ESdat Export Information:

Project(s):	
Filter:	Sampled Date between "March 2019 " and "Sep 2020"
	Field or Lab Data "Both"
	Locations In "GW1,GW2,GW3,GW5,GW6"
	Projects In "Redland Landfills"
Export Date/Time:	26/08/2020 12:56

Settings:

Chem Profile:	5329 Redlands GW
Chem Table Layout:	Redlands SW (Giles)
Env Standards:	
Include Result Prefix:	Y
Detects Only:	N
Exceedances Only:	N
Qualifiers:	
Comments:	
Chem Grouping:	Chem Group
Hidden Groups:	Phenols
	Halogenated Benzenes
	Organochlorine Pesticides
	Organophosphorous Pesticides
	Pesticides
Hidden ChemNames:	Redox Potential (Field)
	Temp (Field)
	DO (Field)
	DO (Field) (filtered)
	Dissolved Oxygen
	DO % Saturation (Field)
	Turbidity (Field)
	TDS (Field)
	Nitrite + Nitrate as N
	Alkalinity (Bicarbonate as CaCO3)
	Alkalinity (Carbonate as CaCO3)
	Alkalinity (Hydroxide) as CaCO3
	Alkalinity (total) as CaCO3
	Anions Total
	BOD
	Cations Total
	COD
	Ionic Balance
	Kjeldahl Nitrogen Total
	Nitrite (as N)
	Nitrogen (Total Oxidised)
	Nitrogen (Total)
	Phosphorus
	Sulphate (filtered)
	Chromium (Trivalent) (filtered)
	Cobalt (filtered)
	Selenium (filtered)
	Silver (filtered)
	Tin (filtered)

				Field		Inorganics						Metals													
				pH (Field)	EC (field)	Sulfate as SO4 - Turbidimetric (filtered)	Ammonia as N	Chloride	Nitrate (as N)	Sodium (filtered)	TOC	Aluminium (filtered)	Arsenic (filtered)	Cadmium (filtered)	Calcium (filtered)	Chromium (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Magnesium (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Potassium (filtered)	Zinc (filtered)
				-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL						1	0.01	1	0.01	1	1	0.005	0.0002	0.00005	1	0.0002	0.0005	0.002	0.0001	1	0.0005	0.00004	0.0005	1	0.001
Site ID	**Monitoring Zone**	**Location Code**	**Date**																						
Coochiemudlo Island		**GW3**	**15/03/2019**	4.58	117		<0.01	25	0.11	20	4	0.163	<0.0002	<0.00005	1	0.0007	0.0024	0.231	0.0003	2	0.0045	<0.0001	<0.0005	<1	0.011
Coochiemudlo Island		**GW3**	**15/03/2019**				<0.01	22	0.09	18	5	0.274	<0.0002	<0.00005	1	0.0011	0.0028	0.356	0.0004	1	0.0043	<0.0001	0.0006	<1	0.011
Coochiemudlo Island		**GW3**	**16/05/2019**	4.89	117.9		0.04	20	0.05	19	3	0.126	<0.0002	<0.00005	2	0.0005	0.0014	0.16	0.0002	2	0.0048	<0.0001	<0.0005	<1	0.174
Coochiemudlo Island		**GW3**	**16/05/2019**				0.04	22	0.05	19	3	0.108	<0.0002	<0.00005	2	0.0004	0.0015	0.148	0.0001	2	0.0048	<0.0001	<0.0005	<1	0.163
Coochiemudlo Island		**GW3**	**9/07/2019**	5.44	125.5	8	<0.01	15	0.06	14	3	0.033	<0.0002	<0.00005	2	<0.0002	0.0007	0.046	0.0001	2	0.004	<0.0001	<0.0005	<1	0.008
Coochiemudlo Island		**GW3**	**9/07/2019**			8	<0.01	15	0.06	14	2	0.043	<0.0002	<0.00005	2	0.0002	0.0007	0.053	0.0003	2	0.0041	<0.0001	<0.0005	<1	0.008
Coochiemudlo Island		**GW3**	**29/08/2019**	4.95	259.3		<0.01	43	0.06	32	3	0.024	<0.0002	<0.00005	2	<0.0002	0.0009	0.324	<0.0001	2	0.0076	<0.00004	0.0006	<1	0.059
Coochiemudlo Island		**GW3**	**7/11/2019**	4.6	222		<0.01	41	0.11	37	3	0.195	<0.0002	<0.00005	2	0.0006	0.0018	0.252	0.0002	2	0.0066	<0.0001	0.0006	<1	0.147
Coochiemudlo Island		**GW3**	**12/02/2020**	5.9	30.6	2	<0.01	3	0.04	4	5	0.37			<1	0.001		0.23	<0.001	<1			<0.001	<1	<0.005
Coochiemudlo Island		**GW3**	**20/05/2020**	5.4	51.3	4	0.02	12	0.02	9	8	0.21	<0.001	<0.0001	1	<0.001	0.012	0.11	<0.001	1	0.003	<0.0001	<0.001	<1	0.012
Coochiemudlo Island		**GW3**	**5/08/2020**	4.93	89.8	12	0.02	175	0.02	16	4	0.12	<0.001	<0.0001	1	<0.001	0.001	0.08	<0.001	2	0.004	<0.0001	<0.001	<1	0.007
Coochiemudlo Island		**GW5**	**6/04/2018**	5.21	408.2	22	0.03	79	3.38	63	1	0.006	<0.0002	<0.00005	2	<0.0002	0.0011	<0.002	0.0005	5	0.0038	<0.0001	0.001	<1	<0.001
Coochiemudlo Island		**GW5**	**6/04/2018**			21	0.03	81	3.28	63	1	0.01	<0.0002	<0.00005	2	<0.0002	0.0012	<0.002	0.0005	5	0.0038	<0.0001	0.0009	<1	0.001
Coochiemudlo Island		**GW5**	**8/06/2018**	4.82	224.8	15	0.03	74	3.08	48	1	0.012	<0.0002	<0.00005	<1	<0.0002	<0.0005	<0.002	0.0001	4	0.0018	<0.00004	<0.0005	<1	<0.001
Coochiemudlo Island		**GW5**	**8/06/2018**			15	0.03	74	3.11	48	<1	0.011	<0.0002	<0.00005	<1	<0.0002	<0.0005	<0.002	0.0001	4	0.0018	<0.00004	<0.0005	<1	<0.001
Coochiemudlo Island		**GW5**	**15/11/2018**	4.63	446.3		0.02	55	3.03	45	1	0.011	<0.0002	<0.00005	1	<0.0002	0.003	0.009	0.0002	3	0.0035	<0.0001	0.0005	<1	0.015
Coochiemudlo Island		**GW5**	**15/03/2019**	4.62	332.8		<0.01	80	3.02	55	<1	0.01	<0.0002	<0.00005	1	0.0004	<0.0005	0.004	<0.0001	5	0.0022	<0.0001	<0.0005	<1	<0.001
Coochiemudlo Island		**GW5**	**16/05/2019**	4.63	290.7		0.03	74	2.91	50	<1	0.009	<0.0002	<0.00005	1	<0.0002	<0.0005	<0.002	<0.0001	4	0.0026	<0.0001	<0.0005	<1	0.001
Coochiemudlo Island		**GW5**	**9/07/2019**	4.77	391.7	17	0.01	72	2.93	51	1	0.018	<0.0002	<0.00005	<1	<0.0002	<0.0005	<0.002	<0.0001	5	0.0019	<0.0001	<0.0005	<1	<0.001
Coochiemudlo Island		**GW5**	**29/08/2019**	4.74	321		<0.01	73	2.62	48	<1	0.022	<0.0002	<0.00005	<1	<0.0002	<0.0005	<0.002	<0.0001	5	0.0019	<0.00004	<0.0005	<1	<0.001
Coochiemudlo Island		**GW5**	**7/11/2019**	4.63	306.3		<0.01	63	2.47	48	1	0.014	<0.0002	<0.00005	<1	<0.0002	<0.0005	<0.002	0.0001	4	0.0019	<0.0001	<0.0005	<1	0.001
Coochiemudlo Island		**GW5**	**12/02/2020**	4.82	287	19	<0.01	61	1.95	48	<1	0.02			<1	<0.001		<0.05	<0.001	4			<0.001	<1	<0.005
Coochiemudlo Island		**GW5**	**20/05/2020**	4.73	334	21	<0.01	74	1.56	52	2	0.02	<0.001	<0.0001	<1	<0.001	<0.001	<0.05	<0.001	4	0.001	<0.0001	<0.001	<1	<0.005
Coochiemudlo Island		**GW5**	**5/08/2020**	4.59	279	25	<0.01	69	1.48	49	2	0.02	<0.001	<0.0001	<1	<0.001	<0.001	<0.05	<0.001	4	0.001	<0.0001	<0.001	<1	<0.005
Coochiemudlo Island		**GW6**	**6/04/2018**	3.89	2,282	13	0.03	704	0.03	314	1	5.7	<0.0002	0.00006	7	0.0002	0.0069	0.153	0.0012	57	0.214	<0.0001	0.0071	3	0.096
Coochiemudlo Island		**GW6**	**8/06/2018**	3.83	2,112	14	0.06	732	0.03	305	3	5.58	<0.0002	<0.00005	4	<0.0002	0.0027	0.34	0.0008	54	0.148	<0.00004	0.0036	2	0.035
Coochiemudlo Island		**GW6**	**15/11/2018**	4.12	2,454		0.02	779	0.02	345	1	7.39	0.0002	<0.00005	4	<0.0002	0.0033	0.078	0.0008	60	0.139	<0.0001	0.0032	2	0.033
Coochiemudlo Island		**GW6**	**15/11/2018**				<0.01	872	0.02	385	2	7.59	<0.0002	<0.00005	4	0.0002	0.0009	0.479	0.0007	68	0.12	<0.0001	0.0032	2	0.022
Coochiemudlo Island		**GW6**	**16/05/2019**	3.95	1,806		0.04	669	0.03	292	<1	4.12	<0.0002	<0.00005	3	<0.0002	0.0008	0.172	0.001	50	0.16	<0.0001	0.002	3	0.129
Coochiemudlo Island		**GW6**	**9/07/2019**	3.99	2,225	17	<0.01	760	0.02	338	2	6.97	<0.0002	<0.00005	3	0.0002	0.0009	0.153	0.001	60	0.13	<0.0001	0.0027	2	0.018
Coochiemudlo Island		**GW6**	**29/08/2019**	3.83	2,368		0.02	793	<0.01	321	2	6.87	<0.0002	<0.00005	3	0.0002	0.0007	0.745	0.0007	62	0.128	<0.00004	0.003	2	0.05
Coochiemudlo Island		**GW6**	**7/11/2019**	3.77	2,077		<0.01	720	0.04	299	1	4.34	<0.0002	<0.00005	2	0.0002	0.0005	0.241	0.001	49	0.149	<0.0001	0.0022	3	0.025
Coochiemudlo Island		**GW6**	**12/02/2020**	3.64	2,360	18	0.02	825	<0.01	373	<1	7.6			3	0.001		0.11	<0.001	69			0.003	2	0.022
Coochiemudlo Island		**GW6**	**20/05/2020**	3.72	2,724	15	<0.01	770	<0.01	336	2	6.05	<0.001	<0.0001	3	<0.001	<0.001	1.49	<0.001	56	0.138	<0.0001	0.002	2	0.014
Coochiemudlo Island		**GW6**	**5/08/2020**	3.8	2,074	15	<0.01	763	<0.01	335	3	5.71	<0.001	<0.0001	2	<0.001	<0.001	2.23	<0.001	57	0.135	<0.0001	0.003	2	0.015

ESdat Export Information:

Project(s):	
Filter:	Sampled Date between "March 2019" and "Septebmer 2020" Field or Lab Data "Both" Locations In "CISW1,CISW2,CISW3,CISW4,CISW5" Projects In "Redland Landfills"
Export Date/Time:	26/08/2020 10:19

Settings:

Chem Profile:	5329 Redlands SW
Chem Table Layout:	Redlands SW (Giles)
Env Standards:	
Include Result Prefix:	Y
Detects Only:	N
Exceedances Only:	N
Qualifiers:	
Comments:	
Chem Grouping:	Chem Group
Hidden Groups:	Phenols Halogenated Benzenes Organochlorine Pesticides Organophosphorous Pesticides Pesticides
Hidden ChemNames:	Temp (Field) TDS (Field) Redox Potential (Field) Turbidity (Field) Nitrite + Nitrate as N Alkalinity (Bicarbonate as CaCO3) Alkalinity (Carbonate as CaCO3) Alkalinity (Hydroxide) as CaCO3 Alkalinity (total) as CaCO3 Anions Total Cations Total Ionic Balance Kjeldahl Nitrogen Total Nitrite (as N) Nitrogen (Total Oxidised) Chromium (hexavalent) (filtered) Chromium (Trivalent) (filtered) Cobalt (filtered) Selenium (filtered) Silver (filtered) Tin (filtered)

Terms & Conditions

Disclaimer:
All care has been exercised in the compilation of these guidelines (or Environmental Standards), however no liability is taken for any error.
It is the responsibility of the user to review the contained data and ensure their data is compliant with the relevant guidelines, and that this compilation of guidelines meets their requirements.

			Field			Inorganics											Metals														
			pH (Field)	EC (field)	DO % Saturation (Field)	Sulfate as SO4 - Turbidimetric (filtered)	Ammonia as N	BOD	Chloride	COD	Nitrate (as N)	Nitrogen (Total)	Phosphorus	Sodium (filtered)	TOC	TSS	Aluminium (filtered)	Arsenic (filtered)	Cadmium (filtered)	Calcium (filtered)	Chromium (filtered)	Copper (filtered)	Iron (filtered)	Lead (filtered)	Magnesium (filtered)	Manganese (filtered)	Mercury (filtered)	Nickel (filtered)	Potassium (filtered)	Zinc (filtered)	
			-	µS/cm	%Sat	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL						1	0.01	2	1	10	0.01	0.1	0.01	1	1	5	0.005	0.0002	0.00005	1	0.0002	0.0005	0.002	0.0001	1	0.0005	0.00004	0.0005	1	0.001
Site ID	**Location Code**	**Date**																												
Coochiemudlo Island	**CISW1**	**15/03/2019**	4.03	4,009			2.71	24	99	205	<0.1	6.8	0.08	86	44		64.8	0.0034	0.0271	272	0.011	0.0072	416	0.0195	141	2.05	<0.00004	0.232	15	37.8
Coochiemudlo Island	**CISW1**	**16/05/2019**	5.03	3,743	2.6		0.01	3	124	102	<0.01	1.4	0.06	52	23		0.032	0.0007	<0.00005	36	0.0008	0.0008	0.723	<0.0001	25	0.0532	<0.0001	0.0006	13	0.32
Coochiemudlo Island	**CISW1**	**16/05/2019**				170	<0.01	<2	169	40	<0.01	0.5	0.01	66	16		0.042	0.0004	<0.00005	50	0.0008	<0.0005	0.645	0.0001	40	0.0109	<0.0001	<0.0005	17	0.005
Coochiemudlo Island	**CISW1**	**29/08/2019**	5.75	3,456	1.3		<0.01	<2	239	24	<0.01	0.4	<0.01	84	10		0.01	0.0003	<0.00005	71	<0.0002	<0.0005	1.33	<0.0001	62	0.0463	<0.00004	<0.0005	19	0.015
Coochiemudlo Island	**CISW1**	**12/02/2020**	6.45	92.6	50.3	<1	<0.01	<2	10	36	0.01	0.6		8	13	14	1.85			4	0.002		0.69	<0.001	2			<0.001	4	0.008
Coochiemudlo Island	**CISW1**	**20/05/2020**	6.66	916	34.9	110	0.04	3	151	44	<0.01	0.6	0.01	67	17	6	0.03	<0.001	<0.0001	39	<0.001	0.002	0.88	<0.001	31	0.013	<0.0001	<0.001	18	<0.005
Coochiemudlo Island	**CISW1**	**5/08/2020**	6.46	681	42.1	101	<0.01	<2	161	34	<0.01	0.4	0.01	68	14	<5	0.32	<0.001	<0.0001	32	0.001	<0.001	0.56	<0.001	30	0.008	<0.0001	<0.001	15	0.009
Coochiemudlo Island	**CISW2**	**22/03/2018**	5.95	301.3	0.1	19	<0.01	12	62	260	<0.05	3.2	0.37	36	83		0.919	0.0041	<0.00005	12	0.0034	0.0012	12.1	0.0005	8	0.0533	<0.00004	0.0024	8	0.006
Coochiemudlo Island	**CISW2**	**8/06/2018**	5.86	273	12	23	<0.01	4	71	118	<0.01	1.5	0.15	36	34		0.254	0.0012	<0.00005	8	0.0026	0.0006	4.21	0.0001	5	0.0201	<0.00004	0.0005	7	0.002
Coochiemudlo Island	**CISW2**	**12/02/2020**	5.8	83.8	40	<1	<0.01	4	11	94	0.02	1.2		10	39	6	0.89			2	0.002		0.37	<0.001	1			<0.001	4	0.007
Coochiemudlo Island	**CISW2**	**20/05/2020**	6.25	331	49.4	3	0.01	3	81	307	<0.01	2.4	0.17	40	43	74	0.19	0.001	<0.0001	6	0.002	0.001	1.98	<0.001	5	0.014	<0.0001	<0.001	10	0.007
Coochiemudlo Island	**CISW2**	**5/08/2020**	4.91	418	64.4	58	0.01	3	86	143	<0.05	1.5	0.08	51	39	21	0.4	0.001	<0.0001	10	0.002	0.001	4.33	<0.001	10	0.036	<0.0001	0.001	6	0.01
Coochiemudlo Island	**CISW3**	**22/03/2018**	4.63	362.7	2.8	116	<0.01	12	112	270	<0.02	2.3	0.25	77	105		0.751	0.0024	<0.00005	15	0.0035	0.0013	17.2	0.0001	21	0.106	<0.00004	0.0041	13	0.015
Coochiemudlo Island	**CISW3**	**12/02/2020**	5.44	117.2	78.3	6	<0.01	3	22	70	<0.01	0.8		14	31	<5	0.44			2	0.002		0.31	<0.001	2			<0.001	3	<0.005
Coochiemudlo Island	**CISW3**	**20/05/2020**	5.59	304	37.3	<5	0.08	<2	75	452	<0.05	4	0.26	38	59	129	0.34	0.001	<0.0001	6	0.002	<0.001	7.36	<0.001	5	0.029	<0.0001	<0.001	8	<0.005
Coochiemudlo Island	**CISW3**	**5/08/2020**	4.91	284	52.4	25	<0.01	4	64	185	<0.05	1.6	0.08	37	44	15	0.22	<0.001	<0.0001	8	0.002	0.001	4.73	<0.001	6	0.043	<0.0001	0.001	8	0.007
Coochiemudlo Island	**CISW4**	**22/03/2018**	5.96	218.3	1.2	4	0.03	4	27	48	<0.01	0.7	0.05	20	17		0.981	0.0114	<0.00005	5	0.0031	0.0008	10.4	0.0004	4	0.0436	<0.00004	0.0012	1	0.004
Coochiemudlo Island	**CISW4**	**22/03/2018**				22	<0.05	8	53	346	0.02	4.3	0.29	35	84		0.057	0.0036	<0.00005	4	0.0012	<0.0005	4.15	<0.0001	5	0.0325	<0.0001	0.001	<1	0.121
Coochiemudlo Island	**CISW4**	**12/02/2020**	6.41	103.1	48.9	5	0.01	2	14	29	0.07	0.6		11	12	9	0.36			5	0.002		0.27	<0.001	2			<0.001	2	0.022
Coochiemudlo Island	**CISW4**	**20/05/2020**	6.7	340	38.3	8	<0.01	<2	53	76	<0.01	1.4	0.1	33	28	42	0.2	0.004	<0.0001	8	0.003	<0.001	14.5	<0.001	8	0.046	<0.0001	0.002	2	0.025
Coochiemudlo Island	**CISW4**	**5/08/2020**	5.47	362	37.8	38	0.01	2	95	46	<0.01	0.7	0.02	57	19	10	0.26	0.002	<0.0001	7	0.003	0.001	2.09	<0.001	9	0.019	<0.0001	<0.001	<1	0.013
Coochiemudlo Island	**CISW5**	**22/03/2018**	6.1	155.2	6.1	4	<0.01	<2	18	34	<0.01	0.5	0.04	13	10		1.95	0.0026	<0.00005	5	0.0021	0.0022	1.22	0.0007	3	0.0133	<0.00004	0.0009	2	0.004
Coochiemudlo Island	**CISW5**	**8/06/2018**	6.1	57.4	27	1	0.03	<2	10	26	<0.01	0.4	0.05	7	8		0.544	0.0015	<0.00005	3	0.0007	0.0008	0.868	0.0005	1	0.0104	<0.00004	<0.0005	2	0.003
Coochiemudlo Island	**CISW5**	**8/06/2018**					<0.01	5	9	48	0.02	0.8	0.2	6	17		0.221	0.0077	<0.00005	3	0.0015	0.0039	1.26	0.0011	1	0.04	<0.0001	0.0006	2	0.009
Coochiemudlo Island	**CISW5**	**16/05/2019**	5.47	101.5	9.7		0.02	2	22	52	<0.01	0.8	0.05	14	19		0.142	0.0043	<0.00005	6	0.0014	<0.0005	1.93	0.0001	2	0.0496	<0.0001	0.0009	3	0.09
Coochiemudlo Island	**CISW5**	**16/05/2019**				2	<0.01	2	18	56	<0.01	0.8	0.08	11	15		0.322	0.0037	<0.00005	4	0.0012	0.0006	2.61	0.0002	2	0.0471	<0.0001	0.0009	3	0.004
Coochiemudlo Island	**CISW5**	**12/02/2020**	6.14	65.5	47.6	<1	<0.01	2	10	54	<0.01	0.5		7	11	34	1.83			2	0.003		0.74	<0.001	1			<0.001	2	0.007
Coochiemudlo Island	**CISW5**	**20/05/2020**	5.85	180.5	34.9	24	<0.01	7	29	30	0.02	0.6	0.04	22	11	7	0.87	0.002	<0.0001	5	0.001	0.002	0.53	<0.001	2	0.031	<0.0001	<0.001	3	0.022
Coochiemudlo Island	**CISW5**	**5/08/2020**	6.18	96.9	36	<1	0.03	<2	22	45	<0.01	0.6	0.05	14	15	<5	0.42	0.004	<0.0001	4	0.002	<0.001	3.13	<0.001	2	0.019	<0.0001	<0.001	2	0.006

