APPENDIX 4

Water Use Standards Comparison

Purpose

This document reviews the Company's compliance against adopted international standards and guidelines.

The Table below:

- summarises key requirements of adopted international and EC standards,
- compares these with the current requirements applied to the Project,
- does not review any emergency,
- provides a Comment stating the extent of compliance with the adopted international and EC Standards.

Who is this for?

This document supports the Asset/Activity HSE Managers and Environmental Specialists to determine compliance, maintain internal standards and specifications, and advise Asset/Activity Managers on relevant requirements.

Ref	Issue/Item	International Standards	EC standards	Current requirements applied to Project	Monitoring overview	Comment
1.	Discharge of treated effluent water (including treated sewage effluent, storm water) from the LNG/OET treatment facilities.	**(General Environmental, Health and Safety Guidelines (2007) IFC** The quality of treated process wastewater, wastewater from utility operations or storm water discharged on land, including wetlands, should be established based on local regulatory requirements. **Environmental, Health, and Safety Guidelines for Liquefied Natural Gas (LNG) Facilities (IFC, April 11, 2017)** Treatment as per guidance in the General EHS Guidelines, including discharge requirements. Provision of facilities to receive LNG tanker effluents may be required. **(General Environmental, Health and Safety Guidelines (2007) IFC, table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharge):** Units in mg/l except pH pH 6-9 BOD 30 COD 125 Oil and grease 10 TSS 50 Total Nitrogen 10 Total Phosphorus 2.0 Coliform bacteria < 400 MPN/100 ml **Standard applicable at time of Design:** **World Bank PPAH Onshore Oil and Gas Guidelines (1998) General environmental guidelines, Table 4.** Ammonia 10 **Environmental, Health, and Safety Guidelines for Ports, Harbors, and Terminals (IFC, February 2, 2017)** Avoid installing storm drainage catch basins that discharge directly into surface waters; Install filter mechanisms (e.g., draining swabs, filter berms, drainage inlet protection, sediment traps and sediment basins) to prevent sediment and particulates from reaching the surface	EC Directive concerning urban waste water treatment (91/271/EEC): Requirements for discharges from urban waste water treatment plants subject to Articles 4 and 5 of the Directive: • BOD_5 at 20°C: 25 mg/l O_2* • COD: 125 mg/l O_2 • TSS: 60 mg/l * BOD_{20} at 20°C (recalculated): 35.75 mg/l O_2 Requirements for discharges from urban waste water treatment plants to sensitive areas that are subject to eutrophication. Either of these parameters may apply depending on the local situation: • Total phosphorus: 2 mg/l P (10 000 - 100 000 pop. est.); • Total nitrogen: 15 mg/l N (10 000 - 100 000 pop. est.).	Table 1 below contains minimum requirements for the parameters to be monitored for the effluent treatment plants and for the quality of treated sewage effluent. **Table 1** Units in mg/l except pH pH 6-9 BOD_{20} 30 COD 125 Oil and grease 10 TSS 50 Total Nitrogen (Ammonium nitrogen) 10 Total Phosphorus (Phosphates by phosphorus) 2.0 Coliform bacteria < 400 MPN/100 ml Any additional parameters to those in Table 1 that are required by RF legislation shall also be monitored. If the RF regulatory requirement for any particular parameter in a Water Discharge Permit is different to that in Table 1, the most stringent of the two limits will apply. Drainage systems collect all oil contaminated water for further on-site treatment. Separators and storm containment basins are provided and maintained. No storm drainage catch basins discharge directly into surface waters.LNG plant applies air cooling for main process (not cooling water).	Sewage effluent quality and sea water quality is monitored under the Industrial Environmental Control Programme for LNG/OET considering monitoring parameters, locations and frequency, and analysis methods. Programme includes all parameters from Table 1 (except for COD as non-relevant for sea waters) and additional parameters from Water Discharge Permits.	Comply

