



30 June 2015

## *2014 Dalyellup Annual Environmental Report*



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Brilliance inspired by titanium

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### SUMMARY

This report documents the environmental review of the Dalyellup treated solid residue disposal facility operated by Cristal. The report is submitted to satisfy the following requirements for the period January 2014 - May 2015 for the:

- Closure Notice for Licence 6130/1989/12 (Appendix A) issued by the Department of Environment Regulation under Part V of the Environmental Protection Act 1986, which commenced 14 May 2013; and
- Ministerial Conditions (Appendix B) imposed under Part IV of the Environmental Protection Act 1986.

The key findings of this review are:

- Assessment of monitoring data indicates that the operation of the solid residue facility results in minimal environmental impacts;
- Radiation levels measured at the site boundaries and in groundwater are consistent with previous years and remain at background levels;
- No significant levels of dioxins and furans were found in any of the ground water samples;
- The majority of contaminants in the waste remain fixed to the solid residue. Leachable levels of metals in the waste are within the most benign landfill (Class 1) except for elevated molybdenum, which is naturally occurring in the ore;
- The main drinking supply, the Yarragadee aquifer, remains unaffected by the site;
- The site ceased operation on 1 March 2013, and rehabilitation plans have commenced with ponds capped with at least 2 metres of clean fill;
- The Contaminated Sites Auditor's review of the health risk assessment for development of sporting fields concluded potential health risks have shown to be not unacceptable under the proposed use. Waiting for the Mandatory Audit Report to be finalised and sent to DER's Contaminated Sites Branch; and
- Ministerial conditions related to the closure have been met to the satisfaction of the Office of Environmental Protection Authority.

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## 1.0 INTRODUCTION

### 1.1 Background of Operations and Purpose

Cristal Pigment Australia Ltd, is a Cristal company that produces titanium dioxide pigment for use in the manufacture of paint, paper, plastic, cosmetics and many other products. Cristal has two manufacturing facilities in the south west region near Bunbury (see Figure 1). They are the Kemerton processing plant and the Australind finishing plant. Combined, the two plants produced 95,689 tonnes of finished pigment in 2014. Cristal also operated a solid residue disposal facility at Dalyellup, 8 kilometres south of Bunbury until March 1 2013. Since 2013, the treated solid residue has been sent to Transpacific Industries' Banksia Road Facility at Dardanup.

A Closure Notice was issued in May 2013 by DER and revised in August 2013. This report documents the ongoing monitoring of the Dalyellup Treated Solid Residue (TSR) Disposal Facility as required by the Notice.



Figure 1 – Site Location

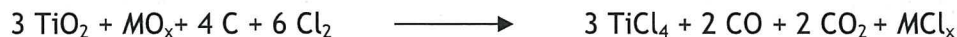
### 1.2 Source of Treated Solid residue (TSR)

The vast majority of TSR sent to Dalyellup was from the Kemerton Processing plant (~95%). The plant utilises the chloride process to produce  $TiO_2$ . The chloride process is based on the production of titanium tetrachloride ( $TiCl_4$ ) from the chlorination of titanium bearing ore. The purified  $TiCl_4$  is subsequently oxidised, yielding titanium dioxide and allowing recycling of chlorine ( $Cl_2$ ).

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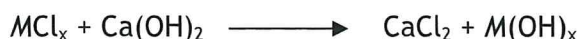
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Titanium-rich ore, together with a supply of carbon (petroleum coke), is fed into a chlorinating vessel, which operates at approximately 900-1100°C. Chlorine entering the vessel reacts with the TiO<sub>2</sub> and some of the ore impurities to form TiCl<sub>4</sub>, metal chlorides as well as carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>). The reaction is as follows:



In the purification process, solid and liquid impurities are separated from the hot gas. The gas is condensed and then distilled to produce pure titanium tetrachloride as an intermediate product.

The solid residue separated from the gas stream typically consists of metal chlorides, oxides, various silicates, unreacted ore and coke. Most of the ore and coke is recovered and separated prior to being reused in the production process. A neutralisation process is used to treat the remaining solid residue from the chlorinated gas stream. Lime is added to each of a series of tanks to raise the pH and precipitate the contaminants as hydroxides.



Metal chlorides + lime  $\longrightarrow$  calcium chloride + metal hydroxides

The slurry is then sent to a clarifier where the solids settle and are separated. The solids are filtered by a vacuum filter, washed to remove a large proportion of the soluble salts and was transferred as a ~20% solid slurry by tankers to the disposal site at Dalyellup.

The Australind residue contributed approximately 2-6% of the total residue sent to Dalyellup. The Australind finishing plant receives TiO<sub>2</sub> slurry from Kemerton via road tanker where it then undergoes surface treatment, washing, filtering, drying, final milling and packaging. Any process wastewater is captured in the drain system which is transferred to the neutralisation plant. The neutralisation process is the same as Kemerton and slurry was transported to Dalyellup in the same manner. The dried residue is an inert, insoluble, non-toxic, clay-like material.

