Memo

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To: Dee Thompson
Cc: Jeremy Bower
From: David Blakeway
Date: 21 June 2013
Subject: Cockatoo Island barge Wharf benthic habitat survey

Pluton Resources' document *Cockatoo Island Iron Ore Mine and Processing Facility Provision of information for the construction of a Barge Wharf (Tenements M04/448 and M04/235)* proposes the construction of a barge wharf on the south-eastern bank of the Cockatoo Island Iron Ore Project (at approximately 16°06'08"S, 123°36'54"E) and a redirection of the fuel line from its existing location to a new output point at the newly constructed barge wharf. The DEC requires sufficient information to determine that the proposed work will not pose an additional threat or concern to the environment on Cockatoo Island. This memo provides information on the benthic habitats in and around the proposed construction site.

Benthic habitats were surveyed on the 16th July 2013 using a drop video camera. The survey was undertaken by driving over the area in a boat and lowering the video camera to the seafloor to record a short video of the substrate at 70 pre-selected points. The 70 points were laid out in a grid pattern spaced at 50m intervals alongshore and 15m intervals offshore (Figure 1). Depth and time were also recorded at each point. Coordinates, depths and times are tabulated in the appendix.

The study area comprises a shallow nearshore flat between 10 and 30 m wide that drops off at its seaward edge into depths of approximately 10-15m below lowest astronomical tide (LAT) The Shiploader straddles the dropoff at approximately 6-12m below LAT. Four benthic habitat categories were identified in the survey area: rock, sediment, filter-feeding invertebrates and coral. The distribution of the four habitats is shown in Figure 1.

The rock unit is the base of the mine embankment. It consists of angular boulders up to approximately 0.5m diameter (Figure 3). Very few plants or animals grow on the rocks as they are exposed out of water for several hours during spring low tides.

Sediment was the most widely distributed habitat, occupying approximately 95% of the survey area. The sediment is predominantly fine to medium grained sand but includes localised patches of mud and carbonate gravel/rubble. The mud occurs adjacent to the Stage 3 Settlement Pond and also in the deeper water below the slope. The deeper mud habitat is occupied by burrowing invertebrates, possibly shrimp (Figure 4).The gravel/rubble consists of dead coral and shell fragments on the outer flat and the slope. Filter-feeding invertebrates and coral colonise some of the coral rubble. Locations where filter feeder or coral density reached 5% or more (by visual estimate) were classified accordingly as filter feeder or coral habitat.

Filter-feeding invertebrates occupy hard substrate including coral rubble and shiploader pylons (Figure 6). The highest density of filter feeders, approximately 5-10%, occurred at two sites beneath the shiploader and one site off the Stage 3 Settlement Pond (Figure 1). The invertebrates include gorgonian soft coral 'sea whips', sponges, and crinoids. It is likely that similar invertebrate communities occupy most of the deeper pylons.

Live coral occurs in small patches on the coral rubble on the outer flat and upper reef slope at approximately 1 to 5m below LAT, approximately 500m from the proposed construction site (Figure 1). Live

coral cover at these sites is approximately 10%. Coral genera are primarily *Acropora and Montipora* (Figure 7). Occasional coral colonies were also recorded on the shiploader pylons.

The proposed barge wharf construction site is in an area that has been highly disturbed by several decades of mining and shipping operations. As no sensitive habitats occur near the construction site, the barge wharf construction and fuel line redirection described in Pluton Resources' proposal are unlikely to significantly impact benthic habitat.

