ASHTON LONGWALL 4 – END OF PANEL SUMMARY REPORT

1 INTRODUCTION

This report has been prepared in conjunction with the SCT Operations Pty Ltd (SCT) Longwall 4 – End of Panel Subsidence Report and the Aquaterra Longwall 4 End of Panel Summary Report.
The combination of these reports were prepared to satisfy the requirements of the *Subsidence Management Plan Approval, Ashton Coal Longwall Panels 1-4, Clause 21*

End of Panel Report

21 Within 6 months of the completion of each longwall panel, an end of panel report must be prepared to the satisfaction of the Director Environmental Sustainability. The end of panel report must:

a) include a summary of the subsidence and environmental monitoring results for the applicable longwall panel;

b) include an analysis of these monitoring results against the relevant;

- impact assessment criteria;
- monitoring results from previous panels; and
- predictions in the SMP and EIS;

c) identify any trends in the monitoring results over the life of the activity; and

d) describe what actions were taken to ensure adequate management of any potential subsidence impacts due to longwall mining.

2 BACKGROUND

Longwall 4 began extraction on the 2 April 2009 and completed longwall mining on 15 October 2009. Longwall 4 was 2290m long, 205m wide and was mined without any unexpected impact to the surface environment or infrastructure above it.
The effects of subsidence were monitored in accordance with the ASHTON LONGWALLS 1-4 SUBSIDENCE MANAGEMENT PLAN; this included both regular survey monitoring and visual inspection of both land features and infrastructure.

3 Mine Subsidence

The Pikes Gully Seam section mined along the length of Longwalls 1 to 4 at Ashton Underground Mine. Mining height is nominally in the 2.5m to 2.6m range. The seam dips to the southwest at a grade of up to 1 in 10. Overburden ranges in thickness from 125m at the start of the longwall panel to 75m at the take off end. The final extraction void is nominally 216m. This includes the 5.5m width of development drivage either side of the longwall block. Chain pillars are 25m rib-to-rib at 100m cut-through centres.

Ashton's longwall mining operation commenced in February 2007. Since then 4 panels have been completed with the 5th currently being mined. Longwall 4 was completed in October 2009. The progress of longwall extraction is shown in **Figure 1.**

