SAKHALIN-1 PROJECT
ENVIRONMENT PROTECTION REPORT

EXXON NEFTEGAS LIMITED

2015
# Table of Contents

1. Occupational Health safety and Environmental protection measures in 2015 ................................................................. 3

2. 2015 Environmental Performance ........................................... 3

   2.1 Waste Management .................................................................. 3
   2.2 Water Use, Water Consumption and Water Discharge ................ 6
   2.3 Air Emissions .......................................................................... 8
   2.4 Oil and Petroleum Products Spills Prevention and Response ....... 9
   2.5 ENL Expenditures on Environmental Safeguards ....................... 11
   2.6 Natural resources Use Charges ............................................... 12

3. Key Environmental Protection and Ecological Monitoring Programs .... 12

   3.1 Pipeline ROW Repair and Maintenance ..................................... 12
   3.2 Environmental and In-Process Compliance Monitoring ............... 13
   3.3 Summary of the 2015 Environmental and In-Process Monitoring Results ................................................................. 16
   3.4 Key Environmental Protection Programs .................................... 30
   3.5 Aquatic Biota Damage Compensation ....................................... 32

ENL SHE Performance Results 2014-2015 ..................................... 33
1. OCCUPATIONAL HEALTH SAFETY AND ENVIRONMENTAL PROTECTION MEASURES IN 2015

The following main initiatives in the field of safety culture development, occupational health and protection of environment were carried out by Exxon Neftegas Limited in 2015:

1. Promotion of safety culture principles adopted in Exxon Mobil Corporation and ENL among contractors;
2. Conducted the 12th annual SHE&S Forum for Contractors in Yuzhno-Sakhalinsk with participants representing more than 30 contractor companies;
3. Continued implementation of contractor’s safety improvement process through best practices for contractor interface management;
4. Performed internal assessment of Operations Integrity Management System;
5. Conducted emergency response exercises at Company’s sites.

In 2015 no emergencies, including oil and oil products spills, with significant (high-profile public impact) social and environmental damage were recorded at the Sakhalin-1 Project facilities.

2. 2015 ENVIRONMENTAL PERFORMANCE

Exxon Neftegas Limited pays special attention to environmental measures and tracks various environmental performance indicators and parameters on a daily, monthly, quarterly and annual basis. This section outlines the overview of Sakhalin-1 Project’s environmental performance indicators.

2.1 Waste Management

Drilling Waste and Domestic Wastewater

In 2014, Sakhalin-1 Project construction and production facilities in Sakhalin Oblast and Khabarovsk Krai generated 197,348 tons of production and consumption waste.

The production and consumption waste generated by Sakhalin-1 Project construction and production facilities in Sakhalin Oblast and Khabarovsk Krai in 2015 included:

- Drilling waste (slurry, drill cuttings);
- Domestic wastewater from the Orlan Offshore Platform;
- Domestic wastewater from the De-Kastri oil export terminal (OET).

Domestic wastewater from the De-Kastri oil export terminal (OET) was fully transferred for decontamination to the Municipal Unitary Enterprise for Housing and Communal Services of De-Kastri Rural Settlement.

Domestic wastewater from the Orlan Platform and drilling waste from Orlan and Berkut Platforms were injected through special-purpose wells into deep horizons of the license areas:

- well at Chayvo WS (Chayvo onshore subsoil area);
- well at Orlan Offshore Platform (OP) (Chayvo offshore subsoil area);
- well at Berkut OP (Arkutun-Dagi Field subsoil area).
A part of drilling waste amounting to 3,205.5 tons was transferred to Terra-Torf LLC licensed enterprise for disposal. Drilling waste and wastewater from the Orlan Platform and De-Kastri OET account for 96.7% of the total waste generated in 2015.

**Other Industrial and Domestic Waste**

Out of the total volume of other industrial and domestic waste of hazard classes 1 - 5 generated and carried over from 2014, 6,535 tons (or 98.42%) were decontaminated, buried, and disposed of in 2015, including:

**Decontamination**

8.5% of waste was thermally neutralized in the company’s own incinerators, including:
- oily waste;
- industrial waste;
- domestic waste.

14.9% of waste was transferred to contractors and subcontractors for decontamination using special-purpose equipment.

**Reuse/Disposal**

- 0.86% of waste was reused for the main production operations, as well as for auxiliary processes.
- 66.9% of generated waste was transferred to third party organizations for disposal.

**Burial**

- 6.5% of Hazard Class 4 and 5 waste was disposed of at a specialized SDW landfill;
- 0.3% of industrial and domestic waste of Hazard Class 4 and 5 was disposed of at the Company’s own landfill in De-Kastri;
- 0.07% of Hazard Class 2 and 3 waste was transferred to the Serebristy special-purpose landfill (ZAO Zelenyi Gorod, Krasnoyarsk);
- 0.4% of other process waste was injected into injection zones of license areas through wells OD-1, DD-1, and OND-1.

**Decontamination of Other Industrial and Domestic Waste of Hazard Classes 1-5 in 2015.**

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Returned to process flow</td>
<td>0.86%</td>
</tr>
<tr>
<td>Transferred for disposal</td>
<td>66.9%</td>
</tr>
<tr>
<td>Disposed using own facilities</td>
<td>8.5%</td>
</tr>
<tr>
<td>Transferred for decontamination</td>
<td>14.9%</td>
</tr>
<tr>
<td>Injected in wells</td>
<td>0.4 %</td>
</tr>
<tr>
<td>Transferred for disposal at landfill</td>
<td>6.57%</td>
</tr>
<tr>
<td>Disposed at own landfill</td>
<td>0.3 %</td>
</tr>
</tbody>
</table>

**Use of Best Available Waste Management Technologies**

**Waste Neutralization.**

Waste neutralization (including burning in incinerators) is a key point of the ENL waste management strategy aimed at reducing the volume of buried waste.

- In 2015, ENL drafted a package of technical documentation titled *Incineration of
Industrial and Domestic Waste at Sakhalin 1 Project Facilities, which has received a favorable state environmental expert review opinion;

- As part of this project, in the reporting year ENL replaced four Forsazh-1 incinerators with SMART ASH units that are more environmentally friendly (two at Chayvo and two at Odoptu), and put into service a special-purpose UZG-1M unit for decontamination of oily sludge and contaminated soil;
- The percentage of Sakhalin 1 Project waste decontaminated in the company's own incinerators and those operated by contractors increased from 6% to 23% in 2015.

Waste Disposal

- The main objectives of ENL in the field of waste disposal are the efficient use of available capacities of waste disposal facilities and the use of environmentally acceptable methods of waste disposal.
- ENL injects drilling waste and produced water into isolated zones of the subsoil license areas. This method is generally recognized as the most environmentally safe method of handling drilling and oil production wastes.
- The percentage of waste transferred to contractors to be buried decreased to 6.6% in 2015 from 24% in 2014.
- In addition, waste generated at the De-Kastri OET is disposed at the ENL's own landfill for industrial and household waste. As a result of implementation of the waste burial reduction strategy, 971 tons of waste was disposed of at the landfill as of the end of the reporting period, which is 46% less than the permitted level.
- As part of implementation of the Waste Management Concept, ENL conducted surveys at potential sites for Sakhalin-1 Project industrial and domestic waste landfills in Okha and Nogliki Districts in 2015.

Reuse / Disposal

The main focus of waste management is identification of waste generation sources and selective collection of wastes that can be reused in key process operations or transferred for recycling as secondary raw materials.

In 2015, ENL expanded the list of waste recycling and reuse contractors and the range of waste handled by them. Specifically:

- In 2015, the amount of glass waste and glass containers sent for recycling increased from 3.8 to 21.7 tons/year as the glass recycling program expanded to include the primary operational facilities of Sakhalin-1.
- ENL started transferring incinerator ash to a specialist contractor, Promintech OJSC, to be recycled into KASS sorbent. A total of 67 tons of ash was transferred in the reporting year.

In 2015, the overall volume of disposal for industrial and domestic waste generated at the ENL facilities amounted to 67%. This result was made possible due to high working standards, early and complete waste segregation and waste management processes preventing waste burial and/or secondary contamination of potentially recyclable waste.

The graph below shows the percentage breakdown of the main methods of treatment of industrial and domestic waste for Sakhalin-1 Project for the period from 2006 through 2015.
The other industrial and domestic waste disposed and decontaminated in 2015 totaled 6,049 tons. Their ratio to the total number of waste being managed (amount of waste as of the beginning of 2015 and waste generated in 2015) is 0.91.

**Development of Infrastructure for Environmentally Safe Waste Removal, Neutralization, and Disposal**

Within the scope of development of infrastructure for environmentally safe waste removal, neutralization and disposal, in 2015 the Company implemented the following activities:

- Reorganization of the Chayvo temporary waste storage site (TWSS) involved upgrading the power supply system, repairing the weighing module, and preparing technical specifications for an auxiliary tent.
- Metal containers for collecting and accumulating flammable waste were replaced at all Project operating facilities;
- Technical audits were performed on the fixed incinerators at Odoptu WS, Chayvo OPF, and De-Kastri OET.

**Monitoring of Waste Management Facilities**

In accordance with the requirements of Russian environmental protection legislation and regulatory documents, ENL performs environmental monitoring at sites where waste management facilities are located.

Monitoring is performed under “The Environmental Monitoring and Industrial Environmental Oversight Program for the Operation Phase” approved by the State Environmental Expert Review.
Under this program, monitoring is carried out at the waste disposal landfill at De-Kastri, temporary waste storage sites at Chayvo OPF, Odoptu WS, and DeKastri OET, incinerators and injection wells. Monitoring includes the soil condition, air emissions from the incinerators, groundwater quality at the areas of the landfill and temporary waste storage sites.

