Responses to Recommendations January 2014 Update

Strategic Environmental Issues	Recommendations (Summary)	PTFI Response	PTFI Responsible Group	Timing
Tailings Management	TM1 Actual drills should be carried out by the TIAP team in order to address simulated failure conditions.	An emergency drill based on the revised Tailings Incident Action Plan was held on the west levee in Q3 2011.	TRMP	Complete
	TM2 The results of the analysis on the identification of the concentration trend in the direction of flow based on the east-west transect data for a longitudinal cross-section of the ModADA should be presented, together with its interpretation.	The data is presented in RKL RPL report in various graphs with each graph presenting the sediment characteristic testing result for Sulfur content, pH NAG, ANC, MPA, NAPP and ANC/MPA . These plots present the sediment quality analysis for the entire ModADA area data (north, east, south, and west) as requested.	TRMP	Complete
	TM3 Further study is recommended to develop a methodology to optimize tailings retention in ModADA on land	Study B completed as required by KepMen 431:2008 evaluated tailings retention efforts. This study and other tailings retention	TRMP	Included in Ongoing Operating Plans

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	and simultaneously reducing impacted areas and promote reclamation in the ModADA. Low production periods following Grasberg open-pit mine closure should be used to review and implement new ideas and strategies for tailings retention.	options continue to be followed up as a part of the TRMP annual work plans. Additional equipment and dedicated technical personnel have been assigned to this work. Updated LIDAR information is being used as basis for designing the work plan.		
	TM4 LIDAR survey data should remain a priority for the TRMP priority to ensure a more accurate estimate of the freeboard level.	LIDAR data is becoming routinely used in TRMP operations. Bi annual LIDAR surveys are planned. The 2012 data is complete.	TRMP	Complete
	TM5 Positive efforts to create a vegetation buffer along the length of the levees using *Phragmites sp*. to direct the tailings stream away from the levee structure should be continued.	Keeping flow away from the levee is standard practice to reduce erosion. Methods used include planting of vegetation by local contractors. In the period 2011-2013, 360 hectares of vegetation were planted to reduce erosion.	TRMP	Included in Ongoing Operating Plans
	TM6 The issue of ModADA	Additional data is required to	Hydrology	Complete

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	groundwater potentially impacting Timika needs further review. The current 2D model analysis needs to be confirmed with data collected through the installation of additional piezometers, as required by EMP # 4-2011. Local-scale groundwater flow and transport models, focusing on Timika and regional groundwater flow upstream should be further developed, The current 2D model should be developed into a 3D.	confirm the assumptions used in the groundwater model including surface water or hydraulic low points. Seven additional piezometers on the eastern part of the Kwamki Lakes have been installed to provide the required data. The wells have been included in the routine environmental monitoring program. An internally developed 3D model has been completed.		
	TM7 A groundwater monitoring system in Timika should be developed in cooperation with the Timika administration in order to better understand the hydraulic conditions of local groundwater flow and groundwater quality (both shallow and deep).	Existing groundwater wells in the Timika area have been added to the routine environmental monitoring program	Hydrology	Complete

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	TM8 PTFI needs to anticipate new developments in environmental management concepts and new instruments emerging with issuance of Law No. 32/2009,	Legal and environmental staff will monitor for implementing regulations based on this law.	Environmental and Legal	Included in Ongoing Operating Plans
Overburden Management	OM1 The current practice of mixing fine material or sediment with overburden material (at a ratio of 1:5) should be carefully reviewed, as it could weaken the entire overburden material in the stockpile.	Standards for placement of sediment from the drainage boxes into overburden is covered in Chapter 09 of the Grasberg Surface Mine Planning Standards Manual. These standards were determined by the geotechnical engineer to maintain stability of the slope. The standard has been reviewed and will now include a step to mix the sediments cleaned from the traps with crushed rock before placement into the waste rock stockpiles.	Geotechnical Services	Complete
	OM2 Monitoring system for the geotechnical stability of overburden stockpiles should be evaluated to minimize slippages	Detailed criteria to manage short and long term stability have been developed using historical data and experience. These criteria include	Geotechnical Services	Included in Ongoing Operating Plans