## 2.0 SITE INFORMATION

### 2.1 Site History and Location

The disposal site is adjacent to and set within the buffer zone of the No.2 Bunbury Sewage Treatment Works and is approximately 200 metres from the ocean. The disposal site is situated in the swale between the vegetated linear primary dunes and the parabolic secondary dunes, which have a maximum elevation in the area of 45 metres Australian Height Datum (AHD).

Disposal at the site commenced in March 1989 under a five year agreement with the Shire of Capel. DEC, however, agreed to the use of the site for three years, conditional upon satisfactory environmental performance. In June 1991, the company submitted a proposal to the DEC for a two-year extension of its disposal facilities. This was consistent with the original agreement made with the Shire of Capel. In response, the DEC called for a Consultative Environmental Review.

The CER was released in September 1991 and, following the normal public review and assessment period, approval for the project to proceed was received from the Minister for the Environment on 23 January 1992. The extension, approved under Ministerial Statement No. 213 expired on 4 March 1994.



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In August 1993 Cristal submitted a proposal to the DEC for continued use of the disposal site. Pursuant to section 46(1) of the Environmental Protection Act (1986), the Minister for the Environment requested the DEC to inquire into and report on the proposed change to Environmental Condition M1.

The section 46 amendment was approved in Ministerial Statement No. 332, published on 9 December 1993. Further Ministerial Conditions were set on the project (see Section 5). The extension, for the “Life of the Site”, is subject to the licensing requirements of the Environmental Protection Act (1986). Cristal was granted approval to operate this site until March 2010.

The site was registered in May 2007 as a Contaminated Site, as required under the Contaminated Sites Act 2003. The registration was accompanied by copies of the licence, the annual reports from previous years, and other studies and reports. The site has been classified by the DEC Contaminated Sites Branch as ‘Possibly Contaminated’ and is suitable for its current use.

In 2008 Cristal commenced community consultation for the issue of a new licence to operate the site from 2010 to 2013. The extension was requested as the facility would not be fully utilised until 2013. This is due to Cristal implementing waste reduction and recycling programs at the Kemerton facility.

During 2009, the Shire of Capel, WA Planning Commission, Radiological Council and Environmental Protection Authority approved continued use of the site. An assessment by the DEC followed and a licence was issued on the 25<sup>th</sup> January 2010 to operate the site to March 2013. This is when the site ceased to operate.

In 2009-2010, studies on the impact of leachate to the near shore, concluded that there was no evidence of metal, chromium VI, dioxin or furan contamination found in the sediment, sediment elutriates or marine water adjacent to the Dalyellup waste disposal site, and on the basis of the results, ground water discharge adjacent to the site posed negligible risk to the marine environment and has a negligible impact on recreational uses on the beach and waters adjacent to the site.

The Shire of Capel has expressed interest, upon closure of the facility, to redevelop the site to sporting fields to cater for football, soccer, cricket and softball.

The site has been classified under the Contaminated Sites Act (2003) as “Possibly Contaminated - Investigation Required”, therefore assessment consistent with the DEC’s guidelines was required before the site can be reclassified and considered for redevelopment. The Shire has engaged Environmental Resources Management Australia Pty Ltd (ERM), to prepare a Health Risk assessment. The assessment could not be finalised, and reviewed by DER, until after the facility closed, however, an interim report (April 2012), concluded:

*Based on the current understanding of the site conditions, it is considered that enough evidence has been gathered to support a reclassification of the Site under the CS Act (2003) from Contaminated – Investigation Required to Remediated – Restricted Use, pending review and incorporation of 2012 monitoring data, implementation/adhere of the specific controls and the auditor endorsement.*

Disposal ceased at the site on March 1<sup>st</sup> 2013 and the Final Closure Notice, issued in May 2013 by DER, details the ongoing monitoring on the site. There are still two options: redevelopment to sporting fields; and the other rehabilitated back to native vegetation. The final outcome will be dependent on the risk assessment, further community consultation and the Shire of Capel’s final approval.

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The remaining treated solid residue ponds were covered with 3-4 metres of clean fill in September 2013 which is a prerequisite for either option.

In 2015, the OEPA was satisfied that ministerial conditions related to the closure had been met (Appendix H). The Contaminated Sites Auditor's review of the health risk assessment for development of sporting fields concluded potential health risks have shown to be not unacceptable under the proposed use (Appendix H). At time of reporting, Cristal and the Shire of Capel are waiting for the Mandatory Audit Report to be finalised and sent to DER's Contaminated Sites Branch for reclassification of the site.