Memorandum

19 December 2019

To	Redland City Council		
Copy to			
From	Simon Hodgkison	Tel	
Subject	Coochiemudlo Island Weed Management Memorandum	Job no	4127018/19/

1 Introduction

Redland City Council has commissioned GHD to provide advice on ecologically sensitive ways to manage weeds in Coochiemudlo Wetland.

Recent studies have highlighted the ecological values of the Coochiemudlo Wetland (Green 2016; Deveco 2017; GHD 2018). It is a small, isolated wetland with high ecological values. The wetland, which occurs on the north-eastern side of Coochiemudlo Island, has the potential to provide habitat for conservation significant species including the wallum sedge frog (*Litoria olongburensis*), wallum rocket frog (*Litoria freycineti*) and wallum froglet (*Crinia tinnula*) (Deveco 2017; GHD 2019) and is confirmed habitat for the swamp orchid (*Phaius australis*) (Green 2016). All species are listed under the Queensland *Nature Conservation Act 1992* (NC Act) and the wallum sedge frog and swamp orchid are also listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Wallum frogs have highly specific hydrology and water chemistry requirements, only occurring in ephemeral waterbodies with low pH and low nutrient (Meyer et al 2006). Inappropriate herbicide application in or adjacent to Coochiemudlo Wetland has the potential to degrade the quality of habitats for wallum frogs and the swamp orchid.

Identifying ecologically sensitive options for weed control is a high priority for management of the wetland. To address this issue Redland City Council has previously commissioned a number of studies to assess weed management options on Coochiemudlo Island (EPM Consulting 2004; FRC 2012), to prepare an Integrated Weed Management Plan for Coochiemudlo Island (Ecosure 2017) and review the suitability and toxicity of herbicides used by Redland City Council on Coochiemudlo Island (Prochazka et al. 2015). To utilise the information gained from recent ecological surveys (GHD, 2019), spatially explicit information is required on appropriate weed management within different parts of the wetland.

This memorandum aims to provide a synthesis of those studies and give location-specific weed management recommendations for the wetland. This will maximise weed management outcomes whilst protecting the ecological integrity of potential habitats for the wallum frogs and swamp orchid.

2 Approach

This memorandum has the following structure:

- Section 3 reviews the ecological values of Coochiemudlo Wetland

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- Section 4 reviews the risks and benefits of common weed control methods including those used in the Integrated Weed Management Plan for Coochiemudlo Wetland (Ecosure 2017)
- Section 5 reviews the potential risks to amphibians from herbicides typically used by Redland City Council on Coochiemudlo Island based on the findings detailed in Prochazka et al. 2015.
- Section 6 provides location-specific recommendations for appropriate weed control and herbicide application within different parts of Coochiemudlo Wetland.

3 Review of the ecological values of Coochiemudlo Wetland

3.1 Description of Coochiemudlo Wetland

Coochiemudlo Wetland occurs on the north-east side of Coochiemudlo Island, a small island located 800 m northeast of Victoria Point in southern Moreton Bay, Queensland. The wetland is the major environmental feature of the island, containing an array of native flora and fauna. The wetland covers approximately 7 ha, and is surrounded by residential properties to the south and north, Norfolk Beach to the east and Laurie Burns Recreation Reserve to the west (Figure 1). A small drainage line intersects the wetland, flowing east towards Norfolk Beach. Vegetation within the wetland consists of Melaleuca forest surrounded by Eucalypt woodland. Two regional ecosystem (RE) communities are present within the wetland, as detailed in Table 1 and mapped in Figure 2. The wetland is mapped as essential habitat for five conservation significant species listed under the NC Act: the wallum froglet, wallum rocket frog, wallum sedge frog, swamp orchid and the koala (*Phascolarctos cinereus*) (Figure 2). While the wetland has high ecological values, parts of the wetland, particularly around the south-western and southern fringes have moderate-high levels of weed encroachment and require active weed management.

Table 1 Regional ecosystems of the Coochiemudlo Island wetland

RE	VM Act	BD Status	Description
12.2.7	Least concern	No concern at present	Open forest of *Melaleuca quinquenervia* or rarely *M. dealbata*. A shrub layer of *Melastoma malabathricum* or *Banksia robur* may be present. The ground layer is sparse and dense. Occurs on Quaternary coastal dunes and seasonally waterlogged sandplains.
12.5.3	Endangered	Endangered	*Eucalyptus racemosa* w/ *Corymbia intermedia*, *E. siderophloia* and various Eucalypt species. *Melaleuca quinquenervia* present on lower slopes. Occurs on complex remnant tertiary soils +/- Cainozoic and Mesozoic sediments.

Key to table: VM Act – Vegetation Management Act 1999, BD Status – Biodiversity status.

1:4,000 (at A4)
0 20 40 60 80 100
Metres
Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Redland City Council
Coochiemudlo Island
Frog Survey Report

Job Number 41-27018
Revision 0
Date 31 Oct 2019

Coochiemudlo Wetland Location

Figure 1

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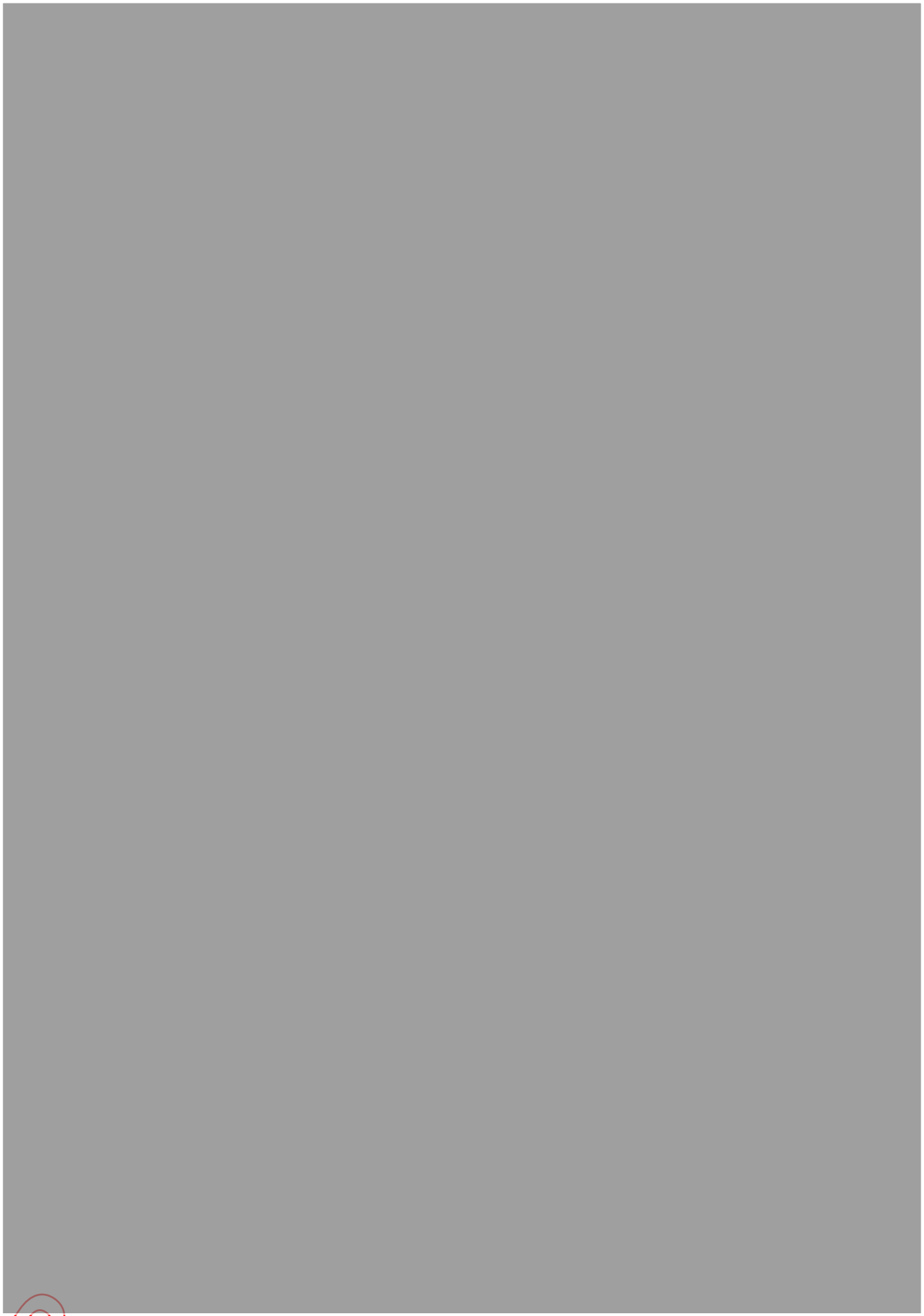
Data Source: DNRME: Cadastre (2017), WMS Imagery (2015), Roads (2018); GA: Mainlands, Watercourse Areas (2007); GHD: Site Boundary (2018). Created : xml



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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Redland City Council
Coochiemudlo Island
Frog Survey Report

Regional Ecosystems within the Coochiemudlo Wetland

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Figure 2

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Data Source: DNRME: Cadastre (2017), WMS Imagery (2015), Roads, Essential Habitat v6, Regional Ecosystems v10.1 (2018); GHD: Swamp Orchid (2019), Site Boundary (2018). Created : knoble

3.2 Habitat types present within Coochiemudlo wetland

A survey by GHD (2019) reported the following five broad habitat types within Coochiemudlo wetland:

- Semi-permanent wetland with Melaleuca and open understorey
- Semi-permanent wetland with Melaleuca and tall reeds
- Ephemeral wetland with Melaleuca and low reeds/sedges
- Melaleuca wetland fringe with dense weed infestation
- Eucalypt woodland with shrubby understorey

The distribution of the habitats is mapped in Figure 3 and their ecological values are summarised below.

Habitat 1 - Semi-permanent wetland with Melaleuca and open understory

The centre of the wetland coincides with deep, semi-permanent pools, mature *Melaleuca quinquenervia* and relatively sparse shrub and ground layer. The absence of reeds and sedges in this area, means it provides limited calling and perching substrate for wallum frogs. The semi-permanent nature of the waterbody makes it less suitable as a breeding habitat for wallum frogs. However, the wallum froglet may utilise the area, during drier years when this section of the wetland becomes more ephemeral.

Habitat 2 - Semi-permanent wetland with Melaleuca and tall reeds

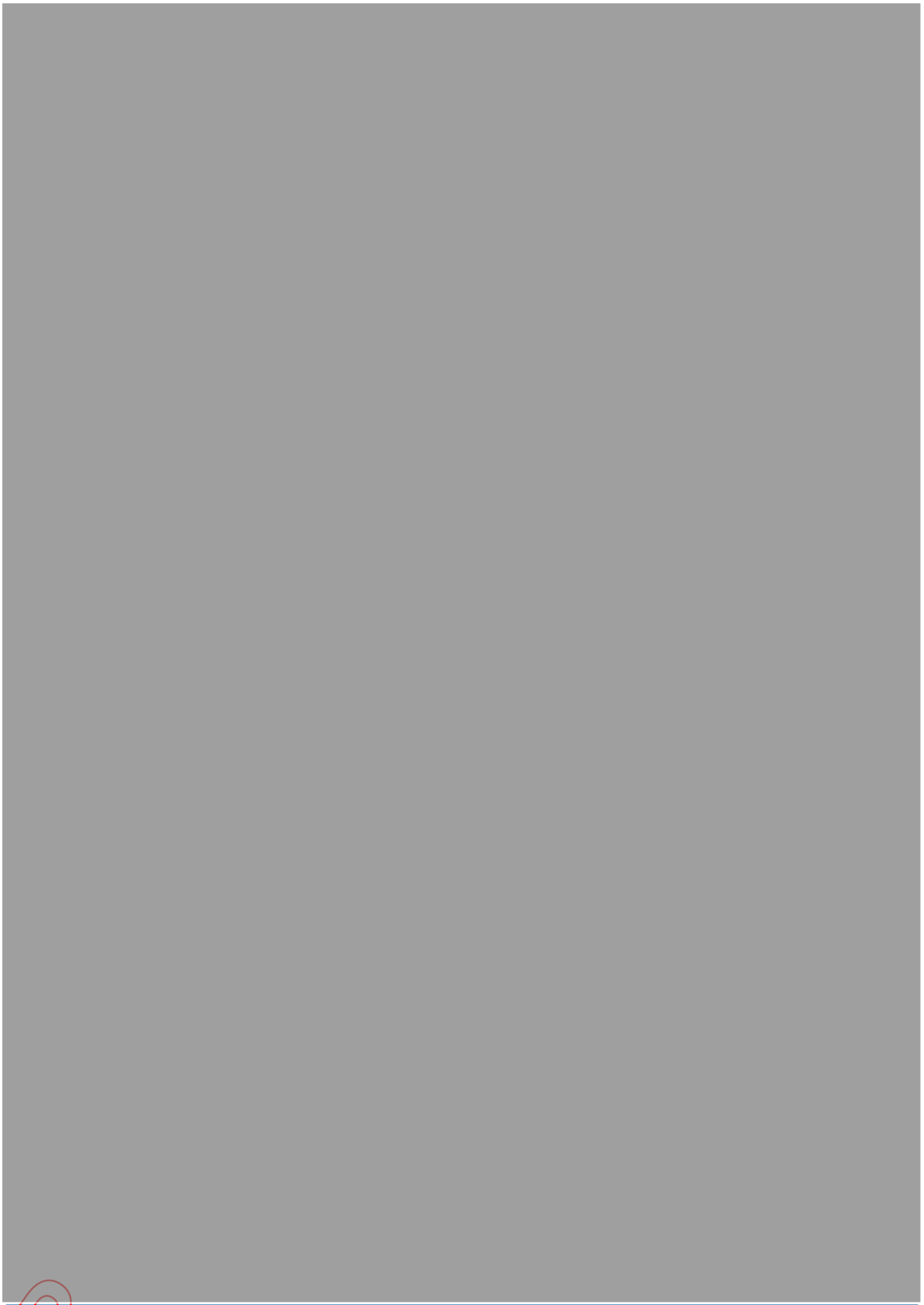
This habitat occurs as a band of dense tall reeds and sedges within the inner fringe of Coochiemudlo wetland. This corresponds with deeper pools that are likely to be too permanent to represent breeding habitat for wallum frogs. However, this area provides breeding habitat for common frogs. The outer fringes intergrade with shallower areas that may represent foraging habitat for the wallum sedge frog.