<table>
<tr><td></td><td></td><td>water;
Install oil/grit or oil/water separators in all runoff collection areas;
Regularly maintain oil/water separators and trapping catch basins;
<u>Environmental, Health, and Safety Guidelines for Crude Oil and Petroleum Product Terminals (IFC, April 30, 2007)</u>
As the major wastewater sources are tank bottom water and storm water runoff, wastewater flows in this sector typically occur in batches, not lending themselves to on-site biological treatment. These types of effluents may need to be pre-treated via oil / water separators, with further on-site or off-site biological and chemical treatment and activated carbon systems, depending on the volume of contaminants present, and whether the facility is discharging the wastewater into a municipal system or directly to surface waters.</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td>Ship wastewater in the Port Prigorodnoye</td><td><u>Environmental, Health, and Safety Guidelines for Ports, Harbors, and Terminals (IFC, February 2, 2017)</u>
Port operators should provide collection, storage, and transfer and / or treatment services, and facilities of sufficient capacity and type for all wastewater generated by vessels at the port in accordance with MARPOL and national regulations:
Oily waste and wastewater should be collected in barges, vehicles, or central collection systems and storage tanks. The capacity of oily waste collection should be established based on applicable MARPOL provisions. Sewage from ships should be collected and treated onsite or off-site according to the recommendations provided in the General EHS Guidelines (see above).</td><td>N/A</td><td>The LNG terminal or TLU has no facilities for receiving any oily residues. No discharges are accepted.
As required in the TEOC, all overboard discharge valves are isolated closed and sealed, and all deck scuppers plugged, while the export tanker is moored to the LNG terminal or TLU.</td><td>N/A</td><td>Sakhalin Energy does not permit any discharges from ships moored at the LNG or TLU. Protection of the environment and human health is therefore achieved without the need for the collection or treatment facilities stated in IFC guidelines.</td></tr>
<tr><td>3.</td><td>Treated wastewater discharge from the OPF site for produced water and mixed treated water (sewage, storm water)</td><td><u>Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (IFC, April 30,2007)</u>
Produced water disposal may be injected into reservoir to enhance oil recovery or injected into a dedicated disposal well, drilled to a suitable receiving subsurface geological formation. Produced water discharges to surface waters or to land should be the last option considered and only if there is no other option available.
Storm water runoff should be treated through an oil/water separation system able to achieve an oil and grease concentration of 10 mg/l.
(<u>General Environmental, Health and Safety Guidelines (2007) IFC</u>
The quality of treated process wastewater, wastewater from utility operations or storm water discharged on land, including wetlands, should be established based on local regulatory requirements.
Where land is used as part of the treatment system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required.</td><td>N/A</td><td>Produced/process waters are discharged to dedicated injection wells. Zero discharge of produced waters to surface waters. Zero discharge of cooling waters.
All sewage effluent and storm water after treatment is discharged to land.
Table 1 below contains minimum requirements for the parameters to be monitored for the effluent treatment plants and for the quality of treated sewage effluent.
Table 1
<table>
<tr><th></th><th><u>Units in mg/l except pH</u></th></tr>
<tr><td>pH</td><td>6-9</td></tr>
<tr><td>BOD_{20}</td><td>30</td></tr>
<tr><td>COD</td><td>125</td></tr>
<tr><td>Oil and grease</td><td>10</td></tr>
<tr><td>TSS</td><td>50</td></tr>
<tr><td>Total Nitrogen (Ammonium nitrogen)</td><td>10</td></tr>
<tr><td>Total Phosphorus (Phosphates by phosphorus)</td><td>2.0</td></tr>
<tr><td>Coliform bacteria</td><td>< 400 MPN/100 ml</td></tr>
</table>
Discharge limits for storm water runoff
Storm water runoff should contain no more oil and grease concentration as of 10 mg/l.
Any additional parameters to those in Table 1 that are required by RF legislation shall also be monitored. If the RF regulatory requirement for any particular parameter is different</td><td>Sewage effluent quality is monitored under the Industrial Environmental Control Programmes for OPF considering monitoring parameters, locations and frequency, and analysis methods.
In order to detect or monitor potential contamination of groundwater 19 monitoring wells are installed and sampled at least annually (chemical composition, water level). Monitoring results are reviewed to assess the risk of groundwater contamination and determine what investigation, control or remedial action is required (See Water Use Management and Ground Water Protection Standard, Appendix 5).</td><td>Comply</td></tr>
</table>

