VUNG ANG II THERMAL POWER LIMITED LIABILITY COMPANY

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ENVIRONMENTAL IMPACT ASSESSMENT REPORT

For "Vung Ang II BOT Thermal Power Plant Project"

Location: Ky Loi Commune, Ky Trinh Ward, Ky Long Ward, Ky Anh Town, Ha Tinh Province

(The report has been revised and supplemented according to the opinion of the Appraisal Council)

PROJECT OWNER

VUNG ANG II THERMAL POWER LLC

GENERAL DIRECTOR

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GIÁM ĐỐC

Bùi Duy Khánh

Ha Tinh, 7/2024

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A.1.1. General information about the project

In recent years, Vietnam's electricity demand has increased rapidly and is expected to maintain the growth rate in the near future to ensure socio-economic development. The Government has a policy of diversifying electricity investment and trading methods, encouraging many economic sectors to participate, especially investing in the development of power source projects.

Back to the project establishment phase during the period (2011-2020), the National Electricity Development Plan for the period 2011-2020 with a vision to 2030 (Adjusted Electricity Plan VII) was approved by the Prime Minister under Decision No. 428/QD-TTg dated March 18, 2016. Currently, the National Power Development Plan for the period 2021-2030, with a vision towards 2050 (Power Plan VIII), has also been approved by the Prime Minister under Decision No. 500/QD-TTg dated May 15, 2023. Vung Ang II Thermal Power Plant Project with gross capacity of 2x665 MW (net capacity 2x600 MW) is a new construction investment project designed in the Master Plan of Vung Ang Power Center. Vung Ang II Thermal Power Plant is expected to commercially operate the units in 2025 and will be developed in the form of BOT investment by the investor Vung Ang II Thermal Power Company Limited (VAPCO). VAPCO is a LLC established by OneEnergy Asia Limited, VAPCO signed a BOT (Build-Operate-Transfer) contract with the Ministry of Industry and Trade on December 15, 2020.

The Environmental impact assessment Report (EIA) of the Vung Ang II Thermal Power Plant project prepared by VAPCO (1st time) was approved according to Decision No. 40/QD-BTNMT dated January 19, 2011, of Ministry of Natural Resources and Environment. Report on the construction investment project of Vung Ang II Thermal Power Plant in Vung Ang Economic Zone, Ha Tinh province implemented by VAPCO was approved in Decision No. 0538/QD-BCT, of the Ministry of Industry and Trade dated January 28, 2011 on the Approved the Feasibility Study Report of Vung Ang II BOT Thermal Power Plant (1st approval) and approved the 2nd adjustment in Decision No. 664/QD-BCT dated March 24, 2019 and approved the 3rd adjustment in Decision No. Decision No. 131/QD-BCT dated January 30, 2023.

The Environmental impact assessment Report of the Vung Ang II Thermal Power Plant project prepared by VAPCO (2nd time) with the advice of Electricity Consulting Joint Stock Company 1 (PECC1) has been approved according to Decision No. 393/QD-BTNMT dated February 13, 2015, of the Ministry of Natural Resources and Environment. According to Decision No. 393/QD-BTNMT dated February 13, 2015, project items include dredging items and measures to handle dredged materials (dumping at sea, at the location approved by the Provincial People's Committee). Ha Tinh introduced (Document No. 1590/UBND-GT dated April 22, 2014 of the People's Committee of Ha Tinh province on the location of the dredged waste disposal area. However, during the implementation phase, due to difficulties in negotiating the The project contract was with the Government, so the project did not meet the schedule. Decision No. 393/QD-BTNMT on approving the 2015 Environmental impact assessment Report has expired (36 months overdue), Therefore, the Vung Ang II Thermal Power Plant project with a capacity of 2x665MW must re-establish an EIA report according to current legal regulations in 2018.

The 3rd iteration of the project's Environmental impact assessment Report was also approved by the Ministry of Natural Resources and Environment in Decision No. 3055/QD-BTNMT dated October 8, 2018. However, the 3rd Environmental impact assessment Report and Decision No. 3055/QD-BTNMT do not include dredging and treatment of dredged materials (submergence). According to document No. 3709/STNMT -CCBD dated December 19, 2018 of the Department of Natural Resources and Environment of Ha Tinh province, the area expected to sink dredged materials of the project is located in the sea area that is being monitored for future developments. Environmental incidents therefore do not meet the requirements of the Ministry of Natural Resources and Environment and the Ministry of Agriculture and Rural Development. Since the approval of the EIA in 2018, the Project has also made adjustments to the contents related to the project and reported them for review and approval by the Ministry of Natural Resources and Environment, with milestones Adjustment time is as follows:

- On November 28, 2018, the Ministry of Natural Resources and Environment issued document No. 6515/BTNMT-TCMT accordingly approving the plan to upgrade and adjust the project's steam conditions from supercritical to above supercritical, slightly High parameters help increase the efficiency of steam cycles, help reduce fuel consumption, and reduce gas emissions that pollute the environment.

- On January 15, 2020, the Ministry of Natural Resources and Environment issued Decision No. 132/QD-BTNMT thereby approving the change in project scale approved in EIA in 2018, adding the scope of the project. en, the scale and capacity of the project includes one (01) specialized coal import port of 100,000 DWT and dredging of cooling water intake and discharge routes, wharves, wharf areas, turning basins and inlet channels. Specialized coal import port with a total volume of dredged material of 3.4 million m3 (including 2.7 million m3 from dredging wharfs, turning basins, fairways and 0.7 million m3 from water intake and discharge canals cooling). All dredged material is transported and used to: (1) level the main plant area with a volume of about 1.4 million m3; (2) balance excavation to fill the cooling water intake and discharge pipeline with a volume of about 0.3 million m3; (3) leveling the land area of 61.33

hectares in Vung Ang Economic Zone with a volume of about 1.7 million m3 according to the content of Official Dispatch No. 7395/UBND-GT dated November 5, 2019 of the People's Committee Ha Tinh province on approving the location of the dredged material dumping area on land of the Vung Ang II Thermal Power Plant Project.

- On April 1, 2020, the Ministry of Natural Resources and Environment issued document No. 721/BTNMT-TCMT approving the plan:

+ Construction and installation of open coal storage to closed coal storage.

+ Install additional NOx treatment equipment in exhaust gas using selective catalyst (SCR) to ensure NOx concentration in exhaust gas ≤ 300 mg/Nm3

- On July 15, 2021, the Ministry of Natural Resources and Environment issued document No. 3923/BTNMT-TCMT approving the adjustment of the project's dredging and leveling construction plan, which adjusted the main construction method. The work of the project is to use a dredger and only use wire buckets to construct at some locations that create slopes and unfavorable construction locations. Do not use geotextile screens in dredging areas to ensure the safety of maritime operations according to comments from Ha Tinh Maritime Port Authority in Document No. 768/CVHHHT-PC dated June 21, 2021; Adjust the location coordinates of some sampling points according to the location of the dredged material pumping station.

- On November 1, 2021, the Ministry of Natural Resources and Environment issued document No. 6636/BTNMT-TCMT approving the adjustment of water intake pipelines, cooling water discharge, dredged material storage yards and coal loading and unloading equipment. of project. The main adjusted contents include:

+ Adjust the location, scale, and depth of cooling water intake and cooling water discharge pipes of Vung Ang II Thermal Power Plant according to the agreed content in Official Dispatch No. 3969/CHHVN-KHDT dated September 24 2021 of the Vietnam Maritime Administration (pipe size 4.0m × 4.0m; bottom elevation of cooling water intake pipeline -11.4m (nautical chart elevation system) and bottom elevation of water discharge pipeline cooling -17m (Navy altitude system)). Update the coordinates describing the water control points of the pipeline, in which the water area controlling the cooling water intake pipeline is 2.93 hectares and the water area controlling the cooling water discharge pipeline is 7.14 hectares.

+ Adjust and supplement the area of the area using dredged materials for leveling with a total area of 15 hectares (area 1 with 8 hectares and area 2 with 7 hectares) according to the approval of the Area Management Board. Ha Tinh province's economy in Official Dispatch No. 749/KKT-QHXD dated July 30, 2021. Updated layout of dredged material storage area, pumping station site, pipeline route in material storage area dredging and updating the environmental management and monitoring program according to the adjustment of the dredged material storage site. The total area of the dredged material storage area remains unchanged at 61.33 hectares.

+ Adjust and supplement the plan to use screw-type coal loading and unloading equipment (same loading and unloading capacity) as an alternative to bucket-type loading and unloading equipment. The decision to select the coal loading and unloading equipment option at the port is made during the design and construction phase of the Project.

- On November 7, 2022, the Ministry of Natural Resources and Environment issued document No. 4028/BTNMT-TD approving the change in location of the project's dredged material storage yard and ash storage yard. Accordingly:

+ Adjustment of dredged material storage yard: Do not use the 12.63 ha storage area because this is the land area allocated to the Investor of the Cellpin Vines Plant project, using the material storage yard. Dredging in the eastern area of the current dump with an area of 16.63 hectares according to the approval of the Economic Zone Management Board of Ha Tinh province in Official Dispatch No. 1307/KKT-QHXD dated November 16, 2021. As Therefore, the total area of the dredged material storage area has increased to about 4 hectares to meet the capacity to accommodate the volume of dredged material

+ Changing the ash dump with an area of 49.4 hectares in the approved environmental impact assessment report, specifically: Reducing the original ash dump area to about 34.4 hectares and arranging a ash dump with an area of about 15 hectares next to the main Vung Ang II Thermal Power Plant according to the location introduction of the Economic Zone Management Board of Ha Tinh province in Official Dispatch No. 03/KKT-QHXD dated March 4, 2022 and opinions of the People's Committee of Ha Tinh province in Official Dispatch No. 662/UBND-KT1 dated February 14, 2022.

- On June 6, 2023, the Ministry of Natural Resources and Environment issued Document No. 4435/BTNMT-MT regarding the change of construction methods during dredging and the transfer of dredged materials to the storage area of the Vung Ang II Thermal Power Plant Project (based on proposals from Vung Ang II Thermal Power Limited Liability Company in Documents No. VAPCO/VNMA/00832 dated April 5, 2023, and Document No. VAPCO/VNMA/00665 dated December 22, 2022). In the project's construction plan, the proposal includes the use of a Transfer Pit with an area of 6.0 hectares, a bottom depth of approximately -2.0 meters relative to the seabed, and a distance of over 300 meters from the shore, to temporarily receive dredged materials before using dredging vessels to pump them onto the material storage area onshore. In this case, the Company is responsible for conducting an environmental impact assessment for the project's seabed dumping activities as regulated by environmental protection laws; preparing documentation to apply for a Offshore Disposal Permit as stipulated by laws on marine resources, environment, and islands.

- Currently, regarding the project implementation progress, most of the essential components of the Project are being implemented in accordance with the BOT contract schedule signed with the Ministry on December 15, 2020, and the current regulations of Vietnamese law. However, for the dredging items in the inlet area, outlet area, turning basin, and shipping channel, the progress cannot meet the requirements due to discrepancies in the geological characteristics of the seabed during the actual construction process compared to the proposed plans in the previously approved environmental documents, necessitating adjustments to the construction plan to be able to transport materials to the landfill area. However, this adjustment has not been approved by the Ministry of Natural Resources and Environment due to potential risks to the coastal environment compared to the approved environmental impact assessment in 2018.

Based on the topographic survey map and design parameters for the cooling water intake channel, cooling water discharge channel, turning basin, waters in front of the dock, and channel, the total dredging volume is 3,048,317 m^3. As of 31/05/2024, the total volume of dredged material used for filling the foundation for the main plant and placed in the dredged material storage area is 623,234 m^3, leaving 2,425,083 m^3 still to be dredged. Dredging activities in the construction area of the port and the cooling water intake/discharge channel have temporarily ceased to prepare this adjusted EIA report, related to the change in the disposal method of dredged materials from entirely onshore disposal to a combined approach of offshore disposal and onshore disposal to ensure the commercial operation schedule according to the signed BOT contract.

Based on a thorough assessment of the current characteristics of the project's dredged materials, it is found that the composition of the dredged material layer is primarily clay, which poses difficulties in the pumping process to the storage area. VAPCO proposes to implement the method of offshore disposal for 1,761,232 m^3 and onshore disposal for 663,851 m^3. With this plan, including the volume of dredged material used for filling the main plant's foundation and the volume of dredged material brought to the disposal site during the previous phase, the total volume of dredged material brought ashore (including the main plant foundation and the disposal site) is 1,287,085m^3, accounting for 42.22% of the total dredged volume. The volume of dredged material dumped offshore is 1.761.232m^3, accounting for 57,78% of the total dredged volume.

The onshore disposal area has been approved by the People's Committee of Ha Tinh Province according to documents No. 7395/UBND-GT dated November 5, 2019, document No. 749/KKT-QHXD dated July 30, 2021, document No. 1307/KKT-QHXD dated November 16, 2021, and document No. 1144/KKT-QLĐT dated September 27, 2022, from the Ha Tinh Economic Zone Management Board. The proposed offshore disposal area is located offshore of Ky Anh town, covering an area of approximately 200 hectares, about 22-25km northeast of the project site.

Pursuant to the provisions of Decree No. 08/2022/ND-CP dated January 10, 2022 of the Government detailing a number of articles of the Law on Environmental Protection and instructions of the Ministry of Natural Resources and Environment, the project The project belongs to the type of service that has the risk of causing environmental pollution, in order number 9, Appendix III, Decree No. 08/2022/ND-CP- Project with sea dumping activities under the authority of the competent authority. Dumping permits from the Ministry of Natural Resources and Environment are subject to an environmental impact assessment report as prescribed in Point a, Clause 1, Article 30, Law on Environmental Protection. The project belongs to group I, so the agency appraising the environmental impact assessment report is the Ministry of Natural Resources and Environment as prescribed in Point a, Clause 1, Article 35, Law on Environmental Protection.

Project type: Adjusted investment project due to a change in the dredged material handling plan.

A.1.2. The agency or organization with the authority to approve the investment policy (for projects that require an investment policy decision), the feasibility study report, or equivalent documents to the project's feasibility study report.

- The authority responsible for deciding the project's investment policy: Ministry of Industry and Trade

- Agency approving the investment project: Ministry of Industry and Trade (Document No. 131/QĐ-BCT dated January 30, 2023, by the Ministry of Industry and Trade regarding the approval of the Feasibility Study Report (third revision) for the Vung Ang II BOT Thermal Power Plant Project.

A.1.3. The project's compatibility with the national environmental protection planning, regional planning, provincial planning, and legal regulations on environmental protection; The project's relationship with other projects, planning and other relevant legal regulations.

(1) The project's compatibility with the national power development planning

The project investment in Vung Ang II Thermal Power Plant is based on the National Power Development Master Plan for the period 2011-2020, considering up to 2030 (adjusted Power Plan VII), which was approved by the Prime Minister under Decision No. 428/QD-TTg dated March 18, 2016. The project is also included in the list of Power Plan VIII (List of ongoing coal-fired thermal power plants) approved by the Prime Minister under Decision No. 500/QD-TTg dated May 15, 2023, which approves the National Power Development Plan for the period 2021-2030, with a vision towards 2050.

→ ***The project is entirely in line with the national power development plan.***

(2) The project's compatibility with provincial planning and industrial development planning

The provincial planning for Ha Tinh province for the period 2021-2030, with a vision towards 2050, was approved by the Prime Minister under Decision No. 1363/QD-TTg dated November 8, 2022. It outlines the development orientation for key industries of the province, stating: *"Electricity production: Maintain existing power plants; complete Vung Ang II Thermal Power Plant with coal-fired technology; research and deploy construction of power development projects according to the National Power Development Plan for the period 2021-2030, with a vision towards 2050."* The project is also listed in the priority investment projects for the period 2021-2030, with a vision towards 2050, in Appendix XVII, issued under Decision No. 1363/QD-TTg dated November 8, 2022, approving the provincial planning for Ha Tinh province for the period 2021-2030, with a vision towards 2050.

Vung Ang II Thermal Power Plant project is located in Vung Ang Economic Zone, one of five key coastal economic zones. Vung Ang Economic Zone was approved under Decision No. 1076/QD-TTg, of the Prime Minister, dated August 20, 2007 on approving the General Planning for construction of Vung Ang Economic Zone, Ha Tinh province until 2025 (Appendix MD04). Resolution No. 903/NQ-UBTVQH13 of the National Assembly Standing Committee dated April 10, 2015 on adjusting the administrative boundaries of Ky Anh district to establish Ky Anh town and 06 wards of Ky Anh town, Ha Tinh province (Appendix MD05). In the period from 2015 to present, there has been a local adjustment based on the adjustment of the administrative boundaries of Ky Anh district to establish Ky Anh town and 06 wards of Ky Anh town, Ha Tinh province. However, the planning criteria (population size, land, technical infrastructure...) in this local adjustment plan do not change the objectives and nature of the approved Vung Ang Economic Zone. according to Decision No. 1076/QD-TTg, of the Prime Minister, dated August 20, 2007. Vung Ang Economic Zone has an area of about 22,781 hectares including:

- Steel rolling refinery complex;
- Thermal Power Center
- Deep water port;
- Petrochemical refining center;
- Oil storage center;
- And other areas such as tourism, sports, general services...

After 10 years of construction and development, Vung Ang Economic Zone is gradually forming as the industrial, commercial and urban center of the region, and is one of the five key coastal economic zones of the country. To date, Vung Ang Economic Zone has more than 500 operating businesses and about 118 licensed projects, including 69 domestic investment projects with over 48 trillion VND and 49 foreign investment projects with the amount of Capital is about 11.5 billion USD registered capital. Investment projects in Vung Ang Economic Zone focus on areas such as steel rolling industry, seaport, electricity, post-steel industry; production and distribution of petroleum and industrial gas; Hotels, restaurants, shopping centers, offices for rent...

=> The project is entirely compatible with the industrial development orientation in Ha Tinh province.

(3) The project's compatibility with the National Environmental Protection Plan, regional planning, and provincial planning approved by the competent state management authority.

Currently, there is no National Environmental Protection Plan or regional planning approved by the competent authority.

(4) The project's compatibility with Ha Tinh province's environmental protection planning.

The project is fully compatible with the environmental zoning plan of Ha Tinh province for the period 2021-2030, as approved in the provincial planning decision No. 1363/QD-TTg dated November 8, 2022, by the Prime Minister (Appendix XIII). According to this plan, Ha Tinh province is divided into 4 zones: 3 emission-restricted zones and 1 strictly protected zone. The project belongs to sub-zone I.1.4, which is the "Sub-zone of sandbars at Cua Khau and coastal waters of Ky Anh district and Ky Anh town (including Vung Ang Port)."

- The project is planned with centralized wastewater treatment systems, with treated wastewater meeting column B-QCVN 40:2011/BTNMT standards before discharge into the coastal waters; gas emissions meeting QCVN 22:2009/BTNMT – National technical standards on industrial emissions from thermal power plants and QCVN 19:2009/BTNMT - National technical standards on industrial emissions for dust and inorganic substances; it includes locations for storing and plans for transporting and treating solid waste, hazardous waste;

- The project adopts national technical standards issued in 2023 by the Ministry of Natural Resources and Environment, including national technical standards on ambient environmental quality; soil quality; air quality; surface water quality; wastewater quality, etc., to manage and ensure corresponding environmental quality as regulated.

→ The project is entirely compatible with Ha Tinh province's environmental protection planning.

(5) The project's compatibility with the master plan of Ky Anh town, Ha Tinh province

- Until 2035, the project is entirely compatible with the master plan of Ky Anh town, and approved by the Prime Minister under Decision No. 706/QD-TTg dated June 7, 2018.

- The project is entirely compatible with the land use planning for the period 2021-2030 of Ky Anh town, approved under Decision No. 1776/QD-UBND, and the land use plan for the year 2023 approved under Decision No. 522/QD-UBND dated March 10, 2023, by the People's Committee of Ha Tinh province. In the local land use planning maps, the project's plant area is designated as land for energy development (LED).

(6) The project's compatibility with the coastal port planning.

The coal receiving port of Vung Ang II Thermal Power Plant is included in the overall development plan of Vietnam's seaport system for the period 2021-2030, with a vision towards 2050, approved by the Prime Minister under Decision No. 1579/QD-TTg dated September 22, 2021.

The sea area for the construction of offshore structures of the project has also been allocated by the Ministry of Natural Resources and Environment under Decision No. 691/QD-BTNMT dated March 23, 2023.

(7) Relationship of the project with other projects

Currently, projects directly related to the BOT Vung Ang II Thermal Power Plant that have commenced commercial operations include Vung Ang 1 Thermal Power Plant, which is part of the Vung Ang Power Center. Vung Ang 1 Thermal Power Plant, owned independently by Vietnam Oil and Gas Group (100% domestic capital), including port facilities, water intake and discharge systems, differs from Vung Ang II BOT Thermal Power Plant. It has been handed over to the Vietnam Oil and Gas Power Corporation, with the responsibility of management and operation assigned to PetroVietnam Power Corporation Ha Tinh, and its units went into operation on December 1, 2014, and May 2, 2015, respectively.

Vung Ang II Thermal Power PlantVung Ang II Thermal Power PlantVung Ang II Thermal Power PlantEmission parameters of Vung Ang 1 Thermal Power Plant are applied in assessing the cumulative impact between Vung Ang 1 and II Thermal Power Plants. The study of establishing an investment project for Vung Ang II Thermal Power Plant is also consistent with Decision No. 1076/2007/QD-TTg on approving the General Planning for construction of Vung Ang Economic Zone, Ha Tinh province until 2025, issued by the Prime Minister. Government issued on August 20, 2007, as well as in accordance with the Master Plan for Socio-Economic Development of Ky Anh Town and the Master Plan for Socio-Economic Development of Ha Tinh Province to 2020, approximately vision to 2050.

A.2. Legal and technical basis of implementing Environmental impact assessment (EIA)

A.2.1. Legal documents, regulations, standards and technical instructions

a. Relevant legal basis

- Law on Environmental Protection dated November 17, 2020;
- Law on Seas and Islands dated June 25, 2015;
- Electricity Law No. 24/2012/QH13, November 20, 2012;
- Vietnam Maritime Code No. 95/2015/QH13 dated November 25, 2015 of the National Assembly;
- Vietnam Sea Law No. 18/2012/QH13 dated June 21, 2012;
- Law on Water Resources dated June 21, 2012;
- Law on Forestry dated November 15, 2017;
- Law on Biodiversity dated November 13, 2008;
- Law amending and supplementing a number of articles of 37 laws related to planning dated November 20, 2018;
- Construction Law dated June 18, 2014;
- Law amending and supplementing a number of articles of the Construction Law dated June 17, 2020;
- Planning Law dated November 24, 2017;
- Investment Law dated June 17, 2020;
- Law on Public Investment dated June 13, 2019;
- Law amending and supplementing a number of articles of the Law on Public Investment, Law on Investment by Public-Private Partnership, Law on Investment, Law on Housing, Law on Bidding, Law on Electricity, Law on Enterprises, Law on Consumption Tax special admission and Law on enforcement of civil judgments dated January 11, 2022;
- Land Law dated November 29, 2013;
- Law on Fire Prevention and Fighting dated June 29, 2001;
- Law amending and supplementing a number of articles of the Law on Fire Prevention and Fighting dated November 22, 2013;
- Road Traffic Law dated November 13, 2008;
- Law on Natural Disaster Prevention and Control dated June 19, 2013.

b. Documents under the relevant law

- Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing several provisions of the Law on Environmental Protection.
- Decree No. 53/2020/ND-CP dated May 6, 2020, of the Government on environmental protection fees for wastewater.

- Decree No. 45/2022/ND-CP dated July 7, 2022, on administrative penalties in the field of environmental protection.

- Decree No. 02/2023/ND-CP dated February 1, 2023, of the Government detailing the implementation of several provisions of the Law on Water Resources.

- Decree No. 80/2014/ND-CP dated August 6, 2014, of the Government on drainage and wastewater treatment.

- Decree No. 06/2021/ND-CP dated January 26, 2021, of the Government detailing several contents on the management of construction quality and maintenance of construction works.

- Decree No. 08/2021/ND-CP dated January 28, 2021, of the Government on the management of inland waterway activities.

- Decree No. 09/2021/ND-CP dated February 9, 2021, of the Government on the management of construction materials.

- Decree No. 10/2021/ND-CP dated February 9, 2021, of the Government on the management of construction investment costs.

- Decree No. 15/2021/ND-CP dated March 3, 2021, of the Government detailing several contents on the management of construction investment projects.

- Decree No. 11/2021/ND-CP dated February 10, 2021, of the Government on the assignment of specific sea areas to organizations and individuals for marine resource exploitation and use.

- Decree No. 58/2017/ND-CP dated May 10, 2017, of the Government detailing several provisions of the Vietnam Maritime Code on maritime activities management.

- Decree No. 69/2022/ND-CP dated September 23, 2022, of the Government amending and supplementing several decrees related to business activities in the maritime field, effective from October 30, 2022.

- Decree No. 43/2014/ND-CP dated May 15, 2014, of the Government detailing the implementation of several provisions of the 2013 Land Law.

- Decree No. 148/2020/ND-CP dated December 18, 2020, of the Government amending and supplementing several decrees detailing the implementation of the Land Law.

- Decree No. 47/2014/ND-CP dated May 15, 2014, of the Government on compensation, support, and resettlement when the State recovers land.

- Decree No. 01/2017/ND-CP dated January 6, 2017, of the Government amending and supplementing several decrees detailing the implementation of the Land Law.

- Decree No. 31/2021/ND-CP dated March 26, 2021, of the Government detailing and guiding the implementation of several provisions of the Investment Law.

- Decree No. 40/2020/ND-CP dated April 6, 2020, of the Government detailing the implementation of several provisions of the Public Investment Law.

- Decree No. 135/2016/ND-CP dated September 9, 2016, of the Government amending and supplementing several provisions of the decrees on land use fees, land rental, and water surface rental.

- Decree No. 01/2017/ND-CP dated January 6, 2017, of the Government amending and supplementing several decrees detailing the implementation of the Land Law.

- Decree No. 160/2013/ND-CP dated November 12, 2013, of the Government on criteria for identifying species and managing species on the list of endangered, precious, and rare species prioritized for protection.

- Decree No. 06/2019/ND-CP dated January 22, 2019, of the Government on the management of endangered, precious, and rare forest plants and animals and the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

- Decree No. 84/2021/ND-CP dated November 30, 2021, of the Government amending and supplementing several provisions of Decree No. 06/2019/ND-CP dated January 22, 2019, on the management of endangered, precious, and rare forest plants and animals and the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

- Decree No. 83/2017/ND-CP dated July 18, 2017, of the Government on the rescue and salvage activities of the fire prevention and fighting force.

- Decree No. 136/2020/ND-CP dated November 24, 2020, of the Government detailing several provisions and measures for the implementation of the Law on Fire Prevention and Fighting and the Law amending and supplementing several provisions of the Law on Fire Prevention and Fighting.

- Decree No. 46/2012/ND-CP dated May 22, 2012, of the Government amending and supplementing several provisions of Decree No. 35/2003/ND-CP dated April 4, 2003, detailing the implementation of several provisions of the Law on Fire Prevention and Fighting and Decree No. 130/2006/ND-CP dated November 8, 2006, on the compulsory fire and explosion insurance regime.

- Decree No. 79/2014/ND-CP dated July 31, 2014, detailing the implementation of several provisions of the Law on Fire Prevention and Fighting and the law amending and supplementing several provisions of the Law on Fire Prevention and Fighting.

- Directive No. 41/2019/CT-TTg of the Prime Minister on urgent measures to strengthen solid waste management.

- Directive No. 03/CT-TTg dated January 18, 2021, of the Prime Minister on strengthening air pollution control.

- Directive No. 08/CT-TTg dated March 26, 2021, of the Prime Minister on promoting the treatment and use of ash, ash, and gypsum from thermal power plants, chemical plants, and fertilizer plants as raw materials for building materials and construction works.

- Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Minister of Natural Resources and Environment detailing the implementation of several provisions of the Law on Environmental Protection.

- Circular No. 10/2021/TT-BTNMT dated June 30, 2021, of the Ministry of Natural Resources and Environment on environmental monitoring techniques and management of environmental quality monitoring information and data.

- Circular No. 37/2014/TT-BTNMT dated June 30, 2014, of the Ministry of Natural Resources and Environment detailing compensation, support, and resettlement when the State recovers land.

- Circular No. 04/2015/TT-BXD dated April 3, 2015, of the Ministry of Construction guiding the implementation of several provisions of Decree No. 80/2014/ND-CP dated June 8, 2014, on drainage and wastewater treatment.

- Circular No. 08/2017/TT-BXD dated May 16, 2017, of the Ministry of Construction on the management of construction waste.

- Circular No. 02/2018/TT-BXD dated February 6, 2018, of the Ministry of Construction on environmental protection during the construction of works and the reporting regime on environmental protection in the construction sector.

- Circular No. 11/2021/TT-BXD dated August 31, 2021, of the Ministry of Construction on guiding several contents on determining and managing construction investment costs.

- Circular No. 28/2019/TT-BTNMT dated December 31, 2019, "Regulations on technical evaluation of dredged materials and identification of areas for dumping dredged materials in Vietnamese seas."

- Circular No. 23/2022/TT-BTNMT dated December 26, 2022, of the Minister of Natural Resources and Environment amending and supplementing several provisions of Circular No. 28/2019/TT-BTNMT dated December 31, 2019, of the Minister of Natural Resources and Environment on technical evaluation of dredged materials and identification of areas for dumping dredged materials in Vietnamese seas.

- Circular No. 41/2017/TT-BGTVT dated November 14, 2017, of the Ministry of Transport on the management of waste collection and treatment from ships in port waters.

- Circular No. 35/2019/TT-BGTVT dated September 9, 2019, of the Ministry of Transport on dredging activities in port waters.

- Circular No. 27/2021/TT-BGTVT dated November 30, 2021, of the Ministry of Transport amending and supplementing several provisions of Circular No. 35/2019/TT-BGTVT dated September 9, 2019, of the Minister of Transport on dredging activities in port waters and Circular No. 42/2019/TT-BGTVT dated October 30, 2019, of the Minister of Transport on criteria, inspection, monitoring, evaluation, and acceptance of the quality of public service activities ensuring maritime safety.

- Circular No. 42/2021/TT-BGTVT dated December 31, 2021, of the Ministry of Transport on controlling and ensuring safe navigation and preventing collisions and congestion in inland waterways.

- Circular No. 34/2020/TT-BGTVT dated December 23, 2020, of the Ministry of Transport amending and supplementing several provisions of the Circulars on the periodic reporting regime in the maritime field.

- Circular No. 49/2013/TT-BGTVT dated December 6, 2013, of the Ministry of Transport announcing the waters of Ha Tinh province's ports and the management areas of Ha Tinh Maritime Administration.

- Circular No. 12/2021/TT-BXD dated August 31, 2021, of the Ministry of Construction promulgating construction norms.

- Circular No. 04/2017/TT-BXD dated March 30, 2017, of the Ministry of Construction on the management of occupational safety in construction works.

- Decision No. 500/QD-TTg dated May 15, 2023, of the Prime Minister approving the national electricity development plan for the period 2021-2030, with a vision to 2050 (Power Plan VIII).

- Decision No. 1363/QD-TTg dated November 6, 2022, of the Prime Minister approving the planning of Ha Tinh province for the period 2021-2030, with a vision to 2050.

- Decision No. 706/QD-TTg dated June 7, 2018, of the Prime Minister approving the general planning of Ky Anh town, Ha Tinh province, until 2035.

- Decision No. 1579/QD-TTg dated September 22, 2021, of the Prime Minister approving the master plan for the development of Vietnam's seaport system for the period 2021-2030, with a vision to 2050.

- Decision No. 958a/QD-TTg dated June 1, 2016, of the Prime Minister on the national action plan for air quality management until 2020, with a vision to 2025.

- Decision No. 09/2020/QD-TTg dated March 18, 2020, of the Prime Minister on the response regulation for waste incidents.

- Decision No. 1076/QD-TTg dated August 20, 2007, of the Prime Minister approving the planning for the construction of Vung Ang economic zone, Ha Tinh province, until 2025.

- Decision No. 2368/QD-BGTVT dated July 29, 2016, of the Minister of Transport approving the detailed planning of the North Central Coast seaport group (group 2) for the period until 2020, with orientation to 2030.

- Decision No. 251/QD-CHHVN dated April 10, 2015, of the Vietnam Maritime Administration approving the establishment of channels, pilot boarding areas, quarantine areas in Vung Ang; establishing pilot boarding areas, quarantine areas, and anchorage areas in Son Duong port.

- Decision No. 2495/QD-BGTVT dated June 30, 2014, of the Ministry of Transport announcing the coastal transport route from Quang Ninh to Quang Binh.

- Decision No. 1776/QD-UBND dated August 26, 2022, of the People's Committee of Ha Tinh province approving the land use plan for the period 2021-2030 of Ky Anh town, Ha Tinh province.

