

Mercury Management in the Philippines

Outline

- Legal and Regulatory Framework
- Mercury using UNEP Tool Kit
- Monitoring Coal-Fired Power Plants

Legal and Regulatory Framework

RA 6969
Toxic Substances
and Hazardous
and Nuclear
Wastes Control
Act of 1990

**Joint DENR-DOH
AO 2005-02**
Management of
Health Care
Wastes

DENR AO 2013-22
Revised Procedures
and Standards for
HW Management

**DENR AO
1992-29**
IRR of RA 6969

DENR AO 1997-38
CCO for Mercury and
Mercury Compounds

**JAO DENR-DOE
2013-09-001**
Lamp Waste
Management



Legal and Regulatory Framework

**DENR AO
1990-34 & 35**
WQG and Effluent
Standards

RA 9003
Ecological Solid
Waste Management
Act of 2000

RA 9275
Philippine Clean
Water Act of 2004

RA 8749
Philippine Clean
Air Act of 1999

**DENR AO
2001-34**
IRR of RA 9003

**DENR AO
2005-10**
IRR of RA 9275

DAO 1997-38:

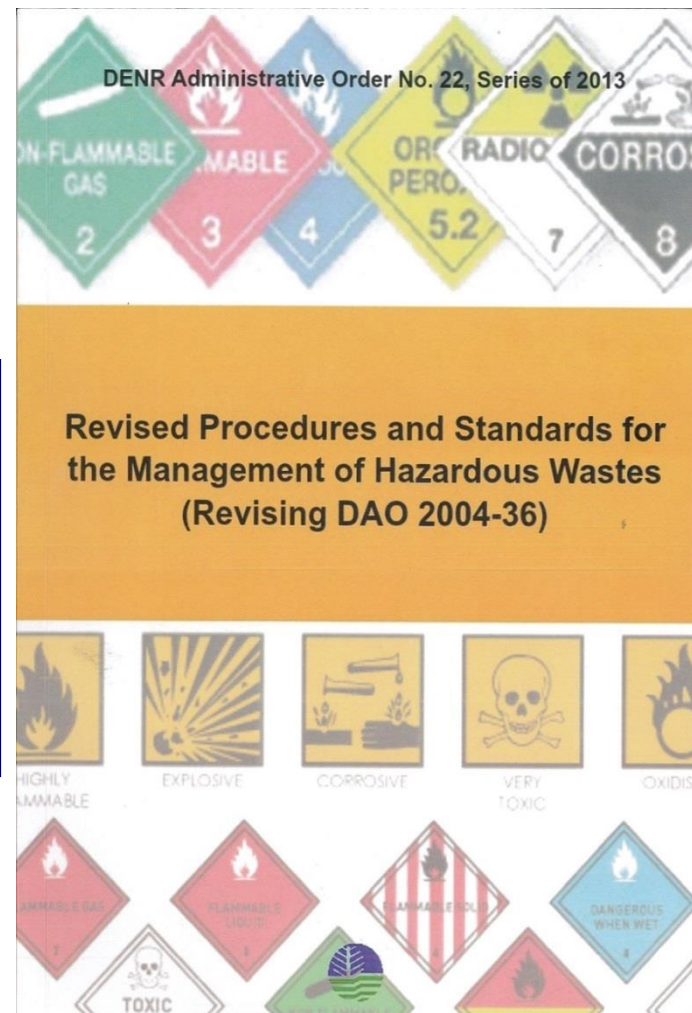
CCO for Mercury and Mercury Compounds

Section 7, the use of mercury and mercury compounds is strictly limited to the following end-users:

- **Chlor-alkali plants**
- **Mining and metallurgical industries**
- **Electrical apparatus (lamps, arc rectifiers, battery cells, and others)**
- **Industrial and control instruments**
- **Pharmaceutical**
- **Paint manufacturing**
- **Pulp and paper manufacturing**
- **Dental amalgam**
- **Industrial catalyst**
- **Pesticides (fungicide) production or formulation**

Title III: Hazardous Waste Management

DAO 2013-22: REVISED PROCEDURES AND STANDARDS FOR THE MANAGEMENT OF HAZARDOUS WASTES (Revising DAO 2004-36)



