BHP Billiton Olympic Dam

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LM1 ANNUAL REPORT

August 2012

BHP Billiton Olympic Dam Corporation Pty Ltd

Uranium CSG

ABN 99 007 835 761

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OLYMPIC DAM

LM1 ANNUAL REPORT

August 2012

DISTRIBUTION

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Table of Contents

List of Figures

List of Tables

1 Introduction

This document is the LM1 report on radiation protection for BHP Billiton Olympic Dam. As required under the terms of the licence LM1, granted on September 28 1988 under the Radiation Protection and Control Act 1982 to mine and treat uranium bearing ores, the following information is included in this document:

- Plans of mine workings showing all existing workings and facilities for ventilation of the mine as of 30 June 2012;

- Indications of areas in which new mine development is planned and of areas from which ore extraction is planned for the period to 30 June 2013;

- Details of significant changes in processing plant layout, major equipment, or mill process during the twelve months ending 30 June 2012; and

- Estimates of quantities of radioactive wastes produced at Olympic Dam during the twelve months ending 30 June 2012.

A separate annual report containing employee radiation dose assessments, dose calculation methodologies, dose parameters and dose conversion factors for the period 1 July 2011 to 30 June 2012 will be submitted to the Radiation Protection Branch of the SA EPA in October 2012.

2 Mine workings during FY12

2.1 Mining methods

2.1.1 Current Mining Method

Sub-level open stoping has been the mining method of choice at Olympic Dam since the commencement of operations in 1988. Once the stopes are mined out they are backfilled with either unconsolidated rock fill or a mixture of aggregate and binder as Cemented Aggregate Fill (CAF). The nature of the backfill material is based on future requirements of the fill mass. Where the operation plans to expose walls or backs in the future, CAF will be selected to backfill the stope. Conversely, if the fill mass is not going to be exposed at a later date, then the stope will be filled using rock fill.

In cycle fibrecrete (shotcrete containing steel fibres) is a part of the mining cycle which provides a greater level of surface support for developing drives and rehabilitation sites.

2.1.2 Stope Size and Shape

The current stope design contains stopes of various shapes and sizes. Footprints vary from 20m by 20m to 30m by 30m. Stope height is designed as much as possible to encompass the full extent of the ore. Current stope heights generally vary from 1 to 5 lifts high (~60m to ~300m). Consequently, stope tonnages can vary from under 100,000t to in excess of 500,000t.

2.1.3 Extraction Sequence

The initial stope extraction sequence at Olympic Dam is defined as 'Primary-Secondary-Tertiary' (P/S/T). The extraction sequence was modified in 2005 to a pillarless sequence known as 'Mining Fronts'.

The Mining Fronts extraction sequence minimises re-work caused by the need to re-access areas over time (i.e. for rehabilitation work, ventilation controls, etc.). This sequence also minimises dilution caused by CAF falling from a primary into a secondary stope and minimises ore losses caused by primary stope CAF shadowing secondary stope ore. Furthermore, the Mining Fronts sequence minimises any future impact of stress increase or decrease on the rock mass behaviour, thus maximising ore recovery. No remnant pillars need to be recovered in a Mining Front scenario and the operator retains the ability to close off areas upon completion of the stope extraction. Mining Fronts also provides the opportunity for consistent and systematic designs, increased predictability, reliability and sustainability of the mining plan, and minimises potential for ore loss.

2.1.4 Backfill Requirements

The permanent (existing) plant produces CAF via a pug mill and utilises neutralised tailing sands, whilst the temporary plant produces CAF via a large agitator-mixing bowl and utilises quarry fines as the sand medium. Both plants are operated by BHP Billiton and a contractor delivers the CAF to surface boreholes using semi-trailer bottom dump trucks. Binders (cement, fly ash and lime) are added to the CAF mixture according to strength requirements and are sourced externally. Crushed dolomite/limestone aggregate is sourced from an onsite quarry. Water comprises both recycled process water and local saline water.

2.2 Mine development and Production during FY12

The actual production, backfill and raise drilling schedules for FY12 are described in Tables 1 - 4.