- Decision No. 522/QD-UBND dated March 10, 2023, of the People's Committee of Ha Tinh province approving the land use plan for 2023 of Ky Anh town, Ha Tinh province.

c. National Standards and Technical Regulations on Environment

- QCVN 08:2023/BTNMT - National Technical Regulation on Surface Water Quality.

- QCVN 03:2023/BTNMT - National Technical Regulation on Soil Quality.

- QCVN 43:2017/BTNMT - National Technical Regulation on Sediment Quality.

- QCVN 14:2008/BTNMT - National Technical Regulation on Domestic Wastewater.

- QCVN 40:2011/BTNMT - National Technical Regulation on Industrial Wastewater.

- QCVN 09:2023/BTNMT - National Technical Regulation on Groundwater Quality.

- QCVN 10:2023/BTNMT - National Technical Regulation on Marine Water Quality.

- QCVN 05:2023/BTNMT - National Technical Regulation on Ambient Air Quality.

- QCVN 19:2009/BTNMT - National Technical Regulation on Industrial Emissions for Inorganic Substances and Dust.

- QCVN 22:2009/BTNMT - National Technical Regulation on Industrial Emissions for Thermal Power Plants.

- Sulphite standards in industrial wastewater referencing some European countries.

- QCVN 26:2010/BTNMT - National Technical Regulation on Noise.

- QCVN 27:2010/BTNMT - National Technical Regulation on Vibration.

- QCVN 07:2009/BTNMT - National Technical Regulation on Hazardous Waste Thresholds.

- TCVN 6707:2009 - National Standard on Hazardous Waste - Warning Signs and Prevention.

- TCVN 6705:2009 - National Standard on Common Solid Waste - Classification.

- QCXDVN 01:2021/BXD - National Technical Regulation on Construction Planning.

- TCVN 4054-2005 - Road Design Requirements.

- TCVN 8700:2011 - Requirements for Drains, Tanks, Pits, Technical Trenches, and Cable Cabinets for Telecommunications.

- TCVN 8699:2011 - Technical Requirements for Plastic Pipes used in Underground Cable Routes for Telecommunications Networks.

- TCVN 11820-5:2021 - Port Structures - Design Requirements - Part 5: Berths.

- TCVN 11820-9:2023 - Port Structures - Design Requirements - Part 9: Dredging and Reclamation.

- TCVN 13606:2023 - Water Supply - Network of Pipes and Structures - Design Requirements.

- TCVN 7957:2023 - Drainage - Network and External Structures - Design Standards.

A.2.2. Legal documents, decisions, or written opinions from competent authorities related to the project.

a. Legal documents related to investment activities, specialized design appraisal of the project

- Decision No. 2582/QD-BCN dated September 20, 2006, of the Ministry of Industry approving the Master Plan for Vung Ang Power Center.

- Document No. 1266/VPVP-KTN dated March 2, 2009, from the Government on the development of the Vung Ang 2 Thermal Power Project in the form of BOT.

- Document No. 9749/BCT-NL dated September 24, 2009, from the Ministry of Industry and Trade on the adjustment of the Connection Plan for Vung Ang Power Center.

- Document No. 1097/QD-BCT dated March 4, 2010, from the Ministry of Industry and Trade approving the adjusted Connection Plan for Vung Ang Power Center to the national power system.

- Document No. 2195/BGTVT-KHDT dated April 7, 2010, from the Ministry of Transport on supplementing the specialized port planning for coal import serving Vung Ang II Thermal Power Plant.

- BOT Build-Operate-Transfer Contract signed on December 15, 2020, between the Ministry of Industry and Trade and Vung Ang II Thermal Power Co., Ltd.

- Decision No. 0538/QD-BCT dated January 28, 2011, from the Ministry of Industry and Trade approving the feasibility study report for the project investment.

- Decision No. 664/QD-BCT dated March 21, 2019, from the Ministry of Industry and Trade approving the adjustment of the feasibility study report for the Vung Ang II BOT Thermal Power Plant project.

- Document No. 463/DL-ND&DHN dated April 9, 2021, from the Electricity and Renewable Energy Authority – Ministry of Industry and Trade appraising and notifying the appraisal results of the Technical Design of the Vung Ang II BOT Thermal Power Plant project.

- Document No. 3969/CHHVN-KHDT dated September 24, 2021, from the Vietnam Maritime Administration regarding the location of the cooling water intake pipe, the cooling water discharge pipe of Vung Ang II Thermal Power Plant, and the extended cooling water discharge pipe of Vung Ang 1 Thermal Power Plant.

- Decision No. 2545/QD-BCT dated November 28, 2022, approving the adjustment of the General Layout of Vung Ang Power Center (adjustment of the ash disposal site location and land occupation scope of the Vung Ang II BOT Thermal Power Plant project).

- Decision No. 131/QD-BCT dated January 30, 2023, from the Ministry of Industry and Trade approving the feasibility study report (3rd time) for the Vung Ang II BOT Thermal Power Plant project.

- Decision No. 691/QD-BTNMT dated March 23, 2023, from the Ministry of Natural Resources and Environment on the allocation of marine areas.

- Document No. 416/DL-ND&DHN dated March 14, 2023, from the Electricity and Renewable Energy Authority – Ministry of Industry and Trade appraising and notifying the appraisal results of the Vung Ang II BOT Thermal Power Plant project.

- Document No. 539/PCCC&CNCH-P4 dated March 17, 2021, from the Fire and Rescue Police Department providing comments on fire prevention and firefighting for the basic design dossier.

b. Legal documents related to the environmental procedures of the project

- Decision No. 40/QD-BTNMT dated January 19, 2011, by the Ministry of Natural Resources and Environment approving the Environmental Impact Assessment Report for the "Vung Ang II Thermal Power Plant Project with a capacity of 2x660MW".

- Decision No. 393/QD-BTNMT dated February 13, 2015, by the Ministry of Natural Resources and Environment approving the Environmental Impact Assessment Report for the "Vung Ang II Thermal Power Plant Project" in Ha Tinh Province.

- Decision No. 3055/QD-BTNMT dated October 8, 2018, by the Ministry of Natural Resources and Environment approving the Environmental Impact Assessment Report for the "Vung Ang II Thermal Power Plant Project" in Ha Tinh Province (3rd time).

- Document No. 6515/BTNMT-TCMT dated November 28, 2018, by the Ministry of Natural Resources and Environment approving the plan to upgrade and adjust the steam conditions of the project from supercritical to ultra-supercritical.

- Decision No. 132/QD-BTNMT dated January 15, 2020, by the Ministry of Natural Resources and Environment approving the adjustment of the contents of the Environmental Impact Assessment Report approval decision.

- Document No. 1721/BTNMT-TCMT dated April 1, 2020, by the Ministry of Natural Resources and Environment approving the installation of enclosed coal storage and additional NOx treatment equipment in the project's emissions.

- Document No. 3923/BTNMT-TCMT dated July 15, 2021, by the Ministry of Natural Resources and Environment approving the adjustment of the dredging and land reclamation plan of the project.

- Document No. 6636/BTNMT-TCMT dated November 1, 2021, by the Ministry of Natural Resources and Environment approving the adjustment of the cooling water intake and discharge pipelines, dredged material storage yard, and coal unloading equipment of the project.

- Document No. 4028/BTNMT-TD dated November 7, 2022, by the Ministry of Natural Resources and Environment approving the change in the location of the dredged material storage yard and ash storage yard of the project.

- Legal documents related to changes in the dredged material treatment plan:

+ Document No. 2062/BTNMT-MT dated March 28, 2023, by the Ministry of Natural Resources and Environment clarifying the dredging construction method and dredged material storage yard of the Vung Ang II Thermal Power Plant Project in Ha Tinh Province.

+ Document No. 4435/BTNMT-TD dated June 16, 2023, by the Ministry of Natural Resources and Environment on changing the construction method of the dredging process and transferring the dredged material to the storage yard of the Vung Ang II Thermal Power Plant Project.

+ Document No. 3610/STNMT-TNN&BD dated September 5, 2023, by the Department of Natural Resources and Environment of Ha Tinh Province reporting the results of the proposal by Vung Ang II Thermal Power Co., Ltd. to survey the dumping site location at sea for the Vung Ang II Thermal Power Plant project.

+ Document No. 2235/SGTVT-QLCL dated September 26, 2023, by the Department of Transport of Ha Tinh Province reporting the plan for treating dredged material from Vung Ang II Thermal Power Plant for land reclamation in Vung Ang Economic Zone.

+ Document No. 5584/SGTVT-TNN&BD dated December 29, 2023, by the Department of Transport of Ha Tinh Province reporting the plan for treating dredged material from Vung Ang II Thermal Power Plant.

c. Documents and minutes on land handover for construction of project items

- Land handover minutes for the main plant area on August 18, 2021.

- Document No. 03/KKT-QHXD dated March 4, 2022, by the Ha Tinh Provincial Economic Zone Management Board introducing the location of the ash storage yard for the Vung Ang II Thermal Power Plant project.

- Land handover minutes for the ash storage yard phase 1 (first batch) on June 15, 2023.

- Land handover minutes for the ash storage yard phase 1 (entire 15ha area) on September 26, 2023.

- Document No. 1190/KKT-QHXD dated October 5, 2022, on approving the adjustment of the layout for the ash storage yard of the Vung Ang II Thermal Power Plant project.

- Land handover minutes for the area for constructing the cooling water system, pump station, and jetty on September 6, 2021.

- Land handover minutes for the area for constructing the cooling water system, pump station, and jetty (second batch) on November 18, 2021.

- Land handover minutes for the area for constructing the cooling water system, pump station, and jetty (third batch) on May 20, 2022.

- Land handover minutes for the Laydown area No. 1 on September 22, 2021.

- Land handover minutes for the Laydown area No. 2 on November 24, 2021.

- Land handover minutes for the area for constructing the access road to the plant on August 31, 2021.

- Land handover minutes for the area for organic material disposal on May 17, 2021.

- Document No. 749/KKT-QHXD dated July 30, 2021, by the Economic Zone Management Board on approving the addition of the area for seabed dredged material disposal during the implementation of the Vung Ang II Thermal Power Plant project.

- Land handover minutes for the seabed dredged material disposal area on September 30, 2021 (61.33ha area).

- Document No. 1307/KKT-QHXD dated November 16, 2021, by the Economic Zone Management Board on approving the addition of the area for seabed dredged material disposal during the implementation of the Vung Ang II Thermal Power Plant project.

- Land handover minutes for the seabed dredged material disposal area on May 23, 2022 (16.63ha area).

- Document No. 1144/KKT-QLDT dated September 27, 2022, by the Ha Tinh Provincial Economic Zone Management Board on the approved seabed dredged material disposal area during the implementation of the Vung Ang II Thermal Power Plant project.

- Document No. 1007/KKT-QHXHD dated December 11, 2018, on agreeing on the position, scope, and route direction for constructing the ash disposal pipeline for the Vung Ang II Thermal Power Plant project.

d. Documents related to the shipping route, coal import port of the project

- Decision No. 1579/QD-TTg dated September 22, 2021 of the Prime Minister approving the overall plan for the development of the Vietnamese seaport system for the period 2021 - 2030, with a vision to 2050.

- Decision No. 251/QD-CHHVN dated April 10, 2015 of the Vietnam Maritime Administration approving the establishment of shipping routes, pilotage areas, and inspection areas in the Vung Ang region.

- Decision No. 691/QD-BTNMT dated March 23, 2023 of the Ministry of Natural Resources and Environment on the allocation of marine areas.

- Document No. 12823/BGTVT-KHĐT dated November 13, 2023 from the Ministry of Transport regarding the proposal for investment in dredging the shipping route to the port of the Vung Ang II Thermal Power Plant Project.

- Document No. 3550/BGTVT-KHĐT dated April 3, 2024 from the Ministry of Transport concerning the agreement on upgrading the shipping route to the port of the Vung Ang II Thermal Power Plant Project;

e. Legal documents related to the officer and worker housing area

- Decision No. 638/QD-UBND dated March 2, 2018, approving the adjustment project of the detailed construction planning at a scale of 1/500 for The officer and worker housing area, operation and maintenance of the Vung Ang II Thermal Power Plant in Ky Long Ward, Ky Anh town.

- Document No. 298/SXD-KTQH dated June 4, 2018, of the Department of Construction of Ha Tinh province announcing the result of the appraisal of the project's foundation design for officer and worker housing at the Vung Ang II Thermal Power Plant.

- Decision No. 3934/QD-UBND dated December 27, 2018, of the Ha Tinh Provincial People's Committee approving the Environmental Impact Assessment (EIA) report of the project "Officer and Worker Housing Area, Vung Ang II Thermal Power Plant" in Ky Long Ward, Ky Anh town.

- Environmental Permit No. 2761/GPMT dated October 24, 2023, issued by the Ha Tinh Provincial People's Committee for the officer residential project.

f. Other documents related to the project

- License for exploitation and use of seawater No. 53/GP-BTNMT dated February 16, 2024, issued by the Ministry of Natural Resources and Environment.

- Contract No. VA2-AD-2022-003 dated May 3, 2022, for the collection, transportation, and treatment of domestic waste and certain types of industrial and hazardous waste.

- Contract No. VA2-AD-2022-002 dated April 26, 2022, for the collection and transportation of hazardous waste.***;***

A.2.3. Documents and information created by the project owner are utilized during the implementation process of EIA.

- Feasibility study report adjustment for the Project.

- Infrastructure design explanation, technical design explanation of the Project.

- Documents, data regarding geographical location, meteorology, hydrology, infrastructure, socio-economic situation in the project implementation area.

- Current environmental documents, socio-economic conditions in the project area conducted by CEC Construction Investment and Environmental Safety Joint Stock Company.

- Design drawings of infrastructure, related overall planning of the Project.

A.3. Organization of implementing Environmental Impact Assessment Report

The Environmental Impact Assessment Report of the project 'Vung Ang II BOT Thermal Power Plant' is conducted by the project owner, Vung Ang II Thermal Power Limited Liability Company, in collaboration with the consulting consortium including Phuoc Dat Environmental Technology Limited Liability Company and CEC Construction Investment and Environmental Safety Joint Stock Company.

Details on organizations of implementing report is as follow:

A.3.1. Project Owner

- Project Investor: Vung Ang II Thermal Power Limited Liability Company (VAPCO), a limited liability company established by OneEnergy Asia Limited.

- Project Owner's Name: Vung Ang II Thermal Power Limited Liability Company

- Project Owner's Representative: Mr. Go Fukushima – General Director

- Address: Vung Ang Economic Zone - Ky Anh District - Ha Tinh Province

- Hanoi Office: R3011, 30th floor, West Tower, Lotte Center, 54 Lieu Giai street, Ba Dinh district, Hanoi Vietnam.

- Phone Number: +84 24 71098799

- Fax Number: +84 24 3624 8485

- E-mail: go.fukushima@vapco.com.vn

A.3.2. Consulting unit

1. ***First member of the consortium: CEC Construction Investment and Environmental Safety Joint Stock Company***

- Address: Lot B10/D7 New Urban Area Cau Giay, Dich Vong Ward, Cau Giay District, Hanoi

- Representative: Mr. Hoang Sy Tuan - Position: General Director

- Tax code: 0109765744

2. Second member of the consortium: Phuoc Dat Environmental Technology Limited Liability Company

- Company Name: Phuoc Dat Environmental Technology Limited Liability Company

- Representative: Mr. Bui Duy Khanh - Position: Director

- Contact Address: 4th Floor, 204 Hoang Ngan Street, Trung Hoa Ward, Cau Giay District, Hanoi City, Vietnam

- Phone: 024.22623777

A.3.3. Implementation Sequence

Step 1: Prepare and approve the detailed outline of the report

Step 2: Review existing documents

Investment project documents for construction, including the feasibility study report and basic design documents.

Related documents and information collected.

Results of geological survey drilling.

Step 3: Collect data, conduct field surveys, measurements, and analysis

Gather data on natural, economic, and social conditions, and biodiversity in the project area and surrounding areas in Ky Loi commune, Ky Trinh ward, and Ky Long ward in Ky Anh town.

Use laboratory equipment, survey measurements, sample collection, and environmental status analysis in the project area.

Step 4: Data analysis, report writing

Analyze and process data on the environmental status of the project area.

Based on the data received, identify and forecast pollution levels, and propose measures to mitigate adverse environmental impacts.

Compile data and draft the report.

Submit the draft report for consultation with relevant organizations and individuals through the Ministry of Natural Resources and Environment's electronic portal, revise and finalize the report based on feedback.

Submit the Environmental Impact Assessment (EIA) report for approval to the competent authority as required.

(The list of individuals involved in preparing the Environmental Impact Assessment Report for the Vung Ang II BOT Thermal Power Plant Project is attached at the end of the report).

A.4. Methods of Environmental Impact Assessment

A.4.1. Methods of EIA

a. Rapid assessment method

This method is used to quickly determine the load, concentration of pollutants in exhaust gases, wastewater, noise levels, vibrations, solid waste, and hazardous waste generated from the project activities. The calculation of pollutant load is based on pollution coefficients. This method is applied in Chapter 3 of the report.

b. Modeling method

The Sutton model is used to calculate and forecast the concentration of pollutants generated from traffic activities to determine the average concentration of particulate pollutants emitted from dust sources. The Gifford & Hanna model is used to determine the average concentration of pollutants emitted during the construction phase of the Project. This modeling method is used in Chapter 3 of the report

This modeling method is applied in Chapter 3 of the report to calculate and forecast the levels of pollutants generated, and their dispersion, forming the basis for impact assessment and proposing mitigation measures. The models used include the Mike 21/3 Coupled model, the Sutton model, and the Gifford & Hanna model.

A.4.2. Other methods

a. Statistical method

This method is used in processing data from the preliminary environmental assessment to identify the characteristics of the environmental resource data series through: investigation, survey, field sampling, and laboratory sample analysis. It helps determine parameters about the current state of air, water, soil quality, and noise levels. These are then compared with mandatory environmental standards and regulations issued by the Ministry of Natural Resources and Environment and other related departments. This method is primarily used in Chapter 2 of the report.

b. Comparative method

As per the General Guidelines on conducting EIA for investment projects, by the General Department of Environment, Hanoi December 2010. This method is "used to assess the level of impact based on calculated data compared with national technical standards and regulations on the environment". This is an indispensable method in EIA, widely used around the world**.**

- Typically, this method is approached in two ways:

+ Comparing with values specified in the set standards.

+ Comparing with actual measurement data from similar projects.

The method applied to assess the pollution concentration is based on the Vietnamese Environmental Standards and Regulations (chapters 2, 3).

c. Investigation, data collection and field survey method

Before proceeding with project implementation, the Project Owner chaired a site investigation and survey to identify the sensitive objects surrounding the area, susceptible to impacts during the construction and operation phases of the Project.

Simultaneously, during the investigation and survey process, the environmental sampling locations were identified as the basis for measuring background environmental parameters.

Additionally, the current conditions of the project implementation area were surveyed regarding land, vegetation, biodiversity, infrastructure facilities, climate conditions, and preliminary assessment of baseline environmental quality. This method is primarily used in Chapters 1 and 2 of the report.

d. The method of analysis and data processing in the laboratory

During the site investigation and survey, environmental parameters such as air, soil, and water were sampled and measured. The sampling and measurement processes strictly adhered to current regulations. The consulting firm responsible for environmental sampling and analysis is a member of Technical Resources and Environment Limited Liability Company, authorized by the Ministry of Natural Resources and Environment with license number vimcert 208 to provide environmental monitoring services.

Based on the analysis results, assessments and evaluations of the baseline environmental quality of the area were made to propose corresponding solutions for the construction and operation phases of the Project. The section presenting the results of the current environmental analysis of the area is detailed in Chapter 2, with assessments and corresponding mitigation strategies outlined in Chapter 3 of the report.

e. *The method of inheritance and document synthesis*

This method is indispensable in environmental impact assessment work in particular and scientific research in general.

- Inheriting the assessment and data from EIA 2015 and 2018 remains relevant up to the present time because it allows to build upon previous achievements while minimizing shortcomings and aligning with the project's current information and data for the 2023 EIA report.

- Referring to specialized documents, especially those related to the Project, plays a crucial role in identifying and analyzing impacts associated with the activities of Project; Project-based design documents have been reviewed in 2011, 2019, 2020, and 2023, and technical designs were reviewed in 2021 and 2023.

Furthermore, forecasting the impacts of construction and operation activities of the Vung Ang II BOT Thermal Power Plant is based on global documents and experiences, considering the nature of the Project's activities. The forecasting method is developed by a preliminary assessment of the Project's impacts on the natural environment and socio-economic aspects.

- Inheriting the environmental impact assessment documents from the water cooling process using the GEMSS model conducted in the 2018 EIA report, which was previously approved.

- Inheriting the environmental impact assessment documents from the water cooling process using the Delft3D-Flow hydraulic model conducted by the European consulting firm Deltares in 2019

f. Community consultation method

Using this approach when working with leaders and representatives of the community in Ky Loi commune, Ky Long ward, and Ky Trinh ward, who are potentially affected by the project, aims to: Provide the community with the necessary information to understand the project, its negative impacts, and corresponding mitigation measures; inform the community about the benefits of implementing the project; listen to feedback from affected individuals and local authorities in the project area; adjust the EIA report based on community contributions and feedback to align with local realities.

g. The method of creating a listing table

This involves establishing a representation of the relationship between the project's impacts and environmental parameters susceptible to these impacts. The goal is to identify environmental impacts qualitatively, discerning how different factors during the project's construction and operation phases affect the environment. Specifically, this includes tables listing impact source assessments and affected entities during the construction and operational stages, detailed in Chapter 3 of the report.

A.5. Summary of the Environmental Impact Assessment Report

A.5.1. Project information

A.5.1.1. General infomation

- Project Name: Vung Ang II BOT Thermal Power Plant

- Scope of assessment in this EIA report includes changes in the dredging material handling construction method.

- Project Location: Ky Loi Commune, Ky Anh Town, Ha Tinh Province

- Project Owner: Vung Ang II Thermal Power Limited Liability Company

The project completed legal procedures, fulfilled financial obligations, and began implementing construction works in 2021. To date, basic construction work has been completed. Currently, the project is stuck in finding solutions for handling dredged materials for the ship channel, and cooling water intake and discharge channels. Although the project owner has made significant efforts to implement the approved solutions, the actual construction results were not as expected, seriously affecting the commercial power generation schedule.

To find a solution, from August 2022 to now, the project owner has sent numerous reports and worked with relevant authorities at various levels, from local to central, from the commune level to the Government Office.

In Ha Tinh province, regarding the request for approval of the policy on the dumping location as a basis for researching solutions, there have been three departmental meetings, two committee meetings, and one specific field inspection (the Department of Natural Resources and Environment was assigned by the People's Committee to chair the first meeting with the content of assessing the environmental impact of the dumping area; the Department of Transport was assigned to chair the second meeting with the content of reviewing technical solutions to bring dredged materials ashore; the Department of Construction was assigned to chair the third meeting with the content of reviewing the material composition and the possibility of utilizing dredged materials for land filling) and a field inspection led by the Department of Transport. After the meetings and field inspections, the Provincial People's Committee organized a direct dialogue with the investor; however, the project owner has not received a consensual response for the dumping area as a basis for the next steps.

At the Ministry of Natural Resources and Environment, the project owner has sent one document requesting approval to adjust the construction solution using a transfer pit to bring dredged materials ashore, submitted two sets of interagency documents requesting adjustment of the dredged material handling plan, and also underwent two council meetings; one meeting to find solutions and two field inspections.

With the guidance of Ministries, Sectors, and local authorities, in this report, the project owner has reviewed and evaluated the solutions for handling dredged materials with full legal bases, calculated the socio-economic efficiency of the options, and proposed the optimal solution of offshore disposal 1,761,232 m^3 and bringing 663,851 m^3 to a storage site to meet the local land reclamation material needs and the commercial power generation schedule for the Ministry of Natural Resources and Environment to consider and approve.

A.5.1.2. Scope, scale, capacity

* Scope and activities of the project in various stages

The scope of the Environmental Impact Assessment (EIA) report for the "Vung Ang II BOT Thermal Power Plant" project includes two stages:

- Construction Stage:

+ Continue constructing the main plant components as approved in the 2018 EIA report and subsequent adjustment documents.

+ Dredging activities in the intake and discharge channels for cooling water, the turning basin, the area in front of the berth, and the maritime channel; transporting dredged materials for offshore disposal and bring ashore.

- Operation Stage: Operate the entire thermal power plant with 2 units and accompanying auxiliary structures.

The scope of the EIA report does not include environmental impact assessments for the components approved in the 2018 EIA report and previous adjustment documents.

- Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report of "Vung Ang II Thermal Power Plant" in Ha Tinh province (3rd revision).

- Decision No. 132/QD-BTNMT dated January 15, 2020, approving the amendment to the content of the EIA report of the project.

Additionally, after the 2018 EIA approval, the project also made adjustments to some project-related content and reported them for consideration and approval by MONRE in the following documents:

- Document No. 6515/BTNMT-TCMT dated November 28, 2018, approving the upgrade plan to adjust the steam conditions of the project from supercritical to ultra-supercritical.

- Document No. 1721/BTNMT-TCMT dated April 1, 2020, approving the installation of enclosed coal storage and additional NOx treatment equipment in the exhaust gas of the Project.

- Document No. 3923/BTNMT-TCMT dated July 15, 2021, approving the adjustment of the dredging and backfilling plan of the project.

- Document No. 6636/BTNMT-TCMT dated November 1, 2021, approving the adjustment of the water intake pipeline, discharge water, dredging material storage area, and coal handling equipment of the project.

- Document No. 4028/BTNMT-TD dated November 7, 2022, approving the change in location of the dredging material storage and ash storage areas of the project.

* Project Scale

- Electricity Generation Capacity: gross capacity: 2 x 665 MW, net capacity: 2 x 600 MW

- Land use scale: total area of land, water surface land, and sea area is approximately 499.56 hectares.

+ Land use area, water surface land is approximately 192.13 hectares.

+ Sea area is approximately 307.43 hectares.

* Technology and Project Type

- Type: Group A project, first-class energy industry facility

- Technology: Generating electricity by burning coal to heat the boiler with ultra-supercritical technology.

A.5.1.4.3. The components and operation of the project

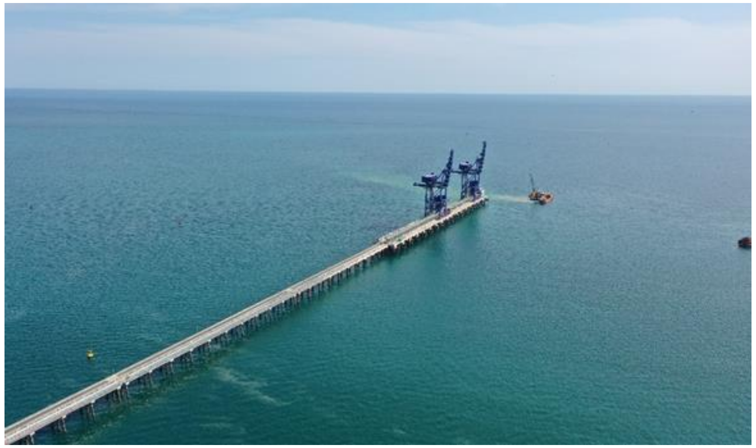
The progress of implementing these components is summarized in the table below:

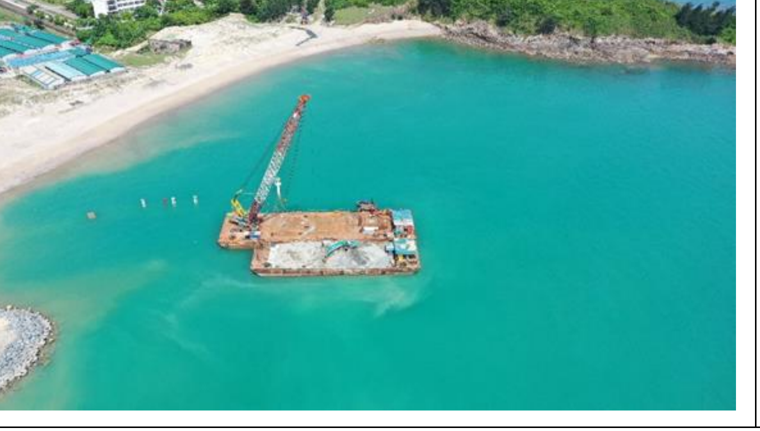
Table A.1 Project components

No.	Project Components	Updated progress to May 31, 2024	Scope of implementation in the adjusted EIA Report
1	The components within the main plant area are arranged as follows: - The main plant area includes the turbine generator building, boiler area, electrostatic precipitator, SWFGD, and chimney, which are situated in the central part of the plant site. - The coal storage area, comprising two rows of warehouses, is located to the west of the plant. - The switchyard is located to the south of the plant (outside the main plant boundary), adjacent to a hill, and includes a 500kV power switchyard. - Auxiliary facilities, including the water treatment area, wastewater treatment area, oil storage, mechanical repair workshop, etc., are located to the east and north of the plant. - The office and administrative buildings are situated to the southwest of the plant.		As of May 31, 2024, this component has been completed 77.73% according to Decision No. 3055/QD-BTNMT dated October 8, 2018, and Decision No. 132/QD-BTNMT dated January 15, 2020, which approved the EIA report. Therefore, **it will not be assessed in this report.**

No.	Project Components	Updated progress to May 31, 2024	Scope of implementation in the adjusted EIA Report
	- Infrastructure items include roads, stormwater drainage systems, lighting, greenery, and landscaping within the plant area. - Other components		
2	Staff and Worker Housing for Vung Ang II Thermal Power Plant (*According to Decision No. 3055/QD-BTNMT dated October 8, 2018, by the Ministry of Natural Resources and Environment approving the Environmental Impact Assessment (EIA) report for the "Vung Ang II Thermal Power Plant" project, the housing for operation management staff was not included.* *However, according to the Environmental Protection Law 2020, each investment project should prepare a single EIA report; therefore, the project owner has updated this in the current EIA.)*		As of 31/05/2024, this component has been put into use and has been approved with environmental permit number: 2716/GPMT dated 24/10/2023 by the People's Committee of Ha Tinh province; therefore, it is Not assessed in this Report.

No.	Project Components	Updated progress to May 31, 2024	Scope of implementation in the adjusted EIA Report
3	Cooling water system, pumping station, and inland wharf		As of May 31, 2024, this component has been completed 90.53% according to Decision No. 3055/QD-BTNMT dated October 8, 2018, and Decision No. 132/QD-BTNMT dated January 15, 2020, which approved the EIA report. Therefore, **it will not be assessed in this report.**

No.	Project Components	Updated progress to May 31, 2024	Scope of implementation in the adjusted EIA Report
4.	Offshore Coal Conveyor, Port System and other offshore facilities		As of May 31, 2024, this component has been completed 81.52% according to Decision No. 3055/QD-BTNMT dated October 8, 2018, and Decision No. 132/QD-BTNMT dated January 15, 2020, which approved the EIA report. Therefore, **it will not be assessed in this report.**

No.	Project Components	Updated progress to May 31, 2024	Scope of implementation in the adjusted EIA Report
5	Dredging and bringing ashore of 663,851 m3 of dredged materials.		The assessment of issues related to dredging activities and bring dredged materials to shore. This ***will be presented in detail in this Report.***
6	Dredging and offshore dumping of 1,761,232 m3 of dredged materials.		The assessment of issues related to dredging activities and bring dredged materials to shore. This ***will be presented in detail in this Report.***

Completed and ongoing components:

- Main Plant Area: Includes the turbine generator building, boiler area, electrostatic precipitator, and chimney, all situated in the central part of the plant site.

- Coal Storage Area: Comprises two rows of warehouses located to the west of the plant.

- Switchyard: Located to the south of the plant (outside the main plant boundary), adjacent to a hill, and includes a 500kV power switchyard.

- Auxiliary Facilities: Includes the water treatment area, wastewater treatment area, oil storage, mechanical repair workshop, etc., located to the east and north of the plant.

- Office and Administrative Buildings: Situated to the southeast of the plant.

- Infrastructure Items: Includes roads, stormwater drainage systems, lighting, greenery, and landscaping within the plant area.

- Cooling Water System, Pumping Station, and Inland Wharf.

- Bridge System and Coal Port for Offshore Construction.

- Other components

During the implementation phase to date, no environmental issues have arisen, and all activities comply with Decision No. 3055/QĐ-BTNMT dated October 8, 2018, which approved the Environmental Impact Assessment Report.

Adjusted Components: dredging and disposal of dredged material: from the waters in front of the wharf and turning basin, waters serving the connection of the navigation channel, cooling water intake canal, and cooling water discharge canal.