Habitat 3 - Ephemeral wetland with Melaleuca and low reeds/sedges

The outer fringes of the wetland support ephemeral waterbodies that represent suitable habitat for wallum frogs. The area has a canopy of *Melaleuca quinquenervia* with a dense cover of sedges and reeds. Low sedges provide microhabitats for the wallum sedge frog and wallum froglet. Waterbodies displayed characteristics favoured by wallum frogs, with suitable hydroperiod and clear, tannin-stained water on sandy substrate. This represents potential breeding and foraging habitat for all three species.

Habitat 4 - Melaleuca wetland fringe with dense weed infestation

The outer edges of the wetland have been degraded by weeds. Ephemeral waterbodies occur in this area and provide breeding sites for common frogs. The level of weed infestation is likely to exclude wallum frog species from this area. The abundance of weeds may indicate elevated soil nutrient levels that are unsuited to wallum frogs. However, it may represent sub-optimal foraging habitat for wallum frogs. While existing eutrophication and weed infestation has limited the value of this area as breeding habitat for wallum frogs, the hydrology is consistent with that observed in wallum frog breeding habitat. If rehabilitated to remove weeds and restore natural nutrient and soil/water chemistry levels, this area has the potential to become suitable wallum frog habitat. Proximity to higher value habitat (habitat 3) means it is an important buffer protecting the integrity of wallum frog habitats. At the same time, it currently represents a source for local weed incursion that requires ongoing active weed control.



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0 20 40 60 80 100

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Redland City Council
Coochiemudlo Island
Frog Survey Report

Job Number 41-27018
Revision 0
Date 08 Nov 2019

Broad Habitat Types of the Coochiemudlo Wetland

Figure 3

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Data Source: DNRME: Cadastre (2017), WMS Imagery (2015), Roads (2018); GHD: Site Boundary, Broad Habitat Types (2018), Potential Wallum Frog Breeding Habitat (2019), Swamp Orchid (2019). Created : knoble

Habitat 5 - Eucalypt woodland

The outer edges of the Coochiemudlo wetland are bordered by mixed Eucalypt woodlands with mature scribbly gum (*Eucalyptus racemosa*), Queensland blue gum (*Eucalyptus tereticornis*) and swamp mahogany (*Lophostomen suaveolens*). The absence of substantial waterbodies means this area has limited value as breeding habitat for wallum frogs, but may be utilised as foraging habitat. Woodland habitat plays an important role maintaining hydrology and water chemistry (Meyer et al. 2006).

4 Review of weed application methods used on Coochiemudlo Island

The Integrated Weed Management Plan for Coochiemudlo Island (Ecosure 2017) recommends the following methods of weed application within Coochiemudlo Wetland:

- Hand removal
- Crowning method
- Cut, scrape and paint method
- Spot spraying

This section reviews the potential risks and benefits of those and other common weed control methods. The potential risks to amphibians are summarised in Table 2.

4.1 Herbicide free methods

Hand removal

This method aims to remove the entire weed from the soil by hand pulling. The target species is held tightly by base of the stem and pulled so that the root system is completely removed from the soil. This method is useful for small-scale infestations or within environmental sensitive areas as it does not require any herbicides, specialised equipment or produce environmental impacts. Whilst hand pulling may result in localised soil disturbance, which may promote environmental weeds, this risk can be mitigated by tamping any disturbed soil back into place. This method presents no impacts to amphibians other than the short-term impacts of trampling and the potential for sediment mobilisation if large areas of weeds are cleared.

Crowning method

The crowning method is a manual, herbicide free method used for the removal of weed species with subterranean organs (e.g. rhizomes, bulbs or lignotubers). Such organs store carbohydrates, which may allow the plant to reshoot if not properly removed. This method involves using a knife to cut through the root system of the weed, allowing for easy removal of the crown of the plant. Once removed, the plant must be disposed of or hung up so that the plant is not in contact with the ground, as this may allow the specimen to reshoot. This method does not require herbicides and presents no impact to amphibians.

Weed matting

Weed matting can be used to suppress ground-cover weeds by removing their capacity for photosynthesis. Given the method also removes the potential photosynthetic capabilities of native plants

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it only suitable for use in areas that are extensively infested with weeds or to prevent weed incursions in areas that have been subject to clearing. This method has no adverse impacts on amphibians other than the potential to remove sedges or other native plants that provide microhabitats for amphibians. The method is regarded as most suited as an interim measure to prevent colonisation of disturbed areas prior to revegetation. Weed matting can alter soil chemistry properties.

4.2 Herbicidal methods

Scrape and paint

This technique involves the use of a knife to scrape away approximately ten centimetres of the bark on one side of the target weed to expose the sapwood. By removing a small portion of the bark, the herbicide penetrates into the plant's sapwood, travelling through the plant and effectively destroying it. To ensure success of this method, herbicide (typically glyphosate) is immediately applied to the scraped surface on the stem using a paint brush. This technique is effective on specimens that are too large to foliar spray or remove by hand and eliminates the risk of spray drift or off-target application. This technique is effective on woody weeds and vines. Given the targeted method of herbicide application, the potential for non-target risks can be minimised. This method should not be used within wetlands but can be used in adjacent areas under controlled conditions.

Cut, scrape and paint

This technique is similar to scrape and paint but involves cutting the plant approximately 1-2 centimetres above ground level, prior to scraping. Herbicide, such as glyphosate is then applied directly to the cut stump and scraped stem with a paint brush. This method is typically effective on woody weeds and vines that can coppice. As for the scrape and paint method, cut, scrape and paint is a relatively targeted application. This method should not be used within wetlands but can be used in adjacent areas under controlled conditions.

Cut and stump method

The cut and stump technique is used mainly on woody weeds. This involves cutting the stem as close to ground level as possible (yet keeping soil away from the cut surface) and immediately applying herbicide onto the cut surface with an injector kit, dripper bottle or paint brush. Generally 100% glyphosate or diluted with water at 1:1.5 is used for cut and paint applications. Failure to apply herbicide quickly will reduce the effectiveness of uptake. This allows for the treatment of larger specimens that are to resilient to foliar spray, however renders the technique inapplicable to small weeds and inefficient for broad scale applications. As herbicide is applied directly to the target weed, the likelihood of off-target application is considered lower than foliar spraying. This method should not be used within wetlands but can be used in adjacent areas under controlled conditions.

Wick-wipe method

Wick-wiping involves the direct application of herbicides to weeds, via a wick/curtain of material brushed directly against the target plant. This allows the applied herbicide to be distributed through the plant. This technique is extremely useful where isolated broadleaf weeds occur in good quality vegetation or where high quality species persist amongst weeds. Applying the herbicide directly also reduces the likelihood of non-target application and presents limited risks to amphibians. This method can be administered using

an array of different ways, including via a carpet roller, wick wiper, rope wick application or a similar device. Hand–held applicators are used mainly to deliver glyphosate 1:10 and/or metsulfuron methyl mix and is useful for the spot control of weeds in sensitive areas. However hand-held applicators can drip and are messy to maintain and careful spot spraying can often achieve the same results as hand–held wick–wipers. This method should not be used within wetlands but can be used in adjacent areas under controlled conditions.

Spot spraying

Spot-spraying involves targeted spraying of individual plants, typically with glyphosate and metsulfuron methyl and a marker dye. This is applied at low pressure from a 15 L backpack spray unit with a directional nozzle to avoid overspray. This method requires careful preparation of the target area prior to application, to remove weed species from native plants and identify any potentially sensitive native species. Surfactants such as Pulse® can be applied when treating some weed species. Provided sufficient time is allowed for site preparation, the ecological risks of this targeted application method can be reduced. Despite the targeted nature of this method, it is not suitable for wetlands but can be undertaken adjacent to wetlands under controlled conditions.

Foliar spraying

Foliar spraying is suitable for a large number of weeds, including grasses, herbs and shrubs up to two metres or shoulder height. The technique involves the application of herbicides using a portable sprayer that disperses liquid through a hand-held nozzle attached to a pressurised reservoir carried on the operators back. Foliar spraying is not labour intensive and provides a cost and time efficient approach to weed management in large areas. However, this method presents risks to non-target species via spray drift, over spraying and run off and cannot be used during rain or high wind. This method is not suitable for environmentally sensitive areas and should not be undertaken in or adjacent to wetlands.

Stem injection

The stem injection technique is used to control shrubs and trees or very large woody vine weeds. Stem injection describes the application of herbicide to cuts or drill holes to the lower basal circumference of a tree stem or trunk. The herbicide is delivered using a stem injector kit, spray pack or sidewinder/pressurised injector. When using a chainsaw or tomahawk, cuts are generally applied at an angle and are set in staggered rows around the circumference of the tree. The cuts must overlap in a brick–work style of pattern and rows should be at least 5 cm apart to avoid complete ring barking. Immediately fill cuts/drill holes with herbicide. Stem injection has the benefit of leaving tree biomass standing in situ which can provide perches native fauna. However, the technique should only be used where falling limbs will not compromise public safety (e.g. best in forested areas and away from pedestrian activity). Although this method can be highly effective on large specimens, it should not be undertaken in or adjacent to wetlands given the potential for non-target impacts.

4.3 Alternative method – thermal weeding

Thermal weeding involves applying high temperatures to weeds, causing cell breakdowns, dehydration and death. In the last decade, thermal weeding has become an increasingly popular method of weed control offering the potential as a herbicide free, environmental friendly weed management method.

These methods are still in the developmental phase, however many applications indicate they have significant ecological benefits, particularly for ecologically sensitive areas. There are four kinds of thermal weeding methods: flame, hot water, steam or a hot water / steam combination. Flame methods have been excluded from this report as they represent an unacceptable fire risk for Australian conditions and are considered unsuitable in urban environments (Banks and Sandral 2007).

Thermal weed control – hot water

Thermal weeding using hot water involves the application of heated water (approximately 90° C) directly to the target weed species. The high temperatures penetrate up to 1 cm below the soil and are highly effective at killing cells in the base of the plant. This method allows for deeper penetration into the target plant cells and residual heat in the soil surface is enough to destroy dormant seed banks (Kristoffersen et al. 2007). The effectiveness of this method can increased by the addition of a biodegradable surfactant foam (Kurfess and Kleisinger 2000; Quarles, 2001) or by using a narrow nozzle (Hansson and Ascard, 2002). As this method requires no herbicides it is generally more benign on the environment, making it suitable for environmentally sensitive areas (Ascard et al. 2007). However, this method has several constraints, including the requirement of excessive amounts of water (over 600 L an hour), inability to be applied to large areas and the potential to kill desirable soil-borne microorganisms or insects (Owombo et al. 2014). The water requirements means this is generally unsuitable for areas without vehicle access.

Thermal weed control – steam

The steam method involves heating water to between 98 – 103° C before applying steam to the leaves of the target weed. The combination of heat and force breaks down the plant's cell structure, killing the crown of the plant within a matter of days. This method uses less water than the hot water method and delivers higher temperatures, however once applied the steam rapidly cools, limiting ground penetration and the methods effectiveness at killing weed seed banks (Owombo et al. 2014). This technique is considered highly effective on young annual weeds although less effective on mature perennial weeds. As this method produces no residual weed controls, routine treatments are often required every 4 – 6 weeks (Ascard et al. 2007). High-energy requirements, the release of carbon emissions, slow application speeds and high labour rates are considered disadvantages of this method. As this method is less accurate than the hot water technique, there is a low-moderate risk for off-target application for amphibians that may persist under groundcover immediately adjacent to weeds. This method is considered effective for areas with high ecological sensitivity and low weed densities.

Table 2 Summary of recommended weed management methods

Method	Risk to frogs	Benefits and constraints
Manual methods		
Hand removal	Low	**Benefits:** Herbicide free, highly targeted application with limited off-target impacts, low risk to fauna **Constraints:** Time consuming, inability to be applied to large areas, large soil disturbance, not suitable in hard soils
Crowning method	Low	**Benefits:** Herbicide free, effective on plants with basal organs, highly selective, low risk to fauna **Constraints:** High soil disturbance, only applicable to small infestations, time consuming and laborious, not to be used in erosion prone area, ineffective unless the whole plant is removed
Weed matting	Moderate	**Benefits:** Effect on a wide range of weeds, cost efficient, limited soil disturbance, low risk to fauna, herbicide free **Constraints:** Non-selective, prevents native flora growth, requires maintenance, alters soil chemistry, reduces habitat
Herbicidal methods		
Scrape and paint	Low-Moderate	**Benefits:** Highly selective, cost efficient, low risk to fauna, effective on large weeds and limited environmental impacts **Constraints:** Time consuming, only applicable to large woody specimens, not suitable for large areas or wetlands
Stem injection	Low-Moderate	**Benefits:** Highly selective, cost efficient, low risk to fauna, effective on woody weeds and environmentally sensitive. **Constraints:** Labour intensive, requires herbicide, limited application, time consuming, potential public and environmental impacts.

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Method	Risk to frogs	Benefits and constraints
Cut and stump	Low-Moderate	**Benefits:** Highly selective, cost efficient, low risk to fauna, effective on large weeds and limited environmental impacts **Constraints:** Labour intensive, requires herbicide, potential public / environmental risk
Wick / Wipe method	Moderate	**Benefits:** Effective for large areas, can be used in environmentally sensitive areas **Constraints:** Time consuming, messy equipment, requires herbicide, potential public / environmental risk
Spot spraying	Moderate	**Benefits:** Effective for small areas, can be used within proximity to environmentally sensitive areas **Constraints:** Requires time-consuming site preparation, potential environmental risk
Foliar spraying	High	**Benefits:** Time and cost efficient, suitable for large areas, can be used to distribute a wide range of herbicides, produces minimal soil disturbance and requires less frequent treating **Constraints:** High potential for off target application, requires the use of a wide range of herbicides, greater operator, public and environmental risk
Thermal weeding methods		
Hot water weeding	Low	**Benefits:** Herbicide free, highly selective, limited non-target impacts and effective on young, annual weeds **Constraints:** Ineffective on mature weeds, uses large amounts of water, slow and inefficient application, large energy demands and involves a large, initial investment and potential impacts to soil microbes
Steam weeding	Low-Moderate	**Benefits:** Herbicide free, highly selective, destroys seed banks and promote germination in native, fire adapted species, uses less water than hot water method, reduced impacts to soil microbes **Constraints:** Rapid cooling reduces effectiveness, slow operating speed, reduced ground penetration, expensive and equipment is not generally suited to natural areas

5 Review of herbicide options study by Griffith University

A review by Griffith University into the herbicide options used by Redland City Council reported that three commercial herbicides are currently used to manage weeds within the Coochiemudlo wetland (Prochazka et al. 2015). These herbicides include Brush-Off, Starane Advanced and Weedmaster. The wetting agent Synthertrol was not included in this memorandum as the solution does not increase the toxicity of the herbicide. Council has previously used Amicide 625 and LI 700, however these chemical are no longer used, and thus have not been discussed further. A summary of the herbicides currently used on Coochiemudlo Island are presented below.

5.1 Brush-Off (Metsulfuron-methyl)

Brush-Off is a group B selective herbicide marketed for the control of certain brush and broad-leaf species, as well as the pre and post emergence control of annual, perennial and woody plants. Redland City Council currently use this herbicide for the control of native environmental weed species like Fishbone fern (*Nephrolepis cordifolia/auriculata*) at the recommended application ratio of 0.1 g/L under APVMA permit number 11463. Metsulfuran-methyl is highly mobile and can be transported in surface water run-off and into groundwater. It can also be transported through soil, and is more mobile in alkaline soils (SERA, 2005). Metsulfuran-methyl is practically non-toxic to fish, birds and bees (SERA, 2015) and the risk aquatic invertebrates, terrestrial vertebrates and algae is considered low (EFSA, 2015; Klemm et al. 1993; PMEP 1999).

5.2 Starane Advanced (Fluroxypyr-MHE)

Starane Advanced is a group I selective, post-emergent herbicide used for the control of a wide range of broadleaf and woody weeds in a variety of areas. It currently used by Redland City Council to control environmental weeds such as Mother-of-millions (*Byrophylum* spp.), Asparagus fern (*Asparagus* spp.) and Corky passionflower (*Passiflora suberosa*). The active ingredient in Starane Advanced is fluroxypyr as a methyl-heptyl ester (fluroxypyr-MHE) at a concentration of 333g/L, and is applied at a maximum concentration of 60 mL/L, as per APVMA permit number 11463. Fluroxypyr-MHE appear to be relatively non-toxic to mammals and birds (EFSA, 2011; SERA, 2015). However there is little consensus regarding its toxicity to aquatic species (SERA, 2015). The risk to non-target arthropods, earthworms and other soil microorganisms is considered low (EFSA, 2011).

5.3 Weedmaster DUO (Glyphosate)

Weedmaster DUO is a group M, non-selective herbicide used to treat a wide range of plant species. It is currently used Redland City Council to control environmental weeds, such as African lovegrass (*Eragrostis* sp.), Guinea grass (*Megathyrsus maximus*), Red natal grass (*meliniss repens)* and Signal grass (*Bachiara decumbens*). It is administered at a concentration of 10 mL/L, as per APVMA permit no. 11463. The active ingredient in Weedmaster DUO is glyphosate ($C_3H_8NO_5P$), which has a low toxicity to bees, fish and aquatic organisms (Klemm et al. 1993; PMEP 1999; SERA 2011). Weedmaster DUO contains the salt form of glyphosate and doesn't contain any surfactant or additional components other than water, making it less toxic to aquatic organism and amphibians. Due to the increased permeability of amphibian skin, only a direct spray scenario is of potential concern for amphibian toxicity (SERA,

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2011). The chemical binds strongly to soil, where it is inactivated and readily metabolised by soil microorganisms to ultimately for carbon dioxide (AATSE 2002; PMEP 1999; Schuette 1998). Similar 'frog-friendly' herbicides include Roundup Biactive, Glyphocyde 360, Bio Smart 360 and Fusilade.

5.4 Synertrol Horti Oil (wetting agent)

Synertrol is a wetting agent used by Redland City Council to increase wetting, spreading and sticking of herbicides and to minimise drift during herbicide application. Synertrol is comprised of 60% vegetable oil, 10% polyethoxylated oil and 30% water and is classified as non hazardous by the National Occupational Health and Safety Commission, Australia (OCP, 2011). No independent risk assessment information was available for Synertol and there is no evidence that the product affects the toxicity of the herbicides used.