Table 1 – Actual Production Schedule FY12

Stope	Mine Area	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Orange111	DCN1	■											
Cyan159	FN2	■											
Olive155	Whenan	■											
Brown224	F2	■											
Purple225	F2	■											
Purple238	F3	■											
Purple258	FN4	■	■										
Cyan127	FN3		■										
Blue148	DCN1	■	■										
Green114	Whenan	■	■										
Jade119	DC2	■	■	■									
Cyan359	FN2	■	■	■	■								
Orange148	DSE2	■	■	■	■								
Scarlet144	DC2	■	■	■	■								
Scarlet154	DSE3	■	■	■	■	■							
Purple246	F2	■	■	■	■	■							
Blue104	DSE1	■	■	■	■	■	■						
Amber448	FN1	■	■	■	■	■	■						
Scarlet128	DC2	■	■	■	■	■	■						
Cyan106	FN2	■	■	■	■	■	■	■					
Orange103	DCN1	■	■	■	■	■	■	■	■				
Purple252	F1	■	■	■	■	■	■	■	■	■			
Amber322	FN1	■	■	■	■	■	■	■	■	■			
Scarlet120	DSE1	■	■	■	■	■	■	■	■		■	■	■
Scarlet159	DSE3		■	■	■	■	■	■	■	■	■		
Scarlet139	DSE1		■	■	■	■	■	■	■	■	■	■	■
Scarlet151	DSE3			■	■	■	■	■	■	■	■		
Green106	Whenan				■	■	■	■	■	■	■	■	■
Blue110	DC2					■	■	■	■	■			
Purple219	F2					■	■	■	■	■			
Orange114	DCN1					■	■	■	■	■	■	■	■
Purple453	F1					■	■	■	■	■	■	■	■
Yellow10	Whenan						■	■	■	■			
Olive113	Whenan						■	■	■	■	■		
Olive169	DSE2						■	■	■	■	■	■	■
Brown203	F1							■	■	■	■		
Cyan144	FN3							■	■	■	■	■	■
Jade116	DSE2							■	■	■	■		■
Purple244	F1							■	■	■	■	■	■
Orange109	DCN1								■	■		■	
Orange104	DCN1								■	■	■	■	■
Brown219	F2									■	■	■	
Green115	Whenan									■	■	■	■
Purple263	FN4									■	■	■	■
Purple255	F1									■	■	■	■
Olive153	Whenan										■	■	■
Orange552	DCN2										■	■	■
Cyan113	FN4										■	■	■
Cyan149	FN3											■	■
Olive102	DCN2											■	■
Amber329	FN1											■	■
Yellow417	DC2											■	■
Blue156	DC2												■
Purple202	DCN1												■

Table 2 – Actual Backfill Schedule FY12

Stope	Fill Type	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
Scarlet152	CAF	■	■				■						
Cyan475	CAF	■											
Orange107	CAF	■		■	■								
Purple265	CAF	■											
Cyan326	CAF	■											
Scarlet157	CAF	■	■										
Olive107	CAF	■											
Amber521	CAF	■	■										
Amber521	URF	■	■										
Blue127	CAF	■											
Blue127	URF	■											
Cyan017	CAF	■											
Olive155	CAF	■	■										
Orange111	CAF	■	■	■	■			■	■	■	■		
Pink116	CAF	■	■	■									
Cyan477	URF		■										
Pink116	URF		■	■									
Pink109	CAF		■		■								
Pink109	URF		■	■									
Purple258	CAF		■	■	■	■							
Blue148	CAF		■	■	■	■	■						
Cyan477	SRF			■									
Cyan159	URF			■	■	■	■						
Pink109	SRF			■	■								
Cyan127	CAF			■	■	■	■						
Cyan140	CAF				■	■							
Cyan477	CAF				■	■							
Green114	CAF				■	■	■	■					
Brown224	URF				■	■							
Purple225	CAF				■		■	■	■	■			■
Blue142	CAF				■	■		■	■	■			
Blue101	CAF				■	■	■	■	■	■	■	■	■
Purple225	URF					■	■	■	■	■			
Scarlet144	CAF					■	■	■	■			■	
Blue148	URF						■	■					
Jade119	CAF						■	■	■	■			
Scarlet154	CAF						■	■	■	■	■		
Brown224	CAF						■	■	■	■		■	
Cyan359	URF						■	■	■				
Purple246	CAF						■	■	■	■	■		
Cyan159	SRF							■					
Scarlet128	CAF							■	■	■	■	■	■
Blue104	CAF							■	■	■	■	■	■
Cyan159	CAF								■	■			
Cyan106	CAF								■	■	■		
Cyan106	SRF								■				
Amber448	CAF								■	■	■	■	■
Purple238	URF									■	■		■
Orange148	CAF									■	■	■	■
Orange148	URF									■	■	■	■
Cyan359	CAF										■		■
Orange103	CAF										■		■
Purple219	URF										■	■	■
Yellow10	CAF											■	■
Orange103	URF											■	
Amber322	CAF											■	■
Purple252	CAF											■	■
Blue110	CAF												■
Blue110	URF												■
Scarlet159	CAF												■
Olive113	CAF												■

