



Environment Protection Authority

# An investigation into metals in soil around the Newcrest gold mine in Cadia



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In July 2023 the NSW Environment Protection Authority investigated the concentrations of metals in soil in the area surrounding the Newcrest gold mine in Cadia NSW. This report summarises the sampling results.

# Background

The community surrounding the Newcrest gold mine site in Cadia NSW (Cadia Valley Operations) has expressed concern that contaminated dust may be leaving the mine site and contaminating the surrounding land and domestic water tanks.

The NSW Environment Protection Authority (EPA) understands that in March 2023, with the assistance of Dr Ian Wright (University of Western Sydney), residents of the Cadia area undertook testing of tank water in their local community. The results of this testing were provided to the EPA and the NSW Department of Planning and Environment (DPE): they showed that the concentrations of some metals in sampled tank waters exceeded the health-related guideline values in the Australian Drinking Water Guidelines (ADWG) at multiple locations.<sup>1</sup> In May 2023 members of the local community conducted blood tests. In some cases these showed elevated levels of metals such as lead, nickel and selenium.<sup>2</sup>

In response, the EPA is monitoring soil, air and tank water in the community close the mine. The aim of these studies is to better understand the potential impact of the mine on environmental and human health and to guide any potential measures to manage exposure.

This report summarises the results of soil testing for metals in the Cadia area. The aims of this study were to:

- determine if surface soil has been affected by the deposition of dust containing heavy metals
- characterise the metal content below the surface soil layer, at a depth of up to 0.5 m (to provide a comparison with the surface soils)
- determine if management measures are needed to protect human health from exposure to potentially contaminated soils.

## Approach taken

Soil samples were collected at 30 sites located near public roads and parks in the Cadia Valley area, including one site on the mine allotment. The sites were randomly selected within a 15 km radius of the mine.

The soil sampling involved removing grass cover from a small area and taking a sample of surface soil. Where possible, a hole was then dug at the site and a second sample was collected at 50 cm depth. Care was taken to ensure sampling shovels, trowels, and other equipment were cleaned appropriately between sampling events to prevent cross contamination, and sample duplicates were collected at approximately every tenth site.

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<sup>1</sup> Wahlquist, C. (2023), "Community-led rainwater testing near Orange finds one in three tanks have unsafe lead levels", *The Guardian*, 13 March. <https://www.theguardian.com/australia-news/2023/mar/13/community-led-rainwater-testing-near-orange-finds-one-in-three-tanks-have-unsafe-lead-levels> (accessed 8 August 2023)

<sup>2</sup> Woodburn, J & Hambrett M (2023), "EPA to probe Cadia gold mine after heavy metals found in residents' blood, rainwater", 22 May. <https://www.abc.net.au/news/2023-05-22/epa-probe-cadia-gold-mine-heavy-metal-contamination-claims/102374344> (accessed 8 August 2023)

The samples were analysed at a National Association of Testing Authorities (NATA) accredited laboratory for metals of interest for the area, including lead, cadmium, nickel, selenium, copper, arsenic and zinc.

Metals of concern for the sampling program were selected with respect to:

- the metals identified by community testing as being present through their sampling programs
- the nature of Cadia Valley Operations
- potential local sources of metals (e.g. lead roof flashing).



Figure 1 The EPA sampling surface soil in Cadia Valley. Photo: Cameron Jennings/EPA

## Test results

The EPA collected 43 soil samples for laboratory testing, from 30 sites in the Cadia Valley area.

- **Attachment 1** shows the locations and results of the soil testing.
- **Attachment 2** provides the laboratory results for each sample.

## What do the results mean?

The EPA has compared the results of the soil sampling program to the national guidelines for contaminants in soil, known as the National Environment Protection (Assessment of Site Contamination) Measure 1999. These guidelines define health investigation levels (HILs) for soil contaminants for common land uses. The relevant HILs applied for soil sampling in Cadia were HIL-C (developed open space or recreational areas). The EPA has also compared the results to

the most stringent guideline value, HIL-A (low-density residential land with accessible gardens) as residential land is in the vicinity. The EPA notes that an exceedance of the HILs levels does not necessarily mean there is a risk to human health but that further investigation would be warranted. A range of factors must be considered in determining the actual risk to human health from soil contamination, including the ways in which people are exposed to the contamination and how often exposure may occur.

The EPA also compared the results to the level of metals in soil from before the mine started operating (as reported in the *Cadia Gold Mine Environmental Impact Assessment 1995*), and to lead contamination levels for a known contaminated area in NSW at Broken Hill.