				to that in Table 1, the most stringent requirement will apply.		
4.	Produced water (relevant to platforms only)	**Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development (IFC, June 5, 2015)** Reinject. Discharge to sea is allowed if oil and grease content does not exceed 42 mg/l daily maximum; 29 mg/L monthly average •	N/A	All produced water is re-injected into the production reservoirs.	N/A	Comply
5.	Drilling Fluids (relevant to platforms only)	**Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development (IFC, June 5, 2015)** 1) WBDF: Reinject or ship-to-shore, no discharge to sea except: • In compliance with 96 hr. LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids or alternatively testing based on standard toxicity assessment speciese (preferably site-specific species) 2) WBDF cuttings: Reinject or ship-to-shore, no discharge to sea except: • Facilities located beyond 3 miles (4.8 km) from shore; • Hg: 1 mg/kg dry weight in stock barite • Cd: 3 mg/kg dry weight in stock barite • Maximum chloride concentration must be less than four times the ambient concentration of fresh or brackish receiving water • Discharge via a caisson (at least 15 m below sea surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated)	N/A	All oily water / wastewater from the platforms is re-injected. The platform drainage system is designed to collect all oily effluents and to re-inject these into special wells. There is no discharge of oily water from the platforms into the sea.	N/A	Comply
6.	Produced sand (relevant to platforms only)	**Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development (IFC, June 5, 2015)** Ship-to-shore or reinject: No discharge to sea except when oil concentration lower than 1% by weight on dry sand	N/A	Produced sand is collected and transported onshore for disposal.	N/A	Comply
7.	Cooling water (Platforms only)	**Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development (IFC, June 5, 2015)** The effluent should result in a temperature increase of no more than 3º C at the edge of the zone where initial mixing and dilution take place. Where the zone is not defined, use 100 meters from the point of discharge. Antifoulant chemical dosing to prevent marine fouling of offshore facility cooling water systems should be carefully considered. Available alternatives should be evaluated and, where practical, the seawater intake depth should be optimized to reduce the need for use of chemicals. An assessment of alternatives should be adequately documented. Appropriate screens should be fitted to the seawater intake, if safe and practical, to avoid entrainment and impingement of marine flora and fauna.	N/A	The zone is defined at 250 m and at this perimeter edge the temperature increase falls within these guidelines. Lun-A and PA-B platforms use sodium hypochlorite for preventing biofouling of sea water cooling systems. Cooling water should contain no more sodium hypochlorite concentration than established by Water Discharge Permits.	Cooling water quality is monitored under the Industrial Environmental Control Programmes for LUN-A, PA-A and PA-B platforms that are based on Water Discharge Permits considering monitoring parameters, locations and frequency, and analysis methods.	Comply
8.	Treated Waste Water Discharge from the Lun-A, PA-A and PA-B platforms. Exclude produced water (see I section #4) and cooling water (see	**Environmental, Health, and Safety Guidelines for Offshore Oil and Gas Development (IFC, June 5, 2015)** Deck drainage water: Drainage water generated from precipitation, sea spray, or routine operations, such as deck and equipment cleaning and fire drills, should be routed to separate drainage systems in offshore facilities. This includes drainage water from process areas that could be contaminated with oil (closed drains) and drainage water from nonprocess areas (open drains). All process areas should be bunded to ensure that drainage water flows into the closed drainage system. Drip	N/A	The platform operations are designed for zero discharge of hydrocarbons into the sea. All platforms are situated in nearshore waters, these are fixed offshore platforms. All wastewater containing oily products (including deck drainage from process areas and bilge waters) will be re-injected. The platform's drains system is designed to collect all spilled oily and chemical products and to re-inject these effluents. There is no discharge of oily water.	Sewage effluent quality and sea water quality is monitored under the Industrial Environmental Control Programmes for LUN-A, PA-A and PA-B platforms that are based on Water Discharge Permits considering monitoring parameters, locations and frequency, and analysis methods.	Comply

