PT PLN (PERSERO)

ENERGY TRANSITION AND SUSTAINABILITY DIVISION

Hazardous Materials

MANAGEMENT GUIDELINE

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Key Abbreviation

AST	:	Above-ground Storage Tank
AOI	:	Area of Influence
CAS	:	Chemical Abstracts Service
CHSS	:	Community Health, Safety and Security
ERP	:	Emergency Response Plan
E&S	:	Environmental and Social
ESF	:	Environmental and Social Framework
ESMP	:	Environmental and Social Management Plan
ESMS	:	Environmental and Social Management System
ESS	:	Environmental and Social Standard
EHS	:	Environmental, Health and Safety
FMEA	:	Failure Mode and Effects Analysis
GHG	:	Greenhouse Gas
HAZOP	:	Hazard and Operability
HAZID	:	Hazard Identification
IA	:	Impact Assessment
IFC	:	International Finance Corporation
JSA	:	Job Safety Analysis
MSDS	:	Material Safety Data Sheet
MoEF	:	Ministry of Environment and Forestry
OHS	:	Occupational Health and Safety
PS	:	Performance Standard
PPE	:	Personal Protective Equipment
RPFLH	:	*Rencana Pemulihan Fungsi Lingkungan Hidup*
SOP	:	Standard Operating Procedure
SCADA	:	Supervisory Control and Data Acquisition
SSPLT	:	*Surat Status Penyelesaian Lahan Terkontaminasi*
UST	:	Underground Storage Tank
WBG	:	World Bank Group

1 Introduction

PLN is committed to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing the risks and impacts of the use of hazardous materials. This guideline has been developed to manage the risk of hazardous materials being used in a project and their impacts resulted by PLN's Projects and facilities, whether for a new project development, expansion of an ongoing project or there are changes in the operation of PLN's facilities. This guideline is developed to be consistent with the E&S principles as described in the ESMS Manual and based on international good practice including the World Bank's ESS 3, WBG Environmental Health and Safety (EHS) Guidelines, IFC Performance Standard (PS) 3 and also based on PLN's documents related to hazardous material (see **Section 13**) and other documents as listed in **Section 14** of this management guideline.

This guideline will be required for projects that involve the use of hazardous material for the Project's construction and operation activities. Hazardous materials are defined as materials that represent risk to human health, property, or the environment due to their physical or chemical characteristics. Hazardous materials can be classified as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; biomedical hazards, and corrosive substances. Hazardous materials are also classified by the applicable national rules and regulation.

The main objectives of projects that involve the use of hazardous materials should be the protection of the workforce and surrounding communities and the prevention and control of releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into day-to-day business activities. The overall objective of hazardous materials management is to avoid or minimize uncontrolled releases of hazardous materials or accidents (including explosion and fire) during the process of production (e.g., energy generation of power plant), handling, storage and use of hazardous materials.

2 Disclaimer

This guideline should not be taken as a standard, regulation, or manual and is not described to the detail level of a work instruction. If a more relevant or updated standard, regulation, or manual is available and requires for revision of this guideline, then such revision is permitted. If any revision is made; references, rationales and amended sections should be clearly defined.

To be able to serve its purpose, this guideline should be reviewed, implemented, and enforced by PLN staff with relevant authorities and competencies specified in the ESMS Manual Section 3. Any changes to this guideline may potentially trigger the need to revise the associated procedures and other guidelines that connected with this guideline. Any update, deviation, or suggestion on the implementation of this guideline will be followed up in alignment with the provision of Chapter 9 of the ESMS Manual (Management of Change).

3 Management Approach

Every project should avoid the use of hazardous materials and if avoidance is not feasible, the project will minimize and control the release and use of hazardous materials. Projects which handle, use, or store hazardous materials should establish management programs that are commensurate with the potential risks present. The potential risks of production, transportation, handling, storage, and use of hazardous materials in project activities will be assessed through the environmental and social assessment.

PLN and its contractors and sub-contractors will avoid the use of chemical, biochemical and hazardous materials subject to international bans, restrictions or phase-outs unless for an acceptable purpose as defined by the conventions or protocols or if an exemption has been obtained by PLN, consistent with Republic of Indonesia government commitments under the applicable international agreements.

Chemicals, biochemicals and hazardous materials that must be avoided are identified in relevant international conventions, such as:

- The Stockholm Convention on Persistent Organic Pollutants[1];
- The Rotterdam Convention on the Prior Informed Consent for Certain Hazardous Chemicals and Pesticides in International Trade;
- The Montreal Protocol on Substances that Deplete the Ozone Layer, including the Kigali Amendment to the Montreal Protocol,
- The Minamata Convention on Mercury; and
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

The relevant international conventions will be considered in the environmental and social assessment as they relate to the project. The requirements of these conventions, and their protocols, and agreements will be addressed, as relevant, in proposed mitigation measures.

The following approach is implemented for an effective hazardous material management:

- Establishing hazardous materials management priorities based on hazard analysis of risky operations, which are identified through Environmental and Social Assessment;
- Where practicable, avoiding or minimizing the use of hazardous materials. This may include using non-hazardous or less-hazardous substitutes;
- Preventing uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that might result in fire or explosion;
- Using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of hazard; and

[1] One of the concerned chemicals that commonly used in PLN's Projects are PCB, which listed in Annex A to the Stockholm Convention. The production and new uses of PCB are banned, and Parties to the Stockholm Convention must eliminate the use of PCB in equipment by 2025 and to ensure the environmentally sound waste management of liquids containing PCB and equipment contaminated with PCB by 2028

- Implementing management controls (procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented or controlled through engineering measures.