Properties of injected drilling waste and production water, as well as technical parameters of injection processes are monitored in accordance with the requirements of authorized subsoil use agencies.

The results of monitoring at waste disposal sites in 2014 showed that in general controlled parameters met the required environmental quality standards.

2.2 Water Use, Water Consumption and Wastewater Discharge

ENL does not discharge contaminated wastewater to surface water bodies. Contaminated industrial and domestic wastewater is injected into special-purpose wells.

In 2015, during construction and production operations under the Sakhalin-1 Project, ENL conducted water management activities pursuant to six Decisions and four Agreements for surface water body use and four licenses for the right to use mineral resources for the production of subterranean waters.

Water consumption totaled 14,405 thousand cubic meters. Water discharge totaled 14,357 thousand cubic meters. Waste water was discharged to water bodies, leach fields, re-injected into deep formations and transferred to other companies for additional treatment.

Orlan Offshore Platform

In the reporting year, water use on the Orlan Platform was based on three Water Use Agreements and three Water Use Decisions.

In 2015, sea water intake totaled 4,766 thousand cubic meters. The established sea water intake limit amounts to 10,908 thous. m³/year.

Water discharge:
- Standard clean water used for equipment cooling and fire pump systems testing was discharged into the sea in the amount of 4,655 thous. m³;
- Standard clean water from the desalination system was discharged into the sea in the amount of 100.5 thous. m³;
- Household waste water treated by electrochemical dissociation system, drain water from production areas, as well as stormwater drains from decks were injected into the injector well.

The total amount of all categories of wastewater injected into well in 2015 was 34.6 thous. m³.

Chayvo Onshore Processing Facility (Chayvo OPF) and Chayvo Well Site (WS Chayvo)

Water consumption of Chayvo OPF and Chayvo WS totaled 156 thous. m³

Water disposal:
- after treatment at the biological sewage treatment facilities at Chayvo OPF sewage water was discharged into leach fields in the amount of 85 thous. m$^3$;
- process wastewater was injected into injection wells for the disposal of produced water and other process waste;
- the water used for drill mud mixing was injected into a special-purpose well.

**De-Kastri Oil Export Terminal, Export Oil Pipeline and SPM located in Ulchsky District of Khabarovsky Krai**

Fresh water was taken from the underground sources based on a subsoil use license and totaled 22 thous. m$^3$.

Water disposal: domestic wastewater in the amount 17 thous. m$^3$, after being treated at the biological treatment facilities, was handed over to the Municipal Unitary Enterprise for Housing and Communal Services of De-Kastri Rural Settlement.

**Odoptu-2 Well Site (North).**

Water for the facility, including the Multi-Purpose Building and Drillers’ Camp was supplied from Odoptu-4 Water Intake owned by EON LLC.

Water consumption totaled 95 thous. m$^3$.

**Domestic wastewater** in the amount of 91 thous. m$^3$ was treated and discharged to the leach fields.

**Berkut Fixed Offshore Platform**

The Berkut fixed offshore platform is located offshore north-east Sakhalin island, in the Sea of Okhotsk, in the Russian Federation’s exclusive economic zone.

According to Clarification No. BN-02-28/4462 of September 20, 2011 received from the RF Federal Water Resource Agency, the provisions of the RF Water Code applicable to the conclusion of a Water Use Contract and to the Decision to allow use of water body do not apply to water areas of any water bodies located in the RF exclusive economic zone.

In 2015, intake of sea water totaled 9,309 thous. m$^3$.

Discharge into the Sea:
- the total amount of mixed (treated to standard quality) waste water discharge from the platform into the sea was 9,261 thous. m$^3$.

**2.3 Air Emissions**

**Gas Flaring**

The volume of gas flared and released into the atmosphere through gas vents at Chayvo Field in 2015 amounted to 167,055 thous. m$^3$ or 1.9% of the total volume of produced gas at the field, with the permitted flare volume equal to 5%.

The volume of flared gas at Odoptu Field amounted to 29,319 thous. m$^3$ or 4.4% of the total volume of produced gas at the field, with the permitted flare volume equal to 5%.
Hydrocarbon production from the Arkutun-Dagi field started in 2015. The volume of flared gas at the Arkutun-Dagi field amounted to 4,135.7 thou. m³ or 7.7% of the total volume of produced gas at the field, with the permitted flare level equal to 20%.

2015 flaring level for the Sakhalin-1 Project equals to 2.1%.

**Emissions into the Atmosphere**

The total quantity of permitted air pollutant emissions in 2015 for all ENL facilities (according to permits issued for construction and operation) was 63,221 tons (including NOX as NO2 equivalent). Actual emissions for the reporting period were 25,806 tons (including NOX as NO2 equivalent), which is 1.75 kg/toe.

For Sakhalin Oblast the total quantity of permitted air pollutant emissions (according to the issued permits) was 60,258 tons/year (including NOX as NO2 equivalent). Actual emissions for the reporting period were 23,689 tons (including NOX as NO2 equivalent).

For Khabarovsk Krai the total quantity of permitted air pollutant emissions was 2,985 tons/year (including NOX as NO2 equivalent). Actual emissions for the reporting period were 2,117 tons/year (including NOX and NO2 equivalent).

**2.4 Oil and Petroleum Products Spills Prevention and Response**

**Petroleum Product Spills**

Over the entire Sakhalin-1 Project activity period there have been no incidents involving technological equipment failure or pipeline breakage resulting in crude spills.

In 2015, 36 minor cases of oil spills were registered at ENL facilities during production and construction operations, 29 of which took place at operation sites in Sakhalin Oblast, and 7 – in Khabarovsk Krai.

The total volume of oil spill was 412.11 liters.

This indicator also includes incidents involving spills/leaks of such oil products as hydraulic liquids, lube oils, diesel fuel. The key reason for such leaks is breakage of heavy equipment and transport vehicles used for industrial activities at Sakhalin-1 sites. In every particular case, ENL specialists working at the sites took proper response measures in due time. Consequences of minor leaks were eliminated immediately.

Sakhalin-1’s Orlan and Berkut fixed offshore platforms are equipped with an internal drainage system that works in a closed circuit. In the event of an oil or product leak at any deck of the platforms, all liquids are contained within the drainage system to stop them from entering the environment.

ENL is committed to reducing the number of such incidents at its sites by developing and implementing various procedures to enhance the in-process control, particularly:

- implementation of a system for pre- and post-work checks of equipment for hydraulics and mechanisms wear;
- requirements for mandatory installation of leak-tight trays below heavy equipment at parking places;
- strengthening of requirements for motor vehicles of contractors and subcontractors providing material and equipment delivery services to Sakhalin-1 sites.

ENL is constantly working with contractors and subcontractors providing services for Sakhalin-1 sites. Contractors and subcontractors are notified on a regular basis of the requirement to take all necessary measures to prevent oil and product spills during work activities. ENL regards oil and product spill and leak prevention not only as one of its top priorities, but also as a necessary operational standard.

In all cases of oil product leaks a written report was produced, and causes of the spill were investigated and analyzed.

Sakhalin-1 OSR Plan Approval

During the period 2010 - 2011 ENL developed a new Corporate Oil Spill Response Plan (COSRP) for the "Sakhalin-1" Project that covers existing facilities and those scheduled to be built in the nearest future under the Project. COSRP was approved on April 10, 2012 by letter No. 22-2-495 of RF MChS Department for Federal Support of Territories and made effective by ENL President Jim Taylor’s Order No. 442 dated April 15, 2012. The plan shall be effective for the period of 5 years from the date of its approval.

In 2015, ENL started developing a new COSRP that will take effect in April 2017.

ENL OSR and ER Training Summary for 2015

Oil Spill and Emergency Response Exercises

On September 16-17, 2015, ENL staged the Hucho Periyi oil spill response exercise involving a combined offshore/onshore scenario, with the use of sea vessels, manpower, and resources available at Chayvo OPF and Berkut Platform, and with the participation of the operations support group in Yuzhno-Sakhalinsk.

Exercise objectives:

♦ Practice real-time exchange of information between the Commission for Emergencies and Fire Safety and the Chayvo OPF Emergency Response Team, and also between operations support groups in Yuzhno-Sakhalinsk;
♦ Test the preparedness of offshore manpower and resources to respond oil spills in northeast of Sakhalin;
♦ Test the oil spill response preparedness of Chayvo OPF manpower and resources as well as that of professional emergency response and rescue contractors;
♦ Practice the interaction with Sakhalin Energy Investment Company as part of the existing Mutual Assistance Agreement.

Manpower involved in the OSR exercise:

• Strategic operations support group (Yuzhno-Sakhalinsk) – 10 persons.
• Tactical crisis management group (Yuzhno-Sakhalinsk) – 49 persons.
• Chayvo OPF field response group – 17 persons.
• Ecoshelf LLC personnel – 18 persons.
• Ecospas Sakhalin Center personnel – 11 persons.
• Rosnefteflot Neftegaz-70 CJSC – 20 persons.
• Vitus Bering support vessel – 22 persons.
• Support personnel – 2 persons.
The drill participants successfully deployed OSR equipment both offshore and onshore and completed recovery of a simulated oil spill. Observers representing the Sakhalin office of the Federal Maritime and River Transport Agency Marine Rescue Service were present during the exercise.

