or vent
- Water cannons that during a leak can activate water spray in order to dilute a leaking gas cloud; such water cannons may be operated both manually and automatically upon identifying a gas leak at the second warning level.

Means for preventing spills and dispersion of liquids:

- Sumps for liquid containers according to the requirements of the relevant regulations and authorities: the Ministry of Environmental Protection - Guidelines for Sumps and Collection Areas, the Home Front Command - Technical Specifications for Protection, the Petroleum Law, relevant NFPA standards.
- A level gauge with excessive height warnings (in order to prevent overflow during filling) in containers.

- Use of dedicated hoses, such as a smart hose for the prevention of spills during the discharge of chemicals from tankers or during the loading of tankers.
- Transmitted level gauge in sumps in order to warn of liquid leaks.
- Means for blocking drainage pits so as to prevent liquid spill outside the plant area. For example, sealing cushions for drainage or blocks preventing the spill from reaching drainage apertures for runoff.

The means for preventing environmental pollution as a consequence of leaks are detailed in Section 3.4.6 and 4.11.1.

4.7.4. Action plans and means applied in the case of a leak

Action plans and means to be adopted in the case of a leak of oils and other substances, including procedures and timetables for action, will be submitted by the plan developer during the building permits stage and approved by the relevant governmental parties.

A plan for handling pollution events in groundwater as a consequence of leakage of condensate and/or operating fuel and product water will be drawn up in accordance with the guidelines of the Ministry of Environmental Protection and will include the customary contents of plans for readiness and response to polluting events (contingency plans) as follows: definition of forces and tasks and specification of action methods and means in accordance with the stage of event handling and in accordance with the nature of the event, communication and reporting procedures, procedures for coordinating with relevant parties and other action plans (such as: the relevant local authorities, the Water Authority). The plan for handling various scenarios of liquid spills into the environment will address, inter alia, the results of the predictions of the impact of these substances in the soil.

4.8. Handling Product Water and Condensate

The environmental impact of product water and condensate will be discussed in the context of the offshore environment impact survey. The impact expected within the onshore environment is from leakage of liquids from the pipeline (see details in Section 4.10 below). In addition, throughout the life of the project there is a certain possibility of the accumulation of salt in the product water. A situation of this type only occurs when the product water is mixed with saline formation water. In such a case, it will be necessary to provide additional treatment for the MEG that will ultimately yield salt surpluses. The salt obtained in this process will be collected in a container and evacuated via truck to a dedicated separate site, where the salt surpluses will be stored in dedicated containers.

The quantity of salt depends on the treatment quantity of the MEG, and cannot be estimated at this stage. Nevertheless, it should be emphasized that the quantities of salt under consideration are not large, since if a well produces a large quantity of salt, the pumping from it is usually stopped.

4.9. **Impact on Habitats and Natural Values**

4.9.1. Onshore environment

A. Expected influences on the natural environment

This section surveys the expected influences on the natural environment as a consequence of the plan's realization. The influences will be surveyed for all plan elements: coastal entry array, pipeline to the treatment facility and the gas treatment facility itself.

In addition, details are provided of light and noise nuisances, invasive species, the continuity of open areas and the impact on the migration and activity of fowl.

<u>Coastal receiving stations</u>

The coastal entry point planned at Hof Dor relies on an existing pipeline alignment. The block valve station and the staging areas are planned to be located within the area of dry fish pools that are no longer active. The Hof Dor area has many ecological values stemming from a variety of habitats that include the shore area and wet habitats. These habitats offer a rich biological variety with an emphasis on types of fowl. In the data bank of the nature and parks authority and at the biological diversity website of the Hebrew University, we can find past documentation of 162 species of fowl in the area between Nachsholim and Ma'agan Michael; the Taninim Stream survey conducted by the Society for the Protection of Nature documented 91 additional species. All in all, 243 species have been observed within the area, of which 111 nest and 20 have become extinct as nesters or are zoned for high levels of risk (see Appendix D for a list of the types of fowl at Hof Dor). Various mammals are also present in the area, such as: wild boar, the common fox, wildcat, and mongooses. In the area of the inactive pools, a habitat has developed which includes a variety of ecological niches in accordance with the abiotic conditions. Within the areas of the pools that drain water during the winter, a thicket of common reeds and tamarisks has formed, and with the drying of the water various annual flora appears, including various species of atriplex, such as: pickle weed, juncus bufonius, juncus acutus, bulrushes, golden santhire, atriplex prostrata, atriplex halinus. In the pool area are also found two types of flora under risk of extinction (red) - sarcocornia perennis and ipomoea sagittata. Within the pool area, there is a large variety of ruderal flora that is slowly overtaking the entire habitat during the summer months when the soil is dry, such as: white mustard, holy thistle, thin safflower, horseweed, fleabane, false yellowhead, Jaffa scabious. This habitat has a relatively low sensitivity because of already existing disruptions and because of the relatively quick rehabilitation capacity of wetland habitats. We may learn about the impact of passing the pipeline through the pools from the rehabilitation of the local flora along the existing pipeline, which is no different from the flora within the areas where the alignment does not pass. The permanent block valve station includes a fenced-off area covering about 5 dunams and the main impact is expected in the course of the construction work and the marginal influences of noise and lighting. Since the Hof Dor area is sensitive from the point of view of the nesting activities of water fowl and sea turtles on the sandy beach, it is recommended not to perform the works during the spring and summer seasons (the nesting season) but only at the end of the summer and the autumn (September and later). It is also recommended to locate the block valve station within disturbed areas close to the fish pool embankments.

Figure 4.9.1-1: Existing Pipeline Alignment in the Deserted Fish Polls to the South of Moshav Dor (date of photograph: May 3, 2013)

Transmission line to the treatment facility

In the context of the survey, a 150-meter wide inspection strip was defined. It was assumed that in actual practice the pipeline strip and the work strip will be between 40-60 m wide. For the pipeline alignment, Chapters A and B of the Survey examined two alternatives – a northern alternative and a southern alternative. These alternatives cross the south Carmel range area along about 10 km and are expected to significantly damage a variety of natural habitats in which various formations of Mediterranean flora exist, as well as many natural values. This section addresses only the northern alternative (for an explanation regarding the rejection of the southern alignment, see details in Section 3). The following are details of the expected impacts:

West alignment segment (shoreline - Road 4)

The line will pass in parallel with the existing line strip. As stated above, the deserted pools area has a relatively low ecological sensitivity and the area is expected to recover after excavation and burial of the pipeline. Within the kurkar range to the west of the pools, there is a mosaic of habitats and floral units that include a garrigue of mastic trees and Palestine buckthorn, herbaceous dwarf shrubbery and ruderal types, agricultural areas and ancient excavation pits where wetland habitats are developing. As detailed in Chapter A, these habitats have a variety of unique flora as well. The planned alignment crosses the kurkar range within an area that is mostly used for agricultural activity of plantations, so that no significant damage is expected to vulnerable habitats. Between the kurkar range and Road 4, the alignment passes within a cultivated agricultural area, where no damage to natural values is expected except for the crossing of a boulevard of cypresses around the circumference of the agricultural areas.

East alignment segment (Road 4 - treatment facility)

In this segment as well, the northern alignment passes adjacent to the existing pipeline that lies to the south and requires the excavation of a new infrastructure strip. The alignment crosses a variety of Mediterranean habitats with a high level of sensitivity, including human planted forests where there is a developed sub-forest layer, Mediterranean forest of common oak, Tabor oak, carob, spiny hawthorn, officinal styrax, true laurel, and Palestinian mastic and various levels of density, and alongside them there are patches of garrigue and rocky dwarf shrubbery dominated by shrubs and bushes such as Palestine buckthorn, mastic tree, spiny broom, prickly burnet, Israeli thyme. The sub-forest and forest offer concentrations of protected flora and geophytes, such as: crown anemone, Persian cyclamen, common narcissus, toothed orchid and the Carmel bee orchid.

In the eastern part of the segment, the alignment crosses a mosaic of bushes and dwarf shrubbery located on the ridge to the north of Nahal Tut and to the east of Nahal Elkana. Subsequently, the alignment passes within an area of herbaceous dwarf shrubbery where grazing is also taking place, and where there are unique species such as the Red-stemmed Figwort (endemic), the Syrian Cornflower-thistle (endemic) the Blue Lupine, the Yellow Asphodel, the Vartan's Iris, the Orchis saccata and the Milk-vetch, which serves as host for the Tomares nesimachus butterfly. Rehabilitation of the area after construction of the facility is fast in the dwarf shrubbery area because of the dominance of the therophyte floral types. Along the existing line, it is possible to see full and unbroken coverage of herbaceous shrubs and therophytes of similar composition to the surrounding area. In specific locales we see stands of floral units dominated by pioneer species and ruderal species such as the Common Fennel, the Milk Thisle, the Artichoke Cotton-thistle and the Charlock (Figure 4.9.1-3). In the areas of bushes and dwarf shrubs, rehabilitation is slower and the composition of the species comprises both the features of herbaceous shrubbery and of dwarf shrub formations. The herbaceous shrubbery area constitutes part of the filling basis of Nahal Tut and the springs in the vicinity of the Hagit power station. The pipe strip changes the characteristics of the soil and correspondingly also the characteristic of runoff transmission. The strip has the potential to constitute a channel that drains the runoff and changes their course in a way that is liable to lead to drying up local springs.

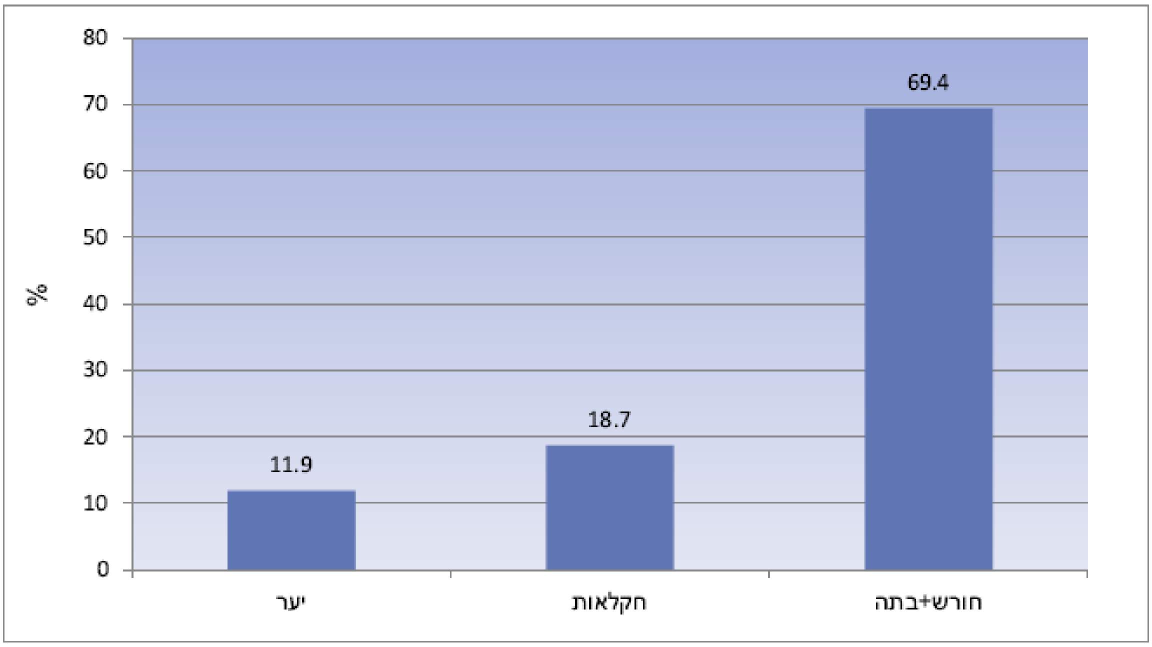
The alignment proposed along this segment, which extends over a distance of 9600 meters, mostly passes within natural areas of undisturbed woods and dwarf shrub formations (about 6660 meters or 64.4%), within agricultural areas (about 1795 meters or 18.7%) and within forests planted by man (about 1145 meters or 11.9%) (Figure 4.9.1-1). It is possible to learn about the future impact from the rehabilitation process along the existing line. The line was laid by an excavation and fill process and there is a service road for maintenance purposes that extends along the alignment. The line strip constitutes a prominent landscape nuisance on the background of its environment and is easily distinguishable. Floral units along the infrastructures strip differ from those found in the habitats that it crosses. Within the infrastructure strip that passes within woods and forests there are dwarf shrub formations dominated by Prickly Burnet and Spiny Broom and herbaceous shrubbery dominated by therophytes such as the Thin Safflower, the Common Caper, the Common Fennel, Wild Oats, Dwarf Chicory and the Common Globe-thistle. Along the alignment, a number of individual specimens of the invasive species Tobacco Tree were found, and close to the pine forest areas it is possible to see seed plants taking over the disturbed alignment. As a matter of principle it is not possible to allow the development of deeply rooted trees in the vicinity of the pipeline alignment, so that it may be assumed that the oak wood or forest formations typical of the area today will not be allowed to develop.

Along the alignment there are concentrations of mature forest trees (in particular in the segment between coordinate 198890/724630 and coordinate 201300/724680), among them mature and impressive specimens of the Tabor oak, common oak and common carob.

Figure 4.9.1-2: Existing Alignment and Service Road in the Area of the Natural Forest Crossing

Image 4.9.1-3: Existing Pipeline Alignment within the Herbaceous Dwarf Shrubbery Area to the East of the Plan

Figure 4.9.1-1: Distribution of the Passage of Pipeline Strip between the Main Habitats in the Segment between Road 4 and the Treatment Facility



[From left to right: Forest, Agricultural, Forest + Dwarf Shrubbery]

Treatment facility at the Hagit Site

The treatment facility located to the east of the Hagit power station is also located within the range of the herbaceous dwarf shrubbery area. In the western part of the plan area, there is a relatively high grazing pressure that leads to the dominance of species that are grazing-resistant, such as: Tall Viper's-bugloss, Dwarf Chicory, Syrian Thistle, and False yellowhead. In the northern part, adjacent to the Nahal Hagit bed, there is a cattle raising area that disturbs the ground. Relatively high grazing pressure also prevails along the north bank of Nahal Hagit, thereby facilitating the appearance of hundreds of Anemones and of Blue Lupine. The dwarf shrubbery areas surrounding the Hagit power station serve as an activity site for the Tomares nesimachus butterfly and the largest population of Gazella gazella gazelle in the Carmel area. In general, this area constitutes an important ecological spaces that connects the south of the Carmel with the Ramot Menashe area. Construction of the facility close to the Hagit power station will take up some of the dwarf shrubbery area, but its main impact is in increasing such nuisances as noise and lighting that are liable to impact the way in which the gazelle population and other fauna utilize the space. The Hagit power station is located in the drainage and fill basin of Nahal Tut and the Tut spring. The hill on which the facility is to be built constitutes a runoff percolation area that feeds the Ein Tut spring. Nahal Tut is an extremely vulnerable wetland habitat with a variety of organisms, some of which are under risk of extinction, such as the *Acanthobrama telavivensis* fish and the *turus vittatus* amphibian. Establishing the station in its present location may change the runoff and percolation regime and lead to the drying up or dwindling of the amount of water in the stream and the springs that feed it, thereby harming the existing ecological system. In addition, the facility is bisected by the Nahal Hagit channel so that the channel is liable to sustain physical damage, and it is also possible that polluted runoff may flow from the facility. A gas pipe transmitting treated gas goes back from the facility to a pressure reducing station located westwards. The pipeline alignment passes along an existing road and a gardening embankment, so no damage to natural habitats is expected.

The increase in industrial activity around the Hagit power station because of construction of the gas treatment facility constitutes a threat from the point of view of nature preservation, due to the damage to a high-quality area that constitutes an ecological "bottleneck" of supreme importance that connects between the Carmel and Ramot Menashe, and because of the great potential for damage along with the pipeline alignment to the variety of the species and their habitats in the south Carmel.

