

MARINE VESSEL SHANGHAI SPIRIT

ANALYSIS OF AIR QUALITY MONITORING DATA ASSOCIATED WITH BULK NICKEL SULFIDE SHIP-LOADING ON 14-15 DECEMBER 2010

Revision	Prepared	Reviewed	Approved	Date	Description
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1. INTRODUCTION

1.1 Licence Reporting Conditions

This document reports the air quality monitoring for the loading of the MV Shanghai Spirit between 0457 hrs on the 14th of December 2010 to 1257 hrs on the 15th of December 2010 at the Esperance Port. This report is compiled and issued in compliance with Condition 10 and includes data analysis consistent with requirements of Condition 7 of the Government of Western Australia Department of Environment and Conservation (DEC) Licence L5099/1974/12 ('the licence'). The licence was issued to Esperance Ports Sea & Land (EPSL) on the 6th January 2009 and has since been amended on the 16th of September 2010. The licence is available on the DEC website.

1.2 Location of Monitoring Stations

As required by the licence, ambient monitoring is being undertaken at four locations surrounding the Port operations and one community monitor 1.6 km from the Port (**Figure 1**). The monitor locations were chosen in consultation with the DEC and the Government of Western Australia Department of Health (DoH).

The EPSL has an Australian Standards-compliant meteorological station adjacent to E-Sampler 7, located on the Port premises adjacent to Berth 3. This meteorological station records both wind speed and direction. Data from this station has been used for this report.

1.3 Assessment Criteria

The following ambient concentration targets are used in this assessment, as adapted from Table 1 in the licence:

Table 1: Pollution concentration targets from Table 1 in Licence L5099/1974/12

Parameter	Target
Nickel in air	0.14 µg/m ³
Dust as PM ₁₀	50 µg/m ³
Dust as TSP	90 µg/m ³

Map of EPSL monitoring sites:



Figure 1: Location of monitoring sites

2. ANALYSIS OF BULK NICKEL SHIP LOADING

2.1 Port Activities

The 'berthing period' in this report will refer to 0457 hours on the 14/12/2010 to 1257 hours on the 15/12/2010. The '**loading period**' in this report will refer to **0710 on the 14/12/2010 to 1031 hours on the 15/12/2010**.

Bulk nickel loading ceased on two occasions due to winds being in the red zone from 0305 to 0348, from 0610 to 0700 on the 15 December 2010 for the total of 1 hour and 33 minutes. Approximately 7,037 tonnes of BHP Billiton Nickel West nickel sulphide concentrate bulk was loaded.

No other marine vessels were in Port during the monitoring period.

Products received/delivered other than by marine vessels, were:

- 17,793 tonnes of iron ore averaged across 2 trains delivered to the Port and
- 286 tonnes of nickel concentrate across 5 trucks delivered to the Port in Kibbles*

2.2 Meteorological Conditions

All wind speeds and directions described in this section are limited to the loading period.

- The wind direction varied from SW to SSE (30% SW, 40% SSW, 25% S, 5% SSE) (**Figure 2**).
- The maximum hourly wind speed recorded was 8.1 m/s (29.2 km/h) from the SW direction (green zone), which occurred between 0800 and 0855 on the 14/12/2010.
- The average wind speed during the loading periods was 6.1 m/s (22 km/h). The 'Beaufort Wind Force Scale' is a measure for understanding wind speeds in descriptive terminology. A wind speed of 6.1 m/s is described as 'moderate' winds (BOM 2010).

*Each truck can carry up to 8 kibbles which is a total of about 64 tonnes of product.

2.3 Odour and Dust Monitoring

Pre-loading determination of the Nickel West concentrate was undertaken as per the requirement of EPSL ‘Environmental Considerations for Nickel Ship-loading Procedure’ (PR088) (EsPA 2009). It was determined that the Nickel West concentrate was classified as ‘very weak’, and had a low dust potential indicated by the average moisture of >8%. The nickel concentrate was therefore loaded as per Section 3.1 of the procedure (EsPA 2009). The odour and moisture content record sheet is included in **Appendix A**.