On June 4, 2015, ENL staged the Taimen exercise to practice a response to a helicopter emergency on the Orlan Platform involving an explosion and fire, including first aid to the injured and evacuation from the platform. The exercise was conducted using the manpower and resources of Chayvo OPF and with the participation of ENL management at the ENL head office in Yuzhno-Sakhalinsk.

The objectives of the exercise were as follows:

- Improve the use of available ER structures, plans, processes and tools.
- Test the interface between the incident site, Chayvo ERT, Yuzhno ESG, the Incident Management Team (IMT) and between ENL-selected external organizations.
- Practice deployment of Chayvo emergency teams and real-time aid involving simulated patients (on-site treatment/ evacuation/ notification);
- Manage public relations, interaction with state authorities and media.

Personnel and OSR teams involved in drills:

- Orlan Platform
- Aviation group
- ENL Contractors
- ENL IMT at the ENL production office in Yuzhno-Sakhalinsk
- ISOS medical personnel

OSR and ER Training

In order to maintain a high level of readiness for oil spill and emergency response among its personnel and contractors, ENL provided regular training courses at the non-state professional educational establishment Sakhalin Technical Training Center. The training included courses in OSR, fire safety, first aid, survival in a helicopter emergency, etc. Personnel from the ENL occupational safety and emergency response departments flew to Thailand for international firefighting courses. The Company conducts planned drills at all Sakhalin-1 Project facilities as per annually approved internal ENL schedule.

During 2015, ENL conducted a total of over 400 planned/unplanned training sessions on various ER, OSR, and Fire Safety topics with company and contractor personnel at the “Sakhalin-1” Project facilities.

OSR Equipment Expenditures in 2015.

In 2015, ENL spent USD 850,000 on oil spill response equipment (a set of shipboard OSR equipment made by DESM)

2.5 ENL Expenditures on Environmental Safeguards

Each Sakhalin-1 Project facility includes numerous environmental safeguards as part of the project design and implementation. Design solutions include the latest environmental
protection equipment and use of environmentally safe technologies. The table below shows ENL expenditures on environmental protection in 2015.

**Preliminary data on environmental protection program expenses in 2015**

<table>
<thead>
<tr>
<th>Category</th>
<th>Environmental capital expenditures (Thous.Rub)</th>
<th>Operating costs (Thous.Rub)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental/regulatory technical personnel</td>
<td>506,363</td>
<td>34,539</td>
</tr>
<tr>
<td>Land reclamation</td>
<td>540</td>
<td>73,248</td>
</tr>
<tr>
<td>Water protection</td>
<td>604,800</td>
<td>15,176</td>
</tr>
<tr>
<td>Air protection</td>
<td>0</td>
<td>135,717</td>
</tr>
<tr>
<td>Waste management</td>
<td>119,487</td>
<td>269,670</td>
</tr>
<tr>
<td>Gray whale studies</td>
<td>75,415</td>
<td>368,203</td>
</tr>
<tr>
<td>Monitoring the populations of birds listed in the RF Red Book</td>
<td>4,301</td>
<td>9,187</td>
</tr>
<tr>
<td>Environmental and in-process compliance monitoring</td>
<td>20,323</td>
<td>111,934</td>
</tr>
<tr>
<td>Environmental surveys</td>
<td>48,480</td>
<td>24,942</td>
</tr>
<tr>
<td>OSR activities</td>
<td>59,787</td>
<td>255,407</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,423,401</td>
<td>882,773</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,757,519</td>
</tr>
</tbody>
</table>

### 2.6 Natural Resource Use Charges

Russian Federation law and the Sakhalin-1 Production Sharing Agreement envisage charges for land, forest, and water use related to project facilities. Payments made in 2015 in this category are listed in the table below. No above-standard payments for negative environmental impact were made.

**Natural resource use charges in 2015.**

<table>
<thead>
<tr>
<th>Payment type</th>
<th>Amount (Roubles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land use (leases)</td>
<td>32,526,094.56</td>
</tr>
<tr>
<td>Subsoil use fees</td>
<td>7,127.00</td>
</tr>
<tr>
<td>Tax on the extraction of common minerals</td>
<td>2,927,730.00</td>
</tr>
<tr>
<td>Water tax</td>
<td>50,720.00</td>
</tr>
<tr>
<td>Water use fees</td>
<td>139,525.09</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>36,651,196.65</strong></td>
</tr>
</tbody>
</table>

### 3. KEY ENVIRONMENTAL PROTECTION AND ECOLOGICAL MONITORING PROGRAMS

#### 3.1 Pipeline ROW Repair and Maintenance

In 2015, the following Sakhalin 1 Project pipelines underwent repairs and servicing: Odoptu WS – Chayvo OPF flowline, Chayvo – Botasino gas export pipeline, Chayvo OPF – De-Kastri OET oil export pipeline. These operations involved:
• Elimination of soil erosion sites and construction of engineered protective structures;
• Remediation of the natural vegetative cover;
• Pruning and selectively cutting trees and shrubs;
• Restoring the shoreline, elimination of subsidence or scouring, building shore protection structures at pipeline crossings over bodies of water;
• Restoration of backfill;
• Repair and restoration of signs (aeronautical, information, road signs) installed within the pipeline right-of-way.

Regular visual inspections and aerial monitoring were conducted throughout the year in both insular and mainland areas to: assess the technical condition of the route corridor, assess the effectiveness of engineered protective structures, and identify any adverse exogenous processes in a timely manner. The following operations were completed:

**Odoptu WS – Chayvo OPF Flowline**

Bank protection structures were built at the Piltun River pipeline crossing on both banks near the river channel. Water-filled areas revealing subsidence over the pipeline were filled within the swampy flood plain of the river.

The backfill layer was restored at the pipeline section in the interfluve between Chiru Stream and the Bolshoi Garomai River.

**Chayvo OPF – Botasino Gas Export Pipeline**

Technical and biological remediation was performed along the entire length of the pipeline route. Soil erosion was eliminated at 9 sites and the natural vegetative cover was restored as part of the remediation effort. Aeronautical, information, and road signs were also restored along the entire route.

**Chayvo OPF – De-Kastri OET Oil Export Pipeline**

34 soil erosion sites were eliminated during the activities at the Val River and Tyuksyu River pipeline sections. Biological remediation was also performed along all sections to restore the natural vegetative cover.

Bank reinforcement was performed and scoured shoreline was backfilled with crushed stone at the pipeline crossing point on the Khunmakhta River.

Engineered protective structures were built within the pipeline section. The river channel was cleaned to remove driftwood at the pipeline crossing point.

In Khabarovsk Krai, a cathodic protection cable was backfilled at the cable crossing point on the Malaya Tabo River.

Water was drained from the eastern part of the route corridor, and the marshland stream was cleaned and routed into a single channel.

The channel of the Medved River was cleaned. Servicing of the mainland portion of the oil export pipeline involved cutting of trees and shrubs and installing fittings to hold the damaged test point columns in place.

**3.2 Environmental and In-Process Compliance Monitoring**

The environmental and in-process compliance monitoring implemented in 2015 at ENL construction and operating sites included the types of operations listed below.
Monitoring stationary air emission sources at:
- Chayvo onshore processing facility (OPF);
- Chayvo well site;
- De-Kastri oil export terminal (OET)
- Orlan offshore platform
- Berkut fixed offshore platform (Berkut FOP)
- Odoptu-2 (North) well site
- Olympia residential complex
- Grounds of ENL production office in Yuzhno-Sakhalinsk (YPO)

Air quality monitoring at:
- Chayvo WS
- De-Kastri OET
- Odoptu-2 (North) well site
- Orlan offshore platform
- Grounds of ENL production office in Yuzhno-Sakhalinsk
- Olympia residential complex
- Chayvo OPF temporary waste storage area
- De-Kastri oil terminal temporary waste storage area
- De-Kastri oil terminal industrial and domestic waste landfill
- Odoptu 2 (North) well site temporary waste storage area
- Odoptu South WS Borrow Pit 2
- Borrow Pit 3A-ENL
- Road from Odoptu-1 (South) WS to Odoptu-2 (North) WS

Potable water quality monitoring at:
- Chayvo OPF
- Chayvo WS
- Orlan offshore platform
- Berkut offshore platform
- De-Kastri OET
- Odoptu-2 (North) WS
- Olympia residential complex
- ENL production office.

Domestic wastewater quality monitoring at:
- Chayvo OPF
- Chayvo WS
- Orlan offshore platform
- Berkut offshore platform
- De-Kastri OET
- Olympia residential complex
- ENL production office
- Odoptu-2 (North) WS.

Injected wastewater/ formation water monitoring at:
- Odoptu-2 (North) WS
- Chayvo OPF
- Orlan offshore platform

Groundwater level and quality monitoring at:
**Groundwater level monitoring:**
- Along the Chayvo OPF – Cape Uangi (Sakhalin Oblast) and Cape Kamenny – De-Kastri Oil Terminal (Khabarovsk Krai) trunk oil pipeline routes.

**Surface stream hydrology and morphology monitoring on:**
- River crossings along the Chayvo OPF – Cape Uangi (Sakhalin Oblast) and Cape Kamenny – De-Kastri OET (Khabarovsk Krai) trunk oil pipeline routes
- River crossings along the Odoptu-2 (North) WS – Chayvo OPF flowline; and
- Bezymyanniy Creek near Chayvo OPF

**Seawater quality monitoring in:**
- Chikhachev Bay;
- Piltun Bay;
- Sea of Okhotsk, in the Arkutun-Dagi Field area.

**Monitoring of water protection zones in:**
- Chikhachev Bay, in the De-Kastri OET area
- Piltun Bay, near the TOF under the Odoptu Onshore Facilities. Odoptu-2 (North) Wellsite Expansion. Temporary Offloading Facility project

**Monitoring of marine life and bottom sediments in:**
- Piltun Bay;
- Tatar Strait and Chikhachev Bay along the routes of offshore pipelines and in the vicinity of the single-point mooring (SPM);
- Sea of Okhotsk, in the Arkutun-Dagi Field area.