Dredging Area Scope: Includes the cooling water intake canal, cooling water discharge canal, marine fairway, connection waters, turning basin, and waters in front of the Coal import port of the Vung Ang II BOT Power Plant. The specific layout of the dredging area is shown in the diagram below:

Figure A.1. Diagram of the dredging area scope of the Project

Disposal Area Scope: The proposed disposal site for the dredged material from the BOT Vung Ang II Power Plant Project is a 200-hectare area in the sea, within the jurisdiction of Ky Anh town, Ha Tinh province, approximately 22 km northeast of the dredging area. The sea depth ranges from 39m to 42m and is bounded by four points P2.1, P2.2, P2.3, and P2.4 with specific coordinates as follows:

Table A.2. Coordinates of the boundary points for the 200 ha dredged material disposal area

Corner point	Coordinates in VN-2000 Coordinate System, central meridian 105°30', zone 3 projection			
	Geographical Coordinates		Rectangular Coordinates	
	Latitude (B)	Longtitude (L)	X (m)	Y (m)
P2.1	18º 17' 36.11"	106º 32' 50.71"	2023567.292	610735.865
P2.2	18º 17' 03.83"	106º 33' 25.01"	2022580.678	611749.074
P2.3	18º 16' 31.06"	106º 32' 51.22"	2021567.469	610762.460
P2.4	18º 17' 03.34"	106º 32' 16.92"	2022554.083	609749.250

Onshore Disposal Area: The onshore disposal area for the dredged material has a total area of 55.33 hectares and is designated for industrial and heavy industrial use (Lot CN04) according to the general plan of the Vung Ang Economic Zone (located in Ky Loi commune). It includes two specific zones:

+ Dredged material storage site no. 1: Covers an area of 38.33 hectares. It is located on the left side of Nguyen Chi Thanh Road leading to Son Duong Port (adjacent to the Cellpin Vines manufacturing plant and the Viet Hai Ash Handling and Recycling Plant) approximately 5.0 km southeast of the main plant.

+ Dredged material storage site no. 2: Covers an area of 16.63 hectares. It is situated opposite Zone 1. The area was handed over on-site by the Economic Zone Management Board as per the minutes dated May 23, 2022. The current average elevation is +0.2 meters, with a planned finished elevation of +3.0 meters after filling.

Based on document no. 892/KKT-TNMT dated 24/06/2024 from the Vung Ang Economic Zone Management Board regarding the consultation on the construction site layout plan;

Based on document no. 81/CVHHHT-PCHH dated 26/06/2024 from the Ha Tinh Maritime Administration regarding the consultation on the construction site layout plan for dredged material placement for the "Vung Ang II Thermal Power Plant" project;

Based on document no. 143/UBND-ĐC dated 25/06/2024 from the People's Committee of Ky Loi commune regarding the consultation on the construction site layout plan for the "Vung Ang II Thermal Power Plant" project;

The construction site layout for placing dredged material into the storage area, including the locations for the pump stations and unloading points for transferring dredged material ashore, has been agreed upon and is described in the figure below:

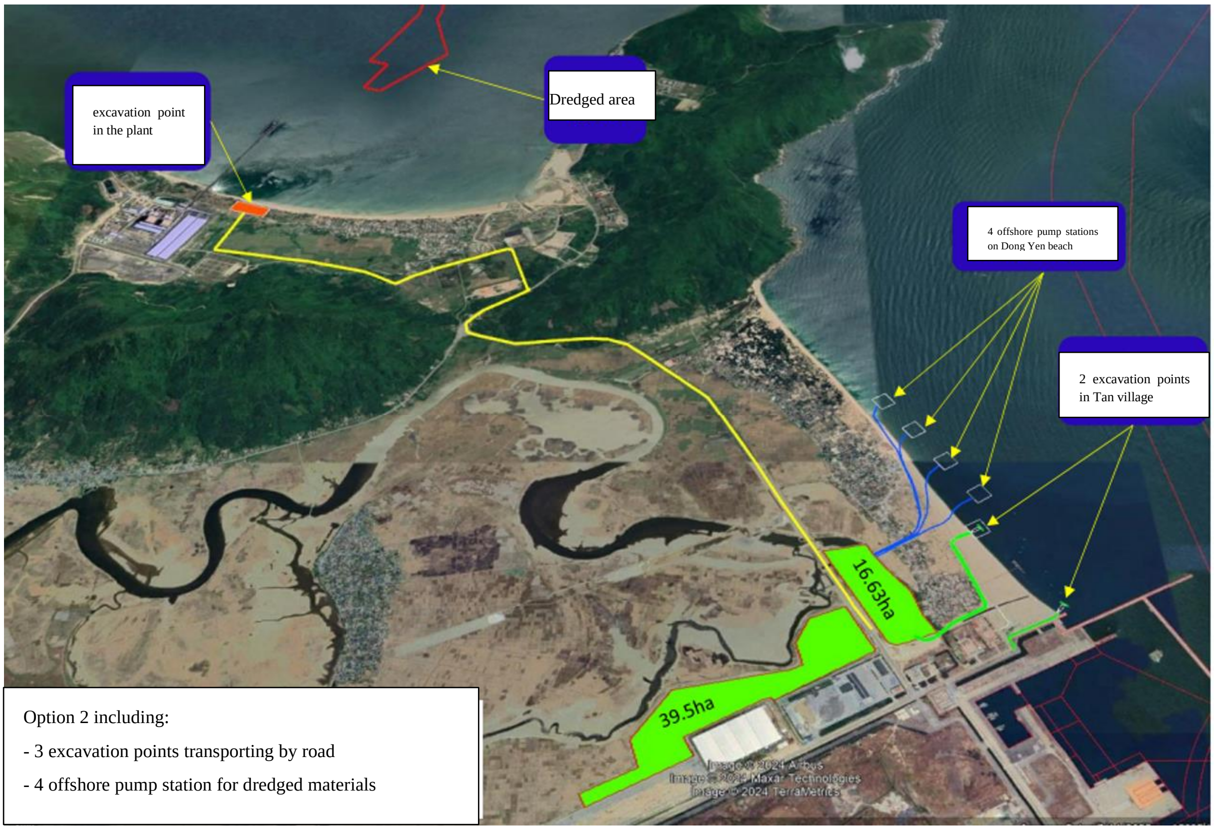


Figure A.2. Layout diagram depicting the arrangement of pump station and excavation points.

The project components and activities evaluated in this report include: dredging operations; transportation of dredged material to the submergence area and shore disposal area; shore disposal and submergence of dredged material at approved locations.

- Dredging Operations

Due to the geological characteristics at the dredging site, which is divided into layers including: the top layer of poorly graded silty sand and clayey sand, the second layer of soft to hard clay, and the third layer of rock, the dredging operations are carried out as follows:

- Step 1: Use a clamshell dredger combined with a suction dredger to dredge the entire first and second layers and bring the material ashore to the maximum extent, with some material submerged.

- Step 2: For areas with weathered rock, use a rock-breaking chisel, then load the material onto barges using a grab dredger, transport to the collection point, and transfer to the storage area by truck.

- Transportation of dredged material for submergence

Dredged material is stored in suction hopper dredgers and barges, then transported to the designated sea disposal site. The average transport distance is approximately 26 km. The specific process is as follows:

The process of dredging and ocean disposal of dredged material is as follows: a clamshell dredger scoops the dredged material onto a barge; the suction hopper dredger pumps the dredged material into the storage compartment → the suction hopper dredger and barge transport the dredged material to the disposal site → the suction hopper dredger and barge discharge the dredged material to the seabed.

- Transportation of Dredged Material to the Storage Area

To transport dredged material to storage sites, two methods are used: a transfer pump station and road transportation by trucks, with the specific processes as follows:

- The process of dredging and transporting dredged material to onshore storage sites by truck is as follows: A clamshell dredger scoops the dredged material onto a barge → the barge transports the dredged material to loading points → an excavator loads the dredged material from the barge onto trucks → the trucks transport the dredged material to the storage site → the dredged material is dumped and leveled at the onshore storage site.

- The process of dredging and transporting dredged material to onshore storage sites by pump station is as follows: A clamshell dredger scoops the dredged material onto a barge → the barge transports it to the pump station → an excavator transfers the dredged material to the storage compartment of the pump station, using a cutter to break up the mixture of dredged material and seawater → the mixture of dredged material and seawater is pumped to the onshore storage site.

Method Using Transfer Pump Station:

Use barges with a capacity of up to 2,500 m^3 to transport dredged material to the onshore storage area, covering a distance of about 12 km. The dredged material will then be pumped into the onshore storage area using pumps with a capacity of 800-2000 HP through a pipeline about 2.9 km long. The pumping system uses two HDPE pipes of 300 mm diameter.

At the storage areas, excess seawater is directed to a settling tank and then led into an HDPE pipeline with a diameter of 400 mm, which passes through an existing irrigation culvert on Nguyen Chi Thanh Road and into an open drainage ditch that flows to the sea. (The drainage ditch is excavated and lined with a nylon layer on the inner surface of the embankment for protection since the existing road will be expanded to avoid overlap during construction). The pipeline for pumping dredged material to the storage area is also installed through this existing culvert.

- Main Construction Equipment:

+ Clamshell dredger

+ Transport barge

+ Sand pumping barge assembly, including flat barge, excavator barge, or crane barge, Bell pump 300 hydraulic pump, transfer pump, approximately 3,000 m of pipeline.

Method Using Trucks:

Dredged material is loaded onto barges and transported to three unloading points, where it is unloaded by excavators and transported to the storage area by 14 m^3 trucks, with a transportation distance of about 7.5 km from the unloading point at the main plant area or 2 km from the unloading point at Tan Phuc Thanh beach to the storage area. At the storage area, the dredged material is leveled by bulldozers and excavators.

Main Construction Equipment:

- Clamshell dredger
- Transport barge
- Excavators, bulldozers
- Trucks

For the two unloading points at Tan Phuc Thanh beach, the investor will coordinate with the contractor to build a temporary road for the transport trucks.

*/ Construction organization for the volume of dredged material transported and dumped onshore:

All dredged material brought onshore is divided into 4 construction sites.

In which, Laydown area No. 1, No. 3, and No. 4 transport dredged material to shore by truck. Sitee No. 2 transports dredged material to shore using a cutting and pumping system to a storage site. The detailed characteristics, personnel arrangements, and equipment for each construction front are shown inthe table below.

Table A.3. Detailed description of construction fronts and transportation of dredged material to shore

Construction Site	Dredged Material Handling Plan	Construction Method	Construction Sequence	Distance from Transfer Station to Storage Site	Service Road/Dredged Material Pipeline	Construction Equipment (machines)	Number of Workers (people)	Productivity (m³/day)	Construction Days	Construction Volume (m³)
1	Bring to onshore storage area	Use of trucks	Dragline excavator for dredged material → barge → transport dredged material to main plant transfer station → Excavator transports dredged material from barge to truck → Transport to storage site	7.5	none	- Excavator: 02 - Truck: 10 - Barge: 02 - Dragline excavator: 01 - Tugboat: 01	54	1520,36	65	98,823.6
2	Bring to onshore storage area	Use of pump station	Dragline excavator for dredged material → barge → transport to pump station area → Excavator loads dredged material into pump station storage tank, using cutter to mix dredged material and seawater → Pump to storage site	3	2 HDPE pipelines D300, total length 6000m	- Pump system 350 m³/h: 04 - Dragline excavator ≤10 m³/h: 03 - Barge ≤2500 m³/h: 08 - Tugboat 450: 02 - HDPE pipeline D300: 6000m	162	1413	65	367,380
3	Bring to onshore	Use of trucks	Dragline excavator scoops dredged	2	Temporary road: L=110	- Excavator: 02	44	1520,36	65	98,823.6

	storage area		material → barge → transport dredged material to main plant transfer station → Excavator moves dredged material from barge to truck → Transport to storage site		0m; W=6m. Total area: 6500m^2, road base thickness 0.5m	- Truck: 05 - Barge: 02 - Dragline excavator: 01 - Tugboat: 01				
4	Bring to onshore storage area	Use of trucks	Dragline excavator scoops dredged material → barge → transport dredged material to main plant transfer station → Excavator moves dredged material from barge to truck → Transport to storage site	2	Temporary road: L=420m; W=5m. Total area: 2300m^2; road base thickness 0.5m	- Excavator: 02 - Truck: 05 - Barge: 02 - Dragline excavator: 01 - Tugboat: 01	44	1520,36	65	98,823.6

A.5.1.4. Sensitive Environmental Factors

- Distance to the nearest residential area: About 100 m northeast of the project is the residential area of Hai Phong village, Ky Loi commune. This residential area is subject to relocation (according to the general planning map of Ky Anh town oriented to 2035). About 2.5 km southwest of the project is the residential area of Tay Yen village.

- Submergence of dredged material in the offshore area is about 22-25 km east of the project area.

A.5.2. Project components and activities with potential adverse environmental impacts:

- During the construction phase of the project (continuing implementation according to the contents approved in 2018 and the adjusted dredged material handling plan):

+ The living activities of construction workers generate domestic solid waste and domestic wastewater, affecting the aesthetic of the Project area.

+ The transportation of construction materials, machinery, and equipment affects the air quality of the Project area and the surrounding areas.

+ The construction of project components generates dust, emissions, wastewater, waste rock, construction solid waste, hazardous waste, noise, and vibrations, affecting the air quality, water environment, and aesthetics of the Project area and surrounding areas.

+ The flushing of pipelines and steam systems before trial operation generates wastewater and sludge, which may negatively impact the wastewater receiving area.

+ The operation of dredging, disposal, and transportation vehicles for dredged material to onshore storage sites generates noise, dust, and emissions, affecting the air quality of the area.

+ Dredging and disposal of dredged material at sea increase turbidity and the spread of Total Suspended Solids (TSS), affecting the seawater quality in the dredging and disposal areas at sea.

- During the operational phase of the entire project:

+ The activities of workers operating the main plant and worker housing generate domestic solid waste and domestic wastewater, affecting the aesthetic of the Project area.

+ The electricity production activities of the two power generating units, the coal transportation system, and the transportation of ash and slag generate dust, emissions, industrial wastewater, domestic solid waste, general industrial solid waste, and hazardous waste, affecting the air quality, water environment, aquatic ecosystems, and aesthetics of the Project area and surrounding areas.

A.5.3. Environmental impacts prediction of main pollutants and waste generated during different project phases

The major environmental impacts and waste generation by project phase include:

A.5.3.1. Construction phase

Table A.4. Major environmental impacts during the construction phase

No.	Source	Waste generation			Non-waste related impacts	
		Dust and emissions	Wastewater	Solid waste		
I. Construction of onshore components						
1	Land leveling for ash disposal site phase 1	Dust, SO_2, CO, NO_2, VOC				No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
2	Transportation of construction materials	Dust, SO_2, CO, NO_2, VOC			Noise	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
3	Construction of plant components	Dust, SO_2, CO, NO_2, VOC	Wastewater	Construction waste	Noise, vibration, ecosystem, animals, plants	No changes compared to the assessments approved in

No.	Source	Waste generation			Non-waste related impacts	
		Dust and emissions	Wastewater	Solid waste		
						Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
4	Operation of construction machinery and equipment	Dust, SO_2, CO, NO_2, VOC	Wastewater	Waste oil	Noise, vibration, ecosystem, animals, plants	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
5	Transportation of construction waste	Dust, SO_2, CO, NO_2, VOC	Equipment cleaning wastewater	Waste oil	Noise, vibration, increased traffic density	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.

No.	Source	Waste generation			Non-waste related impacts	
		Dust and emissions	Wastewater	Solid waste		
6	Pipe and steam system flushing before trial operation		Wastewater	Sludge	Water pollution in receiving water bodies	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
7	Concentration of workers on site		Domestic wastewater	Domestic solid waste	Increased consumption of food, supplies by project staff and workers, affected local households, increased traffic density	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
III. Construction of offshore project components						
1	Bridge conveyors and coal port system for offshore construction	Dust, CO, NO_2, SO_2, VOC	Wastewater	Construction waste	Noise, marine environment, water traffic	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated

No.	Source	Waste generation			Non-waste related impacts	
		Dust and emissions	Wastewater	Solid waste		
						October 8, 2018, therefore, it is not re-evaluated in this Report.
2	Dredging, transporting dredged material, dumping, and storing dredged material at an onshore storage site using a pump station	Dust, CO, NO_2, SO_2, VOC	Wastewater	Waste oil, domestic solid waste	Noise, marine environment, water traffic, suspended solids dispersion	It will be specifically presented in this report.
3	Dredging, transporting dredged material, dumping, and storing dredged material at an onshore storage site using trucks	Dust, CO, NO_2, SO_2, VOC	Wastewater	Waste oil, domestic solid waste	Noise, road traffic	It will be specifically presented in this report.
4	Dredging, transporting dredged material, and dumping dredged material at sea	Dust, CO, NO_2, SO_2, VOC	Wastewater	Waste oil, domestic solid waste	Noise, marine environment, waterway traffic, suspended solids spread	It will be specifically presented in this report.

The assessment and forecast of major environmental impacts and waste generated during the construction phase of the project basically remain unchanged from the contents approved in the Environmental Impact Assessment Report under Decision No. 3055/QD-BTNMT dated October 8, 2018. Therefore, the assessment of major environmental impacts and waste generated in this report inherits the results already implemented in Decision No. 3055/QD-BTNMT dated October 8, 2018. Specifically:

a. Dust and Emissions

- Dust generated from the ground leveling construction of the ash disposal area in Phase 1 and the proposed ash disposal area in Phase 2.

- Dust and emissions generated from transporting construction materials. Major pollutants: SO2, NOx, CO, etc.
- Dust and emissions from the operation of construction machinery and equipment. Major pollutants: SO2, NOx, CO, etc.
- Dust and emissions generated from the construction of marine structures and dumping of dredged materials. Major pollutants: SO2, NOx, CO, etc.
- Dust and emissions generated from the dredging and transporting dredged materials to the storage site. Major pollutants: SO2, NOx, CO, etc.

b. Wastewater

- Runoff: The amount of runoff in the main plant construction area is approximately 6.87 m^3/s. The main characteristic of the runoff is suspended solids.
- Domestic wastewater: Domestic wastewater at the construction site camp is discharged at a rate of about 167.72 m^3/day. Typical pollutants include BOD5, TSS, Total N, Total P, Ammonium, and Coliform.
- Construction wastewater from washing vehicles and cleaning machinery: Approximately 23.8 m^3/day.
- Bilge water from construction watercraft: Approximately 0.256 m^3/day. Main pollutants: TSS, mineral oil.
- The runoff water from the process of pumping dredged material to the storage site has a flow rate of approximately 549.5 m^3/h. The main pollutant component: TSS.
- Wastewater from pipeline flushing with a volume of about 12,000 m^3/flush. Main pollutants: TSS, TDS, Fe, Cu, etc.

c. General Solid Waste

- Solid waste generated from worker activities on the construction site: Estimated volume of about 1,500 kg/day. Main components: Cans, newspapers, packaging, bottles, food containers, etc.
- Weak soil removed during ground leveling: Volume of about 97,250 m^3.
- Solid waste generated from basic construction activities: Volume of about 4,660 kg/day. Main components: Soil, sand, construction steel, broken bricks, cement bags, and substandard materials.

d. Hazardous Waste

- Hazardous waste from basic construction activities with a volume of about 246.94 kg/month. Includes used DO oil, batteries, lead-acid batteries, fluorescent lamps, oil filters, bilge water.

e. Non-waste-related Impacts

- Noise impacts from construction machinery on site.

- Impacts on local security and order.
- Impacts on road and waterway traffic activities.
- Impacts from the spread of suspended solids due to dredging and dumping activities.
- Risks of incidents such as: Oil spills; fire and explosion accidents; embankment erosion accidents; dam failure at dredged material storage sites; pipeline rupture transporting dredged material from the pump system; traffic accidents; workplace accidents; incidents caused by natural disasters and extreme weather....

The specific components of the adjusted dredged material handling methods are focused on assessing and forecasting the main environmental impacts and generated waste, including:

Table A.5. Main environmental impacts of adjusted dredged material handling methods

<table>
<tr><th>No.</th><th>Project Activity</th><th>Waste-related Impact Source</th><th>Non-waste-related Impact Source</th></tr>
<tr><td>1</td><td>Dredging activities</td><td rowspan="6">- Dust and emissions (TSP, CO, SO2, NO2) generated by machinery and equipment during dredging, dumping, and disposal activities.
- Increase in TSS in seawater in the project area due to dredging and dumping activities.
- Overflow from barge storage compartments.
- Domestic wastewater and solid waste from workers.
- Hazardous waste from equipment repair and maintenance.</td><td rowspan="6">- Noise.
- Increased traffic volume and potential traffic conflicts on roads and waterways.
- Risk of coastal erosion during dredging.
- Economic and social impacts.
- Worker concentration.
- Conflicts arising (in living conditions, equipment management, etc.).
- Oil spills; fires and explosions; traffic accidents; occupational accidents; natural disasters and extreme weather events.</td></tr>
<tr><td>2</td><td>Transporting dredged material from dredging area to pump station, transfer station and dumping area</td></tr>
<tr><td>3</td><td>Transferring dredged material to storage site by pump system</td></tr>
<tr><td>4</td><td>Transporting dredged material to storage area by trucks</td></tr>
<tr><td>5</td><td>Dredged material</td></tr>
<tr><td>6</td><td>Worker activities on the construction site</td></tr>
</table>

A.5.3.2. Operation phase

Table A.6. Main environmental impacts during operation phase.

No.	Source	Waste generation			Non-related waste source	Note
		Dust and emission	**Wastewater**	**Solid waste**		
1	Operation of the coal supply and transfer system	Dust			Noise	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
2	Operation of boilers and power generation turbines	Dust, NO2, SO2...	Wastewater	Fly ash	Noise, marine ecosystem	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
3	Transportation of fly ash	Dust, CO, NO2, SO2, VOC	Wastewater	Waste oil and grease	Noise, road traffic	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8,

No.	Source	Waste generation			Non-related waste source	Note
		Dust and emission	Wastewater	Solid waste		
						2018, therefore, it is not re-evaluated in this Report.
4	Operation of the cooling system		Cooling wastewater		Marine environment	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
5	Operation of the wastewater treatment system	H_2S, VOC...	Treated wastewater	Sludge	Odor pollution, receiving water bodies	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, therefore, it is not re-evaluated in this Report.
6	Living activities of staff and workers at Vung Ang II Thermal Power Plant in the residential area at Ky Long		Domestic wastewater	Domestic solid waste	Increased consumption of food, necessities by staff, workers, and affected	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated

No.	Source	Waste generation			Non-related waste source	Note
		Dust and emission	Wastewater	Solid waste		
	ward, Ky Anh town				households, increased traffic density.	October 8, 2018, therefore, it is not re-evaluated in this Report.
7	Periodic maintenance dredging	Dust, CO, NO2, SO2, VOC	Wastewater	Waste oil, domestic solid waste	Noise, marine environment, waterway traffic, road traffic, suspended solids spread	Every 3 years, the project owner will sign a contract with a contractor to carry out maintenance dredging with an estimated volume of 0.3 million m³. However, the content of the maintenance dredging will be developed as a separate project and an environmental impact assessment will be conducted in accordance with regulations before implementation. Therefore, it is

No.	Source	Waste generation			Non-related waste source	Note
		Dust and emission	Wastewater	Solid waste		
						Not assessed in this report.

The assessment and prediction of the main environmental impacts and waste generated during the operational phase of the project remain fundamentally unchanged compared to the contents approved in the Environmental Impact Assessment Report according to Decision No. 3055/QĐ-BTNMT dated October 8, 2018, and Decision No. 3934/QĐ-UBND dated December 27, 2018. Therefore, the assessment of the main environmental impacts and waste generated in this Report inherits the results established in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, and Decision No. 3934/QĐ-UBND dated December 27, 2018 (Details in Appendix IV. The Environmental Impact Assessment Report of 2018, approved by Decision No. 3055/QĐ-BTNMT dated October 8, 2018). Specifically:

a. Emissions

- Dust from coal unloading processes.
- Dust and emissions from coal combustion activities providing heat for 2 generator units with the maximum capacity of 3,100,000 m3/hour/unit. Main pollutants: SO2, NOx, dust.
- Dust emissions from the road transport of ash.
- Odor from the drainage system and storage equipment for household waste, temporary household waste collection areas before being transferred to specialized vehicles.

b. Wastewater

- Stormwater runoff from the main plant area, ash disposal site area, and port area. Main pollutants: Suspended solids; potentially impacted area: Coastal area near the project.
- Domestic wastewater generated from activities of staff and workers at the plant with a volume of about 104.4 m^3/day. Pollutant parameters: Suspended solids (SS), BOD5, COD, nitrogen (N), phosphorus (P), coliform; potentially impacted area: Coastal area near the project.
- Domestic wastewater generated from activities of staff and workers at the residential area with a volume of about 140m^3/day. Pollutant parameters: Suspended solids (SS), BOD5, COD, nitrogen (N), phosphorus (P), coliform; potentially impacted area: Da Hat stream area flowing into Quyen River.

- Cooling water from condensers and wastewater from the seawater flue gas desulfurization system after aeration, main pollutants are Temperature, Sulfites (HSO3-, SO32-); potentially impacted area: Coastal area near the project.

- Production wastewater (including coal-contaminated wastewater, chemical-contaminated wastewater, and oil-contaminated wastewater) with a volume of about 165 m^3/h. Main pollutants: COD, TSS, Oil & grease; potentially impacted area: Coastal area near the project.

c. General solid waste

- Domestic solid waste is generated at a volume of approximately 1,024 kg/day (including approximately 464 kg/day from the main plant area and 560 kg/day from the worker housing area). The primary components include: can containers, pallets, newspapers, packaging, bottles, food containers, and leftover food.

- Sludge is generated from septic tanks. The main component is sludge with a high content of organic matter and microorganisms.

- Sludge generated from the domestic wastewater treatment station is approximately 1.08 tons/month of biological sludge (including approximately 0.54 tons/month from the main plant area and 0.54 tons/month from the worker housing area).

- Ash and slag from coal-fired boilers amount to approximately 1,438 tons/day.

d. Hazardous waste

- Hazardous waste from production activities mainly includes waste oil and grease from machinery and equipment maintenance, and oil-contaminated rags from cleaning machinery and equipment. The total amount of hazardous waste from production activities during the operational phase is approximately 130.7 tons per year.

- Sludge generated from the physico-chemical treatment process at the industrial wastewater treatment station is approximately 20.73 tons per month and is classified as industrial solid waste requiring control.

- Hazardous waste from the worker housing area is generated at approximately 20 - 30 kg per month. The primary components include batteries, accumulators, and fluorescent light bulbs.

e. Noise and vibration

Noise and vibration from engine operations, generators, and turbines.

f. Non-waste related impacts

- Impact on coastal ecosystems.

- Impact due to thermal pollution.

- Impact on the local socio-economic area.

g. Impacts due to risks and environmental incidents

- Fire and explosion incidents
- Oil spill incidents
- Incidents with the wastewater treatment system
- Incidents with the emissions treatment system
- Incidents with the ash and slag storage site
- Earthquake incidents
- Flooding incidents
- Ammonia (NH_3) leakage incidents.

A.5.4. Environmental protection works and measures

A.5.4.1. Construction phase

a. Environmental protection works and measures for dust and emission management

- Use transport vehicles that are inspected and certified as per regulations; vehicles for transporting raw materials and supplies must carry within their nominal load capacity and cover the truck bed with tarpaulins during transport; register transport vehicles and transportation schedules with relevant state management agencies as required.

- Develop a suitable construction plan and schedule; organize specialized teams to clean up spilled materials around the construction site and surrounding areas.

- Install AIS (Automatic Identification System) and monitor the load of marine vessels on the waterway used for transporting dredged material to the sea disposal site.

- Clean transport vehicles before leaving the construction site; perform regular maintenance on vehicles, machinery, and equipment to ensure technical safety and environmental protection.

- Provide full personal protective equipment for workers on the construction site as required.

- Adhere to the approved dredging and disposal plan to ensure safety and environmental cleanliness as regulated.

b. Environmental protection works and measures for wastewater collection and treatment

- Domestic wastewater:

+ Install 13 portable toilets on the construction site with waste tanks of approximately 6.0 m^3/tank; periodically transfer to a designated unit for collection, transportation, and treatment in accordance with regulations.

+ Construct and operate a domestic wastewater treatment system for the construction management office with a capacity of 60 m^3/day-night; the technological process is as follows:

Wastewater → collection tank → equalization tank → anoxic tank → aerobic tank → settling tank → intermediate tank → MBR tank → disinfection tank → treated wastewater meets QCVN 14:2008/BTNMT (Column B, K coefficient = 1.2) → area drainage channel (discharge point coordinates: X(m) = 2001791.710 and Y(m) = 594248.650).

+ Provide sufficient holding tanks and toilets on watercraft used for dredging and dumping activities.

- Vehicle wash wastewater: Construct a 2-compartment settling tank, including 1 settling compartment and 1 water storage compartment to settle sand and filter oil (8.0m^3). The settling pit has SOS fabric to filter oil. SOS fabric containing oil is collected and treated as hazardous waste. Treated water is recirculated for road watering, dust control, and vehicle washing, with no discharge into the environment.

- Bilge water from construction vessels: The construction contractor equips storage devices and is responsible for hiring a service unit to collect and treat it according to the regulations of Circular No. 41/2017/TT-BGTVT dated November 14, 2017, of the Ministry of Transport and Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Ministry of Natural Resources and Environment. This content is reflected in the construction contract between the project owner and the contractor, and the project owner will monitor compliance.

- Wastewater from pipe flushing, hydrostatic testing, and steam systems is collected and transported by a service unit with appropriate functions for treatment according to regulations.

- Stormwater runoff: Collect in the temporary drainage system on the construction site (main plant area, construction yard area, organic soil stripping area) with dimensions B x H = (0.6-0.8) m x (0.6-0.8) m with sedimentation manholes of 0.6 x 0.6 m along the route, with an average distance between manholes of 30 - 40 m/manhole, ensuring effective water drainage.

- Drainage water at the dredging material storage area onshore is collected in a 3-compartment settling tank (capacity 600m^3) to settle and filter suspended solid waste before discharging into the sea.

- Minimize the impact of overflow from the cargo holds of construction vessels: Maintain the dredged material volume in the holds of vessels within the allowable load limit, avoiding overfilling to prevent dredged material from spilling into the surrounding environment..

c. Environmental protection works and measures for solid waste collection, storage, management, and treatment

- Domestic solid waste generated at the project site is collected and stored in classified bins placed at the construction site. The construction contractors provide plastic bins with a capacity of 100-120 liters for domestic waste. The contractors' office areas are also equipped with suitable bins for domestic waste.

- One general domestic waste storage facility of about 24.0 m² is set up at the construction site for temporary storage of domestic waste.

- Domestic waste generated at the project site is contracted to a local service unit for collection and transportation for treatment as per regulations, with a frequency of once or twice a day. Currently, the main contractor for the project, DOOSAN Enerbility Vietnam Co., Ltd., has signed contract No. VA2-AD-2022-003 dated May 3, 2022, with Ha Tinh Industrial Waste Processing Co., Ltd., for collecting this waste.

- Construction solid waste is sorted based on usage value, reusing soil, rocks, and broken concrete for leveling roads within the project area, and recyclable components like surplus steel are transferred to a recycling unit.

- Organic soil is collected and transported to an 83,061 m² organic material dumping site in Ky Trinh ward, Ky Anh town, Ha Tinh province, as per the handover record on May 18, 2021, between the Ha Tinh Economic Zone Management Board. The soil is leveled immediately upon dumping, and the storage area is designed with a temporary rainwater collection ditch of dimensions B x H = 0.8 m x 0.6 m to collect rainwater runoff.

- Dredged materials transported ashore are stored at two storage sites (site 1 with an area of 38.33 ha and site 2 with an area of 16.63 ha) with a volume of about 663,851 m³; the dredged materials are dumped correctly to avoid spillage into the environment, affecting surrounding areas.

+ Dredged material storage site 1: Approved by the Provincial Economic Zone Management Board in Document No. 278/KKT-QHXD dated May 2, 2019, with additional approval and adjustment in Documents No. 749/KKT-QHXD dated July 30, 2021, 1307/KKT-QHXD dated November 16, 2021, and No. 1144/KKT-QLĐT dated September 27, 2022.

+ Dredged material storage site 2: Approved by the Provincial Economic Zone Management Board in Document No. 1307/KKT-QHXD dated November 16, 2021, and handed over on-site as per the handover record dated May 23, 2022.

- Transport dredged materials for dumping at sea with a volume of about 1,761,232 m³ in an area of about 200 ha located in the sea area under Ky Anh town, Ha Tinh province, approximately 22 km northeast of the dredging area, with a sea depth of 39 m - 42 m.

d. Environmental protection works and measures for hazardous waste collection, storage, management, and treatment

- Classify hazardous and non-hazardous waste;

- Minimize waste by both quantity and type;

- Properly store hazardous waste temporarily to prevent contamination of soil, water, and air as follows:

+ A general hazardous waste storage facility for the main contractor has been built with an area of about 90 m^2, equipped with a roof for rain and sun protection, a sealed concrete floor, labeled with hazardous waste warnings, and equipped with fire safety equipment as per regulations.

