

ALASKA SOURCE REDUCTION EVALUATION M/V “SILVER SHADOW”

Pursuant to Section 1.9.1 in Alaska Department of Environmental Conservation Large Commercial Passenger Vessel Wastewater Discharge Permit No. 2007DB0002, and following authorisation 0025 Silver Shadow given by ADEC Alaska to discharge **copper and nickel** under interim effluent limits, Silversea Cruises is submitting this Source Reduction Evaluation (SRE) Plan to identify methods to reduce the presence of these constituents in the discharges authorized.

It should be recognised that this plan has been issued in response to General Permit and ADEC authorisation, as mentioned, and it will be updated and amended as further information will be gathered in process of completing this evaluation.

Source Reduction Evaluation overview.

Efforts under this plan will fall into one of two categories of activities:

1. **Source Reduction** of inflows to reduce introduction of constituents to waste water system.
2. **Technology Evaluation/** Implementation to identify a better technology to eventually reduce effluent concentrations.

It should be noted that technology solutions are not yet commercially available for application on a large cruise ship, and therefore at present there remains much in certainty in the evaluation and potential implementation of such technologies.

Activities under each of these categories are described further below:

1. **Influent Source Reduction Evaluation** is going to be implemented soon after presentation of this plan and it will be considering three areas such as use of chemicals, source water evaluation and other potential contributors, and more in details as follows:
 - a) Additional sampling of potable water in different points of the distribution and production plant in order to locate anomalies, if any. (First sampling has been carried out on June 6th, Ketchikan)
 - b) To collect technical sheets and identify all cleaning products and maintenance products used on board. Evaluation and estimation of potential contributions from cleaning products or source water to copper, nickel in the effluent.

- c) Adoption of operational practice to reduce pollutants sources such as use of alternative cleaning products
- d) To plan water sampling analysis of the shore water supply bunkered and water produced on board the vessel.
- e) To prepare a list of the water influents to be treated and currently formed by: laundry water, water originated by passengers and crew accommodations, water from the toilets.
- f) To list the different typology of piping used and forming the fresh water system and collection of the discharge as for example:
 - Sanitary hot water distribution: cupronickel
 - Heat exchange hot water: cupronickel
 - Cold water distribution system: zinc piping on intake manifold and pumps delivery.
 - Water production: evaporators - cupronickel. Reverse Osmosis suction on feeding sea water pump (zinc steel)
 - Grey and black water collection tank (zinc steel – engine room)
 - A/C units discharge (PVC – zinc steel)
 - A/C units where condensation is produced and conveyed in the grey water and technical water (copper alloy)
- g) Planning in order to make a report to ADEC and regarding the fresh water supplied outside Alaska boundaries, eventually taking some sample to analyse the content.
- h) To take into account the quantity of water supplied in Alaskan ports.
- i) To avoid mixing water produced from galleys (supposed more polluting in this respect) with water from other sources to be treated, in order to mitigate metal pollution effect. Water from galley to be eventually discharged on shore facilities (procedure already in place on Silver Shadow), or, where permitted in accordance to international / national / local legislation.
- j) To produce list of technical sheets of the paints used on board for the potable water tanks, water purifier, double bottoms used for grey water collection.

Annual progress report to be presented December 15th, 2008.

The purpose of all the above mentioned actions / points, it will be to identify potential sources of **copper and zinc** as they may enter the waste stream, and to investigate and implement means to reduce their presence in the influent to the Advanced Waste Water Purification systems on board.

2) Treatment Technology Evaluation

- a) Identification of potential technologies for addressing the target constituent is both more complex than, and yet will be considerably informed by, the influent source reduction evaluation described above. Therefore during the incoming months Silversea will work with our AWWPS vendors and evaluate additional treatment technologies as appropriate for reduction of these pollutants that are practicable for implementation in a cruise ship environment.

Technology evaluation will be updated by December 15th, 2008.