## 2.2 Site Hydrogeology

### 1.1.1 Superficial Formations

The sediments below the disposal area are calcareous, fine to medium grained sands. They range in depth from 10 to 20 metres. Limestone, sand and sandy clays occur in the area at depths between 10 to 30 metres. Below these sediments are dark grey, silty, micaceous clays. Some heavy minerals and silty organic matter occur throughout the profile. The secondary dunes are overlain by about 0.5 to 1.0 metres of topsoil. The area is underlain by superficial formations, which extend from the ground surface to about 10 metres AHD. The superficial formations form an anisotropic unconfined aquifer, comprising sand and limestone, with a basal section of less permeable silty sand and sandy clay. The depth to the water table is about 10 metres beneath the base of the lagoons and varies with topographic elevation and mounding effects. Seasonal fluctuation is estimated to be 1 to 1.5 metres. The superficial aquifer has a saturated thickness at about 10 metres beneath the disposal site. Groundwater flow through the superficial formation is towards the ocean where discharge occurs across a seawater interface. The hydraulic gradient is about 1:100. Baseline studies, prior to commissioning the site, recorded electrical conductivities in the order of 1,350  $\mu\text{S}/\text{cm}$ , equivalent to about 800 mg/L TDS. Figure 2 shows a hydrogeological conceptual model of the disposal site.

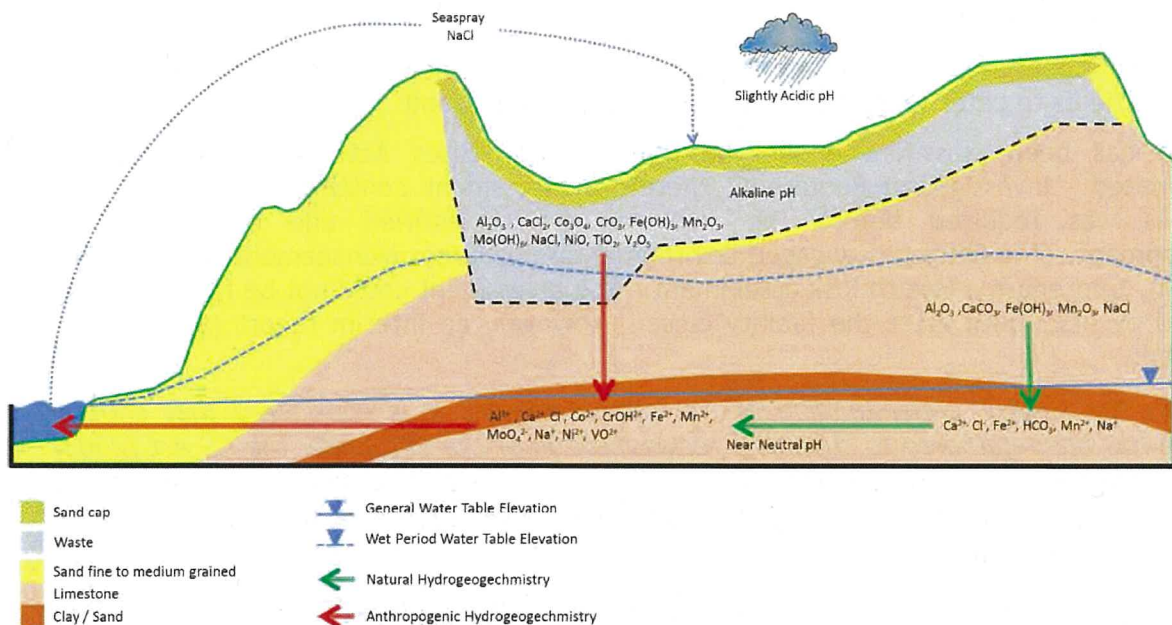


Figure 2 – Conceptual model of the Site<sup>1</sup>

<sup>1</sup> Dalyellup Waste Residue Facility – Hydrogeological Assessment, GHD, April 2015

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### 1.1.2 *Yarragadee Formation*

