APPENDIX 6A

Air Quality Monitoring Results

Introduction

Appendix 6A summarises the monitoring data that was used to determine the air quality baseline conditions for the SD2 Project.

Air quality monitoring has been carried out for nitrogen dioxide (NO_2), sulphur dioxide (SO_2), benzene and total volatile organic compounds (VOCs) in and around Sangachal Terminal since 2003 using diffusion tubes. The air quality monitoring programme has used a total of 23 monitoring station locations throughout this time period.

From 2003 to 2007, air quality monitoring occurred at 13 locations (ST01-ST13). Post 2007, monitoring at stations ST01 to ST05 was discontinued and an additional 10 monitoring stations (AAQ14 – AAQ23) were established. Monitoring locations are presented in Figure 1.

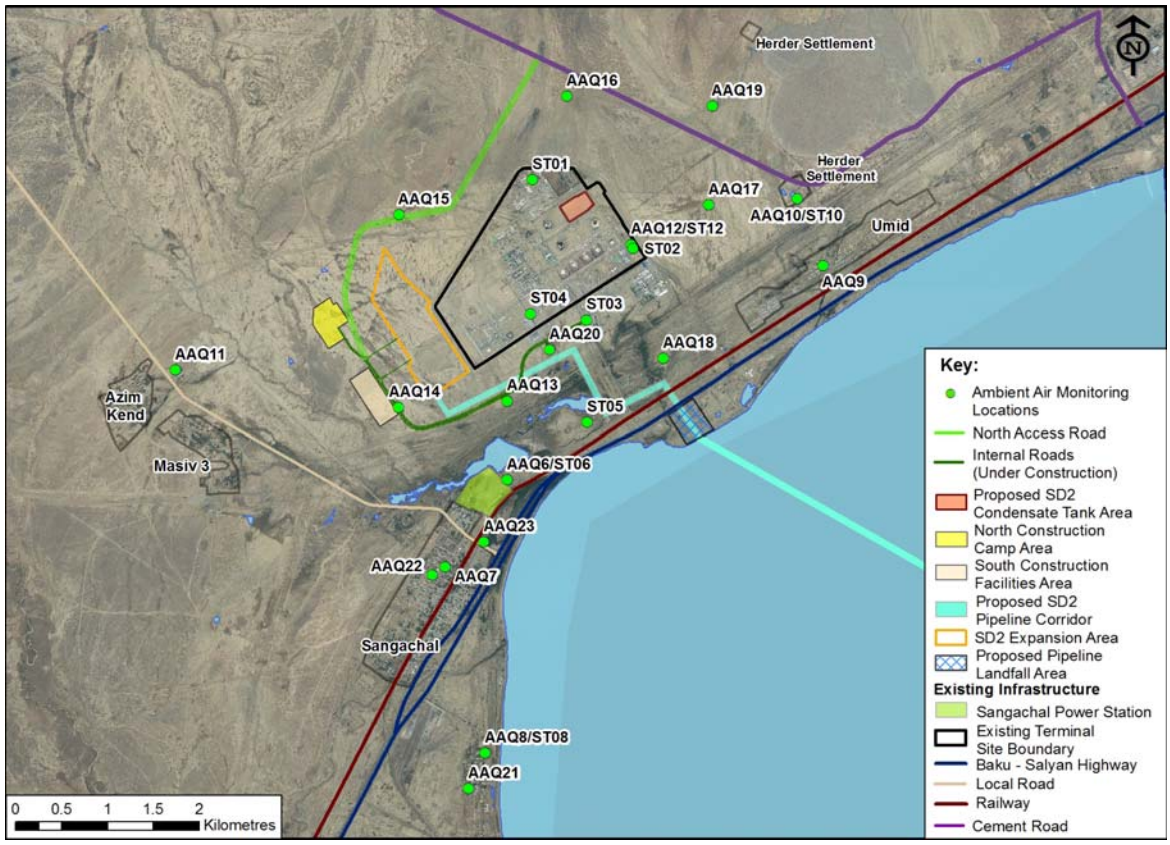
Data from 2007 included anomalously high data values for all pollutants. The reason for this is not known. In addition monitoring techniques have also changed throughout this period. As a result, data from 2008 to 2011 was used to establish the baseline air quality

Within the ESIA the monitoring stations have been divided into three groups:

- Background: locations upwind of the Terminal and away from local communities and major sources (e.g. the Power Station and Highway);
- Terminal: locations around the Terminal and the SD2 Expansion Area, predominantly downwind of the Terminal; and
- Receptors: locations within the local communities i.e. Sangachal, Azim Kend/Masiv 3 and Umid.