Table 3 – Actual Raise Drilling Schedule FY12

Description	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
39 Blue 110 Backfill UGR	■											
46 Orange 103 Slot Raise	■											
35 Orange 109 UGR Fill Raise	■											
45 Scarlet 159 Slot Raise	■	■										
45 Scarlet 151 Slot Raise	■	■										
26 Blue 110 Backfill UGR	■	■	■									
34 Cyan 127 Transfer	■	■										
52 Purple 219 Slot Raise		■										
29 Blue 142 Backfill UGR		■	■									
39 Green 106 Slot Raise		■	■									
42 Orange 114 Slot Raise		■	■	■								
RB8 EXT Raise			■	■								
27 Green 106 Slot Raise			■	■								
26 Olive 113 Slot Raise			■	■								
26 Jade 119 Transfer Raise				■	■							
46 Purple 219 Backfill Raise				■	■							
41 Purple 244 Slot Raise				■	■							
45 Olive 169 Slot Raise				■	■							
27 Cyan 144 Slot Raise					■							
30 Orange 104 Slot Raise					■							
39 Olive 169 Slot Raise					■							
41 Brown 203 Slot Pilot					■	■						
27 Amber 329 Slot Raise						■			■	■		
26 Olive 169 Backfill Raise						■						
46 Orange 104 Slot Raise					■	■	■					
37 Brown 203 Slot Raise						■						
31 Yellow 417 Slot Raise						■	■					
51 Orange 109 Slot Raise						■						
45 Olive 191 VENT RAISE(F)							■					
36 Orange 104 Slot Raise							■					
52 Purple 255 Slot Raise							■					
36NH54 Exhaust Raise												
41 Cyan 113 Slot Raise							■	■				
36 Purple 263 Slot Raise							■	■				
34 Green 115 Slot Raise								■				
35 Brown 219 Slot Raise								■				
30 Orange 148 Backfill Raise								■	■			
36 RB35 Extension - UGR1335								■	■			
46 OR109 SLOT Raise								■	■			
52 Cyan 149 Slot Raise									■			
26 Olive 153 Slot Raise									■	■		
RB4 EXT Raise									■			
36 Orange 103 Backfill Transfer Hole									■	■		
42 Orange 552 Slot Raise									■	■		
39 OLIVE 102 Slot Raise										■		
26 Purple 202 Slot Raise										■		
34 Cyan 113 Backfill Transfer Raise										■		
54 Crusher Exhaust Raise (Clark Direct Tip)										■	■	
26 Olive 135 Slot Raise										■	■	
39 Blue 156 Slot Raise										■	■	
26 Blue 156 Vent Raise										■	■	
46 Cyan 149 Backfill Transfer Raise											■	
52 Scarlet 146 Slot Raise											■	
36 Blue 156 Slot Raise											■	
29 Yellow 424 Backfill Raise											■	
39 Green 101 Slot Raise											■	■
32 Olive 135 Vent Raise											■	■
39 Scarlet 145 Slot Raise												■
42 CDT VENT RAISE (Clark Direct Tip)												■
27 Cyan 156 Slot Raise												■
45 Scarlet 146 Slot Raise												■
39 Olive 191 Slot Raise												■
37 Jade 116 Backfill Raise												■

Table 4 – Actual Raise Bore Schedule FY12

Description	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12
RB35 RAISE - Reaming	■	■										

2.2.1 Mine Ventilation

The mine ventilation system is shown in the plan ODM-VNT-036-2011. Total air in circulation as of 31st July 2012 was 4737 m^3/s, an increase of approximately 500 m^3/s from the previous year. A list of the air intake and exhaust shafts is shown in Table 5.

Table 5 – Intake and Exhaust Shafts

INTAKES	EXHAUST SHAFTS
RB5	RB1
RB11	RB2
RB13	RB3
RB14	RB4
RB18	RB6
RB22	RB7
RB23	RB8
RB26	RB9
RB27	RB10
RB28	RB12
RB31	RB15
RB32	RB16
Robinson Shaft	RB17
Clark Shaft	RB19
Whenan Shaft	RB20
Surface Decline	RB21
A-North Decline	RB24
	RB29
	RB30
	RB33
	RB34
	RB35

2.2.2 Financial Year 2012 - Changes to Primary Ventilation Circuit

RB33 and RB35 have been commissioned during FY12. RB33 is to assist the rail level and RB35 is for the violet area. A-North decline was completed to service the violets areas and to assist the mine with an additional intake airway. RB2 has been upgraded to run at a higher pressure to help ventilate Whenan crusher and grizzlies area. RB8 has also been upgraded to assist the olives area in particular 39 MacMahon's workshop and CV002 Whenan conveyor incline.

3 Planned Mine Development for FY13

Mine development will occur in those areas as outlined in the OM3 mine plan series and also shown in the overview plan ODM-ADM-250. The approximate scheduling of major Mine activities can be seen in Tables 6 - 9. Programming of the work may change with operational requirements. New stopes will be developed and brought on line as existing stopes are depleted. All stopes currently planned for FY13 are in the B, C, DC, DNW, DSE, F and FN mine areas.

Table 6 – Production Schedule FY13

Stope	Mine Area	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
Scarlet120	DSE	■											
Purple244	F	■											
Purple263	F	■											
Purple255	F	■	■										
Cyan149	FN	■	■										
Orange109	DNW	■	■	■									
Orange552	DCN	■	■	■									
Blue156	DC	■	■	■	■								
Cyan113	FN	■	■	■	■								
Purple202	DNW	■	■	■	■	■							
Olive102	C	■	■	■	■	■							
Cyan156	FN	■	■	■	■	■							
Amber329	FN	■	■	■	■	■	■						
Yellow417	B	■	■	■	■	■	■						
Olive153	C	■	■			■	■	■					
Orange104	DNW	■	■	■	■	■	■	■	■	■	■		
Yellow424	B		■			■	■	■	■	■			
Scarlet145	DSE			■	■	■	■	■					
Green101	DNW			■	■	■	■	■					
Brown223	F			■	■	■	■	■					
Scarlet146	DSE			■	■	■	■	■					
Purple493	F			■	■	■	■	■	■				
Olive191	C			■	■	■	■	■	■				
Olive135	C			■	■	■	■	■	■	■	■	■	■
Blue143	DC				■	■	■	■	■	■	■		
Blue118	DC					■	■	■	■	■			
Jade118	DSE					■	■	■	■	■	■	■	■
Cyan139	FN						■	■	■				
Olive178	C						■	■	■	■	■	■	■
Amber445	FN						■	■	■	■	■	■	■
Olive112	C							■	■	■	■	■	
Purple259	F							■	■	■	■	■	■
Orange151	DC							■	■	■	■	■	■
Blue150	DC							■	■	■	■	■	■
Amber363	FN							■	■	■	■	■	■
Amber488	FN								■	■	■	■	
Scarlet129	DSE								■	■	■	■	■
Yellow422	B								■	■	■	■	■
Scarlet163	DSE									■	■	■	■
Orange149	DCN									■	■	■	■
Purple264	F										■	■	■
Green109	DNW										■	■	■
Olive105	C											■	■
Cyan154	FN												■