Classification of Hazardous Wastes

CLASS	WASTE NUMBER
A. Wastes with cyanide	A101
B. Acid wastes	B201 to B299
C. Alkali wastes	C101 to C399
D. Wastes with Inorganic Chemicals	D401 to D499
E. Reactive Chemical Wastes	E501 to E599
F. Inks/Dyes/Pigments/Paint/Resins/Latex/ Adhesives/Organic Sludge	F601 to F699
G. Waste Organic Solvents	G703 to G704
H. Organic Wastes	H802
I. Oil	I101-I104
J. Containers	J201
K. Stabilized Waste	K301 to K303
L. Organic Chemicals	L401 to L404
M. Miscellaneous Wastes	M501 to M507

Classification of Hazardous Wastes

CLASS	DESCRIPTION	WASTE NUMBER
Mercury and mercury compounds	Includes all wastes with a total Hg concentration > 0.1 mg/L based on analysis of an extract. These also includes organomercury compounds. Refer to CCO	D407
Waste electrical and electronic equipment (WEEE)	Include all waste electrical and electronic equipment that contain hazardous components such as lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) that includes its peripherals i.e., ink cartridges, toners, etc.	M506

GENERATORS



TRANSPORTERS



DISPOSAL FACILITY



TREATERS

Hazardous Waste Management

Department of Health Directive

DOH Administrative Order No. 2008-0021: Gradual Phase-Out of Mercury in all Philippine Healthcare Facilities and Institutions

- Thermometers (December 2009)
- Sphygmomanometers (December 2010)
- Guidelines for setting up a proper temporary mercury storage area
- Specific storage requirements and standards

Joint Directive of the Department of Environment and Natural Resources and the Department of Energy

Joint DENR-DOE Administrative Order (JAO 2013-09-0001): Lighting Industry Waste Management Guidelines

- The JAO aims to regulate the end-of-life disposal of lighting products to control the release of mercury and other toxic substances into the environment
- The implementation of the Extended Producer Responsibility (EPR) for lighting products and the operationalization of a Lamp Waste Management Facility (LWMF) is part of the Philippine Energy Efficiency Project (PEEP) of the DOE

Executive Order No. 79, s. 2012

Institutionalizing and Implementing Reforms in the Philippine Mining Sector Providing Policies and Guidelines to Ensure Environmental Protection and Responsible Mining in the Utilization of Mineral Resources

- Section 2: Full enforcement of environmental standards in mining
- Section 11: Measures to Improve Small-Scale Mining Activities

The use of mercury in small-scale mining shall be strictly prohibited.

Improve the health and environment and artisanal gold mining communities in the Philippines by reducing mercury emissions



- A formalized ASGM entity to facilitate the reduction of mercury is established.
- Comprehensive health education, techniques, and technology training programs to reduce mercury in ASGM are developed, including mercury surveillance program at the community level to prevent exposure among high risk populations.
- Two replicable pilot projects are implemented with local and national stakeholders. Overall mercury use, emissions, and exposure are reduced at pilot sites.
- Capacity for regional and sub-regional collaboration and coordination to manage and monitor mercury are increased.

High Risk Practices in ASGM - Philippines



Courtesy of the "Improve the health and environment and artisanal gold mining communities in the Philippines by reducing mercury emissions" Project
(c/o Ms. Elvira Pausing, Project Coordinator)

Mercury Assessment for the Philippines Using the UNEP Mercury Toolkit



Top three (3) principal sub-categories releasing mercury in the Philippines are:

- ❖ Primary Virgin Metal production – 65,927 kg Hg/year (32% of total releases) – ASGM;
- ❖ Extraction and Use of Fuel and Energy Resources – 31,940 kg Hg/year (20% of total releases)
- ❖ Other intentional use – products, e.g. thermometer, etc. – 29,471 kg Hg/year (20% of total releases)