	section #7).	trays should be used to collect runoff from equipment that is not contained within a bunded area and the contents routed to the closed drainage system. . . Bilge waters from machinery spaces in offshore facilities and support vessels should be routed to the facility's closed drainage system or contained and treated before discharge to meet the guidelines provided in MARPOL 73/78. If treatment to this standard is not possible, these waters should be contained and shipped to shore for disposal. Gray and black water from showers, toilets, and kitchen facilities should be treated in an appropriate on-site marine sanitary treatment unit in compliance with International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 requirements. In nearshore waters (e.g. less than 12 nautical miles from shore), carefully select discharge location based on environmental sensitivities and assimilative capacity of receiving waters: MARPOL 73/78 requirements apply for all fixed offshore platforms: • The effluent shall not produce visible floating solids in, nor cause discoloration of the surrounding water • Oil/grease is 15 mg/l (The 1992 amendments Adoption: 6 March 1992 Entry into force: 6 July 1993.) Treatment system should have International Sewage Pollution Prevention Certificate. The Resolution MEPC.159 (55) adopted on 13 October 2006 - Revised Guidelines on Implementation of Effluent Standards and Performance Tests for Sewage Treatment Plants apply to sewage treatment plants installed on board on or after 1 January 2010. Sewage treatment plant should satisfy by the following; • Thermotolerant coliforms should not exceed 100 coliforms/100 ml, • TSS no more than 35 mg/l plus x mg/l, where x is TSS for flushing water (if using), • BOD_5 – 25 mg/l, • COD – 125 mg/l, • pH – 6 – 8,5		In 2012 all platforms were registered as immovable property and therefore they exclude from Maritime Register of shipping. International Sewage Pollution Prevention Certificates is not issued for Sewage treatment systems of the objects not included in the Maritime Register of shipping. Nevertheless all Sewage treatment systems of the platforms have the Declaration of conformity with technical regulations of Russia. Existing treatment plants were installed before 1st January 2010. MARPOL 73/78 doesn't set the regulation for the level of contaminants in sewage water after treatment for STPs older than those installed after January 1, 2010, excluding oil products. The third unit of STP on PA-A was installed in 2015. This unit is used as a backup for the other two units. All three units are of the same type and size. It should not be considered as a new installation. Lun-A and PA-B platforms use ultraviolet as a sterilisation medium. Treated wastewater discharges must meet Water Discharge Permit conditions.		
9.	Quality of drinking water (at all project sites)	WHO guidelines for drinking water quality.	N/A	The Project adopts the WHO guidelines for drinking water quality.	Drinking water quality is monitored under the separate Sanitary Monitoring Programme.	Comply
10.	Storm water effluent (Onshore sites only)	**Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (IFC, April 30,2007)** All process areas should be bunded to ensure drainage water flows into the closed drainage system and that uncontrolled contaminated surfaces run-off is avoided. Storm water flow channels and collection ponds should be fitted with oil/water separator. Separators may include baffle type or coalescing plate type and should be regulatory maintained. Storm water discharge should contain no more oil and grease concentration as of 10 mg/l.	N/A	General requirements relating to installed facilities are described in Water Use Management and Ground Water Protection Standard, Appendix 7. Storm water accumulating in plant operating areas or tank farms is contained and discharged only after receiving appropriate treatment, or verification that it meets water quality requirements without treatment. Separators of baffle type are used in storm water drainage. Storm water runoff should contain no more oil and grease concentration as of 10 mg/l.	Storm water runoff quality is monitored under the Industrial Environmental Control Programmes for OPF, Onshore Pipelines, LNG, and Accommodation considering monitoring parameters, locations and frequency, and analysis methods.	Comply