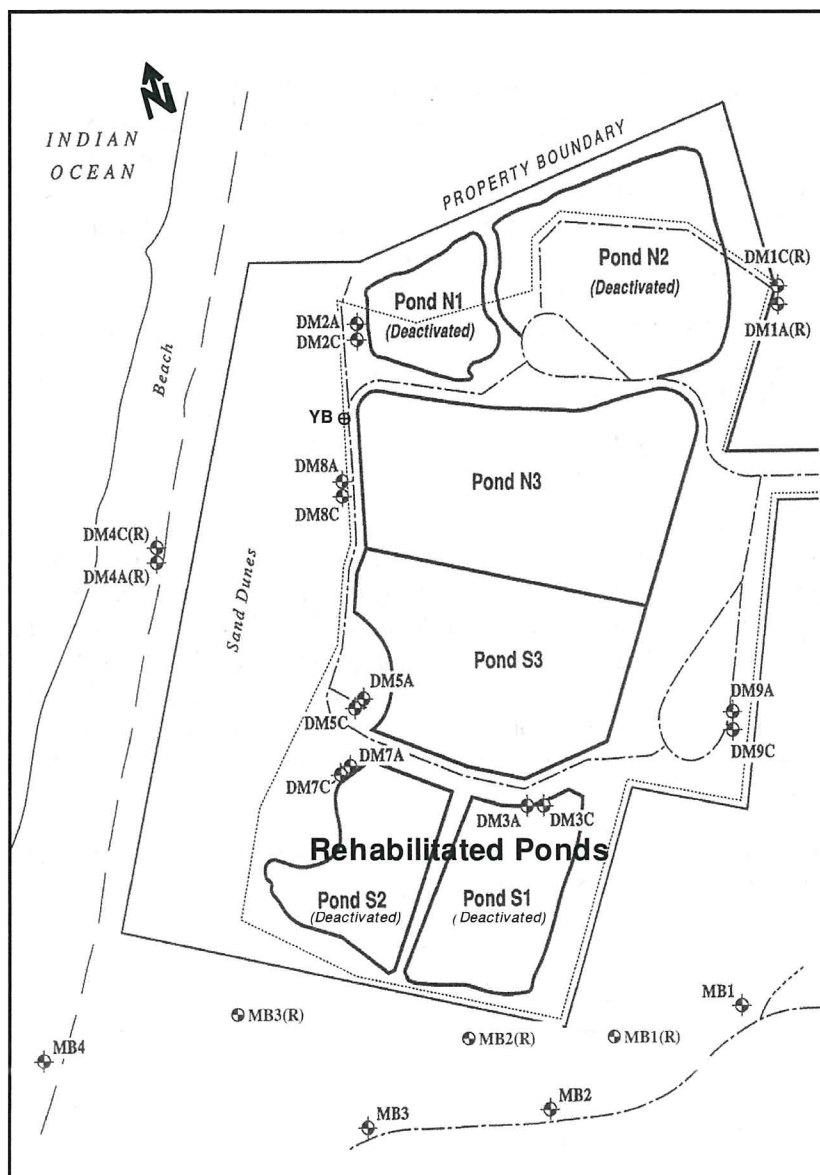
The Yarragadee formation directly underlies the superficial formation in this area and forms a confined multi layered aquifer, comprising interbedded sandstone, siltstone and shale. In 1996 it was determined that the potentiometric head in the confined aquifer was about 1m higher than in the superficial formations. Consequently, there is upward recharge into the superficial formations. This upward head prevents leachate entering the Yarragadee Aquifer. Regional groundwater flow in the Yarragadee formation is in a North West direction and discharge is via the superficial formation into the ocean. Beneath the disposal site, the groundwater salinity in the Yarragadee formation ranges between 600 and 1,000 mg/L TDS.

## 3.0 GROUNDWATER MONITORING

### 3.1 Monitoring Well Network

The monitoring wells on the site are cased with Class 9 PVC, ranging in size from 50 to 100mm. Construction details of the monitoring wells are given in Appendix C. The wells can be divided into two main groups, background monitoring wells and site monitoring wells. The background monitoring wells are constructed of 100mm PVC and are slotted against the entire aquifer thickness; these are designated by the MB (monitoring bore) prefix. The site monitoring wells are located in pairs, one deep (A) and one shallow (C); these are designated by the DM (Dalyellup monitoring) prefix e.g. DM2A and DM2C. Monitoring at two depths in the aquifer is conducted to identify any stratification that may be occurring in the plume.

Fifteen monitoring wells have been installed around the Dalyellup disposal facility (see Figure 3) including a well to monitor the Yarragadee (YB).



**Figure 3 - Monitoring Bore Locations**

Wells range in depth from around 15 to 50 metres below ground level and monitor groundwater in the Superficial Formations (quaternary aged shallow aquifer system). Since the monitoring bore network was constructed in 1989, several bores have been replaced. Bores DM1(R) and DM4(R) were replaced in 1992 and 1996 respectively as part of earth works on the site. MB1, MB2 and MB3 were replaced in February 2001 due to earthworks associated with the Dalyellup residential sub-division, which borders the southern boundary of the disposal area. In May 2004 MB1 and MB2 were decommissioned due to further earthworks. This was discussed with the DEC at the time and the licence was amended to reflect the changes in July 2005.

The southern ponds were rehabilitated in 2002; DM3A and DM3C were located in the southern ponds and have now been decommissioned. Some sand was also removed from the southwest part of the central pond to help build a separating wall in the pond. This, unintentionally, created some erosion around bores DM5A and DM5C and made sampling of these bores unsafe. They are now decommissioned.