+ Sign contracts with hazardous waste treatment service units to collect and process these types of waste periodically. Currently, the main contractor for the project, DOOSAN Enerbility Vietnam Co., Ltd., has signed contract No. VA2-AD-2022-003 dated May 3, 2022, with Ha Tinh Industrial Waste Processing Co., Ltd., to collect this waste in accordance with Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Ministry of Natural Resources and Environment.

e. Environmental protection works and measures to minimize noise and vibration impacts

- Regularly maintain and replace moving parts and worn equipment, strictly following maintenance schedules to reduce air pollution.

- Turn off or reduce speed of equipment not in regular use between work cycles.

- Reduce the number of operating equipment simultaneously and avoid using multiple noisy and vibrating machines at the same time to prevent noise and vibration resonance..

f. Other measures to minimize various impacts

- Impact on local security and order:

+ Prioritize hiring local workers for suitable jobs and do not house workers at the construction site.

+ Coordinate with local authorities to register temporary residence and manage project workers to prevent and prohibit theft, gambling, and other social vices.

- Dredging and disposal impact:

+ Survey the dredging area to plan dredging operations minimizing environmental impacts.

+ Analyze the physical and chemical properties of bottom sediments before dredging to implement mitigation measures.

+ Choose appropriate dredging times with low flow velocities.

+ Avoid dredging and disposal during rough seas, strong winds, and storms.

+ Strengthen monitoring and strict measures to prevent contractors from improper disposal of dredged materials. Equip barges with GPS for precise navigation.

+ Follow the approved construction plan for dredged material disposal, ensuring no spillage or leakage during transport.

+ Implement a monitoring program for environmental quality in the disposal area and surroundings during construction.

- Minimize impact on the area's landscape and ecosystem:

+ Comply with construction regulations.

+ Adhere to approved plans and designs, limiting activities to designated areas. Minimize soil spillage and clean up promptly.

+ Prohibit illegal disposal of waste, hazardous substances, and construction debris into the marine environment near the construction of marinas and tourist piers.

+ Strictly prohibit improper waste disposal by workers.

+ Collect and treat all hazardous waste, used oil, and ensure proper preventive measures as outlined.

A.5.4.2. Operation phase

a. Dust and emission treatment facilities and measures

- Install two boiler exhaust gas treatment systems with a capacity of 3,100,000 m^3/h per system, following the process:

Boiler exhaust gas → Selective Catalytic Reduction (SCR) → Electrostatic Precipitator (ESP) (2 ESPs per boiler, each with 4 fields) → Seawater Flue Gas Desulfurization (SWFGD) tower → chimney ensuring compliance with QCVN 22:2009/BTNMT (column B, Kp = 0.7, Kv = 1.0) - National technical regulation on industrial emissions for thermal power and QCVN 19:2009/BTNMT (Kp = 0.8, Kv = 1.0) - National technical regulation on industrial emissions for dust and inorganic substances, with specific parameters: Total Dust $\leq$ 50 mg/Nm^3, $SO_2 \leq$ 200 mg/Nm^3, NOx $\leq$ 300 mg/Nm^3, as committed by the Project Owner.

- Traffic management to minimize dust and exhaust emissions from vehicles and reduce the risk of accidents.

- During hot, dry weather, assign environmental sanitation staff to regularly spray water using equipped water pumps and spray nozzles in project areas (internal roads, landscaping areas). Perform this 1-2 times/day, increasing frequency during the dry season.

- Plant trees to reduce dust and noise pollution around the port area. Design flower gardens, lawns, and green areas to ensure the project's environmental landscape and minimize pollution.

b. Wastewater collection and treatment facilities and measures

- Domestic wastewater in the main plant area: Construct a domestic wastewater treatment system with a capacity of 150 m^3/day. The treatment process: Domestic wastewater → septic tank/grease trap → trash rack → equalization tank → anoxic tank → aerobic tank → biological settling tank → disinfection tank → post-treatment water storage tank → treated wastewater pumped to the primary tank of the industrial wastewater treatment system for further treatment.

- Domestic wastewater in worker housing: Construct a domestic wastewater treatment system with a capacity of 150 m^3/day. The treatment process: Domestic wastewater → septic tank/grease trap → collection tank → equalization tank → anoxic tank → aerobic tank → biological settling tank → disinfection tank → treated wastewater ensuring QCVN 14:2008/BTNMT (column A, K = 1.0) → Da Hat stream (discharge point coordinates: X (m) = 1993232; Y (m) = 593800).

- Production wastewater: Construct an industrial wastewater treatment system with a capacity of 200 m^3/h. The treatment process: Industrial wastewater → primary storage tank → pH adjustment tank → coagulation tank → flocculation tank → settling tank → intermediate tank → pressure filter → activated carbon filter → final pH adjustment tank → post-treatment water storage tank → treated wastewater ensuring QCVN 40:2011/BTNMT (column B, Kq = 1.3, Kf = 0.9) → discharge into the cooling water discharge system (discharge point coordinates: X (m) = 2003603; Y (m) = 594666, located after the continuous automatic monitoring point of the cooling water discharge system).

- One (01) preliminary treatment system for oily wastewater with a capacity of 25 m^3/h. The treatment process: Oily water → oily wastewater storage tank → oil separator → final pH adjustment tank of the industrial wastewater treatment system.

- Stormwater runoff:

+ Main plant area: Stormwater runoff is collected through a system of reinforced concrete circular culverts with sizes D200 - D1800 and reinforced concrete channels with sizes B300 - B5000 before discharging into the sea.

+ Worker housing area: Stormwater runoff is collected through a system of covered reinforced concrete channels with sizes B400-B1000 before discharging into the common drainage system along the area's roads.

c. Solid waste collection, storage, management, and treatment facilities and measures

- Place covered trash bins with capacities of 20 - 200 liters in offices, workshops, canteens, along roads, and in worker housing areas for temporary storage of domestic waste. Regularly transfer the waste to a service unit for collection, transportation, and treatment as per regulations.

- Study solutions for reusing ash and slag in accordance with Directive No. 08/CT-TTg dated March 26, 2021, of the Prime Minister on promoting the treatment and use of ash, slag, and gypsum from thermal power plants, chemical, and fertilizer plants as raw materials for construction material production and in construction projects.

- Design two ash disposal sites: disposal site 1 (15 ha) near the main plant and disposal site 2 (34.4 ha) in Ky Trinh ward, Ky Anh town, Ha Tinh province.

+ Ash disposal site 1: Crest width of 5.0-7.0 m, compacted soil embankment structure; maximum crest height +23m, outer slope 1:2 with grass cover for slope protection, inner slope 1:1.75 with geotextile and HDPE membrane for waterproofing.

+ Ash disposal site 2: Crest width of 3.0-8.0 m, compacted soil embankment structure; maximum crest height +32m, outer slope 1:2 with grass cover for slope protection, inner slope 1:1.75 with geotextile and HDPE membrane for waterproofing.

+ Ash disposal method: Ash and slag, if utilized, will be transported by trucks directly from the silo. If not utilized, they will be disposed of in the storage sites: Ash and slag are cooled, mixed with water inside the plant, and pumped through pipelines to the storage sites. The pipelines run along the embankments, with discharge points spaced evenly and extendable. The water in the ash and slag settles and is collected at the farthest point from the discharge area. The ash and slag are deposited by gravity. A pump system will be installed to collect the settled water and pump it back to the plant for reuse in mixing ash and slag, ensuring no discharge into the environment.

+ Stormwater drainage system: Concrete channels on the embankments with dimensions B x H = 0.3 m x 0.6 m collect rainwater, which is directed to main channels at the foot of the ash and slag storage dam; outside and embankment drainage systems include reinforced concrete channels with varying dimensions BxH = 2.5 x (1.8-2.0) m.

+ Seepage water collection system from the ash and slag storage sites: A floating platform pump station collects seepage water from the ash and slag storage sites and pumps it back for reuse in transporting ash and slag, ensuring no discharge into the environment.

- Regulations: Strictly comply with the provisions of Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several articles of the Environmental Protection Law.

d. Hazardous waste collection, storage, management, and treatment facilities and measures

- Provide one hazardous waste storage area of 200 m² in the main plant area and two hazardous waste storage areas of 6.0 m² each in the worker housing area. Regularly transfer to a service unit for collection, transportation, and treatment as per regulations.

- The design complies with Circular No. 02/TT-BTNMT dated January 10, 2022: The storage floor is sealed and impermeable, with rainproof roofing. Equipped with fire protection, warning signs, and absorbent materials.

- Contract with licensed units for collection and transportation for disposal according to regulations.

e. Noise and vibration mitigation facilities and measures

- Use well-maintained equipment only.

- Use noise-reducing devices for noisy machinery. Major noise-generating equipment (turbines, steam pipes, etc.) is placed in shielded workshops to minimize noise impact. Additionally, noise-damping cushions are installed for high-power machines.

- Plant trees and erect walls as sound barriers around the facility.

- Regularly maintain moving parts of equipment that use lubricants and are prone to wear.

- Conduct maintenance work during the daytime.

- Install noise-reducing devices at steam exhaust points.

- Control and operation rooms are built with soundproof materials.

- Install low-noise equipment, silencers, and soundproof materials where necessary (around turbines and boilers).

f. Other impact mitigation facilities and measures

- Coastal ecosystem impact: Strictly implement wastewater, emission, regular solid waste, and hazardous waste collection and treatment measures according to regulations.

- Thermal pollution: Equip with central ventilation and air conditioning systems.

- Socio-economic impact: Collaborate closely with local authorities such as the Department of Education and Training, the Department of Health, and the Department of Labor, Invalids and Social Affairs to plan and implement education and health care programs to meet the needs of employees and their families.

g. Structures and measures to mitigate impacts from environmental risks and incidents

The project owner develops response programs for potential risks and incidents, trains, and raises awareness among staff and workers on safe plant operation. Ensure minimal risk and incident occurrence while being ready with plans, equipment, and resources for response in case of incidents.

A.5.5. Environmental management and monitoring program by the Project Owner

a. Environmental management program

The project owner manages environmental protection activities through:

Defining the contractor's responsibilities to comply with and implement environmental protection measures proposed in the construction contract.

Hiring an independent consulting organization to supervise and urge the contractor throughout the construction period.

Engaging an independent environmental monitoring organization to conduct regular environmental monitoring, sampling, and laboratory analysis of relevant environmental quality indicators during the construction period.

Establishing a specialized team to guide and disseminate environmental protection activities to project personnel; weekly inspections to assess the contractor's environmental compliance and documenting evaluations as required. The environmental management program is implemented throughout all project phases.

b. Environmental monitoring program

The environmental monitoring program includes:

b1. Monitoring Program during Construction Phase

** Wastewater Monitoring Program*

a) Domestic wastewater

- Monitoring location: 01 location (at the outlet of the domestic wastewater treatment system with a capacity of 60 m^3/day and night).

- Monitoring parameters: Flow rate, pH, Total suspended solids (TSS), Total dissolved solids (TDS), BOD5, Ammonium (NH4+), Sulfide (H2S), Nitrate (NO3-), Phosphate (PO43-), animal and vegetable oils, Total surfactants, Total Coliforms.

- Monitoring frequency: Every 3 months.

- Comparison standard: QCVN 14:2008/BTNMT - National technical regulation on domestic wastewater (column B, coefficient K = 1.0).

b) Wastewater from construction activities

- Monitoring locations: 02 locations, specifically as follows:

+ NT1: construction wastewater at the main plant.

+ NT2: construction wastewater at Laydown area No. 2 near Quyen River.

- Monitoring parameters: pH, Suspended solids (SS), BOD5, COD, Ammonium (NH4+), Nitrate (NO3-), Phosphate (PO43-), Total Nitrogen (N), Total Phosphorus (P), Total mineral oils, Total Coliforms, Arsenic (As), Lead (Pb), Iron (Fe), Copper (Cu).

- Monitoring frequency: Every 3 months.

- Comparison standard: QCVN 40:2011/BTNMT (column B) - National technical regulation on industrial wastewater.

* *Air Quality Monitoring Program*

- Monitoring locations: 07 locations including:

+ K1: At the main factory construction site

+ K2: At the residential area in Hai Phong village near the project

+ K3: Near the Tay Yen intersection on the transportation route

+ K4: Laydown area No. 2

+ K5: Ash disposal construction site

+ K6: Near the material storage area during dredging operations

+ K7: Residential area in Dong Yen village

- Monitoring parameters: Total Suspended Particulates (TSP), PM10, noise, vibration, SO2, NO2, CO

- Monitoring frequency: Once every 3 months

- Comparison standards: QCVN 05:2023/BTNMT (National Technical Regulation on Air Quality); QCVN 26:2010/BTNMT (National Technical Regulation on Noise); QCVN 27:2010/BTNMT (National Technical Regulation on Vibration)

* *Surface water quality monitoring program*

- Monitoring locations: 05 locations

+ NM1: Quyen River water near Laydown area No. 2

+ NM2: Quyen River water near the dredged material storage area

+ NM3: Quyen River water at the upstream near the topsoil storage site.

+ NM4: Quyen River water at the downstream near the topsoil storage site.

+ NM5: Quyen River water at the area near the dredged material storage sites.

- Monitoring parameters: pH, BOD5, TOC, TSS, DO, Total P, Total Nitrogen, Total Coliform, oil, mineral grease

- Monitoring frequency: Once every 3 months

- Comparison standards: QCVN 08:2023/BTNMT (National Technical Regulation on Surface Water Quality)

** Seawater quality monitoring program*

- Monitoring locations: 12 locations (NB01-NB12)

+ Route T1 (NB01-NB02): Monitoring seawater quality at the dumping site based on dominant wind directions

+ Route T2 (NB03-NB04): Monitoring seawater quality and assessing the impact of dumping activities on the ecosystem around Hon Son Duong and Hon Con Chim

+ Route T3 (NB05-NB06): Monitoring seawater quality and assessing the impact of dumping activities on the coastal fisheries protection area from Cam Linh to Ky Xuan according to the Fisheries Resources Protection and Exploitation Plan for 2021-2030, with a vision to 2050

+ Points NB07 to NB12: Monitoring the impact of dredging activities on nearby areas such as Mui Ron, Vung Ang Port, Hai Phong Beach, Ky Ninh Beach...

- Monitoring times:

+ Continuous monitoring from 7 days before the start of dredging to 7 days after the end of dredging and dumping activities

- Monitoring parameters:

+ For nearshore points NB01, NB02, NB03, NB05: monitoring parameters include pH, TSS, As, Cd, Pb, Cr, Cu, Zn, Hg, CN-, Aldrin, Lindane, Dieldrin, Total DDT, Heptachlor & Heptachlorepoxide, Diazinon, Parathion, Malathion, Total Phenol, oil, Mineral grease.

+ For coastal points NB04, NB06, NB07 to NB12: monitoring parameters include pH, DO, TSS, Total petroleum hydrocarbons, Total Coliform, NH4+, PO43-, As, Cd, Pb, Hg, Cu, Zn, Mn, Cr6+, CN-, F-, Fe, Total phenol, Mineral oil, Aldrin, Lindane, Dieldrin, Total DDT, Heptachlor & Heptachlorepoxide, Polychlorinated biphenyl (PCB), Diazinon, Parathion, Malathion, 1-1-1 Trichloroethane, Tetrachloroethylene PCE, Trichloroethylene, Dichloromethane, Benzene, Anionic surfactants.

- Number of samples:

+ For nearshore water monitoring points (NB01, NB02, NB03, NB05): Each monitoring point will take 03 samples at 3 water layers: surface layer (1m below the sea surface), middle layer (midway between the sea surface and the seabed), and bottom layer (1m above the seabed). For the oil and mineral grease parameter, only the surface layer is sampled, with 01 sample per location.

+ For coastal water monitoring stations (NB04, NB06, NB07 to NB11): Each monitoring point will take 04 samples at 02 water layers: surface layer (1m below the sea surface) and bottom layer (1m above the seabed) at 02 times: high tide and low tide.

For the oil and mineral grease parameter, only the surface layer is sampled, with 01 sample per location.

- Monitoring frequency: pH, DO, TSS monitored daily; other parameters monitored monthly

- Comparison standards: QCVN 10:2023/BTNMT (National Technical Regulation on Seawater Quality)

* *Biological monitoring program*

- Monitoring locations: SH01, SH02, SH03, SH04

- Number of samples: 01 sample/location

- Monitoring parameters: Benthic fauna, zooplankton, phytoplankton

- Sampling times: 01 time within 07 days before construction, during construction, and 01 time within 07 days after dredging/dumping activities

- Frequency: Once a week

* *Dredged material monitoring program*

- Monitoring location: At the dredging area

- Number of samples: 3 samples of dredged material per session; random sampling from active dredging sites

- Monitoring frequency: Once a week

- Monitoring parameters: As, Cd, Pb, Zn, Hg, Cr, Cu, PCB, Organochlorine pesticides, Polycyclic aromatic hydrocarbons (PAH), Dioxin and Furan, Total oil, Total hydrocarbons, Total alpha and beta radioactivity, Tributyltin

- Comparison standards: QCVN43:2017/BTNMT and Appendix 01 of Circular 28/2019/TT-BTNMT

- Monitoring times: From the start to 1 week after the end of construction activities

* *Seawater environmental monitoring program for coastal area near pump stations and unloading points*

- Locations: 8 points at 4 dredged material pumping stations, 3 points at 3 loading points, and 1 point at the sea discharge point for excess seawater.

- Number of samples: 04 samples per location (at 02 water layers: surface layer (1m below the sea surface) and bottom layer (1m above the seabed) at 02 times: high tide and low tide).

- Frequency: Once a week until 1 month after the completion of dredging.

- Monitoring Parameters: pH, DO, TSS, oil & mineral grease(only taken on the surface layer and 1 sample/point)

- Comparison standards: QCVN 10:2023/BTNMT (National Technical Regulation on Seawater Quality)

** Solid and hazardous waste monitoring*

- Monitor the implementation of sorting, collecting, and transferring solid waste and hazardous waste to licensed units for transportation and treatment according to current regulations.

- Applicable management regulations: Decree No. 08/2022/NĐ-CP dated January 10, 2022, by the Government detailing the implementation of a number of articles of the Law on Environmental Protection, Circular No. 02/2022/TT-BTNMT dated January 10, 2022, by the Ministry of Natural Resources and Environment detailing the implementation of a number of articles of the Law on Environmental Protection.

** Other monitoring*

- Monitor the transportation routes of dredged materials using trucks to onshore storage sites; monitor the pipeline route for pumping dredged materials from the pumping station to onshore storage sites; monitor the containment systems at onshore storage sites.

- Monitor and coordinate with construction units to implement risk and incident mitigation measures: oil spill incidents; fire and explosion incidents; landslide incidents; containment breach incidents at dredged material storage sites; pipeline rupture incidents for transporting dredged materials from the pumping system; traffic accidents; occupational accidents; incidents caused by natural disasters and extreme weather according to the prepared prevention and incident response plans.

b2. Monitoring Program during Operation Phase

- ***Periodic Monitoring Program***

** Monitoring of industrial wastewater after treatment by the treatment system with a capacity of 4,800 m^3/day and night.*

- Monitoring location: 01 location before discharging into the cooling canal at the position after the aeration tank.

- Monitoring parameters: Flow rate, Temperature, pH, Color, BOD5, COD, TSS, Residual Chlorine, Total Nitrogen, Total Phosphorus (calculated as P), Arsenic (As), Mercury (Hg), Lead (Pb), Cadmium (Cd), Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe), Total Mineral Oil and Grease, Fluoride (F-), Sulfide, Ammonium (calculated as N), Coliform.

- Monitoring frequency: Once every 3 months.

- Comparison standard: QCVN 40:2011/BTNMT - National technical regulation on industrial wastewater (column B, Kq = 1.3, Kf = 0.9).

** Periodic monitoring of emissions*

- Monitoring location: 02 positions KT1 and KT2 corresponding to the chimneys of the 2 generating units.

- Monitoring frequency: Once every 3 months.

- Monitoring indicators: Total Dust, SO_2, NO_x, CO.

- QCVN 22:2009/BTNMT - National technical regulation on industrial emissions from thermal power plants (Column B, Kp = 0.7; Kv = 1.0) and QCVN 19:2009/BTNMT National technical regulation on industrial emissions for dust and inorganic substances (Column B, Kp = 0.8; Kv = 1.0). (The plant commits to indicators lower than the standard, such as Total Dust ≤ 50 mg/L; SO_2 ≤ 200 mg/L; NO_x ≤ 300 mg/L).

* *Monitoring of ambient air quality, noise, and vibration during operation*

- Monitoring location: 09 locations

+ K1: area at the intersection of Tay Yen village.

+ K2: area at the intersection along the Quyen river.

+ K3: area in Tay Yen village.

+ K4: 1 point south of the 15 ha ash disposal site.

+ K5-K9: 05 points in the residential area of Hai Phong village north of the slag storage site.

- Monitoring frequency: Once every 3 months.

- Monitoring indicators: Total Suspended Particles (TSP), PM10, NO_2, SO_2, CO, noise, vibration.

- Comparison QCVN: QCVN 05:2023/BTNMT, QCVN 26:2010/BTNMT; QCVN 27:2010/BTNMT.

* *Monitoring of groundwater quality*

- Monitoring location: 1 point at the well south of the slag storage site.

- Monitoring frequency: Once every 6 months.

- Monitoring indicators: pH, Total Coliform, NO_3^-, NH_4^+, Permanganate index, Total Dissolved Solids (TDS), Hardness (calculated as $CaCO_3$), As, Cl^-, Pb, Hg, Fe, Cu.

- Comparison QCVN: QCVN 09:2023/BTNMT- National technical regulation on groundwater quality.

* *Monitoring of surface water quality*

- Monitoring location: 02 locations on the drainage river adjacent to the 15 ha slag storage site.

- Monitoring indicators: pH, BOD5, COD, DO, TSS, Total N, Total P, Total Coliform.

- Monitoring frequency: Once every 3 months.

- Comparison standard: QCVN 08:2023/BTNMT - National technical regulation on surface water quality.

* *Monitoring of river sediment quality*

- Monitoring location: 02 locations on the drainage river adjacent to the 15 ha slag storage site.

- Monitoring frequency: Once every 3 months.

- Monitoring indicators: As, Cd, Pb, Zn, Hg, Cr, Cu, total Hydrocarbons.

- Comparison standard: QCVN 43:2017/BTNMT - National technical regulation on sediment quality.

➢ ***Continuous automatic monitoring program***

* *Continuous automatic emissions monitoring*

- Monitoring location: 02 positions corresponding to the chimneys of 2 power generation units.

- Monitoring frequency: automatic, continuous.

- Monitoring parameters: Flow rate, pressure, temperature, O2, Total dust, SO2, NOx (calculated as NO2), CO.

- Applicable standards: QCVN 22:2009/BTNMT (column B, Kp coefficient = 0.7 and Kv coefficient = 1.0) - National technical regulation on emissions for thermal power plants, and QCVN 19:2009/BTNMT (column B, Kp coefficient = 0.8 and Kv coefficient = 1.0) - National technical regulation on emissions for industrial dust and inorganic substances, specifically: Total dust ≤ 50 mg/Nm3; SO2 ≤ 200 mg/Nm3; NOx ≤ 300 mg/Nm3.

* *Automatic, continuous monitoring of industrial wastewater after treatment by the treatment system with a capacity of 4,800 m^3/day and night*

- Monitoring location: 01 location before discharging into the cooling canal at the position after the aeration tank.

- Monitoring parameters: Flow rate (inlet, outlet), Temperature, pH, TSS, COD, NH4+.

- Monitoring frequency: Automatic, continuous, with monitoring cameras transmitting data to the Ha Tinh Department of Natural Resources and Environment as per regulations.

- Comparison standard: QCVN 40:2011/BTNMT, column B (Kq coefficient = 1.3; Kf coefficient = 0.9).

* *Automatic, continuous monitoring of wastewater quality after the FGD system*

- Monitoring location: 02 positions at the end of the aeration tank of each unit, before discharge into the cooling water discharge system.

- Monitoring frequency: Automatic, continuous.

- Monitoring parameters: Flow rate, temperature, pH, Total suspended solids (TSS), Dissolved oxygen (DO), COD, Total sulfite ions (HSO3- and SO32-).

- Comparison standard: QCVN 40:2011/BTNMT (column B, Kf coefficient = 0.9 and Kq coefficient = 1.3) - National technical regulation on industrial wastewater. Specific parameters: Total sulfite ions ≤ 1.0 mg/l, Dissolved oxygen (DO) > 2 and pH > 6 as committed by the project owner.

** Continuous automatic monitoring of condenser cooling water quality*

- Monitoring location: 01 position at the cooling water discharge system.

- Monitoring frequency: Automatic, continuous.

- Monitoring parameters: Flow rate, temperature, pH, Residual chlorine.

- Comparison standard: QCVN 40:2011/BTNMT (column B, Kf coefficient = 0.9 and Kq coefficient = 1.3) - National technical regulation on industrial wastewater. Specific parameters: Residual chlorine ≤ 0.2 mg/l and pH > 6.

- The automatic, continuous wastewater monitoring system must have its quality controlled periodically once a year as specified in Circular No. 10/2021/TT-BTNMT dated June 30, 2021, by the Ministry of Natural Resources and Environment. The company is exempt from periodic wastewater monitoring for parameters already automatically and continuously monitored as specified in Clause 4, Article 97, Decree 08/2022/ND-CP.

➢ ***Other environmental monitoring program***

** Monitoring of domestic solid waste and hazardous waste*

- Monitoring locations: Areas generating domestic solid waste and hazardous waste at the main plant area, port area.

- Monitoring parameters: Composition, waste quantity, waste collection, and management activities as prescribed.

- Monitoring frequency: Regularly (daily)

- Applied regulations: Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several articles of the Law on Environmental Protection, Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Ministry of Natural Resources and Environment detailing the implementation of several articles of the Law on Environmental Protection.

** Monitoring of other environmental issues*

- Monitoring Locations: Project implementation area, waterway channel leading to the project.
- Monitoring Content: Monitoring of oil spill incidents, changes in water flow, sediment deposition in the channel, biodiversity, weather fluctuations in the area.
- Monitoring Frequency: Regularly (daily).

CHAPTER 1. PROJECT INFORMATION

1.1. Project information

1.1.1. Project name.

" Vung Ang II BOT Thermal Power Plant"

1.1.2. Project owner, address, and contact information; legal representative of the project owner; project implementation schedule.

- Investor: Vung Ang II Thermal Power Company Limited (VAPCO) is a limited liability company established by OneEnergy Asia Limited.

- Project Owner's Name: Vung Ang II Thermal Power Company Limited

- Project Owner's Representative: Mr. Go Fukushima - General Director

- Address: Vung Ang Economic Zone - Ky Anh District - Ha Tinh Province

- Phone Number: +84 24 71098799

- Fax Number: +84 24 3624 8485

- E-mail : go.fukushima@vapco.com.vn

- Project Timeline: from the year 2021 to 2025Geographical location (coordinates according to national coordinate system, boundaries) of the project site.

1.1.3. Project Implementation Context

The Vung Ang II BOT thermal power plant Project (the Project) was approved by the Government of Vietnam for development under the BOT model as per document No. 1266/VPCP-KTN dated March 2, 2009, with a total investment of USD 2.4 billion (~VND 55.2 trillion). The project is developed by One Energy Asia Limited, owned by Mitsubishi Corporation (Japan) (40%), KEPCO (Korea) (40%), and Chugoku (Japan) (20%). Doosan Heavy Industries and Samsung E&C (Korea), along with Pacific Corporation, are the main contractors.

The Project has a net capacity of 2 x 600MW, using the latest ultra-supercritical technology. The fuel used is imported coal from Australia and Indonesia. The project agreements, including the BOT Contract, Government Guarantee, Power Purchase Agreement, and Land Lease Agreement, were signed in December 2020. Financial closure and construction commencement occurred on October 26, 2021. Unit 1 is expected to begin commercial operation in June 2025, and Unit 2 in October 2025.

Currently, the basic contents of the Project are being implemented in compliance with the schedule committed to the Ministry of Industry and Trade and the current regulations of Vietnamese law. However, before commercial operation of Unit 1 in June 2025, about three months are needed to complete the legal procedures for port opening, depth survey, maritime notification, port security documentation, fire prevention and fighting, and completion of reports with the State Acceptance Council. To complete these procedures, the water area in front of the wharf, the turning basin, and the water area serving the connection to the navigational channel must be completed to technical standards ensuring the ability to receive ships with a tonnage of up to 100,000 DWT entering and leaving the port. Besides, from November 2024 to the end of March 2025, it is very difficult to carry out construction at sea due to adverse weather conditions.

Currently, the dredging items at the intake, discharge area, turning basin, and navigational channel cannot meet the required schedule because the dredging material is mainly clay and weathered rock. Bringing all this material to the storage yard according to the previously approved EIA plan is very difficult and seriously affects the project's schedule.

To address this difficulty, the Project Owner has coordinated with related units to find solutions. The Project Owner has evaluated many handling options such as: transporting all dredged material to shore by truck or pump station; dumping all dredged material at sea; maximizing the transport of dredged material to shore and dumping the remainder at sea; staging the project to maximize the transport of dredged material to shore.

Regarding the phased construction plan to ensure that a 50,000 DWT vessel can dock for trial operations according to specific time milestones in October 2024 and June 2025. Based on these timelines, along with the construction capacity of the equipment, combined with the implementation of administrative procedures before the plant goes into commercial operation, the feasibility of the phased solution is analyzed and evaluated as follows: if the timeline is set as April 1, 2025, it will take a minimum of 62 days to complete the procedures before commercial operation, equivalent to June 3, 2025. If an additional buffer time of about 15 days is included, it will be equivalent to June 18, 2025. Both of these timelines coincide with the timeline when the plant needs to be in commercial operation. Therefore, if the procedures start on April 1, 2025, it will be very difficult to meet the commercial operation schedule. Thus, construction must be completed before April 1, 2025. Furthermore, from November 1, 2024, to April 1, 2025, construction is very difficult due to the harsh conditions of the Northeast monsoon season.

Therefore, considering the legal procedures and construction conditions, the phased solution is not feasible to meet the commercial operation schedule, with a delay in commercial operation of about 6 months.

Considering various aspects such as legal basis, equipment capability, environmental impact, project implementation schedule, and working results with related units, the Project Owner has proposed two construction options as a basis for economic and social efficiency analysis as follows:

- Option 1: Transport all dredged material to the onshore storage yard (according to the approved EIA decision).

- Option 2: Maximize the transport of dredged material to the onshore storage yard (663,851 m^3) and dump the remaining dredged material at sea (1,761,232 m^3). (This is the chosen option after the Project Owner consulted with the provincial People's Committee on construction solutions and consulted relevant agencies on arranging safe construction sites to propose site arrangements and construction fronts to maximize the transport of dredged material to the storage yard).

The Project Owner has prepared a report analyzing the economic and social efficiency comparing these two options, assessing the project's impact from many aspects: the project's role in the national power structure, microeconomic efficiency, macroeconomic efficiency, impact on national energy security, impact on attracting foreign investment (diplomatic relations between Vietnam and South Korea), impact on creating jobs for local workers. The results of the economic and social efficiency assessment show:

Currently, the plant is urgently implementing the project items to meet the commercial operation schedule as per the BOT contract signed in October 2024. During implementation, the Plant and the contractor consortium strictly comply with Vietnamese law. However, during implementation, due to prolonged construction time and actual construction conditions influenced by weather factors, there are difficulties in dredging and transporting materials to the storage yard as per the regulations of the Ministry of Natural Resources and Environment and agreements with local authorities.

According to the results of the economic and social efficiency assessment, the choice of handling dredged material significantly affects the project's schedule. Therefore, this choice will affect both microeconomic and macroeconomic aspects in the short and long term. In the microeconomic aspect, the affected subjects are identified as the Investor and state budget revenue.

In the microeconomic aspect, if Option 1 (transporting all dredged material to shore) is chosen, it will lead to a one-year delay in commercial operation (2025), estimated to cause losses of about VND 12.3 trillion for the Investor. This option is estimated to cause state budget revenue losses of about VND 1,009.95 billion. In the microeconomic aspect, considering the two affected subjects, the choice of solution only affects the short-term period, from 2025-2026. Long-term impacts are not clearly demonstrated.

In the macroeconomic aspect, if Option 1 is chosen, it is estimated to affect the GDP index in the short term by about USD 1.4 billion (according to the World Bank's view and data, assuming the impact of delayed commercial operation combined with the predicted return of the El Niño phenomenon in 2025-2026). According to the projected electricity demand ratio in Power Plan VIII for 2025, the impact of the chosen solution on electricity demand is estimated at 17%. Considering the long-term period (2025-2030 planning period), based on aggregated documents and statistical data, it is estimated to affect the long-term GDP index by about 1.35%, equivalent to approximately USD 2.1 billion/year.