Key observations from the results are:

1. There were no exceedances of HIL-A or HIL-C for soil samples collected as part of this program, either from the surface or at depth (Table 1).
2. Soil metal concentrations did not vary significantly for surface samples or at depth.
3. Soil metal concentrations did not vary significantly in relation to the distance from the mine.
4. Soil metal concentrations were similar to levels reported in the area before the Cadia gold mine began operating.<sup>3</sup>
5. Soil lead concentrations for Cadia are orders of magnitude lower than those reported for residential properties affected by the lead mine in Broken Hill.

**Table 1 Comparison of EPA soil sampling results with Health Investigation Level A (residential soils) and Health Investigation Level C (public land)**

The average lead in soil level and the maximum lead in soil level for residential properties in Broken Hill (2004 to 2015) is provided for comparison.<sup>4</sup>

	Lead, Pb (mg/kg)	Cadmium, Cd (mg/kg)	Nickel, Ni (mg/kg)	Selenium, Se (mg/kg)	Copper, Cu (mg/kg)	Arsenic, As (mg/kg)	Zinc, Zn (mg/kg)
HIL-C	600	100	800	700	20,000	300	30,000
HIL-A	300	20	400	200	7,000	100	8,000
Cadia – surface (range)	6 to 21	<0.4	3 to 38	<2	11 to 1,000	<4 to 32	13 to 73
Cadia – depth (range)	5 to 17	<0.4	3 to 23	<2	5 to 120	<4 to 5	7 to 35
Broken Hill (average)	875	-	-	-	-	-	-
Broken Hill (max)	3,712	-	-	-	-	-	-

<sup>3</sup> ACG Woodward-Clyde Pty Limited (1995) *Cadia Gold Mine Environmental Impact Statement*. [https://s3-ap-southeast-2.amazonaws.com/eis-pdf-records/EIS%201343%20Vol%201\\_AB020025.pdf](https://s3-ap-southeast-2.amazonaws.com/eis-pdf-records/EIS%201343%20Vol%201_AB020025.pdf)

<sup>4</sup> NSW Health data on lead in soil at 184 residential properties in Broken Hill (2004 to 2015)