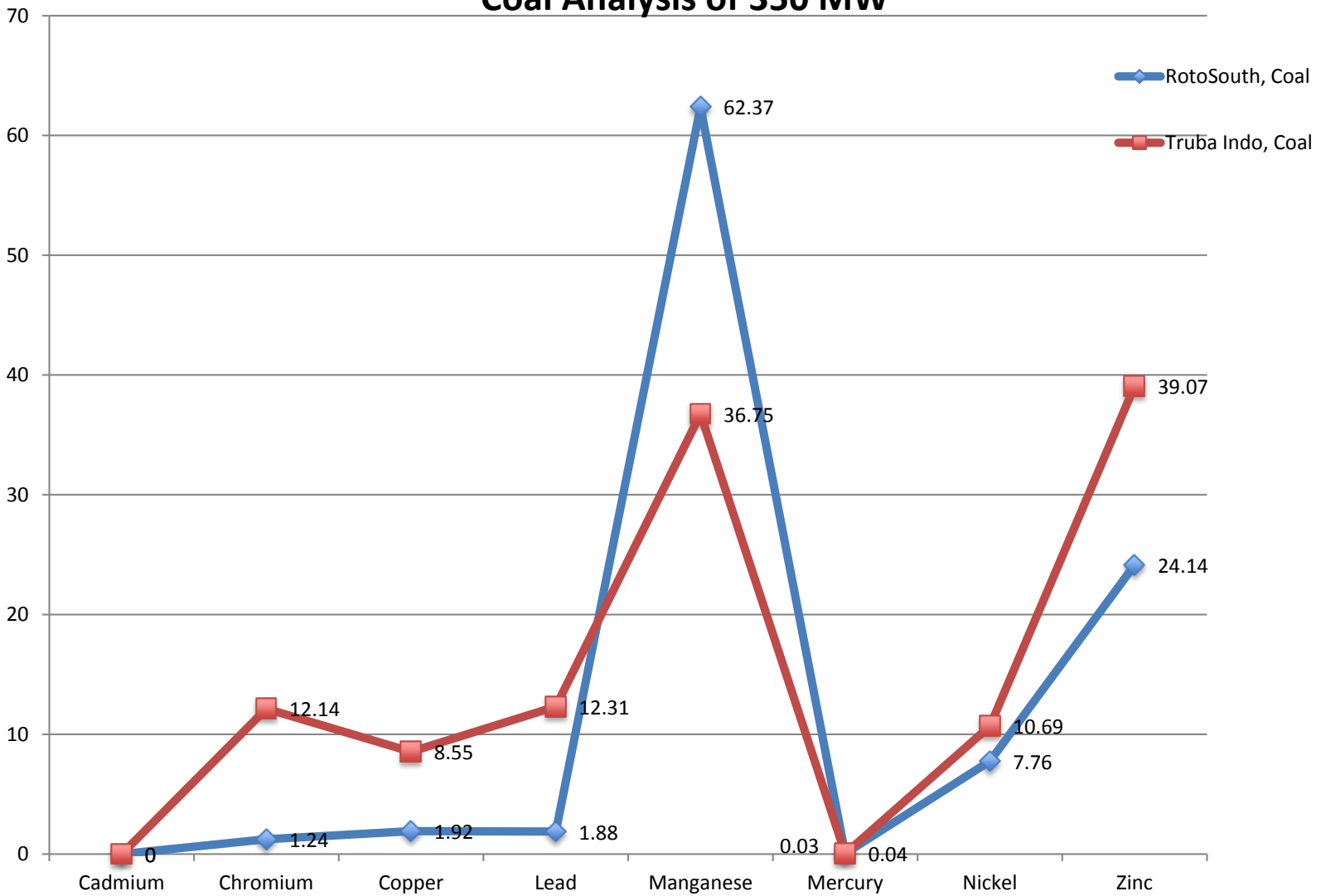
Over-all mercury emissions are distributed mainly to:

- ❖ air (45%); land (19%); water (18%); and the rest to general waste and others.