4 Process Overview

In order to achieve the objectives of each step of the E&S safeguard process, the development of management of hazardous materials will implement the following process:

- Identification of risks and impacts of hazardous material use;
- Assessment of the identified risks and impacts;
- Planning of mitigation measures; and
- Monitoring and review of the implementation of mitigation measures.

All the above process is conducted within the Impact Assessment (IA) process as required by the ESMS manual, which includes the screening process and categorization, scoping, a baseline study, analysing and assessing potential impact, defining mitigation measures and management and monitoring strategies. In every step of the IA process, the mitigation hierarchy will be taken into consideration.

5 Screening and Categorization

5.1 Screening of potential hazardous material impact

The screening stage is a preliminary step for initial identification of impacts related to the use of hazardous materials in a project, it is conducted at an early stage of a project's lifecycle. The objective of screening in context of hazardous material management is to identify hazardous materials that may be used by the proposed project or activity. Screening of potential hazardous material impacts serves as the basis for scoping (see **Section 6**) and will contribute in calculating the likely E&S effect of a project when determining project category (see ESMS Manual Chapter 5.3).

Screening is based on professional judgement and the information available at the time. Project screening and categorization process is conducted at the earliest possible stage in every project lifecycle; therefore, it is probable that the data used for identification is not widely available and not very detailed. Whenever possible the data collection and the initial identification of impact is conducted concurrently with or part of the pre-feasibility and feasibility studies, and in collaboration with preparers of the feasibility assessments.

The potential impacts of the presence of hazardous materials on a site differ from other environmental elements in as much as their presence is not necessarily an impact, potential impacts stem from their storage, use, and management. The identification of potential risks and impacts of hazardous materials will include of the following information:

- The source of risk and impact.
  The source of impact are activities of project that potentially have risks associated with the handling and use of hazardous materials. This also includes the storage of hazardous materials.
- Types of hazardous material and their hazardous characteristics; and

- The receptors of the potential impact (e.g., workers, communities, soil, water, etc).

Initial identification of potential hazardous material impacts is mostly based on whether the project will require the use of hazardous materials for construction, operation, and/or decommissioning activities. When the project identifies the need of hazardous material, there is potential risk and impacts from the use and handling of the hazardous materials. Information that needs to be obtained includes the following but is not limited to:

- Type of project (e.g., transmission line, types of power plant, distribution line, etc.)
- Technology used in general (e.g., types of transformers, etc.)
- Project phases (e.g., construction, operation, decommissioning)

All the above information will give information on the types of hazardous materials that are typically used and rough estimation on the amount. Information on potential risk and impact of hazardous material can be also obtain from Hazard Assessment (e.g., HAZID, HAZOP, etc) that may have been done, if any.

5.2 Preliminary assessment of hazardous material impact

Once relevant information and potential hazardous material impacts has been assembled, a preliminary assessment will be conducted to assess the significance of the identified potential impacts. The significance of the potential hazardous material impacts is measured by assessing the probability and the consequence level, using reference criteria for probability and consequence as provided in Appendix 4 of the ESMS Manual, criteria for Resource Efficiency, Pollution and Emissions of Greenhouse Gases (GHG).

The significance of potential hazardous material impacts will contribute in calculating the Likely E&S effect of a project when determining project's category. The potential hazardous material impacts assessed will likely consist of several impacts, due to various hazardous materials that may be used and handled, where each of these impacts will have its own impact significance. However, in context of determining project E&S category, the risk category will follow the highest risk significance.

The results of the screening and categorization process are preliminary in nature and will be expanded and revisited as part of the Impact Assessment, when more information about the nature and the scope of a project becomes available or when project definition and circumstances change (e.g., screening of subprojects identified during project implementation, change of project design or components, etc.). This is in line with an adaptive risk management approach.

6 Scoping of Hazardous Material Impact

Scoping aims to deepen the understanding of the potential hazardous material impacts (in condition that they have been identified during Project Screening and Categorization), to clearly define what is within the scope of the assessment (activities, risks/impacts, affected area), and develop a suitable methodology for the hazardous material Impact Assessment that ensues.

At the scoping stage, the identification of impacts of hazardous material will be further broadened and deepened. Identification of the potential impacts from the use and handling of hazardous material are still derived based on the project's description. However, more information about the project is usually available, detailed and more defined, compared to the information available during the project screening and categorization stage. All impacts identified from the project screening and categorization stage will be included in the list of a project's potential impacts.

The scoping will include, but is not limited to:

a. Understanding project activities, project description and project alternatives.

   At this stage of the project, information regarding the project is available in a more comprehensive manner, such as the project's phases, the technology to be applied, the site design, etc., including some alternatives of project components design. Understanding of the project activities and description will be needed to identify potential interaction between the project and receptors in the Area of Influence (see point c).

b. Identify potential hazardous material impacts

   Identifying potential hazardous material impacts in the scoping stage is basically an iteration of identifying potential impact in the screening stage. However, usually more information about the project is available, detailed and more defined (although some alternatives of design and/or project locations may still exist, but not in a broad range of selection), compared to the information available during the project screening and categorization process. Therefore, the identification of impacts of hazardous material that will be used for the project and its handling is more clearly defined. Potential impacts from inappropriate use or handling or of the hazardous materials are readily available in the form of MSDS (Material Safety Data Sheet).