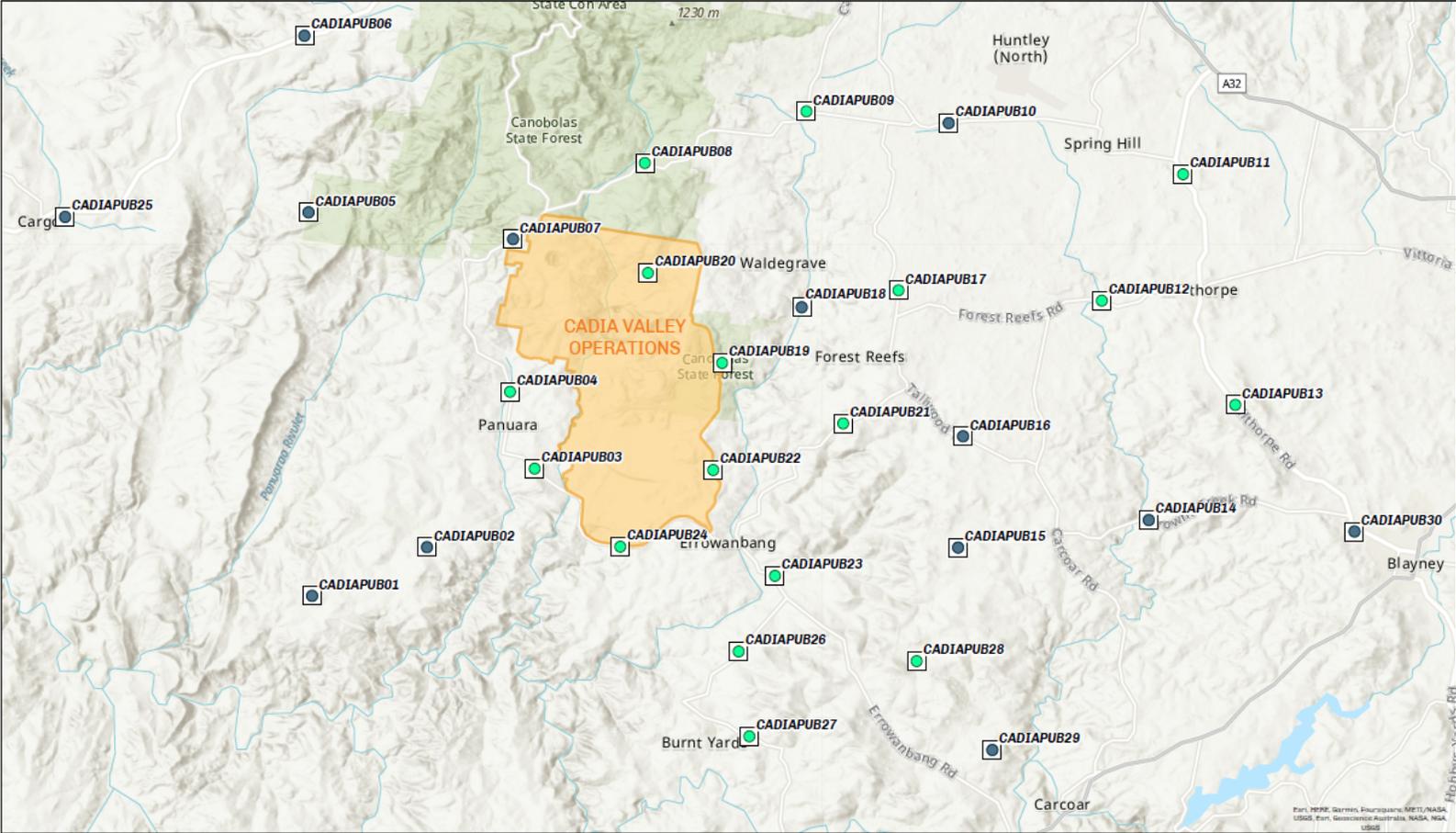
# Conclusion

Elevated levels of the metals of concern were not observed in surface soils or at 50 cm depth in the area surrounding the Newcrest gold mine in Cadia. None of the samples had metal concentrations that exceeded even the most conservative guideline concentrations (HIL-A). Furthermore, all metal concentrations were at a similar level observed prior to operation of the Cadia gold mine. This provides an important line of evidence to suggest that dust deposition from the mine has not increased metal concentrations in soil in the area.

No further soil sampling is proposed.

The EPA will continue to monitor the environmental performance of the mine against its obligations under *Protection of the Environment Operations Act 1997* and other relevant legislation and policies, and to minimise its impact on the community.

# Attachment 1: Map of testing locations



- Surface sample only
- Surface and depth sample
- No exceedance
- Exceedance to Health Investigation Level A – Residential Land
- Exceedance to Health Investigation Level C – Public Open Space
- Cadia Valley Operations

**Metals in surface soils and at depth  
in the area surrounding the  
Cadia Gold Mine**

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Produced by EPA Spatial Insights and Design Team

# Attachment 2: Summary of laboratory results

Note: Sample IDs ending “-S” are surface samples and those ending “-D50” or “-D40” were collected at a depth of 50 cm or 40 cm respectively

Sample ID	Date Sampled	Time	Site ID	Lead, Pb (mg/kg)	Cadmium, Cd (mg/kg)	Nickel, Ni (mg/kg)	Selenium, Se (mg/kg)	Copper, Cu (mg/kg)	Arsenic, As (mg/kg)	Zinc, Zn (mg/kg)
<b>Health Investigation Level C for soil contaminants</b>				<b>600</b>	<b>100</b>	<b>800</b>	<b>700</b>	<b>20,000</b>	<b>300</b>	<b>30,000</b>
<b>Health Investigation Level A for soil contaminants</b>				<b>300</b>	<b>20</b>	<b>400</b>	<b>200</b>	<b>7,000</b>	<b>100</b>	<b>8,000</b>
CADIAPUB01-S	12/07/2023	11:10	Site 1	14	<0.4	15	<2	74	9	33
CADIAPUB01-D50	12/07/2023	11:15	Site 1	13	<0.4	15	<2	120	5	35
CADIAPUB02-S	12/07/2023	11:25	Site 2	11	<0.4	15	<2	18	<4	18
CADIAPUB02-D50	12/07/2023	11:25	Site 2	10	<0.4	10	<2	8	<4	7
CADIAPUB03-S	12/07/2023	11:45	Site 3	11	<0.4	13	<2	71	<4	48
CADIAPUB04-S	12/07/2023	11:52	Site 4	8	<0.4	13	<2	58	32	44
CADIAPUB05-S	12/07/2023	13:55	Site 5	10	<0.4	12	<2	59	26	39
CADIAPUB05-D40	12/07/2023	14:00	Site 5	17	<0.4	9	<2	8	4	26
CADIAPUB06-S	12/07/2023	13:55	Site 6	12	<0.4	8	<2	25	<4	34
CADIAPUB06-D50	12/07/2023	14:00	Site 6	11	<0.4	8	<2	13	<4	32
CADIAPUB07-S	12/07/2023	14:55	Site 7	7	<0.4	3	<2	12	<4	13
CADIAPUB07-D50	12/07/2023	14:55	Site 7	5	<0.4	3	<2	5	<4	11
CADIAPUB08-S	12/07/2023	14:55	Site 8	12	<0.4	38	<2	26	<4	69
CADIAPUB09-S	12/07/2023	15:25	Site 9	6	<0.4	7	<2	1,000	6	73
CADIAPUB10-S	12/07/2023	15:15	Site 10	11	<0.4	9	<2	11	<4	35
CADIAPUB10-D50	12/07/2023	15:20	Site 10	9	<0.4	9	<2	12	<4	24
CADIAPUB11-S	12/07/2023	09:45	Site 11	14	<0.4	32	<2	32	<4	41