6 Location-specific weed control recommendations for Coochiemudlo Wetland

This section provides recommendations for appropriate weed control measures in each of the five broad habitat types identified in Coochiemudlo wetland. A description of the recommended weed management techniques to be used within each habitat is discussed below and summarized in Table 3.

Habitat 1 - Semi-permanent wetland with Melaleuca and open understory

Ecological sensitivity: This area has moderate-high ecological sensitivity. It represents potential sub-optimal breeding and foraging habitat for wallum frogs.

Recommended weed control methods: Hand removal and crowning methods are recommended within this zone due the ecological sensitivity of the area. Hand removal will allow for better plant identification whilst eliminating the chance of accidental herbicide application that can occur when spraying. Spraying of weeds is generally not recommended in this area due to the potential for impact on amphibians. Alternative methods like thermal treatment with hot water could be trialled in this area as the method is herbicide free, allows for accurate application and is permitted for use within environmentally sensitive areas.

Habitat 2 - Semi-permanent wetland with Melaleuca and tall reeds

Ecological sensitivity: This area has high ecological sensitivity. It represents breeding habitat for common frog species and potential foraging habitat for wallum frogs.

Recommended weed control methods: As above, hand removal and crowning methods are recommended for this zone. Herbicide spraying is not recommended for this area. Care should be taken not to trample or damage any native sedges or reeds which can provide habitat for frogs. Once weeds are removed, native species will have the potential to recolonise and reduce the likelihood of weeds becoming re-established.

Habitat 3 - Ephemeral wetland with Melaleuca and low reeds/sedges

Ecological sensitivity: This area has very high ecological sensitivity providing potential breeding habitat for wallum frogs and confirmed habitat for the swamp orchid.

Recommended weed control methods: Within this habitat, hand removal of weed is highly recommended as this method eliminates the possibility of herbicide run off and non-target application. Normally, hand

removal is inefficient and expensive as the technique is more time consuming and laborious. However, as weed infestations within the habitat is considered low, this technique could achieve optimum results with negligible environmental impacts. Care should be taken when operating within this habitat so that only the smallest footprint is created and that the entire root system of the target weed is removed.

Habitat 4 - Melaleuca wetland fringe with dense weed infestation

Ecological sensitivity: This area has moderate ecological sensitivity, representing a buffer to higher value potential wallum frog habitat. If rehabilitated, the area has the potential to become suitable habitat for wallum frogs.

Recommended weed control methods: This area has high densities of fishbone fern (*Nephrolepis exaltata*) and Singapore daisy (*Sphagneticola trilobata*). Council currently use Brush-Off for the treatment of fishbone fern. This herbicide should only be applied using a spot-spraying and used only in areas containing dense weed infestations and where no waterbodies are present as this herbicide can be transported through water and soil. In areas where fishbone fern occurs amongst reeds and waterbodies, and where weed infestations are too dense to hand pull Weedmaster DUO may be used with strict abidance to the recommended concentrations (10mL/L). When the appropriate dilution is used, studies show glyphosate (Weedmaster DUO) produces no adverse impacts on the growth, development or survival of frog species (Edge et al. 2012, 2013), and can be inactivated by soil. Council have noted asparagus fern (*Asparagus* spp) occurs within the wetland. Should this species be identified, the crowning method is the recommended technique for controlling this species. If the infestation is larger than 2 m x 2 m, thermal heating with hot water may be effective as the method can penetrate soil and destroy the species' underground rhizomes. As the steam method provides limited soil penetration, the rhizomes are not destroyed, allowing the species to reshoot and re colonise.

Habitat 5 - Eucalypt woodland

Ecological sensitivity: This area has lower ecological sensitivity. Nevertheless, it provides an important buffer to the wetland and represents potential sub-optimal foraging habitat for wallum frogs.

Recommended weed control methods: The primary focus of weed management within this zone would be to address to encroachment of weeds from the waste transfer station situated on the western boundary of the wetland. The scrape and swap method should be applied vines species (e.g. corky passionfruit, monkey rope and Brazilian nightshade) and the stem injection method for woody weeds (e.g. Easter cassia and *Solanum* species). Both methods allow direct application to target species whilst reducing the likelihood of accidental application and run off. Brush-Off and Starane are the recommended herbicide for the cut and scrape method due to their effectiveness on woody plants and vines and their low toxicity to birds and terrestrial vertebrates. However, this herbicide is transportable in surface water, and as such, should only be applied directly to the target specimen.

Areas where the groundcover is dominated by weed species (e.g. Singapore daisy, molasses grass and Guinea grass) can be addressed by spot spraying as these will unlikely constitute habitat for wallum frogs. Weedmaster DUO is the most appropriate herbicide as this herbicide is effective on a wide range of invasive grass species. Weedmaster DUO is inactivated by soil, eliminating the risk of transportation by the drainage line that flows through the wetland. Dense weed infestations located away from watercourses can be treated with Weedmaster DUO supplemented with Brush-Off (at a rate of 1-2 g / 10

L of water) to treat a broad range of weeds. Areas of Singapore daisy can be treated with spot spraying with Brush-Off (metsulfuron methyl) at a ratio of 1.5 g / 10 L of water plus a marker dye provided sufficient site preparation is undertaken prior to application to prevent run-off into non-target areas.

6.1 Summary of weed control measures

Three broad zones have been identified for differential weed application within Coochiemudlo Wetland. These are summarised below in Table 3 and mapped in Figure 4.

Zone A – This zone includes habitats 1, 2 and 3 in the centre of the wetland, watercourses leading to the wetland and areas within a 10 m buffer of confirmed habitat for the swamp orchid and potential breeding habitat for wallum frogs. Weed control within this area should use chemical-free methods including hand removal, crowning methods and trial of thermal weed control. Herbicide application should not be undertaken within this area given the proximity to sensitive habitats. This area generally has low weed densities and high ecological sensitivity and is therefore suitable for chemical free weed control methods.

Zone B – This zone includes the area of high weed infestation on the fringes of the wetland. This area is hydrologically connected to higher value amphibian habitats and therefore should be protected from herbicide exposure wherever possible. Hand weeding, crowning and thermal weeding are recommended for this area. However due to higher densities of weeds some spot spraying and cut, scrape and paint may be required as a last resort. This should not occur within 10 m of waterbodies or known swamp orchid locations. Only Weedmaster Duo should be used with no surfactants. Any areas requiring cut, scrape and paint methods should be carefully prepared prior to application to separate weeds from native plants and protect soil and waterbodies from herbicide contact.

Zone C – This zone has lower ecological sensitivity and is therefore suitable for a broader range of weed control options. This area does provide a buffer to the wetland. Herbicide application should be limited to targeted methods such as cut, scrape and paint and spot-spraying.

Table 3 Summary of recommended weed management methods for use in Coochiemudlo Wetland

Zone	Habitat	Ecological sensitivity	Weed density	Recommended Method	Recommended Herbicide (s)
A	1	Moderate	Low	Hand removal Crowning method Thermal weeding	Not applicable
	2	Moderate	Low		
	3	High	Low		
B	4	Moderate	High	Hand removal Crowning method Thermal weeding Spot spraying and cut, scrape and paint	Weedmaster Duo for spot spraying. No surfactant
C	5	Low	Moderate	Spot spraying of ground cover. Scrape and swab for vine species. Stem injection for woody weeds Thermal treatment	Weedmaster Duo or Brush-Off for spot spraying. No surfactant Brush-Off and Starane for cut and scrape.

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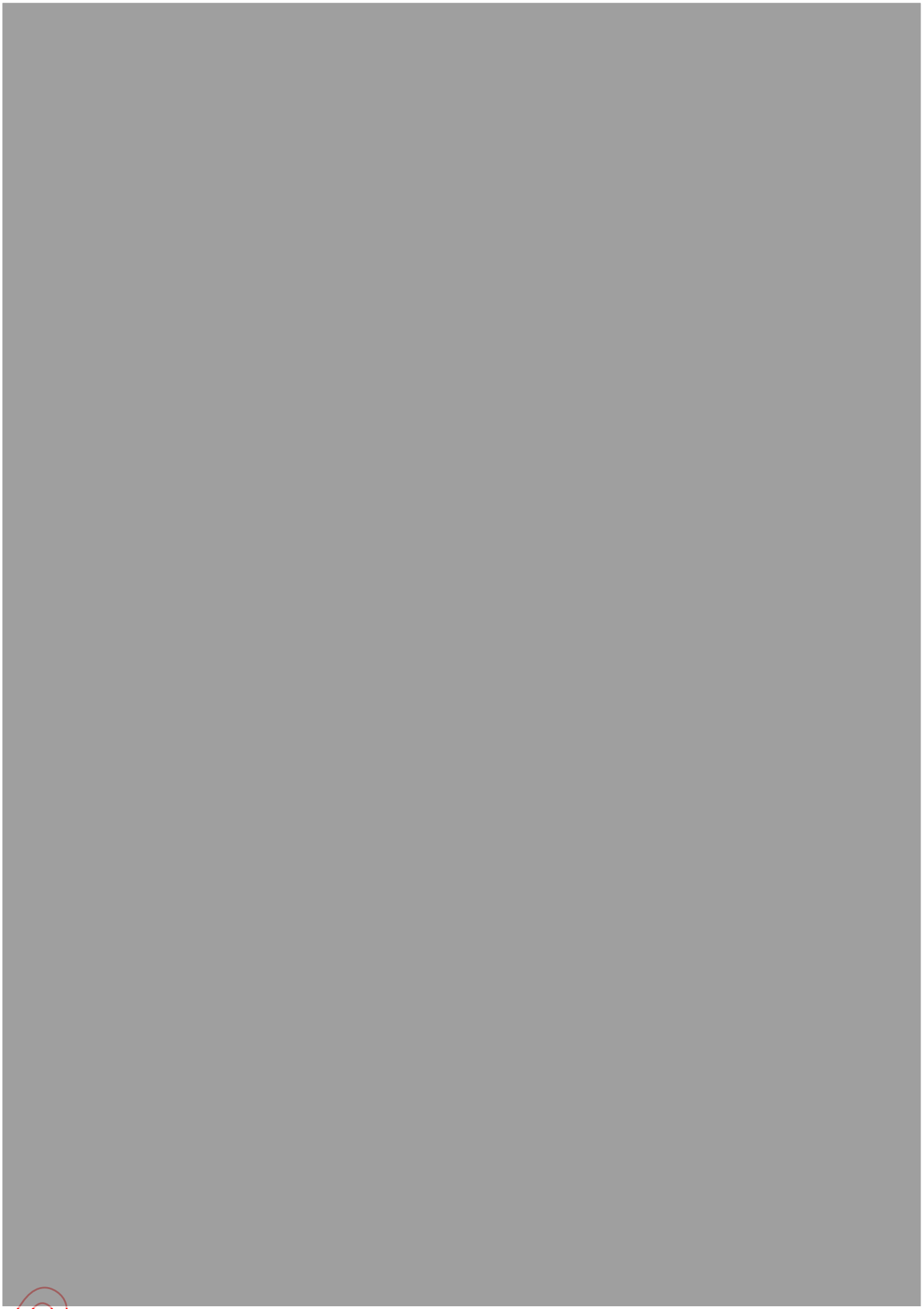

1:2,500 (at A4)

0 20 40 60 80 100

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Redland City Council
Coochiemudlo Island
Frog Survey Report

Job Number 41-27018
Revision 0
Date 08 Nov 2019

Broad Habitat Types of the Coochiemudlo Wetland

Figure 4

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Data Source: DNRME: Cadastre (2017), WMS Imagery (2015), Roads (2018); GHD: Habitat Zones (2019), Site Boundary, Broad Habitat Types (2018), Potential Wallum Frog Breeding Habitat (2019), Swamp Orchid (2019).
Created: knoble

7 Conclusion

The ecological values of Coochiemudlo Wetland need to be protected from non-target weed control impacts. The existing Integrated Weed Management Plan for Coochiemudlo Wetland provides good guidance on methods for the safe application of herbicides. However, this should consider the zones of sensitivity outlined in this report. Wherever possible, weed management within the interior of the wetland and along watercourses leading to it, sensitive, chemical free methods of application should be applied. Weed control will need to be adaptive and respond to changes in the landscape over time. Consistency in weed management crews will be important to maintain long-term continuity. Weed management will need to consider changing weather conditions, with reduced herbicide use in times of rainfall where there is increased potential for non-target responses due to run-off and surface flows of water. Increased weed control will be required after fire events to prevent new weed incursions. Monitoring of habitat for the swamp orchid and wallum frogs is recommended over time to assess changes in the long-term health of the environment within the wetland

Regards

Simon Hodgkison

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Appendix A - Ecology of wallum frogs

Wallum froglet

The wallum froglet (*Crinia tinnula*) is a small, terrestrial frog measuring less than 22 mm in length. The species is extremely variable in colour and pattern, ranging from light grey or brown to dark grey above and white or light brown below. They have a relatively pointed snout that extends beyond the lower jaw and a fine median line of white dots often occurs on the underside of the throat and across the belly. They have no webbing on their feet and toe pads are absent. The wallum froglet inhabits lowland coastal plains of southeast Queensland and northern New South Wales, with preferred habitats including Melaleuca swamps, sedgeland, wallum/woodland areas and wet / dry heathlands. The species possesses specialised habitat requirements, preferring ephemeral swamps on nutrient-poor sandy soils (Ehmann 1997; Neilson, 2000). Breeding generally takes place in autumn / winter or immediately following rain, and is largely restricted to oligotrophic, tannin stained, acidic (pH < 6.0) pools of water (Anstis 2002; Meyer et al. 2006; McFarland 2007). Adult diets comprises a variety of arthropods whilst tadpoles feed on a diet of sediment and algae (Cogger at al. 1983; Anstis 2002).

Wallum sedge frog

The wallum sedge frog (*Litoria olongburensis*) is a small, slender bodied frog with a narrow head and sharp projecting snout. Dorsal colouration is light grey-brown, bright green whilst ventral colouration is white with a brown peppered on the throat. A white stripe extends from below the eye to over the shoulder before breaking into thick, globular spots, whilst a dark brown stripe runs between the snout and the eye, and through the tympanum. The wallum sedge frog is confined to coastal lowlands of southeast Queensland and northern New South Wales, with preferred habitats including ephemeral, acidic (< pH 5.5) swamps, freshwater lakes and drainage lines on sandy, low nutrient soils (Anstis, 2002; Barker et al. 1995; Lewis and Goldingay, 2005; Meyer et al. 2006; Meyer 2012). Breeding takes place following rain and can occur year round during favourable conditions. This species can lay between 200 – 1000 eggs, which attach the grasses and sedges in ponds approximately 0.5 – 1.5 m deep.

Wallum rocket frog

The wallum rocket frog (*Litoria freycineti*) is a medium sized, slender bodied terrestrial frog with long hind limbs and a protruding snout. Larger than most wallum frog species, the wallum rocket frog can grow up to 45 mm in length. Dorsal colouration is light brown with irregular dark blotches and a pale triangular patch on the snout. Ventral colouration is cream or white, whilst the throat is dark with a pale yellow wash present on males. A dark lateral strip extends from the snout, passed the eye, to the base of the forearm. The posterior thigh is brown, with large cream spot. Toe and finger discs are small, with toes partly webbed and fingers unwebbed (Barker et al. 1995; Cogger 2000; Meyer et al. 2006). The wallum rocket frog inhabits a range of habitats, from sandstone heath habitats to wallum swamps, and breeding to occur in autumn or early winter, though breeding can occur at any time following rain.

Memorandum

26 June 2020

To	Redland City Council		
Copy to			
From	GHD	Tel	
Subject	GHD response to Deveco comments – Coochiemudlo Island	Job no.	4127018

1 Introduction

GHD Pty Ltd (GHD) prepared a report to summarise and interpret results from environmental monitoring associated with the former landfill on Coochiemudlo Island: *Coochiemudlo Island Former Landfill – Surface Water and Groundwater Monitoring Report* (GHD, December 2018).

Redland City Council subsequently received comments from the Coochiemudlo Island Coastcare group in relation to the GHD report in a letter dated 19 February 2019 *Comments on Redland City Council – Coochiemudlo Island Former Landfill Surface Water (SW) and Groundwater Monitoring Report (GW) (December 2018)* from Mark Pillsworth of Deveco Pty Ltd (Deveco).

This memo has been prepared for Redland City Council by GHD to provide comment on the Deveco letter in response to the GHD report.

This memorandum is issued subject to the limitations presented in Section 3.

2 Response to Deveco comments

The Deveco letter was structured in a way where broad themes were apparent. These themes are addressed individually below.

Selection of appropriate assessment criteria.

The Queensland Government developed *the Environmental Protection (Water) Policy 2009* (EPP Water) to protect Queensland's waters while supporting ecologically sustainable development. Queensland's waters include water in rivers, streams, wetlands, lakes, groundwater, estuaries and coastal areas.

Schedule 1 of the EPP Water contains documents that detail the relevant environmental values and associated water quality objectives for specific catchments areas throughout Queensland. The water quality objectives have been developed to provide protection to the identified environmental values.

The GHD (2018) assessment utilised water quality objectives for the protection of the 'Aquatic Ecosystems' environmental value as detailed under the *Environmental Protection (Water) Policy 2009 Moreton Bay environmental values and water quality objectives* (Department of Environment and

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Resource Management, July 2010). The selection of water quality objectives is based on the specific locality on Coochiemudlo Island. This approach is consistent with Queensland legislation and is therefore considered appropriate.

To provide additional assessment in relation to potential impacts on Wallum frog species, an ecological survey was completed of the Melaleuca wetland and reported in *Coochiemudlo Island wetland Wallum frog assessment* (GHD, 2019). The ecological survey identified that the Melaleuca wetland comprises multiple habitats, and only a portion of these habitats are suitable for Wallum frogs. More stringent assessment criteria were applied to areas that corresponded to potential Wallum frog habitat.

The adopted approach to the selection of published guidelines for the protection of Aquatic Ecosystems utilised in the GHD (2018) assessment is considered to comply with legislative requirements and provide assessment specific for the Wallum frog species. This approach does not amount to the "discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away'" as stated in the Deveco letter.

Timing and location of sampling

Monitoring at Coochiemudlo Island is completed according to a monitoring schedule. This schedule has historically provided some flexibility with regard to the timing of sampling, however sampling is not always able to be completed to capture 'first flush', and during the monitoring described in GHD (2018), the prevailing conditions were dry.