Light pollution

The term ecological light pollution refers to the various influences of artificial light and wavelength on the activity and behavior of fauna. These influences can take place at various levels of organization by influencing the composition of the species in the illuminated area, changes in population size as a consequence of increased predation risks, and changes in the nocturnal behavior and biological rhythms that depend on seasonal and daily light changes. Peripheral lighting systems are planned both for the block valve stations as part of the security requirements, and for the treatment facility. The influence of light depends on its dispersion around the facilities, and in lighted areas we may expect an impact on the behavior of fauna. Particular sensitivity exists in the areas of the block valve stations proximate to the vulnerable habitats of the coastal strip, where there is a reasonable risk that the lighting will overflow into vulnerable habitat areas. In the area of the treatment facility, overflow of light into open spaces is liable to disrupt the movement and activity of fauna. During the performance of the works involved in burying the pipeline, it is possible that a temporary disruption will occur in the event that such works take place during the nighttime.

Noise

High noise levels are liable to create a disturbance for the current activities of fauna, pushing them away to more distant areas. It is also possible that species that have sound communication may be impacted, such as songbirds and amphibians, which is expressed in behavioral changes compensating for the environmental noise. The issue of the noise was examined in the context of the Survey (see Section 4.6). The findings indicate that the noise levels predicted within the boundaries of the plan are close to the already existing noise levels, and also due to the existing topographic structure the level of the noise quickly fades away. In the Nahal Tut area, noise levels are considerably lower than existing standards (for residential areas) and it is reasonable to assume that the interchange and adjacent road will have a greater impact from an acoustic point of view. It may therefore be estimated that no disruption is expected to the sound communications between fauna, even though it is possible that an acoustic impact area will exist around the facility that will push away species that currently make use of that space.

Invasive species

Within the survey area there are a number of species of flora that are defined as invasive, such as: tree tobacco, acacia saligna and golden asters. The gas transmission infrastructure construction work and all of its installations will damage the soil surface, which leads to changes in the abiotic environment. This change has the potential to create conditions favorable to invasive and disruptive species, providing them with a competitive advantage over local species. The dominance of invasive species is expected to decrease the biological variety within the habitats and to lead to a change in the composition of the flora and fauna communities, as expressed in the disappearance of specializing and unique species within the system, and the invasion of species that have wider distribution characteristics – generalists. In order to minimize the phenomenon whereby invasive species become entrenched in the work areas, is it necessary to perform removal and uprooting works before beginning the work, and use a long-range monitoring interface after completing the work. These activities are detailed below.

Contiguity of open areas

There is impact potential on the contiguity of open areas and ecological corridors for facilities that are permanently established in the area, which include the onshore block valve stations and the treatment facility. The pipeline is a buried line and therefore only a temporary local impact is expected during the work. The block valve stations are located within the national ecological corridor that passes along the shore and extends over a width of about 1,000 m. The size of the station is about 5 dunams and is planned within the area of fish pools that are inactive and which constitute an area of fauna activity. Because of the need to fence off the block valves, it is expected that some of the corridor area will be removed (about 5%) but the ability to move and pass within the area will remain possible on the basis of the open areas in the station vicinity.

The treatment facility is located within the area of the national ecological corridor that passes along the Carmel range and Ramot Menashe. The facility is adjacent to an existing power station and therefore does not create new segmentation of the area. At the same time, the facility area itself is a region where the Mediterranean forest shifts into the Menashe dwarf shrubbery area (ecotone) with an extremely high ecological importance for the passage and movement of fauna, with an emphasis on the largest population of Israeli gazelles in the Carmel. An overhead ecological passage over Road 70 is located at a distance of about 2 km from the plan and serves as the only linkage point between the two bio-geographical units. The planned facility is located within the axis of the gazelle population's movement and activity and therefore has the potential to increase existing disruptions (as a consequence of the activity of the Hagit power station) and impact the function and quality of the ecological passage.

<u>Impact on the migration and activity of fowl</u>[29]

For the purpose of examining the various aspects of impact on fowl activity, a detailed ornithological opinion has been prepared by the ornithologist Asaf Meiroz. The full opinion is enclosed as Appendix D of the Survey. The main points and conclusions of that work are presented below:

1. **Migration of fowl within the plan area**

   1.1. **<u>Introduction</u>**

Israel constitutes an intercontinental junction and bottleneck of global importance for the migration of birds. According to estimates based on a study using radar, at least 500 million birds pass over Israel per season, in the autumn and the spring (Bruderer et al. 1994), and these birds belong to 283 species (Shirihai 1996).

<u>Figure 4.9.1-1: Schematic Map of Bird Migration Axes around the Mediterranean Basin</u>

[29] Full list of sources - see Appendix D below

Migratory birds may be roughly divided into two groups – passive migrators (or "day migrators") and active migrators ("night migrators"), which may be distinguished by the migration technique and its timing:

1.2. <u>Migration of gliding birds (passive migrators)</u>

The differences between the two groups in the migration method also lead to different selections of migratory routes and axes – most passive migrators refrain from crossing large bodies of water, and therefore Israel constitutes for the populations of Eastern Europe and Western Asia the almost sole axis of transportation on their way to Africa. Moreover, because the distribution areas of a number of gliding fowl are limited to said areas, **Israel and the eastern Mediterranean constitute the sole axis of movement for their global populations.**

The significance of this is that Israel is important in maintaining entire populations of migratory species and it bears responsibility for the condition of the natural systems in great expanses of East Europe and West Asia. In the north of Israel, the main axis of migration for the gliding fowl in autumn begins about 10 km east of the shoreline and its peak is along the western slopes of the mountain spine – in the Galilee, Samaria and Judea. Another central axis passes along the Jordan Valley up to the north of the Dead Sea, and then southwest to northern Sinai (Figure 4.9.1-2). Within the space located 5-15 km from the shoreline, as many as 50,000 raptors may pass each season (Meiroz and Eyal 1986).

<u>Figure 4.9.1-2: Main Migratory Routes of Gliding Fowl (Passive Migrators) in our Area (Leshem and Bahat 1994)</u>u

1.3. <u>Night migrators (active migrators)</u>

For active migrators, which numerically constitute the absolute majority of migrators, the situation is less clear-cut for a number of reasons. The first is that they pass over Israel in a wide angle. They do not avoid crossing bodies of water, so a smaller segment of their populations circumvents the Mediterranean Sea and the Red Sea and passes over Israel. Another reason is related to our ability to collect quality information regarding their migration.

A summary of the data collected by various means indicates that the migratory axis passing through Israel is one of the most important in the world, perhaps the most important within the area of the Old World, and is comparable in its power to the Transamerican migratory axis between North and South America (Leshem & Yom-Tov 1998).

About 70% of all migrants fly over Israel during the nighttime, and most of them are passerines. The migration over the west of Israel is extremely significant during autumn, while in spring most of the migrants pass along the east axis, above the east Negev and the Arava, the Jordan Valley and the eastern slopes of the mountain spine (Bruderer 1994).

1.4. <u>Intermediate stops during migration</u>

A large number of the fowl that migrate over our region do not stop for any rest or way station during their migration. Gliding birds, i.e. raptors, pelicans and storks, consume distances of 200 to 500 km per day and most of them are obliged to land every evening, because during the nighttime the thermals vital for their migration do not form (Leshem & Yom-Tov, 1998). In other words, these fowl usually land for a single night only within the borders of Israel, and the next morning they continue their migration without delay. Exceptional in this regard are exceptional weather events that force the birds to stop for a number of days. Various types of species such as cranes and bee-eaters combine both passive and active migration, and do not need to stop for a rest every day, but migrate using thermals during the day and continue by night using active flight.

Another part of the migratory birds stop in Israel for longer periods in order to rest, feed and accumulate fat, which becomes the "fuel" that allows them to continue their journey. This group comprises isolated individuals or parts of the migrating flocks of most of the species that pass through Israel, although there are species for which stopping in Israel on the way is more important. One example is that of the white pelican, which mainly winters in South Sudan. In the onshore segment between Israel and South Sudan, there are almost no appropriate food sources for it. Therefore, Israel constitutes its last fueling station before a journey of 2,000 to 3,000 km over the deserts of Sinai and the Sahara. Most of the pelicans that pass through Israel in autumn (about 40,000 individuals), also pass through the coastal plain and Emek Hefer. Some of them only land for one night without feeding, while others remain for a period of a number of days to a number of weeks and feed off the water reservoirs and the fish pools in the valley. In the autumn of 2012, for example, 40,000 pelicans landed in the valley for a stop of one night to three weeks (Asaf Kaplan, Agricultural Damages Supervisor and the Nature and Parks Authority, verbal report).

2. Fowl that stay at Ramot Menashe for prolonged periods (stable/wintering/summering)

2.1. <u>General</u>

Out of about 540 species of fowl observed in Israel up until now, about 200 species also nest here (175 are permanent nesters and the rest are incidental nesters). Among the permanent nesters, 57 species are stable (they remain in Israel throughout the year), 44 species summer (they come in spring and leave in autumn) and 74 species are "complex nesters," i.e. part of their population summers and part of it is stable.

In addition, there are 216 species of fowl defined as winterers (some of them also pass through Israel and some of them only winter here).

The number of birds staying in Israel during the winter or resting during migration is immeasurably greater than the number of stable fowl and those that nest here.

2.2. Fowl habitats in the vicinity of the Hagit treatment facility

The Hagit treatment facility is located within a natural area of herbaceous dwarf shrubbery along the south and east slopes of the Carmel range – on the Ramot Menashe boundary, in proximity to the Hagit power station. Within the plan area and in its vicinity, we can find fowl habitats that serve the birds throughout all seasons (for a list of representative species, see Appendix D). A precise definition of the species of these fowl and their numbers requires long-range monitoring, for these data change all the time. The plan area and its immediate environment comprises a mosaic of important fowl habitats:

- Herbaceous dwarf shrubbery: Most of the plan area is characterized by a cover of herbaceous dwarf shrubbery (some of it is open cattle pasture) used by fowls that favor dwarf shrubbery formations such as the streaked fantail warbler or the corn bunting, and for the predation of raptors such as the common kestrel, the lesser kestrel, the hen harrier and the pallid harrier.
- Stream thicket and wetland: To the south of the plan are stream wetlands surrounding the low Nahal Tut basin and the tributaries flowing into it (some of it is included in the Nahal Tut nature reserve). These wetlands are used for nesting by such thicket favoring fowl as the Eurasion reed warbler, the eastern olivaceous warbler, the Sardinian warbler, the streaked fantail warbler and Cetti's warbler. In winter and spring, the wetlands expand and shallow seasonal pools are formed, and at such times various water fowl are also observed in this area, such as the mallard, the Eurasian teal, the common kingfisher, various types of sandpipers and the common moorhen.
- Plantations, planted forest and natural woods: The plan area borders on agricultural areas to south and to the east (dryland farming areas, olive plantations and deciduous plantations). Mount Tabor oaks have been planted to the northeast of the plan area (to the north of Ein Yoach) and various types of trees have been planted to the northwest. On the more distant periphery, about 2 km. to the north and south of the facility, is an area of both natural and planted Mediterranean forest (as part of the Carmel Forest part, the Har HaCarmel reserve and the Har Horshan

reserve). All these are populated by wood favoring foul, such as blackbirds, tits and jays, and species that accompany human habitation such as the palm dove, the common bulbul, the house sparrow, and the hooded crow.

2.3. Dwarf shrubbery favoring fowl as a unique group

Most of the area proposed for construction of the facility is characterized by low and herbaceous dwarf shrubbery. In general, no proper consideration was devoted in Israel to the preservation of the dwarf shrubbery areas for a number of reasons: there are no trees there, pedestrian movement through them is usually difficult, their value as pasture is limited, while on the other hand the cost of preparing dwarf shrubbery areas for development is relatively low. In Israeli tradition, damage to trees is considered more severe than damage to shrubs and bushes. For these reasons, planning institutions and the developing parties allow, with relative ease, damage to be caused to dwarf shrubbery areas. Channeling development to dwarf shrubbery areas, in addition to the conversion of many dwarf shrubbery areas into human-planted forestry areas, led to a situation in which this important landscape formation has become very rare in the Israeli biological landscape, and did not receive appropriate representation in nature reserves or other protected areas. In parallel, fauna that used the dwarf shrubbery areas as their habitat, became rare (Shakedi and Engel, 2004, Rothschild 2012).

In the dwarf shrubbery area there are fowl that are "specialists in dwarf shrubbery," adapted to nesting and foraging for food within a semiarid area characterized by low flora. Among them:

- Ground nesting fowl such as the crested lark, Black-eared wheatear and the Long-billed pipit.
- Low thicket nesters such as the graceful prinia, streaked fantail warbler, and spectacled warbler.
- Bush dwellers such as the red-backed shrike, the scrub robin, and Upcher's warbler.
- Earth wall nesters such as the European roller and the European bee-eater
- Cliff wall, stone wall, and ruin nesters such as the lesser kestrel, the little owl and the Eurasian eagle-owl.

Today, as a consequence of the dwindling of the dwarf shrub formation areas, the populations of these species are declining and some of them are under threat of extinction, such as the spectacled warbler, Upcher's warbler and the Long-billed pipit (an endemic species found only in Israel, Lebanon, Syria and Jordan), the scrub robin, the Black-eared wheatear, the black-headed bunting and Cretzschmar's bunting.

The dwarf shrub formation is a vital predation area for many raptors such as the lesser kestrel, the pallid harrier, and the eastern imperial eagle (all three under threat of global extinction), Bonelli's eagle, the long-legged buzzard, and the short-toed snake eagle, which exploit the open dwarf shrub areas where not trees obscure the prey, to identify their prey (rodents and reptiles) and descend on them from a great height. These species of raptors find it hard to hunt in forest or wood area, and therefore depend on dwarf shrubbery and grassy areas for their livelihood.

From among the species of birds that nest in Israel, 39 species have been defined as "favoring dwarf shrubbery," of which 9 species are at risk of extinction in Israel (Meiroz and Alon 2001, Perlman and Alon 2008).

Species that are specialists in dwarf shrubbery are specialist species that are extremely vulnerable to changes in habitat and respond to changes that take place at a distance from their nesting estates. In the northern Negev, for example, it was found that the presence of specialist species in dwarf shrubbery increases prominently in the dwarf shrubbery patches that are larger than 500 dunams. It was also found that the presence of large dwarf shrubbery patches increases the biological variety of the entire area as compared with an increase of forest areas that does not contribute to an increase in biological variety (Shochat et al 2001). The totality of these factors (that indicate that the dwarf shrubbery fowl community comprises rare birds and relative sensitivity to changes), make dwarf shrubbery areas particularly valuable for the preservation of a variety of fowl species in Israel.

Birds observed within the plan area

A list of 130 species of birds observed in areas close to the plan is presented in Appendix D, below and comprises observations from the information databases of the Nature and Parks Authority (Sever 2001) and personal observations carried out by Asaf Meiroz and additional ornithologists over the years. This list is certainly not complete, but it comprises most of the species of birds that represent the area. From among the birds observed, two groups of species are worthy of particular attention:

Fowl that favor dwarf shrubbery formations:

This group includes various specialist and vulnerable species which are likely to be negatively impacted by construction of the facility, influencing their entire populations in the area, well beyond the physical boundaries of the facility, e.g., the chukar partridge, the common quail, the lesser kestrel, the short-toed snake eagle, the pallid harrier, long-legged buzzard, streaked fantail warbler, the common whitethroat , and the corn bunting.

Raptors:

Within the area of the open spaces in the plan region various types of raptors have been observed, among them a number of species that are at risk of extinction either globally or regionally:

- The eastern imperial eagle – has been awarded a VU "Threatened" global conservation status (the third in its severity) in 2013. It is one of the species that winter in the region, especially young individuals.

- The Palled Harrier – has been awarded a "Near Threatened" global conservation status. (Birdlife International 2013).
- The Lesser Kestrel – is a species with a small global population. It summers and nests in colonies in area localities (including Elyakim and Bat Shlomo). The Ramot Menashe nesting colony is the largest in Israel and numbers about 250 pairs (Gal and Meiroz, 2004).
- Many other raptors hunt in this area, including the short-toed snake eagle, the long-legged buzzard and the Eurasian sparrowhawk that nest in the region, as well as the western marsh harrier, the hen harrier, the common buzzard and the merlin that winter there.