Sample ID	Date Sampled	Time	Site ID	Lead, Pb (mg/kg)	Cadmium, Cd (mg/kg)	Nickel, Ni (mg/kg)	Selenium, Se (mg/kg)	Copper, Cu (mg/kg)	Arsenic, As (mg/kg)	Zinc, Zn (mg/kg)
<b>Health Investigation Level C for soil contaminants</b>				<b>600</b>	<b>100</b>	<b>800</b>	<b>700</b>	<b>20,000</b>	<b>300</b>	<b>30,000</b>
<b>Health Investigation Level A for soil contaminants</b>				<b>300</b>	<b>20</b>	<b>400</b>	<b>200</b>	<b>7,000</b>	<b>100</b>	<b>8,000</b>
CADIAPUB12-S	12/07/2023	10:20	Site 12	7	<0.4	29	<2	24	4	41
CADIAPUB13-S	12/07/2023	16:00	Site 13	21	<0.4	23	<2	16	<4	32
CADIAPUB14-S	13/07/2023	10:00	Site 14	15	<0.4	31	<2	37	6	36
CADIAPUB14-D50	13/07/2023	10:05	Site 14	12	<0.4	23	<2	22	<4	14
CADIAPUB15-S	13/07/2023	10:45	Site 15	11	<0.4	18	<2	28	5	31
CADIAPUB15-D50	13/07/2023	10:55	Site 15	13	<0.4	3	<2	7	<4	9
CADIAPUB16-S	13/07/2023	11:00	Site 16	7	<0.4	6	<2	29	5	32
CADIAPUB16-D50	13/07/2023	11:10	Site 16	12	<0.4	7	<2	15	<4	19
CADIAPUB17-S	13/07/2023	11:30	Site 17	13	<0.4	7	<2	16	<4	24
CADIAPUB18-S	13/07/2023	11:30	Site 18	12	<0.4	8	<2	17	<4	29
CADIAPUB18-D50	13/07/2023	11:30	Site 18	9	<0.4	9	<2	16	<4	27
CADIAPUB19-S	13/07/2023	12:10	Site 19	15	<0.4	12	<2	34	<4	21
CADIAPUB20-S	13/07/2023	12:00	Site 20	8	<0.4	36	<2	50	<4	55
CADIAPUB21-S	13/07/2023	11:50	Site 21	19	<0.4	4	<2	18	<4	28
CADIAPUB22-S	13/07/2023	12:20	Site 22	7	<0.4	5	<2	18	6	30
CADIAPUB23-S	13/07/2023	13:56	Site 23	18	<0.4	6	<2	23	6	22
CADIAPUB24-S	13/07/2023	12:30	Site 24	14	<0.4	17	<2	28	<4	25
CADIAPUB25-S	13/07/2023	15:55	Site 25	12	<0.4	5	<2	25	<4	30
CADIAPUB25-D50	13/07/2023	16:00	Site 25	9	<0.4	9	<2	67	<4	30
CADIAPUB26-S	13/07/2023	15:15	Site 26	9	<0.4	13	<2	32	6	38

Sample ID	Date Sampled	Time	Site ID	Lead, Pb (mg/kg)	Cadmium, Cd (mg/kg)	Nickel, Ni (mg/kg)	Selenium, Se (mg/kg)	Copper, Cu (mg/kg)	Arsenic, As (mg/kg)	Zinc, Zn (mg/kg)
<b>Health Investigation Level C for soil contaminants</b>				<b>600</b>	<b>100</b>	<b>800</b>	<b>700</b>	<b>20,000</b>	<b>300</b>	<b>30,000</b>
<b>Health Investigation Level A for soil contaminants</b>				<b>300</b>	<b>20</b>	<b>400</b>	<b>200</b>	<b>7,000</b>	<b>100</b>	<b>8,000</b>
CADIAPUB27-S	13/07/2023	14:30	Site 27	13	<0.4	10	<2	37	6	47
CADIAPUB28-S	13/07/2023	14:25	Site 28	14	<0.4	5	<2	22	<4	20
CADIAPUB29-S	13/07/2023	14:45	Site 29	10	<0.4	4	<2	14	<4	17
CADIAPUB29-D50	13/07/2023	14:50	Site 29	14	<0.4	7	<2	16	<4	14
CADIAPUB30-S	13/07/2023	10:25	Site 30	9	<0.4	12	<2	19	<4	25
CADIAPUB30-D50	13/07/2023	10:30	Site 30	11	<0.4	12	<2	18	<4	25