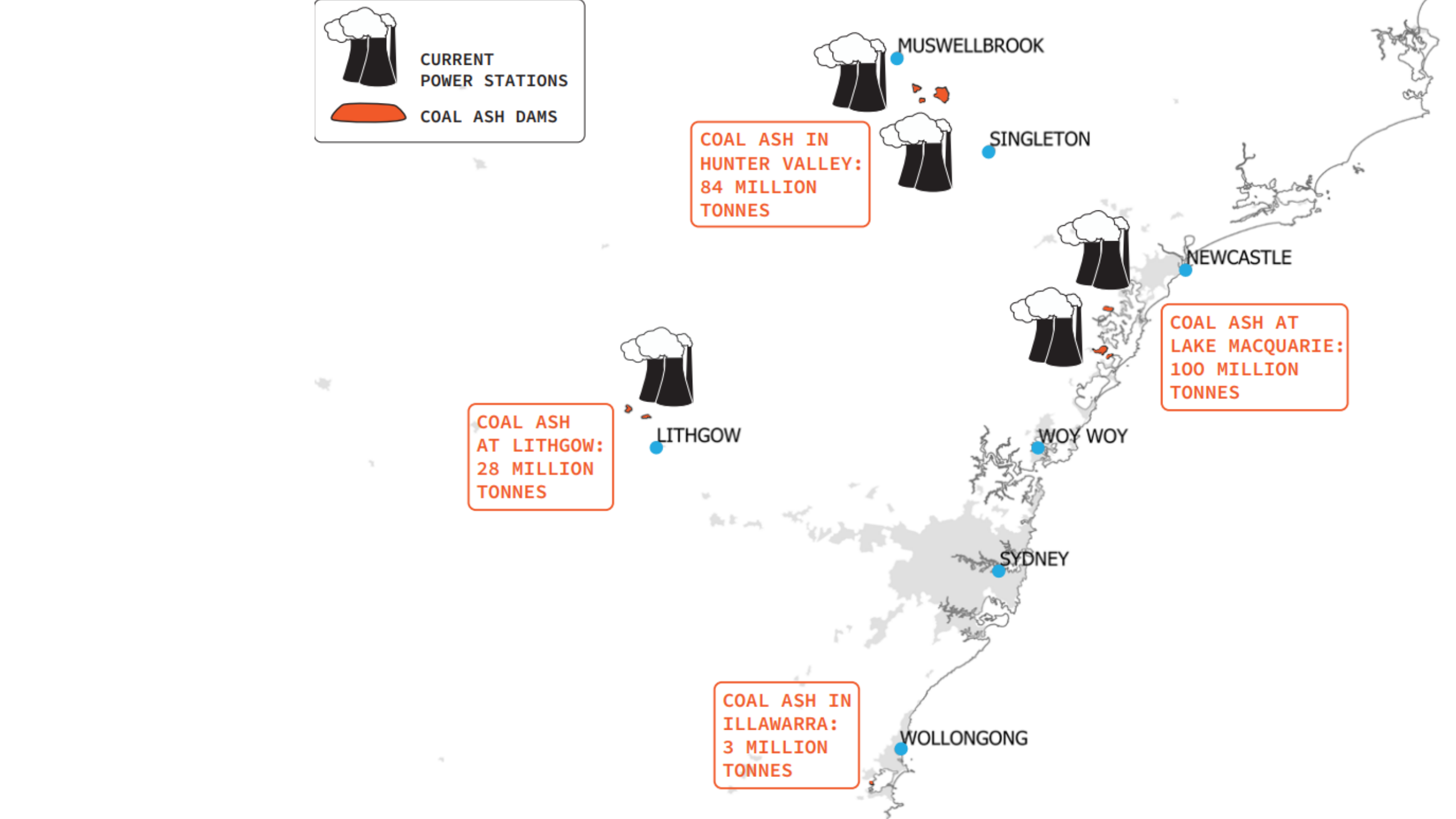
NSW coal-ash impacts

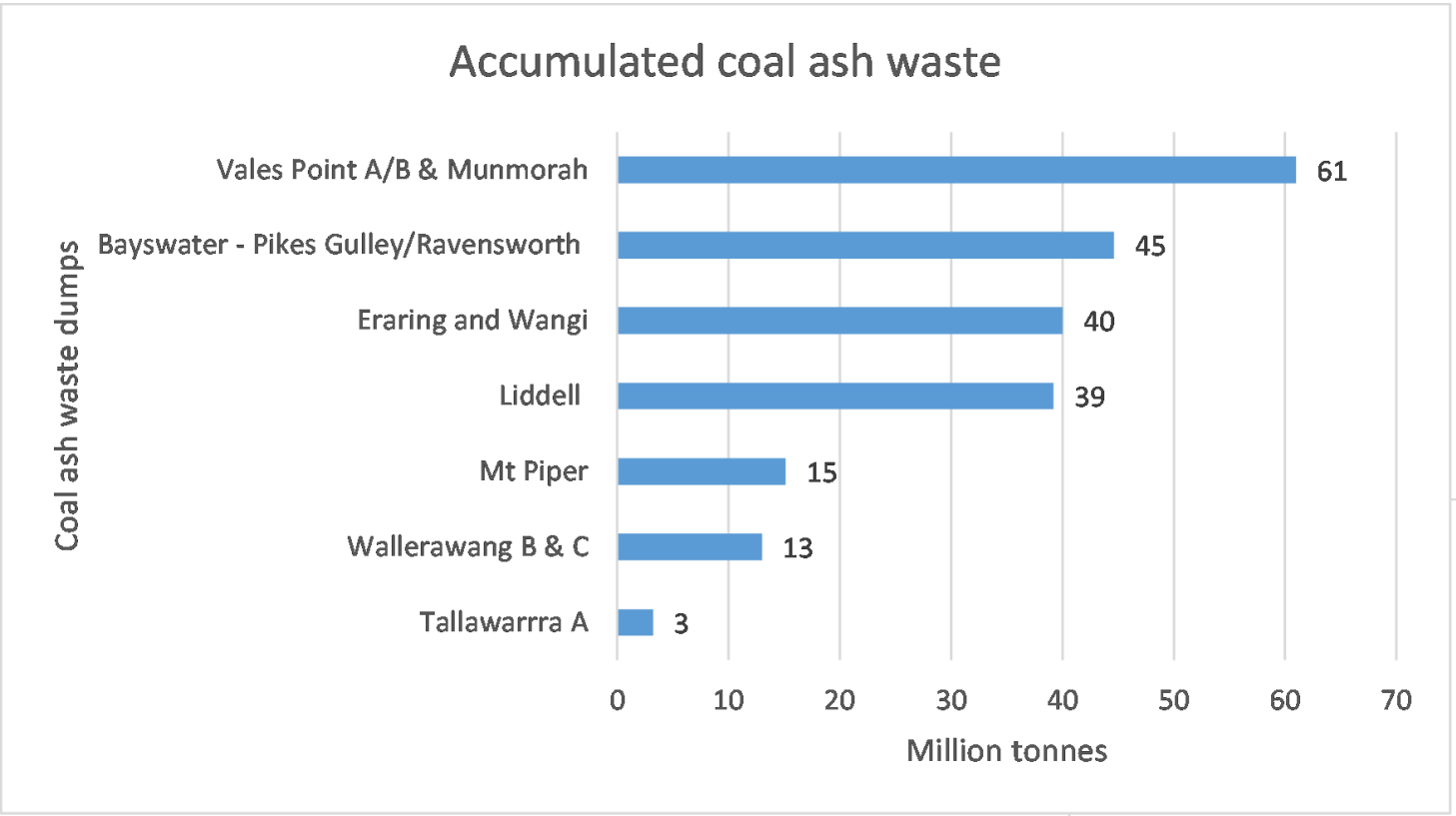
Hunter Community Environment Centre

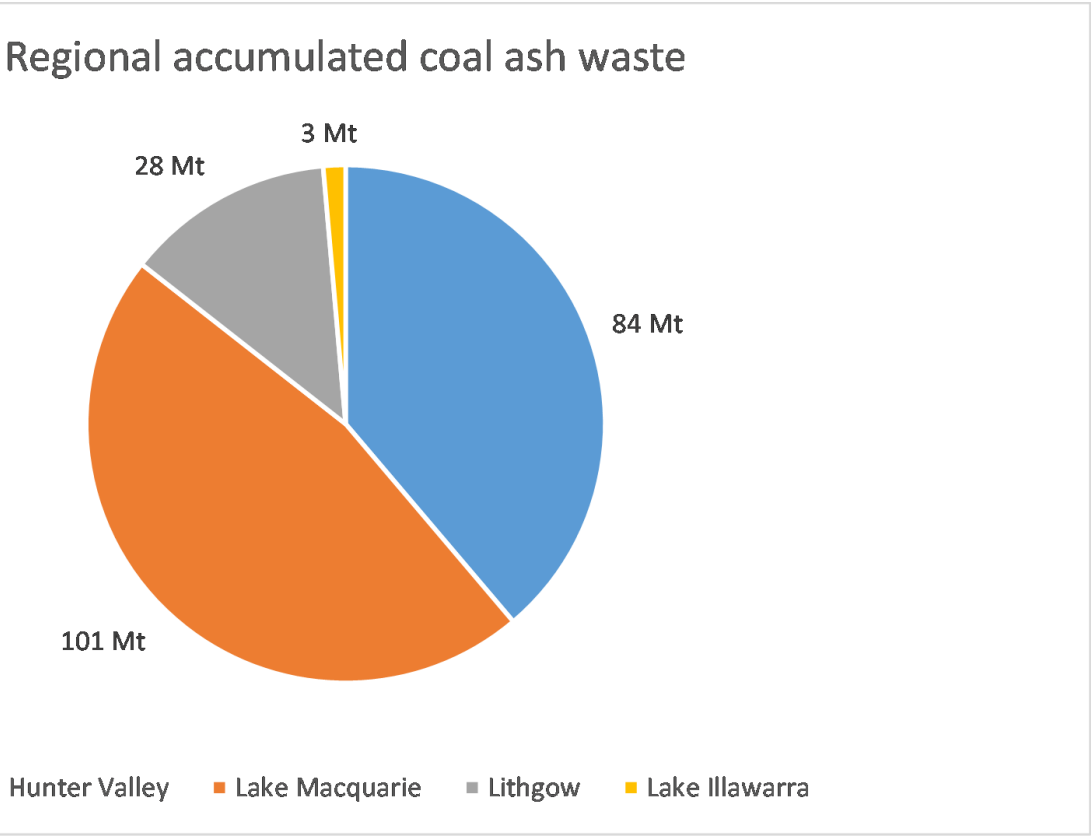
September 2022

Overview

- Legacy coal-ash waste in NSW
- NSW Treasury's Baseline Contamination Assessments
- HCEC sampling results
- Metal bioaccumulation in water birds
- The true cost of coal ash.


CURRENT
POWER STATIONS
COAL ASH DAMS
MUSWELLBROOK
SINGLETON
COAL ASH IN
HUNTER VALLEY:
84 MILLION
TONNES
NEWCASTLE
COAL ASH AT
LAKE MACQUARIE:
100 MILLION
TONNES
LITHGOW
COAL ASH
AT LITHGOW:
28 MILLION
TONNES
WOY WOY
SYDNEY
COAL ASH IN
ILLAWARRA:
3 MILLION
TONNES
WOLLONGONG


Accumulated coal ash waste
Coal ash waste dumps
Vales Point A/B & Munmorah
Bayswater - Pikes Gulley/Ravensworth
Eraring and Wangi
Liddell
Mt Piper
Wallerawang B & C
Tallawarrra A
61
45
40
39
15
13
3
0
10
20
30
40
50
60
70
Million tonnes


Regional accumulated coal ash waste
3 Mt
28 Mt
84 Mt
101 Mt
Central Hunter Valley
Lake Macquarie
Lithgow
Lake Illawarra

