PT PLN (PERSERO)

ENERGY TRANSITION AND SUSTAINABILITY DIVISION

Erosion and Sediment Control MANAGEMENT GUIDELINE

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Key Abbreviation

AOI : Area of Influence
E&S : Environmental and Social

EHS	:	Environmental, Health and Safety
ESF	:	Environmental and Social Framework
ESMP	:	Environmental and Social Management Plan
ESMS	:	Environmental and Social Management System
ESS	:	Environmental and Social Standard
GHG	:	Greenhouse Gas
IFC	:	International Finance Corporation
PS	:	Performance Standard
WBG	:	World Bank Group
TSS	:	Total Suspended Solid
DED	:	Detailed Engineering Design

1 Introduction

PLN is committed to avoid or minimise adverse impact on human health and the environment, including avoiding and minimizing impact on water quality and aquatic habitat due erosion, water run-off and sedimentation. This guideline is developed in order to manage the impact derived by erosion and water run-off due to PLN's project 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 Environmental and Social Standard (ESS) 3, WBG Environmental Health and Safety (EHS) Guideline, IFC Performance Standard (PS) 3, and other documents as listed in **Section 13** of this management guideline.

In general, soil erosion may be caused by exposure of soil surface to rain, run-off and wind during land clearing, earth moving, and excavation activities. The mobilization and transport of soil particles by water run-off may impact in natural water systems by degradation, sedimentation and ultimately can impact the biological systems that use these waters.

By managing the impact due to erosion and water run-off, it is expected that the following objectives can be achieved:

- When avoidance is not feasible, the erosion rate can be minimized;
- Erosion can be controlled by number of means;
- Sedimentation in in natural water systems can be controlled;
- Deterioration of water quality in the natural water system can be prevented or reduced;
- Disruption to biological systems using the affected water system can be avoided or reduced; and
- Water quality and biological system in the natural water system affected can still meet the requirements of applicable national law and regulation and good international industry practice.

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 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 guidelines or procedures. Any update, deviation, or suggestion 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

The management of erosion and sedimentation impact is a risk-based approach, which means that the management activities will be proportional to risk or impact. The base activities of a risk-based approach are identifying potential impact due to erosion and sedimentation and assessing the significance level of those impact, and based this identification – assessment process, the management effort and activities will be determined proportional with the significance level of the impacts.

For example, land clearing of certain size in areas with loose soil characteristic will have potential of significant erosion impact compared to areas that have a much less loose soil characteristic, thus the sedimentation pond that are built as measure to mitigate the erosion impact in area with loose soil characteristic may have larger in design

The impact of erosion will be closely related to the impact of runoff water, therefore in developing the erosion management plan, wastewater management aspects must be included.

4 Process Overview

In order to achieve the objectives of each step of the E&S safeguard process, the development of erosion and sediment control will implement the following process:

- Identification of risks and impacts by soil erosion;
- Assessment of the identified risk and impact;
- 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, baseline study, analysing and assessing 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 impact due to erosion and run-off

The screening stage is a key step for an initial identification of impact related to erosion and run-off from a project, which conducted at an early stage of a project's lifecycle. The objective of screening in the context of erosion and sediment control is to identify potential major erosion and water run-off impacts of a proposed project/activity. Screening of potential erosion and run-off impact 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 5.3).

Screening is based on professional judgement and the information available at the time. The 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 concurrent with or part of the pre-feasibility and feasibility studies, and in collaboration with preparers of the feasibility assessments.

The identification of erosion and water run-off impact will include of the following information:

- The source of impact.
  The source of impact is basically activities of the project that potentially causing soil erosion, such as land clearing, earth moving, and excavation activities. These in combination with site drainage and potential alterations to it.
- The receptor of the impact (water bodies and its aquatic habitat).

Initial identification of impact by soil erosion will be based on information of the project type and its nature, the activities planned in general, the proposed location in general and timing of the activity in relation to potential rain events. Information that needs to be obtained are the following but 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 solar panel, etc.)
- Project phases (e.g., construction, operation, decommissioning)
- Location characteristics in general (e.g., land cover, the presence of water bodies surrounding the project area, climate & weather in general, topography in general, etc.)
- Timing of the activities (e.g., during wet season, dry season).