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	(such as the March incident at the Lower Wanangon stockpile) and to ensure long-term stability, particularly in the post-mining period.	allowable crest advance rate, desireable ratios between coarse and fine material allowed in the stockpile, and stockpile maintenance requirements. Extensometers and GPS are utilized in monitoring stockpile stability along with a daily inspection of each crest by the geotechnical engineer. Additional radar monitoring is planned. SOP E09-40 specifies that final faces of the Wanagon overburden stockpile will be re-sloped to overall 2H:1V with final drainage structures in place before re-vegetation activities commence.		
	OM3 It is suggested to continue studying the subsidence footprint from Grasberg Block Cave and the potential impacts it could bring, with risk assessments conducted on various simulated scenarios.	A more detailed analysis of the risks from this crack line will be performed. A thorough review was completed in 2012. This risk analysis will need to be updated regularly in the future.	Geotechnical Services	Included in Ongoing Operating Plans

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	OM4 Impacts on groundwater east of Bali Dumps need to be reviewed, particularly on Meren Lakes towards the boundary of the COW area; this will require the installation of monitoring wells.	Three additional wells have been installed for this purpose and the wells have been added to the routine environmental monitoring program.	Hydrology	Complete
	OM5 Key strategies for ARD control and treatment require constant evaluation as mining progresses to ensure long-term (post-mining) management and control of ARD in the stockpiles.	Current strategies of segregation and blending of overburden types and collection and treatment of leachates is proving to be effective. Lower Wanagon overburden stockpile is designed to have no potential for ARD formation by blending of overburden types and addition of limestone when needed. The Wanagon Drainage Drift (WDD) under construction is part of a contingency plan to collect and treat ARD if necessary.	Grasberg Engineering	Included in Ongoing Operating Plans
	OM6 The Wanagon Drainage Drift (WDD) should be completed, as the drainage	Progress toward completing the WDD is tracked and reported monthly. Drift has advanced as	Underground	Mid-2013. One water pipeline first

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	system will serve to control stockpile pore water pressure to ensure stability.	necessary for dewatering efforts. Five piezometers and thirty five dewatering holes have been completed. Collected water volumes up to 8000 gpm have been achieved.		quarter 2014.
	OM7 The base of the stockpile at the furthest end of Lower Wanagon and its drainage system should consider a limestone structure that can control potential long-term ARD generation (after the end of open pit mining activities).	Lower Wanagon has been designed and is being constructed to have no potential for ARD formation. Should additional protection be needed, a limestone structure at the base will be evaluated along with other possible alternatives.	Grasberg Engineering	Included in Ongoing Operating Plans
	OM8 Final slope configuration of overburden stockpiles should consider revegetation requirements.	Final slope adjustments are constrained by topography. Field development of methods to successfully re-vegetate on these slopes continues.	Environmental	Included in Ongoing Operating Plans
Biodiversity	B1 A Bioregional approach to biodiversity management should be considered, based on various	FCX has formed corporate teams to cover sustainable development issues. The biodiversity team is	Environmental	Included in Ongoing Operating

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	information collected by PTFI and the participation of other parties including experts.	assisting all sites (including PTFI) to prepare a biodiversity inventory and a land management plan. Related biodiversity action plans (BAPs) have been formulated. The reclamation activities take a bioregional approach into account by using native/local species at Grasberg and local species (lowland tropical rain forest plant species collected from the KK forest) after pioneer plant species planted in tailings in Double Levee area. Wildlife returned to natural habitats are returned to suitable sites in the region. Pemanent biodiversity monitoring locations represent all ecosystems on site.		Plans
	B2 Comparison of biodiversity data with reference points in unimpacted areas should be expanded to include terrestrial natural succession areas.	Directly comparable ecosystem reference plots may not exist for former tailings areas as the soils, drainage, and elevations are not similar. However, we continue to document natural succession and	Environmental	Included in Ongoing Operating Plans

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		development of a healthy ecosystem in those areas and compare to reference sites such as Kuala Kencana forest and Sago forest. Off site unimpacted areas are not owned or controlled by PTFI.		
	B3 Biodiversity management in the estuary area downstream from the compliance points should be improved, considering the bioregional approach. The bioregional management approach requires the integration of all regions, both impacted and natural.	Biodiversity monitoring in the estuary includes extensive comparisons to unaffected areas as part of a bioregional approach.	Environmental	Included in Ongoing Operating Plans
	B4 The restoration of Wanagon River once overburden placement in the Lower Wanagon OBS ceases should be used as a pilot test for restoration of the ecological integrity of comparable river systems in the	This will be built into the routine monitoring program after the Wanagon Stockpilies are closed (after 2016)	Environmental	Included in Ongoing Operating Plans