Liddell Environmental Site Assessment

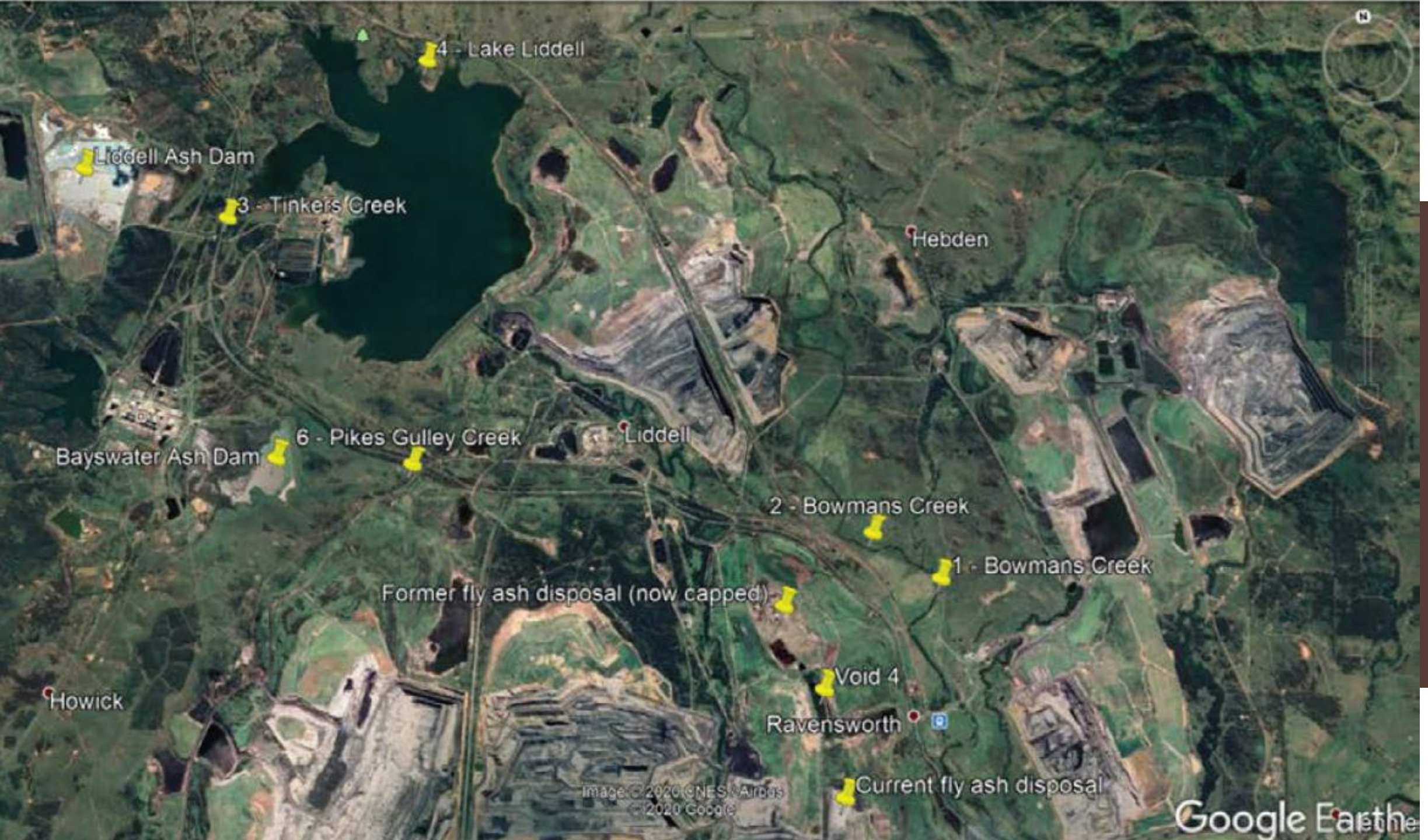
- **Arsenic, cadmium, lead, nickel and selenium** in excess of the NHMRC drinking water values in groundwater across the site.
- **Lead, selenium and nickel** exceeded NHMRC recreational water guidelines in some areas.
- Substantial exceedances (above an order of magnitude of background) **boron, cadmium, lead, nickel, selenium, zinc** at the ash dam boundary.

Bayswater Environmental Site Assessment

- **Pikes Gully ash dam - Boron, cadmium, copper, lead, manganese, nickel, and zinc** in excess drinking water guidelines. **Lead and nickel** above the recreational use guidelines.