The types of projects and technology that will be applied in each of the project phases will give information on rough estimation on the needs of land clearing, earth moving and/or excavation activities. The location characteristics will give rough estimation of the potential volume of excavation and earthworks and magnitude of soil erosion and run-off if the erosion occurs. For examples, areas with steep slopes will have a higher risk of soil erosion, high precipitation will increase the risk of soil erosion and higher run-off and higher sedimentation in the receiving body of water, etc.

5.2 Preliminary assessment of erosion and water run-off impacts

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

The significance of erosion and run-off impact will contribute to calculating Likely E&S effect of a project when determining the project's category. If potential erosion and run-off impacts assessed consist of several impacts, each of these impacts will have its own impact significance. However, in context of determining project 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 Erosion and Run-off Impact

Scoping aims to deepen the understanding of the potential erosion and run-off 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 and sampling strategy for the erosion and run-off Impact Assessment that ensues.

At the scoping stage, the identification of impacts of erosion and run-off will be further broadened and deepened. Identification of the potential impacts of erosion and run-off 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. More detailed information on the technology/system used for the project and the condition of the proposed locations are available from various sources, one of them is through the process of the feasibility study, although some alternatives of design and/or project locations are still exist, but not in a broad range of selection. All impacts identified from the project screening & categorization stage will be included in the list of 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 resources/receptors in the Area of Influence (see point c).

b. Identify potential erosion and run-off impact

   Identification of potential erosion and run-off 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 erosion and run-off are further broadened and deepened in this scoping process.

   Identification of erosion and run-off impacts is based on the project's description, activities that poses impact related to erosion and run-off and how it interacts with the receptors.

   During the identification of potential impacts, permit or license required related activities that may cause erosion and run-off shall be also identified. Identification of permit and

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

c. Identify area of influence (AOI) for erosion and water runoff impact.

The project activities will impact spatial (area) and temporal (time) dimension. Based on the potential erosion and run-off impact that has been identified (both in the screening process and deepened in this scoping process), the area of influence for erosion and run-off impacts will be determined. The extent of AOI for erosion and run-off impact will consider the extent of the direct and indirect impact of erosion and run-off impact and location characteristic, such as receiving waters and their sensitivity. The extent of the direct impact will be determined based on location characteristic and may be based on reference of similar project or activities, or other justified studies. Location characteristic, including topography, type and condition of receiving water bodies, etc. will be the main factor to determine the AOI, for example, erosion particles carried by run-off into a receiving river that has a calm and slow flow will be transported over a short distance and if a receiving river drains to the sea in an area with sensitive ecosystems such as reefs or mangroves, then the AOI will include those receptors.

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

d. Identify sensitive receptors

Erosion and run-off impacts that related to or may affect the sensitive receptors need to be identified in order to determine which erosion and run-off impacts that need to be focused and analysed in more depth. Sensitive receptors include water ecosystems (e.g., reefs, mangroves, etc.), community (e.g., children), etc.

e. Identify existing environment conditions and social issues related to erosion and water runoff

Existing environment conditions and social issues related to erosion and water run-off that can exacerbated by the project will be identified. For example, if the receiving water body, where the water body is utilized by the community for daily life, has a poor quality then the run-off carrying erosion particle may decrease the water quality even more. Changes to drainage may also lead to localised flooding. These kind of environmental conditions and social issues need to be considered when analysing the impacts, also as basis when planning appropriate erosion and sediment control.

f. Define methodology for impact analysis

In analysing the potential erosion and run-off impacts, there are methods that can be used, including quantitative, semi-quantitative, and qualitative methods. As much as feasible, the erosion and water runoff impact assessment is carried on quantitatively. In general, the methodology for erosion and water runoff impact assessment consists of, but not limited to:

- Primary and secondary data collection

The primary and secondary data collection will be conducted as part of the baseline study (see **Section 7**).