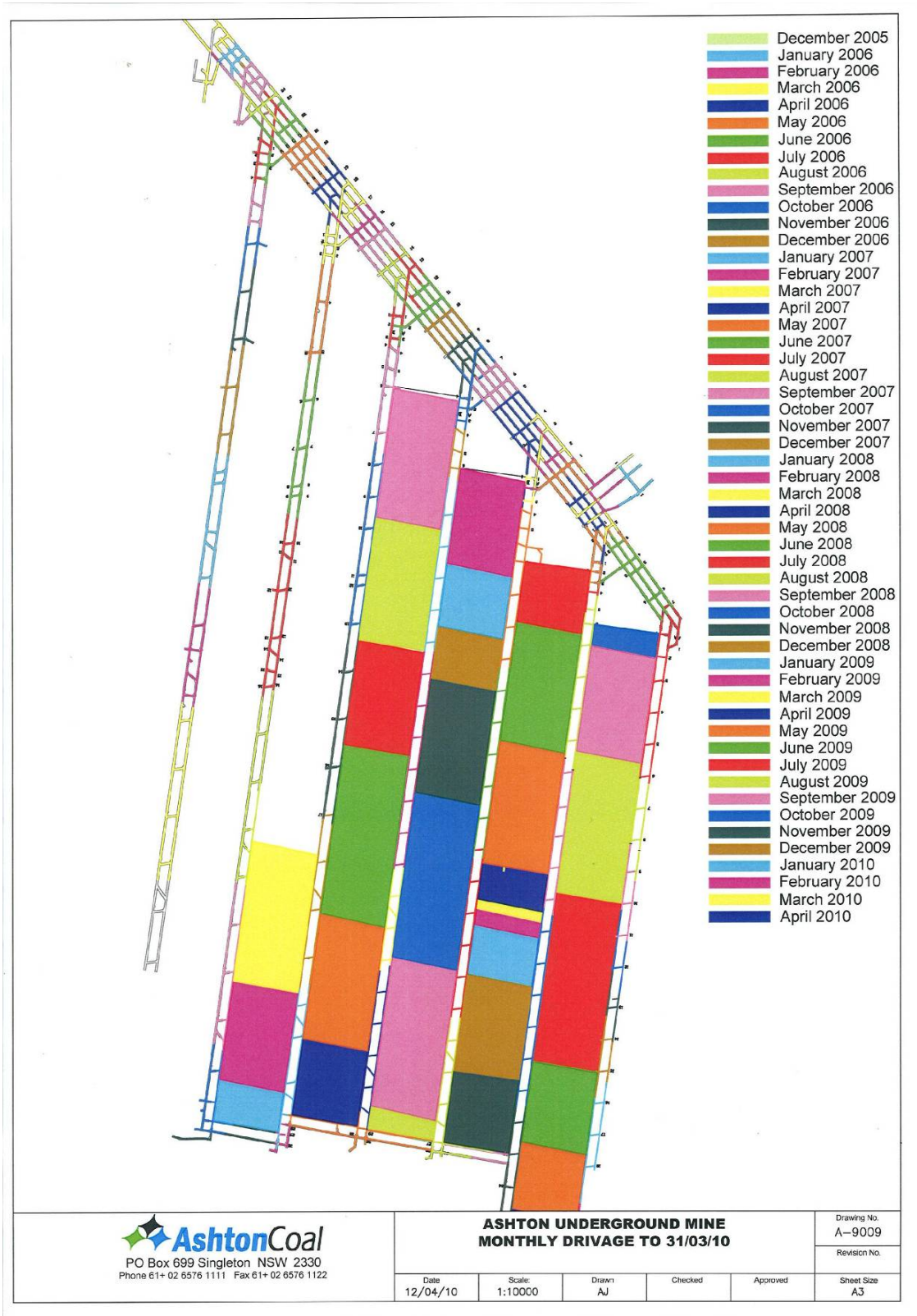

Figure 1: Progression of Longwall Extraction

4 MONITORING

Ashton Coal has monitored the subsidence movement on the surface during the extraction of Longwall's 1-4 using longitudinal subsidence lines. These are located over the start and finish of each panel and a main cross line extending over all three panels. Several other subsidence lines have been used to monitor the slope leading down to Glennies Creek, closure across the New England Highway, and subsidence across a dyke. These locations can be seen in **Figure 2.**

The following table outlines the maximum subsidence parameters recorded during regular survey of subsidence lines as the longwall passed each location.

Table 1: Subsidence of Mined Longwall Panels - Predicted vs. Actual (SCT End of Panel Subsidence Report, 2009)

	Maximum Predicted EIS	**Maximum Predicted SMP**	**Maximum Measured**			
North End of LW1			**CL2**	**XL8**		
Subsidence (mm)	1430	1800	1528	1500		
Tilt (mm/m)	122	244	100	103		
Horizontal Movement (mm)	-	>500	476	500		
Tensile Strain (mm/m)	16	73	40	15		
Compressive Strain (mm/m)	25	98	28	27		
Remainder of LW1			**CL1**	**XL5**		
Subsidence (mm)	1690	1700	1318	1436		
Tilt (mm/m)	60	141	60	75		
Horizontal Movement (mm)	-	300-500	480	503		
Tensile Strain (mm/m)	8	42	49	17		
Compressive Strain (mm/m)	12	56	23	24		
Longwall 2			**CL1**	**CL2**	**XL5**	
Subsidence (mm)	1690	1600	1296	1513	1266	
Tilt (mm/m)	91	102	40	82	78	
Horizontal Movement (mm)	-	300-500	440	298	390	
Tensile Strain (mm/m)	12	30	17	16	11	
Compressive Strain (mm/m)	18	41	16	32	28	
Longwall 3			**CL1**	**CL2**	**XL5**	
Subsidence (mm)	1500	1600	1420	1354	1429	
Tilt (mm/m)	65	78	41	48	97	
Horizontal Movement (mm)	-	300-500	463	345	394	
Tensile Strain (mm/m)	9	23	10	17	22	
Compressive Strain (mm/m)	13	31	7	18	24	
Longwall 4			**CL1**	**CL2**	**XL5**	**XL10**
Subsidence (mm)	1430	1600	1397	1194	1546	1263
Tilt (mm/m)	46	78	36	40	53	33
Horizontal Movement (mm)	-	300-500	230	560	360	258[1]
Tensile Strain (mm/m)	6	23	10	18	9	6
Compressive Strain (mm/m)	9	31	9	67	9	10

Subsidence monitoring over longwall 4 consisted of regular survey of centreline 1 (CL), centreline 2 (CL2), cross line 5 (XL5) and cross line 10 (XL10). The results of this have been maintained per monitoring document 05/1688 *Ashton Mine Subsidence Monitoring Programme Longwall 4.* This information was supplied to the Principal Subsidence Engineer.