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	COW area (after end of mine).			
	B5 The application of phytoremediation techniques for sediment mitigation (for example, using pioneer *Phragmites* as a "natural filter") should be further researched to be applied as part of the ecological engineering approach for wetlands management in the ModADA.	Additional research will be conducted as part of the ecological engineering approach for wetlands management in the ModADA. Plan to utilize university students to initiate trials in 2013 and follow trial results in future years. Program has started. First set of samples collected in August 2013 and analyses completed.	Environmental	Complete
	B6 Further investigation is needed on the use of local and exotic earthworm species for soil fertilization, especially to avoid cross breeding until the taxonomies of the two species are clear and the potential impacts of genetic pollution and dominance by the exotic species if brought to the planting location have been identified and evaluated.	We will initiate a field study on this issue. In the meantime we will add monitoring of earthworm species to our meso fauna monitoring program.	Environmental	In progress. Schedule to be determined.

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	B7 It should be confirmed that the introduction of certain species for cultivation purposes would not result in them becoming expansive and retaining alien characteristics.	We will review the list of plants that have been used in Reclamation program in the Tailing Deposition area to make this evaluation.	Environmental	Complete
	B8 Further research is recommended to define the best OBS slope for revegetation success; limestone reject use should be continued.	Final slope adjustments are constrained by topography. Field development of methods to successfully re-vegetate on these slopes continues.	Environmental	Included in Ongoing Operating Plans
	B9 SOPs should be further developed for the entire reclamation procedure including plant preparation, preparation of soil medium, transplant and monitoring.	Work on developing this comprehensive SOP continues. Third party consultants have been engaged to assist in the development. The Grasberg portions have been revised. The lowland SOP's have been prepared and approved. Most details of the specific tasks are contained in Work Instructions under the PTFI EMS.	Environmental	Complete

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	B10 Biodiversity monitoring data compatibility should be achieved on spatial dimensions and time data and parameters such as species abundance similar to interpretation of aquatic biota data	The Annual Biodiversity Report will include this type of information. The 2012 report has incorporated additional time series data.	Environmental	Complete.
	B11 Use more precise bathymetric measurement equipment to increase the quality of data for the estuary beyond the compliance points model to predict the change in bed of estuary due to sedimentation.	Over ten years of time sequence bathymetric data on three transects in the Ajkwa Estuary is available as well as sedimentation rates in the mangrove forests in the area. Earlier modeling (1997) of the effects of sedimentation in the estuary was completed by two consultants. Additional sophisticated modeling is in progress. PTFI is planning to buy an instrument to enhance its in-house bathymetry capabilities.	Environmental	Complete
	B12 Land subsidence areas resulted from the implementation of block caving underground	Our Five Year Reclamation Plan(2009-2013) does not cover subsidence areas as no activity is	Environmental	Complete

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	mining method are considered disturbed areas; PTFI should develop a revegetation strategy for these areas.	required during the period covered. The Mine Closure Plan does cover restricting access to subsidence areas post mining due to safety concerns. Natural succession revegetation is expected to occur and will be monitored post-mining.		
	B13 PTFI should include specific biodiversity data in the plan for Grasberg open pit closure in 2016 as well as mine closure in 2041.	Biodiversity monitoring is included in the closure plans for comparison to undisturbed areas.	Environmental	Complete
	B14 Records of the natural succession process in permanent plots, especially on former tailings retention areas, need further comparison with ecosystem reference plots.	Directly comparable ecosystem reference plots may not exist for former tailings areas as the soils, drainage, and elevations are not similar. However, we continue to document natural succession and development of a healthy ecosystem in those areas and compare similarity indices to reference sites such as Kuala Kencana forest and Sago forest.	Environmental	Complete