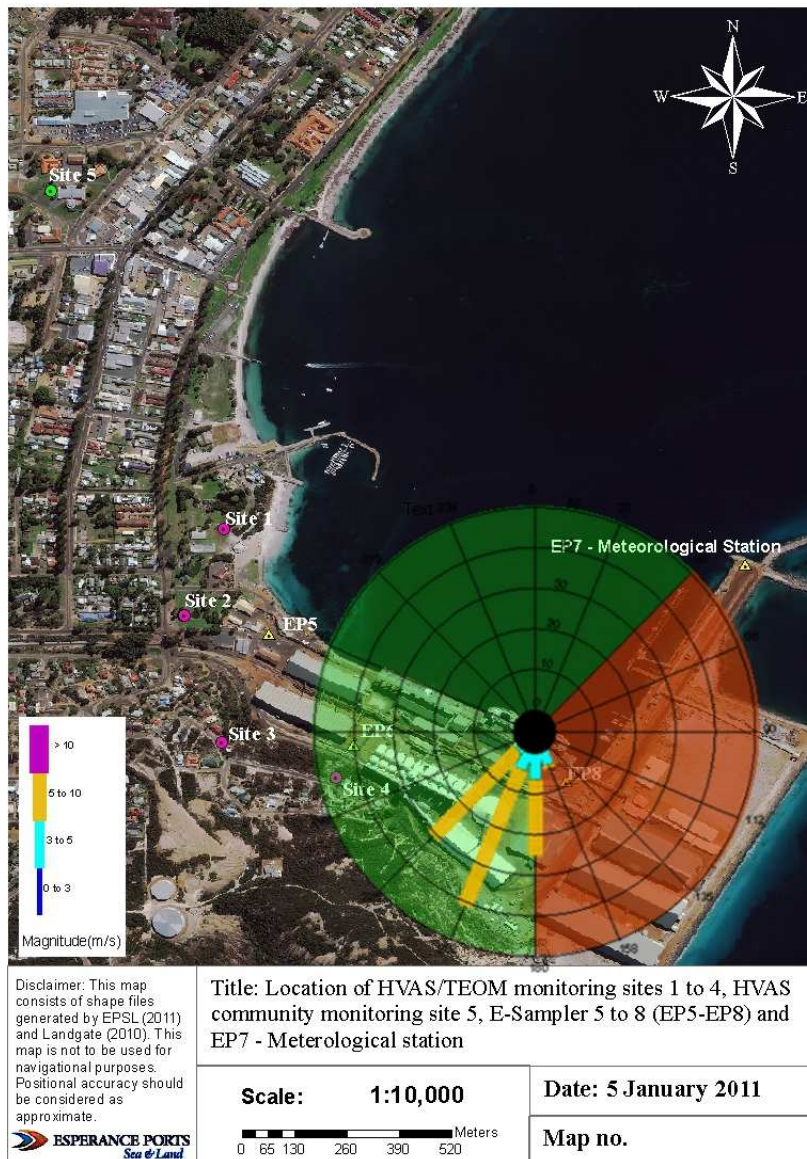


Figure 2: Wind arc zones defined in EPSL (2008), where ‘red zone’ is 45° to 180° and ‘green zone’ is 180° to 45°, showing loading wind rose data measured at the meteorological station adjacent to E-Sampler 7 from 0710 on the 14/12/2010 to 1031 on the 15/12/2010.

2.4 Compliance to loading protocol

The loading was compliant with the loading protocol (**Figure 2 and 3**). The wind arc zones in which EPSL may or may not load bulk nickel sulphide concentrate (green and red respectively) are illustrated in **Figure 2** and are documented within EPSL's internal procedures. These conditions are in place to minimise nickel particulate emitted from the Port to the community which is more sensitive than the marine environment. The effectiveness of these procedures has been demonstrated in the absence of any exceedences since implementation of the wind arc procedure in December 2008.

The bar chart in **Figure 3** shows tonnes of nickel loaded (tonnes/hour) in relation to hourly averages of wind direction (line plot) and the red/green loading zones (background). The loading of Shanghai Spirit the wind direction was in the green zone between 180 to 360 degrees during the loading period.

As a further restriction to minimise ship-loading emissions, EPSL has to maintain less than 1000 tonnes per hour (tph) nominal ship-loading rate as part of its protocol. This ship loading protocol (PR026) was not exceeded during the loading of the MV Shanghai Spirit (**Figure 3**). However, loading rates do not appear to be critical in controlling dust emissions from the Berth 2 ship loader based on recent ship loading events since shipping upgrades (**Appendix D**).