**Monitoring of vegetation communities at:**
- Chayvo WS;
- Chayvo OPF;
- De-Kastri OET.

**Topsoil monitoring at:**
- Chayvo OPF temporary waste store area;
- De-Kastri oil terminal temporary waste storage area;
- De-Kastri oil terminal industrial and domestic waste landfill area;
- Odoptu-2 (North) WS temporary waste storage area;
- Odoptu-2 (North) WS;
- Chayvo WS;
- Chayvo OPF;
- Olympia residential complex;
- Road from Odoptu-1 (South) WS to Odoptu-2 (North) WS;
- Odoptu South WS Borrow Pit 2;
- 3A-ENL Borrow Pit.

**Geotechnical monitoring:**
Along the Chayvo OPF – Cape Uangi (Sakhalin Oblast) and Cape Kamenny – De-Kastri OET(Khabarovsk Krai) trunk oil pipeline routes
Along the Odoptu-2 (North) WS – Chayvo OPF flowline route
Along the Chayvo OPF – Boatasino trunk gas pipeline route
Along the Chayvo OPF – Orlan platform gas reinjection line route
Along the full wellstream flowline from the Orlan platform wells
Along the Chayvo OPF – Berkut platform formation water reinjection pipeline route
In the pipeline landfall area near Chayvo WS
At Chayvo OPF
At Chayvo WS
At De-Kastri OET
At Odoptu-2 (North) WS
In the pipeline landfall area associated with the Odoptu-2 (North) WS – Chayvo OPF underwater pipeline crossing of Piltun Bay

Geodynamic (seismic and geo-deformation) monitoring
- Seismic activity monitoring,
- Geo-deformation monitoring at points where the trunk oil pipeline crosses active faults (Garomay and Central Sakhalin Faults).

Monitoring of physical impact factors at
- Orlan offshore platform
- Berkut Offshore Platform
- Chayvo OPF
- Chayvo WS
- De-Kastri OET
- Odoptu-2 (North) WS
- ENL production office
- Olympia residential complex.

3.3 Summary of the 2015 Environmental and In-Process Monitoring Results

Monitoring of stationary air emission sources.
In most cases, the stationary source air emission monitoring did not indicate any exceedance of maximum permissible emissions standards with respect to the monitored parameters, which was made possible by timely equipment maintenance, the use of high-quality fuel, and normal operating conditions.

Air quality monitoring.
The measured pollutant concentrations did not exceed the standard requirements for residential and workplace air quality.

Potable water quality monitoring
Water samples according to all parameters for the monitoring period conformed to GN 2.1.5.1315-03 Maximum Permissible Concentrations (MPC) of Chemicals in Domestic Water Supply and Recreational Water Bodies and SanPiN 2.1.4.1074-1 Potable Water. Health

**Domestic wastewater quality monitoring**

The analyses of wastewater samples taken at the intakes and outlets of biological treatment facilities indicate that on the whole, treatment efficiency in terms of the regulated parameters conforms to treatment facility specifications.

With respect to microbiological and parasitological parameters, the water samples after treatment also met regulatory requirements.

**Injected waste water quality monitoring**

The Chayvo OPF and Odoptu-2 (North) WS produced water treatment systems are designed to separate oil from the water. After the treatment cycles, the water is pumped into a wash drum to remove light hydrocarbons and then injected into a disposal well while all injection parameters are continuously monitored.

On the Orlan platform, domestic wastewater is passed through an electrodissociative treatment system in the wastewater treatment plant and is then pumped from the storage tank into a disposal well. No wastewater is discharged into the sea.

**Groundwater level and quality monitoring**

The results indicate that natural factors play the primary role in determining groundwater levels at ENL’s industrial sites at Chayvo WS and OPF. No manmade disturbances in the groundwater regime (or associated changes in groundwater table depths) were observed.

Groundwater quality analysis results remained stable by comparison with previous years of monitoring.

Static groundwater levels on the grounds of the De-Kastri OET are located at depths of 8 or more meters below ground level, i.e. groundwater does not come into contact with OET facilities. No manmade disturbances in the groundwater regime (or associated changes in groundwater table depths) were observed.

Groundwater quality analysis results generally remained stable throughout the entire period of observations.

The fluctuations in groundwater levels at Odoptu-2 (North) WS in observation wells are minor and seasonal in nature.

Water samples from the waterlogged excavations at borrow pit 2 in the vicinity of Odoptu South WS were taken to check for the presence of petroleum products.

Laboratory analyses show the environmental safeguards taken during operations to have been effective.

**Groundwater level monitoring**

**Chayvo OPF – Cape Uangi (Sakhalin Oblast) and Cape Kamenny – De-Kastri OET (Khabarovsk Krai) trunk oil pipelines**

Comparison of hydrogeological monitoring data for 2012–2015 showed that the fluctuations in groundwater levels in wells drilled toward watershed areas or the tops of slopes of river valleys with a substantial water table depth are consistent with the natural long-term average intra-annual variations. For wells in stream flood areas, as well as in areas where the water table is shallow (depth less than 5.0 m), fluctuations in levels range from 0.30 to 0.55 m, which also is fully consistent with natural long-term variations.
The 2015 results generally fit within the general set of hydrogeological parameters for the pipeline route. No anomalous “spikes” in levels were recorded in any of the wells, which indicates that the hydrogeological setting along the route corridors remained stable.

Surface stream hydrology and morphology monitoring

**Chayvo OPF – Cape Uangi trunk oil pipeline**

7 crossing areas disturbed by human activity are continuing to blend into the natural stream system at the seven water crossings inspected. This process occurs primarily through overgrowth of the bank belt and bank slopes with hydrophilous grass and bushes (sedge, horsetail, willow). Rubble fill on the bank slopes and the bottom land from the crossing construction phase largely supports the good condition of the riverbank belt. This approach enabled us to prevent directional erosion from occurring during flood water runoff.

The stream channels within the corridor (including the sections immediately above the oil pipeline trench and the fiber optic communication line (FOCL) cable) are stable at all the crossings, and none of the crossings showed any trace of active stream bed deformation (side or bottom erosion). The bank slopes are quickly covered by sandy loam sediment and growth of grass and bushes. This situation has continued in the crossing areas since 2013.

The condition of the crossing areas on the Uniya-Tana, Askasay, Evay, Tuksyu and Yuktalín Rivers is assessed as good and stable based on 2015 monitoring data. There are no signs of negative exogenous processes that threaten the oil pipeline and FOCL cable operation conditions.

The crossing of the Khunmakta River was found to be in good condition. The bank reinforcement plan and work to remove sunken logs and debris from the river bed have helped to improve the situation and stabilize the crossing area.

**Cape Kamenny – De-Kastri EOT oil trunk pipeline**

Based on 2014 data and data from visual observations during the actual operations, a detailed examination was also performed on three crossings: Shimonov Klyuch River, Kizhuch Creek, and Malyy Tabo River.

At the Shimonov Klyuch, Chernaya, and Tatarka River crossings, the crossings were found to be in good, stable condition. There are no areas of rapid erosion or collapse of the bank slopes or bottom within the route corridor, and bed evolution processes take the form of slow scalloped erosion of the banks, which does not threaten the trouble-free use of the route corridor.

5 streams we researched in accordance with the program of monitoring.

Medved River, Malyy Tabo River, Kizhuch Creek, Sushchevskiy Klyuch River and Kadi River crossings were found to be in satisfactory condition.

The riverbank protection belts and water protection zones at all the water crossings are in good, stable condition. No traces of water escaping into the floodplain and forming floodplain currents that could erode the surface of the pipeline corridor were found at any of the river crossings.

**Odoptu-2 (North) WS – Chayvo OPF pipeline**
The process of working all of the water crossings disturbed by human activity are continuing to blend into the natural stream system: Mukhto River, Paromay River, Marevyy Creek, Bolotnny Creek, Piltun River, Ossoy River, Nutovo River, Bolshoy Garomay River, and Malyy Garomay River. This process is promoted primarily by overgrowth of the bank belt and bank slopes with hydrophilous grass and bushes (sedge, horsetail, willow). Stabilization of the situation to a great extent is also the result of the additional bank protection work completed so far to prevent water from getting out of the main river channel into bottom land by way of low-lying areas above the pipeline trench (at the Mukhto, Piltun, and Nutovo River crossings).

All crossings of stream channels within the corridor are stable, and there were no traces of active stream bed deformation (side or bottom erosion) at any of the crossings. The situation has continued in the crossing areas since 2013.

The condition of the Mukhto, Paromay, Malyy Garomay, and Bolshoy Garomay River crossings, and the Marevyy and Bolotnny Creek crossings, was found to be satisfactory and stable based on 2015 monitoring data.

The Piltun and Ossoy River crossings were found to be in satisfactory condition, with an upward trend:
• At the Piltun River crossing – due to bank protection work during the winter of 2014–2015;
• At the Ossoy River crossing – due to ongoing gradual growth of grass and bushes in the belt and stabilization of the bank protection.

