



PRINCESS CRUISES

February 27, 2009

Albert Faure, Cruise Ship Program Manager
Alaska Department of Environmental Conservation
410 Willoughby Avenue, Suite 303
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RE: Response to SRE Report 1 14 2009 PRINCESS

As per your e-mail dated January 22, 2009 please find our response to your list of questions.

The Source Reduction Evaluation submitted to ADEC provides exhibits which contain further detailed information as to the methods which Princess Cruises will be evaluating in order to determine a means of possible reduction of parameters described in the Alaska Vessel General Permit. The exhibits listed under the Progress Report provide all of the information which has been explored and evaluated to date in order to support efforts to be used to continue developing the Source Reduction Evaluation.

The exhibits are abstracts from our consultants, vendors and data surveys. Exhibit 1 of the progress report reflects data which was evaluated from all sampling results obtained during the 2008 season. This exhibit presents data identifying which ships had higher levels of ammonia and metals. The data was used to measure compliance with interim and 2010 limits and to determine correlations and trends with bunkering potable water. Exhibit 2 and 3 of the progress report provides supporting evidence from primary chemical suppliers detailing that chemicals used onboard do not contain listed parameter metals or ammonia. These exhibits support efforts made to identify potential sources entering ship waste water systems. Exhibit 4 provides supporting developments made to research technical solutions which may include system modification, retrofitting and/or redesign with our vendor in order to reduce ammonia. Currently we have not been able to source a vendor for potential metal removal using available technologies suitable for shipboard application. Exhibit 5 highlights our efforts regarding obtaining an external consultant to develop feasibility study of available technologies in the possible treatment to meet 2010 limits. This project and study is in close parallel to contract established between ADEC and Oasis. Exhibit 6 includes all data analysis used to investigate possible sources for copper, nickel and zinc in influent to provide possible source reduction.

In regards to lessons learned it is an on-going process. The analysis testing results of the bunkered water from the various ports in Alaska contained metals which were in some cases higher than the effluent discharge limits under the Alaska Vessel General Permit. It was from this conclusive data that the source water was identified to be responsible for being a source of parameter contaminants.

The process of bunkering potable water cannot be eliminated completely due to the safety and stability of the ship. Additional testing of the potable water being produced onboard through the ships

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evaporators also sourced metals within the ships systems. Whether bunkering or producing potable water, the results of trace identified parameter metals will be a normal and an unavoidable potential source to the waste water system. Piping systems within the ship vary from copper-nickel, to press aluminum. Piping integral to ships potable water production and distribution systems are something which cannot be easily replaced due to the specifications required by the ship building and classification societies. Much of the piping penetrates water tight compartments and this piping cannot be made of material which is non-metallic.

Category Updates:

Category 1: Hepburn Bio Care products will continue to be used on Alaska ships. Princess Cruises and Hepburn Bio Care Products will continue to monitor ships usage and application of these new environmentally friendly products. Evaluation has concluded that these products appear to enhance the treatment process, but no conclusive evidence suggests the products are reducing metals or ammonia.

Category 2: The onboard potable water distribution system testing has been completed and the results have been evaluated. The evaluation concluded metals are being traced within the potable water distribution system. Sources are likely from bunkered, evaporator produced water and piping systems integral to the ship. Additional testing may be considered.

Category 3: Source Water Evaluation – Shore Potable Water Testing has been completed and the results have been evaluated along with similar testing results provided by the Alaska Cruise Ship Association. Our evaluation concluded source water from ports has at times higher concentrations of metals than allowed by Alaska VGP. The bunkering of potable water cannot be avoided or managed differently due to safety and stability of the ship. Additional testing may be considered.

Evaluation of Cleaning Products has been completed for all potential chemical sources which could enter wastewater system. We do not believe that these products are contributing to metals or ammonia.

Category 4: Treatment Technology – Hamworthy Two Phase Evaluation will be Princess Cruises' primary focus on future developments of the Source Reduction Evaluation. The first phase of the evaluation has now been completed. We will proceed with phase two commencing in March 2009 on Golden Princess.