2.5 TEOM PM₁₀ Monitoring

During the berthing period and prior to loading, the wind was in the green zone and a maximum PM₁₀ of 19.2µg/m³ was recorded at Site 2 at 0400 hours on the 14/12/2010. **Figure 4** graphs the hourly PM₁₀ concentration (µg/m³) and wind speed (m/s) against date. Throughout the loading of MV Shanghai Spirit the winds maintained the green zone wind direction. Therefore the recorded PM₁₀ concentrations are likely to be from sources other than nickel loading operations. There is no correlation between wind speed and PM₁₀ during the loading period (refer to **Appendix B** for raw data).

The 24-hour average PM₁₀ concentrations for the monitoring period are presented in **Table 2** as calculated at 1200 hours each date to coincide with the approximate time when TSP filter papers are changed. The 24-hour average licence target concentration of 50µg/m³ was not exceeded at any of the sites. The maximum daily average PM₁₀ concentration of 32.1µg/m³ was recorded at Site 2 between 1200 on the 13th December 2010 and 1200 on the 14th December 2010 and represents 64.2% of the assessment criterion (50µg/m³).

Table 2: Daily 24-hr average TEOM results for PM₁₀ during 13-16 of December 2010

Sampling Start	Sampling Finish	Site 1 (µg/m ³)	Site 2 (µg/m ³)	Site 3 (µg/m ³)	Site 4 (µg/m ³)
1200 13/12/2010	1200 14/12/2010	24.3	32.1	23.8	21.3
1200 14/12/2010	1200 15/12/2010	22.1	25.7	20.4	22.8
1200 15/12/2010	1200 16/12/2010	16.3	19.2	16.1	20.4
Assessment Criterion (µg/m³)		50			

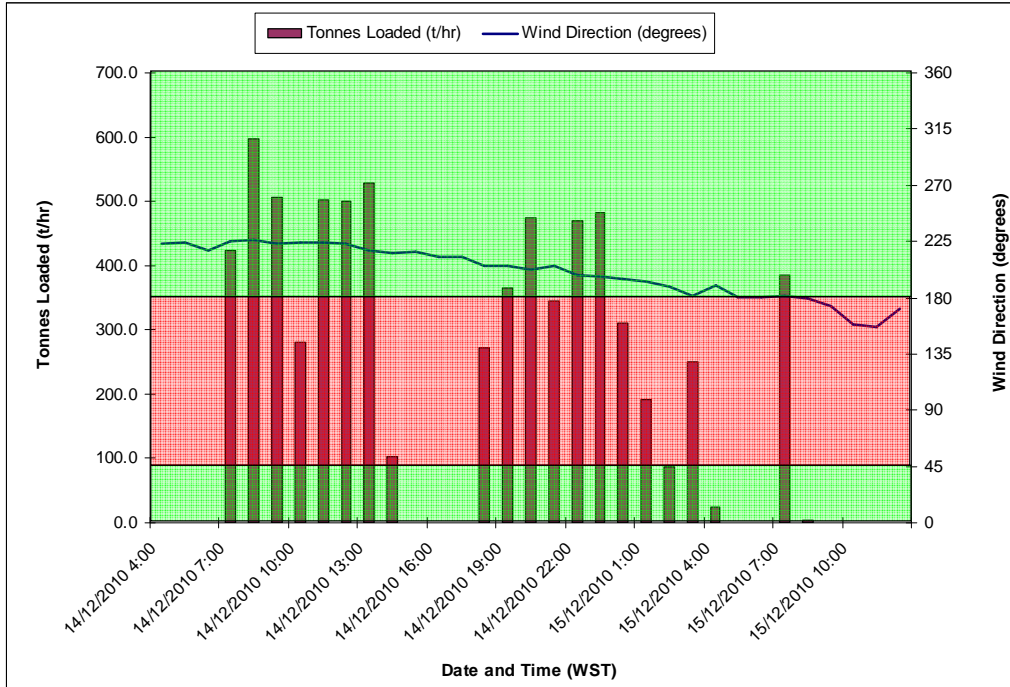


Figure 3: Wind direction and tonnes loaded to MV Shanghai Spirit from 0457 on the 14/12/2010 to 1257 on the 15/12/2010.