Strategic Environmental Issues	Recommendations (Summary)	PTFI Response	PTFI Responsible Group	Timing
		Research has also been conducted on bird species similarity.		
	B15 An integrative approach should be employed in the collection of data and interpretation of biodiversity monitoring results.	This approach is used in preparation of the annual biodiversity monitoring plans.	Environmental	Included in Ongoing Operating Plans
	B16 PTFI should accumulate and integrate the available data and experience into a management model for forest areas that could be included in national and global schemes (CDM, REDD+, etc.)/	PTFI supports the research related to REDD+ and other conservation program in the PTFI COW area, and will work with FCX Biodiversity Task Force (BTF) to develop sustainable biodiversity program to protect the forest. PTFI supported CIFOR research on site in 2011 and a currently proposed USAID REDD+ project.	Environmental	Included in Ongoing Operating Plans
Waste Management	WM1 PTFI has begun to manage non-hazardous waste following the 3R concept;. this approach needs to be further developed,	PTFI has established procedures regarding segregation of waste and has begun to implement the segregation. The PTFI program	Environmental	Included in Ongoing Operating Plans

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	starting with improved waste segregation	emphasizes segregation at the point of originator (not at the landfill itself) and Environmental Dept continues to socialize the procedures to the area owners (originators).		
	WM2 Article 45 of Law No. 18/2008 stipulates that facilities for segregation of hazardous (B3) waste from non-hazardous waste, and recyclable waste (cans, paper, plastics, etc.) from non-recyclable waste should be provided within a period of one year following enforcement of the law. In some areas these facilities are not yet available and should be provided.	This is a continual improvement area for PTFI and specific action plans are covered in the annual Environmental Programs for year 2012	Environmental	Included in Ongoing Operating Plans
	WM3 An SOP for direct routine monitoring and evaluation of existing STP units is required to monitor system performance on a regular basis, both for process units (organic loading, MLVSS, DO, sludge age, etc.) and	Improvements in the operation of STP are presently being implemented. These include establishing equipment and training for STP operators to make more routine measeurments of STP performance parameters in the	Facilities Management	Complete

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	operating units (hydraulic loading, weir loading, etc.).	field. Additional training and development in STP operation has been conducted and the procedures have been incorporated into SOP's and Work Instructions.		
	WM4 In addition to routine sampling and monitoring of influents and effluents in STPs and LTPs, process unit and operating unit performance should be monitored, and changes in loading (both hydraulic and organic) should be anticipated.	Procedures have been incorporated into SOP's and Work Instructions.	Facilities Management	Complete
	WM5 A clear SOP should be developed to guide the modification of aeration at the STPs, based on clear understanding of the process unit mechanism.	Additional training and development in STP operation has been conducted, including use of dissolved oxygen data, and the procedures have been incorporated into SOP's and Work Instructions.	Facilities Management	Complete
	WM6 Written improvement programs should be developed to reduce oil content in workshop activities, in order to meet	SOP 09-19, Petroleum Product Management in Shops and Power Plants, covers this practice site-wide. Some shops have shop-	Environmental	Complete

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	management commitments towards sustainable development.	specific procedures in place. This best practice will continue to be socialized to other site shops.		
	WM7 Waste such as used batteries, ink cartridges, spray cans and e-waste, together with discarded electrical equipment (such as ACs and refrigerators) are categorized as hazardous waste and should be managed as such.	This is a continual improvement area for PTFI and specific action plans are covered in the annual Environmental Programs for year 2012. SOP's for e-waste, ink cartridges, and aerosol cans are in progress.	Environmental/ Facilities Management	Included in Ongoing Operating Plans
	WM8 Monitoring of groundwater from areas around the inert waste landfills at Grasberg, MP72 and MP38 should be implemented.	Monitoring wells have been installed for MP38 inert landfill and wells are already available for monitoring Grasberg. The contract to install wells at the MP72 landfill is in progress. Expect to install the wells in 1st QTR 2014.	Environmental	March 2014
	WM9 Leachate formation in the wet landfill located at MP38 should be minimized by controlling the amount of	The Leachate Treatment Plant is already running considerably under design flow rates. Further reductions would not be practical	Facilities Management	Complete