3. Possible impacts of the facility's construction on fowl

As stated above, the Hagit alternative presents construction of an industrial facility in the very heart of an open, natural area that serves populations of fowl both during their migration and those that remain in the area throughout the year (stable), in the course of winter (winterers), or passing birds that stop in the region for a short period during their migration.

The possible impacts on these fowl may be divided into a number of types:

- Loss of habitat: The construction of the facility will cover an area of about 150 dunams and will come at the expense of quality areas used for passerine nesting and food foraging by raptors. In this context, we should take into account an impact radius of about 300 m from the building line (Asaf Meiroz, personal observations).
- Impact on both local and regional movement: The area of the intended facility is located within the heart of Israel's western ecological corridor (Shakedi and Sadot 2000), which serves fauna moving along the north-south axis, as well as the east-west axis within the area that connects Ramot Menashe and the south of the Carmel. Although the facility is not the first artificial infrastructure to be built in the region, it constitutes another tier in the thickening barrier between Ramot Menashe and Mount Carmel.
- Impact of planting trees or birds specializing in dwarf shrubbery: The facility is planned to be built in an area that is mostly herbaceous dwarf shrubbery. In this habitat, various species that have developed in the course of evolution for life in an open habitat with low coverage, are present. Planting trees in such an area allows the increased penetration of species that exploit the trees for nesting or for observation, such as the hooded crow, the garrulous, the common buzzard, the Eurasian sparrow hawk and various species of shrikes. These increase the predation pressures on ground nesters and shrub nesters, and lead to their disappearance.

- Impact of lighting on local birds: It was found that artificial illumination impacts fowl in many ways, inter alia, it confuses their biological clocks so that the birds carry out mating calls etc. during the nighttime hours, and this leads to the excessive spending of energy and impacts their procreation capacity. In certain cases, light pollution has caused birds to nest in the autumn instead of the spring (Leader 2008, Derickson 1988). It should be noted that light pollution is also liable to damage the stability of whole webs of food by damaging key species in the food chain and putting the entire natural system off kilter (Longcore & Rich 2004).

B. Means for minimizing the impacts

The following are details of means and ways for minimizing the impact on the ecological system during the works and following their completion.

1. General

- The movement of vehicles in sensitive areas will be limited to specified axes only.
- In natural forest areas, it is recommended not to locate staging areas and temporary contractor camps, but rather locate these on agricultural areas and disturbed areas only.

2. Prevention of damage to habitats

- <u>Location of the block valve station</u>

In order to minimize the impact of the block valve station, it is recommended to decrease the fenced-off area as far as possible and avoid the use of lighting. It is also recommended to locate the block valve at the edges of pools in a disturbed area close to the separating embankments.

- <u>Location of the pipeline strip</u>

Along the entire alignment it is recommended to locate the alignment as much as possible within agricultural areas and to avoid damage to natural habitats. Emphasis should be placed on avoiding damage by various means in the following segments:

- Forest and wood areas that include mature and impressive trees. Coordinates 19991000/724853 - 200700/724530.
- Dwarf shrubbery areas of bushes. Coordinates 201266/724959 - 208670/725125.

For example – where it is not possible to divert the alignment or use means such as horizontal drilling, it is proposed to link the alignment as far as possible to existing pipelines in order to minimize the work strip to the lowest possible minimum.

3. Means for preservation and restoration

3.1. Preservation of floral variety

Before beginning the works, a unique floral survey will be performed that will include the collection of rare red and protected floral species that will be returned to their sites once the works are finished. An effort will also be made to preserve the trees along the works alignment that include mature trees, such as: the tabor oak, common oak, common carob, true laurel, Palestinian mastic, spiny hawthorn and officinal styrax. A detailed survey of trees will be conducted as required by the amendment to the Planning and Building Law 89.

3.2. Rehabilitation of habitats

Once the works are completed, the area will be rehabilitated in accordance with its ecological characteristics before beginning the works. For this purpose, the upper surface area will be exposed up to a depth of about 20 cm for the purpose of collecting and preserving a layer of seed bank in the soil. This layer will be kept separately from deeper soil layers and will be layered in an orderly fashion along the line of the works. When the works are finished, this layer will be used for the upper covering of the pipeline alignment. Exposure and preservation of the soil will not be carried out in areas that are subject to invasive species. These will be handled and removed in the context of the preliminary treatment to be implemented before the works commence. Before the start of the works, a detailed rehabilitation plan will be prepared for the various alignment segments addressing the various habitats and the means for rehabilitating the natural coverage that includes both rock faces and flora.

3.3. Prevention of light pollution

As a matter of principle, it is recommended not to make use of fixed lighting at the shore block valve stations and the circumference of the treatment facility. It is proposed to consider the use of other technological means, such as IR cameras, thermal cameras or selective lighting via remote control. In the event that lighting is required for security reasons, use should be made of lighting fixtures with a limited and low dispersion in accordance with the requirements of the Nature and Parks Authority for the planning of lighting in sensitive regions. Ensure that illumination intensities outside the plan area do not exceed 0.1 LUX at a distance of no more than a few meters. For this purpose, the dispersion of light outside the facilities will be examined during the permit stage. In order to avoid disruption of lighting during the works involved in burying the pipeline, avoid illuminating areas outside the works alignment. As a matter of principle, it is recommended to avoid performing works at night.

3.4. Wetland habitats

The pipeline alignment and the treatment facility have the potential of impacting the throughput of springs and the function of wetland ecological systems in the eastern part. Before implementation of the plan, it is necessary to make a thorough inspection of the expected hydrological impact. In the event that a negative impact is discovered, means should be considered such as ecological compensation that will provide water at an appropriate quality for wetland habitats. In order to avoid polluting wetland channels and habitats with runoff that comprises hazardous substances, care should be taken to direct the runoff from the facility to a dedicated installation that will clean and purify the runoff.

3.5. Invasive species

Treatment of invasive flora will take place according to the principles recommended by the Nature and Parks Authority, as presented in the document "The Handling of Invasive Flora in Infrastructure Works with an Emphasis on Longitudinal Infrastructures," The following are guiding principles:

Preliminary treatment (before the works commence) of invasive flora within the area of the infrastructure works increases the chances of success, reduces expected costs and shortens treatment time until full extermination after the works are completed. Preliminary treatment is based on information collected in the context of creating environmental documents or a dedicated survey. The following are the basic rules for the preliminary handling of invasive species:

- All invasive flora within the works area must be exterminated in order to prevent their expansion as a consequence of the works.
- Invasive flora in adjacent areas and along access roads should be handled (either exterminated or suppressed). It is possible to consider the use of mechanical methods (such as cutting down trees or cutting down invasive herbaceous flora, thus preventing the dissemination of seeds) or chemical means (such as drilling and injecting or spraying). It is recommended to commence this treatment before beginning the works and to continue with it during performance of the works, and until they are completed during the rehabilitation stages.
- All invasive flora must be handled, including individual items.
- It is recommended to adopt a systemic approach to treating invasive species present in the area, at all of their development stages: mature plants, young plants, shoots and the seed bank. Appropriate means should be selected for the various invasive species prevalent in the area. It is possible to combine mechanical and chemical methods for handling mature and young plants and to handle the seed bank using thermal treatment (solar or fire).
- Before commencing the works, it is possible to use more lethal methods of extermination that are inappropriate for the rehabilitation stage following completion of the works.

- In the event of infrastructure works in areas predominated by invasive flora, handling of invasive flora should be planned from a regional perspective. To this end, contact should be made with professional bodies at the Nature and Parks Authority.

Planning the handling of invasive flora (monitoring and extermination) during performance of the works

Invasive flora should be handled within the area of the works, within adjacent areas, and along access roads in a similar format to handling these species before commencement of the works. The following operations should be performed:

- Monitoring the presence of invasive flora within the areas disrupted as a consequence of the works.
- Immediate extermination and suppression of invasive flora detected in the area, using appropriate methods.
- Continued suppression of invasive flora in the works environment and along access roads to the works in order to prevent the formation of seeds.
- Immediate commencement of rehabilitation operations within the area sections where the works have been completed in order to prevent invasive flora from taking over.

Planning the handling of invasive flora (monitoring and extermination) after completion of the works

Handling invasive flora after completing the works is a continuation of the handling that was carried out prior to the works and during their performance.

- Immediate commencement of treatment of invasive species, monitoring and rehabilitation at the end of the works is a vital condition for success. Where linear infrastructures are concerned in which the work progresses gradually, invasion species must be handled as the work progresses. Each segment in which the works have been completed must be treated immediately. If invasive species have been discovered in the area intended for rehabilitation, they must be exterminated before beginning the planting or seeding of the plants intended for rehabilitation. Once rehabilitation is completed, it is necessary to monitor for invasive species over a long period of time (5 years after completion of the works) and follow up such monitoring with the extermination of invasive flora appearing in the area.
- Treatment area: Treatment of invasive species must include all of the areas damaged in the course of the works.
- Monitoring and extermination of invasive flora as part of the maintenance of infrastructures: The purpose of monitoring after completion of the infrastructure works is to provide early identification of young sprouts and

plants of invasive species. Monitoring is followed up with immediate treatment that prevents invasive species from taking over the areas that were damaged during the works. Immediately treat any concentrations of sprouts and young plants discovered in the area using methods appropriate to each species. At this stage it is recommended to use selective methods, manual methods or focused chemical ones in order not to disrupt rehabilitation processes in the area.

3.6. Recommendations for minimizing damages in the context of birds[30]

Lighting and light pollution

In general, the impact of artificial lighting on fowl is negative and it is recommended to minimize it as far as possible. In the event of fence illumination around the perimeter, it is recommended to utilize volume detectors in order to activate lighting only when human beings approach the facility.

In the event that the above is not possible, i.e., that it is vital to have fixed perimeter illumination directed outwards, adhere to the following guidelines (Noam Leader, Science Division at the Nature and Parks Authority, verbal communication):

A. Ensure that lighting is not glaring, by using full cutoff lamps.

B. The illumination wavelength must be greater than 500 nanometers (without the element of blue), which has a relatively low impact on the biological clock.

C. The illumination plan should be backed by photometric mapping that presents the scatter of the light around the facility and shows that there is no deviation of the lighting beyond the necessary area (the photometric mapping has to be sent to the planning authorities at the Nature and Parks Authority/the Ministry of Environmental Protection).

Special attention will be given to illuminating high installations such as stacks or antennae. These installations are usually lighted with a continuous red illumination in order to mark the installation for aircraft. This type of illumination was found to be dangerous for migratory fowl, as it causes deviations in the migratory course and increased collisions. It is recommended to utilize non-continuous illumination and a light that is not red (Ohad Hatzofeh, verbal communication). In the US it was shown that use of an LED that flickers at a frequency of 27-33 flickers per minute is extremely efficient in preventing the collision of fowl (Patterson 2012).

Preventing collisions

[30] For a full list of sources - see Appendix D below.

Collisions with buildings: The use of glass in outside walls of buildings increases the rate at which birds collide with the building. It is recommended to reduce the use of glass in the outer building frame, and if it is necessary to use glass, it should be screened from outside by something that will prevent reflection, such as curtains or external screens, painting the windows or affixing dense stickers.

Collisions with cables: Night-flying birds collide with voltage cables. It is recommended to avoid deploying overhead voltage cables in the vicinity of water sources where the traffic of birds is great. In any case where it is necessary to deploy overhead cables, they must be marked with appropriate means such as reflectors (Image 4.9.1-4) (recommendations for means that were tried can be obtained from the planning bodies within the Nature and Parks Authority).

Figure 4.9.1-4: Reflector for Marking Cables[31]

Avoiding the planting of trees

As stated above, planting trees within dwarf shrub areas negatively impacts the species that are specialists in dwarf shrubs. For this reason, it is recommended to minimize the planting of trees within the area of the facility (it is possible that from other aspects, including the landscape factor, it will be recommended to plant trees). It is especially recommended to avoid the planting of foreign trees and types of invasive flora such as the Aleppo pine or some other pine, the golden

[31] http://hammarprodukter.com/659.php?itemgroup=107

wattle, the Brazilian pepper tree, the tree of heaven and their like (a full list may be found in Dufour-Dror 2010).

Preventing the invasion of housecats

Housecats are recognized the world over as one of the central factors for loss of biological variety, and their damage is particularly harsh where bird species and various other small vertebrates are concerned (Birkner-Brown 2010). The impact of cats on fauna in areas with low coverage may be particularly severe. For this reason, it is recommended to completely avoid introducing any domesticated cats into the facility.

4.9.2. Offshore Environment

A description and examination of the plan implementation impact and the means for minimizing such impacts are presented in the context of the Offshore Environment Impact Survey that is submitted as part of this plan.

4.10. Drainage and Hydrogeology

4.10.1. Impact of construction operations on groundwater quality

Construction of facilities and pipeline

Since no components and materials are produced in the course of building the facility and the pipeline, construction operations will be similar to those that are known from other large infrastructure projects. The main source of groundwater pollution is the work liquids used by the use of engineering equipment in the field. The pollution potential of these sources is relatively small and mainly depends on adhering to the instructions of the Law for Preventing Pollution and Handling Spill Events. Nevertheless, defining the hydrological sensitivity along the pipeline alignment as medium-high (see Figure 3.4.9-1) increases the risk for groundwater pollution. Recommendations for minimizing the damage to groundwater in the event of leaks of polluting liquids, are presented in the context of Chapter E (Section 5.1.e).

As mentioned in Chapter 3.4.9, the risk for groundwater in this area is not just through its pollution, but also mainly damage to the balance of groundwater and the reduction in the throughput of springs that are fed from the shallow Eocene aquifer. Excavation and quarrying works involved in laying the pipeline segment at the entrance to the facility and construction of the facility itself may expose subterranean cracks that are used as the preferred water carriers for the groundwater flow system. Exposure of a flow carrier is liable to divert the flow from the ground to the surface and thereby damage the balance of water in the aquifer, subsequently leading to a reduction in the throughput of the nearby Ein

Tut spring. Changes in the throughput regime of a spring have implications that are discussed in the context of the ecological aspect of the environmental impact (see Section 4.9 above).

It will be possible to reduce the extent of damage to the groundwater balance in three stages:

1. Integration of drilling in order to locate local groundwater levels under the pipeline alignment and under the facility in the context of the soil investigation carried out during the planning stages. It is recommended to install observation pipes that will make it possible to track groundwater elevations in the event of damage to flow carriers in the course of construction.
2. In the event of damage to underground flow carriers during construction work, a plan will be prepared for the periodic monitoring of the throughput of the Ein Tut spring and its comparison with measured background throughputs in accordance with the precipitation regime. The monitoring plan will be approved by the Ministry of Environmental Protection and the Nature and Parks Authority.
3. In accordance with the quantitative evaluation of a relative shortage in spring throughput, consideration should be given to artificial provision of water in order to maintain water availability on the surface for the use of members of the ecological system. Provision of water will be carried out in coordination with the Ministry of Environmental Protection and the Nature and Parks Authority.

In the operating state of **putting the system into motion** it is necessary to remove a one-time volume of pressure test water (see details in Section 3.4.2 above) from the pipeline. During planning, it will be necessary to provide details of the expected water composition and receive a permit to discharge them into the sea in accordance with the Law for the Prevention of Offshore Pollution from Onshore Sources and its regulations. It should be noted that the pressure test is performed after connecting the pipeline parts but before covering the pipeline, and it is not expected that any massive leaks will be detected during the pressure test. Moreover, it is possible that engineering considerations will dictate the direction of the pressure test water flow and for this reason, other alternatives should be considered for removal of the water.

Current operations

<u>Treatment facility</u>

The foundation of the facility infrastructures will be placed on a sealed surface with a dedicated drainage system so that runoff, sewage or spills do not reach groundwater. The facility will be constructed in accordance with the Water Regulations (Prevention of Water Pollution) (Farms and Fuel Tanks) 2004, Regulation 5(A)(1), and will include sumps for those components that are liable to contaminate groundwater, such as:

- Pumping equipment
- Discharge and filling points
- External pump
- Maintenance installations
- Potential locations for fuel drip
- Containers containing polluting liquids

Sumps will be constructed of an impermeable material resistant to the liquids being stored in them and a collection system for leachates.