In addition an automatic monitoring station was established at location AAQ23. Monitoring results from the automatic station are also presented.

Figure 6A.1 Ambient Air Quality Monitoring Locations (2003 – 2011)



Nitrogen Dioxide (NO_2)

Table 6A-1 summarises the monitoring data collected for NO_2 between 2003 and 2011. The air quality monitoring stations have been divided into their respective groups.

Table 6A-1 NO_2 Monitoring Data ($\mu g/m^3$), 2003-2011

Group		Monitoring Station	Year								
			2003	2004	2005	2006	2007	2008	2009	2010	2011
Background		ST08/AAQ8	N/A	4.2	9.6	13.0	12.5	12.0	10.1	9.5	10.8
		ST10/AAQ10	9.3	4.7	7.9	12.0	7.9	15.1	9.0	10.2	8.8
		AAQ15	-	-	-	-	-	3.7	4.0	4.8	5.6
		AAQ16	-	-	-	-	3.4	3.2	3.8	3.9	6.1
		AAQ17	-	-	-	-	-	12.3	4.8	2.4	5.4
		AAQ19	-	-	-	-	-	6.2	4.9	4.6	5.6
		AAQ21	-	-	-	-	-	10.5	11.2	10.2	10.1
		Average	**9.3**	**4.5**	**8.8**	**12.5**	**9.0**	**6.8**	**6.5**	**7.5**	**9.3**
Receptors	Azim Kend	ST11/AAQ11	3.2	4.7	4.9	4.0	4.6	3.3	3.6	3.9	5.5
	Sangachal	ST07/AAQ7	N/A	4.7	10.2	13.0	86.0	6.2	11.7	12.3	11.4
		AAQ22						14.0	10.3	11.4	10.9
	Umid	ST09/AAQ9	N/A	6.0	7.4	11.0	10.8	9.6	7.8	8.7	10.4
		Average	**3.2**	**5.1**	**7.5**	**9.3**	**8.6**	**8.9**	**9.6**	**9.8**	**3.2**
Terminal		ST01	25.0	4.5	10.4	8.7	**-**	**-**	**-**	**-**	**-**
		ST02	23.0	4.7	9.4	14.0	**-**	**-**	**-**	**-**	**-**
		ST03	30.0	13.0	22.3	30.0	**-**	**-**	**-**	**-**	**-**
		ST04	29.0	4.3	18.0	18.0	**-**	**-**	**-**	**-**	**-**
		ST05	8.6	6.6	14.9	13.0	**-**	**-**	**-**	**-**	**-**
		ST06/AAQ6	8.0	5.8	9.8	14.0	-	11.4	14.0	13.5	14.0
		ST12/AAQ12	36.0	10.2	19.8	17.0	9.1	13.7	7.7	9.5	8.8
		AAQ13	-	-	-	-	17.5	9.3	19.1	12.0	
		AAQ14	-	-	-	-	9.4	4.2	3.9	6.3	6.9
		AAQ18	-	-	-	-	5.0	9.6	5.4	7.8	8.7
		AAQ20	-	-	-	-	-	11.3	5.5	9.2	8.1
		Average	**22.8**	**7.0**	**14.9**	**16.4**	**9.7**	**8.0**	**9.4**	**7.4**	**22.8**

Sulphur Dioxide (SO_2)

Table 6A-2 summarises the monitoring data collected for SO_2 between 2003 and 2011.