- Modelling

  In order to have a reliable quantitative data, in some cases the erosion particle dispersion and flooding may need to be modelled, including the rate of sedimentation that will occur. The output of erosion modelling will become input for calculating the consequence of erosion and run-off impact during impact significance assessment (see **Section 8.2**). The modelling will be conducted using appropriate software program, taking into consideration the characteristic of the particles and the characteristic of receiving water body.

g. Identify baseline data requirements

   Baseline data that 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 (including the requirements to conduct modelling), etc. Input from stakeholder engagement that has been conducted as part of the impact assessment process as a whole, especially related to receptors of erosion impact (e.g., receiving water bodies), 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 utilized to understand the location conditions in the Project's AOI before the implementation of the Project and as input for modelling process.

The data to be collected will consider the location characteristics, including the condition of the receptors, and data required to conduct modelling that has been defined. Weather records for the location, especially rainfall history, are particularly relevant.

Primary data collection may consist of field observation, land slope measurement, area of catchment, soil sampling for determining the soil characteristic, sampling and measurement of receiving water body characteristic (water quality, water hydraulic, etc.), laboratory analysis, and interviews. Secondary data collection includes studies that have been conducted earlier in the AOI and supporting data to analyse erosion and run-off impact, such as hydrological data (precipitation, etc.).

7.1 Primary data collection

In designing the primary data collection program, the methodology used considers the following:

- Data collection, methods, equipment are valid, reliable and consistent, i.e., will be conducted in accordance with the national laws and regulations or international standards, whichever is more stringent and technically feasible to be applied. Additionally, the standards to be referred to, including the parameters planned to be

sampled and the associated threshold will be identified based on scoping result, by taking into account the potential significance of the impacts.
- Sampling of the quality of the receiving water body represents the seasonal conditions (wet and dry season) by considering the timing of the activities and proportionate with the potential significance of the impacts.

Sampling of soil characteristics is required to determine the erodibility of the soil, which are one of the factors to calculate the erosion rate in the area.

When soil erosion and run-off impact potentially occur, the baseline information will also be required for monitoring purposes. Sampling of the quality of the receiving water body should be undertaken to assess background levels of suspended solids to differentiate between existing ambient conditions and project-related impacts. The sampling program should align with the water management program of the project (if any) and should consider the following, but not limited to:

- Discharge point of run-off from the project location to the receiving body of water. Sampling should at least be taken in the upstream of the discharge point, and downstream of the discharge point.
- The characteristics of the receiving water body (debit, direction, river flow, etc.,).
- Seasonal (dry and wet season). The sampling should be conducted at least once in each season planned.
- Aquatic habitats in the receiving water body.
- Existing contour of project area and soil characteristic.

The main parameters of the receiving water bodies quality to be sampled are turbidity and TSS (Total Suspended Solid), while other parameters that commonly to be analyses are pH, temperature, clarity, aquatic organism (nekton, plankton, benthos, etc.).

7.2 Secondary data collection

As previously described, secondary data collection includes studies that have been conducted earlier in the AOI and supporting data to analyse erosion and run-off impact. Supporting data include the following but not limited to hydrological data, especially rainfall erosivity, flood levels, land cover to determine the index factor for land management and soil conservation, etc. It should be noted that for modelling purposes, some specific requirements and other data components will need to be collected, depending on the modelling type and software defined.

7.3 Baseline data analysis

Soil characteristic data from soil sampling program will be analysed to determine the soil erodibility. Water samples from the receiving water body will be analysed to describe the water quality condition, and the parameters measured and analysed will be compared with the applicable standards (national regulations and international standard, whichever more stringent and technically feasible). Measurement of water hydraulic conditions will be used as input for some modelling, if required.

8 Analyse and Assess Potential Erosion and Run-off 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 scoping process, the impacts to the various receptors are elaborated 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 identified during the scoping process, including secondary impacts on 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, the run-off from land clearing for land preparation of the project area will flow to the river at the south. However, based on interview with the community near the river, there are several fish cultivation points in the river that carried out by the local community. Therefor the sediment in the run-off is potentially impacting the nekton in the river and may lead to impacts on the livelihood of the community.