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### 3.2 Biennial Hydrogeological Report

Refer to Appendix G. As required by Section 1.3 of the Closure Notice, a report has been prepared on the groundwater beneath the site, for the period 4 March 2013 to 4 March 2015. As Section 1.2.3 required the report to be submitted by 1 July 2015, March 2015 data was not included, due to reporting logistics. In summary the report concluded:

- a) *Geology underlying the Site comprised calcareous, fine to medium grained sands, ranging in depth from 10 to 20 metres. Limestone, sand and sandy clays occur in the area at depths between 10 to 50 metres (deepest at DM9). Below these sediments are dark grey, silty, micaceous clays. The clays appear from 20 to 40 metres, and occasionally occur above or within the sandy limestone layers;*
- b) *Groundwater standing water level resides in the superficial formation between 0.8 - 2.5 m AHD. Yarragadee aquifer standing water level resides between 1.5 - 2.5 m AHD;*
- c) *Groundwater monitoring network incorporating 15 bores was sufficient to complete the hydrogeological review;*
- d) *Groundwater quality investigations reported exceedances of select metals. Of these trace metals, it was concluded that lead, cobalt, copper and zinc are likely to be due to natural background conditions encountered at the time of sampling;*
- e) *Chromium and vanadium were the only two trace metals that appear to be linked to the TSR as their concentration shows an increase between the up and down-gradient wells;*
- f) *Mobility of hexavalent chromium and vanadium is dependent on anionic sorption processes with the main anion attracting sites being ferric hydroxide minerals. Therefore dissolution of these metals is dependent on pH. The pulsed nature of mobility would likely result in very slow transport velocities with these metals only migrating during periods when the pH is in a narrow window where sorption and precipitation are not occurring;*
- g) *TSR is generating saline leachate that is increasing the TDS of the groundwater along flow path;*
- h) *TSR material may be a source of the excess calcium in groundwater samples;*
- i) *The most likely mineral responsible for the majority of the observed effect on the major ion composition of the groundwater is calcium chloride. The source of this mineral is considered to be anthropogenic and probably associated with the TSR; and*
- j) *The hydrogeochemical character at the down-gradient well (DM4(4R)) is influenced by mixing of fresh groundwater discharge, impacted by leachate from the TSR and seawater interface, which would be anticipated given the position of the well near the beach; and*

The report recommends:

- a) *An ongoing monitoring program is already a requirement of the Closure Notice, which can continue in its current form.*
- b) *That an action plan be developed that periodically re-evaluates the hydrogeochemical data to establish that conditions remain stable and provides a*

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*series of actions and measures to be adopted should any future monitoring identify potential changes in hydrogeochemical conditions and / or risk profile of the TSR to the environment.*

- c) *Hydrogeochemical data should be stored and managed in a program which can be updated and analysed easily.*

### 3.3 Yarragadee Bore (YB)

YB is required to be sampled quarterly for standing water level, pH, electrical conductivity, chloride, sodium, redox potential and radionuclides. This data is provided in Appendix D, Other analytes required for the other monitoring bores have also been completed for the YB on a six monthly basis, even though not required.

More information about these results can be found in Appendix G, Dalyellup Waste Residue Facility - Minninup Road, Dalyellup, Western Australia Hydrogeological Assessment by GHD consultants, as per the Closure Notice.

The sodium to chloride ratio is seen as an indicator of leachate. From the report; *there is a significant excess of chloride over sodium in the more saline groundwater samples collected on the Site. These samples generally relate to the source zone wells suggesting that the TSR material may be a source of the excess chloride in these samples. These source zone samples have sodium to chloride ratios of almost up to 1:20. Samples from the up-gradient wells and deeper Yarragadee Formation display sodium to chloride ratios close to 1:1, which is more in line with what would be expected under natural flow conditions in the groundwater systems present at the Site.*

### 3.4 Dioxins and Furans

A requirement of the Closure Notice is to monitor dioxins and furans annually in bores YB, MB3 and DM8. Refer to Appendix I.

There were no measureable dioxins or furans in the groundwater samples from wells MB3, DM8A, and DM8C. In 2014 and 2015 all reported values for all congeners were reported as less than the level of detection or limit of reporting. The tables (1-4) report the lower, middle and upper boundaries of the data on toxicity equivalent (TEQ) basis. Variability can be expected at these very low levels and boundaries provide a potential range within each sample.

**Table 1 - Yarragadee Bore**

Sampled YB	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper bound pg TEQ/L	OCDD pg/L
Aug 2010	0.00	3.08	6.16	<9.29
Feb 2011	0.00	3.94	7.89	<9.29
Aug 2011	0.00	3.00	6.00	<7.20
Feb 2012	0.00	2.72	5.44	<4.37
Sept 2012	0.00	2.13	4.26	<7.34
Feb 2013	0.00	1.95	3.90	<1.69
Apr 2014	0.0	1.50	3.10	<9
Apr 2015	0.00	2.70	5.30	<2

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**Table 2 - Superficial Groundwater Background Bore**