Regarding social impact, the assessment is quantitatively considered based on statistical data and actual events. Accordingly, choosing the solution to transport all dredged material to shore will affect energy security, attract foreign investment (FDI), and stabilize employment, creating income for local people. Long-term impacts on social factors are not clearly demonstrated and therefore are not assessed.

Based on the analysis and evaluation of economic and social efficiency, the optimal option at this stage is to maximize the transport of dredged material to the onshore storage yard (663,851 m^3) and dump the remaining dredged material at sea (1,761,232 m^3) to ensure the commercial operation schedule as committed.

1.1.4. Geographical Location of the Project Site

1.1.4.1. Overview of the Entire Project Scope

The Vung Ang II BOT Thermal Power Plant Project (main plant section) is located in Hai Phong hamlet, Ky Loi commune, Ky Anh town, Ha Tinh province, Vietnam. The project is situated in the Vung Ang Economic Zone (EZ), approximately 60 km south of Ha Tinh city and about 9 km east of National Highway 1. The Vung Ang Economic Zone was established by Decision No. 72/2006/QD-TTg dated April 3, 2006, by the Prime Minister, covering a total area of 22,781 hectares, including 9 communes and wards in the southern part of Ky Anh town. With a favorable position, backed by mountains and facing the East Sea, it is nearly 70 km south of Ha Tinh city and 50 km north of Dong Hoi Airport (Quang Binh).

The Vung Ang II BOT Thermal Power Plant Project is adjacent to the Vung Ang 1 Thermal Power Plant, which has been commercially operational to the west. The project includes both onshore sections (main plant area) and auxiliary sections serving the plant's operations, such as onshore components (construction site area, organic soil storage area, ash storage areas, access roads to the plant, staff housing area...) and offshore components (access bridge, coal import port and turnaround area, cooling water intake line, cooling water discharge line...).

The boundaries of the main plant area are as follows:

- To the northeast, it is 100 meters from the nearest residential area (Hai Phong hamlet);

- To the west, it is adjacent to the 1200 MW Vung Ang 1 Thermal Power Plant and Sang mountain;

- To the north, it borders the sea (Vung Ang bay);

- To the south, it borders Bo Can mountain, which ranges from 85 meters to 300 meters above sea level.

1.1.4.2. Dredging area scope

The dredging area of the project includes the cooling water intake canal, the cooling water discharge canal, the marine fairway, the connecting water area, the turning basin, and the water area in front of the dock of the Vung Ang II BOT thermal power plant port. The dredging area layout is depicted in the figure below:

Figure 1.1 Schematic diagram of the dredging area scope of the project

1.1.4.3. Onshore storage area scope

The disposal area for dredged material has a total area of 55.33 hectares, designated for industrial and heavy industrial use (Lot CN04) according to the master plan of the Vung Ang Economic Zone (located in Ky Loi commune), consisting of two areas as follows:

+ Area 1: 38.33 hectares. Located on the left side of Nguyen Chi Thanh Road leading to Son Duong Port (next to the Cellpin Vines manufacturing plant and the Viethai Ash and Ash Treatment and Recycling Company), approximately 5.0 km southeast of the main plant.

+ Area 2: 16.63 hectares. Located opposite Area 1, the Economic Zone Management Board handed over the area in the field according to the minutes dated May 23, 2022. The current average elevation is +0.2m, with a finished elevation of +3.0m after leveling.

Based on Document No. 1599/SGTVT-QLHT dated June 17, 2024, from the Department of Transport of Ha Tinh Province regarding opinions related to dredged material transportation solutions for Vung Ang II Thermal Power Plant.

Based on Document No. 892/KKT-TNMT dated June 24, 2024, from the Ha Tinh Economic Zone Management Board regarding consultation opinions on the construction site layout plan.

Based on Document No. 81/CVHHHT-PCHH dated June 26, 2024, from the Ha Tinh Maritime Administration regarding consultation opinions on the construction site layout for dredged material transportation under the "Vung Ang II Thermal Power Plant" project.

Based on Document No. 143/UBND-ĐC dated June 25, 2024, from the People's Committee of Ky Loi Commune regarding consultation opinions on the construction site layout plan for the "Vung Ang II Thermal Power Plant" project;

The construction site layout for placing dredged material into the storage area, including the locations for the pump stations and unloading points for transferring dredged material ashore, has been agreed upon and is described in the figure below:

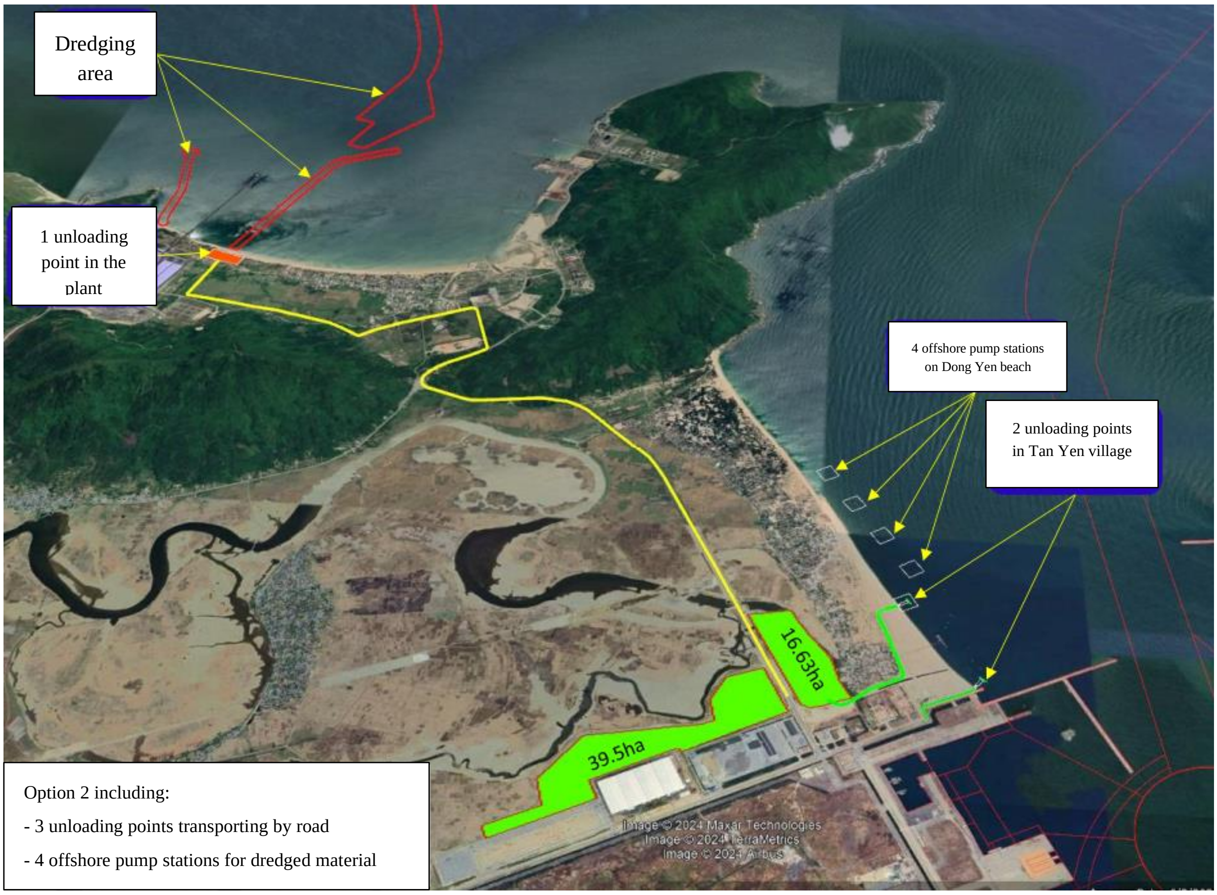


Figure 1.2 Schematic diagram of the layout of the pumping stations and loading points

1.1.4.4. Offshore disposal area scope

The proposed dumping area for the dredged material of the Vung Ang II BOT Thermal Power Plant project covers an area of 200 hectares, located in the sea area under the jurisdiction of Ky Anh town, Ha Tinh province, about 22 km northeast of the dredging area, with sea depths ranging from 39m to 42m and bounded by four points P2.1, P2.2, P2.3, and P2.4 with specific coordinates as follows:

Table 1.1 Coordinates of the boundary points for the 200-hectare dredged material dumping area

Corner point	**Coordinates in VN-2000 Coordinate System, central meridian 105°30', zone 3°**			
	Geographical Coordinates		**Rectangular Coordinates**	
	Latitude (B)	**Longtitude (L)**	**X (m)**	**Y (m)**
P2.1	18º 17' 36.11"	106º 32' 50.71"	2023567.292	610735.865
P2.2	18º 17' 03.83"	106º 33' 25.01"	2022580.678	611749.074
P2.3	18º 16' 31.06"	106º 32' 51.22"	2021567.469	610762.460
P2.4	18º 17' 03.34"	106º 32' 16.92"	2022554.083	609749.250

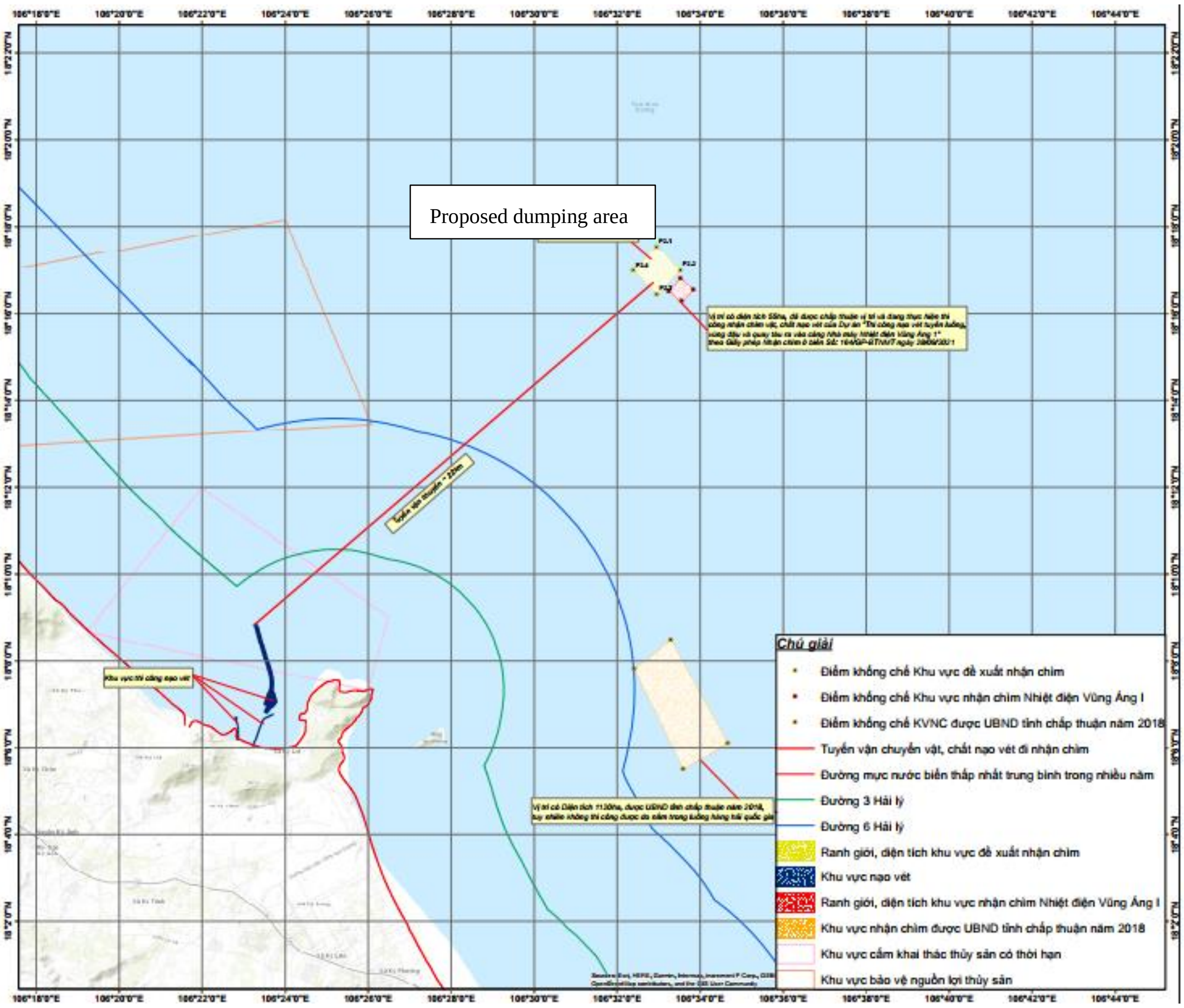


Figure 1.3. General map of the dumping area location.

1.1.5. Current management and usage status of the project land and water surface.

1.1.5.1. Onshore construction items

- The area of the onshore plant is 362,997 m². The project owner was handed over the site in the field by the Compensation, Support, and Resettlement Council of Ky Anh town on August 18, 2021. The project began construction work in October 2021. The construction items at the main plant remain largely unchanged from the EIA approved in 2018, with changes in construction and architecture mainly being in the layout of the master plan and the size of items in the technical design stage to optimize the system in operation and match the actual equipment sizes of the EPC contractor. The designs for the main plant constructions comply with the content assessed in document No. 463/ĐL-NĐ&ĐHN dated April 9, 2021, from the Renewable Energy Department, Ministry of Industry and Trade.

- The area of the ash disposal in phase 1 is 15 hectares. The phase 1 ash dump location is adjacent to the main plant. The project owner was introduced to the site by the Management Board of Ha Tinh Economic Zones in document No. 03/KKT-QHXD dated March 4, 2022, and approved by the General Department of Environment for the location change in document No. 4028/TCMT-TĐ dated November 7, 2022. The project owner was handed over the first batch of land (142,410.7 m²) on June 15, 2023, and the entire area (150,000 m²) in the field on September 26, 2023, by the Compensation, Support, and Resettlement Council of Ky Anh town. Currently, the bottom foundation construction activities for the ash dump are underway. The area is fairly flat, making it convenient for setting up the ash dump and related items for construction and operation.

- The area of the ash disposal in phase 2 is 34.4 hectares. The project owner has not yet received the handover of the phase 2 ash disposal area from the Ha Tinh Economic Zone Management Board. It is expected that phase 2 will commence operations after the phase 1 ash disposal has ceased waste dumping activities. Additionally, the timing for investing in phase 2 depends on the handling and utilization of ash in the area as raw materials for building materials production and construction according to Directive No. 08/CT-TTg dated March 26, 2021, by the Prime Minister. The phase 2 ash dump area mainly consists of single-crop rice fields, annual crops, and perennial plants in Ky Trinh ward, Ky Anh town. The area was approved for land recovery and land-use change in 2022 by the Ha Tinh Provincial People's Council in Resolution No. 61/NQ-HĐND dated December 16, 2021. The phase 2 ash dump area is also included in the 2022 land-use plan of Ky Anh town approved by the Ha Tinh Provincial People's Committee in Decision No. 519/QĐ-UBND dated March 4, 2022, and the 2021-2030 land-use plan of Ky Anh town, Ha Tinh province approved in Decision No. 1776/QĐ-UBND dated August 26, 2022.

- Area for the ash pipeline serving phase 2 ash disposal: The ash pipeline serves to pump ash from the main plant to the phase 2 ash disposal. The pipeline route was approved by the Ha Tinh Economic Zone Management Board in document No. 1007/KKT-QHXD dated December 11, 2018, with a length of about 3.64 km. The pipeline area passes through agricultural land and transportation land, and the project owner has not yet received the land handover for this item.

- The project owner has been handed over 2 construction yards. These yards do not have concrete mixing station activities; commercial concrete is transported to the project by concrete trucks for construction. The yards are used only for storing machinery, equipment, and materials.

+ Yard 1: Area of 132,053.7 m² in Ky Loi commune, according to the handover record between the Ha Tinh Economic Zone Management Board and Vung Ang II Thermal Power Co., Ltd. on September 22, 2021, consisting of 2 areas: Equipment complex area 1-VA2 with an area of 21,500.7 m² and equipment complex area 2-VA2 with an area of 110,553.0 m². Currently, the project only uses equipment complex area 1 in front of the main plant to store equipment and materials for plant construction.

Equipment complex area 2-VA2 remains as forest land with eucalyptus, casuarina, and annual crops due to difficulties in clearing and leveling this area.

+ Yard 2: Area of 237,394.2 m^2 in Ky Loi commune, about 1.8 km southeast of the main plant site. The area has been handed over in the field according to the handover record between the Ha Tinh Economic Zone Management Board and Vung Ang II Thermal Power Co., Ltd. on November 24, 2021.

- Temporary access road to the plant for the construction phase: The project owner has completed about 70% of the access road to the project according to the field handover record between the Ha Tinh Economic Zone Management Board and Vung Ang II Thermal Power Co., Ltd. on August 31, 2021, with an area of 16,234.2 m^2.

- Organic waste dump at Ky Trinh ward, Ky Anh town, Ha Tinh province, with an area of 83,061 m^2, about 10 km west of the project. The project owner has been handed over the site in the field according to the handover record on May 18, 2021. The storage capacity of the dump is estimated at about 250,000 m^3.

- Onshore dredged material storage area: The dredged material disposal area is within the industrial and heavy industrial zone (Lot CN04) according to the general plan of Vung Ang Economic Zone (in Ky Loi commune), consisting of 2 areas:

+ Area 1: Area of 38.33 hectares. Located to the left of Nguyen Chi Thanh road to Son Duong port (next to Cellpin Vines manufacturing plant and Viet Hai Ash Treatment and Recycling Co., Ltd. plant), about 5.0 km southeast of the main plant. The average existing elevation is +0.5 m, and the finished elevation after leveling is +3.5 m.

+ Area 2: Area of 16.63 hectares. Located opposite area 1, handed over by the Economic Zone Management Board in the field according to the handover record on May 23, 2022. The average existing elevation is +0.2 m, and the expected finished elevation after leveling is +3.0 m.

These storage areas are temporarily given for the construction phase to store dredged materials and will be handed over to the Ha Tinh Economic Zone Management Board for industrial development purposes.

1.1.5.2. Offshore area status

The project owner has been approved by the Ministry of Natural Resources and Environment for the sea area use with a total area of 60.27 hectares under Decision No. 691/QĐ-BTNMT dated March 23, 2023, including the following main functional subdivisions:

- Area for construction and operation of the coal port approach bridge: 3.51 hectares.

- Area for construction and operation of the coal port, waters in front of the port, and turning basin: 41.69 hectares.

- Area for construction and operation of waters for connecting the coal port: 5.01 hectares.

- Area for construction and operation of the cooling water intake pipeline system: 2.92 hectares.

- Area for construction and operation of the cooling water discharge pipeline system (Vung Ang 1 Thermal Power Plant and Vung Ang II BOT Thermal Power Plant): 7.14 hectares.

To date, the project owner has completed construction of the coal port approach bridge area and the coal port docking area with approximately 90% completion. For dredging activities at the port area, turning basin, and waters in front of the port, adjustment of the construction plan is underway to ensure progress.

1.1.6. Distance from the project to residential areas and environmentally sensitive areas.

1.1.6.1. Natural objects:

- River System: The Quyen River is the main river flowing through the area near the Project. The project construction area is currently experiencing relatively active traffic, construction, and industrial development activities.

- The project is adjacent to Bo Can Mountain to the south, about 2.4 km away. To the north and northeast, approximately 1.2 km from the project, lies Ong Ton Mountain, and to the west and southwest are Sang Mountain and Cao Vong Mountain..

1.1.6.2. Socio-Economic Objects

- Proximity to Residential Areas: About 100 meters to the northeast of the project is the residential area of Hai Phong Hamlet, Ky Loi Commune. This residential area is scheduled for relocation (according to the general planning map of Ky Anh Town oriented towards 2035, designated as transportation land coded DGT).

About 2.5 km to the southwest of the project is the residential area of Tay Yen Hamlet.

- To the west: The Vung Ang 1 Thermal Power Plant, managed and operated by Ha Tinh Petroleum Power Company, with a capacity of 1,200 MW (2 x 600 MW). The Vung Ang 1 Thermal Power Plant began commercial operations with Unit 1 in December 2014 and Unit 2 in May 2015.

To the south: The 500 kV power switchyard of Vung Ang Power Center. The Vung Ang II project will connect to the national power system at the 500 kV voltage level through the 500 kV switchyard of Vung Ang Power Center, which is invested and built by the National Power Transmission Corporation.

The 500 kV Vung Ang switchyard is designed for long-term operation with three main voltage levels: 500 kV, 220 kV, and 35 kV. Currently, it is operating one transformer: AT-900 MVA-500/220 kV.

- Near the project area, there are fishing and aquaculture activities, including about 5-10 households raising cage fish near Wharf No. 01 of Vung Ang Port, aquaculture activities of households in the lower Quyen River near the estuary, and shrimp farming areas along the coast of Ky Phuong and Ky Nam Communes, Ky Anh Town. Around the project area (outside the port area), there are scattered fishing activities by the residents of Ky Loi Commune, though the fishing scale is small, with primitive fishing equipment and small-scale family operations.

Other water usage and waterway transportation infrastructure in the current status in the area includes:

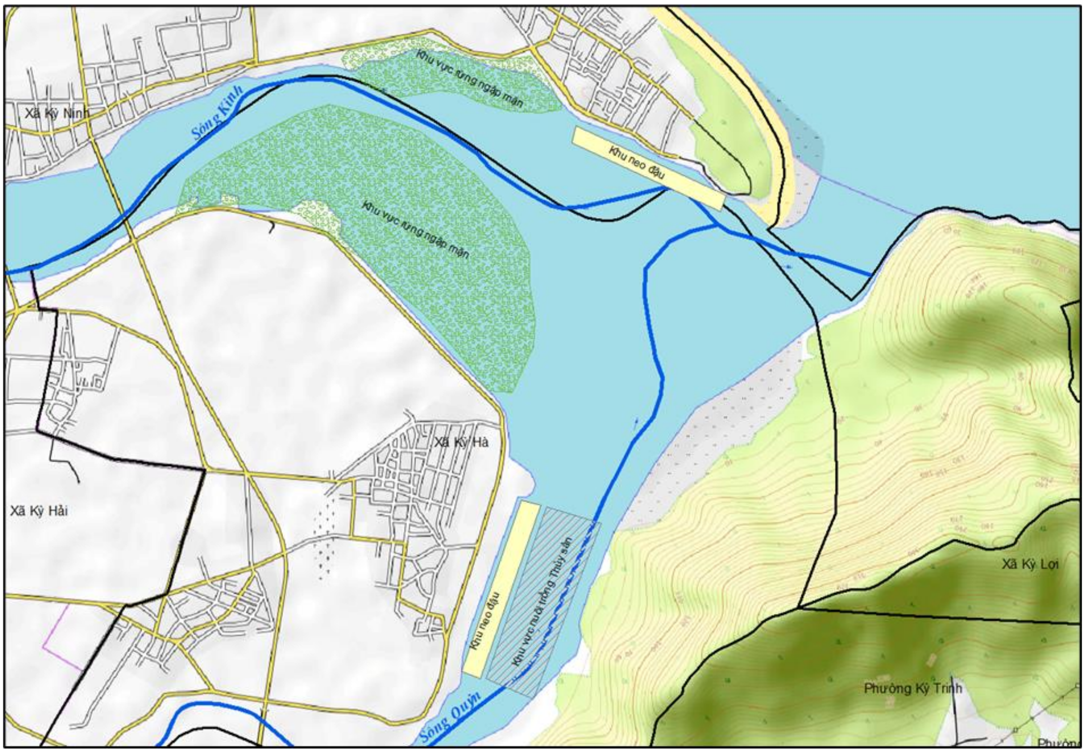
- Vung Ang 1 Thermal Power Plant: About 700 meters east of the water intake is the wharf of Vung Ang 1 Thermal Power Plant, perpendicular to the shoreline with a length of about 900 meters. The wastewater discharge outlet of Vung Ang 1 Thermal Power Plant is located on the shoreline, 50 meters east of the wharf. The wastewater includes cooling wastewater and domestic wastewater with a maximum flow rate of 4,448,126 m^3/day discharged by gravity flow. It is expected that after the Vung Ang II BOT Thermal Power Plant goes into operation, the cooling water discharge system of Vung Ang 1 Thermal Power Plant will be shifted to a parallel and independent line with the underwater discharge pipe compared to the wastewater discharge pipe of Vung Ang II BOT Thermal Power Plant. Vung Ang 1 Thermal Power Plant has been in operation since 2014, without any incidents related to the marine environment.

+ Lao - Vietnam International Port: Includes ports 1-2-3, located to the northeast of the project, exploiting and using the sea area near the project.

+ PVOIL Dedicated Port: Serves activities related to oil and gas commerce.

+ Ports under construction: Includes Port No. 5+6 – Phoenix Port of Phoenix Vung Ang Vietnam Company Ltd., and Port No. 4 - Hoanh Son International General Port, invested by Hoanh Son Port Joint Stock Company.

The adjacent sea areas have been handed over to the ports for waterway exploitation activities. The nearby area, about 3.5 km northwest of the project, belongs to Ky Ha Commune – it is the Cua Khau mooring area with a capacity of 300 boats. The mooring area for boats primarily focuses near the Quyen River estuary, about 1-3 km from the estuary in Ky Ninh and Ky Ha Communes. There are also aquaculture activities in the area, mainly cage fish farming (about 4.0 km from the project and about 5.5 km southwest of the cooling water discharge point).



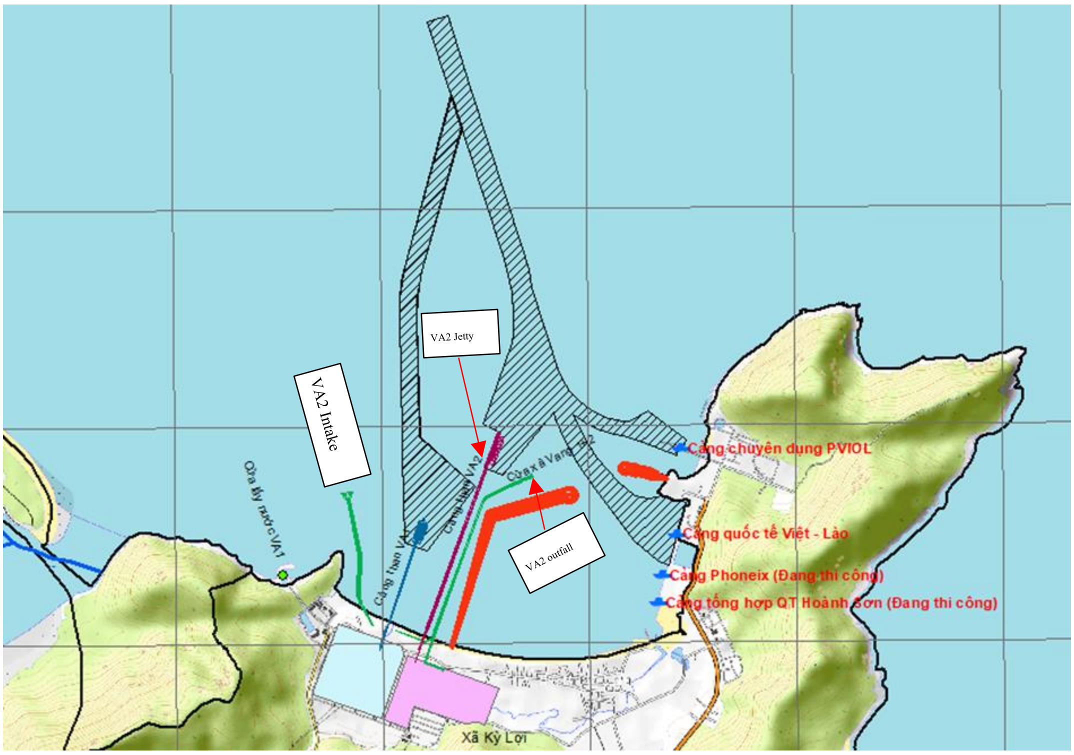


Figure 1.4. The current location of facilities, marine fairway for water usage, and sea areas in the project area.

1.1.7. Objectives; type, scale, capacity, and production technology of the project.

1.1.7.1. Objectives

a. General Objectives of the Project

- Contribute to overcoming the electricity shortage during the dry months and improve the reserve ratio of the national power system from 2023;

- Contribute to increasing the ratio of thermal power to hydropower in the power generation structure, improve the operational regime of the national power system, and enhance the reliability of power supply during the dry season and years with water shortages;

- Directly provide proactive and stable electricity to the local loads, reduce transmission losses on the power grid, and create a sense of safety and reliability for investors to invest in the Vung Ang Economic Zone and Ha Tinh province;

- Create conditions for the socio-economic development of the Vung Ang Economic Zone in particular and Ha Tinh province in general;

- Diversify capital sources in the investment and construction of the thermal power plant.

b. Objectives for adjusting the dredged material handling plan- Dredge the cooling water intake and discharge canals to meet technical standards ensuring operational capability for the plant units when the plant becomes operational.

- Dredge the water area in front of the port and the turning basin, as well as the water area connecting the channel to technical standards to ensure the capability of receiving ships up to 100,000 DWT, thereby supporting the continuous supply of coal for the plant's ongoing production activities.

Based on the project milestones outlined in the signed BOT contract:

- October 26, 2024: Commercial operation of Unit #1

- June 25, 2025: Commercial operation of Unit #2

Due to practical implementation, the project faces some time-related difficulties as follows:

- From November 2024 to the end of March 2025, dredging activities can hardly be carried out due to adverse weather conditions.

- Before the commercial operation of Unit 1 on June 2025, approximately months are needed to complete legal procedures for port opening, fire prevention and fighting, and to finalize reports for the State Acceptance Council. To complete these procedures, the water area in front of the berth, the turning basin, and the water area serving the channel connection must meet the technical standards to ensure the reception of ships with a tonnage of up to 100,000 DWT entering and leaving the port. Therefore, all work related to the above procedures needs to be completed before March 2025 to ensure the schedule, including the dredging of the water area in front of the wharf and the turning basin, the water area serving the connection, and the navigation channel.

Therefore, to ensure completion according to the commitments in the signed BOT contract, the dredging items of the project need to be completed before October 2024 to meet the conditions for the subsequent tasks.

1.1.7.2. Scale

a. General Scale of the Project

- Power Generation Capacity: total capacity of 1330 MW (design capacity: gross: 2 x 665 MW, net: 2 x 600 MW).

- Land Use Scale:

+ Power generation capacity: total capacity of 1330 MW (nominal capacity: (gross) 2 x 665 MW, (net) 2 x 600 MW)

+ Land use scale: total land area, land with water surface, and sea area of approximately 499.56 hectares, including:

++ Land area onshore: approximately 192.13 hectares, including:

++ Main plant area: approximately 36.3 hectares (long-term leased area)

Table 1.2 Coordinates of the main plant area boundary points

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
1	2001538.223	593290.186
2	2002088.827	593492.233
3	2001802.905	594271.195
4	2001447.564	594140.770
5	2001646.886	593555.910
6	2001464.199	593493.564

+ The ash slurry disposal area with a total area of approximately 49.4 hectares (site No. 1 with an area of about 15 hectares and site No. 2 with an area of about 34.4 hectares) (long-term leased area):

Table 1.3 Boundary coordinates of the ash slurry disposal site No. 1.

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
BX1	2001802.905	594271.195
BX2	2001674.597	594619.852
BX3	2001309.960	594605.710

BX4	2001471.048	594149.390

Table 1.4. Boundary coordinates of the ash slurry disposal site No. 2.