Visual and survey monitoring of the existing 2 pole 132kV power structure over Longwall 4 was undertaken regularly. **Appendix 1**, **Figure 10** shows the 2 pole structure in relation to the Longwall 4 dams. The survey data was recorded and again supplied to the Principal Subsidence Engineer as per the *Ashton Mine Subsidence Monitoring Programme Longwall 4.* The effects of subsidence on this structure can be seen in **Appendix 2**.

The 2 pole 132kV power structure over Longwall 5 was replaced by a 3 pole structure prior to mining. The new poles were continuously maintained by survey methods. Monitoring results of this will be discussed further in the LW5 End of Production Report.

Figure 2: Plan location of Monitoring Cross Lines. Also shown is the 132kV power line and longwall 4 dams.

Aboriginal Heritage

In December 2007 Ashton Coal received a Heritage Impact Permit under *Section 90* of the *NPW Act 1974* for the area above Longwalls 1-4. This application was made in June 2007. The permit application was submitted with a detailed management plan that aimed to show the locations of artefacts and a plan detailing possible conservation and management of these artefacts. This included managing remediation and only collecting the artefact where necessary in order to preserve it. While preservation is the ongoing aim of ACOL, due to the nature of subsidence impacts and the potential for emergency remediation works being required due to safety related issues the submission was for a blanket S90 over the entire UG area.

The management plan was developed in conjunction with relevant community groups, Ashton Coal and Angela Besant of Insite Heritage. The plan will be revised post mining of each seam. This will involve consultation with all parties and any subsequent adjustments made to the management plan will be lodged with the DECCW. The plan aims to minimise impact on Aboriginal relics and the integrity of sites while retaining the maximum possible site/s in situ.

The implementation of the management plan is considered to have been effective to date. The process of assessing the potential impacts on artefact sites based on predictions of crack locations has been positive. The result has been the disturbance of one artefact during the mining of Longwall 1. No Artefacts were required to be disturbed during mining of Longwall 2, Longwall 3 or Longwall 4. The Oxbow site was undermined by Longwall 4. This site is fenced in with authorised access only. Should any required remediation in this area be necessary it will not be done due to the sensitivity of this site. Ongoing visual monitoring of crack positions has shown little impact from cracking at other sites. Because of this the need for destructive remediation measures has not been required at these other sites.

5 Subsidence Impacts

Surface subsidence cracks have developed along each edge of the Longwall panels. These run along the projected gateroad edge. Cracks are particularly evident on the up hill side of each panel. In most places, these cracks have been rehabilitated by ripping the surface to reduce surface water ingress and reduce the risk of injury to stock. **Figures 8 and 9** in **Appendix 1** show an example of access road surface cracking and the access road once repaired. The repaired access road is highlighted in brown in **Figure 3**. Cracks through the Voluntary Conservation Area above Longwall 1 were rehabilitated using a small excavator and skid steer loader. Cracked areas in open fields were remediated using a D6 dozer with ripping tines. The extent of subsidence remediation at the goaf edge is outlined in **Figure 3** with the result of ripping being shown in **Figure 5**. Other remediation works were done using a motor grader. This was primarily tasked with access road repairs.

Initial caving over the start of Longwall 4 was typical of the caving behaviour observed elsewhere and consistent with predicted subsidence behaviour. **Appendix 1**, **Figures 6 and 7** show the cracking which has developed over the Longwall 4 start line. Little remediation has been done on these cracks and they remain open for remediation in the future. The timing of this will follow archaeological work which must first be done in the area.

The Access Road was cracked during mining. A diversion was put in place during the impact period until the road was repaired. Remediation occurred frequently using a grader. Diversions were also put into place while any road was being undermined. This was the case for all roads bar the single access road. The single access road required a grader to be permanently on site during mining so that any cracks could be repaired thus allowing the road to remain open and serviceable. This occurred from chainage 590 to 20m. All stakeholders were informed of road closures before undermining occurred.