Table 7 – Backfill Schedule FY13

Stope	Fill Type	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
Purple238	SRF												
Blue104	CAF												
Orange103	URF												
Purple252	URF												
Olive113	CAF												
Scarlet159	SRF												
Orange103	CAF												
Amber448	CAF												
Scarlet159	CAF												
Scarlet151	CAF												
Yellow10	CAF												
Purple252	CAF												
Amber322	CAF												
Green115	URF												
Green106	CAF												
Brown203	CAF												
Cyan144	CAF												
Jade116	CAF												
Scarlet120	CAF												
Purple453	CAF												
Cyan149	CAF												
Purple453	URF												
Purple255	URF												
Purple255	CAF												
Purple255	SRF												
Olive169	CAF												
Orange114	CAF												
Scarlet139	CAF												
Purple238	CAF												
Blue156	URF												
Blue156	CAF												
Purple202	CAF												
Brown219	URF												
Purple219	CAF												
Yellow417	CAF												
Purple244	URF												
Green115	CAF												
Orange109	CAF												
Purple244	CAF												
Cyan113	CAF												
Olive102	SRF												
Olive153	CAF												
Olive153	SRF												
Olive102	CAF												
Brown223	URF												
Scarlet146	CAF												
Scarlet146	URF												
Yellow424	CAF												
Cyan139	URF												
Purple263	CAF												
Cyan139	CAF												
Cyan156	URF												
Purple493	CAF												
Green101	CAF												
Blue110	CAF												
Orange552	CAF												
Orange552	URF												
Brown219	CAF												
Amber329	CAF												
Cyan156	SRF												
Scarlet145	CAF												
Scarlet145	URF												
Olive191	CAF												
Blue118	CAF												
Orange104	CAF												
Brown223	CAF												
Amber488	CAF												
Blue143	CAF												
Blue143	URF												
Olive112	CAF												

Table 8 – Underground Raise Drill Schedule FY13

Description	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
27 Cyan 156 Slot Raise	■											
39 Scarlet 145 Slot Raise	■											
37 Jade 116 Backfill Raise	■											
45 Olive 191 Vent Raise	■											
34 RB32 EXTENSION	■											
39 Olive 191 Slot Raise	■											
43 Blue 143 Slot Raise	■											
26 Jade 116 Backfill Raise	■	■										
37 Jade 118 Slot Raise	■	■										
34 Yellow 424 Slot Raise	■	■										
43 Purple 493 Slot Raise		■										
36 Brown 223 Slot Raise		■										
45 Blue 118 Slot Raise		■										
30 Brown 219 Fill Raise		■										
37 Purple 493 Slot Raise		■										
36 F2 Raise Acc		■	■									
41 Cyan 149 Backfill Transfer Raise		■	■									
57 INFRA 7 Slot Raise		■	■									
35 Brown 223 Vent Raise			■									
27 Amber 445 Slot Raise			■	■								
40NG54 RAISE EXTN (RB35)			■	■								
26 Jade 118 Slot Raise			■	■								
26 Blue 150 Slot Raise			■	■								
45 Scarlet 129 Slot Raise				■								
37 Blue 150 Slot Raise				■								
46ND51Pump Station Exhaust Raise				■								
39 Olive 178 Slot Raise				■	■							
26 Orange 151 Slot Raise				■	■							
35 Brown 223 Backfill Transfer					■							
52 Cyan 139 Slot Raise					■							
46 Amber 363 Slot Raise					■							
46 Amber 445 Slot Raise					■							
26 Olive 112 Slot Raise					■							
46 Purple 259 Slot Raise					■	■						
35 Scarlet 129 Slot Raise					■	■						
30NC52 Ventilation Slot Raise						■						
31 Scarlet 129 B/Fill Transfer Raise						■						
41 Purple 264 Backfill Raise						■						
45 Scarlet 163 Slot and Tip Point Raise						■						
46 Amber 488 Slot Raise						■						
36 Yellow 422 Slot Raise						■						
26 Orange 104 Backfill UGR						■						
46 Purple 264 Slot Raise						■	■					
30 Orange 149 Slot Raise						■	■					
30NH53 Raise (RB35)						■	■					
26 Orange 149 BackFill transfer							■					
42LG 56 VENT RAISE							■					
32 Purple 244 Backfill Transfer Raise							■	■				
27 Green 109 Slot Raise							■	■				
26 Olive 105 Slot Raise								■	■			
41 Cyan 154 Slot Raise								■	■			
26 Purple 510 Slot Raise									■			
41 Orange 123 Slot Raise									■	■		
27 Cyan 154 Slot Raise									■	■		
41 Cyan 132 Slot Raise									■	■		
27 Cyan 143 Slot Raise									■	■	■	
39 Green 123 Slot Raise										■		
36 F2 VENT RAISE										■		
36 Violet 389 Raisebore										■	■	
34 Amber 489 Slot Raise										■	■	
45 Blue 108 Slot Raise											■	
31 Yellow 422 Backfill Raise												■
51 Scarlet 389 Slot Raise												■
41 Amber 489 Slot Raise												■
28 Amber 305 B/Fill Transfer Raise												■
36 Purple 253 Slot Raise												■
45 Olive 103 Slot Raise												■

Table 9 – Raise Bore Schedule FY13

Description	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
RB38 RAISE - Piloting					■	■						
RB38 RAISE - Reaming						■	■	■	■			

3.1 Planned Additions to Primary Ventilation Circuit during FY13

One of the raises below will be completed by end of FY13, final decision is yet to be made.