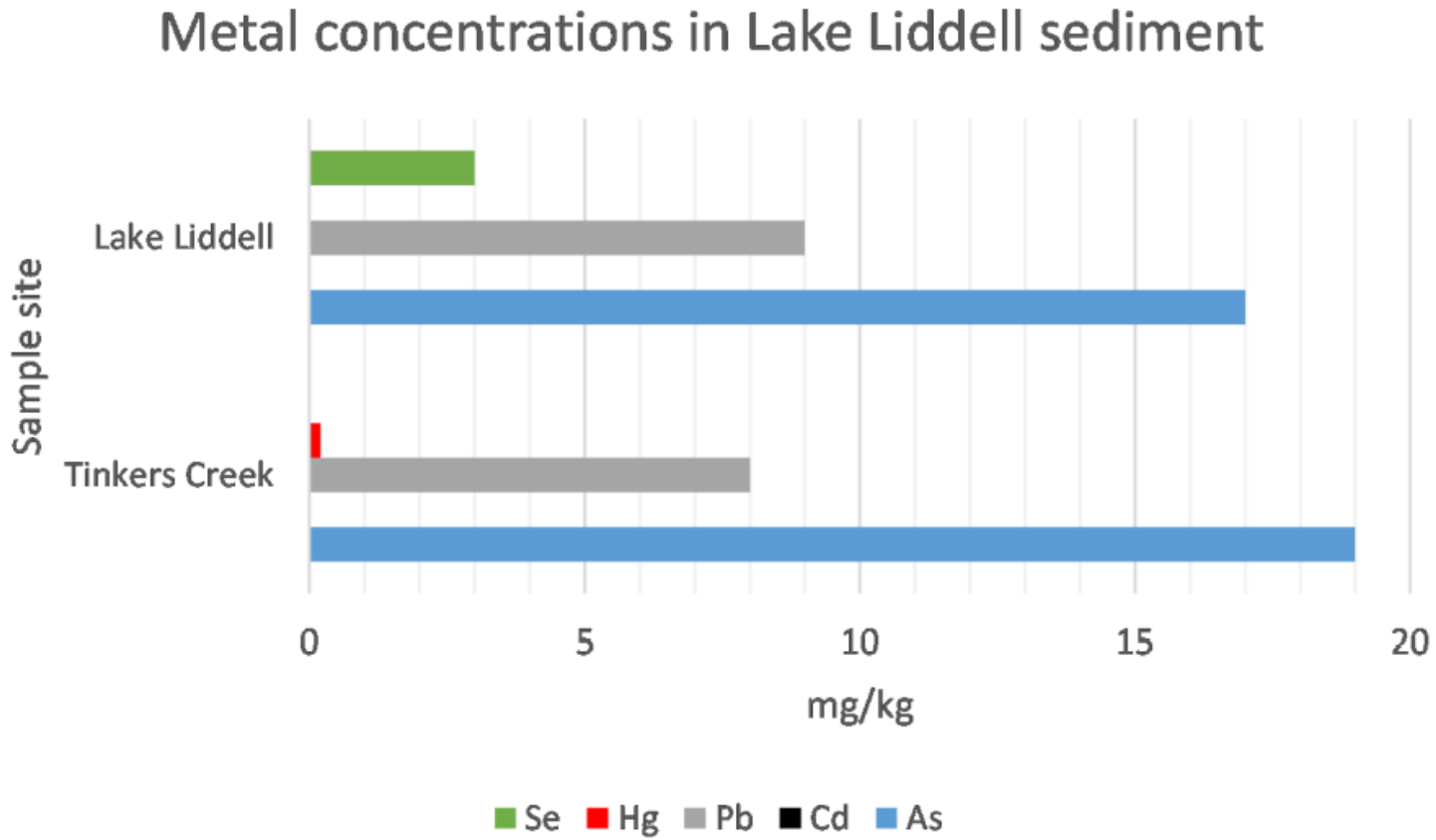
- **Ravensworth Rehabilitation Area** ash dump in contact with regional groundwater flow.

- Impacts observed in the other areas within this catchment would be minor contributors to the overall potential impacts arising from the ash dams.


4 - Lake Liddell
Liddell Ash Dam
3 - Tinkers Creek
Hebden
6 - Pikes Gulley Creek
Liddell
Bayswater Ash Dam
2 - Bowmans Creek
1 - Bowmans Creek
Former fly ash disposal (now capped)
Void 4
Howick
Ravensworth
Current fly ash disposal
Image © 2020 CNES / Airbus
© 2020 Google
Google Earth