Small farm dams in areas of shallow cover were dewatered before the longwall passed beneath and following subsequent rain events were observed to refill and hold water. The dam above Longwall 4 had observed cracking in the wall however still holds some water. The dam wall will require some remediation in the future. Ponding over Longwall 3 (at chainage 530m) has been left as a water storage area. Because of its size and tendency to fill after rain events repair will not occur.

No buried cables were disturbed by undermining or repair work of Longwall 4 subsidence cracks. This included 11kV power lines and Telstra cables.

A small farm shed was undermined at chainage 510m. This had no visible subsidence damage. Mining progressed adjacent to a house in the paddock. The 'Blue House' had no structural signs of damage with cracks developing just outside the house yard. A subsidence hole (**Appendix 1, Figure 4**) in front of this house will require repair when the start line is being ripped and remediated. This house was evacuated prior to the area in front of it being undermined.

In general, the maximum subsidence movements detected were less than those predicted. There is no indication of any significant lateral movement of the steep slope adjacent Glennies Creek or of the New England Highway cutting. Horizontal movement had no predicted value as XL10 was installed post mining of Longwall 3. When horizontal movement is compared to previous longwall panels generally speaking it was less than those predicted values.

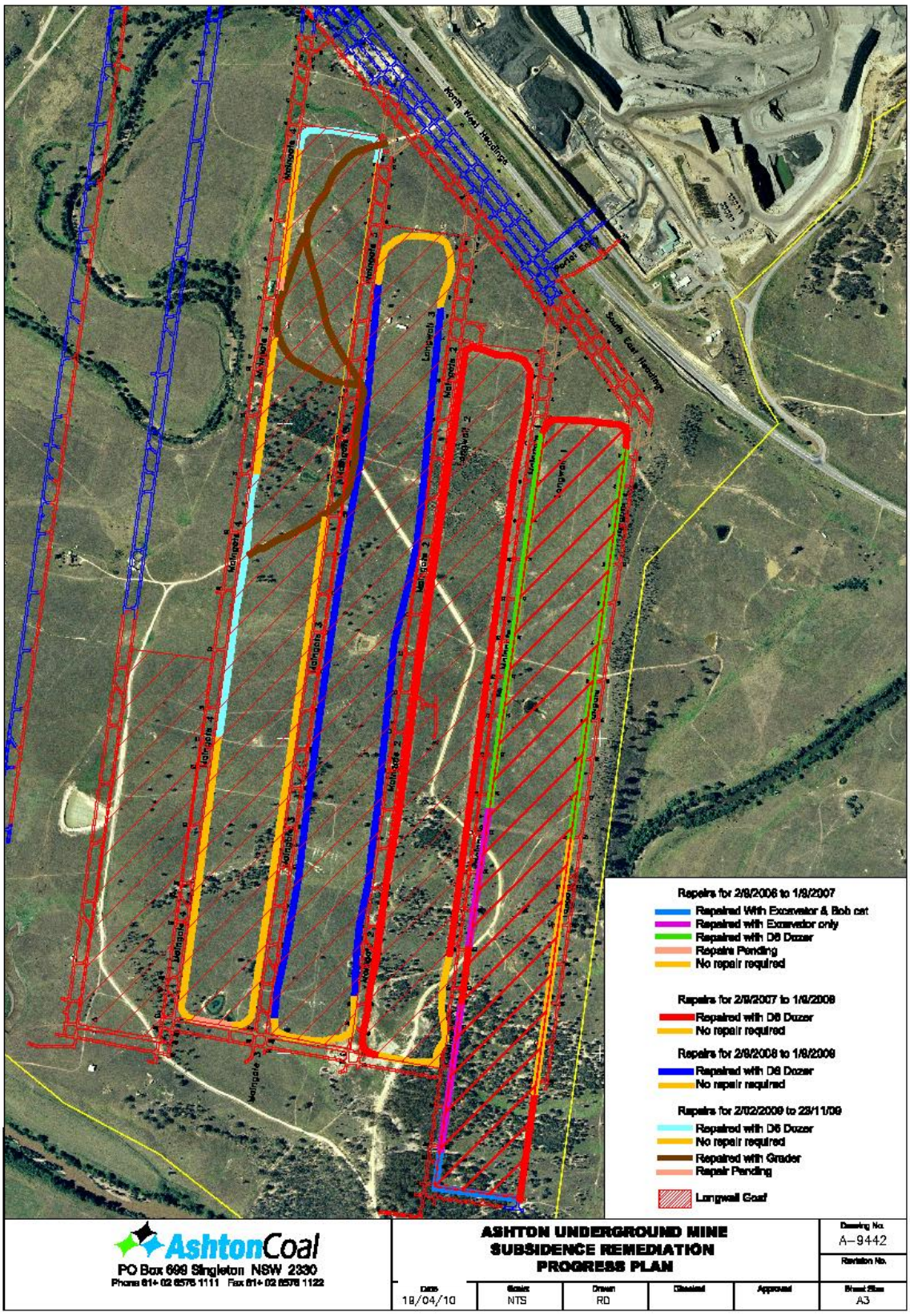

Figure 3: Subsidence remediation progress.