- RB38 intake raise to service the Lime area
- RB40 exhaust raise to service the Lime area

3.2 Changes to Equipment or Process in Mine Production

3.2.1 Changes to Mine Equipment

Equipment purchased during the course of the 2011/2012 year:

- For BHP Billiton Limited the following equipment was purchased and decommissioned during the reporting period:
    - Trucks TR044 and TR 045 were commissioned
    - Trucks UT028, UT029, UT030 and UT022 were decommissioned
    - Loaders UL053 and UL054 were commissioned
    - Loaders UL037, UL039, UL040 and UL041 were decommissioned
    - Tool Carriers FK046, FK047, FK048 and FK049 were commissioned
    - Tool Carriers UF022, UF032, UF033 and UF034 were decommissioned.
    - Drill UJ038 was commissioned
    - Drill UJ026 was decommissioned
    - Rock Breaker BR015 was commissioned
    - Charge up UC006 was commissioned
    - Grader UG009 was commissioned
- For Macmahon Underground Pty. Ltd. and Macmahon Raise Drilling Pty. Ltd., the following equipment changes occurred:
    - Jumbo DR0046 was commissioned
    - Cable bolter DR3214 was commissioned
    - Canter TS0032 was commissioned
    - Truck TR2004 was commissioned
    - Charger TR1920 was commissioned
    - Shotcreter TR1905 was commissioned
    - IT SV061 was commissioned
    - Raise rig 85R was commissioned
    - Light Vehicles LV0871, LV0872, LV0873, LV 1078, LV 1079 were commissioned
    - Light Vehicles LV0278, LV0290, LV306, LV0310, LV0311, LV0315, LV320, LV0342, LV0359 were decommissioned
    - Jumbos DR0026, DR0027 and DR0044 were decommissioned
    - Shotcreters TR1903, TR1905 and TR1907 were decommissioned

  - Trucks TD0043 and LV0017 were decommissioned
  - Cable bolter DR3207 was decommissioned
  - Loader LO7001 was decommissioned
  - Canter LV0059 was decommissioned
- For Boart Longyear Pty Ltd, the following equipment changes occurred:
  - Rig 1 LM90 and Rig 5 LM75 were commissioned
- For Heading Contractors Pty Ltd, the following equipment changes occurred:
  - Excavator X07 and Excavator X08 were commissioned
  - Excavator X01 and Excavator X02 were decommissioned
- For Exact Mining Pty Ltd, the following equipment changes occurred for the CAF plant, quarry and batch plant:
  - Excavators EX445, EX448 and EX 449 were commissioned
  - Generator GS060 was commissioned
  - Truck agitators HV627 and HV628 were commissioned
  - Light vehicles LV422 and LV432 were commissioned
  - Grader MG321 was commissioned

3.2.2 Changes to Mine Procedures

There have been no changes to mine operating procedures with a bearing on environmental and radiation management in the FY12 period.

3.2.3 Changes to Mine Processes

Mining Method

There have been no changes to the mining method in the FY12 period.

Stope size/shape

There have been no changes to the stope size/shapes in the FY12 period.

Extraction sequence

There have been no changes to the extraction sequence in the FY12 period

Backfill Requirements

Backfill production last year was 2.398 Mm^3. The current schedule for FY13 is 2.105 Mm^3. This will be achieved by fully utilising the permanent CAF plant (CAF plant 1) and using the temporary CAF plant (CAF Plant 2) only as required.

Studies will continue to examine varying CAF mix designs to achieve different strengths, as required by mine design

4 Changes to Equipment or Process in the Process Plant

4.1 Changes to Process Plant Equipment

Changes that have a bearing on environmental and radiation management in the plant are as below:

Concentrator

Though there were no major changes to the Concentrator plant, the noted changes or replacements were as follows:

- Maintenance of ANI, Fuller and Svedala Mills
- Overhaul Concentrate Leach Tanks 1, 5 and 10
- Repairs to Filter Feed Tank

Hydromet

Though there were no major changes to the Hydromet and Solvent Extraction (SX) plant the noted changes or replacements were as follows:

Hydromet Plant:

- Tails Leach Tanks 1,3,4,5,6,7 were cleaned/repaired
- CCD1 was overhauled
- Pulse Columns 1,3,9,8 and 10 were overhauled.
- Commissioning of Pregnant Leach Solution Desaturation Pilot Plant
- Removal of Pregnant Leach Solution Sand Filter Plant

SX Plant:

- Copper SX B Train cleaned out
- 30% of the pregnant leach solution (PLS) pipeline replaced
- Uranium SX loaded solvent tank and lines were cleaned out
- Mixboxes on SC3, ST1, ST2 and ST3 were cleaned out
- Commissioned the new Process Drain pumps and dam
- Continued project to replace the SX crud centrifuge
- Continued project to relocate ammonia storage compound to the north of the SX plant

Smelter

The smelter has continued to closely monitor polonium 210 (Po-210) within the process to ensure airborne radionuclide concentrations are maintained below the derived air concentration (DAC). Critical streams are assayed for Po-210 on a daily basis. Routine monitoring of airborne activity exposures to the workforce and fume emission sources has remained in place.