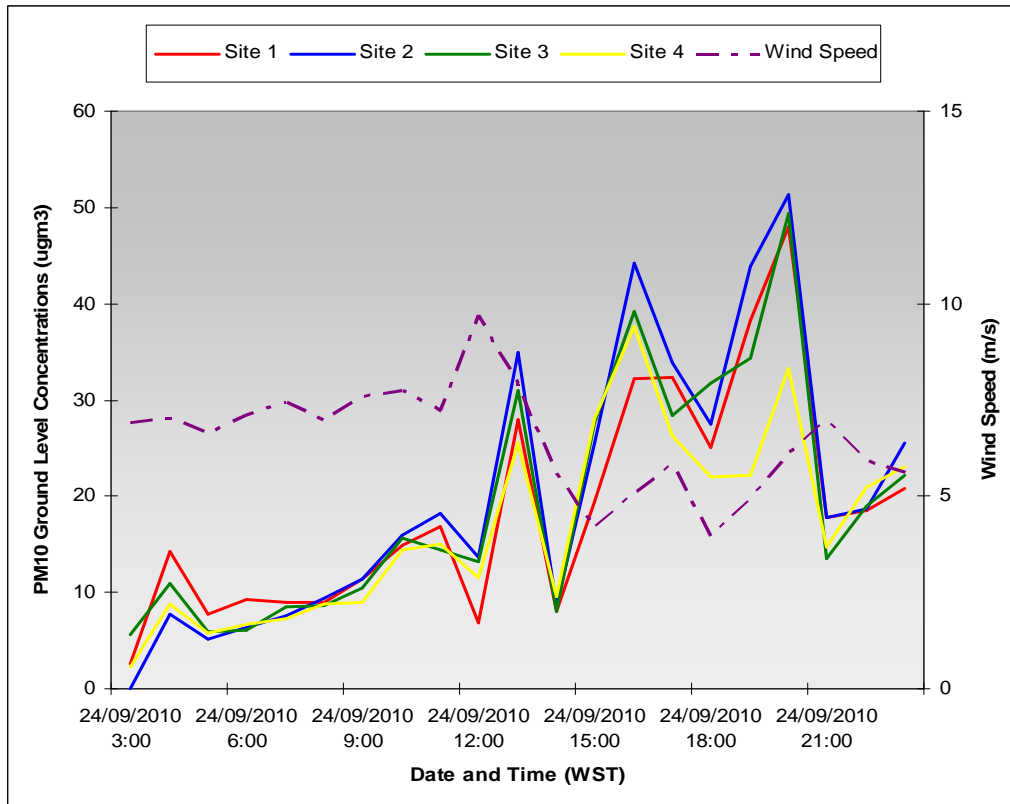


Figure 4: Hourly PM10 concentrations and wind speed between 0457 on the 14/12/2010 to 1257 hours on the 15/12/2010.

2.6 TSP HVAS Data

The results from the laboratory analysis of the TSP filter papers are presented in **Table 3** and the laboratory reports are provided in **Appendix C**. There were no exceedences of the $90\mu\text{g}/\text{m}^3$ 24-hour average concentration target for TSP during the monitoring period. The maximum recorded daily average TSP concentration of $68\mu\text{g}/\text{m}^3$ recorded at Site 2 between 1200 on the 13/12/2010 and 1200 on the 14/12/2010 represents 75.5% of the assessment criterion ($90\mu\text{g}/\text{m}^3$). The source of the dust could be attributed to the Esperance Town from the direction of West Beach with 95% of the winds ($<10\text{m}/\text{s}$) blowing in the wind arc of south to south west.

The 24-hour average licence target of $0.14\mu\text{g}/\text{m}^3$ for nickel was not exceeded during the monitoring period. The 24-hour average nickel concentration recorded during the monitoring period was lower than limit of detection for almost all sites except for site 2 recording 0.01 on 13th and 14th of December and represents 7.1% of the assessment criterion ($50\mu\text{g}/\text{m}^3$).