Bezymyanniy Creek (near Chayvo OPF)

Monitoring was conducted during the ice-free period from June through October 2015. Current speed and water depth were measured. The hydrological characteristics of this unnamed creek are typical for creeks in north Sakhalin.

Seawater quality monitoring

Chikhachev Bay. Treated wastewater (process and surface water) discharge area.

During the reporting period, sampling was performed before and after the discharges. The laboratory test results confirm that the wastewater discharges had no effect on seawater composition and properties in the monitored area.

Chikhachev Bay. SPM area

This portion of the Bay has heavy shipping traffic and is potentially affected by De-Kastri port, so the seawater samples occasionally contain above-MAC petroleum product levels.

The sources of petroleum substances released to the sea by ships are the routine discharges of oily water that is generated onboard by the operation of vessel power plants.

The main criterion for assessing seawater quality in the SPM area is the MAC of fishery water pollutants. During the monitoring period, some above-MAC levels of petroleum products, copper, and suspended matter were recorded. However, no correlation between the instances of excessive petroleum product, suspended matter, and copper content in the water and the tanker loading operations was found, which is confirmed by the measurements taken before and during loadings.
**Piltun Bay. TOF area**

Monitoring in that part of Piltun Bay was conducted before and during construction of the TOF. The monitoring results indicated that all hydrometeorological, morphometric, and hydrological parameters were consistent with natural summer conditions for the area. Determination of organoleptic indices failed to identify any characteristics exceeding the standards for any of the parameters. The pollutant content in June 2015 did not exceed the levels found during pre-construction monitoring (2008). The BOD values at the sampling points did not exceed prescribed MPC levels.

**Part of the Sea of Okhotsk in the area of treated wastewater discharge from combined outlet No. 1 of the Berkut offshore platform under the “Arkutun-Dagi Field. Onshore and Offshore Facilities” project (Sakhalin-1).**

Seawater sampling to determine the effect of discharges of mixed wastewater was conducted at three points within a radius of 250 meters around the Berkut Platform.

Seawater pollutant content did not exceed the maximum allowable fishery concentrations under Order No. 20 of January 18, 2010, On Approval of Fishery Water Quality Standards, Including the Maximum Allowable Concentrations of Harmful Substances in Fishery Waters. No effect of wastewater discharges was found.

**Sea of Okhotsk in the vicinity of plugged and abandoned wells Dagi 7-2 and Dagi 15.**

The studies were a continuation of annual environmental monitoring, and were conducted to assess environmental conditions in the vicinity of plugged and abandoned wells Dagi 7-2 and Dagi 15 in the northeastern shelf waters of Sakhalin Island in 2012-2020.

Visual monitoring in the area failed to detect any impact to the water by oil products. The petroleum hydrocarbon content of the seawater samples analyzed did not exceed the MPCs prescribed by Order No. 20 of January 18, 2010, On Approval of Fishery Water Quality Standards.

**Monitoring of water protection zones (WPZ)**

**Chikhachev Bay. De-Kastri OET Area**

Visual monitoring in the De-Kastri OET area was conducted in the Chikhachev Bay water protection zone. Monitoring showed no changes in the size of the areas overgrown with grass, shrubs, trees, and tree and shrub vegetation as compared to the findings of monitoring conducted in previous years.

**Piltun Bay. Temporary Offloading Facilities (TOF) Area**

Monitoring conducted in 2015 failed to identify any visible erosion processes within the water protection zone of the facility.

**Monitoring of marine biota and bottom sediments**

**Piltun Bay**

Monitoring of the marine biota was conducted in July 2015.
A total of 260 samples of marine biota were collected during the study period: 156 benthos samples and 104 macrophyte samples were collected. Of the total, 50 samples were collected on survey lines I and VIII at five stations in the following locations: one on the pipeline route axis at a depth of about 0.5 m, and the others at the same depth at distances of 30 m and 100 m on either side of the pipeline.

**Zoobenthos**

A total of 25 species of benthic marine life were identified in the samples: 3 aquatic plant species, and 22 species of benthic invertebrates.

The invertebrates represented by the greatest numbers of species were Polychaeta worms (3 species), total crustaceans (6 species), Diptera larvae (5 species), and bivalve mollusks (3 species).

The bulk of the overall density consisted of bivalve mollusks (35.9%), Polychaeta worms (24.0%), gastropods (18.0%), and dipteran larvae (12.9%).

The bulk of the biomass consisted of bivalve mollusks (40.5%) and flowering plants, or bivalve mollusks exclusively (96.6%) for zoobenthos.

Among the major macrobenthos groups, bivalve mollusk biomass shows the smallest variation, and phytoxenthos biomass - the largest. The variations were much larger among secondary macrobenthos groups: for groups whose life cycle proceeds entirely in an aquatic environment (gastropods, amphipods, and Polychaeta worms), there was a significant increase from 2014 to 2015; however, the biomass of amphibiotic insects (Diptera), decreased from 2014 to 2015.

**Macrophytobenthos**

Macrophytes were found at 40 of 52 stations in 2015, which amounts to a 76.9% occurrence rate (compared to 75% in 2014). There were no macrophytes at the other 12 stations.

*Zostera japonica, Zostera marina and Ruppia occidentalis* account for the bulk of the undersea vegetation in Piltun Bay. These are typical inhabitants of soft soils. Among other higher plant species, western eelgrass (*Ruppia occidentalis*), which prefers a habitat in lagoons and brackish reservoirs near the seacoast, was often present.

The overall study area for the total length of the pipeline (based on a pipeline length of 10 km and a right of way width of 300 m) was 3 km².

The biological parameters of macrophyte thickets (average specific biomass and maximum biomass) increased in 2015. Apparently, favorable hydrological conditions contributed to a growing biomass of macrophytes in Piltun Bay. The ice cover receded earlier in 2015 than in 2014, and the water in the bay consequently warmed up faster.

The macrophytobenthos species composition in Piltun Bay remains practically the same as in past years. The numbers of species in the samples in different years ranged from 5 to 7 and depended primarily on the time period during which the samples were collected and on the environmental conditions, such as water clarity and temperature.

*Temporary Offloading Facilities Construction Site Area as Part of the Sakhalin 1 Project. Odoptu Onshore Facilities. Odoptu-2 (North) Wellsite Expansion. Temporary Offloading Facilities*

Monitoring of bottom sediments and marine biota (benthos and macrophytes) was conducted after TOF construction ended in October 2015.
Bottom sediments

The survey waters are notable for a variety of soil types. Fine sand dominates the sandy component. The petroleum hydrocarbon content in the samples generally was low. The level of petroleum hydrocarbon content in bottom sediment in the survey water area was, on average, within the limits of background levels for bottom sediments on the northeast Sakhalin continental shelf (an average of 0.06-0.07 mg/g).

Sea of Okhotsk Waters in the Berkut Fixed Offshore Platform Deployment Area

Bottom sediments and benthos samples were collected from a control station at outlet No. 2 and a background station to determine the impact on benthos and the quality of bottom sediments.

Bottom sediments

The bottom sediments in the work area, as during the pre-construction phase, consist primarily of sand fractions with fine to coarse sand grain sizes. The distribution of pollutants compared to the pre-construction phase is generally the same. The highest concentrations have been found for the background station, both during the pre-construction phase and in 2015, and the increase in the concentrations of individual elements can be assumed to be due to natural changes in the environment.

Benthos

The overall average macrobenthos density and biomass changed only slightly in the Berkut platform area compared to the pre-construction monitoring phase. Bivalve mollusks and sea urchins represented by the dominant species in the benthic community - Astarte borealis and Echinarchnius parma, respectively – were prevalent during both of the periods compared. There was a significant increase in macrobenthos abundance levels at the control station (3000 m), with a change in the benthic community from Megangulus luteus + Echinarchnius parma to Echinarchnius parma + Diastylis bidentata.

Tatar Strait Along the Offshore Pipeline Route and in Chikhachev Bay Around the Single Point Mooring (SPM) and On the Pipeline Route

Tatar Strait

Particle size distribution

The mainland coastal zone consists of sand-aleurite sediments. Fine sand dominated (40.4%) the sand component of the sediment. The sediments in the intermediate section of the pipeline primarily consist of medium sands.

Petroleum hydrocarbons

The concentrations of petroleum hydrocarbons in the bottom sediments along the export pipeline route in 2015 ranged from <0.005 to 0.010 mg/g. Concentrations below the detection limit of the method (<0.005 mg/g) were found to predominate in coastal areas. The concentration of petroleum hydrocarbons generally increased from the Sakhalin shore toward the intermediate section and was lowest in the mainland section area.
**Metals**

Metal concentrations were generally low in the vicinity of the pipeline route across the Tatar Strait. The average levels were within standard limits for bottom sediments and did not exceed a safe level for marine life.

**Benthos**

Zoobenthos along the pipeline route across the Tatar Strait (Nevelskoy Strait consists of 25 species), with bivalve mollusks prevalent in regard to density and biomass. The dominant species are the bivalve mollusks *Macoma balthica* and *Potamocorbula amurensis*. The abundance figures and structure are similar to 2009. There were four macrobenthos communities, of which the *Macoma balthica + Potamocorbula amurensis* community is the most important. The other communities are temporary and seasonal.

**Chikhachev Bay**

*Particle size distribution*

The seafloor surface in Chikhachev Bay primarily consists of fine and mixed sands, as well as mixed sandy gravel.