Appendix 1:

Figure 4: Subsidence in front of Blue House (Chainage 420m)

Figure 5: Subsidence Remediation looking south-south west from 23/11/09

Figure 6: Start line crack in drained dam. This has formed under a tree positioned in the side of the dam wall.

Figure 7: Start line crack continuing up towards dam wall (Background) from under tree. Crack starts from LW4 CL1.

Figure 8: Cracks in the access road which required grading.

Figure 9: Access road post repairs.

Figure 10: 2 pole power line and Dam

Appendix 2:

Table 2: Ashton Coal Underground Survey Monitoring of 2 pole 132kV Power line.

AshtonCoal — **Ashton Underground - 132kV LW5 SET8 Power Pole Monitoring**

	Original	1:00:00 PM 2/4/2008	
Point	East	North	R.L.
SET8BASE1	318090.0960	6404278.3150	65.7650
SET8BASE2	318093.2430	6404281.5400	65.8660
SET8TOP1	318089.9150	6404278.2430	79.3440
SET8TOP2	318093.3090	6404281.9200	79.3060
Direction of Longwall Extrac	**8.04 16**	(hms)	

LW5 Ch of Poles **1178**

	Test-01	10:00:00 AM 16/4/2008		Incremental δ						m/day	Total δ						m/day
	East	North	R.L.	δEast	δNorth	δR.L.	Hr	Bearing	Distance	Velocity	δEast	δNorth	δR.L.	Hr	Bearing	Distance	Velocity
SET8BASE1	318090.0980	6404278.3150	65.7660	0.002	0.000	0.001	#	**90.00 00**	**0.002**	0.0001	0.002	0.000	0.001	#	**90.00 00**	**0.002**	0.0001
SET8BASE2	318093.2460	6404281.5410	65.8670	0.003	0.001	0.001	#	**71.33 54**	**0.003**	0.0002	0.003	0.001	0.001	#	**71.33 54**	**0.003**	0.0002
SET8TOP1	318089.9150	6404278.2530	79.3430	0.000	0.010	-0.001	#	**0.00 00**	**0.010**	0.0007	0.000	0.010	-0.001	#	**0.00 00**	**0.010**	0.0007
SET8TOP2	318093.3080	6404281.9310	79.3060	-0.001	0.011	0.000	#	**354.48 20**	**0.011**	0.0008	-0.001	0.011	0.000	#	**354.48 20**	**0.011**	0.0008
	Test-02	10:00:00 AM 21/4/2008		**Incremental δ**						**m/day**	**Total δ**						**m/day**
	East	**North**	**R.L.**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**
SET8BASE1	318090.1020	6404278.3070	65.7660	0.004	-0.008	0.000	#	**153.26 06**	**0.009**	0.0018	0.006	-0.008	0.001	#	**143.07 48**	**0.010**	0.0005
SET8BASE2	318093.2490	6404281.5310	65.8670	0.003	-0.010	0.000	#	**163.18 03**	**0.010**	0.0021	0.006	-0.009	0.001	#	**146.18 36**	**0.011**	0.0006
SET8TOP1	318089.9160	6404278.2490	79.3440	0.001	-0.004	0.001	#	**165.57 50**	**0.004**	0.0008	0.001	0.006	0.000	#	**9.27 44**	**0.006**	0.0003
SET8TOP2	318093.3080	6404281.9300	79.3070	0.000	-0.001	0.001	#	**180.00 00**	**0.001**	0.0002	-0.001	0.010	0.001	#	**354.17 22**	**0.010**	0.0005
	Test-03	4:00:00 PM 23/4/2008		**Incremental δ**						**m/day**	**Total δ**						**m/day**
	East	**North**	**R.L.**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**
SET8BASE1	318090.0970	6404278.3120	65.7640	-0.005	0.005	-0.002	#	**314.59 60**	**0.007**	0.0031	0.001	-0.003	-0.001	#	**161.33 54**	**0.003**	0.0001