Table 3: Daily HVAS monitoring results for TSP for 13 -16 of December 2010

Sampling Start ¹	Sampling Finish ¹	Site 1 ($\mu\text{g}/\text{m}^3$)		Site 2 ($\mu\text{g}/\text{m}^3$)		Site 3 ($\mu\text{g}/\text{m}^3$)		Site 4 ($\mu\text{g}/\text{m}^3$)		Site 5 ($\mu\text{g}/\text{m}^3$)	
		TSP	Ni	TSP	Ni	TSP	Ni	TSP	Ni	TSP	Ni
1200 13/12/2010	1200 14/12/2010	55	<0.002	68	0.01	42	<0.002	36	<0.002	35	<0.002
1200 14/12/2010	1200 15/12/2010	36	<0.002	54	0.01	33	<0.002	40	<0.002	34	<0.002
1200 15/12/2010	1200 16/12/2010	28	<0.002	46	<0.002	31	<0.002	47	<0.002	25	<0.002
Assessment Criterion ($\mu\text{g}/\text{m}^3$)		90	0.14	90	0.14	90	0.14	90	0.14	90	0.14

¹ These times are approximate for all five monitoring sites.

Bold - exceedance of the $90\mu\text{g}/\text{m}^3$ 24-hour average concentration target for TSP
 0.002 $\mu\text{g}/\text{m}^3$ is the limit of detection for the analysis of nickel.

3. CONCLUSIONS

Loading of the Shanghai Spirit was consistent with EPSL operational procedures, ship-loading only occurred when the wind was blowing from within the green zone and loading rates were less than 1,000 tonnes/hour. Therefore, the potential for dust and odour impacts were significantly reduced.

No odour complaints were reported to EPSL during this period consistent with the 'No perceptible' product odour assessment result. There have been no odour complaints reported to EPSL since December 2008 that are attributable to the activities of the Port.

The licence targets for PM₁₀, TSP and nickel were not exceeded at any of the four monitoring sites during the berthing or loading periods of the Shanghai Spirit. None of these parameters significantly increased during the loading period.

These results warranted no further emission reduction measures.

4. REFERENCES

Bureau of Meteorology (BOM), 2009. Beaufort Wind Scale. Access online 6 March 2010, <http://www.bom.gov.au/lam/glossary/beaufort.shtml>

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Appendix A Odour Record Sheet

 Title: Odour Record Sheet BULK NICKEL CONCENTRATE MOUNT KEITH TML = 9.8%	Form No : FM239
	Revision: 2
	Issue Date: 8/12/02009
	Page: 1 of 1
	Reference: PR089

ODOUR INTENSITY	
Extremely Strong	6
Very Strong	5
Strong	4
Distinct	3
Weak	2
Very Weak	1
Not Perceptible	0

Ship Name: Shanghai Spirit Sampled by: Alex Leonard

Odour Assessor(s)	Date	Time	Sample#	Location	Temperature (°C)	pH	%moisture	Odour intensity (Rate 1 to 6)
AL	13/12	11:00	1	Black Swan	30.2	6.9	8.8	1
AL	↓	↓	2	↓	26.7	6.5	8.4	1
AL	↓	↓	3	↓	27.0	6.9	8.4	0
AL	↓	↓	4	↓	27.4	6.5	9.1	0
AL	↓	↓	5	↓	33.4	6.1	8.8	1
AL	↓	↓	6	↓	27.2	6.4	9.4	1