Once all the impacts that have been collated, they will be grouped based on stages of the project where they will potentially occur and the correlation between impacts (including impact other than erosion and water runoff impact) will be mapped. This will give a clear picture of what impact that may influence other impacts and any interaction amongst the identified impacts that will enable identification of 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, using the same method as in the preliminary assessment stage using a risk matrix method. However, at this stage more reliable data is available, including that from impact modelling that will give more quantitative reliable information, specifically related to the significance of the impact and other impact consequence factors (if available). The significance of impact will be assessed based on the probability of the impact to occur and the extent of its consequences if it occurs. The consequence of the impact will take into account the following factors:

- Type of impact (direct, indirect, and cumulative)
- Duration of impact (short, medium, or long term)
- Extent or size of the affected area
- Reversibility of impact (reversible or permanent)
- Sensitivity of receptor (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 in estimating the raw significance of an impact.

Once the significance of an impact has been defined, the next step is to evaluate what mitigation and enhancement measures are warranted (see **Section** Error! Reference source n ot found.). The main objective of developing mitigation measures is to reduce the significance

of an impact by reducing the consequence and/or lowering the likelihood. Re-evaluation of impact significance value needs to be conducted, once mitigation measures are developed. The significance of the residual impact will be assessed with the same risk matrix, taking into account the application of mitigation measures. For example, land clearing of an area of 1 hectare during the construction period (approximately 1 year) will cause water run-off carrying erosion particulate to the river at the south of the project area. This impact is assessed as an impact with 'medium' consequence and 'very high' likelihood; thus, the impact significance is 'high'. The mitigation measure planned is to build ditches and sedimentation ponds to intercept and direct the run-off to the sedimentation ponds, where the soil particulate will be deposited and a 'cleaner' water run-off flow to the river. With this mitigation measure in place, the impact significance is re-assessed, and the resulting consequence reduced to 'minor' and the likelihood will be lowered to 'high', thus the significance becomes 'moderate'.

All the impacts that have been assessed will be managed, through mitigation measures (See **Section** Error! Reference source not found.) that have been defined and will be monitored (see **Section** Error! Reference source not found.). 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 an Erosion and Sediment Control Management Plan (See **Section** Error! Reference source not found.).

9 Mitigation Measures

Where possible, facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment due to erosion and sediment in run-off. The management of erosion and sediment can be controlled through a combination of the following aspects, whichever applicable and proportionate with the impact significance:

- Management of sediment mobilization and transport;
- Clean run-off management;
- Facility design and drainage plans;
- Design of structural (slope) stability; and
- Managing disturbance to water bodies.

Several examples of erosion and sediment control management action are as follow.

Management of sediment mobilization and transport

- Reducing or preventing erosion by:
  - Scheduling project activities to avoid heavy rainfall periods (i.e., during the dry season) to the extent practical
  - Contouring and minimizing length and steepness of slopes
  - Mulching to stabilize exposed areas
  - Re-vegetating areas promptly
  - Diversion channels during construction
  - Designing channels and ditches for post-construction flows
  - Lining steep channel and slopes (e.g., use jute matting and rip-rap)
- Preventing wind erosion by revegetation of waste piles or covering with tarpaulins;

- Reducing or preventing off-site sediment transport through use of settlement ponds, rip-rap, silt fences, and water treatment, and modifying or suspending activities during extreme rainfall and high winds to the extent practical.

Clean run-off management

- Segregating or diverting clean water run-off to prevent it mixing with the water containing a high solids content, to minimize the volume of water to be treated prior to release.

Road and hard stand design

- Limiting access road gradients to reduce run-off-induced erosion.
- Providing adequate linear road drainage based on road width, surface material, compaction, and maintenance.
- Managing culvert and cross drainage to prevent washouts.

Design of structural (slope) stability

- Providing effective short-term measures for slope stabilization, sediment control and subsidence control until long term measures for the operational phase can be implemented.
- Revegetate as quickly as possible.
- Providing adequate drainage systems to minimize and control infiltration.