A selection of sampling locations were established within the Melaleuca wetland to enable assessment of potential impacts downstream of the former landfill, as well as enable characterisation of water quality at other locations in the wetland. The Melaleuca wetland is surrounded by urban development on three sides, and is potentially impacted my multiple current and historical activities.

Background groundwater quality

The principles of groundwater flow are based upon groundwater moving from areas of higher potential (head) to areas of lower potential. This in turn translates to groundwater flowing from recharge areas to discharge areas. On Coochiemudlo Island, it would be expected that groundwater recharge occurs through infiltrating rainfall, and discharge occurs at topographically low points such as the Melaleuca wetland and Moreton Bay. At the location of the former landfill, an easterly groundwater flow direction would be expected based upon these principles. Upon installation of the monitoring network, the groundwater bores were surveyed, and groundwater levels measured and converted to a common vertical datum (mAHD). Interpretation of the groundwater levels in the monitoring bores confirms an easterly groundwater flow and supports the characterisation of GW5 and GW6 being located up gradient from the landfill. GW3 has been characterised as a down gradient location in the GHD (2018) assessment, although there is evidence to support that it is more representative of a background location.

During drilling of the monitoring bores the intersected geology is inspected and logged. No evidence of landfilling or other anthropogenic disturbance was noted during drilling at these locations.

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The monitored water quality in GW5 and GW6 provides a characterisation of groundwater quality *up gradient* of the landfill. It is possible that the water quality at these locations has been impacted by anthropogenic impacts outside of the former landfill, however it is unlikely to have been impacted by the former landfill. As the objective of the assessment revolved around assessing potential impacts from the former landfill, the positioning of these monitoring bores is appropriate.

Comparison of against background data

Comparison of monitoring data against background results is a key aspect in the assessment of risk attributable to the former landfill. If down gradient water quality is consistent with background water quality, it follows that the former landfill is not impacting upon water quality. Many natural processes can impact water quality, and groundwater quality in particular is strongly impacted by the background geology and geochemical conditions. Hydrogeological experience indicates that groundwater commonly exceeds the adopted WQO for the protection of Aquatic Ecosystems in areas away from anthropogenic impact.

Closing remarks

This memorandum has been prepared to respond to comments in the Deveco letter. The comments in this memorandum support the conclusions of the original assessment.

An ongoing monitoring program is in place at Coochiemudlo Island, which enables the risk to be reviewed on a regular basis and under differing climatic conditions.

3 Limitations

This report: has been prepared by GHD for Redland City Council and may only be used and relied on by Redland City Council.

GHD otherwise disclaims responsibility to any person other than Redland City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

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Debra Weeks

From: Matthew Ingerman
Sent: Wednesday, 20 May 2020 4:09 PM
To: Warren Mortlock
Subject: FW: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island
Attachments: Deveco report.pdf; GHD report query March 2019.docx; HLW Coochiemudlo Project_ media release_FINAL quotes_.docx

Hi Warren,

We are still going to need to work up a response to the Deveco report. Could you please consider how we might be able to address her request.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
Redland City Council
P +617 3829 8979

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Wednesday, 20 May 2020 4:04 PM
To: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Louise Rusan <Louise.Rusan@redland.qld.gov.au>
Subject: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Matthew,

Thank-you for your email but unfortunately, it fails to address our request for a copy of the last GHD report/review and latest ground-water sampling from the new-appointed firm, future-plus environmental.

I've attached the report by deveco Pty Ltd that Coastcare commissioned to examine the GHD findings of December 2018 and also the email response from Brad Taylor(7 March 2019) notifying this would be followed-up.

As you're aware Coastcare's concerns have not received a response from Council.

We'd appreciate your assistance to expedite this exchange of information to support both sound management of the Melaleuca Wetlands and the project funded by the Australian Government.

Kind Regards

Vivienne Roberts-Thomson MOB 0411226363

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
www.coochiemudloislandcoastcare.org.au
coochiecoastcare@gmail.com
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From: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Sent: Thursday, 14 May 2020 5:22 PM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Vivienne,

Our most recent sampling on Coochiemudlo was conducted in February 2020. Based on those monitoring results, the landfill is considered to pose a low risk to downstream and downgradient receivers. To help you in your decision making, Council has not changed its risk based advice to Coochiemudlo Coastcare based on these results. The site will continue to be monitored quarterly unless advised otherwise by Councils external consultants.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
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I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Wednesday, 13 May 2020 9:54 AM
To: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Matthew,

Thank-you for your email.

Could we please have a copy of the latest GHD review/report relating to ongoing testing of groundwater monitoring sites.

The information will assist decision-making for our volunteer organisation as we progress the four-year Landcare funding project in the Melaleuca Wetlands.

We'd also appreciate a response to the email (see attached) sent to Brad Taylor in March 2019 after receipt of GHD's earlier report. You might recall the matter was raised at the meeting with Peter Best, yourself and Allan McNeil earlier this year.

Kind Regards
Vivienne MOB 0411226363

From: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Sent: Tuesday, 17 March 2020 5:18 PM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Vivienne,

Last week Council officers had a meeting with GHD to discuss the annual review of the monitored sites. I can advise you that the annual review has concluded that the former landfill on Coochiemudlo Island remains low risk, ie the risk profile has not changed downstream of the closed Landfill at Laurie Burns and adjoining Wetlands since 2018.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
Redland City Council
P +617 3829 8979

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Friday, 6 March 2020 1:44 PM
To: Peter Best <Peter.Best@redland.qld.gov.au>

Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Peter,

Thank-you for your email which has been onforwarded to Healthy Land and Water.

We appreciated your time and offer to clarify previous advice.

In regards water-testing of the Melaleuca Wetlands, we'd certainly appreciate an update on results from GHD's December 2018 report when convenient.

Kind Regards
Vivienne MOB 0411226363

From: Peter Best <Peter.Best@redland.qld.gov.au>
Sent: Thursday, 27 February 2020 9:06 AM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>
Subject: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Vivienne,

As a follow up to and as was agreed at our collective meeting relating to this matter held at RCC offices in Cleveland on Thursday 6 February 2020, in executing the responsibilities of the contract that Coastcare Coochiemudlo Island (Coastcare) has with Healthy Land and Water for the purposes of weed management on Coochiemudlo Island, as we have discussed, it is recommended that Coastcare utilise the advice provided by GHD relating to PPE and process to undertake weed control activity, noting that this advice has been previously provided to Coastcare by email.

This recommendation does not preclude Coastcare, its volunteers and/or contractors undertaking hazard and risk assessments to determine appropriate safe work methods, as may be required by the contract Coastcare holds with Healthy Land and Water, prior to commencing any on site work activity.

For clarity, the advice from GHD is as follows:

Simple PPE and administrative controls can be used to manage the risk, This should include:

- *Wearing of boots, long trousers and long-sleeved shirts (buttoned at the wrist) to limit potential exposure to soil*
- *Using gloves to provide hand protection and minimise contact with soil*
- *Avoid contact with surface water*

- *Ensuring that hands are thoroughly washed prior to eating or smoking*
- *If indicators of potential contamination are noted (odorous soil, stained soil, protruding or uncapped refuse, leachate seaps), these areas should be avoided.*

Regards,

Peter

Peter Best
General Manager Infrastructure & Operations
Redland City Council
P +617 3829 8644
M 0481 907 030

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

PO Box 288 Ferny Hills Qld 4055
Australia
Mobile 0422415830
Office 07 32077002
Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

Dear Vivienne

RE: Comments on *Redland City Council – Coochiemudlo Island Former Landfill Surface Water* (SW) ***and Groundwater Monitoring Report*** (GW) (December 2018).

Several issues which I commented on previously have now been considered in this *Risk Review* (GHD December 2018) e.g. application of ANZECC WQ Guidelines (2000) and inclusion in results tables (Appendix B), but no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the **deveco** Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected. The aim of these GW/SW studies, in some large part, to determine conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

It is a realty however that RCC has a legal obligation to manage retired landfills to comply with engineering standards and legislative constraints which is the complimentary risk to conservation issues, and to do so in the most cost effective manner.

But there is one caveat here that engineering and legislative requirements must focus on the conservation context in receiving/contiguous areas i.e. what are we aiming to protect in this catchment? This is a fundamental objective in conservation risk assessment, and discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away' is not what the current Commonwealth and State legislation has as its principal objective e.g. by selecting WQ contamination limits that suit the engineering requirements.

The principal focus of the **deveco** review (2017) was concerned with alerting the GHD groundwater (GW) monitoring engineers that the WQ criteria that they had chosen were not appropriate for protection of a RAMSAR area, and did not consider protection of particular species i.e. *Essential Habitat* for a *Vulnerable* Wallum Sedge-frog *Litoria olongburensis* and the *Endangered* orchid *Phais australis.*

Specifically, it was commented on in this **deveco** review (2017) that the GHD monitoring regime initially in 2017 was flawed as GW bores had fallen into disrepair since the EGIS (2001) investigations and WQ samples could not be collected. This has since been addressed with reinstatement of GW bores at strategic locations and further GW sampling in 2018. However, and as highlighted by the **deveco** review (2017), we could draw no meaningful conclusions as to the migration of contamination nuisance down catchment to the RAMSAR wetland as surface water samples in the wetland had not been collected for analysis.

The GW sampling regime should be a coordinated programme where first flush stormwater is collected, and then by reference to historic data on water levels in bores, interpret this data to determine infiltration and run-on rates, with subsequent timely sampling down catchment (specifically the GW 'windows' in the RAMSAR Wetland) and thus capture these flows across the boundary of the retired landfill and into the wetland.

Obviously GHD were cognisant of this sampling gap as they state in the current report (December 2018) that:

> Additional surface water and groundwater monitoring was completed in November 2018 to confirm the findings of the *Risk Review*, with results presented in the current report.

However, in the presentation of WQ monitoring results, GHD (2018) report:

Upstream location CISW2 (potential Wallum frog habitat)
Up gradient location CISW2 was dry during the November 2018 monitoring event and was therefore not sampled. Previous results at CISW2 were consistent with background concentrations.
Upstream location CISW3 (potential Wallum frog habitat)
Up gradient location CISW3 was dry during the November 2018 monitoring event and was therefore not sampled. Previous results at CISW3 were consistent with background concentrations.

Surface water sampling point CISW1 was sampled in November 2018 and no elevated concentrations of [Cu] or [Zn] are reported at levels higher than the ANZECC 2000 guideline limits for FW Slight – Moderately disturbed protection of aquatic species[1]. It should be considered however that groundwater seepage would be low under the December 2018 monitoring periods (November & December rainfall low at 42mm and 53mm respectively at station 040853 Redland Bay Golf Club), and consequently there may have been changes in water chemistry at this time e.g. metals being associated with humics and bound in sediments. First flush stormwater sampling, and subsequent timely sampling in GW is the established approach fundamental to such studies.

[1] In the **deveco** review (2017) these guidelines limits to be adopted were suggested at precautionary limits for Anurans, because one *Vulnerable* species is mapped for this area as *Essential Habitat* i.e. defaulting to an acceptable background level for metals, for example, as determined by the underlying geology. Furthermore, as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland. The WQ guideline limits need to reflect this internationally significant status and it is not appropriate for ANZECC (2000) limits for FW slight-moderately disturbed protection for aquatic species to be applied, rather the 99% protection limits for aquatic species would more appropriate for establishing environmental risk.

Furthermore, as GW 'windows' would be expected to increase with proximity to the shoreline, with fluctuating levels due to tidal pulsing interacting with microtopography relief, then variations in REDOX (with consequent effects on mobilisation of heavy metals in the RAMSAR area) would occur, none of which is considered/commented on in the GHD (2108) *Risk Review*. Although Figure 4, which bears little resemblance to the foreshore under study, would, to the expert interpreter, indicate precisely this i.e. not merely a generic diagram of coastal processes indicating that water finds its own level.

It follows that if insufficient WQ data is available, then we can draw no conclusions as to any up-catchment impacts no matter how we 'rationalise' previous reporting. Simply, the work that was proposed for a competent GW/Surface Water (SW) monitoring programme has not been performed in the recent sampling.

But even without this WQ data, it is proposed that there is a fundamental error in the risk analysis model. Specifically, the error is the assumption that the bores at GW3, GW5 and GW6 are assumed to be located hydraulically upgradient of the former landfill (retired) and are consequently representative of background GW quality i.e. heavy metals levels in GW would be background for that catchment as it is assumed that here has been no anthropogenic impact. Furthermore, as GHD state that GW seepage would be through weathered sandstone and siltstone across this locale i.e. the underlying geology, it is *non sequitur* to propose that [Cu] and [Zn] would result from weathering of this material i.e. it is sedimentary, and then assume that no other principal industrial source has existed above this location.

Reference to the historic area photography of the island reveals that these GW sampling locations are probably within the original 'dump' area in the 60s & 70s (refer aerial photo following). Owing to the nature of the underlying geology, and the previous activity nearer to the roadway i.e. used as a 'dump' and metals recycling location[2], it is questioned if GW3, GW5 and GW6 are in fact upgradient of the original landfill activity and therefore are not representative of what is termed as background GW quality.

Further discussion is not warranted at this juncture as a comprehensive GW/SW monitoring programme has not been performed at this site, and underlying assumptions appear to be flawed.

The conclusion by GHD (2018) after this environmental risk characterisation should not discount the laboratory results which identified several parameters in excess of the adopted assessment criteria in areas down-catchment of the retired landfill site as they *were consistent with or less than background locations*[3].

It follows that if the nature of the GW sampling sites has been misinterpreted i.e. no reference to historic site searches performed as required in an initial contaminated site

[2] When I first came to the island, Laurie Burns had a bulldozer at a site behind the sheds which are visible in this 1974 aerial, and he separated copper and other metals for resale as scrap metal at this location.

[3] Note: [Cu] at GW5 0.003 mg/l; GW6 0.0033 mg/l; > ANZECC 2000 FW Slight-Moderately disturbed limit of 0.0014 mg/l, with [Cu] at GW3 0.0014; this result is emphasized as copper is toxic to Anomurans (Finkel Kristina L.G. & Phillip G. Byrne (2013) *Heavy metal pollution negatively correlates with Anuran species richness and distribution in south-eastern Australia* Austral Ecology **38**, 523-533) at this level and a range of aquatic flora. If the ANZECC (2000) limits for 99% protection of aquatic species is adopted (GHD 2018 Appendix B), and these are appropriate WQ limits for a RAMSAR area, then [Cu] is >> threshold limits (protection value of 0.001 mg/l) at GW5 & GW6, and [Cu] at GW3 now exceeds this limit.

DNR Beenleigh historical aerial photos 1974 (9542/70 – Q2142, 64)

assessment (site history), and a competent WQ/SW sampling programme not performed, then it does not support the conclusion that the risk posed to the down-catchment RAMSAR area and essential habitat areas as mapped is *low* e.g. [Cu] exceeds levels for conservation of Anurans.

The only other comment that I should make is that essential habitat mapping, as interpreted by the State, indicates areas which, in this case, are suitable for the colonisation of the target species Wallum Sedge-frog *Litoria olongburensis*. Whether it exists at this present time is irrelevant in my experience in consulting on development applications. The State will always interpret the mapping as the species could be there owing to the habitat, and physicochemical conditions prevailing in particular.

I add that when I first read the GHD report (December 2018) I thought it was a draft version as on, for example, pp17 & 21 there is a bookmark error warning, heading 'Physiochemical' should be 'Physicochemical', and the references are not in any discernible order.

Yours faithfully

Dr Mark Pillsworth
Principal Ecologist

From: Bradley Taylor <Bradley.Taylor@redland.qld.gov.au>
Sent: Thursday, 7 March 2019 10:34 AM
To: 'gvrthomson@gmail.com' <gvrthomson@gmail.com>; Paula Kemplay <Paula.Kemplay@redland.qld.gov.au>
Cc: Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>
Subject: RE: Wetlands Report

Vivienne,

Thanks for your assessment.

I have resigned from RCC and my last day will be Friday 8th MARCH.

I will pass on this email to Paula Kemplay and ask her to follow up.

Kind Regards,

Brad Taylor

Group Manager

Water and Waste Infrastructure

Redland City Council

P +617 3829 8522

I acknowledge the traditional custodians of the

lands and seas where I work. I pay my respects

to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Thursday, 7 March 2019 8:34 AM
To: Bradley Taylor
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
Subject: Wetlands Report

Hello Brad,

Many thanks for onforwarding the GHD reports which were discussed at our recent management meeting along with the attached feedback provided by **deveco** Pty Ltd.

Coastcare appreciates your willingness to work towards positive outcomes and looks forward to progressing further investigation.

Regarding water quality sampling, we're concerned that conclusions drawn in the GHD report are not supported by evidence, as site sampling has not been done as proposed.

Of particular concern in the GHD Water Quality Report is that "no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the Deveco Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected". Further, "as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland."

In view of continued contradicatory information we believe these reports should be shared as soon as possible with appropriate Commonwealth and State authorities for guidance on the appropriate conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

Also, it would be appreciated if you would confirm if the two GHD reports are draft or final?

We will be commenting on the 'frog report' in due course and also look forward to the opportunity to discuss this with you.

Kind Regards,

Vivienne MOB 0411226363

Coastcare Coochiemudlo Island

Vivienne Roberts-Thomson
President
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Chemical-free weeding to restore Coochiemudlo Island's Melaleuca Wetlands

Healthy Land and Water, Coochiemudlo Island Coastcare and Redland City Council will be working together over the next four years to control weeds within the Coochiemudlo Island Melaleuca Wetlands, as part of the Healthy Land and Water Moreton Bay Ramsar Wetland Project.

The Coochiemudlo Island Wetland Weed Control Project - *Protecting Threatened Species and Restoring Ramsar values,* was launched on Saturday 1st February with a working bee in the Melaleuca Wetlands, in celebration of World Wetlands Day. World Wetlands Day celebrates wetlands listed under the Convention on Wetlands of International Importance (Ramsar Convention) which includes the Moreton Bay Ramsar Wetland.

The Coochiemudlo Island Project will employ innovative chemical-free weeding techniques including saturated steam and hand removal methods to remove a range of weeds from the wetlands. Avoiding the use of chemicals prevents them from leaching through the sandy soils of the Island and subsequently into the groundwater and Moreton Bay. Weeds that will be targeted through this initiative include Singapore daisy, cocos palms, fishbone fern, asparagus fern, cassia, pepper and umbrella trees.