Table 6A-2 SO_2 Monitoring Data ($\mu g/m^3$), 2003-2011

Group		Monitoring Station	Year								
			2003	2004	2005	2006	2007	2008	2009	2010	2011
Background		ST08/AAQ8	N/A	19.2	25.9	3.7	11.2	1.7	3.3	5.2	10.0
		ST10/AAQ10	1.7	130	15.9	1.9	1.8	7.3	3.5	3.7	10.8
		AAQ15	-	-	-	-	-	N/A	1.4	0.8	5.4
		AAQ16	-	-	-	-	-	7.3	3.5	0.8	13.9
		AAQ17	-	-	-	-	-	N/A	0.8	2.1	1.0
		AAQ19	-	-	-	-	-	N/A	2.5	4.7	3.2
		AAQ21	-	-	-	-	-	N/A	70.8	5.3	1.7
		Average	**1.7**	**74.6**	**20.9**	**2.8**	**6.8**	**12.6**	**2.9**	**4.9**	**9.2**
Receptors	Azim Kend	ST11/AAQ11	1.7	12.5	37.7	2.7	13.4	12.5	1.8	21.6	6.5
	Sangachal	ST07/AAQ7	N/A	296.0	3.5	4.2	2.0	1.5	7.6	3.6	5.3
		AAQ22						n/a	2.8	0.8	5.7
	Umid	ST09/AAQ9	N/A	279.8	14.9	9.1	11.7	42.8	9.0	4.3	9.7
		Average	**1.7**	**196.1**	**18.7**	**5.3**	**9.0**	**12.4**	**4.7**	**8.0**	**6.2**
Terminal		ST01	1.6	8.45	18.1	10.2	-	-	-	-	-
		ST02	1.6	9.5	18.5	6.5	-	-	-	-	-
		ST03	1.6	21.1	11.3	29.6	-	-	-	-	-
		ST04	1.6	16	12.9	7.0	-	-	-	-	-
		ST05	1.7	26.6	49.5	2.8	-	-	-	-	-
		ST06/AAQ6	1.7	215	4.4	24.0	N/A	1.1	10.0	11.2	26.1
		ST12/AAQ12	1.6	17.5	5.2	20.0	3.0	1.0	8.5	4.7	N/A
		AAQ13	-	-	-	-	3.8	50.2	3.3	N/A	N/A
		AAQ14	-	-	-	-	1.8	0.9	2.3	5.3	N/A
		AAQ18	-	-	-	-	-	102.6	17.8	0.9	3.5
		AAQ20	-	-	-	-	-	N/A	2.0	2.1	11.5
		Average	**1.6**	**44.9**	**17.1**	**14.3**	**27.8**	**12.2**	**4.5**	**7.2**	**11.2**

Benzene

Table 6A-3 summarises the monitoring data collected for Benzene between 2003 and 2011.

Table 6A-3 Benzene Monitoring Data (μg/m^3), 2003-2011

Group		Monitoring Station	Year								
			2003	2004	2005	2006	2007	2008	2009	2010	2011
Background		ST08/AAQ8	N/A	1.0	1.5	1.3	1.2	0.9	2.1	3.4	1.4
		ST10/AAQ10	1.6	0.8	1.2	2.2	2.2	1.3	4.1	2.8	1.7
		AAQ15	-	-	-	-	N/A	0.7	3.1	2.3	2.2
		AAQ16	-	-	-	-	1.4	0.7	3.5	3.5	1.6
		AAQ17	-	-	-	-	-	N/A	2.6	1.8	2.0
		AAQ19	-	-	-	-	-	0.6	2.9	2.3	2.6
		AAQ21	-	-	-	-	-	1.6	2.5	2.3	1.4
		Average	**1.6**	**0.9**	**1.4**	**1.8**	**1.6**	**1.0**	**3.0**	**2.6**	**1.8**
Receptors	Azim Kend	ST11/AAQ11	1.4	0.7	1.2	1.2	1.4	1.6	2.2	2.4	0.9
	Sangachal	ST07/AAQ7	N/A	2.0	2.3	1.9	17.9	3	20.8	68.3	2.2
		AAQ22						1.4	4.4	4.7	2.0
	Umid	ST09/AAQ9	N/A	1.3	2.7	2	1.6	1.4	3.7	3.1	1.8
		Average	**1.4**	**1.4**	**2.1**	**1.7**	**7.0**	**1.9**	**8.7**	**23.0**	**1.8**
Terminal		ST01	1.4	0.7	1.3	1.2	-	-	-	-	-
		ST02	1.5	0.6	1.2	1.8	-	-	-	-	-
		ST03	1.8	1.4	1.4	1.7	-	-	-	-	-
		ST04	1.8	1.1	1.6	1.2	-	-	-	-	-
		ST05	2.1	3.3	1.2	1.5	-	-	-	-	-
		ST06/AAQ6	1.9	1.0	1.5	1.6	N/A	4.2	9.1	6.4	12.2
		ST12/AAQ12	1.7	1.0	1.4	1.3	1.5	1.1	3.7	3.8	4.0
		AAQ13	-	-	-	-	N/A	0.8	3.6	N/A	N/A
		AAQ14	-	-	-	-	4.7	0.6	3.3	2.7	N/A
		AAQ18	-	-	-	-	-	0.8	4.0	2.6	1.7
		AAQ20	-	-	-	-	-	1	8.0	4.0	2.1
		Average	**1.7**	**1.3**	**1.4**	**1.5**	**3.1**	**1.4**	**5.3**	**3.9**	**5.0**