Monitoring Coal-Fired Power Plants

mg/kg

Coal Analysis of 350 MW



350 MW

UNIT -2 STACK TEST RESULTS FOR METALS (2015-2016)

Standard:

As= 10 mg/Ncm

Cd= 10 mg/Ncm

Cu= 100 mg/Ncm

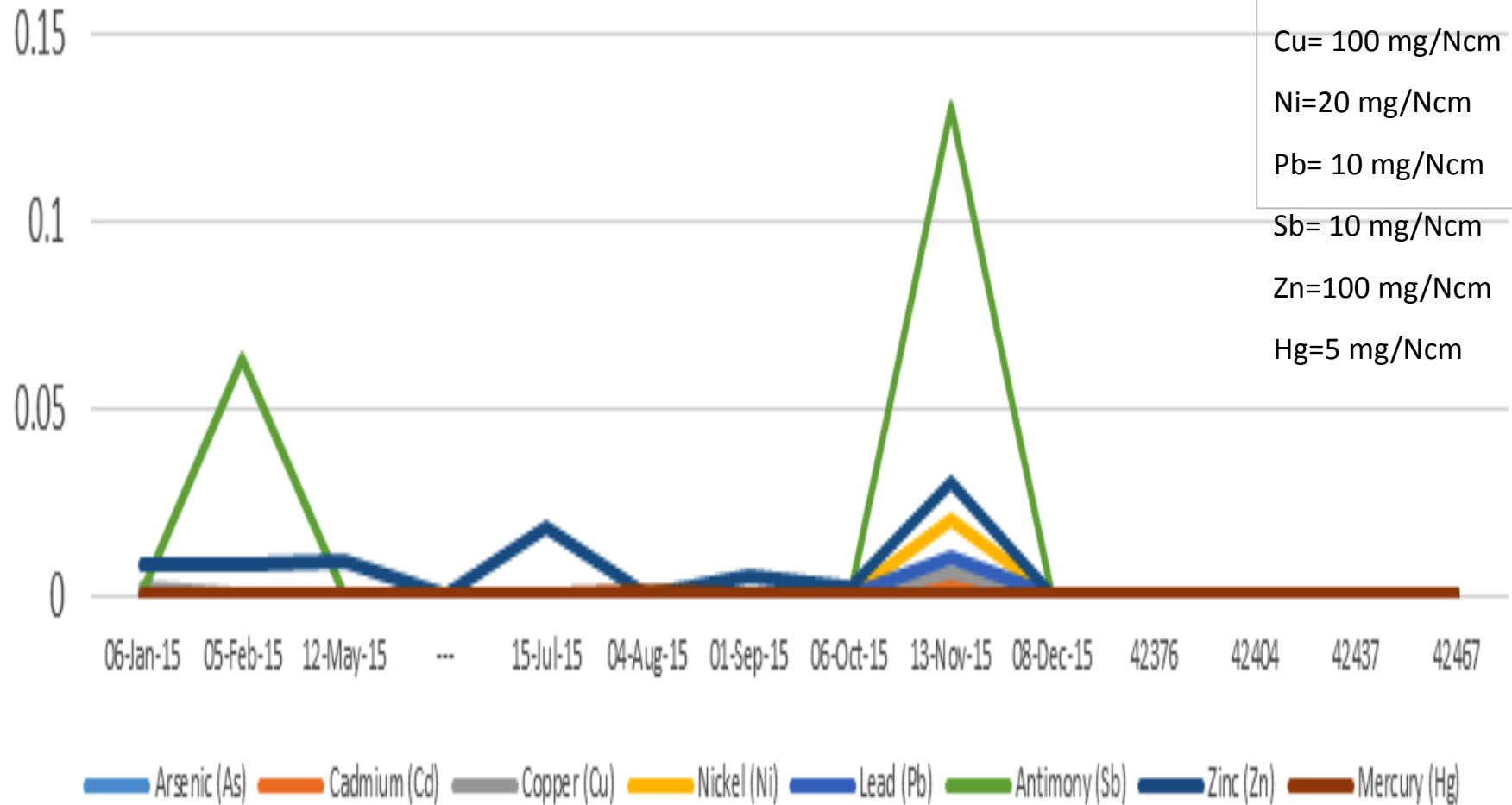
Ni=20 mg/Ncm

Pb= 10 mg/Ncm

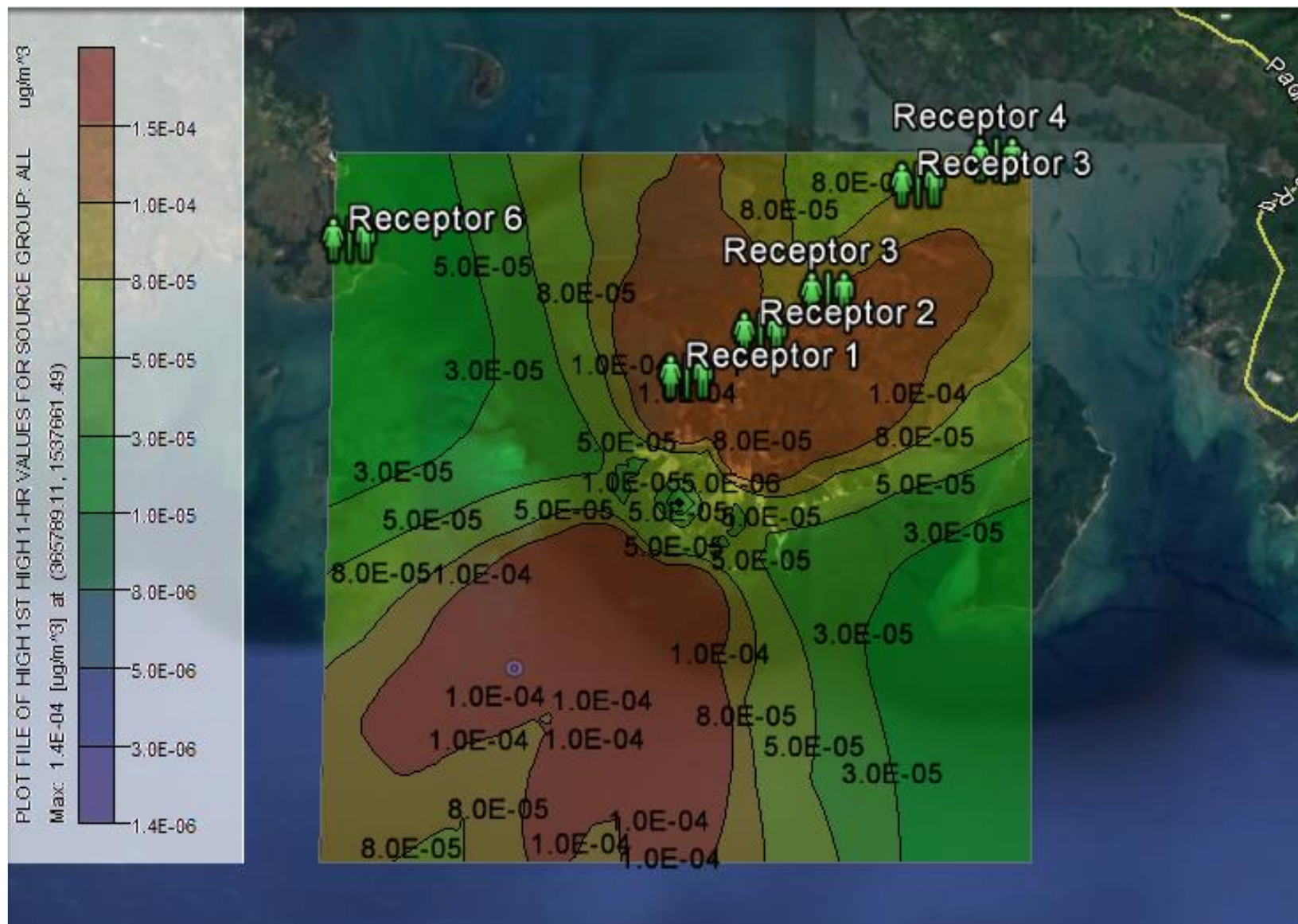
Sb= 10 mg/Ncm

Zn=100 mg/Ncm

Hg=5 mg/Ncm



350 MW



Maximum ground level concentration Hg – 1 hr.