There were no major operational changes to the Smelter. The noted changes or replacements were as follows:

- Process control changes to dust dissolving system. Increased acid addition to achieve better Po-210 separation in the dust leach thickener
- Reduced Electric Furnace revert charge rate to 2tph
- Preventative maintenance program implemented for hygiene dampers

Refinery ER/EW/Gold area

No major changes occurred to the Refinery process flows, the noted changes or replacements were as follows:

- Refurbished 3rd section – increasing plating capacity

Analytical Laboratory

No changes of note occurred to the Analytical Laboratory during July 2011 to June 2012.

Tailings Storage Facility

The following were items of note for the Tailings Storage Facility:

- Commissioned TSF cell 5 in September 2011
- Construction of liquor interception trenches at East wall of TSF Cell 1 and 2

Radioactive Waste Storage

- Temporary radioactive waste storage facility was approved and commissioned.

4.2 Changes to Process Plant Procedures

There were no changes to process plant operating procedures with a bearing on environmental and radiation management in the FY12 period.

5 Estimated Quantities of Radioactive Wastes

During the production of copper cathode and uranium oxide concentrate from ore mined on site, waste streams containing radioactive materials are generated. These are discussed further in the following sections.

5.1 Solid Wastes

Solid wastes from the processing of ore reach the Tailings Storage Facility (TSF) in the form of tailings slurry, deposited via spigots along the edges of any of five TSF Cells. The solids consolidate over time and the majority of the liquor either evaporates on the tailings cell, is captured then transferred to a system of evaporation ponds, or is neutralised by the limestone underneath the TSF before entering the groundwater where it is reclaimed via a number of bores.

For the period 1 July 2011 to 30 June 2012, the mass of solid tailings produced was approximately 8,664,576 tonnes. The TSF water balance indicates that a volume of approximately 8,910,131m^3 of liquor was delivered to the TSF, of which approximately 2,305,699m^3 was decanted to the evaporation ponds with the balance remaining in the tailings cells or evaporating. The data for the previous five years is shown below in Figure 1. The low levels seen in FY10 were the result of reduced production due to the Clark Shaft incident.

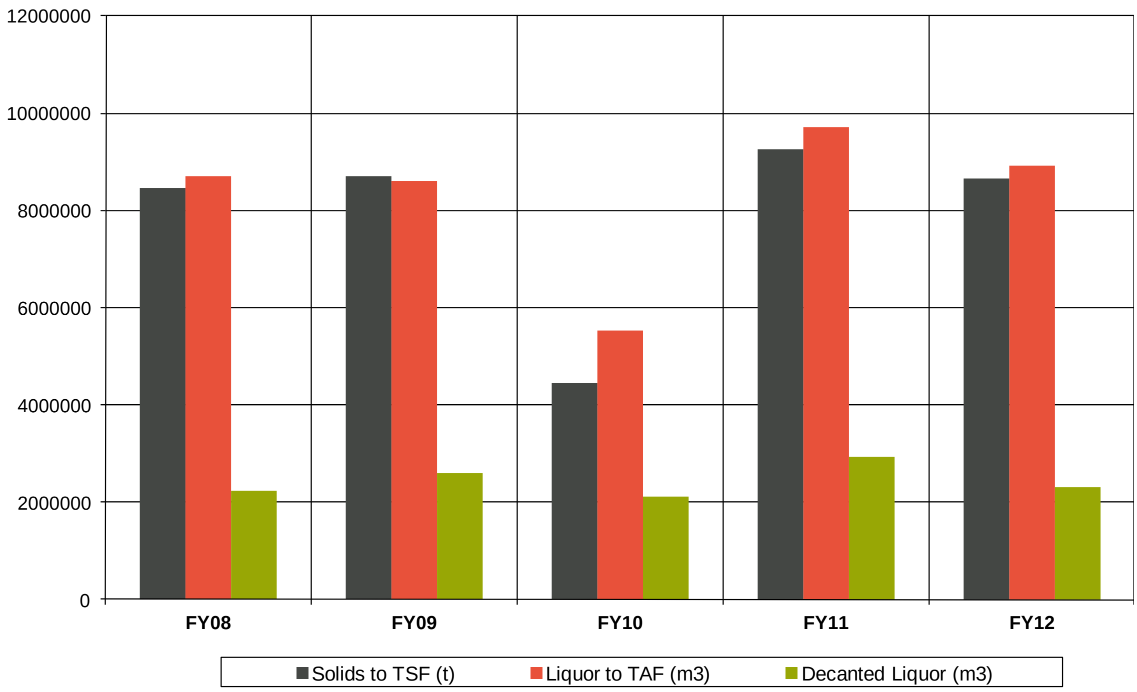

Figure 1: Wastes to the Tailings Storage Facility (TSF)

5.2 Gaseous Wastes

Fugitive radon is emitted from all areas of site; however the most significant are the mine ventilation raise bores, the ore stockpiles, milling activities, emission from the TSF and a component derived from ambient background concentrations.