   Identification of potential hazardous material impacts is based on the project's description, activities that use hazardous material and how, if mishandled, they will interact with receptors.

   When identifying the potential impact of hazardous material misused and mishandled, there are several aspects that need to be considered, such as the types and amounts of hazardous materials, the potential spill and release scenarios, the potential of uncontrolled reaction (e.g., fire and explosion), and the potential pathways to sensitive receptors. The scoping will also need to include-geographical characteristics of the project site e.g., its distance to settlements, water resources, and other environmentally sensitive areas. The potential spill and release scenarios can be referred to industry statistics on spills and accidents where available. The hazardous properties of the materials can be determined by MSDS of the materials that are expected to be used.

   Information on potential risks and impacts of hazardous material can also obtained from Hazard Assessment (e.g., HAZID, HAZOP, etc.) which is usually conducted separately to support the project's designing process.

   During the identification of potential impacts, permitting or licensing requirements related with the use of hazardous material shall be also identified. Identification of permits and

license requirements will provide information on management action that may need to be conducted when developing a plan for mitigation measures.

c. Identify area of influence (AOI) for hazardous material impact.

The project activities will impact spatial (area) and temporal (time) dimensions. Based on the potential hazardous material impacts that have been identified (both in the screening process and deepened in this scoping process), the area of influence for hazardous material impacts will be determined. The extent of AOI for hazardous material impact will consider the extent of the direct and indirect impact of hazardous material impact, potential pathways to receptors, and location characteristics. The extent of the direct impact may be determined based on reference to similar projects or activities, the characteristic of the hazardous material will be used or other justified studies.

It should be noted that the AOI as determined in the scoping process may be revised and adjusted when new information gathered throughout the impact assessment process (e.g., new information on existing baseline condition from the baseline survey result) or circumstances that may change (e.g., changes in project's design).

d. Identify sensitive receptors

Hazardous material impacts need to define the sensitive receptors that may be affected in order to determine which potential hazardous material impacts may need further investigation. Sensitive receptors include community residential receptors, animal, plant, ecological sensitive (e.g., national parks). Children, the sick, infirm and the elderly can be more prone to exposure of hazardous material that make them particularly sensitive.

e. Identify existing environment conditions and social issues related to the use and handling of hazardous material

The existing environmental conditions and social issues related to hazardous materials that can be exacerbated by the project will be identified. For example, if there have been historical public complaints related to a polluted river in the project area which is suspected to have been polluted by discharge of a hazardous substance from other existing activity. The presence of environmental conditions or social issues related to hazardous materials needs to be considered when analysing the impacts, also as a basis for planning appropriate hazardous material impact management.

f. Define the methodology for impact analysis

In analysing the hazardous material impacts, there are methods that can be used, including quantitative, semi-quantitative, and qualitative methods. As much as feasible, the hazardous material impact assessment is carried on quantitatively. In general, the methodology for hazardous material impact assessment will includes primary and secondary data collection.

g. Identify baseline data requirements

Baseline data that may need to be collected will be identified, based on the previous activities in the scoping, i.e., the potential impact identified, the AOI defined, and methodology for impact analysis that has been defined, etc. Input from stakeholder

engagement that has been conducted as part of the overall impact assessment process, especially related to the use and handling of hazardous materials, will be taken into consideration in determining baseline data that may require to be collected.

7 Baseline Study

A baseline study will include collection of primary and secondary data collection and analysis of data collected. The primary and secondary data that shall be collected is used to understand the characteristics of the hazardous materials that will be used in the project and appropriate handling of the materials, and the condition surrounding the project location.

Collection of data and information will include the following, but not limited to:

- The types and amounts of hazardous materials to be used in the project. This information should be recorded and should include a summary table with the following information:
  - Name and description (e.g., composition of a mixture) of the hazardous materials;
  - Classification (e.g., code, class or division) of the hazardous materials;
  - Internationally accepted regulatory reporting threshold quantity or national equivalent of the hazardous materials;
  - Quantity of hazardous materials used per month;
  - Characteristic(s) that make(s) the materials hazardous (e.g., flammability, toxicity);
  - First aid responses for exposure;
  - Storage requirements (e.g., ventilation, temperature etc.);
  - CAS number and MSDS references;
  - Shelf life and disposal strategies if it is exceeded.
- The condition of the location (e.g., building design, etc.) where the hazardous material will be used and stored.
- Applicable regulations related to hazardous material.
- The condition of the surrounding project area, especially related to potential receptors, for examples location of community settlement, water resources other industrial activities and other environmentally sensitive areas.

8 Analyse and Assess Hazardous Material Impacts

8.1 Prediction of impact and impact mapping

All available information and data collected during the scoping process and from the result of baseline study will be analysed to determine what could potentially happen to receptors as a consequence of the project and its associated activities. From the potentially significant interactions identified in the scoping process, the potential impacts to the various receptors and the scenarios in which the materials will reach them are described and evaluated. It is to be noted that impact assessment is not an isolated process, there may be additional information obtained which indicate that an impact will occur, where this impact has not previously been identified during the scoping process, including an impact on one receptor that can cause secondary impacts to other receptors. This will require an assessment of the interaction of impacts that may intensify their scale and significance. For example, based on the scoping process, a potential impact identified from the use of hazardous material that may

pollute the soil and groundwater; meanwhile from the baseline study, it is known that there is a communal shallow groundwater well in close proximity to where the hazardous materials are stored. Therefore, there is potential impact of community health due to contaminated soil and groundwater from the hazardous material.