Managing disturbance to water bodies

- Depending on the potential for adverse impacts, installing free-spanning structures (e.g., single span bridges) for road watercourse crossings.
- Restricting the duration and timing of in-stream activities to lower rain periods, and avoiding periods critical to biological cycles of valued flora and fauna (e.g., migration, spawning, etc.).
- For in-stream works, using isolation techniques such as berming or diversion during construction to limit the exposure of disturbed sediments to moving water.
- Consider using trenchless technology for pipeline crossings (e.g., suspended crossings) or installation by directional drilling.

Any equipment/technology uses that serves as mitigation measures purpose will be maintained accordingly, e.g., maintenance of settlement ponds, etc. The maintenance activity shall be part of the erosion control measures.

10 Monitoring

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

10.1 Management activity monitoring

Each of the mitigation measures that are planned should be monitored 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, as well as early detection of

an increase in erosion rate and increment of pollutant in water bodies. The monitoring plan will be developed based on the mitigation measures that has been set, and will be commensurate with the significance level of impact based on the impact analysis and 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 may relate with sedimentation rate, water quality in of receiving waters, and aquatic habitat in receiving waters, e.g., changes in sedimentation thickness and area, turbidity and TSS of receiving waters, number of plankton/nektons in receiving waters, etc. The parameters to be monitored may also include parameters that stated in the permits, if any. It may also require observational monitoring during peak rain events.

  Monitoring of soil erosion impact at river and lake will cover (but not limited to) analyses of Total Suspended Solid (TSS) and Colour[1] as parameters that are closely associated with soil erosion at water body. For soil erosion impact at sea, turbidity will be added as a monitored parameter. Threshold values of those parameters are regulated in the Government of Indonesia's Regulation No. 22 of 2021: (1) threshold values for four classes[2] of river and lake water are specified in the Appendix VI (see ***Table 1***), while (2) threshold values for seawater are specified in the Appendix VIII (see ***Table 2***).

  Other international standards may be used as reference for monitoring activity as applicable, subject to the availability of data. For example, turbidity threshold value can adopt natural the average background turbidity in the region as used by the United States Environmental Protection Agency (US EPA)[3].

[1] Note that current Indonesian regulations for river and lake water do not specify threshold value for Turbidity as it was specified before in Government Regulation No. 82 of 2001 (which has been obsolete now).

[2] Indonesian regulations provide four classes of river and lake water based on their uses. Thus, any monitoring activity should consider the classes of water in the river or lake. The four classes are:

Class 1	:	water that can be used for drinking, raw material for drinking, and/or other purposes that require the same water quality as these uses.
Class 2	:	water that can be used for infrastructure/facilities, water recreation, freshwater fish farming, "animal husbandry, water for irrigating crops, and/or other purposes that require the same water quality as these uses.
Class 3	:	water that can be used for freshwater fish farming, animal husbandry, water for irrigating crops, and/or other designations that require the same water quality as these uses.
Class 4	:	water that can be used for irrigating crops, and/or other designations that require the same water quality as these uses.

[3] US EPA. (n.d.). SEDIMENT-Related Criteria for Surface Water Quality | US EPA ARCHIVE DOCUMENT. Retrieved from https://archive.epa.gov/epa/sites/production/files/2015-10/documents/sediment-appendix3.pdf

Table 1 Regulatory Threshold for TSS and Colour for River and Lake Water

No.	Parameter	Unit	Class 1	Class 2	Class 3	Class 4	Remarks
A. River Water							
1	Total Suspended Solid (TSS)	mg/L	40	50	100	400	-
2	Colour	Pt-Co Unit	15	50	100	-	Not applicable for peat water
B. Lake Water							
1	Total Suspended Solid (TSS)	mg/L	25	50	100	400	-
2	Colour	Pt-Co Unit	15	50	100	-	Not applicable for peat water

Table 2 Regulatory Threshold for TSS, Colour and Turbidity for Seawater

No.	Parameter	Unit	Port	Marine Tourism	Marine Biota (Ecosystem)
Seawater					
1	Total Suspended Solid (TSS)	mg/L	80	20	Coral: 20 Mangrove: - Seagrass: 20
2	Colour	Pt-Co Unit	-	30	-
3	Turbidity	mg/L	-	5	5

- Baseline
  Before a project is developed, the baseline quality of the receiving water bodies should be undertaken to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-related impacts. Once compared to the applicable standards (compliance to regulatory and/or international standards), the result of monitoring should also be compared to the baseline condition prior the project commencement in order to analyse the project's impact to the receiving water body.