Sampled MB3	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper bound pg TEQ/L	1,2,3,7,8 PeCDD pg/L
Aug 2010	0.0	2.54	5.08	<1.63
Feb 2011	0.0	2.55	5.09	<1.40
Aug 2011	0.0	2.95	5.90	<1.82
Feb 2012	0.0	2.19	4.38	<3.95
Sept 2012	0.0	1.99	3.98	<1.90
Feb 2013	0.0	2.59	5.19	<4.51
Apr 2014	0.0	1.2	1.4	<0.9
Apr 2015	0.0	1.5	3.1	<1

**Table 3 - Downstream Superficial Groundwater Bore (Deep) of the Ponds**

Sampled DM8A	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper bound pg TEQ/L	1,2,3,7,8 PeCDD pg/L
Aug 2010	0.00	1.86	3.71	<1.28
Feb 2011	0.00	3.15	6.29	<1.59
Aug 2011	0.00	2.16	4.33	<1.44
Feb 2012	0.00	2.52	5.03	<1.88
Sept 2012	1.32	3.00	4.68	1.32
Feb 2013	0.00	2.57	5.13	<1.46
Apr 2014	0.0	1.6	3.1	<0.7
Apr 2015	0.0	2.5	5.0	<1

**Table 4 - Downstream Superficial Groundwater Bore (Shallow) of the Ponds**

Sampled DM8C	Lower Bound pg TEQ/L	Middle Bound pg TEQ/L	Upper bound pg TEQ/L	1,2,3,7,8 PeCDD pg/L
Aug 2010	0.00	2.58	5.15	<1.47
Feb 2011	0.00	3.48	6.96	<1.34
Aug 2011	0.00	2.25	4.50	<1.55
Feb 2012	Not sampled			
Sept 2012	0.0	2.31	4.61	<3.44
Feb 2013	0.0	2.35	4.70	<2.43
Apr 2014	0.0	1.5	2.9	<1
Apr 2015	0.0	2.5	5.0	<2

The data confirms that levels in ground water are not detectable hence further monitoring is not required.

### 3.5 Summary of 2014 Radiation Monitoring Results

Independent consultants, Radiation Professionals, conduct bi-annual surveys of the site. A RCWA approved radiation monitoring program has been implemented by Cristal. The annual report (Appendix F) relates to surveys performed on 17<sup>th</sup> October 2013 and 17<sup>th</sup> and 18<sup>th</sup> February 2014.

The results of the gamma monitoring show that the rehabilitation of the area has been successful in returning the gamma radiation levels to within the natural background of the area (0.10  $\mu\text{Gy h}^{-1}$ )

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### 4.0 LICENCE COMPLIANCE & INCIDENTS

#### 4.1 Operating Licence

During the period the site operated under Closure Notice of Prescribed Premises Licence 6130/1989/12. The degree of compliance is summarised in Table 5. DM7C was sampled in October 2014 but recently it was discovered there were no results recorded. The sample had been lost at the laboratory (NMI). This occurrence is a rare event but both the laboratory and Cristal are reviewing the chain of custody processes and the frequency of data review to identify such glitches in a more timely manner.

#### 4.2 Incidents

There were no environmental incidents or community complaints recorded for the Dalyellup site.

**Table 5 - Compliance with Closure Notice**

	Licence Requirement	Comment	Compliance
1.1.1	The Person to Whom this Notice is Given shall undertake the monitoring in Table 1.1.1 according to the specifications of that Table.	Refer to Appendix J.	✓
1.1.2	<p>The Person to Whom this Notice is Given shall ensure that:</p> <p>(a) all samples required by Table 1 are collected and preserved in accordance with AS/NZS 5667.1;</p> <p>(b) all sampling required by Table 1 is conducted in accordance with AS/NZS 5667.11;</p> <p>(c) all samples are submitted to a laboratory with current NATA accreditation for the parameters to be analysed;</p> <p>(d) the limit of detection of analysis for all samples is:</p> <p>(i) one order of magnitude below the relevant ANZECC guideline; or</p> <p>(ii) where the laboratory cannot routinely achieve a limit of detection one order of magnitude below the relevant ANZECC guideline, the lowest limit of detection;</p> <p>(e) quarterly monitoring is undertaken at least 45 days apart, with the first round of sampling to commence in Q3 2013 (i.e. 1 July to 30 September 2013);</p> <p>(f) six monthly monitoring is undertaken at least 5 months apart, with the first round of sampling to commence between 1 July and 31 December 2013; and</p> <p>(g) annual monitoring is undertaken at</p>	<p>As above.</p> <p>See Appendix J Standard operating procedures for groundwater consultant.</p> <p>See Appendix J Standard operating procedures for groundwater consultant.</p> <p>All samples sent to National Measurement Institute (NMI) and Western Radiation Services. Examples in Appendix D.</p> <p>Analysis is to the lowest detection limits possible.</p> <p>See Appendix D note from NMI.</p> <p>See Appendix D. 1<sup>st</sup> quarterly sample taken on 11/7/13 then 10/10/13, 29/1/14, 9/4/14 and 16/10/14.</p> <p>1st bi-annual sample taken on 11/7/13 then 10/10/13, 9/4/14 and 16/10/14.</p> <p>1<sup>st</sup> sampling round was 9/4/14</p>	✓