The impact assessment of hazardous material will be highly dependent on the level of risk of the hazardous materials and the potential mechanisms for its release, where the level risk of hazardous materials is usually determined through a Hazard Assessment. Hazard Assessment should be performed by specialized professionals using internationally accepted methodologies, for examples Hazardous Operations Analysis (HAZOP), Failure Mode and Effects Analysis (FMEA), and Hazard Identification (HAZID). The level of risk of hazardous materials should be assessed based on the following:

- The types and amounts of hazardous materials present in the project.
- Toxicity of the materials and pathways to receptors.
- Analysis of potential spill and release scenarios using available industry statistics on spills and accidents where available
- Analysis of the potential for uncontrolled reactions such as fire and explosions
- Analysis of potential consequences based on the physical-geographical characteristics of the project site, including aspects such as its distance to settlements, water resources, and other environmentally sensitive areas

All the impacts that have been collated, will be grouped based on stages of the project where they will potentially occur and the correlation between impacts (including impact of other than hazardous material impact) will be mapped, which will give a clear picture on which are impacts that may influence other impacts and any intersection amongst identified impacts that will be able to identify possible indirect and cumulative impacts.

8.2 Significance of impact

After the identified potential impacts are defined and mapped, they will be assessed for their significance, by the same method as preliminary assessment stage by using a risk matrix, where the significance of impact will be assessed based on the probability of the impact to occur and its consequences if it occurs. However, at this stage, more reliable data is available than in the earlier screening, possibly including impact modelling or empirical calculations that will give more quantitative and reliable information, specifically related to the extent of the impact and other impact consequence factors (if available). The consequence of the impact will take into account the following factors:

- Type of impact (direct, indirect, and cumulative);
- The circumstances that will cause the release of the hazardous material;
- Duration of impact (short, medium, or long term);
- Extent or size of the affected area.
- Reversibility of impact (reversible or permanent);
- Sensitivity of receptors (vulnerability).

It is important to note that in determining the impact significance, embedded controls (i.e., physical or procedural controls that are included in Project Description) are taken into account. An example of embedded control is the design of hazardous material storage is equipped with

sufficient exhaust to prevent accumulated hazardous vapours that may be released from stored hazardous materials.

Once the significance of an impact has been defined, the next step is to evaluate what mitigation and enhancement measures are warranted (see **Section 9**). The main objective of developing mitigation measures is to reduce the significance of an impact by reducing the consequence and/or lowering the likelihood that it will occur. Re-evaluation of impact significance value needs to be conducted, once mitigation measures developed. The significance of the residual impact will be assessed with the same risk matrix, taking into account the application of mitigation measures.

All the impacts that have been assessed will be managed, through mitigation measures (See **Section 9**) that have been defined and will be monitored (see **Section 10**). The management and monitoring strategies will need to be developed to reduce the impact significance, prevent an impact to escalate, and to improve the E&S performance of a project. The management and monitoring strategies will be conducted through developing a Hazardous Materials Management Plan (See **Section 11**).

9 Management Action and Mitigation Measures

Management actions planned will be included in a Hazardous Materials Management Plan and should be commensurate with the level of potential risk associated with the handling, storage, and use of hazardous materials. Mitigation measures that are planned based on the assessment result will also be arranged in the Hazardous Material Management Plan. The management plan can be part of the Project's ESMP or to be a stand-alone document.

9.1 Management Action

In general, management action to be included in a Hazardous Materials Management Plan should be commensurate with the level of potential risks associated with the handling, storage, and use of hazardous materials. Management actions will cover the following aspect, but not limited to:

- Release Prevention and Control Planning
- Occupational Health and Safety (OHS)
- Process Knowledge and Documentation
- Emergency Response Plan (ERP)
- Community Involvement and Awareness

9.1.1 Release Prevention and Control Planning

Where there is risk of a spill of uncontrolled hazard materials, the project should prepare plans for spill prevention and control . Management action for release prevention and control planning should be tailored to the hazards associated with the project, and include:

- Training of operators on release prevention, including drills specific to hazardous materials as part of emergency response training.
- Programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure,

emergency shutdown systems, controls and pumps, and associated process equipment, through preventive maintenance and inspection.

- Preparation of written Standard Operating Procedures (SOPs) for filling Underground Storage Tanks (USTs), Above-ground Storage Tanks (ASTs) or other containers or equipment as well as for transfer operations by personnel trained in the safe transfer and filling of the hazardous materials, and in spill prevention and response.
- Appropriate design of storage and containment facilities, e.g., bunding, temperature control, ventilation fireproofing etc.
- SOPs for the management of secondary containment structures, specifically the removal of any accumulated fluid, such as rainfall, to ensure that the intent of the system is not accidentally or wilfully defeated.
- Pre-start review, especially for process that uses hazardous material with major hazard.
- Mechanism for contractor control to ensure that contractor implemented hazardous management actions properly.
- Identification of locations of hazardous materials and associated activities on an emergency plan site map.
- Documentation of availability of specific personal protective equipment and training needed to respond to an emergency.
- Documentation of availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources.