APPENDIX B HOURLY AVERAGE PM10 CONCENTRATIONS

Date and Time	Hourly Average PM10 in µg/m3				Hourly Averaged Wind Speed (m/s)	Hourly Averaged Wind Vector (°)	Hourly Averaged Product Loaded (tonnes)
	Site 1	Site 2	Site 3	Site 4			
14/12/2010 4:00	17.6	19.2	15.3	14.6	5.2	223.0	0.0
14/12/2010 5:00	14.4	15.9	12.2	9.8	5.7	224.4	0.0
14/12/2010 6:00	14.5	17.7	12.3	12.7	6.2	217.5	0.0
14/12/2010 7:00	14.6	18.7	13.7	8.8	7.7	224.9	424
14/12/2010 8:00	23.5	36.0	25.1	24.2	8.1	226.1	598
14/12/2010 9:00	22.6	28.0	21.7	18.3	7.3	222.9	506
14/12/2010 10:00	22.0	25.2	25.3	22.1	6.4	224.6	281
14/12/2010 11:00	20.5	25.8	23.3	20.1	6.6	224.2	502
14/12/2010 12:00	24.2	29.7	26.9	24.0	7.5	222.6	500
14/12/2010 13:00	25.1	34.1	22.3	19.8	7.4	217.8	528
14/12/2010 14:00	23.3	31.7	24.0	20.5	7.1	216.3	103
14/12/2010 15:00	22.7	34.1	22.8	19.5	6.9	216.9	0
14/12/2010 16:00	28.4	36.4	24.2	26.7	7.2	212.3	0
14/12/2010 17:00	29.0	33.5	24.0	23.5	6.1	212.8	0
14/12/2010 18:00	25.1	28.6	20.8	25.8	5.8	205.8	273
14/12/2010 19:00	28.0	32.2	22.5	30.5	5.5	205.3	366
14/12/2010 20:00	22.5	23.1	18.9	25.1	5.3	202.1	474
14/12/2010 21:00	22.7	24.5	18.5	23.0	5.4	205.2	345
14/12/2010 22:00	15.8	15.5	15.9	23.4	6.1	197.8	470
14/12/2010 23:00	16.4	16.1	16.2	28.6	6.3	196.7	483
15/12/2010 0:00	16.4	15.6	17.4	19.9	7.1	195.0	311
15/12/2010 1:00	19.1	20.8	20.0	22.1	5.7	193.0	191
15/12/2010 2:00	24.3	26.7	23.5	24.4	5.1	188.3	86
15/12/2010 3:00	21.2	22.6	22.1	21.1	5.6	181.8	251
15/12/2010 4:00	20.5	21.4	20.8	20.2	5.8	189.6	24
15/12/2010 5:00	18.7	18.8	18.8	17.0	5.8	180.4	0
15/12/2010 6:00	17.5	20.2	16.9	14.9	5.6	180.2	0
15/12/2010 7:00	18.6	27.1	15.5	19.6	5.3	181.3	385
15/12/2010 8:00	19.1	24.7	17.7	26.2	4.4	179.4	4
15/12/2010 9:00	23.0	27.0	23.6	27.6	4.3	173.6	0
15/12/2010 10:00	24.2	29.5	20.5	22.4	4.5	158.7	0
15/12/2010 11:00	24.1	22.8	16.6	22.4	4.8	157.1	0.0
15/12/2010 12:00	19.6	15.1	14.5	13.6	5.3	171.5	0.0

APPENDIX C

MPL LABORATORY REPORTS



Part of the Envirolab Group



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www.envirolab.com.au
Envirolab Services (WA) Pty Ltd ABN 53 140 099 207

CERTIFICATE OF ANALYSIS 107842

Client:

Esperance Ports - Sea and Land
PO Box 35
Esperance
WA 6450

Attention: C Magana

Sample log in details:

Your Reference:
No. of samples:
Date samples received:
Date completed instructions received:
Location:

Dust Analysis
18 Hi Volume Filters
18/12/10
18/12/10

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: 23/12/10
Date of Preliminary Report: Not issued
Issue Date: 21/12/10

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Tests not covered by NATA are denoted with *.

Results Approved By:


Dr Monika Berger
Supervisor - Micro, Asbestos, Dust

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107842-1	107842-2	107842-3	107842-4	107842-5
Your Reference:	--	--	EAP248	EAP249	EAP250	EAP251	EAP252
Location:	--	--	Site 4	Site 3	Site 2	Site 1	Site 5
Date Sampled			12/12/10	12/12/10	12/12/10	12/12/10	12/12/10
Dust	mg/filter	0.1	130	130	89	86	82
Dust In Air	µg/m ³	0.1	83	82	57	55	39
Iron	µg/filter	20	2,600	1,400	1,500	1,600	570
Iron In Air	µg/m ³	0.01	1.7	0.89	0.93	1.0	0.37
Nickel	µg/filter	5	9.7	8.1	17	7.6	<-5.0
Nickel In Air	µg/m ³	0.002	0.010	0.010	0.010	<-0.002	<-0.002
Lead	µg/filter	5	<-5.0	<-5.0	5.0	<-5.0	<-5.0
Lead In Air	µg/m ³	0.003	<-0.003	<-0.003	<-0.003	<-0.003	<-0.003
Lithium	µg/filter	5	<-5.0	<-5.0	<-5.0	<-5.0	<-5.0
Lithium In Air	µg/m ³	0.002	<-0.002	<-0.002	<-0.002	<-0.002	<-0.002
Sulfur	µg/filter	50	1,700	1,500	1,400	1,600	1,500
Sulfur In Air	µg/m ³	0.03	1.1	0.93	0.92	1.0	0.92