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	external water entering the landfill area, restricting non-active landfill areas or ensuring proper drainage of water runoff.	or desirable for system operation. However, surface drainage has been improved to manage the water runoff.		
	WM10 Methane emissions in the wet landfill should be minimized, through biogas capture, flaring, or utilization.	We do quarterly tests for Methane gas as per US EPA standard. There are no GOI standards regarding methane gas at landfill. According to the tests, the methane released from the lined landfill is at a very low concentration. Due to the small size of the landfill, capture is not likely to be an environmental improvement. The landfill cell number three is designed to include a gas capture system and is under construction.	Environmental	Complete
	WM 11 Permit from the Governor Nr. 47/ 2010 (effluents standard for oil and grease < 50 mg/L) refers to the effluents standards under Decree Nr. 51/1995. There may be an inconsistency between the	This has been discussed with GoI and resolved during the permit renewal process.	Environmental	Complete

Strategic Environmental Issues	Recommendations (Summary)	PTFI Response	PTFI Responsible Group	Timing
	oil and grease standards of the two documents			
Water Quality and Quantity	W1 Water Footprints or records concerning water resources and their use should be developed for the entire PTFI area, in anticipation of a new law on water resources.	FCX has established corporate sustainable development teams. The Water Management and Conservation Team is assisting active sites (including PTFI) in implementing water management plans in a time frame guided by the sustainable development risk register process. This requires improved water metering, water balance modeling, and prioritization of water management projects. At PTFI, metering is generally in place and individual operations have developed water balances.	Site wide	Complete
	W2 Regarding water consumption, rationalization (conservation) of drinking water use should be encouraged. Certain areas will require measurement, and leaks in the	The PTFI water system supplies restaurants, mess halls, barracks, and many other public facilities in addition to family housing. There are programs for water conservation at PTFI such as automatic water faucets, automatic	Site wide	Included in Ongoing Operating Plans

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	piping system should be monitored.	showers, water monitoring at barracks, etc. Water conservation is an ongoing improvement issue. A study of water consumption at Ridge Camp was completed in 2012 and a comprehensive highland drinking water study was conducted in 2013.		
	W3 Integrated management of water runoff (storm water management) in the mine and mill area should be further improved in order to reduce sediment runoff at these locations.The increase in TSS values detected at station #57 indicates that more frequent and continual monitoring of this parameter is required, as well as control of slope stability of overburden stockpiles.	Sediment traps at the mine are maintained and monitored regularly to reduce this contribution to the sediment loading. Lower Wanagon stockpile will be resloped to reduce erosion at pit closure. Monitoring at station #57 is conducted daily.	Grasberg Operations	Included in Ongoing Operating Plans
	W4 Water meter data in Kuala Kencana should be more	Additional metering has been added such that approximately	Facilities Management	Complete

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	widespread, as it provides more accuracy in monitoring water usage and, at the same time, facilitates the determination of the location of leaks in the water grid that do not show up in the surface.	90% of water useage in the KK system is measured and recorded monthly.		
	W5 PTFI should remap its existing drinking water distribution grid and sewerage system grid in order to include the latest upgrades and modifications. .	Our internal standards call for all field modifications of the piping systems to be updated on as-builts by the engineering department. This is an ongoing process.	Facilities Management	Included in Ongoing Operating Plans
Air Quality	AQ1 PTFI should take action to improve air emissions measurements in order to ensure compliance with emission quality standards during the interval between measurements, as requested by the applicable regulations (Decree by the Minister of Environment Nr. 13/1995).	The additional process monitoring discussed in the response below will help to ensure continual compliance with emissions standards.	Operations	Complete

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	AQ2 Opacity at Mahaka Lime Plant should be monitored.	This is now being estimated based on particulate results.	Environmental	Complete
	AQ3 Process stability should be increased by defining strict specifications for operating parameters in the appropriate SOPs and formalized as a standard (for example, dryers in the Dewatering Plant and kilns in Mahaka Lime Plant). The auditors recommend statistical analysis of operating data to support process control decisions. In this way, PTFI can implement preventive measures that will also be in accordance with the EMS scheme.	SOP will be reviewed and modified as appropriate to include the requirement of action by operator when temperature and pressure range are out of permitted value. For Mahaka lime plant, the SOP's are in place and complete. The DWP has a computer instrument display system that includes alarms for out of range process variables. Additional DWP scrubber studies are in progress to upgrade the scrubbers and controls and operator log sheets are being reviewed and revised. Three consultant groups have visited the site to evaluate the scrubbers and their proposals are pending.	Operations	Scrubber Studies-4th Qtr 2013 Scrubber Upgrades-2014
	AQ4 Air emissions from	Underground ambient air	Operations/	Complete