- Monitoring location
  Monitoring of erosion and sediment monitoring is carried out on water bodies, including settlement pond. The location for monitoring needs to take into account the entry point of run-off in the water bodies and the downstream of the water bodies impacted. Wherever practical, baseline monitoring points should be used to enable direct comparison.

- Frequency of inspection and monitoring.

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 magnitude of impact, and more sensitive receptors will require more frequent monitoring, likewise. The frequency of several parameters that are required to be monitored in the permit, if any, must comply with the provisions in the permit, at minimum. Other factors that should be considered in setting the frequency of inspection is the season or precipitation factors. Monitoring during wet season may require a more frequent monitoring based on rain events. Additional monitoring may also be required in the case of a community grievance.

- Sampling and analysis method
  Monitoring programs should apply national or international methods for sample collection and analysis. Sampling should be conducted by, or under, the supervision of suitably qualified individuals from certified laboratories. Analysis should be conducted by entities permitted or certified for this purpose. Sampling and analysis Quality Assurance/Quality Control (QA/QC) plans should be applied and documented to ensure that data quality is adequate for the intended data use (e.g., method detection limits are below levels of concern). Monitoring reports should include QA/QC documentation.

- 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 will determine the minimum required qualifications of persons who will conduct the monitoring and inspection. At some cases, public participation in monitoring can be a requirement or a strategy in a management. If public monitoring determined to be applied, then it should be regulated and the requirements of the public that will participate should be determined.

10.2 Management plan review

The Erosion and Sediment Control Plan (see **Section 11**) is a living document where it shall refer to every project stage. Its target and approach should be able to be reviewed, modified, or renewed as deemed necessary to find the best possible result.

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

- Schedule for regular review. The management plan should be reviewed regularly, depend on the length of the phase where the management plan implemented. If the phase will be more than one year, then the regular review shall be conducted annually in minimum.
- Response to abnormal circumstance such as major storm events or community grievances;
- The parties that responsible for conducting the review, making an amendment, and the party approving the result of the review.

11 Erosion and Sediment Control Plan

The Erosion and Sediment Control Plan should be developed before the construction activities commence and will be implemented throughout each relevant phase. For operational stage, the Plan should be incorporated into the facilities design that fulfil any requirements based on the impact assessment process. The impact assessment process will need to be conducted concurrently with development of Detailed Engineering Design (DED), therefor the results and requirements from the impact assessment process should be incorporated in the DED.

The erosion and sediment control plan for construction or other activities at existing facilities will initially be based on a due diligence assessment that evaluates the potential for erosion and the risks to surface water quality. All plans will also be informed by and based upon the best judgement of qualified professionals and the experience gained from ongoing activities.

In all cases, site-specific engineering and scientific judgement may be used to confirm that standards are sufficient to control erosion. If there are inconsistencies among or between requirements, the plan must adopt the more stringent requirement unless this conflicts with national law, in which case national law applies.

Mitigation measures that are planned are arranged in a management plan for erosion and sediment control. The Plan can be part of the Project's ESMP, or to as a stand-alone document.

The components of Erosion and Sediment Control Plan are described below.

11.1.1 Component 1: *Objectives*

The management plan should state the objectives of implementing erosion and sediment control measures. The main objective is to keep the natural water system quality and the related marine and aquatic ecosystems are in compliance with the applicable national laws and regulations or the international standards, whichever is more stringent and technically feasible to be applied.

By avoiding, if possible, the erosion to occur, or minimize and control erosion and sediment in run-off, it is aimed at reducing the impact on natural water systems and the biological systems associated with them.