9.1.2 Occupational Health and Safety (OHS)

The Hazardous Materials Management Plan should address applicable, essential elements of occupational health and safety management, including:

- Job safety analysis (JSA) to identify specific potential occupational hazards and industrial hygiene surveys, as appropriate, to monitor and verify chemical exposure levels, and compare with applicable occupational exposure standards.
- Hazard communication and training programs to prepare workers to recognize and respond to workplace chemical hazards. Programs should include aspects of hazard identification, safe operating and materials handling procedures, safe work practices, basic emergency procedures, and special hazards unique to their jobs. Training should incorporate information from Material Safety Data Sheets (MSDSs) for hazardous materials being handled. MSDSs should be readily accessible to employees in their local language.
- Definition and implementation of permitted maintenance activities, such as hot work or confined space entries.
- Provision of suitable personal protection equipment (PPE) (footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities.
- Monitoring and record-keeping activities, including audit procedures designed to verify and record the effectiveness of prevention and control of exposure to occupational hazards, and maintaining accident and incident investigation reports on file for a period of at least five years.

9.1.3 Process Knowledge and Documentation

The Hazardous Materials Management Plan should be incorporated into, and consistent with, the other elements of the facility Environmental and Social/OHS Management System and include:

- Written process safety parameters (i.e., hazards of the chemical substances, safety equipment specifications, safe operation ranges for temperature, pressure, and other applicable parameters, evaluation of the consequences of deviations, etc.). The process safety information must be included
- Written operating procedures.
- Compliance audit procedures.

9.1.4 Emergency Response Plan (ERP)

Emergency Response Plan must be developed for project that use, handle and store hazardous material, where the response action will be developed commensurate with the hazardous risk. Management actions that have been determined for spill prevention, control and countermeasures should be included as a specific component of the ERP.

Description of response activities in the event of a spill, release, or other chemical emergency including:

- Internal and external notification procedures;
- Specific responsibilities of individuals or groups;
- Decision process for assessing severity of the release, and determining appropriate actions (including reporting and post-event activity);
- Facility evacuation routes;
- Post-event activities such as incident investigation, clean-up and disposal (e.g., remediation), employee re-entry, and restoration of spill response equipment.

When an incident occurs, actions to follow is not limited to the initial response and reporting of the incident. However, it is necessary to determine the appropriate post event action, commensurate with the severity of the impact.

For example, in condition where producer suspects/confirms that certain amount of hazardous material or waste is released to the environment, the producer shall conduct investigation that covers identification of volume of released hazardous material or waste, impacted environmental matrix (e.g., soil, surface water, groundwater, etc.), size and depth of impacted area, presence of impacted human and/or ecological receptor, etc., in accordance to the provisions in the national regulation[2].

Based on the investigation result, the producer holds responsibility to conduct ‘Recovery of Environmental Function’ if contamination is confirmed. In this case, producer shall prepare an

[2] Technical process for mitigating hazardous waste contamination issue on soil (that may lead to groundwater and surface water impacts) is specified in the MoEF’s Regulation No. P.101/MENLHK/SETJEN/KUM.1/11/2018 regarding *Guideline for Remediation of Hazardous Waste Contaminated Land*.

Environment Function Recovery Plan (*Rencana Pemulihan Fungsi Lingkungan Hidup* or 'RPFLH'). The RPFLH document must at least contain information such as the steps in recovery of environmental function post contamination and the results of identification of contaminant. This RPFLH needs to be approved by the Minister of Environment and Forestry (MoEF) prior to be executed. Such plan may include various options of technical approach subject to the nature of contamination, such as, physical excavation/collection, transportation, and treatment of contaminated soil and/or groundwater; extraction of contaminant substance (e.g., in Soil Vapour Extraction); insitu bioremediation (e.g. with aeration), and many other methods. If the Recovery attempt has achieved an acceptable condition, MoEF will issue a Contaminated Land Recovery Completion Letter (*Surat Status Penyelesaian Lahan Terkontaminasi* or 'SSPLT') by request of the producer. This request must at least include detailed report on the implementation of Recovery of Environmental Function.

Hazardous Material ERP should be included in the project-level EPRP (Emergency Preparedness and Response Plan) which adjusted to covers existing emergency response system in the project location (e.g., regional PLN's/city/regency emergency call center) and emergency response contacts (e.g., police, army, navy, regional Disaster Mitigation Board (BPBD), etc.) (See Labor and Working Condition Management Guidelines, Section Emergency Preparedness and Response Plan). For major hazard, the emergency response plan should include response system for the community that have the risk upon the hazard, which should be aligned with Community Health, Safety and Security (CHSS) management plan.

9.1.5 Community Involvement and Awareness

For projects that have major hazards, communities who are at risk of these hazards must be involved in development of hazardous management plan, especially ERP component development that specifically related to community response if an incident occurs. They must have awareness of these major hazards and should participate in preventive measures (e.g., complying with the safe limits of the project fence, etc.).

9.2 Mitigation measures

Mitigation measures for hazardous material risk and impact include preventive measures and control measures.