Using the methodology derived from a review of radon source terms undertaken in 2002, the total site fugitive emission of radon decay products is approximately 250TBq for the reporting period. This represents an increase over the previous reporting period's estimation of 230TBq. The change is a combined result of commissioning of TSF cell 5 and increased production. The production increases are consistent with increases seen previously where there were similar levels of mine development and process plant production. The previous five year radon emission activity is trended in Figure 2.

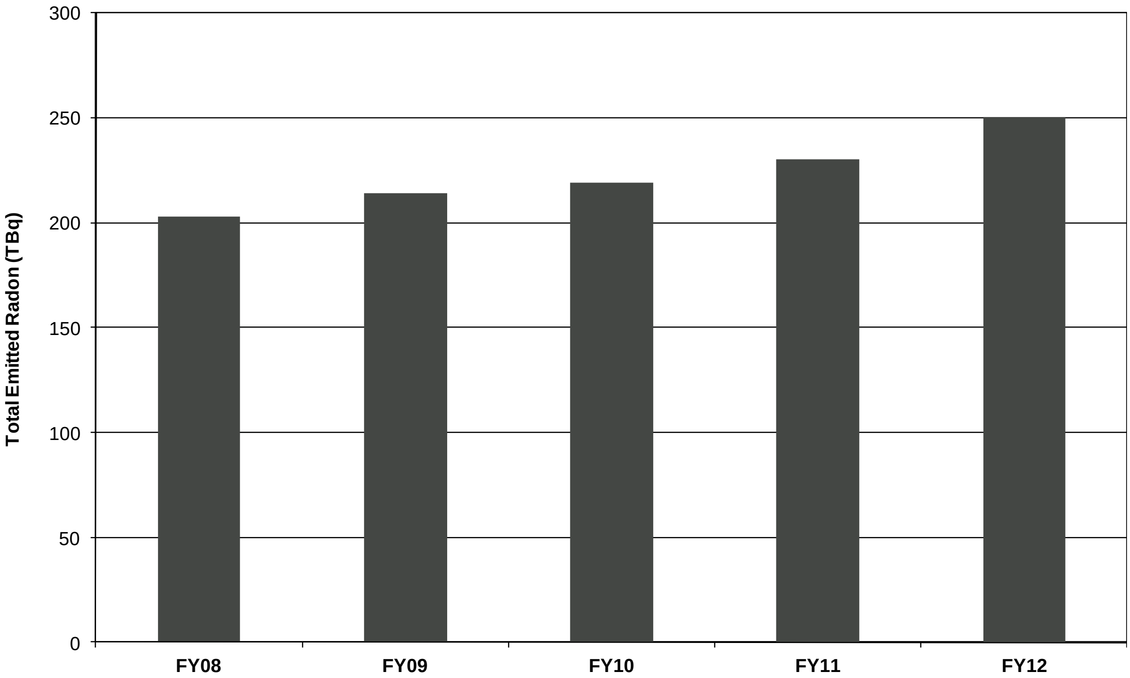

Figure 2: Site total emitted radon

5.3 Dust and Particulate Emissions

Quantities of dust and particulate are generated from point-sources during the processing of ore. The principal point-sources of dust and particulate emissions are Smelter 2 (Smelter 1 only being used for the remelting of clean refinery scrap copper), the Uranium Calcining Facility and the Slimes Treatment Plant (STP).

Smelter 2 processes copper concentrates produced during the milling, flotation, leach and feed preparation stages of the process, and consists of a Flash Furnace (FF), an Electric Slag Reduction Furnace (EF) and two Anode Furnaces. Concentrate is fed into the FF, generating slag, blister copper and off-gas containing significant quantities of sulphur dioxide (SO_2) and dust. The dust is captured within the Waste Heat Boiler (WHB) and the Electrostatic Precipitator (ESP), and either recycled to the FF, or leached and pumped to the Hydromet Tails Leach facility.

The SO_2 goes to the Acid Plant and is converted and absorbed to produce sulphuric acid. The EF takes FF slag and further reduces it to produce blister copper, slag and off-gas containing particulate. The particulate is captured via a quench tower and venturi scrubbing system, before off-gas is emitted to atmosphere. The two Anode Furnaces undertake the final fire-refining of the copper prior to casting copper anodes for use in the refinery. The off-gas from the Anode Furnaces is treated in a gas cleaning system similar to that of the EF. All furnaces are fitted with gas cleaning system bypass stacks for use in emergency or abnormal situations.

The precipitation area of the hydrometallurgical plant includes two calcining furnaces, used to convert ammonium diuranate (ADU) to uranium oxide (U_3O_8). Each calciner has a dedicated gas cleaning system to remove particulate material prior to emission to atmosphere.

The STP (or Gold Room) treats the slimes generated during the electro-refining process to recover gold and silver. The facility includes a Roaster Scrubber designed to treat various furnace off-gas streams and a NOx Scrubber designed to treat emissions from the aciding process.

Using process control system data in coordination with isokinetic sampling, the total site particulate emission is estimated at 130,832kg for the period 1 July 2011 to 30 June 2012.

The previous five year point source particulate emission data is shown in Figure 3.