11.1.2 Component 2: *Source of impact and impact receptors*

The source of impact is the project's activity that has been identified and assessed in the impact assessment process and the rain events associated with them, where the activity cause erosion to occur and increment of sediment in water run-off, thus control measures are required to be implemented.

In the management plan, the source of impact should be stated, along with the anticipated receptor that will be impacted. This information can be aided by a map showing the source of impact (Project's activities), topography, and water drainage features.

11.1.3 Component 3: *Activities*

For each area that has been identified and assessed that may be susceptible to run-off and erosion, the management plan should describe in detail the specific control measures that are used at the project and its maintenance activity.

For specific project's activity that requires permit for its implementation, any requirements of the permit that related with management effort for the impact cause should be included in the Plan.

The activities planned should be aligned with Wastewater Management Plan (if any) and should consider other plans that are related, such as Land Clearing Plan, Water Management Plan, Biodiversity Management Plan, Occupational Health Safety Management Plan, Community Health Safety and Security Management Plan, Stakeholder Management Plan, etc. Procedures for these activities should be put in place, for instance a procedure for inspecting and maintaining a sediment pond.

The management plan must also require that potentially affected stakeholders to be consulted. The Plan must provide for timely treatment of complaints received through the formal grievance mechanism, including identifying the person or teams responsible for handling such issues

11.1.4 Component 4: *Performance Indicators*

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 are determined shall be measurable, wherever possible to be quantitative in nature and can be measured with applicable tools. In most cases the indicators of success are based on sedimentation rate in water bodies, including settlement pond, or specific water quality parameters (e.g., turbidity, TSS) in water bodies, that are regulated in applicable national laws and/or the international standard, whichever is more stringent and technically feasible to be implemented.

11.1.5 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 Plan must also identify the roles and responsibilities of individual positions within these organization.

The management plan should also identify the person or persons that are responsible to follow up and take action upon grievance related erosion and water quality (in context of the receiving water bodies) that submitted through the formal grievance mechanism. Example: HSE officer of Project Construction Organization.

11.1.6 Component 6: *Implementation Schedule*

The management plan should detail an implementation schedule of management activities, taking into account the planned timing of construction and other project activities, including any permit or license that should be obtain prior activity's commencing.

11.1.7 Component 7: *Cost Estimates*

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

11.1.8 Component 8: *Monitoring, Recordkeeping and Reporting*

The management plan must call for inspection/monitoring of run-off and erosion and sediment control. The management plan should specify:

- The erosion and sediment control activities and locations. In general, this should be the downgradient areas of all sites, all engineered erosion control features, and all drainage on the site.
- Parameters to be monitored;
- Temporary site drainage plans during construction;
- The frequency of inspection and monitoring, including during times of high precipitation;
- Regulatory criteria and any specific requirement imposed on the project by government (as applicable);
- Sampling and analysis method;
- Instruments that will be used for monitoring, including calibration requirements;
- The required qualifications of persons who will conduct the 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.

For Project activities or management activities that require a permit for their implementation, the monitoring plan must also include the requirements in the permit, such as parameters to be monitored, the frequency, etc. The monitoring component is further elaborated in **Section 10** of this guideline.

11.1.9 Component 9: *Management Plan Review*

The Plan should determine and state the schedule of management plan review (see **Section 10.2**). 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

In carrying out erosion and sediment control activities, procedures can be developed as necessary (e.g., construction of settlement ponds, water quality sampling, settlement ponds maintenance, etc.). The procedures required are dependent on the nature of the project and the impact and mitigation measure determined, although some procedures may be more general thus can be used for various project (e.g., water quality sampling procedure).

In general, there are several key items that need to be included in the procedures to be developed 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.
- 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 to be complied.
- 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.

13 References

- Act No. 11 Year 2020 on Omnibus Law
- Government Regulation No. 22 Year 2021 on Implementation of Environmental Protection and Management
- 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 Social Safety (EHS) Guidelines, 2007
- IFC PS 3: Resource Efficiency and Pollution Prevention, 2012
- IFC Guidance Note 3: Resource Efficiency and Pollution Prevention, 2012