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
A	1999919.496	590155.854
1	2000005.707	590139.546
2	2000404.988	590002.383
3	2000582.054	590252.493
4	2000632.610	590605.330
10	2000102.122	590713.818
V1	2000084.066	590658.653
V2	2000094.486	590690.488
V3	1999740.269	590787.491
V4	1999731.430	590755.226

+ The area for the cooling water system, pumping station, and onshore wharf with an area of approximately 6.02 hectares (long-term leased area):

Table 1.5 Boundary coordinates of the cooling water system, pumping station, and onshore wharf

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
I4	2002546.603	593104.535
I5	2002563.238	593073.700
C1	2002538.740	593076.428
C1a	2002426.647	593129.278
C1b	2002438.919	593155.307
C2	2002413.922	593102.289
C3	2002454.822	593189.036
C4	2002305.645	593259.371
C5	2002265.059	593245.473
C6	2002258.850	593175.404
C7	2002140.334	593588.153
C8	2002316.984	593654.041
C9	2002308.600	593682.109
C10	2002129.670	593616.283
C11	2002110.425	593668.595
C12	2002291.604	593734.290
C13	2002280.586	593766.982
C14	2002022.463	593673.046

C15	2002063.863	593560.257
C16	2002112.051	593577.853
CR1	2002123.714	593397.160
CR2	2002171.555	593414.720
CR3	2002212.883	593301.418
CR4	2002202.815	593297.710
CR5	2002195.906	593316.583
CR6	2002158.503	593302.376
CR7	2002249.006	593171.795
CR8	2002218.327	593255.462
CR9	2002228.309	593259.127

+ The ash pipeline area is approximately 5.4 ha (long-term lease area):

Table 1.6 Boundary coordinates of the ash pipeline area

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**		**Point**	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**		**X(m)**	**Y(m)**
1	2001538.223	593290.186	O5	2002284.623	593755.021
2	2002088.827	593492.233	O6	2002298.150	593714.853
3	2001802.905	594271.195	O7	2003410.475	594122.774
4	2001447.564	594140.770	O8	2003444.056	594151.448
5	2001646.886	593555.910	P1	2001473.173	593487.108
6	2001464.199	593493.564	P2	2001446.180	593475.656
I4	2002546.603	593104.535	P3	2001436.822	593471.686
I5	2002563.238	593073.700	P4	2001428.529	593468.205
C1	2002538.740	593076.428	P5	2001429.942	593464.408
C1a	2002426.647	593129.278	P6	2001417.700	593461.642
C1b	2002438.919	593155.307	P7	2001363.537	593437.539
C2	2002413.922	593102.289	P8	2001303.444	593401.215
C3	2002454.822	593189.036	P9	2001301.471	593395.486
C4	2002305.645	593259.371	P10	2001312.247	593234.444
C5	2002265.059	593245.473	P11	2001294.578	593174.732
C6	2002258.850	593175.404	P12	2001307.438	593120.852
C7	2002140.334	593588.153	P13	2001345.664	593033.956
C8	2002316.984	593654.041	P14	2001348.208	593032.346
C9	2002308.600	593682.109	P15	2001378.630	593025.846
C10	2002129.670	593616.283	P16	2001401.339	593003.152

C11	2002110.425	593668.595	P17	2001416.832	592960.743
C12	2002291.604	593734.290	P18	2001423.977	592736.415
C13	2002280.586	593766.982	P19	2001415.187	592703.646
C14	2002022.463	593673.046	P20	2001400.003	592694.625
C15	2002063.863	593560.257	P21	2001277.718	592694.116
C16	2002112.051	593577.853	P22	2001249.104	592690.287
CR1	2002123.714	593397.160	P23	2001107.207	592653.215
CR2	2002171.555	593414.720	P24	2001063.677	592638.903
CR3	2002212.883	593301.418	P25	2000840.751	592530.161
CR4	2002202.815	593297.710	P26	2000529.855	592159.046
CR5	2002195.906	593316.583	P27	2000529.180	592096.040
CR6	2002158.503	593302.376	P28	2000522.106	591976.616
CR7	2002249.006	593171.795	P29	2000615.533	591670.572
CR8	2002218.327.	593255.462	P30	2000626.612	591594.653
CR9	2002228.309	593259.127	P31	2000772.502	591201.916
R1P	2001481.682	595095.397	P32	2000777.614	591125.637
R1T	2001468.118	595101.803	P33	2000760.976	590976.108
R2P1	2001307.482	594726.512	P34	2000702.154	590783.726
R2P	2001300.698	594677.019	P35	2000681.047	590686.504
R2P2	2001302.506	594626.834	P36	2000646.897	593539.695
R2T	2001268.301	594678.670	T1	2001472.002	593489.869
R3P	2001496.672	594076.797	T2	2001445.199	593478.499
R3T	2001482.528	594071.803	T3	2001435.661	593474.452
CV1	2003672.031	594179.645	T4	2001425.371	593469.957
CV2	2003680.346	594157.131	T5	2001339.922	593442.134
CV3	2002316.355	593656.146	T6	2001308.371	593426.427
CV4	2002309.473	593679.186	T7	2001293.325	593401.413
B1	2003694.085	594163.586	T8	2001300.965	593233.531
B2	2003685.879	594185.606	T9	2001278.478	593178.451
B3	2003976.364	594293.858	T10	2001300.956	593098.604
B4	2003984.570	594271.837	T11	2001341.272	593025.913
C8	2003985.072	594270.060	T12	2001374.896	593018.969
CV2	2003680.346	594157.131	T13	2001392.483	592995.244
KC14	2003623.509	594311.024	T14	2001407.885	592959.648
KC13	2003909.468	594546.991	T15	2001399.557	592737.906
KC12	2004152.919	594747.882	T16	2001395.605	592708.514
KC11	2004696.220	594575.022	T17	2001356.513	592708.444
KC15	2005491.458	594319.614	T18	2001316.914	592702.150
KC10	2004758.582	594406.170	T19	2001276.690	592700.565

KC9	2004057.155	594147.112	T20	2001106.399	592656.258
I4	2002546.603	593104.535	T21	2001062.542	592641.687
I5	2002563.238	593073.700	T22	2000829.662	592528.090
I7	2002594.879	593069.897	T23	2000819.465	592521.542
I8	2002938.973	593081.215	T24	2000520.007	592162.854
I9	2003400.765	592984.643	T25	2000515.190	592096.720
I10	2003461.982	592938.492	T26	2000512.042	591975.332
I11	2003472.456	593031.877	T27	2000605.778	591668.166
I12	2003406.521	593013.577	T28	2000616.864	591592.199
I13	2002941.543	593110.815	T29	2000741.706	591248.964
I14	2002590.435	593099.267	T30	2000758.628	591204.769
O1	2003633.433	594558.888	T31	2000741.990	591178.050
O2	2003595.012	594576.804	T31a	2000649.490	590641.605
O3	2003418.698	594198.700	T32a	2000632.600	590605.300
O4	2003372.526	594156.211	T32	2000623.810	590544.012

+ The worker housing area is approximately 3.06 ha (long-term lease area):

Table 1.7. Boundary coordinates of the worker housing area

Point	**VN 2000 Coordinate System, meridian 105°30’, projection zone 3°**	
	X(m)	**Y(m)**
A	1993273.790	593725.980
B	1993207.850	593877.100
C	1993391.280	593929.920
D	1993438.250	593766.110
E	1993283.320	593721.500

+ Access road to the main plant area: approximately 1.62 hectares (temporarily leased area);

Table 1.8. Coordinates of boundary points for the access road to the main plant area

Point	**VN 2000 Coordinate System, meridian 105°30’, projection zone 3°**	
	X(m)	**Y(m)**
R1P	2001481.682	595095.397
R1T	2001468.118	595101.803
R2P1	2001307.482	594726.512
R2P	2001300.698	594677.019
R2P2	2001302.506	594626.834
R2T	2001268.301	594678.670
R3P	2001496.672	594076.797

Point	VN 2000 Coordinate System, meridian 105°30’, projection zone 3°	
	X(m)	Y(m)
R3T	2001482.528	594071.803

+ Temporary construction material storage area: total area of approximately 25.89 hectares (construction site 1: approximately 2.15 hectares and construction site 2: approximately 23.74 hectares) (temporarily leased area);

Table 1.9. Coordinates of boundary points for the temporary construction material storage area

Point	VN 2000 Coordinate System, meridian 105°30’, projection zone 3°	
	X(m)	Y(m)
I. Construction site 1: approximately 2.15 hectares		
1	2001969.39	593969.81
2	2001873.08	594297.01
3	2001802.90	594271.19
4	2001920.17	593951.74
5	2001969.39	593969.81
II. Construction site 2: approximately 23.74 hectares		
1	2000694.88	595351.60
2	2000627.01	595333.33
3	2000426.17	595237.32
4	2000385.71	595291.83
5	2000364.68	595271.66
6	2000317.57	595301.12
7	2000543.52	595554.98
8	2000563.38	595684.59
9	2000429.13	596061.31
10	2000414.72	596200.76
11	2000694.89	596251.61
12	2000735.42	596432.86
13	2000745.37	596409.27
14	2000682.94	596118.58
15	2000694.44	596046.84
16	2000721.84	595939.95
17	2000723.96	595902.23
18	2000710.16	595713.79
19	2000722.11	595652.53
20	2000745.60	595672.31
21	2000750.73	595654.84
22	2000728.46	595636.54

23	2000743.41	595598.90
24	2000786.16	595439.35
25	2000780.48	595408.30
26	2000772.28	595397.99
27	2000757.54	595386.87
28	2000691.59	595370.78

+ Soil dumping and storage area: approximately 8.31 hectares (temporarily leased area);

Table 1.10. Coordinates of boundary points for the soil dumping and storage area

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
1	1997686.97	590176.11
2	1997741.50	590159.59
3	1997785.59	590243.88
4	1997880.86	590328.23
5	1997868.83	590450.58
6	1997929.43	590487.56
7	1998013.96	590569.50
8	1998055.61	590755.39
9	1997906.74	590807.24

+ Onshore dredged material storage area: total area of approximately 54.96 hectares (temporarily leased area); Dredged material storage area 1: 38.33 hectares, approved by the Provincial Economic Zone Management Board in Document No. 278/KKT-QHXD dated May 2, 2019, with additional approvals and adjustments in Documents No. 749/KKT-QHXD dated July 30, 2021, No. 1307/KKT-QHXD dated November 16, 2021, and No. 1144/KKT-QLĐT dated September 27, 2022; Dredged material storage area 2: 16.63 hectares, approved by the Provincial Economic Zone Management Board in Document No. 1307/KKT-QHXD dated November 16, 2021, and handed over on-site as per the handover record dated May 23, 2022.

Table 1.11. Coordinates of boundary points for the onshore dredged material storage area

Point	**VN 2000 Coordinate System, meridian 105°30', projection zone 3°**	
	X(m)	**Y(m)**
I. Dredged material storage area 1: 38.33 hectares		
1	1998409.17	597889.94
2	1998509.44	597835.46
3	1998717.31	597730.77
4	1998635.33	597527.73

5	1998475.57	597455.78
6	1998343.63	597478.00
7	1998317.16	597431.39
8	1998199.68	596827.03
9	1997907.34	596638.50
10	1997760.08	596685.78
11	1997615.15	596416.08
12	1997539.74	596459.26
13	1997822.42	596982.72
14	1997923.15	596928.30
15	1998137.98	597325.99
15	1998129.96	597370.65
II. Dredged material storage area 2: 16.63 hectares		
1	1998471.31	597922.66
2	1998545.54	598135.04
3	1998576.58	598184.71
4	1998690.63	598092.89
5	1998818.22	598028.80
6	1999120.00	597821.00
7	1999085.00	597595.00

- The sea area is approximately 307.43 ha, including:

+ The area for the construction and operation of the aqueducts, which is approximately 3.51 ha (long-term lease area);

Table 1.12. Boundary coordinates of the aqueduct area

Point	VN 2000 Coordinate System, meridian 105°30’, projection zone 3°	
	X(m)	**Y(m)**
CV1	2003672.00	594180.00
CV2	2003680.00	594157.00
CV3	2002316.00	593656.00
CV4	2002309.00	593679.00

+ The area for the construction and operation of the jetty, the water area in front of the jetty, and the turning basin, which is approximately 41.69 ha This includes one dedicated coal import port with a capacity of 100,000 DWT. (long-term leased area):

Table 1.13. Boundary coordinates of the jetty area, the water area in front of the jetty, and the turning basin

Point	VN 2000 Coordinate System, meridian 105°30', projection zone 3°	
	X(m)	Y(m)
NV1	2003649.28	594171.29
CV1	2003672.00	594180.00
CV2	2003680.00	594157.00
NV2	2003967.62	594263.61
NV3	2004047.81	594126.81
NV4	2004761.01	594397.08
NV9	2004696.75	594583.74
NV10	2004150.14	594759.60
NV11	2003593.14	594318.40

+ The area for the construction and operation of the water area for connecting the jetty, which is approximately 5.01 ha (long-term lease area)

Table 1.14. Boundary coordinates of the water area for connecting the jetty

Point	VN 2000 Coordinate System, meridian 105°30', projection zone 3°	
	X(m)	Y(m)
NV4	2004761.01	594397.08
NV5	2004946.94	594406.40
NV6	2005130.76	594393.53
NV7	2005310.67	594362.66
NV8	2005489.51	594313.78
KC15	2005491.46	594319.61
NV9	2004696.75	594583.74

+ The area for the shared channel segment into the port: approximately 47.16 hectares (based on Official Letter No. 12823/BGTVT-KHĐT dated November 13, 2023, from the Ministry of Transport regarding the proposal for the project to dredge the maritime channel to the port of the Vũng Áng II Thermal Power Plant project; and Official Letter No. 1822/CHHVN-KHĐT dated May 6, 2024, from the Vietnam Maritime Administration regarding the agreement on the location and detailed technical specifications of the maritime channel to the port of the Vung Ang II Thermal Power Plant);

Table 1.15. Coordinates of the boundary points for the shared channel segment

Point	VN 2000 Coordinate System, meridian 105°30’, projection zone 3°	
	X(m)	Y(m)
NV9	2004696.75	594583.74
BP1	2004737.59	594580.11
BP2	2004963.74	594590.34
BP3	2005181.80	594573.01
BP4	2005396.85	594532.99
BP5	2005601.65	594473.28
BP6	2005792.07	594412.12
BP7	2005982.49	594350.96
BP8	2006172.91	594289.81
BP9	2006363.33	594228.65
BP10	2006553.75	594167.49
BP11	2006744.17	594106.33
BP12	2006934.59	594045.18
BP13	2007125.01	593984.02
BP14	2007315.43	593922.86
BP15	2007527.53	593854.74
BT15	2007472.12	593683.48
BT14	2007260.39	593751.48
BT13	2007069.97	593812.64
BT12	2006879.55	593873.80
BT11	2006689.13	593934.96
BT10	2006498.71	593996.11
BT9	2006308.29	594057.27
BT8	2006117.87	594118.43
BT7	2005927.45	594179.59
BT6	2005737.03	594240.74
BT5	2005546.61	594301.90
KC15	2005491.46	594319.61

+ The area for the construction and operation of the cooling water intake system on the sea, which is approximately 2.92 ha (long-term lease area):

Table 1.16. Boundary coordinates of the cooling water intake system area

Point	VN 2000 Coordinate System, meridian 105°30’, projection zone 3°	
	X (m)	Y (m)
I4	2002546.60	593104.54
I5	2002563.24	593073.70
I7	2002594.88	593069.90

Point	VN 2000 Coordinate System, meridian 105°30', projection zone 3°	
	X (m)	Y (m)
I7a	2002795.25	593076.49
I8	2002938.97	593081.22
I8a	2003156.32	593035.76
I9	2003400.77	592984.64
I9a	2003431.57	592961.42
I10	2003461.98	592938.49
I11	2003472.46	593031.88
I12	2003406.52	593013.58
I13	2002941.54	593110.82
I14	2002590.44	593099.27

+ The area for the construction and operation of the cooling water discharge system on the sea, which is approximately 7.14 ha (long-term lease area):

Table 1.17. Boundary coordinates of the cooling water discharge system area

Point	VN 2000 Coordinate System, meridian 105°30', projection zone 3°	
	X(m)	Y(m)
O1	2003633.00	594559.00
O2	2003595.00	594577.00
O3	2003419.00	594199.00
O4	2003373.00	594156.00
O5	2002285.00	593755.00
O6	2002298.00	593715.00
O7	2003410.00	594123.00
O8	2003444.00	594151.00

+ The sea area for dumping dredged materials is approximately 200 ha:

Table 1.18. Boundary coordinates of the dredged material dumping area

Point	VN 2000 Coordinate System, meridian 105°30', projection zone 3°	
	X(m)	Y(m)
P2.1	2023567.292	610735.865
P2.2	2022580.678	611749.074
P2.3	2021567.469	610762.460
P2.4	2022554.083	609749.250

b. Scale of the Dredging Items

The volume of dredged material for the Project: Based on the topographic map of the water area, determine the scope of dredging and arrange the dredging cross-sections perpendicular to the edge of the berth. The dredging volume is calculated according to the formula:

$$V = \sum_{i=0}^{i=n} \frac{S_{i-1} + S_i}{2} * L_i$$

Where:

S_{i-1} is the area of the previous dredging cross-section (m^2).

S_i is the area of the subsequent dredging cross-section (m^2).

L_i is the distance between adjacent dredging cross-sections (S_i& S_{i-1}) (m).

The actual dredging volume also accounts for the equipment dredging error and sedimentation during construction. According to the standard for dredging work and acceptance TCCS 02:2015/CHHVN, the depth error is 0.3 m, and the width error is 2.0 m. Based on the topographic survey map and the design parameters of the components, including the cooling water intake channel, cooling water discharge channel, turning basin, water area in front of the berth, and the channel route, the total dredging volume is 3,048,317 m^3.

According to the adjusted report approved by Decision No. 132/QĐ-BTNMT dated 15/01/2020 and Document No. 3923/BTNMT-TCMT dated 15/7/2021, "Through bilateral negotiations with the design, procurement, and construction contractor, it was determined that the dredged material is suitable for use as fill material." Following the approved plan, the dredging and filling work is divided into two phases:

- Phase 1 is expected to dredge 890,000 m^3 for use as fill material for the main plant area;

- Phase 2 is expected to dredge the remaining volume, using 164,000 m^3 for filling the intake and discharge pipeline route, with the remainder being disposed of at the dredged material reception site.

However, actual implementation revealed that by the end of Phase 1 (approximately 11 months), the total volume of dredged material brought ashore for use as fill material for the main plant area only reached 248,900 m^3 out of 890,000 m^3. The discrepancy is due to the difference in the characteristics of the dredged material compared to the initial geological drilling results. Therefore, utilizing the dredged material for storage requires complex construction solutions, significantly affecting the Project's progress. Specifically, the dredged material consists mainly of clay (plastic clay, hard clay) with a low sand ratio. Therefore, to recover 248,900 m^3 of sand for use as fill material for the main plant area, the construction contractor used a clamshell dredger to both dredge and select sand meeting the fill standards, loading it onto barges, transporting it to the pumping station, and pumping it ashore. For the clay material, pumping it to the storage site was very challenging, requiring the use of cutting systems to break up the clay and seawater mixture before pumping it to the storage site.

Figure 1.5 Some actual images of the dredged material after being loaded onto barges and pumped to the disposal site

The construction unit has made efforts to dilute the clay-seawater mixture with clay content up to 25% or more to achieve optimal efficiency for pumping to the disposal site. However, the process of breaking down and diluting the clay-seawater solution requires as much water as possible, resulting in very low efficiency with clay content below 5%, leading to a pumping efficiency to the disposal site of only about 1400 m^3/day to 1500 m^3/day (information source based on actual construction supplied by Doosan).

Figure 1.6 The dredged material content in the mixture pumped to the disposal site is less than 5%, resulting in very low work efficiency (water sample taken from the pipe pumping into the disposal site).

Additionally, construction at sea is significantly affected by weather conditions and other objective factors. With the difficulties in construction deployment, the volume of dredged material brought to the disposal site over the years from 2021 to present is as follows:

Table 1.19. The volume of dredged material brought to the disposal site over the years from 2021 to present

Construction period	8/2021-12/2021	1/2022-12/2022	1/2023-12/2023	1/2024-5/2024
Construction volume (m^3)	38.778	210.122	121.264	253.070

As of 31/05/2024, the total volume of dredged material used for foundation filling for the main plant and brought to the disposal site is 623,234 m^3, with a remaining dredging volume of 2,425,083 m^3. Specifically:

Table 1.20. Summary table of dredged material volumes

<table>
<tr><th rowspan="2">Components</th><th colspan="3">Volume (m^3)</th><th>Remark</th></tr>
<tr><th>Calculated volume</th><th>Dredged volume completed</th><th>Remaining dredged volume</th><th></th></tr>
<tr><td>Cooling water intake channel</td><td>375,354</td><td>132,406</td><td>242,948</td><td rowspan="4">248,900 m^3 for filling main plant foundation, 374,334 m^3 brought to disposal site</td></tr>
<tr><td>Cooling water discharge channel</td><td>510,160</td><td>117,928</td><td>392,232</td></tr>
<tr><td>Turning basin, water area in front of berth, connecting water area</td><td>1,772,652</td><td>372,900</td><td>1,399,752</td></tr>
<tr><td>Channel route</td><td>390,151</td><td>0</td><td>390,151</td></tr>
<tr><td></td><td>3,048,317</td><td>623,234</td><td>2,425,083</td><td></td></tr>
</table>

Given the difficulties mentioned above and the time requirements to meet the project's commercial operation schedule, to implement the dredging and handling of the remaining 2,425,083 m^3 of dredged material, the project owner has developed construction plans to maximize the handling capacity of the dredged material. The project owner sent Document No. L-VA2-DS-HTPC-006 dated June 6, 2024, and Document No. L-VA2-DS-HTPC-007 dated June 14, 2024, to the Ha Tinh Provincial People's Committee regarding dredged material transportation solutions. The Ha Tinh Provincial People's Committee organized an on-site inspection on June 12, 2024, with a multidisciplinary team that included the participation of Vice Chairman Tran Bau Ha, Doosan Enerbility Vietnam Co., Ltd., the Ha Tinh Economic Zone Management Board, the Department of Natural Resources and Environment, the Department of Construction, the Ky Anh Town People's Committee, the Ha Tinh Maritime Administration, and other relevant units. The Department of Transport was assigned to provide consultation. Based on Document No. 1599/SGTVT-QLHT dated June 17, 2024, from the Department of Transport regarding opinions related to dredged material transportation solutions for Vung Ang II Thermal Power Plant, with the following guidance:

"Regarding the maritime sector: The maritime sector within the scope of the Vung Ang II Thermal Power Plant port and the area near the Son Duong Fleet port is managed by the Vietnam Maritime Administration according to its authority. Therefore, it is recommended that the Company seek the opinion of the Vietnam Maritime

Administration on procedures related to maritime infrastructure (if any) such as temporary ports, shipping channels, maritime environmental protection..., dredging equipment, and dredged material transportation methods."

"Regarding transportation by road:

After obtaining approval from the competent authorities on the EIA report and the maritime sector as mentioned above, for transportation by road, it is recommended that the Company perform the following tasks:

Work with the Ha Tinh Economic Zone Management Board, the Provincial Economic Zone Construction Investment Project Management Board, and the Ky Anh Town People's Committee to agree on related contents such as the timing of road usage, traffic safety measures, environmental sanitation... on the transportation routes, and clearly define the responsibility for repairing any damage after the transportation of dredged material (if any)."

Following the above guidance, the project owner has developed a construction site layout plan with a combination of pumping stations and transfer points for road transportation by trucks. The plan was sent for consultation to relevant units such as the Ha Tinh Economic Zone Management Board, the Ha Tinh Maritime Administration, and the Ky Loi Commune People's Committee.

Based on Document No. 892/KKT-TNMT dated June 24, 2024, from the Ha Tinh Economic Zone Management Board regarding consultation opinions on the construction site layout plan;

Based on Document No. 81/CVHHHT-PCHH dated June 26, 2024, from the Ha Tinh Maritime Administration regarding consultation opinions on the construction site layout for dredged material transportation under the "Vung Ang II Thermal Power Plant" project;

Based on Document No. 143/UBND-ĐC dated June 25, 2024, from the People's Committee of Ky Loi Commune regarding consultation opinions on the construction site layout plan for the "Vung Ang II Thermal Power Plant" project;

The optimal construction site layout plan chosen is a combination of 04 offshore pumping stations and 03 road transportation transfer points.

Based on the chosen optimal construction site layout plan, the project owner has calculated the construction productivity for each construction team and the projected completion time in October 2024 to ensure the commercial operation schedule. From this, the maximum dredged material volume that can be brought to the storage yard with the layout of 04 offshore pumping stations and 03 road transportation transfer points is 663,851 m^3 of dredged material. The remaining dredged material volume of 1,761,232 m^3 is proposed by the project owner to be dumped at sea.

Therefore, for the 2,425,083 m^3 of dredged material to be handled in this phase, the project owner proposes the following plan: maximize the amount of dredged material brought to the onshore storage yard (663,851 m³) and dump the remaining dredged material (1,761,232 m³) at sea to ensure the commercial operation schedule as committed.

Table 1.21. Dredged Material Handling Plan

Deployment phase	**Dredged material volume used for filling and brought to disposal site (m³)**	**Dredged material volume disposed offshore**	**Total**	**Remark**
Phase 1	623,234	0	623,234	Completed (as of May 31, 2024)
Phase 2	663,851	1,761,232	2,425,083	
Total	**1,287,085**	**1,761,232**	**3,048,317**	
Percentage	**42.22%**	**57.78%**	**100%**	

1.1.7.3. Capacity

a. Technology and Type of the Vung Ang II BOT Thermal Power Plant Project

- Type: Group A project, level I energy industrial construction.
- Technology: Electricity production by coal combustion to provide heat for boilers.

b. Calculation of Construction Productivity for Dredging and Handling Dredged Materials

Based on the volume of dredged material transported to the storage site and the volume disposed of onshore, the project owner proposes a construction plan with specific equipment and productivity as follows:

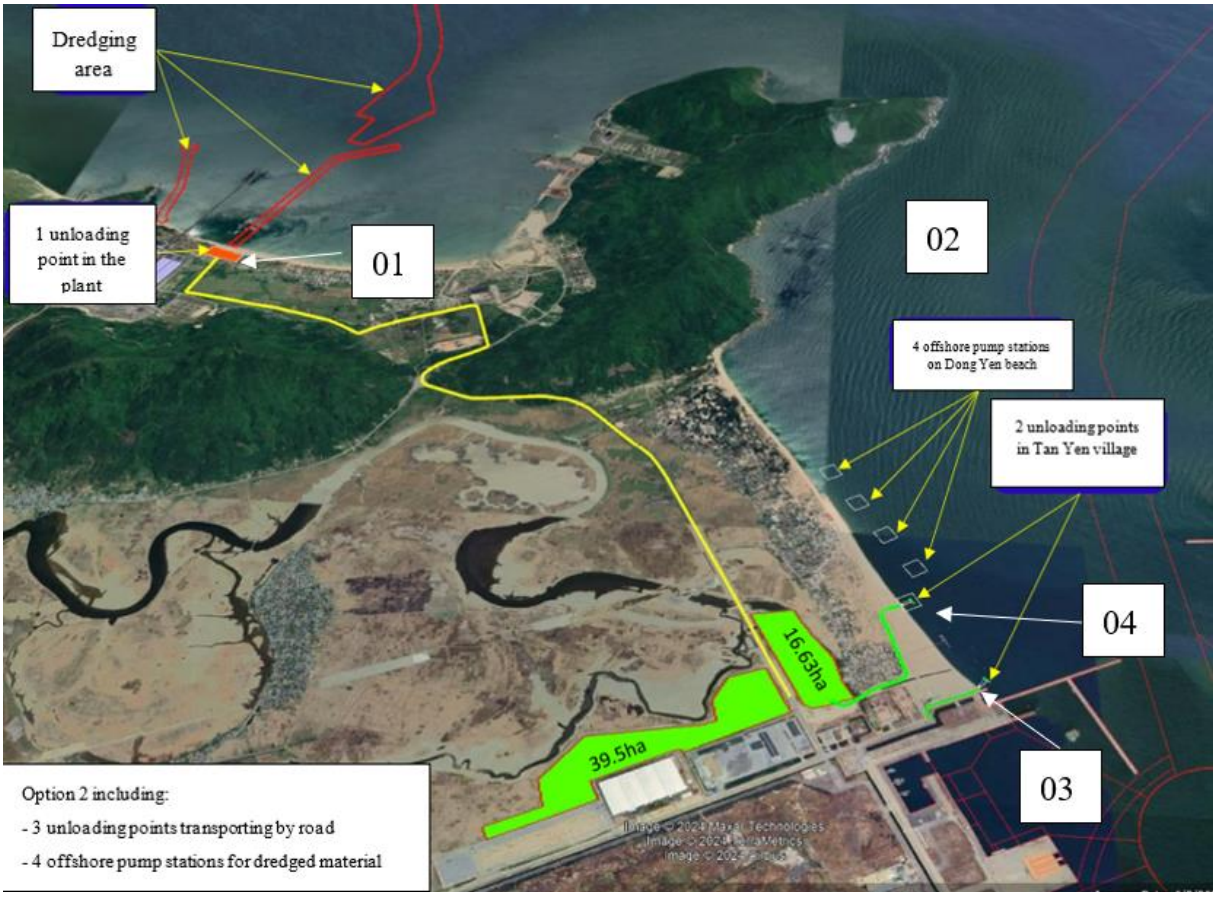


Figure 1.7. Diagram of construction points

a. Equipment plan and productivity for transporting dredged material to the storage site

Table 1.22. Equipment plan and productivity for each construction site

No.	Construction point	Description	Equipment		Personnel		Daily productivity (m3/day)	Construction time (day)	Total construction volume (m3)
			Type	Quantity (item)	Construction location	Quantity (persons)			
1	M1	Dredging with grab, loading onto barge, using excavator to load onto transfer site, then loading onto trucks. Transport 7.0km to the staging area.	Excavator	2	Excavator Operator	4	1,520.36	65	98,823.6
			Truck	10	Truck Driver	20			
			Barge	2	Crew Member	18			
			Dragline	1	Operator + Crew	6			
2	M2	Dredging with grab, loading onto	2	M2	Dredging with grab, loading onto	60	1,413	65	367,380

		barge. Transport 12km to pump station (04 stations). Use pumping system to pump dredged material to the storage site.			barge. Transport 12km to pump station (04 stations). Use pumping system to pump dredged material to the storage site.				
			Dragline	3	Operator + Crew	18			
			Transport Barge	8	Crew Member	72			
			Tugboat	2	Tugboat Crew	12			
			Pipeline	6,000 m	Pipeline Crew	6.000 (m)			
3	M3	Dredging with grab, loading onto	3	M3	Dredging with grab, loading onto	4	1,520.36	65	98,823.6

		barge. Transport 14km to loading point 3; Use excavator to load material onto trucks; Transport 2km to storage site.			barge. Transport 14km to loading point 3; Use excavator to load material onto trucks; Transport 2km to storage site.				
			Truck	5	Truck Driver	10			
			Barge	2	Crew Member	18			
			Dragline	1	Operator + Crew	6			
			Tugboat	1	Tugboat Crew	6			
4	M4	Dredging with grab, loading onto	4	M4	Dredging with grab, loading onto	4	1,520.36	65	98,823.6

		barge. Transport 12km to loading point 3; Use excavator to load material onto trucks; Transport 2km to storage site.			barge. Transport 12km to loading point 3; Use excavator to load material onto trucks; Transport 2km to storage site.				
			Truck	5	Truck Driver	10			
			Barge	2	Crew Member	18			
			Dragline	1	Operator + Crew	6			
			Tugboat	1	Tugboat Crew	6			
5	M5	Disposal	5	M5	Disposal	30	27,096	65	1,761,232
			Barge	27	Crew Member	243			

			Suction Dredger	2	Crew Member	60			
			Tugboat	5	Crew member	30			

Based on the technical features of dredging equipment and considering the terrain, geology, hydrology, construction site conditions, and practical experience from similar projects, the selected construction equipment includes:

- Dredging equipment must meet the contractors' response capabilities.

- Equipment selection must consider geological characteristics along the channel and the natural elevation of the dredging area, as well as local meteorological and hydrological conditions.

- The equipment and construction methods must match the geological layers to be dredged and have appropriate draft depths for the natural depths at the dredging sites.

- The equipment should be mobile to minimize impact on waterway traffic during dredging and to reduce construction costs.

The Project owner plans to carry out the offshore disposal activities over approximately 12 months, and onshore disposal activities in 4 months

With the specified equipment, the maximum calculated daily productivity for offshore disposal is 27,096 m^3/day and onshore disposal is 5,794 m3/day.

Construction productivity may decrease due to adverse weather, equipment failure, waiting for traffic regulation, etc., affecting the daily productivity.

1.2. Project components and activities

Apart from changes in the dredged material handling method, other components of the Vung Ang II BOT Thermal Power Plant Project remain unchanged from those outlined in the Environmental Impact Assessment (EIA) and approved by the Ministry of Natural Resources and Environment (MONRE) in the following decisions:

- Decision No. 40/QĐ-BTNMT dated January 19, 2011, by the Ministry of Natural Resources and Environment approving the environmental impact assessment report of the “Vung Ang II Thermal Power Plant Project with a capacity of 2x660MW”;

- Decision No. 393/QĐ-BTNMT dated February 13, 2015, by the Ministry of Natural Resources and Environment approving the environmental impact assessment report of the “Vung Ang II Thermal Power Plant Project” in Ha Tinh Province;

- Decision No. 3055/QĐ-BTNMT dated October 8, 2018, by the Ministry of Natural Resources and Environment approving the EIA report for the “.Vung Ang II Thermal Power Plant Project” in Ha Tinh province (third time).

- Decision No. 132/QĐ-BTNMT dated January 15, 2020, by the Ministry of Natural Resources and Environment approving adjustments to the content of the EIA report approval for the project.

Additionally, after the EIA approval in 2018, the project made several adjustments and reported them for consideration and approval by the Ministry of Natural Resources and Environment through the following documents:

- Document No. 6515/BTNMT-TCMT dated November 28, 2018, by the Ministry of Natural Resources and Environment approving the upgrade of the project's steam conditions from supercritical to ultra-supercritical.