In view of this, no pollution of groundwater is expected to arise from the facility's current operations.

<u>Pipeline</u>

- A preliminary test will be conducted in the pipeline in order to discover possible leaks before current operations begin (see details in Section 3.4.2 above).
- A plan will be prepared to detect leaks via continuous measurement of engineering parameters in the pipeline (throughput, pressures, etc.).
- Containers and pipes will be protected and monitored in accordance with the relevant regulations.

In addition, there will be a large number of automatic shutoff valves that may be closed from the control room, thereby minimizing leaks in accordance with the event occurring.

In view of this, no pollution of groundwater is expected to arise from the current operations of the facility and the pipeline.

4.10.2. Impact of leaks on groundwater quality

➢ **Description of liquids**

Three polluting liquids flow in the gas treatment system in the piping leading from the facility to the shore and in the facility's systems. The following is a description of these liquids with an emphasis on their contamination potential:

Condensate – condensed hydrocarbons

The condensed hydrocarbons component is a product of the changes in pressure and temperature involved in the process of transmitting the gas and treating it. For details see Section 3.1.5 above. The estimated throughput of the condensate at the beginning of the gas reservoir life cycle is approximately 2,800m^3 per day and the condensate is expected to remain in transition containers within the facility area in a total volume of about 20,000m^3 before they are transmitted along the pipeline for additional use. In the event of a malfunction in the pipeline, it is possible that condensate will be transported from the facility via tankers.

MEG – Mono-ethylene glycol ("Glycol")

MEG is a solution used in industry for preventing the freezing of liquids and for drying gas. MEG is injected into the gas well and is produced along with the gas and flows within the gas pipeline up to the treatment facility, as described in Chapter 3. Most of the MEG is recycled in the treatment facility for repeated use in the well.

Produced water

The source of the produced water is described in Section 3.1.5 above. According to its composition, produced water should be treated as industrial sewage, as regards the laws applicable to their discharge into the sea. There is an option in accordance with the solidity of the produced water to separate the salts from the water before it is returned to the sea (see Section 3.4.3).

- **Potential volumes of leaks**

The maximum possible leaks of various liquids from the pipelines are described in Table 4.10.2, so that during routine operations, no leaks whatsoever are expected to occur in the pipeline.

Table 4.10.2: Maximum Leaks from Pipelines[32]

	Throughput [m^3/day]	Estimated Composition	Length of the Line [km]	Diameter [inch]	Number of Lines	Pipeline Flow Regime	Total Volume [m^3]
Condensate - condensed hydrocarbons	2802-2159	Above 90% Decanes, Heptanes, Hexanes & Octanes	12	8	1	Full	389
MEG - Mono-Ethylene Glycol	437	72% glycol, 28% water	12	6	2	Full	438
Produced Water	1138-1146	100 ppm condensed hydrocarbons, 0.6 ppm aromatic hydrocarbons, 50 ppm glycol and 1474 ppm BTEX*	12	8	1	Full	389

* Produced water may contain additional substances such as various dissolved gasses, heavy metals and anticorrosion materials, but these are not quantified at this stage (PDI, 2013 Table 11-1).

The maximum expected volume of polluting liquids in the facility containers is listed below:

1. 4,750m^3 container for the stabilization of rich condensed hydrocarbons (PDI, 2013, Section 13.3.5).
2. 4,750m^3 container for the stabilization of poor condensed hydrocarbons (PDI, 2013, Section 13.3.5).
3. 20,000m^3 collection containers for stabilized condensed hydrocarbons. Equal to 7 days of throughput (PDI, 2013, Section 7.3.2).
4. Container for anti-corrosion material.
5. Diesel tank for the emergency generator (and the ignition generator) and the fire extinguishing system (PDI, 2013, Section 13.4.4).

[32] The estimated flow data in the pipeline from the treatment facility towards the sea. The composition of condensed hydrocarbons and MEG was taken from Tables 122-C-PR-HMB-2001/2, and the composition of the produced water was taken from Table 50-4, which are included in the technical description document for the onshore alternative of the gas facilities (PDI, 2557).

6. Methanol - $30m^3$ (PDI, 2013, Section 13.3.6).

- **Impact of leaks on groundwater quality**

During routine conditions

Under routine conditions, maintenance leaks from containers and various components of the onshore treatment facility are expected to be received in the sumps installed and removed for appropriate disposal. Moreover, as noted in Section 4.10.1, the entire facility area will be insulated against percolation and drained through dedicated systems for sewage and/or runoff leachates for appropriate treatment. In this condition, no impact is expected from the facility operations on groundwater quality.

No leaks are expected during routine operations from pipelines outside the facility, when installation, maintenance and monitoring of these pipelines are carried out in accordance with the standards. This will minimize the risk of mechanical failure and improve the ability to identify and handle leaks, as shown in detail in Section 4.10.1 above.

Leak scenario during an emergency – liable to be caused, inter alia, by human action or because of seismic events as detailed in Section 4.5 above.

Means for the prevention and minimization of leaks have been described in detail in the context of Sections 3.4.5, 3.4.9 and 4.5.

4.10.3. Impact of the onshore facility on the drainage system

- **Preservation of runoff**

Runoff from topographic inclines is expected to flow around the circumference of the facility in protective channels and continue to Nahal Tut. Runoff from the facility area itself will be drained using the system described below, where it may be assumed that almost the entire volume of precipitation will continue to flow downriver after it passes the oils separator. Thus, the runoff will not detract from the water balance. For this reason, the facility's construction and operation are not expected to significantly influence the flow of natural runoff or water balance in the region.

- **Prevention of runoff pollution in the environment of the onshore facility**

As stated above, all process liquids systems within the facility are closed systems, and wastewater will be directed to dedicated systems for handling wastewater and will not impact the regional runoff array. Conforming to construction and production standards, and the operation and monitoring of the systems in accordance with the provisions of the law, will prevent any leak of polluting liquids from the system components to the environment.

The runoff system within the facility area must handle two main types of flows:

1. Runoff from the facility area during the winter season which may contain some pollutants from operating areas (and are therefore defined as leachates).
2. Liquids from maintenance and malfunction, including:
   - Leak or rupture of a pipe that conveys process liquids –- MEG, produced water or condensate
   - Water and leachates during a fire extinguishing event
   - Water used for maintenance rinses
   - Water collected in container sumps

For the purpose of planning the system and the various ways of treating the types of flows, the following assumptions should be taken into consideration:

- Release of runoff into the regional drainage system will be possible in accordance with the regulations of the Inbar Committee to establish the quality of water that is permitted for discharge into streams, linked to periodic sampling.
- Surfaces and system components will be washed towards the end of summer, in order to allow the drainage of runoff into the regional drainage system.
- After the summer rinse, runoff from rain events during winter is expected to be clear of pollutants, since all liquids flowing in the facility are located within closed systems, and all components that are liable to leak are protected via sumps in accordance with the provisions of the law.
- Runoff throughput will be calculated for the entire area of the facility, minus the sumps, and in the absence of an option for roofing operational areas.

<u>General description of the system</u>

The following is a general description of the drainage system capable of handling all flows mentioned above:

The proposed system comprises both surface and underground drainage of the facility area by means of adjusting surface gradients, installing receptacles for runoff, and placing a ceiling membrane under the entire facility area. The ceiling membrane will be drained to the lowest outlet of the facility. This outlet will provide gravitational flow to a fuel API sedimentation and separation container. During the summer season any flow reaching the runoff array will be transferred to the emergency tanks via a pump and removed from there to an authorized site for treatment.

During the winter season, after the initial cleaning of surfaces, the system default will be to discharge the clean runoff from the sedimentation container through the oils separator to the original drainage system. The volume of the oil separator will be determined in accordance with the guidelines provided by the Water Regulations Proposal (Prevention of Water Pollution) (Farms and Fuel Tanks) 2004, Chapter 21.a, in accordance with the calculations of the API standard for planning oil separators. In the event of a fire extinguishing emergency or malfunction during the winter season, the water will be automatically directed to the emergency containers using the remote command and control system that will be activated in accordance with the operating conditions of the fire extinguishing system and leak control system.

4.11. **Hazardous Substances**

4.11.1. Possible means for minimizing risks

The means for minimizing risks presented in this section are conceptual (actual means will be determined by the company constructing the facility in accordance with accepted international standards, and following the risk analysis processes commencing from the planning stage – HAZOP, HAZID, etc.).

The following is an example of possible means for installation in the gas receiving and treatment facility:

A. <u>Means for detecting gas leaks</u>:

- Pressure control system on the pipes and containers within the facility, with a warning of unscheduled pressure drop.
- Gas detector in the facility with two levels of warning – warning of a leak at a 10% LEL Action Level and an activation level that triggers engineering means for taking control of the leak.

B. <u>Means for controlling a gas leak</u>:

- ESD - Emergency Shutdown Valve
- Release of gas to a flare and/or a vent
- Water cannons, see attached photo. During a leak these cannons spray water mist in order to dilute a leaking gas cloud, the leakage area is cooled down and the risk for fire is minimized. Water cannons are capable of both manual and automatic activation when a gas leak is identified at the second level of warning.
- Means for collecting gases and treating them in the transportation terminal for condensate tankers.

Figure 4.11: Water cannon

C. Means for preventing spill and dispersion of liquids:

- Sumps for liquid containers according to the requirements of the relevant regulations and authorities: the Ministry of Environmental Protection – Guidelines for Sumps and Collection Areas, the Home Front Command – Technical Specifications for Protection, the Petroleum Law, relevant NFPA standards.
- Level gauge with excessive height warnings (in order to prevent overflow during filling) in containers.
- Use of dedicated hoses, such as a smart hose for the prevention of spills during the discharge of chemicals from tankers or during the loading of tankers.
- Transmitted level gauge in sumps in order to warn of liquid leaks.
- Means for blocking drainage pits so as to prevent liquid spill outside the plant area. For example, sealing cushions for drainage or blocks preventing the spill from reaching drainage apertures for runoff.

D. Means for preventing fire or preventing the spread of fires

- Appropriate fire extinguishing means for substances present at the site. For example, a foam extinguishing system connected to an IR sensor in the condensate sumps.

- Automatic extinguishing systems for condensate containers
- Foam cannons around flammable liquid tanks
- Water spray cooling system for condensate containers
- Means to prevent the creation of static electricity and/or prevent electrostatic discharge in accordance with IS 60079 Part 32 and NFPA 77 or in accordance with a standard defined by the Natural Gas Authority
- Classification of the site into explosive areas in accordance with the relevant standards – ATEX, NEC and using relevant explosion-proof equipment in accordance with IS 60079 or some other standard defined by the Natural Gas Authority

E. Means for preventing emission from random ignition sources and preventing injury to drivers:

A traffic signal plus barrier on the roads adjacent to the site at a distance of at least 1 km on both sides of the site, which may be operated manually as well as by warnings of gas detectors at the second level of warning.

4.11.2. Report of Separation Distances from Hazardous Substances

Risk ranges of the gas treatment facility change according to the various components and have been determined in coordination with the Ministry of Environmental Protection (see Section 1.8 of Chapter A of the Onshore Environmental Impact Survey) and the relevant standards.

The following table details the safety ranges for the gas treatment array components:

Table 4.11.2-1: Risk Ranges for the Onshore Treatment Array

Facility Components	Safety Range	Details
Shore Block Valve Station	**109 m** from public receptors	Separation distance - in accordance with the guidelines of the Ministry of Environmental Protection
Pipeline[33]	Minimum **45 m**	Building line distance to the pipeline in

[33] If there are houses at a distance less than 555 m and if the population density in such houses at a distance smaller than 520 m from the pipeline is higher than 0.5 persons per hectare (0 persons per m^2) then a statistical survey should be carried out in accordance with which the person risk must be lower than 1e-6 and the group risk must meet the criterion of acceptability.

Facility Components	Safety Range	Details
		accordance with IS 5664 Part 2
Treatment Facility	**600 m** distant from public receptors	In accordance with an agreement achieved with the Ministry of Environmental Protection
	110 m - an area devoid of ignition sources – distance from vent	In accordance with Standard 25 - IGEM - SR
	186 m - safety distance from a heat radiation aspect	In the event that the gas exiting from the vent is ignited

Relevant scenarios for separation distances from the facility:

- Leakage of natural gas from one of the facilities and the formation of a vapor cloud explosion
- Distance to the fire pool created as a consequence of a condensate spill into a sump
- Safety distance for heat radiation from the vent/flare

Risk distances for the above scenarios:

Table 4.11.2-2: Risk Distances for Scenarios

Scenario	Risk Distance
VCE	600 m
Condensate fire pool	250 m
Heat radiation from the vent/flare	109 m

The following are details of the reports for the separation distances:

VCE – Vapor cloud explosion

The separation distances report for VCE is detailed in Section 1.8 of Chapter A of the Onshore Environmental Impact Survey prepared for this plan and based on agreements coordinated with the Ministry of Environmental Protection, Hazardous Substances Division for the purpose of determining the method for evaluating the risks and separation distances for natural gas, as detailed below:

- Leak from a hole of 1" diameter in the upper part of the pipeline (gas phase) wherein the leak duration is not limited by stop valves. For the purpose of calculating ranges for the flammability boundaries, a stable meteorological condition was assumed.
- The range was calculated up to 60% LEL (Low Explosion Level).
- It was agreed to calculate the risk range for an overpressure of 1.5 psi.
- Calculation method – equivalent TNT and direct calculation using ALOHA.
- In all cases, it will be calculated for a 10-km long pipeline under 110 bars of pressure.

The results are summarized in the following table:

Table 4.11.2-2: Summary of Results – Evaluation of Risks from Leakage

Option	Range for overpressure of 1.5 psi (meters) using the TNT equivalent model	Range of overpressure of 1.5 psi (meters) using ALOHA
24" pipe	609	585
36" pipe	612	609

Conclusion: the risk range is about 600 m.

For the full report – see Section 1.8 of Chapter A of the Onshore Environmental Impact Survey for this plan.

Condensate fire pool

Estimating the risk range for a condensate fire pool in the gas receiving facility:

Basic assumptions:

- There are three liquid containers with a total volume of 20,000m^3
- The maximum volume of a single container is 10,000m^3
- The height of a container is 15 m
- The area of a container is 667m^2
- The diameter of a container is 15m

Calculating the length of the sump wall:

- According to the instructions of the Home Front Command: the height of the sump walls will be established in a way that will ensure that the sump volume will be 110% of the volume of all containers contained within it.

- The distance between the container wall and the sump wall will be greater than the maximum height of the liquid stored in the container relative to the ground, and in any event will be no less than 0.5 m. Thus, for example, if the height of the container is 2 m, the height of the liquid in the container is 1 m, then the distance between the wall of the container and the wall of the sump must be at least 1 m.

  In other words, the volume of the sump of a single container should be at least 11,000m^3.

  The distance between the wall of the container and the sump wall must be about 14m for a 1-m high sump.

  Therefore the length of a sump wall will be 14m + 15m + 14m ≈ 45m.

  Contents: 45X45X1 = 2,025m^3. Insufficient.

  Increasing the height of the sump to a height of 2m will require an area of 11,000/2 = 5,500m^2.

  In other words, in a square sump the length of one side will be 75m.