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	Licence Requirement	Comment	Compliance
	least 9 months apart, with the first round of sampling to commence prior to 1 July 2014.	and then on the 16/4/15.	
1.2.1	The Person to Whom this Notice is Given shall prepare a biennial hydrogeological report on groundwater beneath the Premises, covering the period 4 March 2013 to 4 March 2015.	Refer to Appendix G	✓
1.2.2	The Person to Whom this Notice is Given shall ensure the hydrogeological report referred to in paragraph 1.2.1 of this Notice includes: <ul style="list-style-type: none"> <li>(a) assessment of groundwater quality below and down gradient from the Premises and compared to background groundwater quality;</li> <li>(b) assessment of any contaminant plume size, movement and distribution of contaminant concentrations from below the disposal ponds to the near shore groundwater discharge zone; and</li> <li>(c) a characterisation of the interaction between the treated solid residue and the groundwater, more specifically being: <ul style="list-style-type: none"> <li>(i) the geochemical interactions between leachate, underlying soils and groundwater;</li> <li>(ii) contaminant transport rates; and</li> <li>(iii) contaminant migration pathways.</li> </ul> </li> </ul>	Hydrogeological report. Refer to Appendix G	✓
1.2.3	The Person to Whom this Notice is Given shall submit the hydrogeological report referred to in paragraph 1.2.1 of this Notice to DER at the Contact Address by 5pm on 1 July 2015.	Accompanies the Annual Report that was delivered to the Greater Swan offices In Bunbury before the due date.	✓
2.1.1	The Person to Whom this Notice is Given shall undertake the monitoring in Table 2.1.1 according to the specifications of that Table whilst the ponds remain uncovered.	Dust monitoring not required as the ponds were covered in September 2013.	See Comment
2.1.2	The Person to Whom this Notice is Given shall ensure dust sampling equipment is co-located and sited in compliance with AS/NZS 3580.1.1:2007.	Dust monitoring not required as the ponds were covered in September 2013.	See Comment
3.1.1	3.1.1 The Person to Whom this Notice is Given shall submit to DER at the Contact Address an annual report on the implementation of the requirements of this Notice by 30 June 2014, and by 30 June in each subsequent year.	Compliant with this condition. Annual report issued before 30 June 2015.	✓
3.1.2	The report referred to in paragraph 3.1.1 of this Notice shall include: <ul style="list-style-type: none"> <li>(a) annual monitoring data and other collected data required by any clause in this Notice; and</li> </ul>	Contained in Appendices D, E and G and I.  See Appendix G.	✓

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	Licence Requirement	Comment	Compliance
	<p>(b) interpretation and appraisal of the annual monitoring results against:</p> <p>(i) background water quality below and down gradient from the Premises and compared against background groundwater quality found up gradient of the Premises and against relevant ANZECC guidelines for water quality, historical data, the surrounding environment and other beneficial users; and</p> <p>(ii) NEPM standard of 50 µg/m<sup>3</sup> for PM<sub>10</sub> (24-hour average) and WHO Guideline of 120 µg/m<sup>3</sup> for TSP (24-hour average). The Licensee shall take representative samples of the TSR solid and TSR filtrate prior to the waste being brought to the Premises for disposal at quarterly intervals.</p>	<p>Not required. See condition 2.1.1</p>	

### 5.0 MINISTERIAL CONDITIONS & COMPANY COMMITMENTS

Cristal operates its Dalyellup solid waste disposal facility in accordance with Company Commitments and Ministerial Statements 213 and 332. Details are recorded below (Tables 6 & 7).

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**Table 6 - Compliance with Ministerial Conditions**

Commitment		Action Taken	Outcome
332:M1 Commitments	Fulfil the commitments (which are not inconsistent with the conditions or procedures contained in the Minister's statement)	Cristal has undertaken the requirements that currently apply.	Full compliance.
332:M2:1 Implementation	Adhere to the proposal as amended (via Statement 332) in accordance with any designs, specifications, plans or other technical material submitted by the proponent to the DEC.	Cristal has implemented the proposal as submitted.	Site operated effectively
332:M2:2 Minor amendments	Seek approval for modifications to the proposal by detailing changes to design, specifications, plans or technical material.	Cristal to notify DER of any changes. Closure plans sent to OEPA and other key stakeholders. OEPA satisfied with Closure Plan in February 2015.	Remaining ponds covered with clean fill. Waiting final risk assessment to determine final end use. OEPA approved Final Closure Rehabilitation Plan in February 2015.
213:M3 Compliance Audit Report	Prepare "Annual Compliance Report"	Contained in this report	Fully compliant refer to Tables 6 & 7.
332:M4:1 Rehabilitation	Prepare a final rehabilitation programme.	Cristal submitted a staged rehabilitation management program in October 2001. The DEC, Radiological Council and Shire of Capel approved the plan. Preliminary plan was submitted in September 2012. A Final Closure Rehabilitation Plan was sent June 2013.	Final Closure Rehabilitation Plan requires the completion of the Contaminated Sites risk assessment which is well under way. OEPA approved Final Closure Rehabilitation Plan in February 2015.