The project will be active during 2009 Alaska Season. The definition for ISF feed is the effluent feed flow into Inter-Stage Filter. The definition for DP sensor is differential pressure sensor used to provide the water level signal in the tank. The reason why Tank 5 has been chosen for this trial is because it is a redundant tank close to the MBR used for the trial. The Hepburn Bio Care product being used for this trial is called Ammo 1000 and it is a nitrifier bacteria product readily available on the market. This chemical is intended to be used to speed up the biological nitrification process.

The trial will be concluded by year end. Please see Figure 1 attachment for P&ID diagram provided.

Category 5: Consultant has been contracted. This contractor has provided summary report and will conclude with a feasibility study report which we will use to better understand any potential treatment technologies. This feasibility study report will be an independent report which will be included in future

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updates to ADEC. The consultant has recently provided the draft report for review. The report is similar to the Oasis report.

Category 6-7: Results & Progress Report data are in continued development and will be shared with ADEC as they are received and reviewed. Forms of this data will be drawn from testing of Treatment Technology described in Category 4.

The pre-treatment of waste water prior to entering the AWTS continues to be evaluated for improvement. In 2008 Princess Cruises began using Hepburn Bio WC a biological toilet cleaner which is an alternative to more commercial and industrial strength cleaners. This product is used to keep pipes free of scale and to break down the organic solids within the piping. According to the manufacturer Bio WC uses the pipes as a bioreactor. This has an advantage at eliminating the risk of hydrogen Sulphide Gas. Hepburn Bio ET is dosed into all MBRs to pre-treat the waste and aid in the performance of the AWTS. The results are that the system stays aerobic which means less risk of H₂S and odors, there is also reduction in TSS.

Hepburn Nutrient is being tested to enhance bio-digestion within bioreactors. Hepburn Foam Fighter assist in the reduction of foaming within the MBR system and Ammo 1000 is formulated to convert ammonia to nitrite. Lessons learned: These chemicals being trialed are patented. The evaluation of these products is primarily based on dosing and results of treated effluent. The evaluation to date has not been conclusive of reduction of ammonia or metals. The products so far have proven to help eliminate odors, foaming and acting as alternatives to chemicals which are less environmentally friendly.

The trial on Golden Princess will include the use of Hepburn Ammo 1000. This chemical will be dosed into the bio reactor/aeration tank. The function of this chemical according to the manufacturer is to oxidize the ammonia, turning it into soluble Nitrite and eventually Nitrate. Most of this Nitrate is used up by the bacteria breaking down the organic solids. As to results, more tests are required and in hand by Hepburn Bio Care Products in order to give an accurate picture both before and after application. It is important to note that aeration is critical.

In reference to your questions related to Exhibit 6:

Exhibit 6 includes metal source investigation which provides a summary of sampling results of available bunker water. A new table was created which includes the sampling location and name of ship bunkering if there was one present at the time, please see Figure 2. According to Admiralty Environmental, the contractor which performed this sampling stated that many of the samples were taken while there was a ship bunkering, but not all. The purpose of the sampling was to determine the general water quality at all port locations within the itinerary, whether or not the ship was actually bunkering water there at the time. We have asked the ship's Environmental Officers to check the ship records and confirm if the ship was bunkering water during the sampling. An effort was made to take samples while the ship was bunkering water in order to represent the water quality as taken onboard. The sampling port was flushed for several minutes before sampling. If the ship was not bunkering water at the time, the main bunkering water line and the sampling port were both opened and allowed to flush for several minutes prior to sampling.

Please find information of how the sampling was performed, including the used procedures (e.g. flushing duration / periods / used connectors) location of sampling ("sample valve"), and the used QA QC sampling procedures. Sampling was performed under the general sampling guidelines of the 2008

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NWCA QA/QCP for large ships which address flushing duration period, used connectors and location of sampling valves. All containers and samples were handled and preserved according to procedures in this plan. Sampling training was provided to the vessel Environmental Officer to ensure that their sampling also followed these guidelines. Samples were taken either directly from the main bunkering line or from sampling ports/hose bibs at the end of the bunkering line at the location where the ship connection is made.