Volatile Organic Compounds (VOCs)

Table 6A-4 summarises the monitoring data collected for VOCs between 2003 and 2011.

Table 6A-4 VOC Monitoring Data (μg/m^3), 2003-2011

Group		Monitoring Station	Year								
			2003	2004	2005	2006	2007	2008	2009	2010	2011
Background		ST08/AAQ8	N/A	47.0	32.0	81.0	53.5	23.0	69.0	69.6	67.3
		ST10/AAQ10	14.0	36.0	31.0	85.0	86.0	28.7	102.0	83.7	50.9
		AAQ15	-	-	-	-	N/A	29.0	56.0	36.9	119.5
		AAQ16	-	-	-	-	254.0	19.5	62.0	44.7	269.3
		AAQ17	-	-	-	-	N/A	N/A	46.0	41.3	74.9
		AAQ19	-	-	-	-	-	15.0	39.0	45.3	381.0
		AAQ21	-	-	-	-	-	99.0	95.0	85.6	66.3
		Average	**14.0**	**41.5**	**31.5**	**83.0**	**131.2**	**35.7**	**67.0**	**58.2**	**147.0**
Receptors	Azim Kend	ST11/AAQ11	5.3	49.3	24.0	86.0	62.5	29.3	45.0	67.9	37.5
	Sangachal	ST07/AAQ7	N/A	62.7	36.0	70.0	155.0	46.7	687.0	1858.3	78.6
		AAQ22						48.7	120.0	118.1	81.6
	Umid	ST09/AAQ9	N/A	51.3	41.0	63.0	179.5	21.7	93.0	71.6	59.3
		Average	**5.3**	**54.4**	**33.7**	**73.0**	**132.3**	**38.8**	**269.7**	**620.8**	**67.4**
Terminal		ST01	120.0	50.7	50.0	53.0	-	-	-	-	-
		ST02	18.0	46.0	33.0	69.0	-	-	-	-	-
		ST03	26.0	53.0	67.0	75.0	-	-	-	-	-
		ST04	34.0	55.3	55.0	77.0	-	-	-	-	-
		ST05	18.0	57.0	36.0	50.0	-	-	-	-	-
		ST06/AAQ6	11.0	65.5	27.0	60.0	N/A	115.3	297.0	208.6	444.4
		ST12/AAQ12	26.0	63.3	28.0	53.0	63.5	27	205.0	240.5	261.5
		AAQ13	-	-	-	-	83.5	27.7	132.0	73.0	N/A
		AAQ14	-	-	-	-	67.0	45.0	64.0	56.9	N/A
		AAQ18	-	-	-	-	132.0	24.7	128	64.9	74.4
		AAQ20	-	-	-	-	-	34.7	672.0	272.7	102.5
		Average	**36.1**	**55.8**	**42.3**	**62.4**	**86.5**	**45.7**	**249.7**	**152.8**	**220.7**

Automatic Monitoring Station

A real-time monitoring station located at AAQ23 measuring NO, NO2, NOx, SO2 and Particulates (PM10). The monitoring equipment is located inside a pump station and is close to the highway and the Sangachal Power Station. This area may be influenced by vehicle traffic and other industrial emissions. Frequent interruptions to the electrical supply have lead to equipment system failures over time. The station has been effectively non-operational since 2010. Table 6A-5 summarises the monitoring data collected from the monitoring station for PM_{10} in 2009 and 2010.

Table 6A-5 PM_{10} Concentrations 2009 and 2010 (µg/m^3)

Month	PM_{10} Concentrations (µg/m^3)	
	2009	2010
February	102	-
March	52	-
April	26	-
May	115	51
June	-	56
July	-	33
August	-	125
September	-	146
October	-	118
November	-	160
December	-	180
Average	74	109