11.	Water after hydraulic testing of the pipeline systems	**OFFSHORE PIPELINES** **Environmental, Health and Safety Guidelines, OFFSHORE OIL AND GAS DEVELOPMENT, table 1** • Send to shore for treatment and disposal, • Discharge offshore following environmental risk analysis, Careful selection of chemicals • Reduce use of chemicals **ONSHORE PIPELINES** **Environmental, Health and Safety Guidelines, ONSHORE OIL AND GAS DEVELOPMENT, table 1** For discharge to surface waters or to land: • Total hydrocarbon content: 10 mg/L • pH: 6 - 9 • BOD: 25 mg/L • COD: 125 mg/L • TSS: 35 mg/L • Phenols: 0.5 mg/L • Sulfides: 1 mg/L • Heavy metals (total): 5 mg/L • Chlorides: 600 mg/l (average), 1200 mg/L (maximum)	N/A	General requirements relating to hydrotesting are described in Water Use Management and Ground Water Protection Standard, Appendix 8.	The program of monitoring will be made for every hydrotesting individually in line with Water Use Management and Ground Water Protection Standard, Appendix 8.	Comply
12.	Non-water based muds and cuttings	**Environmental, Health and Safety Guidelines, OFFSHORE OIL AND GAS DEVELOPMENT, table 1** 1) NADF: Reinject or ship-to-shore, no discharge to sea 2) Drilled cuttings: Reinject or ship-to-shore, no discharge to sea except: • Facilities located beyond 3 miles (4.8 km) from shore; • For new facilities: Organic Phase Drilling Fluid concentration lower than 1% by weight on dry cuttings; • For existing facilities: Use of Group III non-aqueous base fluids and treatment in cutting dryers. Maximum residual Non Aqueous Phase Drilling Fluidd (NAF) 6.9% (C16 -C18 internal olefins) or 9.4% (C12-C14 ester or C8 esters) on wet cuttings; • Hg: max 1 mg/kg dry weight in stock barite • Cd: max 3 mg/kg dry weight in stock barite • Discharge via a caisson (at least 15 m below surface is recommended whenever applicable; in any case, a good dispersion of the solids on the seabed should be demonstrated) • .	N/A	No oil-based or synthetic-based cuttings are discharged into the marine environment (also, see commitment below).	N/A	Comply
13.	Water based muds and cuttings	**Environmental, Health and Safety Guidelines, OFFSHORE OIL AND GAS DEVELOPMENT, table 1** 1) WBDF: Reinject or ship-to-shore, no discharge to sea except: • In compliance with 96 hr. LC-50 of Suspended Particulate Phase (SPP)-3% vol. toxicity test first for drilling fluids or alternatively testing based on standard toxicity assessment species (preferably site-specific species) 2) WBDF cuttings: Reinject or ship-to-shore, no discharge to sea except: • Facilities located beyond 3 miles (4.8 km) from shore; • Hg: 1 mg/kg dry weight in stock barite • Cd: 3 mg/kg dry weight in stock barite • Maximum chloride concentration must be less than four times the ambient concentration of fresh or brackish receiving water • Discharge via a caisson (at least 15 m below sea surface is recommended whenever applicable; in any case, a good	N/A	No cuttings or residual muds are disposed into the sea. Cuttings and residual muds are either reinjected or brought onshore for disposal.	N/A	Comply