HCEC sediment testing: Bayswater and Liddell, 2020

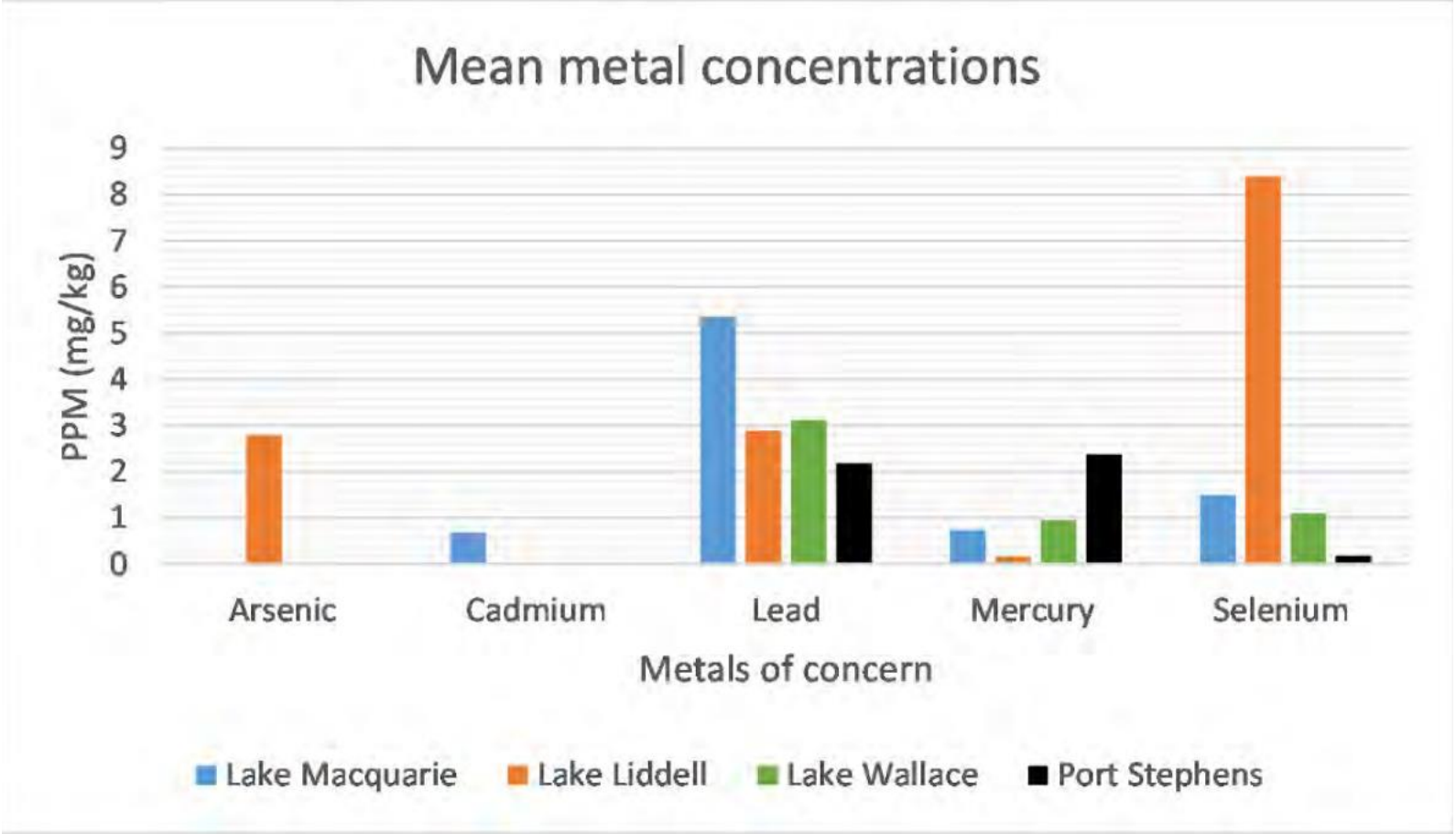
HCEC collected water and sediment samples from waterways draining AGL's Bayswater and Liddell ash dumps in July 2020.



Results for Lake Liddell sediment included:
Selenium - 3mg/kg Arsenic - 19 mg/kg Lead - 9 mg/kg

Toxic Habitat: *Heavy metal impacts on water birds near NSW coal fired power stations*

Half of all birds from which we sampled feathers were potentially suffering health impacts from heavy metals emitted by coal-fired power stations.



Results summary: Bird feather study

Lake Macquarie

Significant concentrations of lead were found in all the waterbird feathers.

Lake Wallace

Seven of the nine feathers collected from Lake Wallace contained detectable concentrations of lead, mercury, and selenium.

Seven feathers had detectable lead. One almost six times the adverse health impact threshold.