<u>Calculating the risk range for heat radiation</u>

According to ALOHA:

SITE DATA:

Location: LERMAN, ISRAEL

Building Air Exchanges Per Hour: 0.43 (sheltered double storied)

Time: February 21, 2013 1215 hours ST (using computer's clock)

CHEMICAL DATA:

Chemical Name: N-DECANE Molecular Weight: 142.28 g/mol

PAC-1:1.9ppm PAC-2: 20ppm PAC-3: 440ppm

LEL: 7500ppm UEL: 54000 ppm

Ambient Boiling Point: 174.2° C

Vapor Pressure at Ambient Temperature: 0.0025 atm

Ambient Saturation Concentration: 2,511 ppm or 0.25%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 5 meters/second from w at 10 meters

Ground Roughness: open country Cloud Cover: 0 tenths

Air Temperature: 30° C Stability Class: C

No Inversion Height Relative Humidity: 50%

SOURCE STRENGTH:

Burning Puddle /Pool Fire

Puddle Area: 5500 square meters Average Puddle Depth: 2 meters

Initial Puddle Temperature: Air temperature

Flame Length: 76 meters

Burn Duration: ALOHA limited the duration to 1 hour

Burn Rate: 24,300 kilograms/min

Total Amount Burned: 1,460,212 kilograms

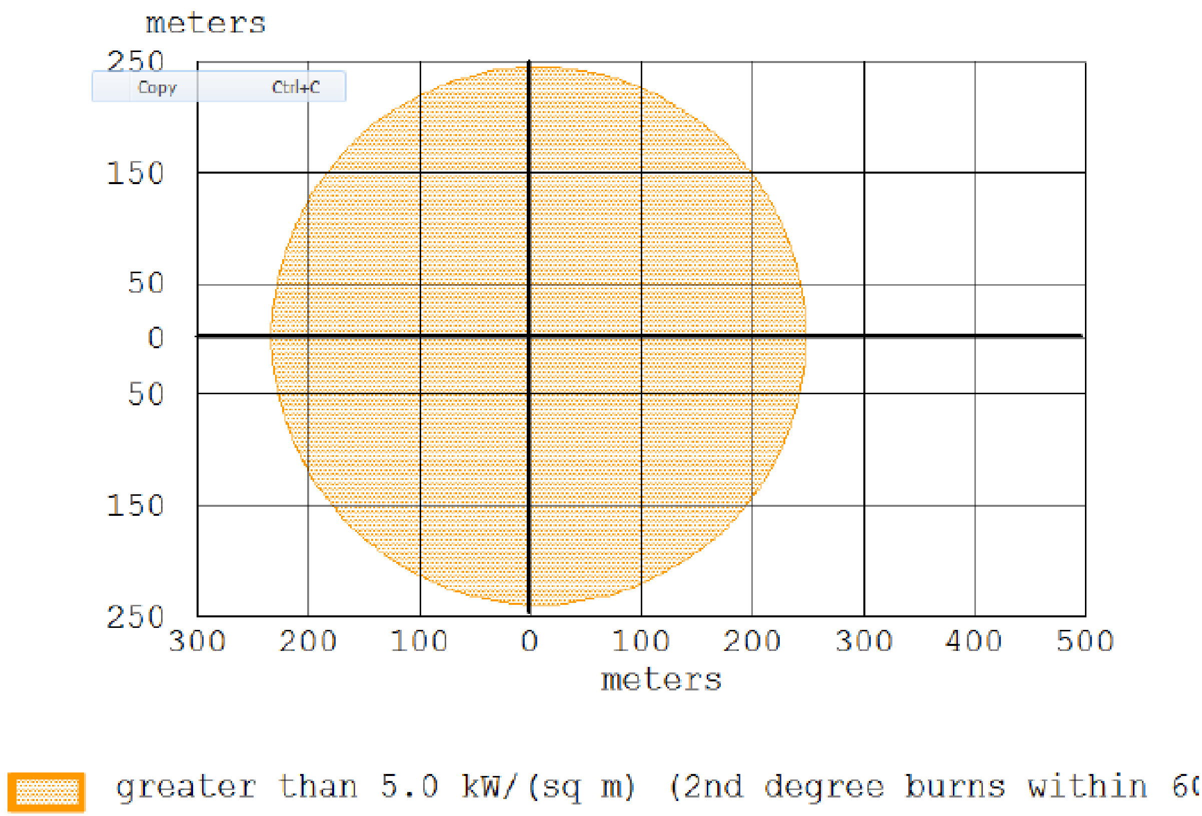
THREAT ZONE:

Threat Modeled: Thermal radiation from pool fire

Red: 182 meters — (10.0 kW/(sq m) = potentially lethal within 60 sec)

Orange: 250 meters — (5.0kW/(sq m) = 2nd degree burns within 60 sec)

Yellow: 378 meters — (2.0 kW/(sq m) = pain within 60 sec)



Heat radiation from the vent/flare

SITE DATA:

Location: LERMAN, ISRAEL

Building Air Exchanges Per Hour: 0.24 (sheltered double storied)

Time: June 13, 2010 0200 hours ST (user specified)

CHEMICAL DATA:

Chemical Name: METHANE Molecular Weight: 16.04 g/mol

PAC-1: 3000 ppm PAC-2: 5000 ppm PAC-3: 200000 ppm

LEL: 44000 ppm UEL: 165000 ppm

Ambient Boiling Point: -161.5° C

Vapor Pressure at Ambient Temperature: greater than 1 atm

Ambient Saturation Concentration: 1,000,000 ppm or 100.0%

ATMOSPHERIC DATA: (MANUAL INPUT OF DATA)

Wind: 1.5 meters/second from w at 10 meters

Ground Roughness: open country Cloud Cover: 0 tenths

Air Temperature: 10° C   Stability Class: F

Inversion Height: 300 meters Relative Humidity: 50%

SOURCE STRENGTH:

Flammable gas is burning as it escapes from pipe

Pipe Diameter: 10 inches   Pipe Length: 100 meters

Unbroken end of the pipe is connected to an infinite source

Pipe Roughness: smooth   Hole Area: 78.5 sq in

Pipe Press: 110 atmospheres Pipe Temperature: 10° C

Max Flame Length: 30 meters

Burn Duration: ALOHA limited the duration to 1 hour

Max Burn Rate: 58,100 kilograms/min

Total Amount Burned: 1,630,527 kilograms

THREAT ZONE:

Threat Modeled: Thermal radiation from jet fire

Orange: 186 meters — (5.0 kW/(sq m) = 2nd degree burns within 60 sec)

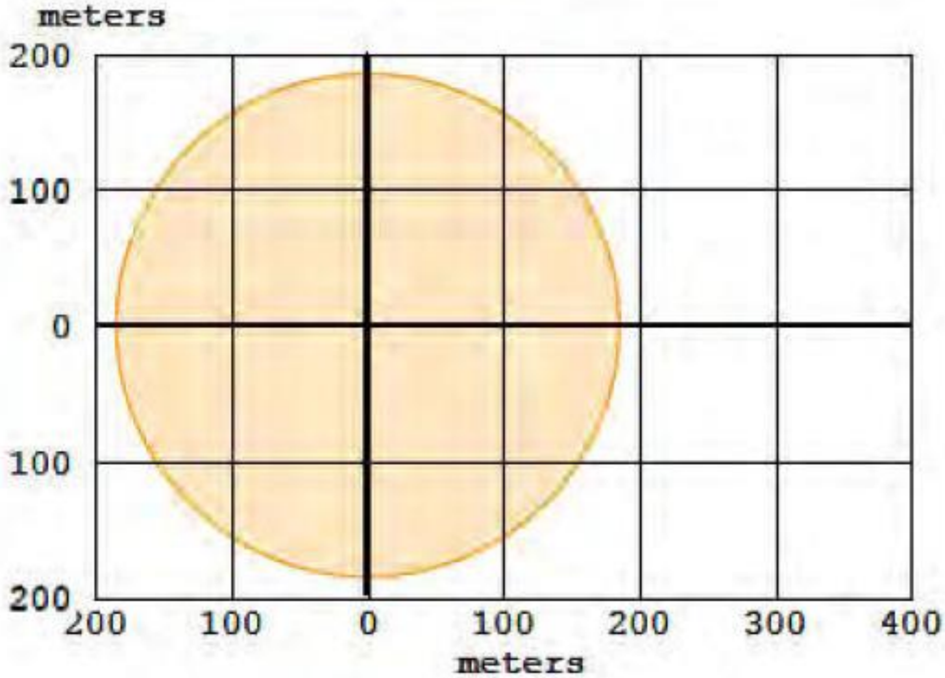
Thermal Radiation Threat Zone **ALOHA® 5.4.3**

Time: June 13, 2010 0200 hours ST (user specified)

Chemical Name: METHANE

Wind: 1.5 meters/second from w at 10 meters

THREAT ZONE:
Threat Modeled: Thermal radiation from jet fire
Orange: 186 meters --- (5.0 kW/(sq m) = 2nd degree burns within 60 sec)



greater than 5.0 kW/(sq m) (2nd degree burns witl

4.12. **Staging Areas, Contractor Camps and Access Roads**

In the context of NOP 37H, staging areas and contractor camps are planned as follows:

A. Staging areas and contractor camps – the contractor's staging areas and camps will be located as far as possible in disturbed areas and in agricultural areas. No contractor camps/staging areas may be established in areas defined as "Do Not Touch." Moreover, it will not be permitted to uproot mature trees and protected trees in order to establish contractor camps/staging areas.

   - Staging area for facility construction – will be located within the area of the facility itself.
   - Staging area for aligning the pipeline – contractor camps and staging area will be located along the pipeline alignment. The location of these areas will be established during detailed planning and not in "Do Not Touch" areas.
   - The staging area for the HDD drilling at the coastal entry, covering an area of about 32 dunams.
   - Staging area for establishing a coastal block valve station adjacent to the block valve station over an area of about 29 dunams.

B. Access routes – in the context of NOP 37H, no new roads will be constructed, except for access roads to the installations detailed in Figure 3.1.1-2 above, which connect the installations to existing roads.

   In the event that it will be necessary to construct additional access routes outside the blue line, they must be coordinated with the rights holders of the land. It will not be permitted to pass access roads through nature reserves, forests and parks, outside the blue line except after receiving approval to do so from the Nature and Parks Authority/JNF.

   - Receiving facility – the access road to the Hagit receiving facility will be part of the plan's blue line and therefore does not require the alignment of additional access routes for the purpose of working in sensitive areas. The access route will be based on the western part of the access road to the Hagit IEC facility.
   - Pipeline alignment – access routes to the pipeline alignment will be based on existing roads only, both paved roads and dirt roads. In areas where there are no dirt roads, the access route will be within the area of the pipeline strip and the work strip.

- HDD drilling and shore block valve station – access routes will be based on existing roads only.

Figure No. 4.12-1 presents the "Do Not Touch" areas.

Figure 4.12-1: Hagit Array on the Regional Background – Do Not Touch – For Staging Areas and Contractor Camps

Chapter E

Proposal for Provisions of the Plan

5. Proposal for Provisions of the Plan

5.

5. Proposal for Provisions of the Plan

5.0. General

This chapter presents in detail the proposals for provisions of the plan on environmental issues that have been examined in this paper with regard to all stages of implementing the plan.

Since the plan is a detailed plan but various subjects still remain for which information is missing, but which affects the planning (such as the composition of gas in the reservoir and the technology planned to be used by the program's developer), a paper on guidelines for preparation of an Environmental Management and Monitoring Plan (EMMP) has been prepared, which details the environmental aspects to which the developer is required to relate during the stage of applying for building permits. The paper is attached to this review as Appendix I. In addition, the required supplements during the building permit stage are detailed as part of and in addition to the EMMP that will be prepared prior to the plan's implementation.

5.1. Proposal for Provisions of the Plan

A. Stages of project implementation

<u>General</u>

The space can serve up to two gas suppliers, which can concentrate the gas supply from different sources from offshore discoveries up to an output of 2 million cubic meters per hour. Construction will be prepared in stages, while the initial supplier will build facilities for its requirements, providing an opportunity for the second supplier to work so that the facility will be able to operate at full capacity, as required, in a safe and secure manner. As part of the plan, surface areas and underground areas will be allocated to the facility and the infrastructure related to it. Planning will not include any form of gas storage.

Construction of the facility may require a long period. In total, there are four principal stages of development:

- Setting up the facility for the first supplier and at the same time laying offshore and onshore pipelines
- Setting up the facility for the second supplier and at the same time laying offshore and onshore pipelines

- Coordinating development for advanced stages of utilizing the reservoir/s of the first supplier
- Coordinating development for advanced stages of utilizing the reservoir/s of the second supplier

The development stages of each of the suppliers are independent of each other.

Determining the stages of the project's implementation is conditional on several principal elements, among which are finding and developing offshore gas fields/gas reservoirs, the type of gas and the gas pressure in the reservoir, the nature of development selected for a reservoir, as well as the question whether several reservoirs that reach the treatment facility of one supplier have been developed jointly, the nature of the commercial agreements with consumers, the entry of additional developers, the development of gas consumption in Israel and determining a technological alternative for treatment of natural gas.

Since at this stage of the project it is still not possible to define all the variables specified above, it has been decided that the plan will facilitate matters as much as possible. Accordingly, the plan's guidelines, which relate to the development and stages of project implementation (with respect to the division among the various suppliers, as well) will be as flexible as possible.

<u>In accordance with the aforesaid, it has been proposed to integrate the following provisions into the plan's regulations</u>:

A.1 The technological option will be proposed by the supplier within the framework of the building permits and will be authorized by the Gas Licensing Authority. The range of technological options extends between maximum onshore treatment and maximum offshore treatment, while the gas entry pressure from sea to land will not exceed 11oBAR.

A.2 Each of the facilities must allow the operation of two suppliers while enabling them to operate properly, as well as safely and securely.

A.3 Upon completion of the planning stage by the first supplier, which will ensure sufficient area for the second supplier's activity, the land zoning of the excess areas will be amended and restored to their former designation.

A.4 Each supplier will be liable for the development of a gas treatment facility and infrastructure separately, except for joint facilities and infrastructure to be established in accordance with directives to be provided during the building permit stage, as specified in Section 3.1.4 of the review of the environmental impact survey on gas treatment facilities in the Meretz wastewater treatment facility and Hagit site.

B. Handling hazardous materials

B.1 Ensure that a poisons permit for the use of hazardous materials at the facility has been obtained and the conditions of the poisons permit of the relevant agencies are met, including the Ministry of Environmental Protection, Home Front Command, Fire Department, Local authority, etc.

B.2 The developer must install means for the discovery of gas leakages, such as a pressure control system, gas detector in the facility with two warning levels –a gas leak alert at Action Level – LEL 10% and an operative level that activates engineering means to gain control of the leakage.

B.3 The developer must undertake means to gain control of a gas leakage such as an Emergency Shut Down Valve – ESD, release of gas to flare and/or to vent, water cannons, means of collecting VOC gases and their treatment, etc.

B.4 The developer will undertake measures to prevent spillage and migration of fluids including spill containment pallets for tanks containing liquids in accordance with the requirements of the regulations and relevant agencies, a level gauge with alerts for excess elevation in tanks, and spill containment pallets, and the use of designated pipes such as Smart Hose for prevention of spills when loading or unloading chemicals to and from tanks.

B.5 The developer will undertake means to prevent fires or to prevent the spread of fires such as a foam fire extinguishing system connected to an I.R. detector in the condensate spill containment pallets, automatic fire extinguishing systems for condensate tanks, foam cannons surrounding flammable fluid tanks, cooling systems that spray water on condensate tanks, the use of means for the prevention of static electricity production and/or the prevention of electrostatic discharge in accordance with Israel Standard 60079 Part 32 and NFPA 77 or a standard to be defined by the Natural Gas Authority, classification of the site as explosion areas in accordance with the relevant standards – ATEX and NEC, and the use of relevant protective equipment against explosive gas atmospheres in accordance with Israel Standard 60079 or another standard to be defined by the Natural Gas Authority.

B.6 If necessary, the developer will take measures to prevent ignition from sporadic sources of ignition and to prevent harm to drivers, such as a traffic light plus barrier on roads adjacent to the site at a distance of at least 1 km on both sides of the site, which may be activated manually and by way of a gas detector alert at a second level of alert.

B.7 The plan developer must ensure an emergency procedure in coordination with Israel Railways in an area that crosses railway tracks, in the event that a line will be damaged and will leak.

B.8 The developer must formulate an emergency procedure that will immediately halt activity at the Ein Ayala quarry in the event of a gas leak or damage to the pipeline route at a distance of less than 600 meters from the quarry.

B.9 Within the area of the pipeline route that is defined as a fire hazard area, the plan developer must formulate an emergency procedure in the event of a leak that will immediately halt military activity at a distance of less than 600 meters from the pipeline route.

C. Preventing marine pollution and handling pollution incidents

Reference to the prevention of marine pollution and handling pollution incidents will be prepared within the framework of the offshore environmental impact survey submitted as part of this plan.