Table No. 2.19 Ground Water conducted by EMB

Vicinity of 350 MW

Parameters	Deepwell	Deepwell Ibaba	Class A Criteria
Cadmium	<0.004	<0.004	0.003
Chromium	<0.012	<0.012	0.01
Copper	0.017	0.021	0.02
Lead	<0.020	<0.020	0.01
Mercury	0.000079	0.000071	0.001
Nickel	0.007	0.011	0.02
Zinc	0.373	0.062	2

Table No. 2.20 of Marine Water Quality conducted by EMB

Parameters	Outfall	100m from mixing zone	Class SC Criteria
Cadmium	0.005	0.006	0.005
Chromium	<0.012	<0.012	0.05
Copper	0.013	0.016	0.02
Lead	<0.020	<0.020	0.05
Mercury	0.000412	0.000265	0.002
Nickel	<0.006	<0.006	0.06
Zinc	0.056	0.056	0.8

470 MW COAL-FIRED POWER

	Jan 6-8, 2015	April 28, 2015	July 23-24, 2015	October 5-6, 2015	Jan 6, 2016	April 12, 2016	AVE	
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr		Standard
SO2	347.0	503.0	251.0	652.0	556.0	516.0	470.8	1500
NO2	247.0	114.0	120.0	337.0	365.0	437.0	270.0	1500
CO	4.0	5.0	32.0	46.0	27.0	148.0	43.7	500
PM	37.0	18.0	23.0	42.0	30.0	27.0	29.5	150
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	AVE	Standard
Hg	0.00696	0.00050	0.00086	0.00002	0.00080	0.00139	0.00175	5
Sb	0.00119	0.00003	0.00034	0.00004	0.00003	0.00003	0.00028	10
As	0.00213	0.00049	0.00202	0.00662	0.00206	0.00118	0.00242	10
Cd	0.00010	0.00118	0.00021	0.00023	0.00020	0.00280	0.00079	10
Cr	0.00255	0.00039	0.00035	0.00012	0.00010	0.00042	0.00066	None
Cu	0.00020	0.01238	0.01002	0.00405	0.00259	0.00033	0.00493	100
Pb	0.00100	0.01149	0.00174	0.00192	0.00169	0.02528	0.00719	10
Mg	0.04270	0.04360	0.03111	0.07552	0.07483	0.03207	0.04997	None
Ni	0.00230	0.01293	0.03170	3.40438	0.00297	0.02090	0.57920	20
Vn	0.00306	0.03117	0.03475	0.03844	0.03375	0.03327	0.02907	None
Zn	0.02440	0.06797	0.04173	0.03932	0.02659	0.00350	0.03392	100
P	0.000918	0.03403	0.00995	0.01101	0.31814	0.00953	0.06393	200

Source Emission Monitoring (2014-2015)

Boiler Exhaust Test Results for Metals

Total Mercury (Hg)