Three of the nine feathers contained detectible selenium. All three were above adverse health impact thresholds

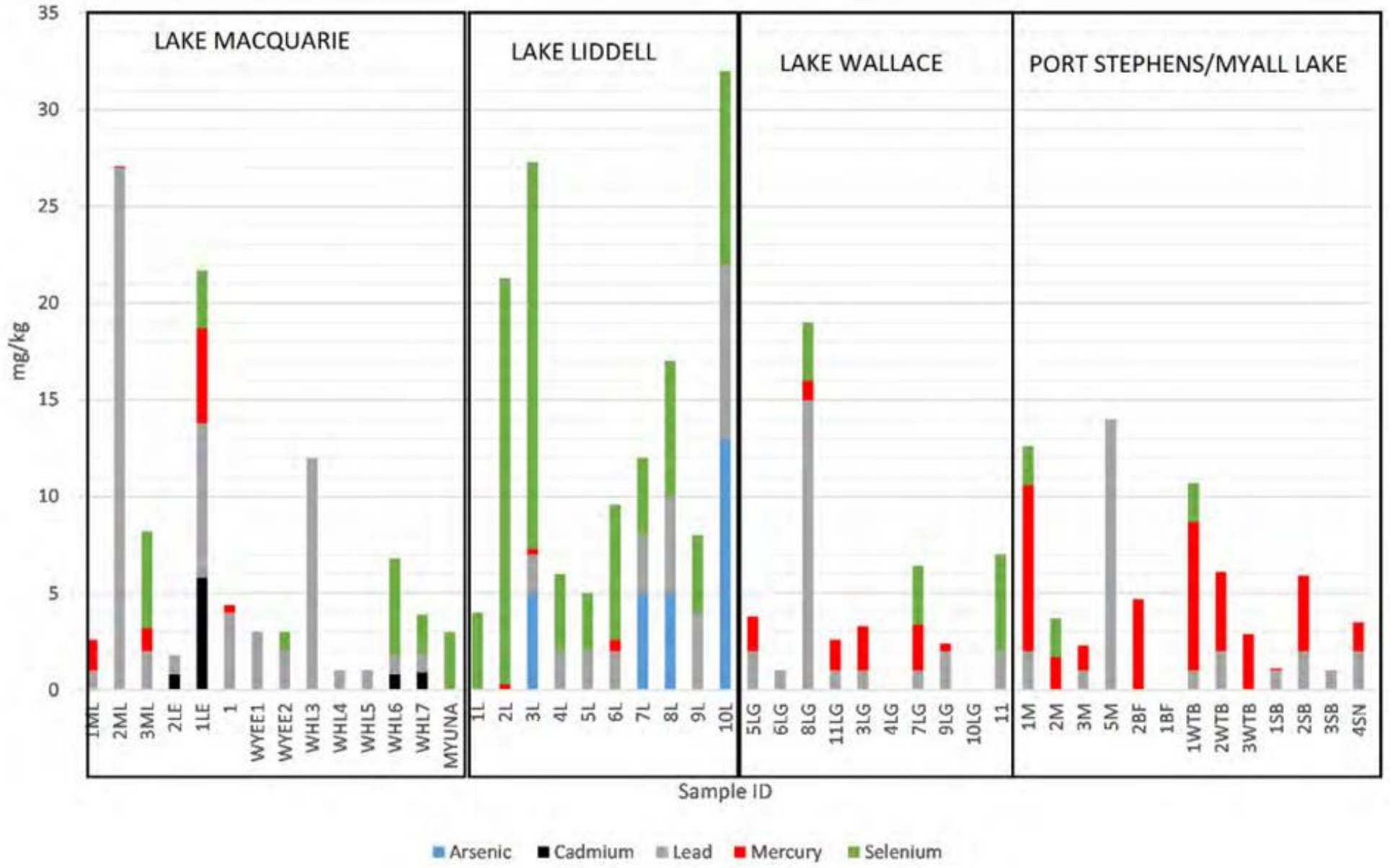
Lake Liddell

Selenium was found in all the feathers collected from Lake Liddell. Many in excess of estimated health impact thresholds.

Arsenic was found in 4/10 feathers from Lake Liddell. Feather from the other sites had no detectable arsenic.

Highest concentrations of arsenic, lead, and selenium was taken from an adult Black Swan carcass.