- Document No. 1721/BTNMT-TCMT dated April 1, 2020, by the Ministry of Natural Resources and Environment regarding the approval of installing a closed coal storage and additional NOx treatment equipment in the project’s exhaust gas.

- Document No. 3923/BTNMT-TCMT dated July 15, 2021, by the Ministry of Natural Resources and Environment approving the adjustment of the dredging and land reclamation construction method of the project.

- Document No. 6636/BTNMT-TCMT dated November 1, 2021, by the Ministry of Natural Resources and Environment approving the adjustment of the intake and discharge water pipeline route, dredged material storage yard, and coal handling equipment of the project.

- Document No. 4028/BTNMT-TĐ dated November 7, 2022, by the Ministry of Natural Resources and Environment approving the change in the location of the dredged material storage yard and ash storage yard of the project.

1.2.1. Main project components

The main plant area is located in the southeast of the Vung Ang Power Center, covering an area of approximately 362,997 m^2. The main components of the project are 2 generating units with a rated capacity of 2 x 665 MW (gross), corresponding to a net capacity of 2 x 600 MW, using Ultra-Supercritical (USC) technology, including:

- Boilers and auxiliary equipment
- Turbines and auxiliary equipment
- Central control building
- Main electrical equipment

Table 1.23. Scale of main project components

No.	Component	Unit	Quantity/ Scale	Main Technical Specifications	Notes
1	Turbine House No. 1	House	01	Turbine hall dimensions: 196.5 x 47.5m, height 34.88m. Steel frame structure on concrete pile foundation. Rigid connections between the foundation and columns, and between columns and beams. Two-layer insulated sheet metal cladding.	No changes from EIA 2018 and the EIA adjustment documents.
2	Turbine House No. 2	House	01		
3	Boiler Area No. 1	Boiler	01	Steel frame structure on concrete pile foundation. Rigid connections between the foundation and columns, and between columns and beams. Outdoor structure without cladding, sheet metal roof. Area dimensions: 82.5 x 64.5m per boiler area.	No changes from EIA 2018 and the EIA adjustment documents.
4	Boiler Area No. 2	Boiler	01		No changes from EIA 2018 and the EIA adjustment documents.

No.	Component	Unit	Quantity/ Scale	Main Technical Specifications	Notes
5	Central Control Building	House	01	Dimensions: 67 x 30.7m, height 16.2m. Cast-in-place reinforced concrete frame, brick walls, concrete floors and roofs with thermal and waterproofing protection.	No changes from EIA 2018 and the EIA adjustment documents.

1.2.2. Auxiliary components of the project

Table 1.24. Auxiliary items during construction phase

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
1	Laydown area No. 1	125,000 m2	21,500.7 m2	Adjusted to suit the actual project delivery (including 2 areas with a total of 110,553 m2 and 21,500.7 m2). However, the VA2 equipment assembly area of 110,553 m2 is currently not needed for the project.
2	Laydown area No. 2	250,000 m2	237,394.2 m2	Adjusted to suit the actual project delivery.
3	Organic waste disposal site	-	83,061 m2	Mentioned in the 2018 EIA, but did not specify the area occupied, adjusted to suit the actual project delivery.
4	Dredged material disposal site	Area 653,300 m2. Including: + Site No. 1: Area 487,000 m2 + Site No. 2: Area 166,300 m2	Area 561,300 m2. Including: + Site No. 1: Area 395,000 m2 + Site No. 2: Area 166,300 m2	Lithium Battery Plant Project took 9.2 hectares according to Document No. 1144/KKT-QLĐT dated September 27, 2022, from the Ha Tinh Economic Zone Management Board.

Table 1.25. Auxiliary items during operation phase

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
1	Accommodation for management and operation staff	Not mentioned	30,573 m2	Added and updated in the project items approved according to Decision No. 131/QĐ-BCT dated January 30, 2023, by the Ministry of Industry and Trade approving the feasibility study report for the investment project (3rd time).
2	Access road to the plant	-	16,234.2 m2	Mentioned in the 2018 EIA, but did not specify the area occupied, adjusted to suit the actual project delivery.
3	Area for cooling water system, pumping station, and port on the mainland	-	60,177 m2	Mentioned in the 2018 EIA, but did not specify the area occupied, adjusted to suit the actual project delivery.
4	Area for construction and operation of the bridge leading to the coal port	-	35,100 m2	Mentioned in the 2018 EIA and documents adjusting the dredging plan, but did not specify the area occupied, adjusted to suit the actual project delivery of the sea area according to Decision No. 691/QĐ-

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
5	Area for construction and operation of the port, the water area in front of the port, and the turning basin	-	416,900 m2	BTNMT dated March 23, 2023.
6	Area for construction and operation of the water area serving the connection of the port	-	50,100 m2	
7	Area for construction and operation of the cooling water intake pipeline system	-	29,200 m2	

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
8	Area for construction and operation of the cooling water discharge pipeline system	-	71,400 m2	
9	Other auxiliary technical infrastructure systems for the main plant's operation			
9.1	Coal supply and storage system: Including coal receiving port, coal conveyor system, coal transfer tower, coal storage	01 system, including open coal storage	01 system, including closed coal storage	Approved in Document No. 1721/BTNMT-TCMT dated April 1, 2020, by the Ministry of Natural Resources and Environment on the approval for the installation of a closed coal storage and the addition of NOx treatment equipment in the project's exhaust gas.

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
9.2	Oil supply and storage system	01 system	01 system	
9.3	Seawater desalination system	01 system with a capacity of 6,000 m3/day	- 03 seawater RO (SWRO) filtration systems, each with a capacity of 176 m3/h. - 02 freshwater demineralization systems (BWRO) with a capacity of 65 m3/h each.	Adjusted to suit the actual project, assessed in the 2021 technical design report of the project.
9.4	Cooling water supply system (including cooling water intake pipeline, cooling water pumping station)	01 system	01 system	No change
9.5	Cooling water discharge channel system	01 system	01 system	No change
9.6	Fire protection system	01 system	01 system	No change

The auxiliary items of the project comply with the approved EIA and the technical designs of the project, which were appraised by the Department of Electricity and Renewable Energy – Ministry of Industry and Trade in 2021 and 2023.

1.2.3. Environmental protection works of the project

Table 1.26. Environmental protection works during construction phase

No.	Project Item	As per approved EIA report under Decision No. 3055/QĐ-BTNMT dated October 8, 2018 and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual Implementation Status (as of May 31, 2024)	Notes
1	Domestic waste water	03 BASTAF septic tanks, each with a capacity of 225 m3. Treated wastewater meets QCVN 14:2008/BTNMT column B	- On-site: 13 container-type mobile toilets, hired service unit for transportation - Office area: 01 centralized treatment system with a capacity of 30 m3/day, with the following technology process: Wastewater → Collection tank → Equalization tank → Anoxic tank → Aerotank → Settling tank → Intermediate tank → MBR tank → Disinfection tank → Treated wastewater meets QCVN 14:2008, column B, K=1.2 coefficient discharged into the environment.	

2	Vehicle washing water	-	Constructed 01 2-chamber settling tank with a capacity of 8.0 m3, including 1 settling chamber and 1 water chamber for sedimentation of soil and oil filtration (8.0 m3).	
3	Excess seawater in dredged material disposal area	01 3-chamber settling tank with a capacity of 600 m3	01 3-chamber settling tank with a capacity of 600 m3	No change
4	Hazardous waste storage	-	01 storage area with a size of 90 m2	Supplementary with specified hazardous waste storage area size

Table 1.27. Environmental protection works during the operation phase

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
1	Rainwater Collection and Drainage System			
-	Rainwater collection and drainage system in the plant	01 system	01 system	No change
-	Rainwater collection and drainage system in the port area	01 system	01 system	No change
-	Rainwater collection and drainage system in the ash disposal site	01 system for 01 ash disposal site of 49.4ha	01 system for ash disposal site No. 1 (15ha) 01 system for ash disposal site No. 2 (34.4ha)	Adjusted according to the number of ash disposal sites of the project
2	Wastewater Collection and Drainage System			
-	Wastewater collection and	01 system	01 system	No change

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
	drainage system for the main plant's domestic wastewater			
-	Wastewater collection and drainage system for the main plant's industrial wastewater	01 system	01 system	No change
-	Wastewater collection and drainage system in the ash disposal site	01 system for 01 ash disposal site of 49.4ha	01 system for ash disposal site No. 1 (15ha) 01 system for ash disposal site No. 2 (34.4ha)	Adjusted according to the number of ash disposal sites of the project
3	Domestic Wastewater Treatment System			
-	Domestic wastewater treatment system with a capacity of 150 m^3/day-	01 system with the following technology process: 'Wastewater → Septic tank → Collection tank →	01 system with the following technology process: Wastewater → Septic tank → Collection tank →	Adjusted to include an additional anoxic treatment step to improve nitrogen removal

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
	night in the main plant	Balancing tank → Biochemical tank (aeration) → Sedimentation tank → Storage tank → Chlorine aeration → Inclined plate filter of the main wastewater treatment system → Effluent meets QCVN 14:2008/BTNMT column B, coefficient K=1.2'	Balancing tank → Anoxic tank → Aerobic tank → Sedimentation tank → Disinfection tank → Storage tank → Effluent meets QCVN 14:2008/BTNMT column B, coefficient K=1.2 and is pumped to the primary storage tank of the industrial wastewater treatment system for further treatment	efficiency in the wastewater
-	Domestic wastewater treatment system with a capacity of 150 m^3/day-night in the staff housing area	-	01 system with the following technology process: Wastewater → Septic tank/grease trap → Collection tank → Balancing tank → Anoxic tank	Added due to the inclusion of the staff housing item in the project scope

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
			→ Aerobic tank → Sedimentation tank → Disinfection tank → Effluent meets QCVN 14:2008/BTNMT column A, coefficient K=1.0 and is discharged to the receiving environment	
4	Centralized Industrial Wastewater Treatment System with a capacity of 200 m^3/hour (4,800 m^3/day-night)	01 system with the following technology process: 'Wastewater → Oil separation tank → Storage tank → Sedimentation tank → pH control tank → Mixing tank → Neutralization tank → Treated wastewater storage tank'	Wastewater → Primary storage tank → pH adjustment tank → Coagulation tank → Sedimentation tank → Intermediate tank → Pressure filter tank → Activated carbon filter tank → pH adjustment tank → Treated wastewater storage	Clarified additional treatment steps including coagulation, pressure filtration, activated carbon filtration, and pH adjustment to enhance treatment efficiency.

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
			tank → Effluent meets QCVN 40:2011/BTNMT column B, coefficient Kq=1.3 and Kf=1.0 and is discharged into the sea along with cooling water and partly reused for ash transportation, dust suppression in the coal storage area, and dust control on internal roads.	
5	Boiler Flue Gas Treatment System for Generator No. 1 with a capacity of 3,100,000 m^3/h	01 system with the following process: 'Boiler flue gas of generator No. 1 → Electrostatic precipitator (ESP) → Exhaust fan → SO2 removal system (FGD) using seawater → Chimney'	01 system with the following process: Boiler flue gas of generator No. 1 → Selective catalytic reduction (SCR) system for NOx removal → Electrostatic precipitator (ESP) → Exhaust fan → SO2 removal system	Approved in Document No. 1721/BTNMT-TCMT dated 01/04/2020 by the Ministry of Natural Resources and Environment on the installation of a closed coal storage and the addition of NOx

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
			(FGD) using seawater → Chimney	treatment equipment in the project's flue gas.
6	Boiler Flue Gas Treatment System for Generator No. 2 with a capacity of 3,100,000 m^3 /h	01 system with the following process: 'Boiler flue gas of generator No. 2 → Electrostatic precipitator (ESP) → Exhaust fan → SO2 removal system (FGD) using seawater → Chimney'	01 system with the following process: Boiler flue gas of generator No. 2 → Selective catalytic reduction (SCR) system for NOx removal → Electrostatic precipitator (ESP) → Exhaust fan → SO2 removal system (FGD) using seawater → Chimney	Approved in Document No. 1721/BTNMT-TCMT dated 01/04/2020 by the Ministry of Natural Resources and Environment on the installation of a closed coal storage and the addition of NOx treatment equipment in the project's flue gas.
7	Common Industrial Waste Collection and Storage System			

No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
-	Ash storage yard	01 yard with an area of 49.4ha	02 yards: + Phase 1 ash disposal site: 15ha + Phase 2 ash disposal site: 34.4ha	Document No. 4028/BTNMT-TD dated 07/11/2022 by the General Department of Environment approved the 2-ash disposal site plan, facilitating land clearance work
-	Fly ash collection system (for both units)	-	03 silos, capacity 1301 m^3/silo	
-	Bottom ash and pyrite collection system for Generator No. 1	-	01 bottom ash silo with a capacity of 384 m^3; 01 pyrite waste silo with a capacity of 30 m^3	
-	Bottom ash and pyrite collection system for Generator No. 2	-	01 bottom ash silo with a capacity of 384 m^3; 01 pyrite waste silo with a capacity of 30 m^3	

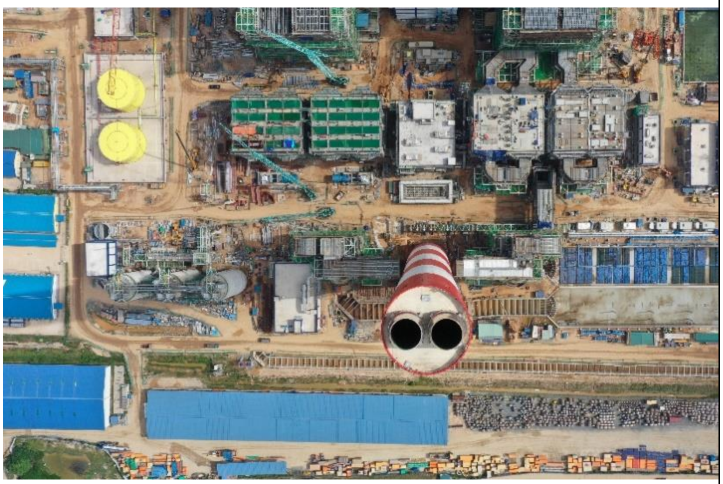
No.	Project Item	According to the Approved EIA Report at Decision No. 3055/QD-BTNMT dated 08/10/2018 and Decision No. 132/QD-BTNMT dated 15/01/2020	Actual Implementation Status (up to 31/05/2024)	Notes
-	Ash transport pipeline system	01 system for 01 ash disposal site of 49.4ha	01 system for ash disposal site No. 1 (15ha) 01 system for ash disposal site No. 2 (34.4ha)	Adjusted according to the number of ash disposal sites of the project
8	Hazardous waste storage warehouse for the main plant	-	01 warehouse with an area of 200 m²	Specified the area of the hazardous waste storage warehouse
9	Hazardous waste storage warehouse for the staff housing area	-	02 warehouses, each with an area of 6.0 m²	Added due to the inclusion of the staff housing item in the project scope

Table 1.28. Summary of project item implementation progress

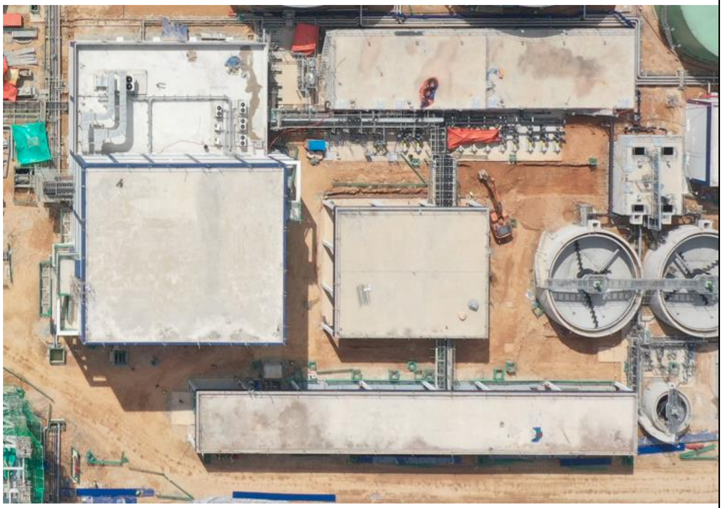
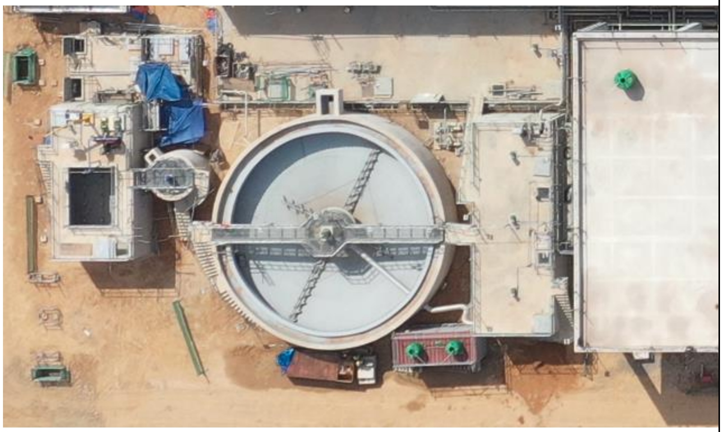
No.	Project Categories	Status of Implementation as of 31/05/2024 according to Approved Decisions	Scope of Implementation in This EIA Report

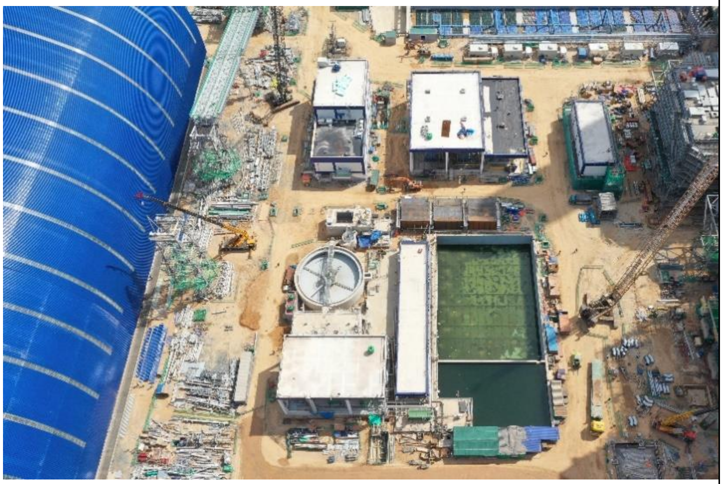
1	Turbine House No. 1		As of May 31, 2024, this item has been 86.57% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
2	Turbine House No. 2		As of May 31, 2024, this item has been 70.1% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

3	Boiler No. 1		As of May 31, 2024, this item has been 84.51% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
4	Boiler No. 2		As of May 31, 2024, this item has been 57.66% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

5	Central Control Room		As of May 31, 2024, this item has been 99.68% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
6	Chimney		As of May 31, 2024, this item has been 100% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

7	Electrostatic Dust Filter System 1		As of May 31, 2024, this item has been 80.54% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
8	Electrostatic Dust Filter System 2		As of May 31, 2024, this item has been 46.43% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

9	Water Treatment System		As of May 31, 2024, this item has been 96.11% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
10	Domestic Wastewater Treatment System		As of May 31, 2024, this item has been 98% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

11	Industrial Wastewater Treatment System		As of May 31, 2024, this item has been 98% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
12	Seawater SO2 Scrubbing System (SFGD1)		As of May 31, 2024, this item has been 92.79% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

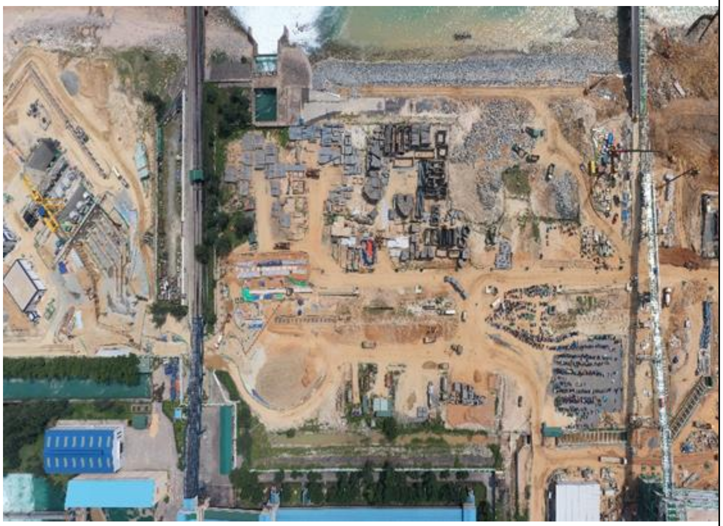
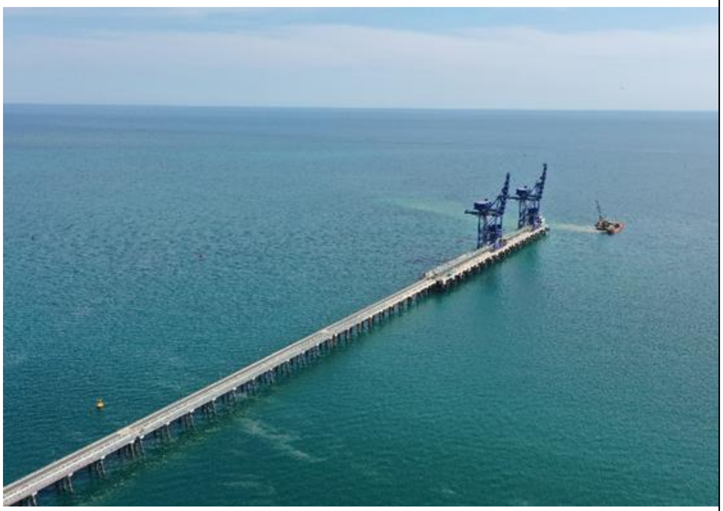
13	Seawater SO2 Scrubbing System (SFGD2)		As of May 31, 2023, this item has been 29% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
14	Measurement and Control System		As of May 31, 2024, this item has been 66.95% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

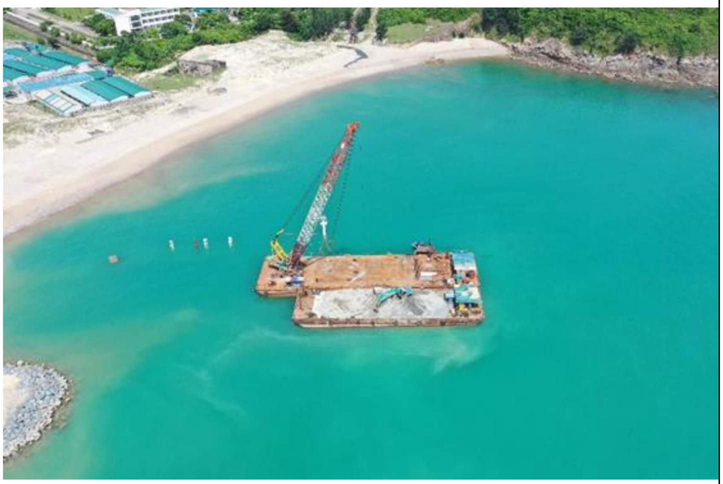
15	Fire Protection System		As of May 31, 2024, this item has been 76.65% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
16	Coal Storage		As of May 31, 2024, this item has been 81.52% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

17	Ash Disposal Area Phase 1 (15ha)		As of May 31, 2024, this item has been 85% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
18	Ash Disposal Area Phase 2 (34.4ha)		This item has not yet been constructed, maintaining implementation method as per Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
19	Ash Disposal Pipeline		This item has not yet been constructed, maintaining implementati

			on method as per Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
20	Housing Area for Staff and Workers of Vung Ang II Thermal Power Plant		As of May 31, 2024, this item has been put into use and has been approved by environmental permit No. 2716/GPMT dated October 24, 2023, by Ha Tinh Provincial People's Committee. **Therefore, Not assessed in this report.**

21	Organic Material Disposal Site		As of May 31, 2024, this item has been 100% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
22	Dredged Material Storage Site		As of May 31, 2024, this item has been 100% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

23	Cooling Water System, Pump Station, and Pier on Land		As of May 31, 2024, this item has been 90.53% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**
24	Marine Construction of Coal Pier and Leading Bridge		As of May 31, 2024, this item has been 81.52% completed according to Decision No. 3055/QD-BTNMT dated October 8, 2018, approving the EIA report. **Not assessed in this report.**

25	Continuation of dredging and deposition of 663,851 m³ of dredged material from the water area in front of the pier, turning basin, connecting water area, water intake channel, and cooling water discharge channel		Evaluation of issues related to dredging activities in the water area in front of the pier, turning basin, connecting water area, water intake channel, and cooling water discharge channel. **Detailed presentation in this report.**
26	Dredging and sinking of 1,761,232 m³ of dredged material from the water area in front of the pier, turning basin,		Evaluation of issues related to the sinking of dredged material in the water area in front of the pier, turning basin, connecting water area, water intake channel, and

	connecting water area, water intake channel, and cooling water discharge channel		cooling water discharge channel. **Detailed presentation in this report.**

1.2.4. Project activities

The project's activities are divided into stages, including the construction phase and the project operation phase, as follows:

- Construction Phase:

+ Continue to complete the main plant and install machinery and equipment at the main plant.

+ Dredge the port area, the channel, the turning basin, and the cooling water intake and discharge channels with a remaining dredging volume of about 2,425,083 m^3.

+ Transport dredged material for dumping with a volume of about 1,761,232 m^3.

+ Transport dredged material for onshore disposal using sand pumping and truck transportation for weathered rock with a volume of about 663,851 m^3.

- Operation Phase:

+ Operate the production activities of the entire plant: Unit 1 is expected to commence commercial operation in June 2025, and Unit 2 in October 2025.

1.3. Raw materials, fuel, chemicals used in the project; power and water supply sources and project products

1.3.1. Electricity demand

- The equipment and vehicles serving dredging and dumping operations all use diesel fuel; therefore, the project's construction activities do not use electricity or generators.

The power supply for Project construction with a capacity of 9.5MVA, 35kV. Electricity used during construction will be drawn from the grid of Ha Tinh Electricity Company in Ky Loi commune.

1.3.2. Water demand

- Water supply for daily needs:

+ During the construction phase, the maximum number of workers on-site is about 3000. With a water supply standard of 45 liters/person/day, the daily water demand is: 3000 x 0.045 = 135 m³/day. The contractor's workers do not live and eat on the construction site but are accommodated in rented houses in Ky Loi commune.

+ Office areas: The office of Vung Ang II Thermal Power Plant Co., Ltd. (VAPCO) and construction contractor: The maximum number of employees is about 400. Water supply standard for daily needs and cooking is about 70 liters/person/day.

The daily water demand for the office area is:

400 x 70/1000 = 28 m³/day.

Water supply for construction:

- The estimated water demand for construction activities is about 200-300 m³/day (for construction activities, moistening, cleaning machinery, and washing vehicles entering and leaving the construction site).

Water for the project during construction will be sourced from the existing water supply in Ky Anh town.

1.3.1. During the Operation Phase

The summary of raw materials and fuels required for the project when the plant is operational is presented in the following table:

Table 1.29. Main Raw Material and Fuel Requirements

Item	Unit	Quantity	Notes
Seawater	m³/day	4,982,400	No consumption of any clean water sources from rivers, lakes, streams, or groundwater
Coal	tons/year	3,000,000	For two units
Various fuel oils	tons/year	20,000	For two units, dependent on the number of times and duration of startup and low-load operation, ranging from 10,000-20,000 tons/year
H_2SO_4	tons/year	600	Wastewater treatment
NaOH	tons/year	900	Wastewater treatment
NH_3	tons/year	3,640	Emission treatment
Coagulant $FeCl_3$	tons/year	180	Wastewater treatment
Flocculant A-polymer	tons/year	270	Wastewater treatment
Disinfectant NaOCl	tons/year	550	

Source: Vung Ang II Thermal Power Company Limited

According to the design, Vung Ang II Thermal Power Plant will use a coal blend with a ratio of 70% sub-bituminous coal and 30% bituminous coal imported from Indonesia and Australia. VAPCO has signed coal supply contracts with suppliers to ensure stable coal supply for the project. Below is a table of coal characteristics provided by the investor based on agreements with the seller. The performance coal characteristics have been used for calculations during the first phase of basic design adjustment when switching from SC (supercritical) technology to USC (ultra-supercritical).

For the ash disposal system, the system's equipment will be designed to handle the maximum ash amount that can be generated under BMCR conditions, burning bituminous coal with ash content up to 14%, as required by the investor.

1.3.2. Project Products

The output product of the project is commercial electricity, which will be transmitted to the national grid through a 500 kV switchyard. The characteristics of the project's products are described in the following table:

Table 1.30. Project Product Characteristics

Operation Indicator	Unit	Value
Nominal capacity (gross) installed in the plant	MW	2x665
Net capacity	MW	2x600
Operating hours	h	6,500
Electricity output	billion kWh	7.8
Gross plant efficiency (based on lower heating value at nominal capacity)	%	43
Net plant efficiency (based on lower heating value at nominal capacity)	%	39.5
Boiler efficiency	%	86.9
Turbine efficiency	%	45.58

1.4. Production and operation technology

The Vung Ang II Thermal Power Plant project uses condensing thermal power technology with supercritical steam parameters and a net capacity of 2x600MW. The main fuel for the boiler is coal, and secondary fuel for startup and low-load operation is LDO.

The plant's electricity production process is as follows: Coal is pulverized to the required size and blown into the boiler combustion chamber along with DO (used during boiler startup and for support combustion). The steam generated from the boiler is directed to the turbine to drive the generators. The electricity generated is fed into the national grid through the switchyard.

Coal, DO → Boiler → High-pressure steam → Turbine → Generator → Switchyard → National grid.

The process flowchart for the project’s production technology is shown in the following figure:

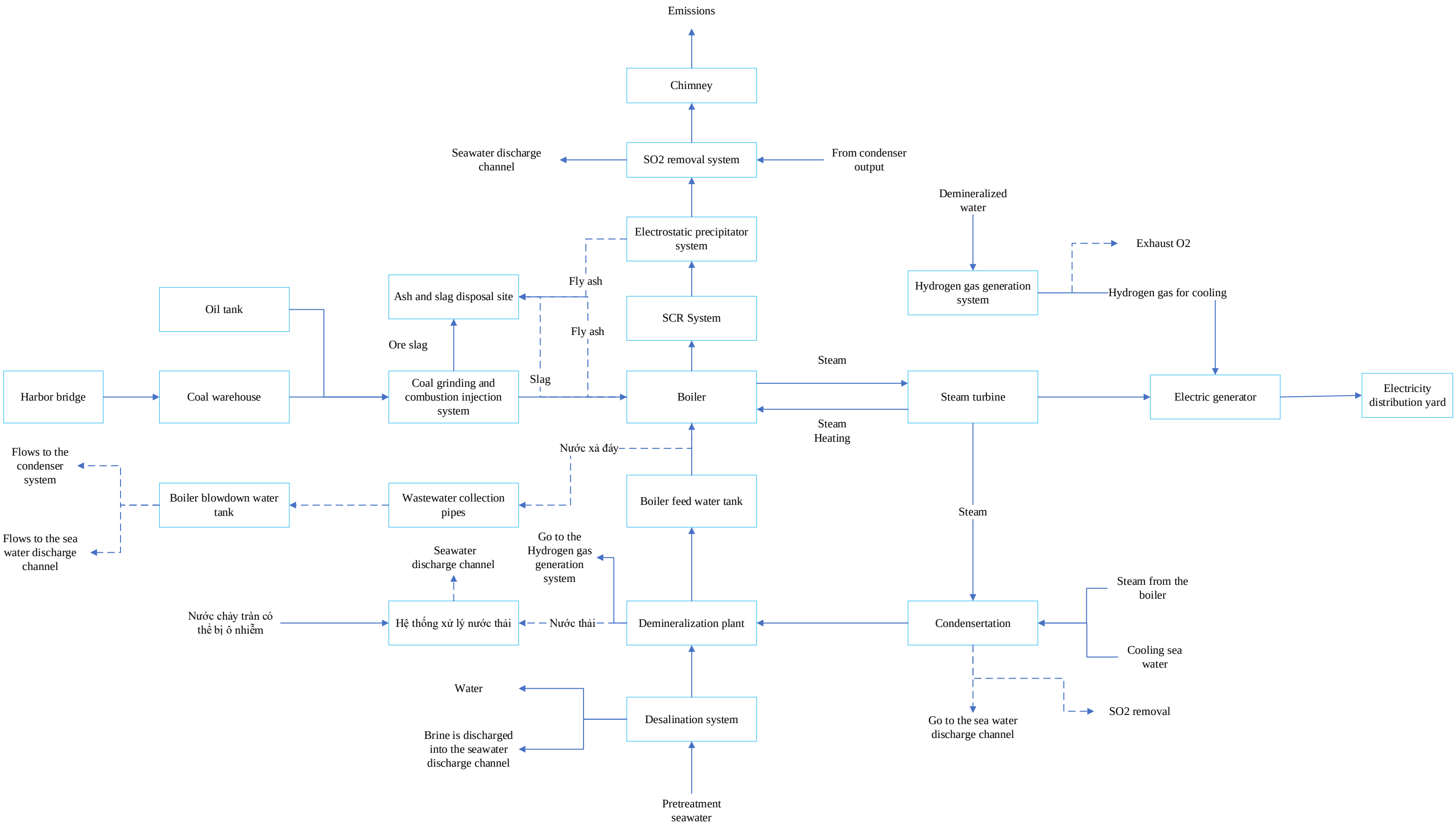


Figure 1.0.8. Production technology process diagram of the plant

The plant configuration includes two (2) units and auxiliary systems. Each unit consists of one (1) coal-fired boiler, one steam turbine, and one generator.