9.2.1 Preventive Measures

Preventive measures include following items, but not limited to:

- Hazardous material transfer. Ensuring all equipment for hazardous material transfer (including fittings, pipes, hoses, etc.) are in accordance with their designation and carry out regular inspection and maintenance, as well as provide secondary containment at connection points or overflow points.
- Overfill protection. Preventing overflow to occurred by developing SOP for filling operation, installing gauges to measure volume inside, uses of dripless hose connections for vehicle tank and fixed connection with storage tanks, provision of automatic fill shutoff valves on storage tanks to prevent overfilling, pumping less volume than available capacity into the tank or vessel, etc.
- Managing reactive, flammable, and explosive materials to avoid uncontrolled reactions or conditions resulting in fire or explosion. Recommended prevention practices include:

- Storage of incompatible materials (acids, bases, flammables, oxidizers, reactive chemicals) in separate areas, and with containment facilities separating material storage areas.
- Provision of grounding and lightning protection for flammable materials storage, transfer stations, and other equipment that handles flammable materials.
- Storage of hazardous materials in an area of the facility separated from the main operational works area.
- Prohibition of all sources of ignition from areas near flammable storage tanks
- Etc.

9.2.2 Control Measures

Control measures include following items, but not limited to:

- Provision of secondary containment.
  Appropriate secondary containment structures consist of berms, dikes, or walls that capable of containing the larger of 110% of the largest tank or 25% of the combined tank volumes in areas of Above-ground Storage Tanks (ASTs) with a total storage volume in area greater than 1,000 Liters. Other secondary containment measures that should be applied depending on site-specific conditions include:
  - Transfer of hazardous materials from vehicle tanks to storage in areas with surfaces sufficiently impervious to avoid loss to the environment and sloped to a collection or a containment structure not connected to municipal wastewater/stormwater collection system.
  - Rainfall protection, roof over the bunded area and/or a release valve for discharging any collected rainwater to appropriate treatment before release.
  - Where it is not practical to provide permanent, dedicated containment structures for transfer operations, one or more alternative forms of spill containment should be provided, such as portable drain covers (which can be deployed for the duration of the operations), automatic shut-off valves on storm water basins, or shut off valves in drainage or sewer facilities, combined with oil-water separators.
  - Storage of drummed hazardous materials with a total volume equal or greater than 1,000 Liters in areas with impervious surfaces that are sloped or beamed to contain a minimum of 25 percent of the total storage volume.
  - Provision of secondary containment for components (tanks, pipes) of the hazardous material storage system, to the extent feasible.
  - Conducting periodic (e.g., daily or weekly) reconciliation of tank contents, and inspection of visible portions of tanks and piping for leaks.
  - Use of double-walled, composite, or specially coated storage and piping systems particularly in the use of underground storage tanks (USTs) and underground piping. If double walled systems are used, they should provide a means of detecting leaks between the two walls.
- Installation of leak detection for storage tank and piping.

Leak detection may be used in conjunction with secondary containment, particularly in high-risk locations[3]. Leak detection is particularly important in situations where secondary containment is not feasible or practicable, such as in long pipe runs. Acceptable leak detection methods include but are not limited to:

- Use of automatic pressure loss detectors on pressurized or long-distance piping.
- Use of approved or certified integrity testing methods on piping or tank systems, at regular intervals.
- Considering the use of SCADA if financially feasible.

- Managing risks of using an Underground Storage Tanks (USTs), such as avoiding using UST for storage of highly soluble organic, conduct groundwater monitoring, Installing permeable liners, etc.

10 Monitoring

Monitoring will serve as a tool to improve the E&S performance. As part of the hazardous material management, monitoring consists of monitoring as part of management activities (i.e., mitigation measures planned) and review of the management plan as whole.

10.1 Hazardous Material Assessment

Hazardous material risk assessment, e.g., A HAZOP study, is not a one-time activity, but a dynamic and ongoing process that needs to be reviewed and updated regularly. This is due to the fact that the conditions and assumptions that were valid at the time of the initial Hazardous Material Assessment study may shift over time, caused by a variety of factors such as modifications or expansions in the project design, changes in operating parameters, new or revised regulations, lessons learned from incidents or audits, feedback from operators or maintenance staff, and advances in technology. These changes can introduce new hazards, operability issues, or deviations that were not considered in the previous Hazardous Material Assessment study. Thus, it is critical to revalidate and update the Hazardous Material Assessment study periodically to reflect the current state and performance of the facilities (powerplant, substation, etc.), and that it identifies and mitigates any potential risks or deviations. By conducting Hazardous Material Assessment regularly, PLN improve its safety, reliability, and efficiency of a facility, as well as comply with regulatory and industry standards.

The frequency of revalidating and updating a Hazardous Material Assessment study is dependent on the nature, complexity, and maturity of the facility, as well as the frequency and magnitude of changes that affect it. Generally, a full Hazardous Material Assessment revalidation and update should occur every five years or as required by regulations or standards. If there is a significant change in the facility design, operation, or environment, or after a major incident or near miss, then a partial Hazardous Material Assessment revalidation and update should occur. Additionally, a periodic Hazardous Material Assessment review and audit should be conducted to monitor the implementation and effectiveness of the recommendations from the previous Hazardous Material Assessment study. Lastly, a

[3] High-risk locations are places where the release of product from the storage system could result in the contamination of drinking water source or those located in water resource protection areas as designated by local authorities.

Hazardous Material Assessment revalidation and update should occur before decommissioning a facility or before restarting it after a prolonged shutdown.