Sample ports were flushed as described above. All documentation (COC, cooler receipt form) was completed as per the general guidelines of the QA/QCP. Samples were filtered in a laboratory setting as soon as possible following sampling. The original table included on the front cover of Exhibit 6 is now provided in excel format. The results in Exhibit 6 include all the potable water sampling (shore side). These are the only results from our shoreside sampling.

If you have any questions pertaining to any part of this letter, please do not hesitate to contact me.

Sincerely,



George Wright
Senior Vice President Marine Operations

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Princess Metals Investigation

Sampling Location - Bunkered Water	Sample Date	ed Coppered	Nickelved Zinc	Berth	Bunkering	Vessel
Skagway Bunkered Water - St. Forward Port	6/12/2008	0.688	6.53	Railroad aft	Yes 0745 - 1615	Star
Ketchikan Bunkering Connection	6/17/2008	3.62	4.14	Berth 3	Yes 0745 - 1315	Star
Ketchikan Bunkered Water - St. Forward Port	6/17/2008	0.43	6.49	Berth 3	Yes 0745 - 1315	Star
JNU Bunkering Connection (AJ Dock)	6/18/2008	28.1	13.7	AJ Dock	No bunker for Star	Star
Bunkering Victoria - On Pier	6/21/2008	2.47	8.92	South "B"	Yes 1645 - 2315	Star
Bunkering Seattle - Forward Port	6/22/2008	0.749	5.85	T-30	Yes 0745 - 1520	Star
JNU Bunkering Connection (S. Franklin Dock)	6/25/2008	41.7	16	AJ Dock	Yes 1520 - 2115	Star
Seattle Princess Dock - North Berth	6/30/2008	34	2600	T-30	Called on 6-29-08	Star
San Francisco Bunkering Connection	7/16/2008	0.83	<0.5	Pier 35	No Star, Dawn in SFO	Dawn
Whittier Bunkering Connection	7/24/2008	1.3	0.345	???	Star bunkers in Skagway	no ship
Vancouver Bunkering Connection North	7/24/2008	1.5	<0.2	Canada Place East	Yes 0810 - 1405	220m3 Tahitian
Vancouver Bunkering Connection Central	7/24/2008	15	<0.2	Canada Place East	Yes 0810 - 1405	220m3 Tahitian
Vancouver Bunkering Connection South	7/24/2008	7.8	<0.2	Canada Place East	Yes 0810 - 1405	220m3 Tahitian
Sampling Location - Star Princess						
Potable Water Tank (8&9) after Retention	6/17/2008	15.3	1.74			
Tap Water - Bridge Pantry Deck 14	6/17/2008	19.5	1.87			
Crew Cabin Deck 10 Fwd. Port (Hot Water)	6/17/2008	52.3	8.27			
Pax. Cabin Deck 8 Fwd. Stbd. (Hot Water)	6/17/2008	56.3	8.2			
Pax. Cabin Deck 11 Port Midship	6/17/2008	44.7	2.21			
Crew Cabin Deck 4 Port	6/17/2008	41.6	1.85			
Tap Water - Crew Galley Deck 5 Aft (Hot)	6/17/2008	26.3	10.4			
Designated Overboard Discharge Sample Port	6/18/2008	59.2	13.6			
Alternate Overboard Discharge Sample Point	6/18/2008	116	258			
Influent MBR - Blackwater - Evac. 4	6/18/2008	17	8.58			
Influent MBR - Graywater - Buffer Tank	6/18/2008	22.5	7.64			
Potable Water Tank (11-12) after Retention	6/18/2008	17.6	1.48			
Evaporator 1	6/20/2008	49.7	3.13			
Evaporator 3	6/20/2008	42.5	1.04			
Evaporator 2	6/23/2008	50.3	1			
Designated Overboard Discharge Sample Port	6/25/2008	55.5	15.7			

2008-06-25
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