D. Preventing air pollution

General

At this stage of the plan, it is impossible to recommend the best technologies (BAT) to reduce emissions to specific environments, since it is impossible to foresee what technologies will be available in another 3 to 4 years as the best technologies currently available are likely to be obsolete technologies in future. Nonetheless, it is possible to propose measures to reduce emissions in principle, albeit not specific technologies.

Below are recommendations for provisions to limit dust at work sites during the work period in regions where such nuisances are likely to occur (which must be observed particularly during the dry seasons):

D.1 Taking measures and work procedures that reduce the level of dust emitted (as specified here below) primarily on days in which the following conditions occur: (a) on days when the media provides a forecast of high levels of particulate air pollution; (b) on days when strong winds are expected (with a velocity that exceeds approximately 6 meters per second).

D.2 Preventing the dispersal of dust particles from dust piles by means of one or more of the following measures:

- Covering piles of soil with sheets
- Wetting piles of soil with water and/or with a material to which dust adheres or with any material, which causes the adhesion of dust particles particularly at times of strong wind velocity (wind velocity of approximately 6 meters per second or more). Varieties of brine are not to be used for the purpose of wetting the dust.

- Fencing off the area of piles of soil or locating it in an area protected from the winds.

D.3 Wetting the following areas: work surfaces, access roads to areas with piles of soil, staging areas that are not paved, or, alternatively, treatment with another material which creates adhesion of the dust particles, as necessary, so that raising dust and its dispersal throughout the vicinity is prevented. Varieties of brine are not to be used for the purpose of wetting these areas.

D.4 All vehicles on site, including engineering equipment, will drive on site solely in the lanes planned for travel.

D.5 Restricting traffic speed within the area of the work site – It is advised to maintain slow travel speeds that do not exceed 15 km per hour. In addition, signs are to be placed on site, which limit driving speed.

D.6 Emptying material from the scoop of a bulldozer or crane into trucks will be performed from as low a height as possible.

D.7 Rinsing truck tires that leave the work site to remove mud and/or dust – If necessary, means will be installed on site to rinse tires exiting the work site.

D.8 Covering trucks for transporting soil with suitable tightly fastened sheeting, which will also cover the sides of the trucks.

<u>Below are recommendations for integrating principal directives to reduce emissions from a natural gas treatment facility</u>:

D.9 *Basic technology to reduce emissions from flares*

Technology that returns gas emissions back to the system like the Flare Gas Recovery Unit (FGRU) must be used.

D.10 *Basic technology to reduce emissions from facilities that operate on burning fuels (liquid or gas)*

The rate of emissions from all facilities that emit burning gas must be adjusted to the rate of emissions indicated in TALUFT 2002 or any other up-to-date standard to be adopted by the Ministry of Environmental Protection. In addition to an instruction to meet installment requirements, means to reduce emissions which operate on the best available technology (BAT), must be installed in these facilities.

D.11 *Basic technology to reduce emissions not localized*

As part of the routine operation of the gas emissions treatment facility, emissions that are not localized are likely to occur from equipment and pipe joints. In order to reduce such emissions, the following measures must be taken:

- Welding as large a number of connecting joints as possible

- Ongoing maintenance of the sources of the joints and valves
- Operating control systems for locating leaks – Operating such systems and the frequency of such operation will be performed in accordance with the directives that appear in the pertinent BREF[34] documents.
- In addition, use of a generator must be limited and use of electricity from a local power station or from the national electricity grid is to be preferred.

E. Prevention of soil pollution, surface water and groundwater pollution

E.1 During the routine use of facility systems, controlled maintenance emissions will be collected by way of spill containment pallets and absorption materials, and these will be removed to a permitted site. In addition, periodic control to locate leaks will be performed and maintenance of the protective and monitoring systems in accordance with the Standards. In the event of an uncontrolled leak, a plan will be prepared that will specify the actions to be taken to halt the leak and treat the spill immediately as well as procedures for recording and reporting to the authorities.

E.2 Planning, establishment, operation, maintenance and monitoring of the facility and pipes will be implemented in accordance with the updated provisions specified in the relevant laws, including:

1. Water Regulations (Prevention of Water Pollution) (Fuel Lines) 5766-2006
2. Proposal for Text of Water Regulations (Prevention of Water Pollution) (Fuel Tank Farms) 5764-2004
3. Business Licensing Regulations (Petroleum Storage) 5737-1976
4. Prevention of Marine Pollution from Land-Based Sources Law, 5748-1988
5. Prevention of Marine Pollution from Land-Based Sources Regulations, 5750-1990
6. Hazardous Materials Law, 5753-1993
7. Public Health Regulations (Sanitary Conditions for Drilling Drinking Water), 5755-1995

[34] Integrated Pollution Prevention and Control (IPPC) Reference Document on Best Available Techniques for Mineral Oil and Gas Refineries, February 2003

8. Public Health Regulations (Effluent Quality Standards and Rules for Sewage Treatment) 5770-2010

E.3 Prevention of soil pollution and groundwater pollution must be emphasized during the period of the works of setting up engineering tanks and storage tanks for fuels and oils. It must be ensured that spill containment pallets are installed for the tanks and for the refueling dispensers and means for treating spills in accordance with volumes expected to be found in the staging areas and work areas are available.

E.4 During the course of planning and setting up the facility and the pipes adjacent to the facility area, special emphasis will be placed on minimizing damage to the groundwater balance. To this end, drilling will be performed to locate shallow groundwater elevations and observation pipes will be installed for follow-up of these elevations; a detailed hydrogeological survey will be performed within a radius of 500 meters from the facility to evaluate the risk to the groundwater balance due to damage to underground water conduits; in the event of damage to the natural underground water conduits, water levels and Ein Tut volumetric flow rates will be monitored; in coordination with the Nature and National Parks Authority a measured quantity of water that will be artificially introduced to Nahal Tut will be determined.

E.5 Updating of the hydrological state in the work area will be performed within the framework of a hydrological-environmental document, which will be submitted to the Ministry of Environmental Protection and the Water Authority during the building permit process.

E.6 In accordance with the treatment alternative selected, it will be necessary to obtain a permit for the discharge of produced water to the sea.

E7 Special protective measures must be determined for the thickened hydrocarbon lines and glycol in the area of overlap with the Magen C Radius of Hof Hacarmel Drilling 2 and, alternatively, moving the drilling – all in coordination with the Ministry of Health and the Mekorot Company and with their authorization.

E.8 The location of active drillings along the route of the planned pipeline must be considered within the framework of coordinating infrastructure in accordance with Section 3.4.9.

<u>Treatment of leachates discharged from the facility</u>

E. 9 Release of the surface run-off (water) to the drainage system will be possible after meeting the Inbar Committee Regulations and/or the updated regulations for determining water quality permitted to be discharged into rivers, together with a periodic sampling.

E.10 The plan for sampling and the parameters to be measured will be authorized by the Ministry of Environmental Protection based on plans specified in the Public Health Regulations (Effluent Quality Standards and Sewage Treatment Rules) 5770-2010, and in accordance with the contents of the Proposed Water Regulations (Prevention of Water Pollution) (Farms and Fuel Tanks) 5764-2004, Chapter 21.A.

E.11 Surfaces and system elements will be rinsed toward the end of summer in order to enable the drainage of rainwater to the regional drainage system. This water will be retained in a controlled manner and will be treated in accordance with the law.

E.12 Malfunction – In the extreme case of a leak of an element from the discharge system that is not protected by its spill containment pallet, the incident will be handled in accordance with a treatment plan for effluents, which will be coordinated with the Ministry of Environmental Protection.

E.13 Water that is used for fire extinguishing and rinsing maintenance will be collected and removed to a permitted treatment site.

E.14 Areas must be defined as not being suspected of pollution and the surface run-off (water) from there must be passed on directly to the regional drainage system.

E.15 The treatment system of Leachates will be emptied and removed to an authorized site in accordance with the directives of the Ministry of Environmental Protection.

E.16 The frequency of emptying the spill containment pallets must be determined so that the available volume in the spill containment pallets will comply with the Regulations.

E.17 System maintenance will be implemented in accordance with the authorized standards.

F. Prevention of damage to natural treasures, landscape and continuity of open spaces

F.1 At the stage of applications for building permits, detailed documents will be submitted that relate to the following subjects:

- Manner of rehabilitating natural habitats in accordance with ecological features of the various area units.
- Handling and monitoring intruding plants that take root along the course of the pipeline, which includes preliminary action prior to the start of the works and long-term monitoring over a period of 5 years in

accordance with a plan that will be coordinated with the Nature and National Parks Authority.

- Examining the dispersion of light outside the areas of the plan and presenting measures to restrict and minimize its effects in accordance with planning principles coordinated with the Nature and Parks Authority
- Hydrological testing of the effect anticipated at Nahal Tut and springs in the area

The documents will be prepared in coordination with the relevant supervisory bodies, including the Nature and Parks Authority and with their authorization.

F.2 In nature areas, restricting the work strip to the minimum possible must be examined and shifting the route to agricultural areas, with the flexibility permitted in accordance with the provisions of the plan, in the following areas:

- Woods and forest areas that include mature and tall trees NZ 200700/724530 – 19991000/724853

- Woodlands area of shrubs NZ 208670/725125 – 201266/724959

F.3 Prior to commencing the works, a survey of the exclusive growth along the course of the works will be carried out. Bulbs and seeds of exclusive species will be collected for the purpose of future rehabilitation. In addition, a survey of mature trees will be carried out in accordance with that which is required in Amendment 89 of the Planning and Building Law.

F.4 In order to prevent harm to birds, it is recommended that the height of the stack will be as low as possible. In addition, cables for reinforcement will not be used in the facility near the water reservoirs. Cables above ground – insofar as such will be dispersed – will be marked in accordance with the instructions of the Nature and Parks Authority.

F.5 During the works of laying the pipeline in sensitive areas along the shore and Carmel ridge, lighting up areas outside the course of the works is to be avoided. At the time of the advanced planning stages, means to restrict the illumination of sensitive areas will be presented, including the possibility of performing work only during daylight hours.

F.6 Surface run-off from the treatment facility will not be discharged directly into open territory. Run-off will be collected and treated so that it will meet the current quality and standard for the discharge, which is not anticipated to cause damage to ecological systems and natural treasures.

F.7 In the event that damage is caused to an aquifer that fills the springs and moist habitats as the result of the plan's implementation, a compensating ecological-hydrological interface will be arranged, which will renew the discharge regimen with suitable quantities and qualities. This subject will be coordinated with the Nature and Parks Authority and the Drainage Authority, and will be implemented with their authorization.

G. Control and handling of leaks

G.1 Treatment facility: It must be ensured that the means of monitoring include, *inter alia*:

- Control of gas, control of fire and smoke control, in addition to control with respect to temperature and pressure
- A control room will be manned at all times (24/7)
- The facility will be equipped with cameras for detecting malfunctions

G.2 Valve station: The monitoring means at valve stations will include, *inter alia*:

- Temperature and pressure control, so that in the event that there is a drop in pressure, it will be possible to close the cut-off valve from the control room to separate the section of the offshore pipeline from the onshore pipeline.
- Security cameras must be present

G.3 Pipes: See Section O herein below.

H. Visual treatment of the site

The aim of these provisions is to ensure minimizing detrimental effects on the landscape around the facility by means of the following measures:

H.1 Reducing visibility of the facilities

During the detailed engineering planning of the facility, facilities that protrude in the landscape will be identified (tanks and structures of a height of 10 meters or more). The comprehensive planning of the facility will be prepared so that the effect of these structures on the landscape will be reduced by the use of the natural topography, current or planned embankments, as well as concealing these underground, insofar as possible in terms of operation and security. The optimal depth of concealment must be considered, which will obscure the presence of the facilities in the landscape without creating more significant damage by way of the exposed rock face.

- Flare height will not exceed 40 meters above the ground surface

- Tank height will not exceed 15 meters above the ground surface

H.2 Reducing damage to the landscape as the result of the staging area works – The detailed engineering planning will take into account the damage to the landscape that will be caused by the exposed white rock face, by means of: the use of finishing materials which will enable a natural patina to develop at an accelerated pace; the use of finishing materials (paint / plaster), which will enable integration of the exposed rock in its environment; the use of technologies to restore walls of excavation by sprinkling seeds of local wild plants and designing the walls of the excavation with suitable slopes for this.

H.3 Finishing materials – During the detailed planning stage, finishing materials will be examined for the design of the structures, facilities and fencing, with flexibility in determining these materials, and preference will be given to the use of finishing materials that will fit in with the surroundings and will not be conspicuous or shiny in relation to their environs.

H.4 Use of landscape for concealment – During the detailed engineering planning of the facility, possible measures will be employed for using the landscape for concealment from the directions of the views that were defined in the Environmental Impact Survey of the Gas Treatment Facilities at the Hagit site, and from additional points, insofar as this will be necessary. Such concealment will be implemented by way of the addition of landscape elements, which will fit in with the environment and its image, such as an avenue of cypress trees to be located along the borders of the facility or nearby.

H.5 A condition for issuing a building permit will be a landscape document, which will be prepared by a certified landscape architect together with an ecologist, and will specify all means taken, within the limits of the plan and outside it, with the aim to reduce the undesirable effects of the facility and auxiliary facilities (such as the valve stations) on the landscape. The document will include sections and simulations, detailed instructions with regard to the finishing materials, the use of plants, and more.

H.6 Interim block valve station, Hagit alignment – Since the facility will constitute a specific disruption to the landscape in an unbroken open space, which damages the view, the plan will allow for flexibility in coordinating the location of the valve stations, insofar as such will be established, with the relevant entities, including the Natural Gas Authority, Parks and Nature Reserves Authority and the Ministry of Environmental Protection.

H.7 General instructions for minimizing damage during the work stages of building the pipeline:

- Each action including that of vehicles, storage of equipment, etc. will be permitted solely within an area of the width of the pipeline corridor, 40-60 meters. Nonetheless, the plan will allow for flexibility along each side for the purpose of a work strip.
- In the initial stage (laying pipes by the first supplier), trees will be uprooted (insofar as there are trees, either natural and/or planted in orchards or groves) solely within the area of the pipeline strip and work area strip.
- Specific maneuvering of vehicles will be in the temporary staging areas insofar as possible.
- Original trees – Insofar as possible, an effort will be made to bypass these trees specifically in order to prevent uprooting them, in coordination with the relevant entities. It is preferable to uproot the trees near the border of the strip. In areas where the soil is piled up, it will be possible to circumvent the piles or to allow limited expansion in the event that a tree is found that is designated for uprooting/shifting within the area.
- The entire course of the establishment work will be performed under control and supervision with regard to landscape and ecology aspects.
- Since the technological option for the treatment procedure will be selected later on, and in accordance with this, the width of the pipeline strip is liable to change considerably, it is advised that a survey of mature trees for the pipeline corridor will be performed at the stage of the building permit.
- In the temporary service roads, first remove 20 cm from the upper layer of the soil and place it in a designated pile. At the end of the works, the contractor will be obligated to evacuate all bedding materials from the trip and replace the upper layer of soil that was removed. Instructions for treatment and piling of the upper layer of soil will also be made in accordance with the ecological provisions.
- It is preferable to perform the works of laying the pipeline during the summer months, insofar as possible, to prevent harm to fertile layers of the earth.
- Establishment works will be performed, to the extent possible, by means of heavy mechanical equipment, equipped with caterpillar tracks rather than wheels, in order to prevent compressing the soil.
- Areas for the work to lay the pipeline and work implements will be located and set up, insofar as possible, in abandoned areas, which

are not sensitive in terms of landscape and environmental protection. Establishment works will be coordinated with the local authorities and relevant environmental bodies with regard to their location and the assumptions pertaining to their operation and rehabilitation. See below Section S (Staging Areas, Contractor Camps, and Access Roads).

- At this point, it is advised that the staging areas for the pipeline designated for the Hagit site will be included within the area of the staging areas of the coastal array entry and in the onshore treatment center. It is proposed that within the framework of the building permit, the possibility will be examined of using the abandoned areas of the Shefaya quarry for the staging areas / contractor's camps, for the purpose of setting up the pipeline alignment.

I. Instructions for the collection, treatment and removal of sewage, brine and produced water

Sanitation sewage

I.1 The treatment facility will be joined to the regional sewage system lines.