10.2 Management activity monitoring

Each of the mitigation measures that are planned should be monitored in order to ensure that management activities are carried out according to plan, ensure that project activities do not violate the provisions that have been regulated and determined, and serves as tools for early notification for abnormal condition. The monitoring plan will be developed based on the mitigation measures that has been set, and will be commensurate with the risk based on the Hazardous Material Assessment result.

In developing a monitoring plan for activities planned in the management plan, the following items should be taken into account, but not limited to:

- Parameters to be monitored.
  Parameters to be monitored are the performance indicators that have been determined when developing management plan. The parameters to be monitored shall also include parameters that are stated in the permits, if any.

- Monitoring location
  Monitoring can be carried out at the source of hazardous risk presence and at the receptor of impact of hazardous material.

- Frequency of inspection and monitoring.
  The frequency of monitoring will depend various factors, which includes the duration of impact, magnitude of impact, the sensitivity or limit of the receptor, etc. Longer periods of impact, larger magnitudes of impact, more sensitive receptors will require more frequent monitoring. The frequency of several parameters that are obligated to be monitored in the permit, if any, must comply with the provisions in the permit, at minimum.

- Instruments that will be used for monitoring, including calibration requirements
  The method and instrument to be used will comply with applicable regulation (if any) and will follow the best practice as technically feasible.

- The resources
  The monitoring plan will determine the minimum required qualifications of persons who will conduct the monitoring and inspection. In some cases, public participation in monitoring can be a requirement or a strategy in a management. The public participation in monitoring should be also determined, including the requirement of the public that will participate.

10.3 Management plan review

The Hazardous Material Management Plan (see **Section 11**) is a living document and have to be referred to every stage along the project cycle. it's the target and approach established in the plan should be able to be reviewed, modified, or renewed from time to time as deemed necessary to find the best possible result.

The following are items that need to be determined related to management plan review:

- Schedule for regular review. The management plan should be reviewed regularly. If the phase will be more than one year, then the regular review shall be conducted annually.
- The inventories of materials on site;
- The parties that responsible for conducting the review, making an amendment, and the party approving the result of the review.

11 Hazardous Material Management Plan

11.1 Component 1: *Objective(s)*

The management plan should state the objectives of implementing hazardous material management activities. The main objective is to minimize the use of hazardous materials that cannot be avoided, and control of release and accidents, and the protection of the workforce and community from hazardous material risks. The management of hazardous materials should also meet with the international requirements and protocols (if applicable) and be in compliance with applicable law and regulation.

11.2 Component 2: Hazard Identification

The management plan must describe the hazardous material inventory and storage layout, describing where all the various hazardous materials to be handled, stored, used, disposed or otherwise managed. The shelf life and disposal strategies for materials with limited shelf life should be described. The management plan must also describe the requirements for hazardous material transport and loading/unloading, along with authorized transport routes.

11.3 Component 3: Activities

All preventive and control measures planned should be described in a clear manner. For specific project activities that require permits for their implementation, any requirements of the permit that are related with management effort for the impact cause should be included in the management plan.

The activities planned should also consider other plans that are related (if any), such as Hazardous Waste Management Plan, Management Plan, Occupational Health Safety Management Plan, Community Health Safety and Security Management Plan, Stakeholder Management Plan, etc.

The management plan should also require that local communities be consulted and informed of hazardous materials that will be transported through their communities or might otherwise have an adverse effect on communities through fire, explosion, spill or other incidents. The management plan must provide for timely handling of complaints received through the formal grievance mechanism or otherwise, including identifying the person or persons responsible for dealing with such issues.

11.4 Component 4: Performance Indicator

Every mitigation measure or management activity planned should have a measurable indicator of success as a tool to determine achievement targets and control the implementation of the management activity. Management indicators determined shall be measurable,

wherever possible to be quantitative in nature and can be measured with applicable tools. The management indicator may be based on the compliance with the rules and regulations, zero incidents related to hazardous material, number or level of grievance related with hazardous material, etc.

11.5 Component 5: Institutional Responsibility

The management plan must identify and describe the responsibilities of all parties (PLN, contractor or other relevant third parties) and competent authorities. The management plan must also identify the roles and responsibilities of individual positions within these organization in implementing the hazardous materials management plan, including the information dissemination of the hazardous materials management (such as hazard risk, training, etc.), and the person or persons that are responsible to following up and take action upon grievance related to hazardous materials that are submitted through the formal grievance mechanism. A training and induction plan for all relevant staff should be included. The project shall ensure that there are first aiders on site with appropriate training and preparedness for dealing with exposure to known hazards and the location of medical facilities that can deal with exposure incidents.

11.6 Component 6: Implementation Schedule

The Plan should detail an implementation schedule of management activities, taking into account the planned timing of construction and other project activities, including any permitting or licensing and any cooperation contract that should be obtained prior to the presence of hazardous material in project location. This implementation schedule includes details of hazardous material transportation schedule, induction and training, etc.

11.7 Component 7: Cost Estimates

The Plan should include cost estimates for each of activity or set of activities implementation, including up-front investment costs and long-term recurrent costs.