The project will help to reduce threats and restore habitat in and around the 19-hectare freshwater wetlands, which forms part of the Moreton Bay Ramsar site. The wetlands are of high cultural and ecological value and are home to more than 170 recorded native plant species including endangered orchids and fungi. The wetlands also provide habitat to more than 100 bird species, native animals and invertebrates.

"Healthy Land and Water is proud to support a project that endeavours to improve the health of the Melaleuca Wetlands and subsequently the Moreton Bay Ramsar Wetland. Wetlands play an important role in providing habitat, protecting our shores from erosion, absorbing pollutants and improving water quality," said Julie McLellan, CEO of Healthy Land and Water.

Melaleuca wetland ecosystems have been diminished in south-east Queensland as a result of land clearing and coastal development pressures. The preservation of these wetlands are important not only for the ecosystem services it provides to the Island and the Moreton Bay Ramsar Wetland, but also as a remnant of this vegetation type in the region.

"The Australian Government is pleased to be able to support a project that applies a chemical free weeding approach to these delicate and ecologically diverse Melaleuca Wetlands and that helps improve the Moreton Bay Ramsar Wetland," said Andrew Laming, Federal Member for Bowman.

According to Lance Hewlett the Deputy Mayor of Redland City Council and local divisional Councillor, "it is encouraging to see how Natural Resource Management organisations, local government, community groups and volunteers can work together to make a significant impact to help restore and protect the natural environment. I am thrilled to see that this project will not employ the use of potentially toxic, harmful chemicals, which in my opinion, is a subject for which the broader community has increasing concern," he said.

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Kim Richards, Member of Parliament for Redland, said it is encouraging to see how dedicated volunteers are in their efforts to protect the wetlands and. "The partnerships forged by Coastcare, Healthy Land and Water, and all levels of government will ensure we work together to protect and preserve the unique coastal environments of Coochiemudlo Island," she said.

Coochiemudlo Island Coastcare has been caring for the Island's environment since 2013 and its 175 members are passionate about undertaking ecosystem protection and restoration activities without the use of chemicals. If you would like to help them rehabilitate the Island's coastal environment and wetlands, please contact Coastcare on coochiecoastcare@gmail.com.

This project is supported by Healthy Land and Water, through funding from the Australian Government's National Landcare Program.

To arrange interviews or for more information: Helené Bam, Marketing & Communications Coordinator, Healthy Land and Water, 07 3177 9130

About Healthy Land and Water
Healthy Land and Water delivers innovative and science-based solutions to environmental challenges in South East Queensland. With expertise in environmental research, monitoring, training and evaluation, we work to make South East Queensland clean, green and healthy.

Debra Weeks

From: Warren Mortlock
Sent: Wednesday, 27 May 2020 10:48 AM
To:
Cc: Paula Kemplay; Closed Landfill Unit; Matthew Ingerman
Subject: GHD Response to Deveco Report of February 2019
Attachments: Deveco report.pdf

Hi James
You are aware of the attached letter and email below from the Coochiemudlo Coastcare group regarding the water quality assessment report undertaken by GHD.
Could you please provide a proposal to me for a comprehensive written response before end June 2020.
We would like GHD to take this opportunity to confirm or otherwise the statements made by Deveco in relation to the work carried out by GHD and Council at the Laurie Burns Reserve .
Unfortunately, our budget is only available in this financial year.
Are you able to respond on the above timeline?
Many thanks
Warren

Warren Mortlock
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council

P +617 3829 8699

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: Paula Kemplay
Sent: Monday, 11 March 2019 5:04 PM
To:
Cc: Pat Pathmanathan <Pat.Pathmanathan@redland.qld.gov.au>
Subject: FW: Wetlands Report

Hi James
Please see attached letter and email below from the Coochiemudlo Coastcare group regarding the water quality assessment report undertaken by GHD. Could I get a cost proposal from GHD to respond to this letter before 30 June 2019 thanks

Regards

Paula Kemplay
Principal Waste Planner

Water and Waste Infrastructure
Redland City Council
P +617 3829 8597

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From: Bradley Taylor
Sent: Thursday, 7 March 2019 10:34 AM
To: 'gvrthomson@gmail.com'; Paula Kemplay
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
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Vivienne,

Thanks for your assessment.
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I will pass on this email to Paula Kemplay and ask her to follow up.

Kind Regards,

Brad Taylor
Group Manager
Water and Waste Infrastructure
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In view of continued contradicatory information we believe these reports should be shared as soon as possible with appropriate Commonwealth and State authorities for guidance on the appropriate conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

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Coastcare
Coochiemudlo Island

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
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Australia
Mobile 0422415830
Office 07 32077002
Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

Dear Vivienne

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Surface water sampling point CISW1 was sampled in November 2018 and no elevated concentrations of [Cu] or [Zn] are reported at levels higher than the ANZECC 2000 guideline limits for FW Slight – Moderately disturbed protection of aquatic species[1]. It should be considered however that groundwater seepage would be low under the December 2018 monitoring periods (November & December rainfall low at 42mm and 53mm respectively at station 040853 Redland Bay Golf Club), and consequently there may have been changes in water chemistry at this time e.g. metals being associated with humics and bound in sediments. First flush stormwater sampling, and subsequent timely sampling in GW is the established approach fundamental to such studies.

[1] In the **deveco** review (2017) these guidelines limits to be adopted were suggested at precautionary limits for Anurans, because one *Vulnerable* species is mapped for this area as *Essential Habitat* i.e. defaulting to an acceptable background level for metals, for example, as determined by the underlying geology. Furthermore, as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland. The WQ guideline limits need to reflect this internationally significant status and it is not appropriate for ANZECC (2000) limits for FW slight-moderately disturbed protection for aquatic species to be applied, rather the 99% protection limits for aquatic species would more appropriate for establishing environmental risk.

Furthermore, as GW 'windows' would be expected to increase with proximity to the shoreline, with fluctuating levels due to tidal pulsing interacting with microtopography relief, then variations in REDOX (with consequent effects on mobilisation of heavy metals in the RAMSAR area) would occur, none of which is considered/commented on in the GHD (2108) *Risk Review*. Although Figure 4, which bears little resemblance to the foreshore under study, would, to the expert interpreter, indicate precisely this i.e. not merely a generic diagram of coastal processes indicating that water finds its own level.

It follows that if insufficient WQ data is available, then we can draw no conclusions as to any up-catchment impacts no matter how we 'rationalise' previous reporting. Simply, the work that was proposed for a competent GW/Surface Water (SW) monitoring programme has not been performed in the recent sampling.

But even without this WQ data, it is proposed that there is a fundamental error in the risk analysis model. Specifically, the error is the assumption that the bores at GW3, GW5 and GW6 are assumed to be located hydraulically upgradient of the former landfill (retired) and are consequently representative of background GW quality i.e. heavy metals levels in GW would be background for that catchment as it is assumed that here has been no anthropogenic impact. Furthermore, as GHD state that GW seepage would be through weathered sandstone and siltstone across this locale i.e. the underlying geology, it is *non sequitur* to propose that [Cu] and [Zn] would result from weathering of this material i.e. it is sedimentary, and then assume that no other principal industrial source has existed above this location.

Reference to the historic area photography of the island reveals that these GW sampling locations are probably within the original 'dump' area in the 60s & 70s (refer aerial photo following). Owing to the nature of the underlying geology, and the previous activity nearer to the roadway i.e. used as a 'dump' and metals recycling location[2], it is questioned if GW3, GW5 and GW6 are in fact upgradient of the original landfill activity and therefore are not representative of what is termed as background GW quality.

Further discussion is not warranted at this juncture as a comprehensive GW/SW monitoring programme has not been performed at this site, and underlying assumptions appear to be flawed.

The conclusion by GHD (2018) after this environmental risk characterisation should not discount the laboratory results which identified several parameters in excess of the adopted assessment criteria in areas down-catchment of the retired landfill site as they *were consistent with or less than background locations*[3].

It follows that if the nature of the GW sampling sites has been misinterpreted i.e. no reference to historic site searches performed as required in an initial contaminated site

[2] When I first came to the island, Laurie Burns had a bulldozer at a site behind the sheds which are visible in this 1974 aerial, and he separated copper and other metals for resale as scrap metal at this location.

[3] Note: [Cu] at GW5 0.003 mg/l; GW6 0.0033 mg/l; > ANZECC 2000 FW Slight-Moderately disturbed limit of 0.0014 mg/l, with [Cu] at GW3 0.0014; this result is emphasized as copper is toxic to Anomurans (Finkel Kristina L.G. & Phillip G. Byrne (2013) *Heavy metal pollution negatively correlates with Anuran species richness and distribution in south-eastern Australia* Austral Ecology **38**, 523-533) at this level and a range of aquatic flora. If the ANZECC (2000) limits for 99% protection of aquatic species is adopted (GHD 2018 Appendix B), and these are appropriate WQ limits for a RAMSAR area, then [Cu] is >> threshold limits (protection value of 0.001 mg/l) at GW5 & GW6, and [Cu] at GW3 now exceeds this limit.

DNR Beenleigh historical aerial photos 1974 (9542/70 – Q2142, 64)

assessment (site history), and a competent WQ/SW sampling programme not performed, then it does not support the conclusion that the risk posed to the down-catchment RAMSAR area and essential habitat areas as mapped is *low* e.g. [Cu] exceeds levels for conservation of Anurans.

The only other comment that I should make is that essential habitat mapping, as interpreted by the State, indicates areas which, in this case, are suitable for the colonisation of the target species Wallum Sedge-frog *Litoria olongburensis*. Whether it exists at this present time is irrelevant in my experience in consulting on development applications. The State will always interpret the mapping as the species could be there owing to the habitat, and physicochemical conditions prevailing in particular.

I add that when I first read the GHD report (December 2018) I thought it was a draft version as on, for example, pp17 & 21 there is a bookmark error warning, heading 'Physiochemical' should be 'Physicochemical', and the references are not in any discernible order.

Yours faithfully

Dr Mark Pillsworth
Principal Ecologist

Debra Weeks

From: James Dowdeswell
Sent: Friday, 29 May 2020 11:52 AM
To: Warren Mortlock
Cc: Paula Kemplay; Closed Landfill Unit; Matthew Ingerman
Subject: RE: GHD Response to Deveco Report of February 2019

Hi Warren

Thanks for the note and the call this week.

We can prepare a letter to respond to the Daveco letter. The proposed scope includes review of the Deveco letter, and drafting of a response letter to address commentary provided in relation to our report.

We can complete this work by the end of June, on the assumption that we receive approval to proceed within the first week of June.

The cost breakdown is presented below. This proposal is costed and submitted under the terms agreed by GHD under the Local Buy Engineering and Environmental Consultancy Services panel (BUS 262-0317).

Please let me know if you have any questions

Kind regards

James Dowdeswell | A GHD Associate
Technical Director – Hydrogeology

GHD
Proudly employee owned

145 Ann Street Brisbane QLD 4000 Australia | GPO Box 668 Brisbane QLD 4001 | www.ghd.com

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From: Warren Mortlock <Warren.Mortlock@redland.qld.gov.au>
Sent: Wednesday, 27 May 2020 10:48 AM
To: James Dowdeswell
Cc: Paula Kemplay (InTouch) <paula.kemplay@redland.qld.gov.au>; Closed Landfill Unit <ClosedLandfill@redland.qld.gov.au>; Matthew Ingerman (InTouch) <matthew.ingerman@redland.qld.gov.au>
Subject: GHD Response to Deveco Report of February 2019

Hi James

You are aware of the attached letter and email below from the Coochiemudlo Coastcare group regarding the water quality assessment report undertaken by GHD.
Could you please provide a proposal to me for a comprehensive written response before end June 2020.
We would like GHD to take this opportunity to confirm or otherwise the statements made by Deveco in relation to the work carried out by GHD and Council at the Laurie Burns Reserve .
Unfortunately, our budget is only available in this financial year.
Are you able to respond on the above timeline?
Many thanks
Warren

Warren Mortlock
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council

P +617 3829 8699

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: Paula Kemplay
Sent: Monday, 11 March 2019 5:04 PM
To:
Cc: Pat Pathmanathan <Pat.Pathmanathan@redland.qld.gov.au>
Subject: FW: Wetlands Report

Hi James
Please see attached letter and email below from the Coochiemudlo Coastcare group regarding the water quality assessment report undertaken by GHD. Could I get a cost proposal from GHD to respond to this letter before 30 June 2019 thanks

Regards

Paula Kemplay
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council

P +617 3829 8597

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: Bradley Taylor
Sent: Thursday, 7 March 2019 10:34 AM
To: 'gvrthomson@gmail.com'; Paula Kemplay
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
Subject: RE: Wetlands Report

Vivienne,

Thanks for your assessment.
I have resigned from RCC and my last day will be Friday 8th MARCH.
I will pass on this email to Paula Kemplay and ask her to follow up.

Kind Regards,

Brad Taylor
Group Manager
Water and Waste Infrastructure
Redland City Council

P +617 3829 8522

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Thursday, 7 March 2019 8:34 AM
To: Bradley Taylor
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
Subject: Wetlands Report

Hello Brad,

Many thanks for onforwarding the GHD reports which were discussed at our recent management meeting along with the attached feedback provided by **deveco** Pty Ltd.

Coastcare appreciates your willingness to work towards positive outcomes and looks forward to progressing further investigation.

Regarding water quality sampling, we're concerned that conclusions drawn in the GHD report are not supported by evidence, as site sampling has not been done as proposed.

Of particular concern in the GHD Water Quality Report is that " no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the Deveco Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected". Further, "as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland."

In view of continued contradicatory information we believe these reports should be shared as soon as possible with appropriate Commonwealth and State authorities for guidance on the appropriate conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in

the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

Also, it would be appreciated if you would confirm if the two GHD reports are draft or final?

We will be commenting on the 'frog report' in due course and also look forward to the opportunity to discuss this with you.

Kind Regards,
Vivienne MOB 0411226363

Debra Weeks

From: Warren Mortlock
Sent: Monday, 1 June 2020 8:38 AM
To: 'James Dowdeswell'
Cc: Paula Kemplay; Closed Landfill Unit; Matthew Ingerman
Subject: RE: GHD Response to Deveco Report of February 2019

Hi James
Thanks for your quick response and for this quote under terms agreed by GHD under the Local Buy Engineering and Environmental Consultancy Services panel (BUS 262-0317).
I hereby give approval to proceed. Please commence this work as soon as you are able.
Many thanks
Warren

Warren Mortlock
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council
P +617 3829 8699

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We can complete this work by the end of June, on the assumption that we receive approval to proceed within the first week of June.

The cost breakdown is presented below. This proposal is costed and submitted under the terms agreed by GHD under the Local Buy Engineering and Environmental Consultancy Services panel (BUS 262-0317).

Please let me know if you have any questions

Kind regards

James Dowdeswell | A GHD Associate
Technical Director – Hydrogeology

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Subject: FW: Wetlands Report

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Regards

Paula Kemplay
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council
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Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
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Group Manager
Water and Waste Infrastructure
Redland City Council
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Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
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Kind Regards,
Vivienne MOB 0411226363

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
www.coochiemudloislandcoastcare.org.au
coochiecoastcare@gmail.com
07 3207 7153

Debra Weeks

From: Warren Mortlock
Sent: Monday, 29 June 2020 11:57 AM
To: Matthew Ingerman
Cc: Paula Kemplay
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island
Attachments: 4127018-MEM-Coochie response.pdf

Hi Matt

Attached is the GHD response to the Deveco letter. You will recall that Paula considered that Council is not suitably qualified to address the various groundwater and surface water points raised by Devco in Feb 2019 and that the response drafted internally did not cover off on what the CCG may be expecting. We decided to give GHD right of reply particularly as there are allegations the upgradient boreholes are located within the rubbish. GHD were asked to do this and their full response is attached. I believe you could send the following to the CCG.

"Dear Vivienne

Council is not an authority on water quality, closed landfills or frog habitat. It relies on the expert assessment by specialist consultants such as GHD to guide its land management and decision-making. Therefore, Council sought a reply from GHD on the issues raised by Deveco with GHD's previous reports. The following is what GHD provided in response.

"The Deveco letter was structured in a way where broad themes were apparent. These themes are addressed individually below.

Selection of appropriate assessment criteria.

The Queensland Government developed *the Environmental Protection (Water) Policy 2009* (EPP Water) to protect Queensland's waters while supporting ecologically sustainable development.

Queensland's waters include water in rivers, streams, wetlands, lakes, groundwater, estuaries and coastal areas.

Schedule 1 of the EPP Water contains documents that detail the relevant environmental values and associated water quality objectives for specific catchments areas throughout Queensland. The water quality objectives have been developed to provide protection to the identified environmental values.

The GHD (2018) assessment utilised water quality objectives for the protection of the 'Aquatic Ecosystems' environmental value as detailed under the *Environmental Protection (Water) Policy 2009 Moreton Bay environmental values and water quality objectives* (Department of Environment and Resource Management, July 2010). The selection of water quality objectives is based on the specific locality on Coochiemudlo Island. This approach is consistent with Queensland legislation and is therefore considered appropriate.

To provide additional assessment in relation to potential impacts on Wallum frog species, an ecological survey was completed of the Melaleuca wetland and reported in *Coochiemudlo Island wetland Wallum frog assessment* (GHD, 2019). The ecological survey identified that the Melaleuca wetland comprises multiple habitats, and only a portion of these habitats are suitable for Wallum frogs. More stringent assessment criteria were applied to areas that corresponded to potential Wallum frog habitat.

The adopted approach to the selection of published guidelines for the protection of Aquatic Ecosystems utilised in the GHD (2018) assessment is considered to comply with legislative requirements and provide assessment specific for the Wallum frog species. This approach does not amount to the "discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away'" as stated in the Deveco letter.

Timing and location of sampling

Monitoring at Coochiemudlo Island is completed according to a monitoring schedule. This schedule has historically provided some flexibility with regard to the timing of sampling, however sampling is not always able to be completed to capture 'first flush', and during the monitoring described in GHD (2018), the prevailing conditions were dry.

A selection of sampling locations were established within the Melaleuca wetland to enable assessment of potential impacts downstream of the former landfill, as well as enable characterisation of water quality at other locations in the wetland. The Melaleuca wetland is surrounded by urban development on three sides, and is potentially impacted my multiple current and historical activities.