I.2 Water with fuels must be prevented from entering the sewage system.

Industrial waste

I.3 Since all fluid systems in the facility are closed systems, no inputs of industrial waste are anticipated from the facility's operation. Inputs that will be created from maintenance works will be handled locally by means of absorption and spill containment pallets and will be evacuated to a permitted treatment site. Run-off, rinse water and fire extinguishing water, which are defined as leachates as the result of contact with elements of the system, will be collected, treated and removed through a system for the treatment of leachates (see further details in Section 4.10.3 in the Environmental Impact Survey of Natural Gas Treatment Facilities in the Meretz and Hagit Wastewater Treatment Facilities, as an example).

Brine

I.4 In the event of the extraction of salts from produced water at an advanced stage of the reservoir, prior to the discharge of produced water into the sea, storage tanks, which will be placed at the spill containment pallets, will be necessary for the brine and these will be inspected periodically in accordance with the standards for brine tanks. This brine will be transferred by way of a tanker for treatment at a permitted site.

Produced water

A recommendation for instructions for treatment of produced water will be specified in the Environmental Impact Survey of the Offshore Environment to be submitted as part of this plan.

J. Performance of earth works and drainage systems in the facilities and along the pipeline alignment

General

Treatment facility: At the Hagit site, excess soil is not expected as part of the establishment works process of the treatment facility. There are no particular instructions with regard to this subject.

Pipeline alignment: Along the pipeline strip, all soil that will be removed during the course of the works for laying the pipeline and arranging the strip will be replaced to fill in the strip so that no significant excess amounts of soil will remain. Accordingly, there are no special instructions with regard to this subject.

Drainage system: Within the framework of the plan at the Hagit site, no earth works are anticipated for the purpose of establishing drainage systems. Accordingly, there are no exclusive instructions with regard to this subject.

Recommendations for provisions of the plan:

J.1 Insofar as the quantity of excess soil will be significant – the up-to-date procedure of the Ministry of the Interior for handling excess soil must be observed, including the types of materials, quantities of materials and designated areas for evacuation. The provisions will also define solutions for handling excess soil, which will be in accordance with the following guiding principles:

A. Suitable raw materials:

- Recycling materials within the project for the purpose of construction, paving, moderating slopes, and landscape development and rehabilitation.
- Exporting raw materials for grinding and processing at an authorized and organized quarry or grinding the material on site and marketing the material to other entities or having the developer evacuate it in a systematic fashion.

- Recycling materials outside the project in an optimal manner in accordance with a statutory procedure, arranged and authorized in accordance with the type of material. For example, agricultural soil reclamation and preparation, preparation of areas for pasture, use as material for paving and construction, land for gardening, landscape treatment.
- Temporary storage as part of the plan or at provisional storage sites, in restricted amounts for a limited time and for a period that will not exceed the date of the project's completion.

B. Unsuitable raw materials:

- Rehabilitation of damaged sites outside the project area;
- Removal of materials and burying materials at prearranged sites; treatment at a waste disposal site.
-

K. Seismic safety of structures and facilities with regard to each of the possible factors for causing damage

K.1 The elements subject to Israel Standard 413 will be planned in accordance with the requirements of Amendment 3 (valid at the time of writing the guidelines) or in accordance with the text of the standard valid at the time of issuing the building permit. In cases where the standard does not require the performance of a site response survey, it will be possible to use the PGA values and the range of response as these appear in Chapter 1.6.6 (East Hagit) and in Chapter 1.6.4.1 (Dor Entry system), while making these compatible with the land classification that emerges from an investigation of the infrastructure during the building permit stage, and the relevant level of restrictions for the facilities.

K.2 In the event that a site response survey is required, it will be performed in accordance with the instructions that appear in Appendix E of Amendment 5 of Standard 413 (2011 Consolidated Edition or a more updated edition). In addition, in accordance with Appendix E, it is not mandatory to use the spectral curves of the standard and the alternative seismotectonic analysis results for the area may be relied on based on the most up-to-date knowledge in the field – the regional tectonic environment, geological data and the seismic activity, expected rate of recurrence of earthquakes in shifting and known original areas, and their maximum anticipated magnitudes, features of the earth's movements and the effects of turbulence near their source areas – insofar as such effects occur.

K.3 Hazardous installations and structures bearing hazardous installations will be planned to withstand earthquakes with a return time of 2,500 years through the use of the spectral curves that will be obtained following fulfillment of the Ministry of Environmental Protection's requirements that appear in the updated edition of "Guide for the Management of Seismic Risks from Stationary Sources in Terms of Hazardous Materials Incidents."

K.4 Engineering elements and structures that are not subject to Israel Standard 413 will be planned in accordance with international standards mentioned in the Israeli standard, and as a default option in accordance with the American Standard ASCE/SEI 7-10.

K.5 Investigation of the infrastructure to be performed during the building permit stages will define the areas of the plan in which there is potential for liquefaction. In these areas, means to prevent damage from liquefaction must be included, such as the use of flexible joints, and methods to improve land features land and to reduce/cancel the potential for liquefaction.

K.6 Planning must include a local earthquake warning system, which will connect in future to a national earthquake and tsunami warning system, and the planning of automatic and non-automatic activities required at the time of receiving an alert from the system.

K.7 Emergency systems, such as control and fire extinguishing, must be planned in accordance with strict seismic standards. System elements must withstand an earthquake with a return time of at least 2,500 years.

K.8 The staff that will prepare the plans for the building permit stage will include an earthquake engineer who will be familiar with the customary practice in the area and the knowledge that has accrued with regard to seismic planning of facilities of the type subject to this plan, in light of experience that has been accumulated with regard to incidents during which facilities such as these have been exposed to seismic forces.

L. Provisions for reducing noise during the stages of the establishment works and ongoing activity

In order to fulfill the Noise Regulations, we advise that the following sections, which concern noise reduction, be added to the plan provisions:

L.1 During the stage of detailed planning and as a condition to obtaining a building permit, the plan's developer will submit an Acoustic Appendix to be prepared by a recognized acoustic consultant for the gas receiving station. The Acoustic Appendix will be called: "Detailed Acoustic Appendix for National Master Plan 37H – Raw Natural Gas Receiving Facility" (hereinafter: "**the Acoustic Appendix**").

L.2 The Acoustic Appendix will include a list of dominant noise sources at the station, including the name of the manufacturer, equipment model number, description of the equipment and level of sound of the equipment. The noise data will be normalized to a distance of 15 meters, while including noise reduction as the result of silencers, acoustic cells, or buildings in which the equipment will be placed. The data will be provided in frequency band distributions of 1/3 octave.

L.3 The noise criterion in the Acoustic Appendix will be a comprehensive noise level of LAeq=40 dB within the residential building. This level includes all sources of mechanical environmental noise to which the regulations apply.

L.4 In the event that the calculated noise levels are higher than the noise criterion specified above, measures for reducing the noise level to comply with the noise criterion will be presented.

L.5 The Acoustic Appendix will include a schedule for the performance of the works including details of work equipment that will operate in each of the stages, their location and duration of operation in the area during a 24-hour period.

L.6 The Acoustic Appendix will include the acoustic features of the equipments to be operated on the site, which will comply with the requirements of the Abatement of Nuisances Regulations (Unreasonable Noise from Construction Equipment) 5739-1979. At the start of the works, the performing contractor will present documentation confirming that all work equipments that he intends to use complies with the requirements of the aforesaid regulations.

L.7 The level of the noise criterion of the establishment works is a value that is 20 dB higher than the maximum noise level defined in the provisions of the Abatement of Nuisances Regulations (Unreasonable Noise) 5750-1990 outside the building. The plan developer will be required to comply with this noise level while taking reasonable measures (for example: use of the same kind of work equipment that is quieter, use of mobile noise blockers, etc.).

L.8 The Appendix will include calculations of noise levels for all stages of work based on details of the work equipments, its location and duration of operation, noise blockers along the way and noise dissemination.

L.9 The Acoustic Appendix will be sent for authorization of the Ministry of Environmental Protection.

L.10 All gas turbines will be ordered with an acoustic canopy that will ensure that the noise level will not exceed LAeq=85 dB at a distance of 1 meter from the equipment’s canopy.

L.11 The noise level from all units of equipment will not exceed LAeq=85 dB at a distance of 1 meter.

L.12 “Unusual Actions” such as the release of gas via a flare will be performed, insofar as possible, solely during daytime hours.

M. Rehabilitation of the seabed environment

This issue will be addressed in the Offshore Environmental Impact Survey, which will be submitted as part of this plan.

N. Rehabilitation of the onshore pipeline alignment

General directives for minimizing damage during the work stages:

N.1 As a rule, deviating from the pipeline corridor will not be permitted – 40-60 meters. Nonetheless, the plan will allow for flexibility of up to 12.5 meters on each side for the purpose of a work strip.

N.2 In the initial stage (laying the pipeline by the initial supplier), uprooting trees (in the event that there are original trees) will take place solely within the pipeline strip and the work strip.

N.3 Localized maneuvering of traffic will take place in the provisional staging areas insofar as possible.

N.4 Original trees – Insofar as possible, an effort will be made in coordination with the relevant bodies to bypass these trees specifically, in order to preclude uprooting the trees. It is preferable to uproot trees near to the strip border. In areas where soil is piled up, it will be possible to bypass the pile itself or to enable restricted spillover in the event that a tree is found that is designated for uprooting/being shifted within the area.

N.5 The entire course of the establishment works will be implemented under supervision and control of the landscape aspect.

N.6 Since the technological option for the treatment process will be selected further on, and the width of the pipeline strip is liable to change accordingly, it is advised that a survey of mature trees in the pipeline corridor be performed at the stage of application for a building permit.

N.7 Along the temporary service roads, 20 cm must first be removed from the upper level of soil and placed in a designated pile. Upon completion of the works, the contractor is obligated to remove all bedding materials from the strip and to replace this with the upper level of soil that was removed.

N.8 It is preferable to perform the pipeline laying work during the summer months, insofar as possible, in order to prevent damage to the fertile layers of earth.

N.9 Establishment works will be performed by way of heavy mechanical equipment on caterpillar tracks rather than wheels, in order to prevent compressing the soil.

N.10 Staging areas along the pipeline and access roads to them will be located and planned at the stage of planning the works and will require submitting an application for a provisional permit to the local authority, while undertaking to rehabilitate the strip upon completion of the work. Areas for laying the pipeline and work equipments will be located and situated insofar as possible in abandoned areas that are not sensitive in environmental terms, in coordination with the local authorities and the relevant environmental bodies.

N.11 In the event that the plan's developer will opt to use the Cofferdam method for coastal entry, a renewed examination will be required of the plan's effects that were reviewed in the Environmental Impact Survey.

For recommendations with regard to provisions with respect to landscape and ecological rehabilitation of the pipeline's alignment onshore, see Sections F and H above.

O. Sealing and monitoring leaks from the pipeline (natural gas and fuel)

O.1 The gas pipeline is made of steel with a covering for cathode protection.

O.2 Pressure control systems will be installed on the pipeline and on the facility's components with a warning of an unplanned reduction in pressure.

O.3 A plan will be prepared for discovering leaks by way of continuous measuring of the engineering parameters in the pipeline (volumetric flow rate, pressures, etc.).

O.4 Pipes will be protected and monitored in accordance with the relevant regulations.

P. Treatment of related infrastructures

Treatment of related infrastructure for the facility, such as electricity lines, sewage, etc., will be implemented in accordance with accepted requirements and standards.

Q. Dismantling the facilities and restoring the area to its former state at the end of the project

The detailed engineering planning of the natural gas treatment facility and related infrastructures will include a description of dismantling the facility, and recycling or evacuating the various components in accordance with preferred alternatives.

An initial dismantling plan will be included in the EMMP document and will include an initial definition for removal of the various elements in accordance with the type of treatment: recycling, evacuation to a waste site, etc. The plan will refer, *inter alia*, to the following subjects:

- Removal of fluids from the pipeline works
- Cleaning leftover remnants and pollutants from the pipeline works
- Evacuating all facility structures and components from the gas treatment facility area
- Dismantling the pipeline
- Rehabilitating the work site and restoring it to its former state

The plan will be updated and authorized periodically throughout the period of the facility's activity so that it will be made to correspond with the technological, regulatory and other alterations and amendments. The plan's details will be completed toward the end of the project and will include a plan for dismantling and evacuation, and a plan for managing the restoration and monitoring of the area and its rehabilitation.

R. Antiquities and heritage sites

R.1 Any work within an area defined as an antiquities site will be coordinated and implemented solely after receiving written authorization from the Antiquities Authority director as required, and subject to the provisions of the Antiquities Law 5738-1978.

R.2 In the event that the Antiquities Authority will require that preliminary actions are taken (supervision; inspection of sample cuts; test excavation/sample salvage excavation; salvage excavation), the developer will perform and finance these activities as determined in law and in accordance with the conditions of the Antiquities Authority.

R.3 In the event that antiquities are discovered that justify preservation / moving the finding in accordance with the Antiquities Law 5738-1978 and the Antiquities Authority Law 5749-1989, all activities required for the preservation of the antiquities will be performed by the developer at his own expense.

R.4 The Antiquities Authority does not undertake to permit development and construction activity of any kind and type whatsoever in the field or in a part of it even after testing / excavation, this in the event that exclusive antiquities will be discovered in the area, which will require preservation of the ancient remnants in situ. In addition, this does not mean that the Antiquities Law is revoked with respect thereto but rather solely agreement in principle.

R.5 In the event that this concerns an archaeological tel, then procedures and policies for tels will apply as customary at the Antiquities Authority (non-performance of development works on archaeological tels). In cases where the pipeline passes close to tels, a tour of the area with the district archaeologist will be determined to discuss the exact location of the pipeline.

R.6 In the event that the Antiquities Authority will require an amendment of the construction plan, the Local Authority and/or the District Authority, in accordance with their authority in law, may permit amendments to the building plans and/or may demand a new plan, provided that no building rights will be accrued or additions that signify damage to the land due to these amendments or submission of a new plan.

S. Staging areas, contractor’s camps and access roads

S.1 The location, operation and restoration of staging areas and contractors camps will be, insofar as possible, within the boundaries of the blue line and in coordination with the Nature and Parks Authority / the Jewish National Fund and the engineer of the pertinent local authority.

S.2 Staging areas and contractor’s camps, as stated above, will be located insofar as possible within the area of the blue line and in abandoned areas. Uprooting mature and protected trees will not be permitted for the purpose of setting up staging areas and contractor’s camps. In any event, staging areas and areas of the contractor’s camps will not be located in the following sensitive areas:

- Natural uncultivated areas, including natural woods, shrub-steppe regions, forests
- Archaeological sites
- Adjacent to residential areas

S.3 Within the framework of the building permit, the possibility will be examined of using abandoned areas such as Shefaya quarry as staging areas or contractor’s camps for the purpose of setting up the pipeline alignment.

S.4 Staging areas and contractor’s camps must be fenced off as required by law prior to the start of the works.

S.5 Access roads for the performance of the works will be based on current roads, and roads within the area of the pipeline strip and the work strip, insofar as possible. In the event that it will be necessary to prepare additional access roads outside the blue line, these roads will have to be coordinated with the rights holders to the land. The passage of access roads through nature reserves, forests and parks will not be permitted outside the blue line except after obtaining authorization of the Nature and Parks Authority / the Jewish National Fund.

S.6 During paving or widening access roads as well as setting up the staging areas, materials that are non-impermeable must be used. The use of concrete, asphalt or any other impermeable material must be avoided for the purpose of setting up access roads. In the event that one of the aforesaid materials will be used due to constraints of performance or due to the need to limit environmental and landscape hazards, the temporary roads will be dismantled and the area rehabilitated no later than 3 months from the end of the performance of the works in the defined area.

S.7 Moving equipment – The movement of mechanical engineering equipment will be limited solely to existing roads, including dirt roads and agricultural roads.

S.8 Temporary access roads as well as the various work sites and staging areas will be rehabilitated after the work is completed and the area will be restored to its former state and/or will be rehabilitated in accordance with a landscape rehabilitation plan. All equipment and/or building material waste will be evacuated to an authorized site no later than 3 months from the end of the performance of the establishment works in the defined segment.