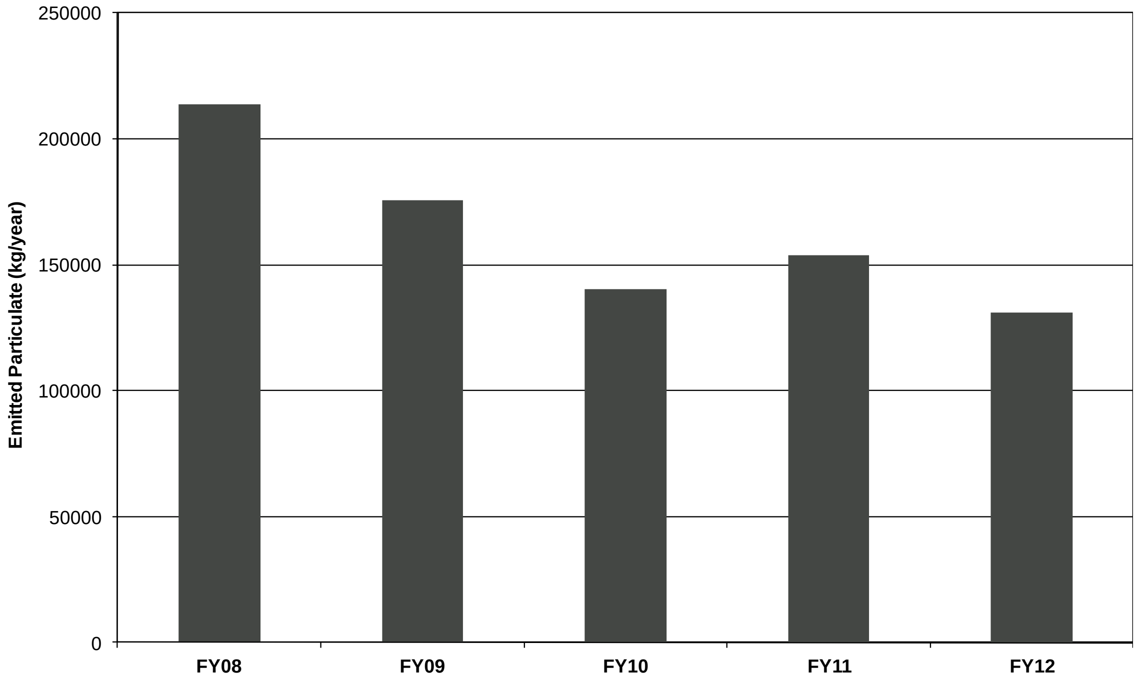

Figure 3: Total emitted point source particulate

Uranium oxide emissions from the calciners are shown in Figure 4. The uranium oxide emissions were determined from radionuclide analysis of samples collected during FY12 stack testing.

The uranium oxide component of calciner stack emissions was calculated to be 82kg for FY12. This represents a decrease from FY11.

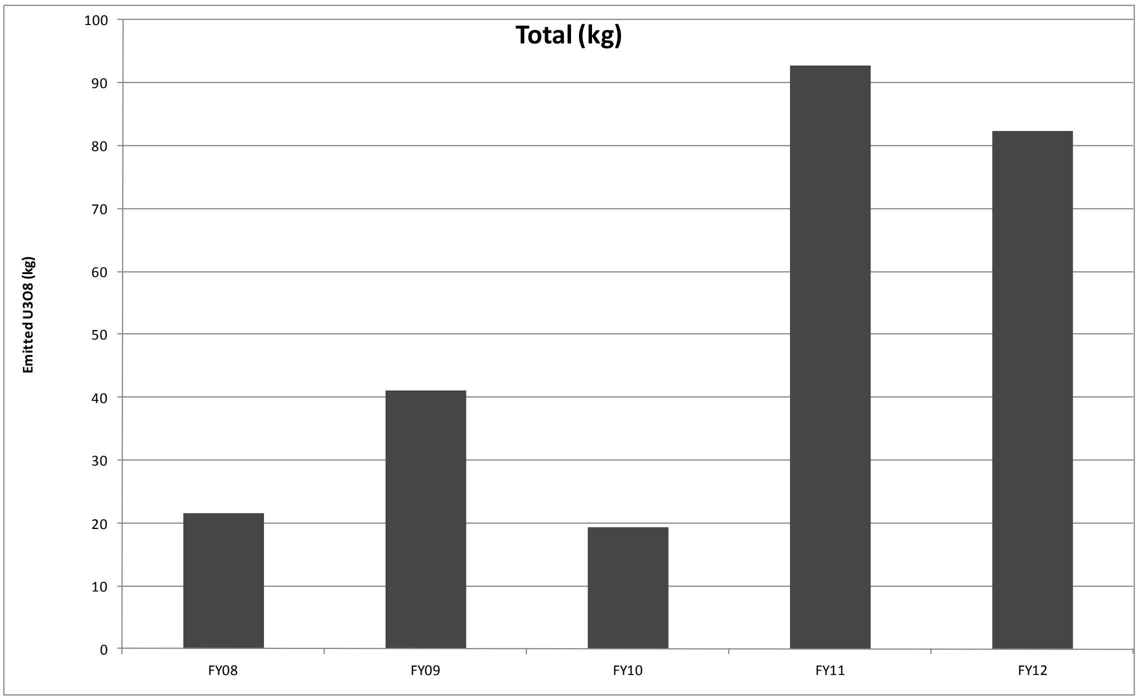

Figure 4: Total emitted uranium oxide (U3O8) from the Calciner facilities