Background groundwater quality

The principles of groundwater flow are based upon groundwater moving from areas of higher potential (head) to areas of lower potential. This in turn translates to groundwater flowing from recharge areas to discharge areas. On Coochiemudlo Island, it would be expected that groundwater recharge occurs through infiltrating rainfall, and discharge occurs at topographically low points such as the Melaleuca wetland and Moreton Bay. At the location of the former landfill, an easterly groundwater flow direction would be expected based upon these principles. Upon installation of the monitoring network, the groundwater bores

were surveyed, and groundwater levels measured and converted to a common vertical datum (mAHD). Interpretation of the groundwater levels in the monitoring bores confirms an easterly groundwater flow and supports the characterisation of GW5 and GW6 being located up gradient from the landfill. GW3 has been characterised as a down gradient location in the GHD (2018) assessment, although there is evidence to support that it is more representative of a background location.
During drilling of the monitoring bores the intersected geology is inspected and logged. No evidence of landfilling or other anthropogenic disturbance was noted during drilling at these locations. The monitored water quality in GW5 and GW6 provides a characterisation of groundwater quality *up gradient* of the landfill. It is possible that the water quality at these locations has been impacted by anthropogenic impacts outside of the former landfill, however it is unlikely to have been impacted by the former landfill. As the objective of the assessment revolved around assessing potential impacts from the former landfill, the positioning of these monitoring bores is appropriate.

Comparison of against background data

Comparison of monitoring data against background results is a key aspect in the assessment of risk attributable to the former landfill. If down gradient water quality is consistent with background water quality, it follows that the former landfill is not impacting upon water quality. Many natural processes can impact water quality, and groundwater quality in particular is strongly impacted by the background geology and geochemical conditions. Hydrogeological experience indicates that groundwater commonly exceeds the adopted WQO for the protection of Aquatic Ecosystems in areas away from anthropogenic impact.

Closing remarks

This memorandum has been prepared to respond to comments in the Deveco letter. The comments in this memorandum support the conclusions of the original assessment. An ongoing monitoring program is in place at Coochiemudlo Island, which enables the risk to be reviewed on a regular basis and under differing climatic conditions."
Council continues to monitor the water quality of surface and groundwaters quarterly at the site."

Many thanks
Warren

Warren Mortlock
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council

P +617 3829 8699

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: Matthew Ingerman
Sent: Wednesday, 20 May 2020 4:09 PM
To: Warren Mortlock <Warren.Mortlock@redland.qld.gov.au>
Subject: FW: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Warren,

We are still going to need to work up a response to the Deveco report. Could you please consider how we might be able to address her request.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
Redland City Council

P +617 3829 8979

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Wednesday, 20 May 2020 4:04 PM
To: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Louise Rusan <Louise.Rusan@redland.qld.gov.au>
Subject: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Matthew,

Thank-you for your email but unfortunately, it fails to address our request for a copy of the last GHD report/review and latest ground-water sampling from the new-appointed firm, future-plus environmental.

I've attached the report by deveco Pty Ltd that Coastcare commissioned to examine the GHD findings of December 2018 and also the email response from Brad Taylor(7 March 2019) notifying this would be followed-up.

As you're aware Coastcare's concerns have not received a response from Council.

We'd appreciate your assistance to expedite this exchange of information to support both sound management of the Melaleuca Wetlands and the project funded by the Australian Government.

Kind Regards

Vivienne Roberts-Thomson MOB 0411226363

From: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Sent: Thursday, 14 May 2020 5:22 PM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Vivienne,

Our most recent sampling on Coochiemudlo was conducted in February 2020. Based on those monitoring results, the landfill is considered to pose a low risk to downstream and downgradient receivers. To help you in your decision making, Council has not changed its risk based advice to Coochiemudlo Coastcare based on these results. The site will continue to be monitored quarterly unless advised otherwise by Councils external consultants.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
Redland City Council

P +617 3829 8979

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Wednesday, 13 May 2020 9:54 AM
To: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Matthew,

Thank-you for your email.

Could we please have a copy of the latest GHD review/report relating to ongoing testing of groundwater monitoring sites.

The information will assist decision-making for our volunteer organisation as we progress the four-year Landcare funding project in the Melaleuca Wetlands.

We'd also appreciate a response to the email (see attached) sent to Brad Taylor in March 2019 after receipt of GHD's earlier report. You might recall the matter was raised at the meeting with Peter Best, yourself and Allan McNeil earlier this year.

Kind Regards
Vivienne MOB 0411226363

From: Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>
Sent: Tuesday, 17 March 2020 5:18 PM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>; Peter Best <Peter.Best@redland.qld.gov.au>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Hi Vivienne,

Last week Council officers had a meeting with GHD to discuss the annual review of the monitored sites. I can advise you that the annual review has concluded that the former landfill on Coochiemudlo Island remains low risk, ie the risk profile has not changed downstream of the closed Landfill at Laurie Burns and adjoining Wetlands since 2018.

Regards,

Matthew Ingerman
Acting Group Manager
Water and Waste Infrastructure
Redland City Council

P +617 3829 8979

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Friday, 6 March 2020 1:44 PM
To: Peter Best <Peter.Best@redland.qld.gov.au>
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>; Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>
Subject: RE: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Peter,

Thank-you for your email which has been onforwarded to Healthy Land and Water.

We appreciated your time and offer to clarify previous advice.

In regards water-testing of the Melaleuca Wetlands, we'd certainly appreciate an update on results from GHD's December 2018 report when convenient.

Kind Regards
Vivienne MOB 0411226363

From: Peter Best <Peter.Best@redland.qld.gov.au>
Sent: Thursday, 27 February 2020 9:06 AM
To: gvrthomson@gmail.com
Cc: Allan McNeil <Allan.McNeil@redland.qld.gov.au>; Matthew Ingerman <Matthew.Ingerman@redland.qld.gov.au>; Mark Davis <Mark.Davis@redland.qld.gov.au>
Subject: Coastcare Coochiemudlo Island and Healthy Land and Water Weed Management Project - Coochiemudlo Island

Dear Vivienne,

As a follow up to and as was agreed at our collective meeting relating to this matter held at RCC offices in Cleveland on Thursday 6 February 2020, in executing the responsibilities of the contract that Coastcare Coochiemudlo Island (Coastcare) has with Healthy Land and Water for the purposes of weed management on Coochiemudlo Island, as we have discussed, it is recommended that Coastcare utilise the advice provided by GHD relating to PPE and process to undertake weed control activity, noting that this advice has been previously provided to Coastcare by email.

This recommendation does not preclude Coastcare, its volunteers and/or contractors undertaking hazard and risk assessments to determine appropriate safe work methods, as may be required by the contract Coastcare holds with Healthy Land and Water, prior to commencing any on site work activity.

For clarity, the advice from GHD is as follows:

Simple PPE and administrative controls can be used to manage the risk, This should include:

- *Wearing of boots, long trousers and long-sleeved shirts (buttoned at the wrist) to limit potential exposure to soil*
- *Using gloves to provide hand protection and minimise contact with soil*
- *Avoid contact with surface water*
- *Ensuring that hands are thoroughly washed prior to eating or smoking*
- *If indicators of potential contamination are noted (odorous soil, stained soil, protruding or uncapped refuse, leachate seaps), these areas should be avoided.*

Regards,

Peter

Peter Best
General Manager Infrastructure & Operations
Redland City Council
P +617 3829 8644

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

Memorandum

26 June 2020

To	Redland City Council		
Copy to			
From	GHD	Tel	
Subject	GHD response to Deveco comments – Coochiemudlo Island	Job no.	4127018

1 Introduction

GHD Pty Ltd (GHD) prepared a report to summarise and interpret results from environmental monitoring associated with the former landfill on Coochiemudlo Island: *Coochiemudlo Island Former Landfill – Surface Water and Groundwater Monitoring Report* (GHD, December 2018).

Redland City Council subsequently received comments from the Coochiemudlo Island Coastcare group in relation to the GHD report in a letter dated 19 February 2019 *Comments on Redland City Council – Coochiemudlo Island Former Landfill Surface Water (SW) and Groundwater Monitoring Report (GW) (December 2018)* from Mark Pillsworth of Deveco Pty Ltd (Deveco).

This memo has been prepared for Redland City Council by GHD to provide comment on the Deveco letter in response to the GHD report.

This memorandum is issued subject to the limitations presented in Section 3.

2 Response to Deveco comments

The Deveco letter was structured in a way where broad themes were apparent. These themes are addressed individually below.

Selection of appropriate assessment criteria.

The Queensland Government developed *the Environmental Protection (Water) Policy 2009* (EPP Water) to protect Queensland's waters while supporting ecologically sustainable development. Queensland's waters include water in rivers, streams, wetlands, lakes, groundwater, estuaries and coastal areas.

Schedule 1 of the EPP Water contains documents that detail the relevant environmental values and associated water quality objectives for specific catchments areas throughout Queensland. The water quality objectives have been developed to provide protection to the identified environmental values.

The GHD (2018) assessment utilised water quality objectives for the protection of the 'Aquatic Ecosystems' environmental value as detailed under the *Environmental Protection (Water) Policy 2009 Moreton Bay environmental values and water quality objectives* (Department of Environment and

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Resource Management, July 2010). The selection of water quality objectives is based on the specific locality on Coochiemudlo Island. This approach is consistent with Queensland legislation and is therefore considered appropriate.

To provide additional assessment in relation to potential impacts on Wallum frog species, an ecological survey was completed of the Melaleuca wetland and reported in *Coochiemudlo Island wetland Wallum frog assessment* (GHD, 2019). The ecological survey identified that the Melaleuca wetland comprises multiple habitats, and only a portion of these habitats are suitable for Wallum frogs. More stringent assessment criteria were applied to areas that corresponded to potential Wallum frog habitat.

The adopted approach to the selection of published guidelines for the protection of Aquatic Ecosystems utilised in the GHD (2018) assessment is considered to comply with legislative requirements and provide assessment specific for the Wallum frog species. This approach does not amount to the "discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away'" as stated in the Deveco letter.

Timing and location of sampling

Monitoring at Coochiemudlo Island is completed according to a monitoring schedule. This schedule has historically provided some flexibility with regard to the timing of sampling, however sampling is not always able to be completed to capture 'first flush', and during the monitoring described in GHD (2018), the prevailing conditions were dry.

A selection of sampling locations were established within the Melaleuca wetland to enable assessment of potential impacts downstream of the former landfill, as well as enable characterisation of water quality at other locations in the wetland. The Melaleuca wetland is surrounded by urban development on three sides, and is potentially impacted my multiple current and historical activities.

Background groundwater quality

The principles of groundwater flow are based upon groundwater moving from areas of higher potential (head) to areas of lower potential. This in turn translates to groundwater flowing from recharge areas to discharge areas. On Coochiemudlo Island, it would be expected that groundwater recharge occurs through infiltrating rainfall, and discharge occurs at topographically low points such as the Melaleuca wetland and Moreton Bay. At the location of the former landfill, an easterly groundwater flow direction would be expected based upon these principles. Upon installation of the monitoring network, the groundwater bores were surveyed, and groundwater levels measured and converted to a common vertical datum (mAHD). Interpretation of the groundwater levels in the monitoring bores confirms an easterly groundwater flow and supports the characterisation of GW5 and GW6 being located up gradient from the landfill. GW3 has been characterised as a down gradient location in the GHD (2018) assessment, although there is evidence to support that it is more representative of a background location.

During drilling of the monitoring bores the intersected geology is inspected and logged. No evidence of landfilling or other anthropogenic disturbance was noted during drilling at these locations.

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The monitored water quality in GW5 and GW6 provides a characterisation of groundwater quality *up gradient* of the landfill. It is possible that the water quality at these locations has been impacted by anthropogenic impacts outside of the former landfill, however it is unlikely to have been impacted by the former landfill. As the objective of the assessment revolved around assessing potential impacts from the former landfill, the positioning of these monitoring bores is appropriate.

Comparison of against background data

Comparison of monitoring data against background results is a key aspect in the assessment of risk attributable to the former landfill. If down gradient water quality is consistent with background water quality, it follows that the former landfill is not impacting upon water quality. Many natural processes can impact water quality, and groundwater quality in particular is strongly impacted by the background geology and geochemical conditions. Hydrogeological experience indicates that groundwater commonly exceeds the adopted WQO for the protection of Aquatic Ecosystems in areas away from anthropogenic impact.

Closing remarks

This memorandum has been prepared to respond to comments in the Deveco letter. The comments in this memorandum support the conclusions of the original assessment.

An ongoing monitoring program is in place at Coochiemudlo Island, which enables the risk to be reviewed on a regular basis and under differing climatic conditions.

3 Limitations

This report: has been prepared by GHD for Redland City Council and may only be used and relied on by Redland City Council.

GHD otherwise disclaims responsibility to any person other than Redland City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

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/o=rccprd/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Debı

From: Bradley Taylor
Sent: Thursday, 7 March 2019 10:34 AM
To: Paula Kemplay
Subject: FW: Wetlands Report
Attachments: Deveco report.pdf

Thanks,

Brad Taylor
Group Manager
Water and Waste Infrastructure
Redland City Council

P +617 3829 8522

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: gvrthomson@gmail.com [mailto:gvrthomson@gmail.com]
Sent: Thursday, 7 March 2019 8:34 AM
To: Bradley Taylor
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
Subject: Wetlands Report

Hello Brad,

Many thanks for onforwarding the GHD reports which were discussed at our recent management meeting along with the attached feedback provided by **deveco** Pty Ltd.

Coastcare appreciates your willingness to work towards positive outcomes and looks forward to progressing further investigation.

Regarding water quality sampling, we're concerned that conclusions drawn in the GHD report are not supported by evidence, as site sampling has not been done as proposed.

Of particular concern in the GHD Water Quality Report is that " no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the Deveco Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected". Further, "as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland."

In view of continued contradicatory information we believe these reports should be shared as soon as possible with appropriate Commonwealth and State authorities for guidance on the appropriate conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

Also, it would be appreciated if you would confirm if the two GHD reports are draft or final?

We will be commenting on the 'frog report' in due course and also look forward to the opportunity to discuss this with you.

Kind Regards,
Vivienne MOB 0411226363

Coastcare Coochiemudlo Island

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
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coochiecoastcare@gmail.com
07 3207 7153

PO Box 288 Ferny Hills Qld 4055
Australia
Mobile 0422415830
Office 07 32077002
Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

Dear Vivienne

RE: Comments on *Redland City Council – Coochiemudlo Island Former Landfill Surface Water* (SW) *and Groundwater Monitoring Report* (GW) (December 2018).

Several issues which I commented on previously have now been considered in this *Risk Review* (GHD December 2018) e.g. application of ANZECC WQ Guidelines (2000) and inclusion in results tables (Appendix B), but no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the **deveco** Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected. The aim of these GW/SW studies, in some large part, to determine conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

It is a realty however that RCC has a legal obligation to manage retired landfills to comply with engineering standards and legislative constraints which is the complimentary risk to conservation issues, and to do so in the most cost effective manner.

But there is one caveat here that engineering and legislative requirements must focus on the conservation context in receiving/contiguous areas i.e. what are we aiming to protect in this catchment? This is a fundamental objective in conservation risk assessment, and discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away' is not what the current Commonwealth and State legislation has as its principal objective e.g. by selecting WQ contamination limits that suit the engineering requirements.

The principal focus of the **deveco** review (2017) was concerned with alerting the GHD groundwater (GW) monitoring engineers that the WQ criteria that they had chosen were not appropriate for protection of a RAMSAR area, and did not consider protection of particular species i.e. *Essential Habitat* for a *Vulnerable* Wallum Sedge-frog *Litoria olongburensis* and the *Endangered* orchid *Phais australis.*

Specifically, it was commented on in this **deveco** review (2017) that the GHD monitoring regime initially in 2017 was flawed as GW bores had fallen into disrepair since the EGIS (2001) investigations and WQ samples could not be collected. This has since been addressed with reinstatement of GW bores at strategic locations and further GW sampling in 2018. However, and as highlighted by the **deveco** review (2017), we could draw no meaningful conclusions as to the migration of contamination nuisance down catchment to the RAMSAR wetland as surface water samples in the wetland had not been collected for analysis.

The GW sampling regime should be a coordinated programme where first flush stormwater is collected, and then by reference to historic data on water levels in bores, interpret this data to determine infiltration and run-on rates, with subsequent timely sampling down catchment (specifically the GW 'windows' in the RAMSAR Wetland) and thus capture these flows across the boundary of the retired landfill and into the wetland.

Obviously GHD were cognisant of this sampling gap as they state in the current report (December 2018) that:

> Additional surface water and groundwater monitoring was completed in November 2018 to confirm the findings of the *Risk Review*, with results presented in the current report.

However, in the presentation of WQ monitoring results, GHD (2018) report:

Upstream location CISW2 (potential Wallum frog habitat)
Up gradient location CISW2 was dry during the November 2018 monitoring event and was therefore not sampled. Previous results at CISW2 were consistent with background concentrations.
Upstream location CISW3 (potential Wallum frog habitat)
Up gradient location CISW3 was dry during the November 2018 monitoring event and was therefore not sampled. Previous results at CISW3 were consistent with background concentrations.

Surface water sampling point CISW1 was sampled in November 2018 and no elevated concentrations of [Cu] or [Zn] are reported at levels higher than the ANZECC 2000 guideline limits for FW Slight – Moderately disturbed protection of aquatic species[1]. It should be considered however that groundwater seepage would be low under the December 2018 monitoring periods (November & December rainfall low at 42mm and 53mm respectively at station 040853 Redland Bay Golf Club), and consequently there may have been changes in water chemistry at this time e.g. metals being associated with humics and bound in sediments. First flush stormwater sampling, and subsequent timely sampling in GW is the established approach fundamental to such studies.

[1] In the **deveco** review (2017) these guidelines limits to be adopted were suggested at precautionary limits for Anurans, because one *Vulnerable* species is mapped for this area as *Essential Habitat* i.e. defaulting to an acceptable background level for metals, for example, as determined by the underlying geology. Furthermore, as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland. The WQ guideline limits need to reflect this internationally significant status and it is not appropriate for ANZECC (2000) limits for FW slight-moderately disturbed protection for aquatic species to be applied, rather the 99% protection limits for aquatic species would more appropriate for establishing environmental risk.

Furthermore, as GW 'windows' would be expected to increase with proximity to the shoreline, with fluctuating levels due to tidal pulsing interacting with microtopography relief, then variations in REDOX (with consequent effects on mobilisation of heavy metals in the RAMSAR area) would occur, none of which is considered/commented on in the GHD (2108) *Risk Review*. Although Figure 4, which bears little resemblance to the foreshore under study, would, to the expert interpreter, indicate precisely this i.e. not merely a generic diagram of coastal processes indicating that water finds its own level.