*Petroleum hydrocarbons*

The concentrations of petroleum hydrocarbons in the bottom sediments near the SPM were negligible, within a range of \(<5–8 \mu g/g\). The concentrations of petroleum hydrocarbons in bottom sediments at the control stations were below the detection limit of the laboratory analysis method. The concentrations of petroleum hydrocarbons in the sediment along the pipeline axis were below the detection threshold of the laboratory method (\(<5 \mu g/g\)) practically everywhere in the survey area.

**Metals**

The average metal concentrations in Chikhachev Bay were low and within standard limits for bottom sediments.

*Microbiological analyses*

Microbiological analyses of the soil in Chikhachev Bay found no lactose-positive bacilli or coliphages.

*Phytoplankton*

Diatomic, cryptophytic, and dinophytic algae made up the basic structure of the phytoplankton population. A total of 120 species and intraspecies taxons were identified. Phytoplankton growth was moderate. The average density was 259,919 cells per liter, while average biomass was 449.127 mg/m³. The spatial distribution was irregular. The highest growth levels were recorded in the middle of the pipeline route.

*Zooplankton*

Zooplankton was represented by 41 species of planktonic invertebrates, with a characteristic predominance of holoplankton. Copepods were represented primarily by the small epipelagic and neritic species *Pseudocalanus newmani*, *Acartia hudsonica*, *Oithona similis*, *Eurytemora herdmani*, *Centropages abdominalis*, *A. longiremis*, and *Ps. minutus* at various stages of development, including eggs and larvae. In addition to holoplankton, meroplankton, made up of pelagic larvae of benthic invertebrates, were very important. The abundance of zooplankton averaged 9354 ind./m³, and biomass was -289.37 mg/m³.
**Ichthyoplankton**

The overall taxonomic list for all sampling areas included eggs and larvae of five fish species from four families: anchovies Engraulidae, smelts Osmeridae, pricklebacks Stichaeidae, and righteye flounders Pleuronectidae. Yellowfin sole eggs showed absolute predominance in terms of percentages for abundance and biomass in the SPM area. The ichthyoplankton composition in the pipeline area was similar to the SPM area.

**Benthos**

Benthos in the survey waters in Chikhachev Bay consisted of 88 invertebrate species from 14 taxonomic groups of different levels. Polychaeta worms made up the bulk of the species diversity. Polychaeta worms and total crustaceans made up the bulk of the density. Bivalve mollusks, basket starts, and Polychaeta worms made the greatest contribution to total biomass. The dominant species were the bivalve mollusks *Macoma calcarea*.

The year-to-year variations in macrobenthos abundance levels in the monitoring areas indicate natural causes and an absence of visible human influence.

**Monitoring of Plant Communities**

**De-Kastri Oil Export Terminal**

Field studies were performed in 29 permanent study areas located in the vicinity of the oil export terminal on the Klykov Peninsula in Chikhachev Bay during the period of September 1–7, 2015.

All the permanent study areas serve successfully as important targets for environmental monitoring and fully support monitoring of the status of all principal plant formations occurring near the facility.

Based on 2015 monitoring data, the De-Kastri terminal had no adverse impact on vegetation cover in the permanent study areas.

**Chayvo OPF and Chayvo WS**

Ten permanent study areas established to monitor flora and vegetation in the vicinity of the Chayvo OPF and Chayvo WS were inspected in 2015.

The vegetation cover had not experienced any adverse human impact in any of the permanent study areas during the period since the last monitoring inspection in 2012.

The vegetation cover in all the permanent study areas near the Chayvo OPF and Chayvo WS was found to be in good condition. For permanent study areas previously impacted by fire, progressive succession is proceeding successfully, and the state of all high-level field vegetation strata is sufficiently stable at all the other sites.

**Soil Cover Pollution Monitoring**

In terms of their chemical, microbiological, and parasitological parameters, the analyzed soil samples meet regulatory requirements at all company sites.
**Geotechnical Monitoring**

**Chayvo OPF – Cape Uangi Export Pipeline**

Areas of active geotechnical processes on most of the route continue to grow smaller. Note that the scale of route corridor damage by gullying continues to decrease. This became possible due to the following factors.

Active growth of grass and shrub vegetation within the route corridor plays an important role. On graded watershed surfaces and in areas of growth from the surfaces of deposits with high loam content, as well as at crossings of bog areas, low-lying swampy areas with no drainage, flooded runoff depressions, and most streams, the plant cover area of grass stands and brush is 100%. In areas where poorly secured, drifting sands of marine origin are developing from the surface, the grass stand plant cover area averages 50–60%, which is substantially higher than the levels of 2013 and 2014.

Annual engineering protection and technical and biological reclamation activities for the route corridor are listed.

Among the exogenous processes which may occur extensively along the oil export pipeline route, the following can be distinguished:

1. Water erosion;
2. Suffosion;
3. Flooding / waterlogging;
4. Landslides and mud flows;
5. Caving;
6. Abrasion.

Water erosion is exhibited in the formation of gullies. The number of new erosion phenomena continues to decrease.

Repeated technical and biological reclamation has been performed in some of the areas of found to be occupied by major erosion forms in 2014, along with additional slope protection, which resulted in stabilization of the situation.

Some intensification of suffosion processes within the corridor was found during the 2015 study. The existing suffosion subsidence does not threaten the operation of the oil pipeline.

In areas where flooding was recorded during previous monitoring efforts, the growth of hydrophilous grassy vegetation over the corridor surface continues.

No cases of freeze-thaw processes (heaving and/or floating up of the pipeline) have been recorded in crossings of swampy runoff gullies or marshes.

The situation of absolute stability is observed at points where the corridor crosses landslide-hazardous areas since the comprehensive work in 2012 for engineering protection of the route corridor. Landslide areas on the right side of the Askasay River valley along the north boundary of the corridor and in the vicinity of Mt. Gobzhokson are in an absolutely stable state and are not dangerous.

The principal caving areas are confined to areas where the route passes over sidehill slopes that were flattened, which involved undercutting the slopes. There has been no increase in the rate of caving in the meantime.

Along the export oil pipeline route from the Chayvo OPF to the De-Kastri Oil Export Terminal (km 0–126 segment), 49 sites have been identified where such processes are under way, and monitoring of the processes will continue in 2016.
Cape Kamenny – De-Kastri OET Export Pipeline Section

The area of plant cover with grass stands is 90–100% over virtually the entire route.

Almost complete revegetation of the route corridor surface contributes a substantial increase in evapotranspiration (i.e., surface moisture absorption from the aeration zone by vegetation), which results in reduced watering and higher overall stability of the route corridor and resistance to erosion processes.

The main adverse exogenous processes and phenomena in the corridor zone include manmade soil subsidence along the western boundary of the route corridor. This process currently is not a direct threat to trouble-free use of the route and does not require technical reclamation.

The effect of the oil pipeline on changes in water runoff conditions in the adjacent area is negligible.

Development of slope processes is restrained by both erosion control weirs and dense grass vegetation that has been restored almost completely within the limits of the route corridor surface.

Gravitational type (caving, mud flows) processes are confined to steep portions of slopes, including areas where slopes were undercut; they occur on a very limited scale.

Small gully erosion and linear erosion. The process has practically been stabilized due to the restoration of surface vegetation within the corridor. No fresh erosion forms have been discovered in the corridor.

Odoptu 2 (North) WS – Chayvo OPF Pipeline

Vegetation growth over the corridor surface continues. The plant cover area along most of the route ranges from 60% to 70% and increases to 100% in swampy stream valleys and runoff gullies. Grass plays the main role in the vegetation composition, and the growth of brush has begun in some areas. The brush includes alder, birch, and scrub larch in watershed areas, while willow is prevalent in swampy stream valleys.

Restoration of the vegetation cover promotes substantial intensification of consumptive water use (i.e., absorption of surface moisture from the aeration zone by vegetation) and, consequently, a decrease in water content, which can be seen most clearly where the oil pipeline route crosses swampy stream valleys. Patches of open water in such areas (i.e., in flooded depressions over the oil pipeline and FOCL cable trench) are growing smaller, and the corridor surface disturbed by construction is gradually being worked into the existing ecosystem.

After construction within the corridor was finished, the natural topography of the land was restored to promote normalizing of surface drainage conditions and prevent the development of flooding initiated by human activity.

Large-scale operations for additional engineering protection and reclamation, including the installation of additional divider ridges and frame bands (of coconut fiber and hemp), reinforcement of erosion areas with geotextile, and finish planting of grass mixtures, were conducted on hillsides (primarily including the banks of runoff gullies with an average slope of up to 20°) from 2012 through 2014.
The engineered protection activities together with the continuing surface vegetation growth promote stabilization of the situation in the corridor and weakening of negative exogenous processes. The overall condition of the corridor in most of the route is assessed as good or satisfactory and stable.

**Chayvo OPF – Botasino Gas Export Pipeline**

The overall condition of the route corridor can be assessed as good and stable for practically all of the route. The area of plant cover with grass stands is at least 70 – 80%, with the exception of some isolated areas. The vegetation has been restored completely in stream valleys.

The most common processes, erosion processes manifested primarily as small channel erosion in areas of scattered drainage of surface water across the route corridor. No major cases of intense erosion were recorded within the gas pipeline route.

There was a single case of a mud flow within the undercut slope at the western boundary of the route corridor.

Areas of underflooding in flat, saucer-shaped runoff gullies and stream valleys are stable. The corridor surface is overgrown everywhere with hydrophilous vegetation, and no human disturbance of surface water drainage or initiation of manmade underflooding was found.

No signs of the presence or intensification of negative exogenous processes affecting the safe use of the route (frost heaving, upward floating of the pipeline) were recorded.