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107842-6	107842-7	107842-8	107842-9	107842-10
Your Reference:	--	--	EAP253	EAP254	EAP255	EAP256	EAP257
Location:	--	--	Blank	Site 4	Site 3	Site 2	Site 1
Date Sampled				13/12/10	13/12/10	13/12/10	13/12/10
Dust	mg/filter	0.1	5.5	55	65	110	85
Dust In Air	µg/m ³	0.1	[NA]	36	42	68	55
Iron	µg/filter	20	150	290	430	1,600	610
Iron In Air	µg/m ³	0.01	[NA]	0.19	0.27	1.0	0.39
Nickel	µg/filter	5	<-5.0	<-5.0	<-5.0	14	<-5.0
Nickel In Air	µg/m ³	0.002	[NA]	<-0.002	<-0.002	0.010	<-0.002
Lead	µg/filter	5	<-5.0	<-5.0	<-5.0	5.3	<-5.0
Lead In Air	µg/m ³	0.003	[NA]	<-0.003	<-0.003	<-0.003	<-0.003
Lithium	µg/filter	5	<-5.0	<-5.0	<-5.0	<-5.0	<-5.0
Lithium In Air	µg/m ³	0.002	[NA]	<-0.002	<-0.002	<-0.002	<-0.002
Sulfur	µg/filter	50	790	1,400	1,500	1,500	1,600
Sulfur In Air	µg/m ³	0.03	[NA]	0.91	0.98	0.97	1.0

Metals In High Volume Filters	UNITS	PQL	107842-11	107842-12	107842-13	107842-14	107842-15
Our Reference:	--	--	EAP258	EAP259	EAP260	EAP261	EAP262
Your Reference	--	--	Site 5	Blank	Site 4	Site 3	Site 2
Location	--	--	13/12/10		14/12/10	14/12/10	14/12/10
Date Sampled							
Dust	mg/liter	0.1	55	5.1	64	52	84
Dust In Air	µg/m ³	0.1	35	[NA]	40	33	54
Iron	µg/liter	20	430	140	530	250	1,500
Iron In Air	µg/m ³	0.01	0.27	[NA]	0.33	0.16	0.95
Nickel	µg/liter	5	<5.0	<5.0	<5.0	<5.0	9.4
Nickel In Air	µg/m ³	0.002	<0.002	[NA]	<0.002	<0.002	0.010
Lead	µg/liter	5	<5.0	<5.0	<5.0	<5.0	<5.0
Lead In Air	µg/m ³	0.003	<0.003	[NA]	<0.003	<0.003	<0.003
Lithium	µg/liter	5	<5.0	<5.0	<5.0	<5.0	<5.0
Lithium In Air	µg/m ³	0.002	<0.002	[NA]	<0.002	<0.002	<0.002
Sulfur	µg/liter	50	1,600	750	1,500	1,200	1,300
Sulfur In Air	µg/m ³	0.03	1.0	[NA]	0.93	0.79	0.82

Metals In High Volume Filters	UNITS	PQL	107842-16	107842-17	107842-18	107842-19
Our Reference:	--	--	EAP263	EAP264	EAP265	Lab Blank
Your Reference	--	--	Site 1	Site 5	Blank	
Location	--	--	14/12/10	14/12/10		
Date Sampled						
Dust	mg/liter	0.1	56	54	1.4	[NA]
Dust In Air	µg/m ³	0.1	36	34	[NA]	[NA]
Iron	µg/liter	20	530	260	120	140
Iron In Air	µg/m ³	0.01	0.34	0.17	[NA]	[NA]
Nickel	µg/liter	5	<5.0	<5.0	<5.0	<5.0
Nickel In Air	µg/m ³	0.002	<0.002	<0.002	[NA]	[NA]
Lead	µg/liter	5	<5.0	<5.0	<5.0	<5.0
Lead In Air	µg/m ³	0.003	<0.003	<0.003	[NA]	[NA]
Lithium	µg/liter	5	<5.0	<5.0	<5.0	<5.0
Lithium In Air	µg/m ³	0.002	<0.002	<0.002	[NA]	[NA]
Sulfur	µg/liter	50	1,200	1,300	580	660
Sulfur In Air	µg/m ³	0.03	0.80	0.80	[NA]	[NA]



