The Result of Water Analysis surrounding the Nickel Mining Sites and the Nickel Processing Plants in Rio Tuba, Palawan in October 2018

(Dates of Water Sampling: October 14, 2018)

Sampling Location No	1	2	3	4	5
Date of Sampling	2018/10/14	2018/10/14	2018/10/14	2018/10/14	2018/10/14
Time of Sampling	8:58:07	13:43:22	14:00:31	14:06:08	15:53:54
Location of Sampling	Togpon River (East side of junction)	The upper end of estuarine basin where the Togpon River flows into	The middle of estuarine basin where the Togpon River flows into	The middle of estuarine basin where the Togpon River flows into	Togpon River (East side of junction)
Latitude and Longitude	N8 33.165 E117 24.813	N8 32.291 E117 24.779	N8 32.099 E117 24.674	N8 31.909 E117 24.621	N8 33.165 E117 24.813
Result of on the spot examination by simple detector tube for hexavalent chromium (mg/L)	0.05	Trace	ND	ND	0.075
pH	6.7	7.4	6.7	6.7	6.5

			colorlessness
sea water	well water, ground water	river water	ponding

processing plants	CBNC office in the site	the first tailing dam	the entrance of quarry of limestone
N8 33.500 E117 25.250	N8 33.463 E117 25.510	N8 34.000 E117 25.333	N8 35.770 E117 27.928

ug/L	1	2	3	4	5	(avareage consistency in sea water)	Japanese Environm ental Standards (Cr=Cr6+) mg/L	Japanese Water Supply Act ((Cr=Cr6+) mg/L	Control Target under the Japanese Water Supply Act mg/L	WHO Guidelines for drinkingwater quality (chromium=Total chromium) mg/L	
Cr	48.9	22.5	10.7	6.1	60.3	0.212	0.05	0.05			Cr
Ni	16.1	55.0	57.7	48.9	17.3	0.48			0.01		Ni
Zn	1.6	16.0	6.4	1.2	1.0	0.350		1			Zn
B	11.1	970	2150	2880	11.2	4500	1	1			B
Mn	32.7	121	130	84.5	39.4	0.020		0.05	0.01	0.4	Mn
Cu	0.7	0.9	1.1	1.1	0.6	0.150		1			Cu
As	0.13	0.79	1.81	2.49	0.13	1.2	0.01	0.01		0.01	As
Se	0.33	1.82	2.88	2.79	0.49	0.155	0.01	0.01		0.01	Se
Cd	0.23	0.25	0.26	0.32	0.24	0.07	0.01	0.003			Cd
Pb	0.29	0.38	0.41	1.19	0.28	0.0027	0.01	0.01			Pb
Hg	0.01	0.00	0.00	0.00	0.01	0.00014	0.0005	0.0005			Hg
Fe	28.6	244	288	391	31.6	0.030		0.3			Fe
Co	0.5	1.7	2.0	1.9	0.6	0.0012					Co
U	0.07	0.63	1.29	1.68	0.07	3.2			0.002		U
Na	11300	2390000	5820000	8130000	12100						
Ca	23900	167000	347000	454000	25600						

<Comments> (by Mr. Junichi Ohnuma, Former Lecturer of Kinjo-gakuin University / Former Lecturer of Chubu University / Former Principal Investigator of Environmental Investigation Center in Aichi Prefecture)

1) Despite the rainy season, there was a small amount of rainfall this time. Therefore, there were not many samples exceeding the standard. However, they are higher than the tests in the dry season. Samples from Togpon river on both days were higher than the standard.
This proved that most of the amount of total chromium detected by ICP-MS is hexavalent chromium, which has been proved by the fact of no detection this time.

2) As we stated in the previous analysis, some countermeasures the companies have been taking, such as covering the stockpiles with canvas sheet and deepening the siltation ponds, are not sufficient or not effective. The companies must take drastic measures immediately. As we proposed in a meeting with Sumitomo Metal Mining Co. (SMM) this year, it is expected that they will take a measure to reduce hexavalent chromium to trivalent chromium on the spot. We have already assumed in the previous analysis that "hexavalent chromium is liquated mainly by rainfall in the mining and the processing plant areas, is flowing out, and is transferring into the Togpon River, which is flowing into the Rio Tuba bay at last." This hypothesis on the whole mechanism of water contamination has been proved every time when we conduct the examination of the water quality in this area.

3) SMM must immediately take drastic anti-pollution measures, taking the joint responsibility with Rio Tuba Nickel Mining Co. (RNTMC), who is under its supply chain of raw material procurement for the Coral Nickel Bay Processing Project. In addition, SMM needs to conduct the joint site investigation with the NGOs, which the NGOs have been proposing a long time so that drastic anti-pollution measures can be developed.

4) Further, SMM must take measures to rehabilitate the mangrove ecosystem in the Rio Tuba bay, which has been heavily destroyed due to the serious contamination, but not only taking measures to improve the water quality in the Togpon River.
5) Boron (B) here is a seawater-derived component.

6) Nickel (Ni) is greatly over the Control Target under the Japanese Water Supply Act in every water sampling locations. Iron and Manganese are also detected at the same level of amounts in the rainy season, which shows the different tendency from Hexavalent Chromium. We have already pointed out in the previous analysis that there is the other liquate mechanism, which is different from the one for hexavalent chromium. The source of Nickel (as well as Iron and Manganese) in the Togpon River might be in the processing plant but not in the mining area. It is necessary for SMM to conduct the joint investigation with the NGOs, which the NGOs have been proposing a long time so that we can find out the real source of water contamination.

7) We showed the results of the examination on Sodium (Na) and Calcium (Ca), too, this time, in order to indicate the dilution rate in the water of Togpon River by seawater. The Na^+ s concentration in the seawater is around 12,000 mg/L (12,000,000 μ g/L).