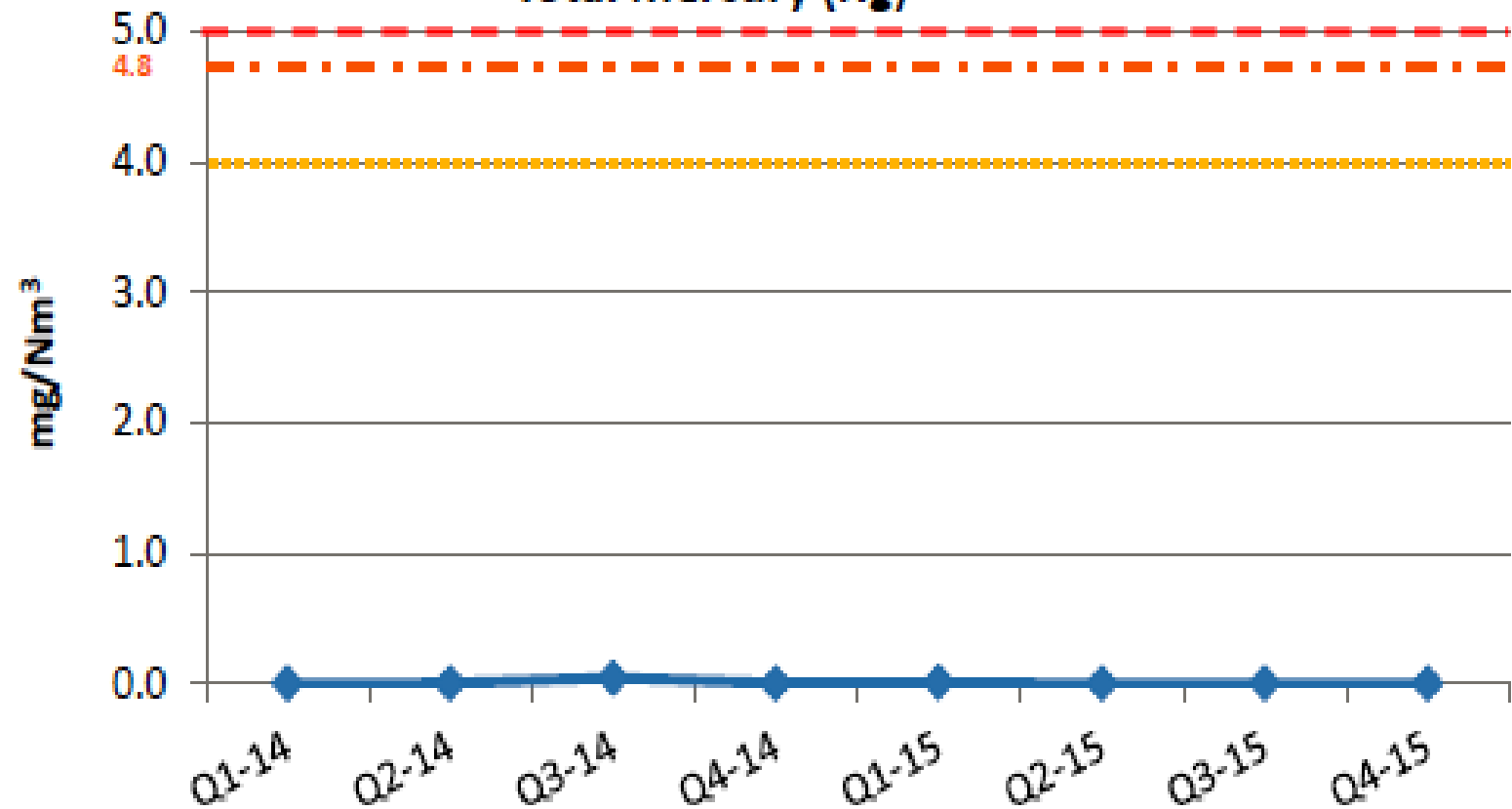


Table no. 2.17-A Results of Spot Ground Water Quality Monitoring

Ground Water Conducted by EMB

Parameters	Station	Resettlement Area	South	Elementary School	Class A Criteria
Cadmium	0.006	<0.004	<0.004	<0.004	0.003
Chromium	0.016	0.012	0.017	<0.012	0.01
Copper	0.015	0.02	0.007	0.022	0.02
Lead	<0.020	<0.020	<0.020	<0.020	0.01
Mercury	0.000063	0.000113	0.000069	0.000117	0.001
Nickel	<0.006	<0.006	<0.007	<0.006	0.02
Zinc	0.06	<0.056	0.08	0.134	2

Marine Water (Intake and Outfall)

Parameters	Intake	Outfall	outside mixing zone	Class SC Criteria
Cadmium	0.005	<0.004	<0.004	0.005
Chromium	0.013	0.013	<0.012	0.05
Copper	0.01	0.028	0.014	0.02
Lead	<0.020	<0.020	0.028	0.05
Mercury	0.000258	0.000305	0.000269	0.002
Nickel	0.017	<0.006	0.015	0.06
Zinc	<0.056	<0.056	<0.056	0.8

SURFACE WATER (Downstream)

Parameters	Downstream	Water Criteria
Cadmium	<0.004	0.005
Chromium	0.017	0.01
Copper	0.007	0.02
Lead	<0.020	0.005
Mercury	0.000069	0.002
Nickel	0.007	0.2
Zinc	0.08	2