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Commitment		Action Taken	Outcome
332:M4:2 Rehabilitation	Implement the rehabilitation programme	<p>Cristal has implemented the first stage of the program as specified in the Staged Rehabilitation Management Program.</p> <p>Final Closure Rehabilitation Plan, June 2013, is being implemented.</p>	<p>Vegetation surveys and dune subsidence surveys conducted in 2003 and 2004. 2009 visual inspections revealed continued success in rates of plant growth.</p> <p>The Contaminated Sites risk assessment is well under way.</p> <p>The remaining ponds were covered with clean fill in Sept 2013.</p> <p>An Environmental Management Plan is currently being reviewed by the DER Contaminated Sites auditor.</p>
213:M5 Proponent	Seek approval for transfer of proponent	Not applicable.	Cristal will comply, when or if appropriate
332:M6:1 Site management	Operate and maintain the waste disposal site to protect the environment from unacceptable environmental impacts	Cristal complies with this condition through regular groundwater and radiation monitoring, dust, geochemical and geotechnical research and by following operational control procedures documented in the EMS and Radiation Management Plan, DER licence and Closure Notice	Refer to 2014 Annual Environmental Report and future AERs for ongoing monitoring and assessment.
332:M6:2 Site management	Extent of disposal. Ensure that disposal occurs within the existing lease boundary and does not encroach on the primary dunes and is limited to a fill height of no more than RL24.	Design for disposal ponds show only areas to the east of the primary dunes will be utilised. Cristal will comply with fill height of RL24.	Validation report on the rehabilitated site in January 2014 has confirmed, from core logs, that the fill coverage on top of the mud is 3-4 metres and mud level is below the RL24 mark across the site.
332:M6:3 Site management	Only dispose of waste from own operations	Only treated solid residue produced at Cristal was disposed at the site.	Full compliance.

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**Table 7 - Compliance with Company Commitments**

Commitment		Action Taken	Outcome
P1	The groundwater monitoring and reporting program will continue. This will be combined with ongoing investigations, including solute transport modelling to improve the understanding of the disposal technique.	Groundwater monitoring, radiation monitoring was conducted to schedule in 2014. Reporting as required.  Biennial Hydrogeological Report submitted to DER in June 2015.	Full compliance.
P2	Existing topsoil removal practices will be continued to ensure that windblown dust remains under control.	Stockpiled topsoil is appropriately located and germinating seed in the soil alleviates dust problems. "Hydromulch" paper mulch and grass seed was sprayed onto the stockpile at various times (last time in November 2013).	Full compliance. No dust issue at the site. No community complaints relating to dust since project inception.
P3	Radiation monitoring and reporting program will continue.	Radiation monitoring program carried out by Radiation Professionals.	Full compliance. Refer 2014 Annual Environmental Report
P4	At the end of the disposal period the proponent will cause the disposal site to be rehabilitated to the satisfaction of the Shire of Capel and the DEC.	Cristal submitted a staged rehabilitation management program in October 2001. The DEC, Radiological Council and Shire of Capel approved the plan. Preliminary plan was submitted in September 2012. A Final Closure Rehabilitation Plan was sent June 2013 and approved by Shire, RCWA, DER, and OEPA. The Shire of Capel expressed interest to convert the site to a sporting field complex.	First stage of the programme completed in 2002 with the successful rehabilitation of the southern ponds. Risk assessment for sports is currently being conducted by the Shire and waiting for Mandatory Auditor Report by the DER appointed auditor..
P5	The proponent will continue Research and Development Studies into methods of waste minimisation and modification including further salinity reductions. This will include further studies of the materials properties and possible uses.	A waste minimisation plant was commissioned in December 1992. This has substantially reduced the quantity of residue solids. A system for washing the solids prior to disposal was also developed.  New Facility at Transpacific's Banksia Road site at Dardanup has a leachate recovery circuit with leachate now returned to Cristal's Kemerton plant for further waste treatment.	Cristal has actively pursued co-product developments with external parties, however no economically viable options were found. Ceased operations at the site in 2013. Continue to run the waste minimisation plant at Kemerton.
P6	The proponent will continue actively pursuing alternative methods of waste disposal.	Cristal has found an alternative residue disposal site. The site will be fully lined and have total leachate recovery. This site is now in use.	Full compliance.