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CERTIFICATE OF ANALYSIS 107962

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WA 6460

Attention: C Magana

Sample log in details:

Your Reference:
No. of samples:
Date samples received:
Date completed instructions received:
Location:

Dust Analysis
30 High Volume Filters
22/12/10
22/12/10

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: 4/01/11
Date of Preliminary Report: Not issued
Issue Date: 4/01/11

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Accredited for compliance with ISO/IEC 17025.

Tests not covered by NATA are denoted with *.

Results Approved By:


Dr Monica Burger
Supervisor - Micro, Asbestos, Dust

MPL Reference: 107962
Revision No: R 00

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Client Reference: Dust Analysis

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107962-1	107962-2	107962-3	107962-4	107962-5
Your Reference:	--	--	EAP266	EAP267	EAP268	EAP269	EAP270
Location:	--	--	Site 4	Site 3	Site 2	Site 1	Site 5
Date Sampled			15/12/10	15/12/10	15/12/10	15/12/10	15/12/10
Dust	mg/liter	0.1	73	49	73	44	39
Dust in Air	µg/m ³	0.1	47	31	46	28	25
Iron	µg/liter	20	730	350	1,400	660	470
Iron in Air	µg/m ³	0.01	0.47	0.22	0.91	0.42	0.30
Nickel	µg/liter	5	<5.0	<5.0	7.0	<5.0	<5.0
Nickel in Air	µg/m ³	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Lead	µg/liter	5	<5.0	<5.0	<5.0	<5.0	<5.0
Lead in Air	µg/m ³	0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Lithium	µg/liter	5	<5.0	<5.0	<5.0	<5.0	<5.0
Lithium in Air	µg/m ³	0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfur	µg/liter	50	1,100	960	980	1,000	1,000
Sulfur in Air	µg/m ³	0.03	0.89	0.61	0.62	0.66	0.63

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107962-6	107962-7	107962-8	107962-9	107962-10
Your Reference:	--	--	EAP271	EAP272	EAP273	EAP274	EAP275
Location:	--	--	Blank	Site 4	Site 3	Site 2	Site 1
Date Sampled			16/12/10	16/12/10	16/12/10	16/12/10	16/12/10
Dust	mg/liter	0.1	6.0	67	56	79	55
Dust in Air	µg/m ³	0.1	[NA]	43	36	50	35
Iron	µg/liter	20	190	[NA]	[NA]	[NA]	[NA]
Nickel	µg/liter	5	<5.0	[NA]	[NA]	[NA]	[NA]
Lead	µg/liter	5	<5.0	[NA]	[NA]	[NA]	[NA]
Lithium	µg/liter	5	<5.0	[NA]	[NA]	[NA]	[NA]
Sulfur	µg/liter	50	550	[NA]	[NA]	[NA]	[NA]

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107962-11	107962-12	107962-13	107962-14	107962-15
Your Reference:	--	--	EAP276	EAP277	EAP278	EAP279	EAP280
Location:	--	--	Site 5	Blank	Site 4	Site 3	Site 2
Date Sampled			16/12/10		17/12/10	17/12/10	17/12/10
Dust	mg/liter	0.1	48	6.0	56	39	64
Dust in Air	µg/m ³	0.1	31	[NA]	37	26	42

Metals in High Volume Filters							
Our Reference:	UNITS	PQL	107962-16	107962-17	107962-18	107962-19	107962-20
Your Reference:	--	--	EAP281	EAP282	EAP283	EAP284	EAP285
Location:	--	--	Site 1	Site 5	Blank	Site 4	Site 3
Date Sampled			17/12/10	17/12/10		18/12/10	18/12/10
Dust	mg/liter	0.1	53	38	6.1	39	27
Dust in Air	µg/m ³	0.1	35	25	[NA]	26	18
Iron	µg/liter	20	[NA]	[NA]	[NA]	950	490

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APPENDIX D LOADING RATES VERSUS DUST DOWNWIND OF BERTH 2 SHIP LOADER