S.9 Areas that will become unusable during the course of the works and are found outside the blue line will also be rehabilitated. Existing service roads and dirt roads that were widened for the purpose of the establishment works will be returned to the width authorized in accordance with the plans and the road shoulders will also be restored. All this will be performed by the contractor and at his own expense. Agricultural roads will be cleared of any waste materials and piles. Areas that have been damaged and compressed will be treated in accordance with specifications and directives of the performance plan.

S.10 Crushing operations, if performed, will take place solely in areas that are designated as staging areas, at a distance from any residential areas, and in accordance with the provisions for complying with the Abatement of Nuisances Regulations (Prevention of Air Pollution and Noise from a Quarry) 5738-1998.

5.2. Provisions and Stipulations for Issuing Building Permits

This section, *inter alia*, will refer to issues for which there is no answer at this point and these should be transmitted or studied in depth at the building permit stage. Some of the issues have been specified and presented in Section 5.1, in the recommendations for the provisions of the plan.

5.2.1. Limiting area occupancy

This section specifies recommendations for provisions of the plan for limiting the plan area occupancy.

A. Staging areas of the first supplier will be located in an area designated for use by the second supplier. After the area is used by the first supplier and prior to the entry of the second supplier, the area will be rehabilitated in accordance with directives of the Ministry of Environmental Protection.

B. Spaces designated for condensate tanks in Figure 3.1.1-2 in the Environmental Impact Survey of the Hagit site will serve solely for these designations. In the event that the plan submitted by the supplier does not include or require said designations, these will be removed from the area of the plan.

C. Remaining areas that are not marked by the supplier will be removed from the plan areas.

D. The developer will examine reducing the accumulation of condensate (see Section 5.2.5 further below).

5.2.2. Separation distances and updating restrictions

See Section 4.11.2 above.

5.2.3. Emissions permit

At the stage of a building permit application, an application for an emissions permit will be submitted, in accordance with the Clean Air Law 5768-2008, updated to the period of submitting the application.

5.2.4. Environmental management and monitoring plan

It is of utmost importance to prepare an environmental monitoring and management plan, which will include, *inter alia*, requirements for environmental documents at the stage of submitting the building permits, plans for operations to prevent and treat emissions (with emphasis on cooperation between public entities and government agencies, including military and civilian systems), as well as directives that relate to monitoring systems in a variety of fields (air pollution, hazardous materials, marine pollution, etc.), which will be planned and operated in facilities, including plans and emergency procedures in the event of fire, emissions and leaks into the environment. The monitoring plan will include control procedures / routine management of offshore and onshore facilities, including determining responsibility and applying supervisory procedures and schedules in order to handle malfunctions in the event that such will be discovered.

Fundamental directives for the preparation of an Environmental Monitoring and Management Plan (EMMP) have been prepared by the Royal Haskoning DHV Co., foreign consultants for the plan. The directives have been attached as Appendix I and include reference to examining the best available technologies (BAT) for preventing and minimizing harmful effects on the environment at the stage of the building permit and preparation of the EMMP.

In addition, when preparing the EMMP and directives for its implementation, the ENVID document, which was prepared with the participation of the Ministry of Environmental Protection and other relevant entities and is attached hereto as Appendix G, may be of use, as it comprises a review of the environmental impact of the onshore and offshore natural gas treatment facilities.

5.2.5. Reducing accumulation of fuels

General:

The plan enables the accumulation of condensate in three tanks, the total capacity of which is 20,000 cu. meters, a quantity that allows the storage of fuel for 7 days of continuous production process.

Recommendation for combining provisions:

The developer will examine limiting the accumulation of condensate by moving it through the designated pipeline to an end solution (for example, the refineries) in accordance with two basic treatment alternatives:

1. Treatment of fuels offshore in a designated treatment facility (FSO) – For this purpose, the fuel will be transferred from the treatment facility back to an offshore treatment facility by way of the onshore pipeline corridor.
2. Treatment of fuels onshore in refineries – In this framework, as first priority the condensate will be removed from the Hagit site / Meretz wastewater treatment plant by way of a designated pipeline next to the existing 5750 pipeline route, Hagit-Elroi-Haifa Refineries, in a statutory strip of the Israel

Natural Gas Lines (INGL) or the gas pipeline strip in the Hagit-Oil Refineries Ltd. (BZ"N) line (in accordance with National Master Plan 37B) – in coordination with the relevant infrastructure owners. In the event that statutory arrangement will be necessary for the current pipeline alignment and for specific points of widening, as required, it will be necessary to conduct environmental surveys in coordination with the Ministry of Environmental Protection and in accordance with its requirements.

5.2.6. Required supplements for the building permit stage

General

As aforesaid, in accordance with the directives for preparation of the plan, the plan is a practicable and flexible plan, which includes the possibility of applying a variety of treatment methods for natural gas that combine offshore and onshore treatment, given that the plan will provide a response to all future offshore gas discoveries so that gas will be provided to the transmission system.

Since a developer has yet to be selected to implement the program and information that is as yet unavailable will affect the planning of treatment facilities (such as the composition of the gas in the reservoir and the technology that is planned to be used), supplements on a variety of subjects that are as yet unknown at this stage will be required for the building permit stage.

Recommendations for the plan provisions:

A. Preparation of an Environmental Management and Monitoring Plan - EMMP

The developer will prepare an EMMP document for environmental management and monitoring at the stage of the building permit and will include, *inter alia*:

Assessment of environmental impact – A study of the environmental impact of the treatment system will be prepared in accordance with the principles specified in the directives for the preparation of the EMMP, which includes reference to the BAT and the ENVID document, attached as Appendices G and I respectively to this document.

B. Hydrogeology and land

B.1 During the course of planning and setting up the facility and the pipeline adjacent to the facility space, emphasis will be placed in particular on limiting damage to the groundwater balance. In order to do so, perform drillings to locate shallow groundwater elevations and install observation pipes for follow-up of the groundwater elevations; perform a detailed hydrogeological survey with a radius of 500 meters from the facility to evaluate the risk to the groundwater balance as the result of damage to underground water conduits; in the event of damage to natural underground water conduits, monitor elevations and volumetric flow rate of Ein Tut; in coordination with the Nature and National Parks Authority, a prescribed quantity will be determined for artificially supplying water to Nahal Tut.

B.2 Update the picture of the hydrological status in the work region within the context of an environmental-hydrological document that will be submitted to the Ministry for Environmental Affairs and the Water Authority during the building permit process.

C. Action plans and measures to be taken in the event of a leak

Action plans and measures to be taken in the event of an oil leak or a leak of other materials, including procedures and schedules for action, will be submitted by the plan's developer at the building permits stage and will be authorized by the relevant government entities.

Prepare a treatment plan with regard to groundwater pollution incidents as the result of leaks of condensate and/or operational fuel and produced water in accordance with the directives of the Ministry of Environmental Protection. The plan will include, as customary in such plans of readiness and response to pollution incidents (contingency plans), a definition of forces and tasks, and details of methods of action and measures to be taken according to the stages of treatment of the incident, in accordance with the nature of the incident, communication and reporting procedures, and coordination with relevant entities and other plans of action (such as relevant local authorities, the Water Authority, etc.). The treatment plan for various scenarios of fluids pouring into the environment will refer, *inter alia*, to the results predicting the fate or the effect of these materials on the ground.

D. Risk management

D.1 Treatment facility and onshore receiving station – As stated herein in this document, the facility will comply with the separation distances of the Ministry of Environmental Protection. In addition:

- Prepare a detailed risk survey in accordance with the requirements of the Ministry of Environmental Protection.
- Fulfill the requirements of the Ministry of Environmental Protection, which appear in the updated edition of "A Guide to Seismic Risk Management from Stationary Sources in Terms of Hazardous Material Incidents."[35]

[35] It should be recalled that the reference scenarios in risk management are different from reference scenarios according to which separation distances have been determined

- Ensure that a Poisons Permit for hazardous materials at the facility is obtained and that the conditions for the Poisons Permit of the relevant authorities are met, such as the Ministry of Environmental Protection, Home Front Command, firefighting services, Hazardous Businesses and Enterprises Licensing Regulations, etc. These conditions include, *inter alia*, spill containment pallets in accordance with the requirements of the Ministry of Environmental Protection and if necessary also in accordance with the technical specifications of the Home Front Command, emergency procedure and plant file for handling emergencies, such as those resulting from hazardous materials and fire, a review of risks in accordance with firefighting services requirements, and thereafter complying with the directives of the firefighting services for the prevention of fires and for handling fires – such as the use of detectors, water cannons and foam, and setting up emergency teams and drills for the teams.

D.2 Pipes

- The supplier will comply with the standard with regard to the criterion for individual and group risk as required in Israel Standard 5664 Part 2. If necessary, in accordance with the criteria in this standard, perform a survey of probable risks for meeting the individual risk criterion of 1e-6/year and meeting the group risk criterion in accordance with that which is customary at the Ministry of Environmental Protection at the time the survey is performed.
- In addition to a risk analysis survey, it will be necessary to coordinate matters with the relevant entities at the Ministry of Defense.

E. Seismic safety

E.1 Perform a site response study for the purpose of planning the facility or its parts for which this study is required in accordance with the directives of Israel Standard 413 that is in effect, insofar as it applies to the various parts of the facility, or the directives of the relevant international standard. The study must be performed as specified in Appendix V of Amendment 5 of Israel Standard 413 (2011 Consolidated Edition or a more updated edition). The seismic content of the facility or its relevant parts will be based on the findings of this study and will be presented within the framework of the permits.

E.2 Perform a subsoil investigation in order to define the plan areas in which there is potential for soil liquefaction. In these areas, include measures for preventing damage from soil liquefaction, such as the use of flexible joints

and, therefore, a new risk assessment must be performed in accordance with such scenarios.

and methods to improve the features of the land to reduce / eliminate the potential for soil liquefaction.

E.3 Present the manner in which the facility will be joined to a local and national earthquake warning system, and the automatic and non-automatic actions that will be performed at the time an alert is received from this system.

E.4 Present planning for emergency systems which take strict seismic standards into consideration. System components must withstand an earthquake whose return time is at least 2,500 years.

The team that will prepare the plans for the building permit stage will include an earthquake engineer who will be knowledgeable as regards the accepted practice in the field and the knowledge that has accrued as to the seismic planning of facilities of the type subject to this plan, in light of the experience that has been amassed with regard to incidents in which facilities of this kind were exposed to seismic forces.

F. Landscape and natural treasures

F.1 A landscape document prepared by a certified landscape architect will specify all means being taken within the limits of the plan and outside it with the aim to reduce the effects of the facility and supplementary installations (such as the block valve stations) on the landscape. The document will include sections and imaging, detailed instructions as regards finishing materials, use of vegetation, etc.

F.2 Since the technological options for the treatment process will be chosen at a later date and in accordance with this the width of the pipeline strip is likely to change considerably, it is proposed to perform a survey of mature trees for the pipeline corridor at the building permits stage.

F.3 Detailed documents will be submitted relating to the following subjects:

- The manner of rehabilitating the natural habitats in accordance with the ecological features of the various units of land
- Treatment and monitoring of invading plants that take root along the pipeline alignment, which include preliminary actions prior to the start of the works and long-term monitoring for five years in accordance with a plan to be coordinated with the Nature and National Parks Authority
- Examining the dispersion of light outside the areas of the plan and presenting means to limit and minimize its effects, in accordance with planning principles coordinated with the Nature and Parks Authority

- Hydrological examination of the anticipated impact on Nahal Tut and springs in the region
- Detailed survey of trees will be performed in accordance with that which is required in Amendment 89 of the Planning and Building Law.

The documents will be prepared in coordination with the relevant supervising bodies, including the Nature and Parks Authority, and with their authorization.

G. Acoustics

G.1 During the stage of detailed planning and as a condition to obtaining a building permit, the plan's developer will submit an Acoustics Appendix to be prepared by a recognized acoustics consultant for the natural gas receiving facility. The Acoustics Appendix will be called: "Detailed Acoustics Appendix to National Master Plan 37 H – Raw Natural Gas Reception Station (hereinafter: "**the Acoustics Appendix**").

G.2 The Acoustics Appendix will include a list of the predominant sources of noise at the station, including the manufacturer's name, equipment model number, description of the equipment and the volume sound level of the equipment. Noise data will be normalized to a distance of 15 meters, with reference to reducing the noise by the use of silencers, and acoustic cells or structures in which the equipment will be placed. The data will be given in frequency band distributions of 1/3 octave.

G.3 The noise criterion in the Acoustic Appendix will be the comprehensive noise level including LAeq=40 dB within the residential building. This level includes all sources of mechanical environmental noise to which the regulations apply.

G.4 In the event that the calculated noise levels will be higher than the levels of the abovementioned criterion, noise reduction measures to comply with said criterion will be presented.

G.5 The Acoustic Appendix will include a schedule for performance of the works, including details of the work equipment to be operated in each of the stages, its location and duration in the area during any 24-hour period.

G.6 The Acoustic Appendix will include the acoustic features of the equipment to be operated on site, which will meet the requirements of the Hazards Prevention Regulations (Unreasonable Noise from Construction Equipment) 5739-1979. At the time of the start of the works, the performing contractor will present documents that confirm that all the work equipment he intends to use in future meet the requirements of the aforesaid regulations.

G.7 The Appendix will include calculations for noise for all stages of the work based on information with regard to the work equipment, their location on site, the time during which these will be in operation, noise barriers along the way and dispersion of the noise.

G.8 The Acoustic Appendix will be sent for authorization of the Ministry of Environmental Protection.

H. Air quality

H.1 During the stage of the Application for a Building Permit, an Application for an Emissions Permit will be submitted in accordance with the requirement of the Clean Air Law 5768-2008, updated to the time at which the Application is submitted.

I. Initiating contact between the parties implementing the project and residents of nearby localities

I.1 The developer will initiate a method for making contact with residents by means such as: information brochures to be distributed by direct mail to residents residing in the facility vicinity, publicizing advertisements in local newspapers and on the Internet, which will include a description of the works, a telephone number and an email address for residents who wish to contact the developer.

I.2 The developer will put into place a mechanism for discussion and handling of residents' complaints, which will include a dedicated telephone line, the number of which will be publicized to the general public to provide a direct response to residents during regular business hours and for leaving voicemail messages during times outside of ordinary business hours. It will also be possible to send queries by email to a dedicated email address to be opened for the project.

The plans and actions specified above will be authorized by the relevant entities such as the Ministry of Environmental Protection, the Firefighting Authority, and the Gas Authority as part of the building permit.

J. Dismantling the facilities and restoring the site to its former state at the end of the project

The detailed engineering planning of the natural gas treatment facility and related infrastructures will include a description of the dismantling of the facility, and the recycling or evacuation of the various components according to an examination of the preferred options.

An initial plan for dismantling a facility will be included in the EMMP document and will include a preliminary description of the evacuation of the various components in accordance with the type of treatment required for them:

recycling, evacuation to a waste site, etc. The plan will include and relate to, *inter alia*, the following subjects:

- Removal of fluids from the pipeline works
- Cleaning remnants and pollutants from the pipeline works
- Vacating all structures and components of a facility from the area of the natural gas treatment facility
- Dismantling the pipeline
- Rehabilitating the site and restoring it to its former state

The plan will be updated and authorized periodically throughout the period of the facility's activity so that it will be made to correspond with the technological changes, regulatory amendments, etc. All details of the plan will be completed prior to the end of the project and will include a plan for dismantling the facility and evacuation of its components, and a plan for managing the rehabilitation and monitoring of the area and its restoration to its former state.

5.3. Restrictions and Guidelines on Zoning, Uses and Activities

Throughout the planning process, an effort has been made to select the location of the plan's elements so that the impact of the plan's implementation on current and authorized uses and zoning will be minimal. Accordingly, there are no special restrictions on the approved uses and zoning, apart from primarily undertaking measures for warning and safety in the event of malfunction (see details in Section 4.2.1 above). The plan's restrictions principally apply to agricultural areas (restrictions on planting and growing trees in the pipeline's strip) and restrictions on future zoning in the event that this will coincide with the plan area.