		dispersion of the solids on the seabed should be demonstrated) •				
14.	Additives and chemicals	**Environmental, Health and Safety Guidelines, OFFSHORE OIL AND GAS DEVELOPMENT(IFC, June 5, 2015)** Carefully select chemical additives, taking into account their concentration, toxicity, bioavailability, and bioaccumulation potential. In particular, the use and dispersion of Kinetic Hydrate Inhibitors (KHI) should be assessed to avoid possible accumulation of poorly degraded residuals. •	N/A	No cuttings or residual muds, nor related additives or chemicals, are disposed into the sea.	N/A	Comply
15.	Onshore Pipelines - Booster Station 2 (BS2), Pipeline Maintenance Depots (PMDs), Camps	**(General Environmental, Health and Safety Guidelines (2007) IFC** The quality of treated process wastewater, wastewater from utility operations or storm water discharged on land, including wetlands, should be established based on local regulatory requirements. Storm water runoff should be treated through an oil/water separation system able to achieve an oil and grease concentration of 10 mg/l.	N/A	Sewage effluent after treatment is discharged to land. Table 1 below contains minimum requirements for the parameters to be monitored for the effluent treatment plants and for the quality of treated sewage effluent. **Table 1** **Units in mg/l except pH** pH: 6-9 BOD_{20}: 30 COD: 125 Oil and grease: 10 TSS: 50 Total Nitrogen (Ammonium nitrogen): 10 Total Phosphorus (Phosphates by phosphorus): 2.0 Coliform bacteria: < 400 MPN/100 ml Any additional parameters to those in Table 1 that are required by RF legislation shall also be monitored. If the RF regulatory requirement for any particular parameter is different to that in Table 1, the most stringent requirement will apply. **Discharge limits for storm water runoff** Storm water runoff should contain no more oil and grease concentration as of 10 mg/l.	Sewage effluent quality is monitored under the Industrial Environmental Control Programme for Onshore Pipelines considering monitoring parameters, locations and frequency, and analysis methods. In order to detect or monitor potential contamination of groundwater 5 (BS-2) and 9 (3 wells per each PMD) monitoring wells are installed and sampled at least annually (chemical composition, water level). Monitoring results are reviewed to assess the risk of groundwater contamination and determine what investigation, control or remedial action is required (*See* Water Use Management and Ground Water Protection Standard, Appendix 5).	Comply
16.	Infrastructure objects (LNG accommodation in Korsakov city, Zima accommodation in Yuzhno-Sakhalinsk city) with discharges to rivers	**Environmental, Health, and Safety Guidelines for Onshore Oil and Gas Development (IFC, April 30,2007)** Gray and black water from showers, toilets and kitchen facilities should be treated accordance **General Environmental, Health and Safety Guidelines (2007) IFC, table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharge** **Units in mg/l except pH** pH: 6-9 BOD: 30 COD: 125 Oil and grease: 10 TSS: 50 Total nitrogen: 10 Total phosphorus: 2.0 Coliform bacteria: < 400 MPN/100 ml **Standard applicable at time of Design:** **World Bank PPAH Onshore Oil and Gas Guidelines (1998)**	EC Directive concerning urban waste water treatment (91/271/EEC): Requirements for discharges from urban waste water treatment plants subject to Articles 4 and 5 of the Directive: • BOD_5 at 20°C: 25 mg/l O_2* • COD: 125 mg/l O_2 • TSS: 60 mg/l * BOD_{20} at 20°C (recalculated): 35.75 mg/l O_2 Requirements for discharges from urban waste water treatment plants to sensitive areas that are subject to eutrophication. Either of these parameters may apply depending on the local situation:	Table 1 below contains minimum requirements for the parameters to be monitored for the effluent treatment plants and for the quality of treated sewage effluent. **Table 1** **Units in mg/l except pH** pH: 6-9 BOD_{20}: 30 COD: 125 Oil and grease: 10 TSS: 50 Total Nitrogen (Ammonium nitrogen): 10 Total Phosphorus (Phosphates by phosphorus): 2.0 Coliform bacteria: < 400 MPN/100 ml Any additional parameters to those in Table 1 that are required	Sewage effluent quality and river water quality is monitored under the Industrial Environmental Programmes for Korsakov camp and Zima accommodation considering monitoring parameters, locations and frequency, and analysis methods. Programmes include parameters from Table 1 and additional parameters from Water Discharge Permits.	Comply

		General environmental guidelines, Table 4. Ammonia 10 (**General Environmental, Health and Safety Guidelines (2007) IFC** Storm water runoff should be treated through an oil/water separation system able to an achieve oil and grease concentration of 10 mg/l.	• Total phosphorus: 2 mg/l P (10 000 - 100 000 pop. est.); • Total nitrogen: 15 mg/l N (10 000 - 100 000 pop. est.).	by RF legislation shall also be monitored. If the RF regulatory requirement for any particular parameter is different to that in Table 1, the most stringent requirement will apply.		