Figure 1. Study area with video survey points

Figure 2. Rock at waypoint162

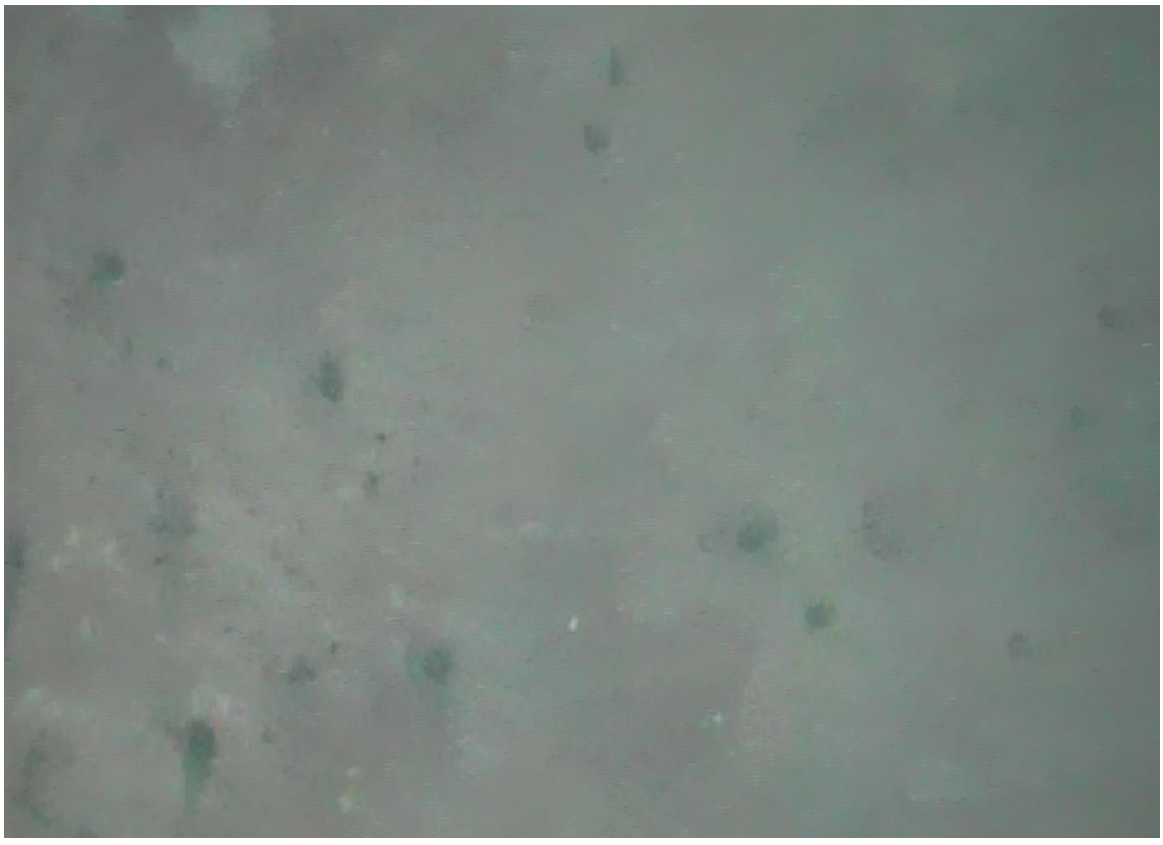

Figure 3. Burrowed mud and fine sand at waypoint 158

Figure 4. Gorgonian filter feeding invertebrates at waypoint 165

Figure 5. Coral genera *Montipora* (left) and *Acropora* (right) on coral rubble at waypoint 204

Appendix: survey data

GPS#3 waypoint	Easting MGA94Z51	Northing MGA94Z52	Timestamp	Depth (m LAT)	Habitat	Comment
140	565816	8219633	16/06/2013 11:03	-4.60	rock	rocks, sand, mud
141	565813	8219619	16/06/2013 11:04	-7.60	sediment	
142	565792	8219605	16/06/2013 11:08	-9.50	sediment	burrowed sand, a few sponges
143	565789	8219594	16/06/2013 11:09	-9.50	sediment	
144	565785	8219579	16/06/2013 11:10	-10.50	sediment	
145	565772	8219578	16/06/2013 11:12	-12.50	sediment	sand with bacterial mat
146	565774	8219555	16/06/2013 11:14	-14.40	sediment	sand w. bacterial mat
147	565766	8219646	16/06/2013 11:20	3.10	rock	
148	565759	8219636	16/06/2013 11:21	-1.60	rock	
149	565749	8219623	16/06/2013 11:22	-9.30	sediment	sand w. bacterial mat
150	565744	8219610	16/06/2013 11:24	-11.30	sediment	sand w. bacterial mat
151	565734	8219596	16/06/2013 11:26	-13.30	sediment	sand w. bacterial mat
152	565727	8219581	16/06/2013 11:28	-16.20	sediment	sand w. bacterial mat
153	565720	8219572	16/06/2013 11:30	-18.20	sediment	burrowed fine sand
154	565715	8219660	16/06/2013 11:36	1.00	rock	
155	565710	8219653	16/06/2013 11:38	-0.30	sediment	
156	565703	8219630	16/06/2013 11:39	-7.00	sediment	
157	565693	8219631	16/06/2013 11:40	-9.00	sediment	
158	565688	8219619	16/06/2013 11:40	-10.00	sediment	
159	565680	8219607	16/06/2013 11:41	-13.00	sediment	some gravel
160	565672	8219581	16/06/2013 11:42	-17.00	sediment	
161	565673	8219683	16/06/2013 11:46	3.10	rock	
162	565665	8219667	16/06/2013 11:47	2.70	rock	
163	565657	8219659	16/06/2013 11:48	0.40	sediment	
164	565648	8219647	16/06/2013 11:49	-3.10	filter feeders	gorgonians near or on shiploader structure, sand surrounding
165	565633	8219631	16/06/2013 11:50	-10.80	filter feeders	under Shiploader, gorgonians and sponges, steel girders
166	565635	8219624	16/06/2013 11:52	-13.80	sediment	burrowed sand, shelly gravel, coral rubble
167	565617	8219685	16/06/2013 11:55	2.30	rock	
168	565609	8219672	16/06/2013 11:56	0.00	sediment	
169	565602	8219659	16/06/2013 11:57	-4.70	sediment	