It follows that if insufficient WQ data is available, then we can draw no conclusions as to any up-catchment impacts no matter how we 'rationalise' previous reporting. Simply, the work that was proposed for a competent GW/Surface Water (SW) monitoring programme has not been performed in the recent sampling.

But even without this WQ data, it is proposed that there is a fundamental error in the risk analysis model. Specifically, the error is the assumption that the bores at GW3, GW5 and GW6 are assumed to be located hydraulically upgradient of the former landfill (retired) and are consequently representative of background GW quality i.e. heavy metals levels in GW would be background for that catchment as it is assumed that here has been no anthropogenic impact. Furthermore, as GHD state that GW seepage would be through weathered sandstone and siltstone across this locale i.e. the underlying geology, it is *non sequitur* to propose that [Cu] and [Zn] would result from weathering of this material i.e. it is sedimentary, and then assume that no other principal industrial source has existed above this location.

Reference to the historic area photography of the island reveals that these GW sampling locations are probably within the original 'dump' area in the 60s & 70s (refer aerial photo following). Owing to the nature of the underlying geology, and the previous activity nearer to the roadway i.e. used as a 'dump' and metals recycling location[2], it is questioned if GW3, GW5 and GW6 are in fact upgradient of the original landfill activity and therefore are not representative of what is termed as background GW quality.

Further discussion is not warranted at this juncture as a comprehensive GW/SW monitoring programme has not been performed at this site, and underlying assumptions appear to be flawed.

The conclusion by GHD (2018) after this environmental risk characterisation should not discount the laboratory results which identified several parameters in excess of the adopted assessment criteria in areas down-catchment of the retired landfill site as they *were consistent with or less than background locations*[3].

It follows that if the nature of the GW sampling sites has been misinterpreted i.e. no reference to historic site searches performed as required in an initial contaminated site

[2] When I first came to the island, Laurie Burns had a bulldozer at a site behind the sheds which are visible in this 1974 aerial, and he separated copper and other metals for resale as scrap metal at this location.

[3] Note: [Cu] at GW5 0.003 mg/l; GW6 0.0033 mg/l; > ANZECC 2000 FW Slight-Moderately disturbed limit of 0.0014 mg/l, with [Cu] at GW3 0.0014; this result is emphasized as copper is toxic to Anomurans (Finkel Kristina L.G. & Phillip G. Byrne (2013) *Heavy metal pollution negatively correlates with Anuran species richness and distribution in south-eastern Australia* Austral Ecology **38**, 523-533) at this level and a range of aquatic flora. If the ANZECC (2000) limits for 99% protection of aquatic species is adopted (GHD 2018 Appendix B), and these are appropriate WQ limits for a RAMSAR area, then [Cu] is >> threshold limits (protection value of 0.001 mg/l) at GW5 & GW6, and [Cu] at GW3 now exceeds this limit.

DNR Beenleigh historical aerial photos 1974 (9542/70 – Q2142, 64)

assessment (site history), and a competent WQ/SW sampling programme not performed, then it does not support the conclusion that the risk posed to the down-catchment RAMSAR area and essential habitat areas as mapped is *low* e.g. [Cu] exceeds levels for conservation of Anurans.

The only other comment that I should make is that essential habitat mapping, as interpreted by the State, indicates areas which, in this case, are suitable for the colonisation of the target species Wallum Sedge-frog *Litoria olongburensis*. Whether it exists at this present time is irrelevant in my experience in consulting on development applications. The State will always interpret the mapping as the species could be there owing to the habitat, and physicochemical conditions prevailing in particular.

I add that when I first read the GHD report (December 2018) I thought it was a draft version as on, for example, pp17 & 21 there is a bookmark error warning, heading 'Physiochemical' should be 'Physicochemical', and the references are not in any discernible order.

Yours faithfully

Dr Mark Pillsworth
Principal Ecologist

/o=rccprd/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Debı

From: Paula Kemplay
Sent: Monday, 11 March 2019 5:04 PM
To:
Cc: Pat Pathmanathan
Subject: FW: Wetlands Report
Attachments: Deveco report.pdf

Hi James
Please see attached letter and email below from the Coochiemudlo Coastcare group regarding the water quality assessment report undertaken by GHD. Could I get a cost proposal from GHD to respond to this letter before 30 June 2019 thanks

Regards

Paula Kemplay
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council
P +617 3829 8597

I acknowledge the traditional custodians of the lands and seas where I work. I pay my respects to Elders, past, present and future.

From: Bradley Taylor
Sent: Thursday, 7 March 2019 10:34 AM
To: 'gvrthomson@gmail.com'; Paula Kemplay
Cc: Cr Lance Hewlett; 'Coochiemudlo Island Coastcare'
Subject: RE: Wetlands Report

Vivienne,

Thanks for your assessment.
I have resigned from RCC and my last day will be Friday 8th MARCH.
I will pass on this email to Paula Kemplay and ask her to follow up.

Kind Regards,

Brad Taylor
Group Manager
Water and Waste Infrastructure
Redland City Council
P +617 3829 8522

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Vivienne Roberts-Thomson
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Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

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Principal Ecologist

/o=rccprd/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Debı

From: gvrthomson@gmail.com
Sent: Wednesday, 2 October 2019 6:38 AM
To: Paula Kemplay
Cc: 'Coochiemudlo Island Coastcare'; Cr Lance Hewlett
Subject: Wetlands Report
Attachments: Deveco report.pdf

Hi Paula,

Thanks for the chat yesterday following receipt of your email.

It's reassuring to know ground water testing is continuing in the wetlands & when convenient we'd appreciate a copy of results this year

As discussed, I've attached the original email sent to Brad Taylor & from memory you were seeking GHD's response to our concerns.

Kind Regards
Vivienne MOB 0411226363

From: Bradley Taylor <Bradley.Taylor@redland.qld.gov.au>
Sent: Thursday, 7 March 2019 10:34 AM
To: 'gvrthomson@gmail.com' <gvrthomson@gmail.com>; Paula Kemplay <Paula.Kemplay@redland.qld.gov.au>
Cc: Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>; 'Coochiemudlo Island Coastcare' <coochiecoastcare@gmail.com>
Subject: RE: Wetlands Report

Vivienne,

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Brad Taylor
Group Manager
Water and Waste Infrastructure
Redland City Council
P +617 3829 8522

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In view of continued contradicatory information we believe these reports should be shared as soon as possible with appropriate Commonwealth and State authorities for guidance on the appropriate conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

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Coastcare Coochiemudlo Island
Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
www.coochiemudloislandcoastcare.org.au
coochiecoastcare@gmail.com
07 3207 7153

PO Box 288 Ferny Hills Qld 4055
Australia
Mobile 0422415830
Office 07 32077002
Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

Dear Vivienne

RE: Comments on *Redland City Council – Coochiemudlo Island Former Landfill Surface Water* (SW) ***and Groundwater Monitoring Report*** (GW) (December 2018).

Several issues which I commented on previously have now been considered in this *Risk Review* (GHD December 2018) e.g. application of ANZECC WQ Guidelines (2000) and inclusion in results tables (Appendix B), but no commentary on safe limits for contaminants in groundwater associated with a dedicated RAMSAR area or *Essential Habitat* mapping as highlighted in the **deveco** Pty Ltd report is given (20 September, 2017). Specifically, there is no commentary with respect to the site conditions and what habitat/species precisely are to be protected. The aim of these GW/SW studies, in some large part, to determine conservation management strategies to preserve *Endangered* and *Vulnerable* species as listed in the *Environmental Protection and Biodiversity Act* 1999 (Cth.) and the *Nature Conservation Act* 1992 (Qld.).

It is a realty however that RCC has a legal obligation to manage retired landfills to comply with engineering standards and legislative constraints which is the complimentary risk to conservation issues, and to do so in the most cost effective manner.

But there is one caveat here that engineering and legislative requirements must focus on the conservation context in receiving/contiguous areas i.e. what are we aiming to protect in this catchment? This is a fundamental objective in conservation risk assessment, and discounting of natural attributes for an engineering/commercial necessity preference to 'make a problem go away' is not what the current Commonwealth and State legislation has as its principal objective e.g. by selecting WQ contamination limits that suit the engineering requirements.

The principal focus of the **deveco** review (2017) was concerned with alerting the GHD groundwater (GW) monitoring engineers that the WQ criteria that they had chosen were not appropriate for protection of a RAMSAR area, and did not consider protection of particular species i.e. *Essential Habitat* for a *Vulnerable* Wallum Sedge-frog *Litoria olongburensis* and the *Endangered* orchid *Phais australis.*

Specifically, it was commented on in this **deveco** review (2017) that the GHD monitoring regime initially in 2017 was flawed as GW bores had fallen into disrepair since the EGIS (2001) investigations and WQ samples could not be collected. This has since been addressed with reinstatement of GW bores at strategic locations and further GW sampling in 2018. However, and as highlighted by the **deveco** review (2017), we could draw no meaningful conclusions as to the migration of contamination nuisance down catchment to the RAMSAR wetland as surface water samples in the wetland had not been collected for analysis.

The GW sampling regime should be a coordinated programme where first flush stormwater is collected, and then by reference to historic data on water levels in bores, interpret this data to determine infiltration and run-on rates, with subsequent timely sampling down catchment (specifically the GW 'windows' in the RAMSAR Wetland) and thus capture these flows across the boundary of the retired landfill and into the wetland.

Obviously GHD were cognisant of this sampling gap as they state in the current report (December 2018) that:

> Additional surface water and groundwater monitoring was completed in November 2018 to confirm the findings of the *Risk Review*, with results presented in the current report.

However, in the presentation of WQ monitoring results, GHD (2018) report:

Upstream location CISW2 (potential Wallum frog habitat)
Up gradient location CISW2 was dry during the November 2018 monitoring event and was therefore not sampled. Previous results at CISW2 were consistent with background concentrations.
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Surface water sampling point CISW1 was sampled in November 2018 and no elevated concentrations of [Cu] or [Zn] are reported at levels higher than the ANZECC 2000 guideline limits for FW Slight – Moderately disturbed protection of aquatic species[1]. It should be considered however that groundwater seepage would be low under the December 2018 monitoring periods (November & December rainfall low at 42mm and 53mm respectively at station 040853 Redland Bay Golf Club), and consequently there may have been changes in water chemistry at this time e.g. metals being associated with humics and bound in sediments. First flush stormwater sampling, and subsequent timely sampling in GW is the established approach fundamental to such studies.

[1] In the **deveco** review (2017) these guidelines limits to be adopted were suggested at precautionary limits for Anurans, because one *Vulnerable* species is mapped for this area as *Essential Habitat* i.e. defaulting to an acceptable background level for metals, for example, as determined by the underlying geology. Furthermore, as this is a RAMSAR area the limits selected by GHD (2018) are inappropriate i.e. if this area is to be managed as a RAMSAR wetland. The WQ guideline limits need to reflect this internationally significant status and it is not appropriate for ANZECC (2000) limits for FW slight-moderately disturbed protection for aquatic species to be applied, rather the 99% protection limits for aquatic species would more appropriate for establishing environmental risk.

Furthermore, as GW 'windows' would be expected to increase with proximity to the shoreline, with fluctuating levels due to tidal pulsing interacting with microtopography relief, then variations in REDOX (with consequent effects on mobilisation of heavy metals in the RAMSAR area) would occur, none of which is considered/commented on in the GHD (2108) *Risk Review*. Although Figure 4, which bears little resemblance to the foreshore under study, would, to the expert interpreter, indicate precisely this i.e. not merely a generic diagram of coastal processes indicating that water finds its own level.

It follows that if insufficient WQ data is available, then we can draw no conclusions as to any up-catchment impacts no matter how we 'rationalise' previous reporting. Simply, the work that was proposed for a competent GW/Surface Water (SW) monitoring programme has not been performed in the recent sampling.

But even without this WQ data, it is proposed that there is a fundamental error in the risk analysis model. Specifically, the error is the assumption that the bores at GW3, GW5 and GW6 are assumed to be located hydraulically upgradient of the former landfill (retired) and are consequently representative of background GW quality i.e. heavy metals levels in GW would be background for that catchment as it is assumed that here has been no anthropogenic impact. Furthermore, as GHD state that GW seepage would be through weathered sandstone and siltstone across this locale i.e. the underlying geology, it is *non sequitur* to propose that [Cu] and [Zn] would result from weathering of this material i.e. it is sedimentary, and then assume that no other principal industrial source has existed above this location.

Reference to the historic area photography of the island reveals that these GW sampling locations are probably within the original 'dump' area in the 60s & 70s (refer aerial photo following). Owing to the nature of the underlying geology, and the previous activity nearer to the roadway i.e. used as a 'dump' and metals recycling location[2], it is questioned if GW3, GW5 and GW6 are in fact upgradient of the original landfill activity and therefore are not representative of what is termed as background GW quality.

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/o=rccprd/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Debı

From: Paula Kemplay
Sent: Wednesday, 2 October 2019 3:01 PM
To: Robin Klein
Subject: FW: Wetlands Report
Attachments: Deveco report.pdf

Regards

Paula Kemplay
Principal Waste Planner
Water and Waste Infrastructure
Redland City Council
P +617 3829 8597

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www.coochiemudloislandcoastcare.org.au
coochiecoastcare@gmail.com
07 3207 7153

PO Box 288 Ferny Hills Qld 4055
Australia
Mobile 0422415830
Office 07 32077002
Email mpillsworth@westnet.com.au

19 February, 2019.

Vivienne Roberts-Thomson
President
Coochiemudlo Island Coastcare Inc.
Coochiemudlo Island QLD 4184

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Yours faithfully

Dr Mark Pillsworth
Principal Ecologist

Debra Weeks

From: Bradley Taylor
Sent: Thursday, 4 October 2018 4:21 PM
To: Cr Lance Hewlett
Cc: Division 4 Support; Paula Kemplay
Subject: RE: Coochie Landfill

Cr Hewlett,

The findings of the GHD report are best summarised as follows;

- Identified receptors for both surface water and groundwater were identified as aquatic ecosystems, which was supported by the habitat assessment completed by GHD which identified ephemeral surface water pools within the Melaleuca Wetland downstream of the site. Therefore there is a hydraulic linkage between the old land fill and the wet lands.
- Two rounds of surface water and groundwater monitoring were completed as part of the assessment, and historical results from two monitoring wells sampled in 2017 were included in the dataset. Laboratory results identified several parameters at concentrations in excess of the adopted assessment criteria (EPP for Water, ANZECC Guidelines for slightly to moderately disturbed ecosystems plus surface water metal concentrations in relation to optimum concentrations for Wallum Frogs and GHD site specific items for Wallum Frogs .. Ph, 3.53. 4.61 EC <90, Tannin acid staining > 9.5, Calcium < 3.2, low levels of monomeric aluminium), however typically results in down gradient / down stream locations were consistent or less than background locations, indicating the landfill represents a low risk to the identified receptors for most parameters assessed. Iron chromium in ground water and electrical conductivity, aluminium, chromium and copper in surface water were above the criteria and background however were sporadic in results and not representative of the general downstream data set. A review of the results does not indicate gross landfill impact.
- Ammonia results provide further support to this conclusion as ammonia is a typical indicator of landfill impact. Ammonia is readily detected in areas of landfill impact due to its typically high concentration in landfill leachate and its mobility in groundwater. Evidence of elevated ammonia was absent in both the surface water and groundwater monitoring programs.
- Monitored surface water quality parameters indicates that the water quality of the potential wallum frog habitat is outside the optimal ranges for wallum frog species, however this is not attributable to the former landfill.
- Based on the findings of this assessment the former landfill is considered to present a low risk to down gradient receptors and remedial works at the landfill are not considered to be required.
- While this assessment has characterised the risk posed by the landfill to identified receptors to be low, it is noted that limited monitoring (two complete events) has been completed and further monitoring is recommended to validate the findings of this assessment and enable characterisation of potential risks over differing climatic and seasonal conditions.

I am intending to commission GHD to follow through with the recommended further monitoring. I will call Vivian to arrange a on island discussion about the report. There are some minor editing that GHD need to make so will not be handing over the report to external parties until the report is finalised.

Regards,

Brad Taylor
Group Manager
Water & Waste Infrastructure
T | 07 3829 8522
E | bradleyt@redland.qld.gov.au
233 Middle St
Cleveland

From: Cr Lance Hewlett
Sent: Thursday, 4 October 2018 2:56 PM
To: Bradley Taylor
Cc: Division 4 Support
Subject: Fwd: Coochie Landfill

Hi Brad,

Any update?

Kind Regards,

Cr Lance Hewlett
Deputy Mayor

Councillor, Division 4
Victoria Point, Redland Bay (Anita Street Precinct) and Coochiemudlo Island
Redland City Council |
Cnr Middle and Bloomfield Streets, Cleveland QLD 4163 |
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Phone: (07) 3829-8603 | Mobile: 0421 880 371
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Web: www.redland.qld.gov.au
Facebook: https://www.facebook.com/lance.hewlett

Begin forwarded message:

From: Bradley Taylor <Bradley.Taylor@redland.qld.gov.au>
Date: 11 September 2018 at 8:46:51 am AEST
To: Cr Lance Hewlett <Lance.Hewlett@redland.qld.gov.au>
Cc: Division 4 Support <Division4Support@redland.qld.gov.au>
Subject: RE: Coochie Landfill

Cr Hewlett,

We have been following up on this work with GHD and have been advised we should receive a report at the end of this week. There has been some Department of Environment and Science audits that we have had GHD respond on. This became a higher priority than the Coochie work.

Regards,

Brad Taylor

Group Manager

Water & Waste Infrastructure

T | 07 3829 8522
E | bradleyt@redland.qld.gov.au

233 Middle St
Cleveland

From: Cr Lance Hewlett
Sent: Tuesday, 11 September 2018 7:11 AM
To: Bradley Taylor
Cc: Division 4 Support
Subject: Coochie Landfill

Hi Brad,

I was a Coastcare meeting last night and it appears that the leachate investigation on Coochie has stalled, apparently due to another issue in the mainland. Could you please provide an update. Thanks.

Kind Regards,

Cr Lance Hewlett

Deputy Mayor

Councillor, Division 4

Victoria Point, Redland Bay (Anita Street Precinct) and Coochiemudlo Island

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