Cumulative metals – all sites



Annual metal leaching from NSW ash

Zinc	5t
Copper	3t
Selenium	3t
Chromium	2t
Arsenic	1.6t
Nickel	681kg
Nickel	681kg
Cadmium	193kg
Lead	80kg
Mercury	40kg

Metal (mg/k - ppm)		NSW coal-fired power stations						Estimated annual leachate (kg)
		1	2	3	12	13	Mean ppm	
Arsenic	As	12	4	6.6	12	43	16	1,634
Boron	B	25	56	89	75	80	65	44,428
Barium	Ba	393	420	653	393	510	474	29,668
Berillium	Be	22	15	4	9	6	11	1,473
Cadmium	Cd	0.4	0.9	0.25	0.44	0.35	0	193
Cobalt	Co	11	10	6	11	38	15	220
Chromium	Cr	50	40	18	45	72	45	2,017
Copper	Cu	52	50	28	47	151	66	2,940
Gernanium	Ge	40	18	5	10	10	17	2,998
Mercuy	Hg	0.02	0.03	0.15	0.12	0.22	0	39
Lithium	Li	180	28	48	58	106	84	12,540
Manganese	Mn	88	200	899	321	413	384	7,939
Molybdenum	Mo	8	5	5	6	10	7	10,802
Nickel	Ni	41	30	11	24	70	35	681
Lead	Pb	59	60	48	68	48	57	78
Antimony	Sb	2.9	2.3	3.1	3.9	2.9	3	760
Selenium	Se	5.2	4.7	2.5	3.5	3.7	4	3,068
Tin	Sn	10	12	6	10	11	10	13
Vanadium	V	128	120	49	109	172	116	10,896
Tungsten	W	5	7	6	6	3	5	1,805
Zinc	Zn	108	86	67	124	142	105	5,210
Zirconium	Zr	600	440	250	400	450	428	14
TOTALS								139,416

Critical Minerals in NSW ashes

Alumina	2.2Mt	$21b
Germanium	3,650t	$13b
Lithium	18,500t	$1.2b
Nickel	7,740t	$285m
Zircon	94,000t	$235m
Cobalt	3,340t	$197m
Copper	14,500t	$180m

Metal (mg/k - ppm)		NSW coal-fired power stations						Price per	Resources (tonnes) in 220Mt fly ash	Resource value AUD
		1	2	3	12	13	Mean ppm	USD/Ton		
High Purity Alumina							**20%**	**6,500**	**2,200,000**	**21b**
Arsenic	**As**	12	**4**	6.6	12	**43**	16			-
Boron	**B**	25	56	89	75	80	65	750	14,300	16m
Barium	**Ba**	393	420	653	393	510	474		104,236	-
Berillium	**Be**	22	15	4	9	6	11	3,500	2,464	13m
Cadmium	**Cd**	0.4	**0.9**	0.25	0.44	**0.35**	0	650	103	98,378
Cobalt	**Co**	11	10	6	11	38	15	40,000	**3,344**	**197m**
Chromium	**Cr**	50	40	**18**	45	**72**	45	9,000	9,900	131m
Copper	**Cu**	**52**	**50**	**28**	**47**	**151**	**66**	**8,500**	**14,432**	**180m**
Gernanium	**Ge**	40	18	5	10	10	17	**2,370,000**	**3,652**	**13b**
Mercuy	**Hg**	**0.02**	0.03	0.15	0.12	**0.22**	0		24	-
Lithium	**Li**	180	28	48	58	106	84	**45,000**	**18,480**	**1.2b**
Manganese	**Mn**	88	200	899	321	413	384	1,000	84,524	124m
Molybdenum	**Mo**	8	5	5	6	10	7	26,000	1,496	57m
Nickel	**Ni**	**41**	**30**	**11**	**24**	**70**	**35**	**25,000**	**7,744**	**286m**
Lead	**Pb**	59	60	48	68	48	57	2,300	12,452	42m
Antimony	**Sb**	2.9	2.3	3.1	3.9	2.9	3	12,000	664	12m
Selenium	**Se**	**5.2**	4.7	**2.5**	3.5	3.7	4	650	862	824,023
Tin	Sn	10	12	6	10	11	10	40,000	2,156	127m
Vanadium	**V**	128	120	49	109	172	116	650	25,432	24m
Tungsten	**W**	5	7	6	6	3	5	6,000	1,188	11m
Zinc	**Zn**	108	86	**67**	124	**142**	105	3,200	23,188	110m
Zirconium	**Zr**	**600**	**440**	**250**	**400**	**450**	**428**	**1,700**	**94,160**	**235m**
TOTALS									**AU$36b**	

Thank you

Hunter Community Environment Centre