**Orlan Platform – Chayvo OPF Full Wellstream Pipeline**

The areas with grass stand plant cover within the route corridor are:

- 80 – 100% - in underflooded planting areas in transition and raised bog areas, in the unnamed creek valley, or near a lake. Practically complete restoration of the vegetation cover promotes substantial intensification of consumption water use (i.e., absorption of surface moisture from the aeration zone by vegetation) and, consequently, a decrease in water content and an overall increase in the resistance of the route corridor to erosion processes;
- 20 % - in the area near the Chayvo WS;
- 10 – 60 % - in the rest of the route.

The dominant exogenous process along the pipeline route is underflooding. A route inspection of the corridor identified four areas of development of manmade underflooding. The condition of the areas is assessed as satisfactory. No changes in the area of underflooding along the route compared to 2014 study data were found.

The development of aeolian processes and associated deflation is most intense in areas near the Chayvo WS and Chayvo OPF which have been altered by human activity. The processes have low potential for further development and do not threaten the trouble-free operation of the pipeline.

Small channel erosion and linear erosion. The process has a very minor degree of development. The restoration of vegetation within the corridor promotes reduction of the area susceptible to erosion. No fresh erosion forms have been discovered anywhere in the corridor.
Chayvo OPF – Berkut Platform Produced Water Reinjection Pipeline

The dominant exogenous process along the pipeline route is underflooding. A route inspection of the corridor identified four areas of development of manmade underflooding. The condition of the areas is assessed as satisfactory. No changes in the area of underflooding along the route compared to 2014 study data were found.

Small channel erosion and linear erosion. This process has developed within localized areas. Two areas of intense development of erosion processes were identified. Individual rills discovered in the rest of the pipeline route are insignificant and have only slight development potential. There was no substantial intensification of the process compared to 2014 monitoring data. The restoration of surface vegetation within the corridor promotes reduction of the area susceptible to erosion.

The development of suffosion processes – subsidence of soil as a backfill bank, as in the adjacent area, is confined to underflooded areas within marshes. The cases of subsidence discovered between the full wellstream pipeline and water reinjection pipeline routes do not threaten the trouble-free use of the route, since they are located away from the pipeline axis.

De-Kastri OET Site

Negative exogenous geological processes on the De-Kastri OET site are limited in scope. The area affected by such processes is not more than 1-3%, and the intensity of the manifestations is low.

Odoptu 2 WS (North)

There has been an increase in intensely of erosion processes in certain areas at the wellsite or in the adjacent areas compared to data from the past monitoring stage.

A total of 27 areas were inspected. Intensification of erosion processes was found in 13 of the areas.

The processes discovered do not threaten the trouble-free use of production buildings and facilities.

The development of suffosion processes was found in one area. The area is associated with the fill for the site and at the current stage of development does not threaten the trouble free operation of the production facilities.

Waterlogging was not found within the production zone of the Odoptu 2 WS (North) site. The process is present in the undisturbed area on the Piltun Spit and north of the main site outside the production facilities.

Underflooding and flooding was not recorded during monitoring.


The results of monitoring of geotechnical processes upon completion of the construction of the TOF in Piltun Bay in 2015 showed that there were no changes in the position of the shore slope in the area during the summer. Reconnaissance survey of the underwater slope showed that small changes in the bottom topography mainly affected the shore section of the underwater slope. These changes are not significant and are due to natural sediment transport.
A route survey to detect linear erosion, underflooding, waterlogging, and deflation processes showed that the above phenomena were not detected within the boundaries of the survey area.

**Odoptu-2 (North) WS - Chayvo OPF Pipeline Underwater Crossing of Piltun Bay.**

Monitoring of possible geotechnical processes in the landfall area of Piltun Bay east and west coasts was conducted in July 2015.

In 2011 thirteen reference points were set on the bay east and west coasts to monitor shore and underwater slope changes in the pipeline landfall areas.

**Eastern Shore of Piltun Bay**

Piltun Bay east shore area near the landfall is a low-lying steep terrace. Its upper part is covered by thick brush, most of it is Siberian dwarf pine. The lower part of the area next to the cliff is grassed. Shore zone and beach are poorly featured. Water comes straight to the terrace steep/cliff.

**Western Shore of Piltun Bay**

Terrain of the Piltun bay west coast in the landfall area is a beach scarp thickly overgrown with trees and brushes. The shoreline approaches straight to the base. The upper part is turf covered and grassed. The lower part of the shore is a desiccation zone periodically covered with tidal water and drained during low tide.

Monitoring in 2015 showed no significant changes of the shore slope position in the east and west landfall coastal areas. Location of the beach scarps edge and the beach width is within the limits of its natural variability (no trace of erosion found in the landfall area).

Profiling of the underwater slope showed that condition of the underwater slope topography/relief is within the limits of its natural variability.

Tacheometric survey of the underwater slope in 2015 showed no deformations of the underwater slope in its coastal zone in the landfall area.

**Monitoring Geotechnical Processes in the Chayvo WS Pipeline Landfall Area**

Monitoring was held in the landfall area of the offshore flowlines:

1. Chayvo OPF to Orlan Platform gas reinjection pipeline
3. Berkut offshore platform – Chayvo WS FWS Flowline;
4. Chayvo OPF – Berkut platform produced-water reinjection line

Purpose of monitoring:
- Determining the location of the edge of the beach scarp relative to the reference grid;
- Determining the width of the beach at monitoring stations of the reference grid;
- Profile of the subsea slope down to 8 meters below mudline within the survey grid.

The survey provided data on the changes of the beach scarp crest position, beach width, measured relative to the reference grid for the period from 2014 to 2015.

2015 survey showed continuing retreat of the shore face terrace to the shore in southern part of the area. The change of the coastal bluff edge position was 1-2 m towards the shore vs. 2014 survey data.
Some small reduction of the terrace edge height – from 0.1 to 0.3 m was observed almost throughout the entire survey area.

A specific feature - subsea ridge of up to 4 m high in its certain sections appeared over the entire survey area of the underwater slope.

2015 monitoring showed that current coastal zone changes are driven by natural phenomena such as storm activity, alongshore currents and riptides, wind transfer of sandy material, etc.

**Geodynamic (Seismic and Geo-Deformation) Monitoring**

In 2015, field acquisition operations were continued and geodeformation monitoring measurements were conducted at locations where the pipeline crosses the Central Sakhalin and Garomay faults.

Results show that during the geodynamic monitoring period of 2006-2015, the areas of the Central Sakhalin and Garomay faults primarily display detectable unidirectional tectonic movements. Minor alternating motions with 4-5 mm amplitude and a period of 8-10 years are recorded on both grids but only for the individual components of the horizontal displacements.

The horizontal strain rates of the Garomay fault zone for the entire monitoring period are extremely slow and do not exceed 1.3 mm/year. Dextral displacement at a rate of 1.7 mm/year is observed within the fault zone. The travel time characteristics of the Garomay fault are consistent with geological surveys and the data of regional geodynamic monitoring in northern Sakhalin by the Marine Geology and Geophysics Institute of the Russian Academy of Sciences Far East Branch. No significant vertical displacement were detected on either side.

Possible ground movements in the areas where the pipeline crosses the Garomay and Central Sakhalin Faults as a result of local and remote earthquakes are negligible and have had no effect on the slip rates of local grid stations.

Seismic monitoring for a period from January 1 through December 31, 2015, identified 222 seismic events with a magnitude of $ML \geq 1.0$, including 154 local earthquakes.

The spatial pattern of seismic activity distribution in the monitoring zone for the reporting period is generally similar to the pattern recorded during the previous reporting periods.

### 3.4 Key Environmental Protection and Monitoring Programs

**Western Gray Whale Population**

In 2015 ENL, with the assistance of specialists from the Institute of Marine Biology (IBM) of the Far East Branch of the Russian Academy of Sciences (DVO RAN), the Pacific Oceanographic Institute of the DVO RAN (TIO), and the Sakhalin State University continued to study the ecological aspects of the distribution and condition of the feeding group of gray whales and their habitat in the nearshore waters of northeast Sakhalin Island during the summer-fall season.

The studies were conducted in summer and fall seasons in accordance with the joint program of Exxon Neftegas Limited and Sakhalin Energy Investment Company Ltd. approved by the proper authorities of the Russian Federation. At present, office processing and analysis of the extensive field data acquired in 2015 is underway.
Preliminary data obtained show the stable state of both the feeding group of Sakhalin gray whales and the benthic prey in the summer-fall season. Examination of benthos shows stable amounts of food resources. About 243 whales can be identified in the photos of the catalogue (according to 2014 data) and this number steadily grows.

ENL Marine Mammal Protection Plan was updated and successfully implemented during the summer and fall marine and coastal operations. In 2015, there was not a single incident with marine mammals.

Studies of Pinnipeds in Piltun Bay Area

In 2015, ENL, with the assistance of specialists from the Pacific Oceanographic Institute, of the DVO RAN conducted studies on pinnipeds at the mouth of Piltun Bay. The studies were aimed at assessing the quantity and species composition of pinnipeds in the area, as well as determining their spatial-temporal dynamics.


Chayvo OPF – Nevelskoy Strait export pipeline, Odoptu 2 WS (North) – Chayvo OPF land pipeline route, Chayvo Bay (Wellsite, Chayvo Onshore Processing Facility, and 1-km potential impact zone around them).

In the course of the 2015 studies, all areas along the flowline and export pipeline on Sakhalin Island were inspected. The studies were conducted during the nesting season and the summer-fall migration season.