11.8 Component 8: Monitoring, Recordkeeping and Reporting

The Plan must call for inspection/monitoring of hazardous material management. The monitoring plan should specify:

- Inventories and locations where hazardous materials are handled, used, stored or otherwise managed;
- Any specific requirement from the government;
- There shall be a specific library of MSDS and copies of the MSDS shall be immediately available in locations where the materials are stored and used;
- Parameters to be monitored (e.g., room temperature, concentration of specific substance in the water or air, etc.);
- The frequency of inspection and monitoring;
- Regulatory criteria (if applicable);
- Instruments that will be used for monitoring, including calibration requirements;
- The required qualifications of persons who will conduct the recording, monitoring and inspection, and of any members of the public who may participate in monitoring;
- Records that must be kept and the person responsible for keeping the records;

- Reports that will be prepared, to whom the reports are to be submitted for review, and the length of time records will be kept. This will include summary reports at intervals and to which institutional should be submitted; and
- Incident and near miss reporting.

For Project activities or management activities that requires a permit for their implementation, the monitoring requirements in the permit must also be included in the monitoring plan. The monitoring component is further elaborated in **Section 10** of this guideline.

11.9 Component 9: Management Plan Review

The management plan should determine and state the schedule of review (see **Section 10.3**). Regular review of the management plan and the party responsible for conducting a review, making an amendment and the party approving the results of the review and the changes made (if any) must be stated in the management plan.

12 Procedures

As a prevention measures on risk/impact of the use of hazardous materials, SOPs should be prepared for each step of all processes or operations within the Project (e.g., initial startup, normal operations, temporary operations, emergency shutdown, emergency operations, normal shutdown, and start-up following a normal or emergency shutdown or major change). These SOPs should include special considerations for hazardous materials used in the process or operations (e.g., temperature control to prevent emissions of a volatile hazardous chemical, spill management and cleanup, diversion of gaseous discharges of hazardous pollutants from the process to a temporary storage tank in case of emergency).

Other procedures to be developed include impacts of deviations, steps to avoid deviations, prevention of chemical exposure, exposure control measures, and equipment inspections.

Inspection and maintenance procedures should be developed and documented to ensure mechanical integrity of equipment, piping, and instrumentation and prevent uncontrolled releases of hazardous materials from the project. The specific process components of major interest include pressure vessels and storage tanks, piping systems, relief and vent systems and devices, emergency shutdown systems, controls, and pumps.

In general, there are several key items that need to be included in the procedures to be developed in the context of the use of hazardous material, which are but not limited to:

- Procedure Information, which includes procedure title, identification number, number of pages.
- Purpose. The procedure should provide information on the objective of the procedure.
- Scope. The procedure should inform the boundary of the procedure, aspects or parties that are covered under the procedure, and limitation to the procedure.
- Definition. The procedure should define the terms used in the procedure.
- Responsibilities. The procedure should identify and state the parties that will be responsible to follow the procedure, supervise the implementation of the procedure, provide training of the procedure, and parties that will regularly review and update the procedure.

- Potential hazard identification.
- Work instructions. The procedure should list, in a simple and clear manners, the specific steps that will be taken to implement the procedure.
- Reference documents. The procedure should list the relevant documents that support, utilized as the basis or provide additional information for the procedure, including rules and regulation that need to be complied. Example: Material Safety Data Sheet (MSDS), Job Safety Analysis (JSA), etc.
- Records. The procedure should provide information of the required documented outcomes of the procedures. Format for required records will be provided under the procedure, as necessary.
- Approving authority. The procedure should provide information on party that is responsible for approving the procedures.
- Issue date. The procedure should provide information on time of procedure issuance.
- Revision date. The procedure should provide information on time of procedure reviewed and revised (Procedures should be continually updated and improved).
- Other Environmental & Social components, if applicable. The procedure should include other environmental and social component, if applicable, related with the activities in the procedure. Example: PPE required for the activities must be clearly stated in the procedure.

Several procedures that are in accordance with the general principles of good hazardous material management in this guideline are already in place within PLN (see **Section 13**), which can be adopted for Project implementation or referred for development of necessary procedure, depending on the nature and requirements of the Project. However, it is to be noted that some of these available procedures in PLN may need to be amended due to the changes in relevant rules and regulation.

13 Relevant Documents

The following is list of PLN documents that are available for implementation of hazardous material management and aligned with this management guideline. To be noted that any changes to this management guideline may potentially trigger the need to revise or amend the following documents. PLN may develop further technical procedures (see **Section 12**) as deemed necessary to complement the implementation of this management guideline.

- PLN PT-K3L-30 on Procedure for PCB Cross-contamination Prevention for Distribution Activities with International Financing
- PLN PT-K3L-32 on Oil Spill Handling Procedure for Transmission and Distribution Activities with International Financing

14 References

- Act No. 11 Year 2020 on Omnibus Law
- Government Regulation No. 74 Year 2001 on Hazardous Material Management
- Minister of Environment Regulation No. 74 Year 2019 on Emergency Management Program for Hazardous Materials and/or Waste

- World Bank Environmental and Social Framework (ESF), Environmental and Social Standard (ESS) 3: Resource Efficiency and Pollution Prevention and Management
- World Bank Environmental and Social Framework (ESF) Guidance Note, Environmental and Social Standard (ESS) 3: Resource Efficiency and Pollution Prevention and Management
- WBG Environmental, Health, and Safety (EHS) Guidelines, 2007
- IFC PS 3: Resource Efficiency and Pollution Prevention, 2012
- IFC Guidance Note 3: Resource Efficiency and Pollution Prevention, 2012