SET8BASE2	318093.2440	6404281.5360	65.8650	-0.005	0.005	-0.002	#	**314.59 60**	**0.007**	0.0031	0.001	-0.004	-0.001	#	**165.57 50**	**0.004**	0.0002
SET8TOP1	318089.9150	6404278.2340	79.3440	-0.001	-0.015	0.000	#	**183.48 51**	**0.015**	0.0067	0.000	-0.009	0.000	#	**180.00 00**	**0.009**	0.0004
SET8TOP2	318093.3080	6404281.9140	79.3060	0.000	-0.016	-0.001	#	**180.00 00**	**0.016**	0.0071	-0.001	-0.006	0.000	#	**189.27 44**	**0.006**	0.0003
	Test-04	3:00:00 PM 28/4/2008		**Incremental δ**						**m/day**	**Total δ**						**m/day**
	East	**North**	**R.L.**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**
SET8BASE1	318090.1030	6404278.3080	65.7600	0.006	-0.004	-0.004	#	**123.41 24**	**0.007**	0.0015	0.007	-0.007	-0.005	#	**135.00 00**	**0.010**	0.0004
SET8BASE2	318093.2500	6404281.5340	65.8610	0.006	-0.002	-0.004	#	**108.26 06**	**0.006**	0.0013	0.007	-0.006	-0.005	#	**130.36 05**	**0.009**	0.0004
SET8TOP1	318089.9310	6404278.2670	79.3390	0.016	0.033	-0.005	#	**25.51 59**	**0.037**	0.0074	0.016	0.024	-0.005	#	**33.41 24**	**0.029**	0.0011
SET8TOP2	318093.3220	6404281.9430	79.3030	0.014	0.029	-0.003	#	**25.46 10**	**0.032**	0.0065	0.013	0.023	-0.003	#	**29.28 33**	**0.026**	0.0010
	Test-05	2:00:00 PM 5/5/2009		**Incremental δ**						**m/day**	**Total δ**						**m/day**
	East	**North**	**R.L.**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**
SET8BASE1	318090.1069	6404278.3142	65.7529	0.004	0.006	-0.007	#	**32.10 16**	**0.007**	0.0000	0.011	-0.001	-0.012	#	**94.11 52**	**0.011**	0.0000
SET8BASE2	318093.2549	6404281.5396	65.8534	0.005	0.006	-0.008	#	**41.11 09**	**0.007**	0.0000	0.012	0.000	-0.013	#	**91.55 31**	**0.012**	0.0000
SET8TOP1	318089.9273	6404278.2706	79.3336	-0.004	0.004	-0.005	#	**314.12 55**	**0.005**	0.0000	0.012	0.028	-0.010	#	**24.01 13**	**0.030**	0.0001
SET8TOP2	318093.3214	6404281.9492	79.2951	-0.001	0.006	-0.008	#	**354.28 21**	**0.006**	0.0000	0.012	0.029	-0.011	#	**23.00 32**	**0.032**	0.0001
	Test-06	2:00:00 PM 14/9/2009		**Incremental δ**						**m/day**	**Total δ**						**m/day**
	East	**North**	**R.L.**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**	**δEast**	**δNorth**	**δR.L.**	**Hr**	**Bearing**	**Distance**	**Velocity**
SET8BASE1	318090.1170	6404278.3270	65.7500	0.010	0.013	-0.003	#	**38.16 32**	**0.016**	0.0001	0.021	0.012	-0.015	#	**60.15 18**	**0.024**	0.0000
SET8BASE2	318093.2670	6404281.5540	65.8510	0.012	0.014	-0.002	#	**40.02 23**	**0.019**	0.0001	0.024	0.014	-0.015	#	**59.44 37**	**0.028**	0.0001
SET8TOP1	318089.9530	6404278.2820	79.3260	0.026	0.011	-0.008	#	**66.04 44**	**0.028**	0.0002	0.038	0.039	-0.018	#	**44.15 21**	**0.054**	0.0001
SET8TOP2	318093.3630	6404281.9510	79.2850	0.042	0.002	-0.010	#	**87.31 21**	**0.042**	0.0003	0.054	0.031	-0.021	#	**60.08 28**	**0.062**	0.0001