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	underground mobile sources are monitored and should be improved by including monitoring of gas concentrations in ambient air in underground areas, as well as ventilation system capabilities. Emissions from outdoor mobile sources also need to be reduced by establishing measurable targets.	concentrations are monitored to evaluate ventilation system performance. Haul trucks in the mine operation use current state of the art emission control equipment. Mobile equipment emissions are tracked and reported in GRI and Carbon Disclosure Project reports. Emissions from mobile equipment will increase until pit closure	Environmental	
	AQ5 The use of large quantities of equipment in support of PTFI operations means large-scale consumption of natural resources in the form of fuel and oil. Reduction of this consumption would reflect PTFI's commitment towards conservation of natural resources.	PTFI measures and reports on energy consumption and GHG for the Indonesian Government, GRI Reporting and the Carbon Disclosure Project. There has been a recent energy audit and effective projects are scheduled for implementation. Energy requirements on site will increase with underground operation due to ventilation and other equipment requirements. Longer term, PTFI is working with the provincial government to evaluate and develop a large hydropower project in the region. Biodiesel is	Environmental	Included in Ongoing Operating Plans

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		produced from used cooking oil and consumed on site. An expansion of the production capacity is in progress.		
	AQ6 PTFI should continue improving the MOE permit for used oil utilization at DWP in accordance with the operating temperature range.	This will be addressed in the next permit renewal cycle.	Environmental	2015
	AQ7 Air emissions should be established as a key aspect, and as such, an emissions reduction program needs to be developed and included in the EMP.	Air emissions are included in the definition of environment in the EMS manual and in COP-1. In SOP E01-01, section 7.1 on "Guidelines for Identifying Environmental Aspects" includes air emissions from stationary sources, from mobile sources, and fugitive emissions in the aspect list to be evaluated. See AQ5 above. There is one EMP 2012 that addresses energy efficiency and therefore greenhouse gas emissions.	Environmental	Complete

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	AQ8 Calculations should be performed to describe the correlation between emissions generated from mobile sources and ambient air concentrations in the underground mine	The Underground ventilation system is designed and operated to accomodate the emissions of equipment being used. The calculations indicated were used in the ventilation system design. Spot checks of air quality in working areas are made on a frequent and statutory basis (weekly where diesel equipment is operated – KEPMEN 555, Chapter VIII, Part 8, Article 370 (12)). These checks are used to verify and document concentrations of various gases are below the threshold levels.	Underground	Complete
	AQ9 Threshold levels used as criteria to monitor air emissions from mobile sources need to be set down in tabular form.	The FRESH Standard (1.15.10) that governs emissions testing of mobile sources (Light Vehicles and Mobile Equipment) has NO_x and CO listed as limit values (section 4.4 and 4.5) respective to the two source types.	Safety	Complete

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Other Issues (Laboratory)	Lab1 Develop acceptance criteria to interpret the calibration results	The procedure for acceptance criteria to interpret the calibration result has been created and implemented	Environmental	Complete
	Lab2 Revise calibration master list table and add columns with operating ranges.	The calibration master list table has been revised to include the operation range for each piece of equipment.	Environmental	Complete
Other Issues (Port Activity)	Port1 The port authority (or KPI) should define oil spill levels (KPI) ranging from very small to very large, which require a bigger emergency response team engaging the government, international agencies, and others.	The KPI SOP calls for all spills to be reported to the harbormaster, an agent of the government.	KPI	Complete
Other Issues (Dredging)	Port2 Dredging activities conducted by KPI at the Portsite should be included in the EMS	PTFI had not originally included dredging within the EMS as allowed by ISO 14001 protocols.	Environmental	Complete

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	process.	The register of aspect and impact has been revised to include the management of dredge material.		
Other Issues (Housekeeping)	General1 Good housekeeping should be observed in all facilities.	Housekeeping is a continual improvement item for all operations. Regular housekeeping day is instituted and Weekly Supervisory Inspection to include requirement of following up housekeeping concerns is implemented.	Site wide	Included in Ongoing Operating Plans