Nine bird species listed in Red Books of different levels were observed along the export pipeline route in 2015.

During the 2015 migration season, 14 rare and protected species were observed on Chayvo Bay: Bewick’s swan, whooping swan, Baikal teal, Steller’s sea eagle, peregrine falcon, Eurasian hobby, long-toed stint, Sakhalin dunlin, green sandpiper, ruff, red-necked phalarope, black-tailed godwit, eastern curlew, and Aleutian tern. The population of swans – Bewick’s and whooping – in the study area are highest during the migration season.

Monitoring of summer nomadic movements and migration of birds in the Chayvo OPF area, on the seacoast near the Wellsite, and in the flowline area showed that there were no changes in the distribution of migratory birds or deviations in the directions of movement or migration routes during the period that these facilities have been in operation. The feeding areas and habitats of waterfowl and shorebirds were not exposed to human impact, and the fall stopover locations of ducks, gulls, and sandpipers remained the same. The migration periods and population trends during the migration period were typical for most species.

The area of construction of temporary offloading facilities (TOF) in Piltun Bay and the coastal area of the Sea of Okhotsk

The summer and fall of 2015, additional data were obtained on the abundance and distribution of avifauna on the bay area in the vicinity of TOF. The significance of the Piltun Bay coastal zone in the pilotage area for migratory birds was assessed.

The results indicate that the TOF construction site is located in the biotope typical for sea spit. The studies in 2015 again confirmed the conclusions of 2014. The range of human disturbance impact during construction work does not exceed a few dozen meters for
sandpipers and gulls, 200-400 meters for diving ducks, 400-700 meters for clusters of dabbling ducks of up to 1000 birds, and 1.2 km for clusters of dabbling ducks of more than 1000 birds.

Key areas – the breeding grounds of bird species listed in the Red Book – remain outside the project impact zone. The shortest distance of nesting areas from a road is 200 meters. The closest major Aleutian tern colony is 2.5 km away.

Swan migration routes in the construction zone did not change. The swans are maintaining the traditional travel routes and migration gathering locations, the largest of which are 4 km north of the TOF.

3.5 Aquatic Biota Damage Compensation

In 2015 ENL continued its compensatory activities to address damage to aquatic biological resources from the Sakhalin-1 activities.

In 2015 ENL implemented measures on artificial reproduction of Pacific salmon to compensate for damage to Sakhalin aquatic biological resources under the Sakhalin-1 Project. Orlan Platform - Chayvo WS Offshore Flowline. A total of 13,131,556 juvenile chum salmon with total value of 21,273,120 (twenty one million two hundred seventy-three thousand one hundred twenty) rubles 72 kopecks were released from the Ado-Tymovo, Pobedino, and Buyukly salmon hatcheries.
# ENL SHE Performance Results 2014-2015

<table>
<thead>
<tr>
<th>Environmental Performance Commitments</th>
<th>2014 Environment Performance indicators relative to oil production</th>
<th>2014 Environment Performance indicators relative to oil and gas production</th>
<th>2015 Environmental Performance indicators relative to oil production</th>
<th>2015 Environmental Performance indicators relative to oil and gas production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine vessel spills (long term leased). Number of oil and petroleum products spills</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other spills (not from marine vessels). Number of oil and petroleum products spills</td>
<td>53</td>
<td>53</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Oil and Petroleum products spilled from Marine vessels</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Volume of Other oil and petroleum products spills (kg/t produced HC)</td>
<td>0,000025</td>
<td>0,000020</td>
<td>0,000042</td>
<td>0,000033</td>
</tr>
<tr>
<td>Specific volume of Other oil and petroleum products spills (kg/t of fuel equivalent)</td>
<td>0,000018</td>
<td>0,000015</td>
<td>0,000029</td>
<td>0,000024</td>
</tr>
<tr>
<td>Specific accident rate on pipelines resulting in oil/condensate/product spills (cases / 1 km of pipelines)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Contaminated land area at year end to year beginning ratio (ha/ha)*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Specific index of pollutants gross emissions (kg/t produced HC)</td>
<td>2,03</td>
<td>1,59</td>
<td>3,09</td>
<td>2,50</td>
</tr>
<tr>
<td>Specific index of pollutants gross emissions (kg/t of fuel equivalent)</td>
<td>1,42</td>
<td>1,18</td>
<td>2,16</td>
<td>1,75</td>
</tr>
<tr>
<td>Specific index of Sulfur Dioxide (SO2) emitted (kg/t produced HC)</td>
<td>0,023</td>
<td>0,018</td>
<td>0,018</td>
<td>0,014</td>
</tr>
<tr>
<td>Specific index of Sulfur Dioxide (SO2) emitted (kg/t of fuel equivalent)</td>
<td>0,016</td>
<td>0,012</td>
<td>0,012</td>
<td>0,010</td>
</tr>
<tr>
<td>Specific index of Nitrogen oxides (NO2) emitted (kg/t produced HC)</td>
<td>0,41</td>
<td>0,32</td>
<td>0,53</td>
<td>0,45</td>
</tr>
<tr>
<td>Specific index of Nitrogen oxides (NO2) emitted (kg/t of fuel equivalent)</td>
<td>0,29</td>
<td>0,22</td>
<td>0,37</td>
<td>0,30</td>
</tr>
<tr>
<td>Specific index of volatile organic compounds (VOC) emitted (kg/t produced HC)</td>
<td>0,68</td>
<td>0,53</td>
<td>0,59</td>
<td>0,48</td>
</tr>
<tr>
<td>Specific index of volatile organic compounds (VOC) emitted (kg/t of fuel equivalent)</td>
<td>0,47</td>
<td>0,38</td>
<td>0,42</td>
<td>0,34</td>
</tr>
<tr>
<td>Associated petroleum gas utilization level (%)</td>
<td>97,65%</td>
<td>97,65%</td>
<td>95,33%</td>
<td>95,33%</td>
</tr>
<tr>
<td>Greenhouse gas (Methane) emitted (kg/t produced HC)</td>
<td>0,018</td>
<td>0,014</td>
<td>0,076</td>
<td>0,062</td>
</tr>
<tr>
<td>Description</td>
<td>2014</td>
<td>2015</td>
<td>2016</td>
<td>2017</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Greenhouse gas (Methane) emitted (kg/t of fuel equivalent)</td>
<td>0,012</td>
<td>0,009</td>
<td>0,053</td>
<td>0,043</td>
</tr>
<tr>
<td>Specific water intake (m³/t produced HC)</td>
<td>1,18</td>
<td>0,92</td>
<td>1,72</td>
<td>1,38</td>
</tr>
<tr>
<td>Water intake (m³/t of fuel equivalent)</td>
<td>0,82</td>
<td>0,65</td>
<td>1,20</td>
<td>0,97</td>
</tr>
<tr>
<td>Contaminated waters disposal into surface water bodies (m³/t produced HC)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Contaminated waters disposal into surface water bodies (m³/t of fuel equivalent)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total Wastes disposed, treated and buried (t)</td>
<td>126 800</td>
<td>126 800</td>
<td>197 300</td>
<td>197 300</td>
</tr>
<tr>
<td>Total wastes generated (t)</td>
<td>156 398</td>
<td>156 398</td>
<td>197 348</td>
<td>197 348</td>
</tr>
<tr>
<td>Ratio of other industrial and domestic wastes disposed and treated to the total other industrial and domestic wastes in circulation (balance of other industrial and domestic wastes as at year start + other industrial and domestic wastes generated over the year)**(t/t)</td>
<td>0,67</td>
<td>0,67</td>
<td>0,91</td>
<td>0,91</td>
</tr>
<tr>
<td>Expenditures on Environmental Safeguards (thousand RUB)</td>
<td>2 306,1</td>
<td>2 306,1</td>
<td>2 757,5</td>
<td>2 757,5</td>
</tr>
<tr>
<td>Emergencies with significant (high-profile public impact) socioeconomic damage</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* Due to the lack of land contaminated as a result of oil and petroleum products spills in 2014 and 2015, the remediation of the contaminated land was not carried out

** Drilling waste and wastewater injected through special-purpose wells account for 94.8% of total waste generation in 2014 and 96.7% of total waste generation in 2015. The combined volume of these two types of waste is excluded from review in order to keep the data representative.
<table>
<thead>
<tr>
<th>Safety and Health Commitments</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Lost-time incident rate – employees (per 200000 work hours)</td>
<td>0,26</td>
<td>0,00</td>
</tr>
<tr>
<td>2 Lost-time incident rate – contractors (per 200000 work hours)</td>
<td>0,00</td>
<td>0,05</td>
</tr>
<tr>
<td>3 Lost-time incident rate – total workforce (per 200000 work hours)</td>
<td>0,04</td>
<td>0,04</td>
</tr>
<tr>
<td>4 Total recordable incident rate – employees (per 200000 work hours)</td>
<td>0,52</td>
<td>0,18</td>
</tr>
<tr>
<td>5 Total recordable incident rate – contractors (per 200000 work hours)</td>
<td>0,20</td>
<td>0,14</td>
</tr>
<tr>
<td>6 Total recordable incident rate – total workforce (per 200000 work hours)</td>
<td>0,26</td>
<td>0,15</td>
</tr>
<tr>
<td>7 Fatalities - employees</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>8 Fatalities - contractors</td>
<td>0,00</td>
<td>0,00</td>
</tr>
<tr>
<td>9 Fatal accident rate – total workforce (per 1 000 000 work hours)</td>
<td>0,00</td>
<td>0,00</td>
</tr>
</tbody>
</table>