170	565595	8219652	16/06/2013 12:00	-9.60	sediment	
171	565576	8219718	16/06/2013 12:04	2.70	rock	
172	565578	8219712	16/06/2013 12:04	1.60	rock	
173	565571	8219694	16/06/2013 12:05	0.30	sediment	few sponges
174	565558	8219678	16/06/2013 12:06	-3.60	sediment	metal scrap on bottom
175	565550	8219676	16/06/2013 12:08	-9.50	sediment	
176	565531	8219737	16/06/2013 12:13	0.90	sediment	
177	565516	8219724	16/06/2013 12:14	-1.90	sediment	
178	565494	8219776	16/06/2013 12:20	1.90	rock	
179	565483	8219764	16/06/2013 12:20	0.60	sediment	
180	565473	8219746	16/06/2013 12:21	-0.90	sediment	few gorgonians
181	565463	8219729	16/06/2013 12:23	-8.20	sediment	
182	565457	8219724	16/06/2013 12:24	-12.10	sediment	
183	565454	8219806	16/06/2013 12:28	1.80	rock	
184	565443	8219784	16/06/2013 12:29	1.00	sediment	
185	565429	8219775	16/06/2013 12:31	0.10	sediment	
186	565429	8219761	16/06/2013 12:32	-8.00	sediment	
187	565400	8219808	16/06/2013 12:35	2.00	sediment	
188	565385	8219801	16/06/2013 12:36	0.30	sediment	
189	565385	8219783	16/06/2013 12:39	-2.10	sediment	
190	565354	8219839	16/06/2013 12:43	1.40	sediment	
191	565345	8219824	16/06/2013 12:45	1.00	sediment	
192	565335	8219806	16/06/2013 12:46	0.70	sediment	
193	565329	8219795	16/06/2013 12:47	-0.30	sediment	
194	565321	8219784	16/06/2013 12:48	-2.50	sediment	
195	565317	8219773	16/06/2013 12:51	-6.60	sediment	
196	565294	8219828	16/06/2013 12:53	0.90	rock	outer edge of rock
197	565282	8219813	16/06/2013 12:55	0.50	sediment	
198	565260	8219773	16/06/2013 12:57	-7.40	sediment	
199	565257	8219860	16/06/2013 13:00	2.60	rock	
200	565249	8219849	16/06/2013 13:01	1.10	sediment	
201	565232	8219835	16/06/2013 13:02	0.90	sediment	
202	565232	8219820	16/06/2013 13:04	0.80	sediment	rubble, 2-3% live coral

203	565225	8219812	16/06/2013 13:05	0.00	sediment	rubble, 2-5% live coral
204	565207	8219796	16/06/2013 13:07	-0.70	coral	10% live coral, *Acropora, Montipora* on dead *Acropora* branches
205	565205	8219788	16/06/2013 13:09	-5.20	coral	10-15% live coral, also sponges, crinoids
206	565199	8219768	16/06/2013 13:13	not recorded	sediment	burrowed
207	565264	8219788	16/06/2013 13:16	-1.40	coral	10% live coral, *Acropora, Montipora* on dead *Acropora* branches
208	565268	8219795	16/06/2013 13:19	-0.50	sediment	burrowed, 4% live coral on rubble, outer reef flat
209	565251	8219769	16/06/2013 13:21	-6.00	filter feeders	gorgonians and soft coral (5%) on rubble and sand, 2% live coral