The steam turbine has a three-body coaxial structure, including one combined high-pressure/intermediate-pressure body and two low-pressure bodies with dual exhaust flows.

Vung Ang II Thermal Power Plant uses imported coal, a mix of bituminous and sub-bituminous coal. Coal is transported to the plant's coal port by ships with a capacity of up to 100,000 DWT. The plant has two dry coal storage warehouses with a total capacity of 500,000 tons, equivalent to 45 days of full-load operation. Bituminous and sub-bituminous coal are mixed by conveyor systems at a ratio of 70% sub-bituminous coal and 30% bituminous coal.

DO (according to TCVN5689:2013 or equivalent) will be used for boiler startup. The annual consumption is about 10,000 to 20,000 tons/year, stored in 2x2,000 m^3 steel tanks, enough for two days of operation at maximum oil consumption. The tanks are placed in a walled isolation area. Oil is transported to the plant by specialized tank trucks.

Dust and flue gas emissions are treated by an electrostatic precipitator system, followed by SO2 removal using seawater-based flue gas desulfurization (Seawater-FGD). Treated flue gas meeting QCVN 22:2009/BTNMT standards is discharged into the atmosphere through a 210 m high stack. The stack comprises an outer concrete shell and two inner steel flues, one for each boiler.

Each unit has a separate system for collecting and handling fly ash from the electrostatic precipitator, air heater, and economizer, conveyed to fly ash silos via pneumatic systems, ensuring the ash is completely dry. Each unit also has a bottom ash handling and storage system, allowing the collection and disposal of bottom ash from the boiler (using chain conveyors) and coal mill ash. Fly ash and bottom ash are transported by wet ash disposal pipeline to the ash disposal site.

Vung Ang II Thermal Power Plant uses seawater for condenser cooling. Seawater is drawn from an intake and pumped into the condenser cooling system. Cooling wastewater is collected in a channel and discharged back into the sea through an outfall parallel to the Vung Ang 1 Thermal Power Plant’s cooling water outfall.

The plant’s auxiliary transformers will be used during plant commissioning and startup, drawing power from the national grid through the 500kV switchyard. Two emergency diesel generators will supply power to critical loads and lighting in case of a normal power supply interruption.

The output from the step-up transformers is connected to the 500 kV switchyard shared by Vung Ang Power Center and connected to the national grid.

The plant will be controlled and monitored by a distributed control system (DCS), with separate control & monitoring systems for each unit and a control & monitoring system for auxiliary systems.

Fly ash from the power plant will be transported by truck or ash disposal pipeline (optional) to the stage 1 ash disposal site adjacent to the plant.

The plant will have all necessary auxiliary systems such as fire protection, water treatment, compressed air, closed-loop cooling water, hydrogen production, ventilation, heating, air conditioning, lifting equipment, fly ash and bottom ash collection and transportation, startup boiler, fuel oil storage and supply, wastewater collection and treatment, administrative buildings, operator housing, and other necessary items and facilities for the plant's operation.

Boiler: Coal from silos is ground and blown into the boiler through suspension burners for combustion. The project will use NOx reduction combustion systems and selective catalytic reduction (SCR) systems to control NOx emissions. Coal dust achieves high combustion efficiency due to large contact surfaces and even mixing with air. The high temperature in the furnace releases volatile gases in the coal. These gases mix with oxygen to initiate combustion. The combustion process breaks coal particles into small, porous ash and ash. The high temperature in the furnace and oxygen burns the coal and releases thermal energy. The typical combustion temperature of pulverized coal is about 1,300°C to 1,700°C.

Hot gases from combustion pass through boiler tubes, converting water to steam. The heating surface in the boiler can boil water and superheat steam, reducing flue gas temperature. Treated flue gas is then discharged into the environment.

The boiler will have an automatic soot blowing system to prevent flue gas paths from clogging and maintain heat transfer efficiency during continuous operation. The soot discharge path will be inclined and equipped with collection devices and valves to prevent water accumulation. Discharged soot will be collected in a storage tank. Steam generated here will be directed to the condensation system.

Steam Turbine: The steam turbine is a single reheating type. High-pressure steam from the boiler acts on the steam turbine, causing the rotor to spin. Medium-pressure steam is reheated in the boiler and returned to the steam turbine. Finally, low-pressure steam is exhausted into the condenser.

Generator: The steam turbine and generator are connected coaxially. When the steam turbine spins due to steam, it turns the generator rotor, inducing an electric current in the stator coils and generating electricity.

The generator’s rotor windings are cooled by a hydrogen circulation cooling system, and the stator windings are cooled by a circulating water cooling system.

Condenser: The surface condenser contacts steam and condenses it back into liquid for reuse, using seawater with added chlorine for one-pass cooling. The condenser consists of a titanium-coated heat exchanger. Steam condenses on the outside, and cooling water flows inside the tubes.

Condensate is demineralized and stored in a demineralized water tank. A portion of the cooling water is used for desulfurization, with the remainder discharged into the sea through a diffused outlet.

To prevent the condenser from being clogged, regular cleaning must be performed using Taprogge's rubber ball condenser tube cleaning technology. This system injects spongy rubber balls into the cooling water flow before it passes through the condenser. The rubber balls exert pressure on the walls of the condenser, keeping the inner walls from becoming clogged. A filter device is installed at the discharge outlet to separate the rubber balls from the water flow.

The comprehensive list of machinery and equipment for the operational phase of the project is shown in the following table:

Table 1.31. List of machinery and equipment during the operational phase

Equipment	Quantity
Boiler and auxiliary equipment	Two (2)
Turbine and auxiliary equipment	Two (2)
Generator and auxiliary equipment	Two (2)
Step-up transformer	Two (2)
Unit service transformer	Two (2)
Self-contained electrical system	Two (2)
Unit control and monitoring system	Two (2)
Auxiliary plant control and monitoring system	One (1)
Seawater treatment system	One (1)
Domestic wastewater treatment system (including main plant and staff housing area)	One (1)
Industrial wastewater treatment system	One (1)
NOx treatment system using selective catalytic reduction (SCR)	Two (2)
Electrostatic precipitator system	Two (2)
Desulfurization system	Two (2)
Coal unloading and supply system	One (1)
DO oil unloading and supply system	One (1)
Cooling water system	Two (2)
Ash and ash handling system	Two (2)
Compressed air system	One (1)

1.5. Construction organization measures for dredging and handling dredged materials

1.5.1. Construction organization measures for items according to the approved EIA 2018.

a. Foundation

The preliminary foundation design for the Project is based on the geotechnical information of the Vung Ang 1 Thermal Power Plant. Light-load structures with minimal settlement equipment will be supported by raft foundations and/or shallow foundations, and the ground will be compacted well. Additionally, the foundation base will be at least 500 mm below the finished elevation.

Other structures and equipment susceptible to significant settlement will be supported by piles. The use of precast concrete piles or drilled piles will depend on the subsurface conditions. For medium-load structures, 300mm² precast concrete piles on rock foundations are suitable. For heavy-load structures, 800mm diameter drilled piles on rock foundations will be used, with reinforced concrete foundations on drilled pile bases.

b. Onshore construction:

For important structures and those exposed to harsh environmental conditions, reinforced concrete structures must be used. These primarily include low-rise buildings/structures. Conversely, structures with large floor areas and low ceilings will use steel frames. Pre-engineered steel structures will be used to reinforce the framework.

c. Offshore construction:

The project will have one coal unloading jetty, located about 1.82 km from the shore to accommodate deep-draft coal vessels. Therefore, the construction of the jetty, including dredging work, will allow these vessels to access the jetty. The technical design documents of the coal jetty have been approved by the Ministry of Transport and the Maritime Administration.

The offshore cooling water intake will be located 500 meters from the shore to avoid thermal recirculation issues from the cooling water discharge outlet. The construction will extend dredging to lay pipes and build the cooling water intake at a depth of 5 meters below the sea surface.

1.5.2. Construction organization measures for dredging and handling dredged materials.

Due to the difficulties in dredging implementation in the previous phase, to evaluate the characteristics of the dredged material, the project owner has coordinated with the Institute of Foundations and Underground Works to conduct a geological survey of the dredging area using high-resolution seismic measurement methods. The results obtained are as follows:

The project is located in Ky Anh district, Ha Tinh province. The terrain surface is quite flat and has not been silted up. The elevation from the ground surface is from +2.16m to +4.16m compared to sea level.

The design route includes 03 main routes, which are repeatedly measured, with the measurements serving the purpose of data calibration. The layout diagram of the routes is shown in Appendix 1. The positions of the survey routes are limited by the following points:

Table 1.32. Detailed survey route table

Route	Point Name	Coordination (VN2000)		Length (m)
		X	Y	
1A	SBP 1	2002496.38	593098.05	1007.0
	SBP 2	2003506.12	592981.68	
	SBP 3	2003512.50	593031.27	1003.0
	SBP 4	2002501.31	593147.82	
2A	SBP 5	2002242.15	593685.20	5010
	SBP 6	2004789.67	594606.82	
	SBP 7	2006871.87	593969.33	
	SBP 8	2002259.165	593638.1821	4630
	SBP 9	2004790.986	594554.1293	
	SBP 10	2006857.232	593921.5227	
3A	SBP 11	2003400.60	594104.30	676.0
	SBP 12	2003635.45	594602.63	
	SBP 13	2003590.53	594624.58	747.0
	SBP 14	2003334.09	594080.23	
Total length of surveyed routes				13073.0

According to the 1/50,000 geological map of the area created by the Vietnam General Department of Geology and Minerals, there are 2 main rock formations encountered in the area as follows (listed from oldest to youngest):

- Quaternary sediments (mvQIV3) include river and alluvial sediments, alluvial and marine sediments (sand, silty clay, clayey sand, silt, clay, etc.).

- Jurassic (Muong Hinh formation, Jmh) includes conglomerate, sandstone, and acid volcanic rock (rhyolite).

Based on the characteristics of the reflection wave field obtained on high-resolution shallow seismic tapes, the sediment layers distributed on the seabed are determined as follows:

- Layer 1: defined by the R1 reflection boundary and the seabed surface, featuring a medium amplitude reflection wave field, parallel reflection form, relatively homogeneous composition, characteristic of clayey sediments, clayey sand. The R1 reflection boundary at some locations is interrupted where bedrock is exposed on the seabed surface.

- Layer 2: defined by the seismic reflection boundary R2 and R1, featuring a hilly, chaotic reflection wave field, "white reflection" seismic reflection amplitude, weak reflection, relatively homogeneous, characteristic of sandy sediments, sandy clay. Some locations of this sediment accumulation are interrupted due to bedrock rising to the seabed surface.

- Layer 3: defined by the R3 and R2 reflection boundaries, featuring a chaotic seismic reflection, quite strong seismic reflection amplitude, representing fine to coarse interbedded sediments corresponding to sand, gravelly sand sediments, clearly visible near the bedrock areas, cut, and weathered.

Area of Route 1A:

Number of cross-sections: 02 cross-sections.

The analysis results show that from the seabed downwards, three layers are identified on the cross-sections as follows:

- Layer 1: Low-plasticity clay mud in a flowable to soft plastic state, poorly graded silty sand, porous structure. The layer thickness ranges from 1.09 to 4.43m.

- Layer 2: Low to medium plasticity clay, low plasticity sandy silt, in a soft plastic to stiff plastic state. The layer thickness ranges from 0.25m to 9.48m.

- Layer 3: Poorly graded silty sand mixed with gravel, sometimes clayey sand - low plasticity silty sand in a medium dense to dense state, low plasticity clay, low plasticity sandy clay. The layer thickness ranges from 3.59 to 9.14m.

There are 2 areas of high rising bedrock exposed on the seabed in the route.

Area of Route 2A:

Number of cross-sections: 04 cross-sections.

The analysis results show that from the seabed downwards, three layers are identified on the cross-sections as follows:

- Layer 1: Low-plasticity clay mud in a flowable to soft plastic state, poorly graded silty sand, porous structure. The layer thickness ranges from 0.43 to 4.69m.

- Layer 2: Low to medium plasticity clay, low plasticity sandy silt, in a soft plastic to stiff plastic state. The layer thickness ranges from 0.14m to 9.43m.

- Layer 3: Poorly graded silty sand mixed with gravel, sometimes clayey sand - low plasticity silty sand in a medium dense to dense state, low plasticity clay, low plasticity sandy clay. The layer thickness ranges from 1.46 to 11.73m.

There are no high rising bedrock areas exposed on the seabed in the route.

Area of Route 3A:

Number of cross-sections: 02 cross-sections.

The analysis results show that from the seabed downwards, three layers are identified on the cross-sections as follows:

- Layer 1: Low-plasticity clay mud in a flowable to soft plastic state, poorly graded silty sand, porous structure. The layer thickness ranges from 1.64 to 3.21m.

- Layer 2: Low to medium plasticity clay, low plasticity sandy silt, in a soft plastic to stiff plastic state. The layer thickness ranges from 0.3m to 6.33m.

- Layer 3: Poorly graded silty sand mixed with gravel, sometimes clayey sand - low plasticity silty sand in a medium dense to dense state, low plasticity clay, low plasticity sandy clay. The layer thickness ranges from 2.72 to 9.93m.

There are no high rising bedrock areas exposed on the seabed in the route.

Thus, the main material composition is poorly graded silty sand, clay mud in a plastic to stiff state, and in the water intake area, there is weathered rock within the dredging scope with a volume of approximately 3,500 m^3.

1.5.2.1. Dredging construction methods

Based on the technical features of various dredging equipment types and considering the terrain, geology, hydrology, and construction site conditions, the selection and arrangement of dredging equipment will involve the use of trailing suction hopper dredgers and clamshell dredgers.

- Before construction, the contractor must clearly notify the relevant authorities of the scope and schedule of the construction. The contractor should proactively work with the local Port Authority to devise a safe plan for navigation along the dredging route.

- All equipment brought to the construction site must be fully registered, inspected, and insured before construction begins. The operational status of the equipment must be checked and confirmed. The construction site must be organized according to technical regulations.

- Site handover, topographical maps, and coordinates for the construction area should be received from the investor.

- The construction unit must work with relevant units to handle all administrative procedures for dredging, traffic management, and safety procedures applicable to the project.

- Equip all construction equipment with fire and explosion prevention, as well as storm protection.

- Equip communication devices to ensure continuous contact between the equipment and the construction command center. Provide adequate safety equipment for personnel and machinery.

- Equip all dredging equipment on the construction site with proper lighting systems in accordance with maritime law.

a. Clamshell dredger construction

➢ Positioning dredging areas

Based on construction drawings and established benchmarks on-site, the contractor determines the construction scope. Positions are identified using DGPS positioning equipment.

➢ Anchoring

- Dredging equipment anchors along the dredging direction before starting and adjusts positions laterally using an anchor system or tugboats. The anchor system must meet the following conditions:

- Anchors must be safe and positioned perpendicular to the construction direction;

- Underwater anchors are placed with the help of tugboats.

➢ Dredging

The construction area is divided into multiple dredging strips along the dredging route. Positions are determined by a positioning system on the pontoon. The excavator works strip by strip, ensuring the dredging bottom elevation is achieved as work progresses (minimizing missed spots). The dredged material is loaded onto barges positioned beside the pontoon. Upon completing one strip, the equipment moves to the next.

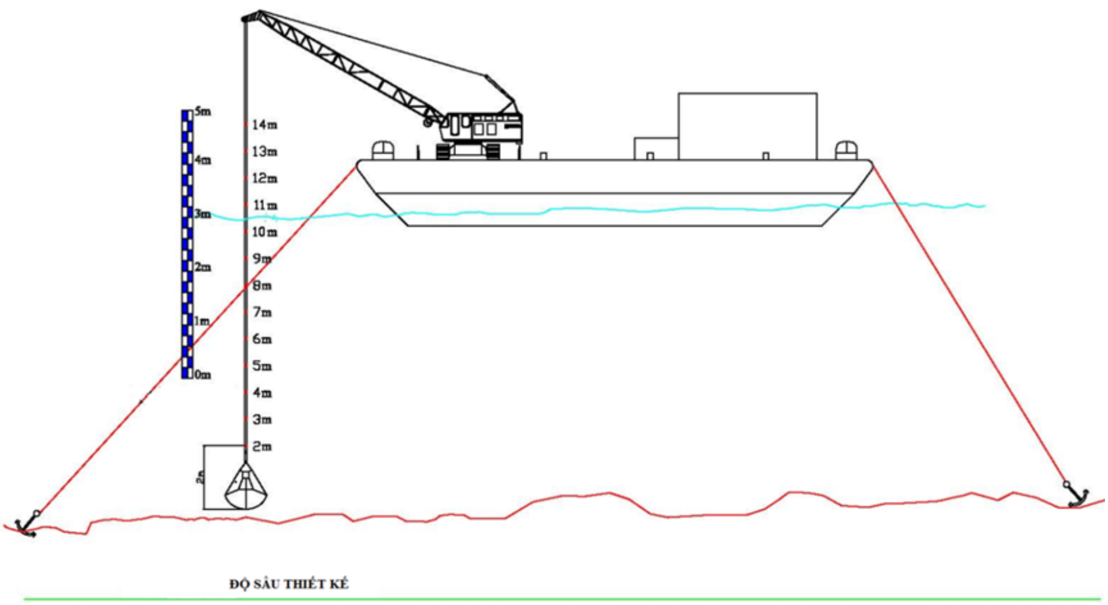


Figure 1.9 Illustration of clamshell dredger construction

Continuously monitor elevation using positioning equipment or a tide gauge, and adjust the bucket's height accordingly with tide changes (approximately 0.1m). Combine with handheld depth sounders and plumb lines to ensure the dredging depth matches the design.

Dredged material is loaded onto adjacent barges and transported to the designated dumping or storage site once filled.

b. Trailing suction hopper dredger construction

In the dredging area, the suction head is lowered to the seabed, and dredging begins with the pump. During dredging, the suction head loosens and collects dredged material. The mixture of water and dredged material is pumped into the hopper. After dredging, the hopper dredger stops the pump, raises the suction pipe, and moves to the disposal site at speeds of 10-20 km/h. At the dumping site, the dredged material is released through bottom doors.

c. For dredging material as stone

Based on the geological survey results, at the area of the cooling water intake dredging, there is a layer of weathered rock with an approximate volume of 3,500 m³. Therefore, to dredge to the designed depth, it is necessary to remove the weathered rock layer. The chosen method is rock breaking using a hammer.

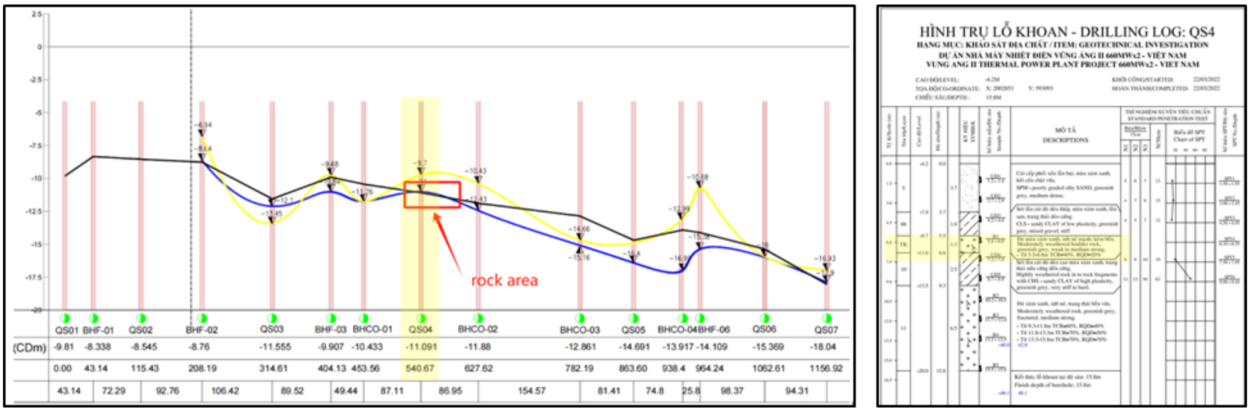


Figure 1.10 Borehole survey results

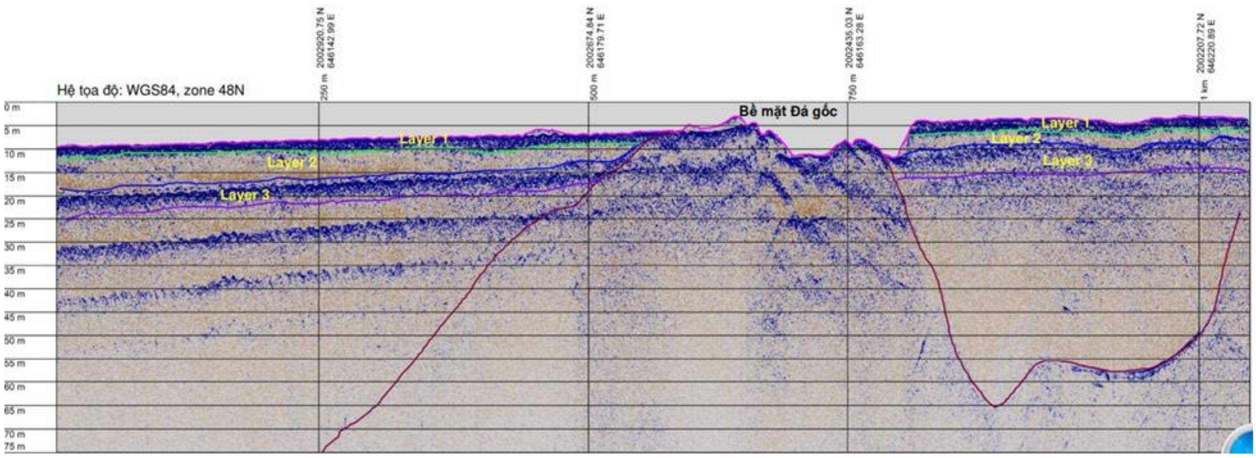


Figure 1.11 High-resolution Sub Bottom survey results

Rock breaking method using a hammer: Prepare, release buoys, turtle, locate the rock breaking position, move the ship to the rock breaking position, release buoys, drop the rock breaking hammer to the position, dive to check the hammer head, break the rock according to the procedure, dive to check the rock field after breaking. Remove the broken rocks to a barge, dive to check during loading and after loading.

The consulting firm collected specific information as follows:

- Grab dredger ship with a capacity of 1,100T;
- Direct pull force of 50T;
- Boom length of 24/30m;
- Rock breaking hammer of 18T;

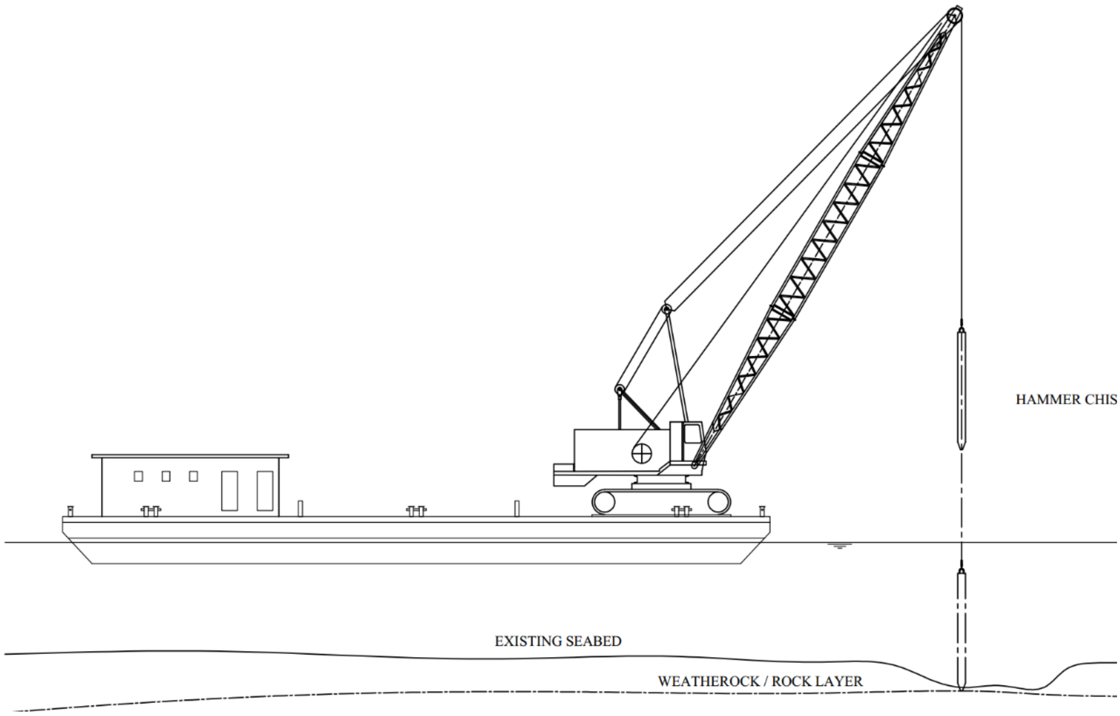


Figure 1.12 Grab dredger ship breaking rock with a hammer

Figure 1.13 Rock breaking hammer

The goal of the rock breaking work is to create a designed depth for the cooling water intake channel. All rock breaking areas are underwater. The broken rock material is lifted by a dragline excavator to a barge and transported to the designated storage site.

* Operational procedure of the rock breaking equipment with a hammer:

The equipment operates based on the lifting and lowering mechanism of the hammer and the control system of the boom. The boom consists of two handles: a cone handle and a brake handle. The lifting mechanism includes an engine connected to the output shaft of the gearbox via plastic drive rods, and the gearbox output is connected to a small gear that meshes with the large gear of the drum shaft. After starting the engine, it transmits power to the gearbox through the small gear, causing the large gear of the drum shaft to rotate. The rock breaking process is divided into three stages:

Stage 1: Lift the hammer up. The operator pulls the cone handle back, tightening the cone sleeve onto the flywheel, causing the drum shaft to rotate counterclockwise, winding the cable and lifting the hammer.

Stage 2: After the hammer reaches a certain height, the operator pushes the cone handle forward, releasing the cone sleeve and allowing the hammer to fall freely onto the rock. The operator continuously moves the cone handle back and forth to continuously hammer, creating a borehole with the diameter of the hammer.

Stage 3: After reaching a certain depth, the hammer is replaced with a debris scoop to remove all debris from the borehole. The debris scoop is constructed with two butterfly flaps at the end, which open when lowered, allowing debris to enter the scoop. When raised, the flaps close to retain the debris.

* Rock breaking construction sequence:

- Prepare the site, survey to determine the rock breaking area, use buoys and stakes to locate the rock breaking positions.

- Move the grab dredger ship to the position, anchor the ship to prevent movement, facilitating rock breaking work.

- Start lifting the rock breaking hammer and drop it freely to break the rocks.

- Use the grab dredger ship to lift the broken rocks to a transport vessel and move them to the storage site onshore.

- Inspect and accept the rock breaking elevation as per design requirements.

- Clean up and hand over the site for the next construction step.

1.5.2.2. Shore disposal construction methods

With the difficulties in the solution for handling dredged material, the project owner has devised construction plans to maximize the dredging handling capacity and issued documents No. L-VA2-DS-HTPC-006 on June 6, 2024, and No. L-VA2-DS-HTPC-007 on June 14, 2024, to the People's Committee of Ha Tinh Province regarding dredged material transportation solutions. The People's Committee of Ha Tinh Province organized a field inspection on June 12, 2024, with an inter-sectoral delegation led by the Vice Chairman of the Provincial People's Committee, Tran Bau Ha, along with representatives from Doosan Enerbility Vietnam Co., Ltd., the Provincial Economic Zone Management Board, the Department of Natural Resources and Environment, the Department of Construction, the People's Committee of Ky Anh Town, Ha Tinh Maritime Administration, and other relevant units, assigning the Department of Transportation to provide guidance.

Based on Document No. 1599/SGTVT-QLHT dated June 17, 2024, from the Ha Tinh Provincial Department of Transportation regarding opinions on dredged material transportation solutions for Thermal Power Plant II, the project owner has prepared a construction site plan with pump station complexes and transfer points for road transportation by trucks, and sent the document to relevant units such as the Ha Tinh Provincial Economic Zone Management Board, Ha Tinh Maritime Administration, and the People's Committee of Ky Loi Commune for consultation.

Based on Document No. 892/KKT-TNMT dated June 24, 2024, from the Ha Tinh Provincial Economic Zone Management Board regarding consultation on the construction site layout plan.

Based on Document No. 81/CVHHHT-PCHH dated June 26, 2024, from the Ha Tinh Maritime Administration regarding consultation on the construction site layout plan for dredged material from the "Vung Ang II Thermal Power Plant" project.

Based on Document No. 143/UBND-ĐC dated June 25, 2024, from the People's Committee of Ky Loi Commune regarding consultation on the construction site layout plan for the "Vung Ang II Thermal Power Plant" project.

The project owner has chosen a plan to transport the dredged material to the shore, divided into four construction fronts from construction front No. 1 to front No. 4, with two main construction methods: using pump stations and transporting by trucks, as follows::

a. Pump station method (construction point 2)

- The dredged material is dredged using a clamshell dredger (dragline excavator), and once the barge is fully loaded, it will begin the journey to the pumping station area. During transportation, the barge must ensure no spillage of mud outside, and the transport distance is about 12km.
- There are 04 floating barge-type pumping stations with dimensions of approximately 60 x 15m, anchored at four corners to the seabed by mooring lines. They operate stably under sea conditions with waves below level 4. The pumping station is located about 150m from the shore, convenient for mooring, ensuring depth and ease of connecting the pumping pipeline. The seabed depth at the pumping station area averages about -6.0m to -8.0m (nautical chart system), which is suitable for transport ships with a draft of 3 to 5m. The pumping station complex includes: a flat barge, an excavator, a dredged material cutting system, Bell pump 300 hydraulic pump, transfer pump, and about 3000m of pumping pipeline.
- The barge or transport ship is about 60m long. The area for the pumping station is an estimated water area with dimensions: 200m x 200m. Based on the "7.2.2 Size of ship turning basin" TCVN 11419:2016 section b, the turning water area of a ship without a tug is a circular area with a diameter of 3xL, approximately 180m. Thus, the four pumping station positions are arranged at least 250m apart from each other to ensure safe and convenient entry and exit for transport ships or barges.
- When the transport barge approaches the pumping station area, excavators on the pumping station will transfer the dredged material from the transport barge to the storage compartment of the pumping station. In the storage compartment, a cutting system is used to loosen the dredged material and seawater mixture before pumping it to the storage site. A high-pressure pump system will pump the "dredged materials + seawater" mixture to the storage site onshore via a pipeline about 2.9km long. The pumping pipeline uses two HDPE pipes with a diameter of 300mm. During this process, seawater will be continuously added to the barge compartment to ensure sufficient water for

loosening the "dredged materials + seawater" mixture in the compartment and pumping the mixture to the storage site.

- At the storage sites, excess seawater is directed to a settling tank and then led through a 400mm HDPE pipeline to the existing drainage canal on Nguyễn Chí Thanh road, leading to an open drainage channel to the sea. The drainage channel is excavated and lined with a nylon sheet on the inner surface of the embankment for protection, as the existing road will be expanded to avoid overlap during construction. the dredged materials pumping pipeline to the storage site is also installed through this existing canal.

Table 1.33. Coordinates of pump station locations.

Pump station	**Corner point**	**VN-2000 Coordination, central meridian 105°30', 3° projection zone.**	
		X (m)	**Y (m)**
Pump station 1	1	1999432.107	598500.184
	2	1999596.449	598386.203
	3	1999710.430	598550.546
	4	1999546.087	598664.526
Pump station 2	1	1999760.759	598272.246
	2	1999927.404	598161.587
	3	2000041.384	598325.930
	4	1999877.042	598439.910
Pump station 3	1	2000094.039	598050.936
	2	2000258.382	597936.955
	3	2000372.362	598101.298
	4	2000208.019	598215.278
Pump station 4	1	2000424.994	597826.319
	2	2000589.337	597712.339
	3	2000703.317	597876.682
	4	2000538.974	597990.662

-

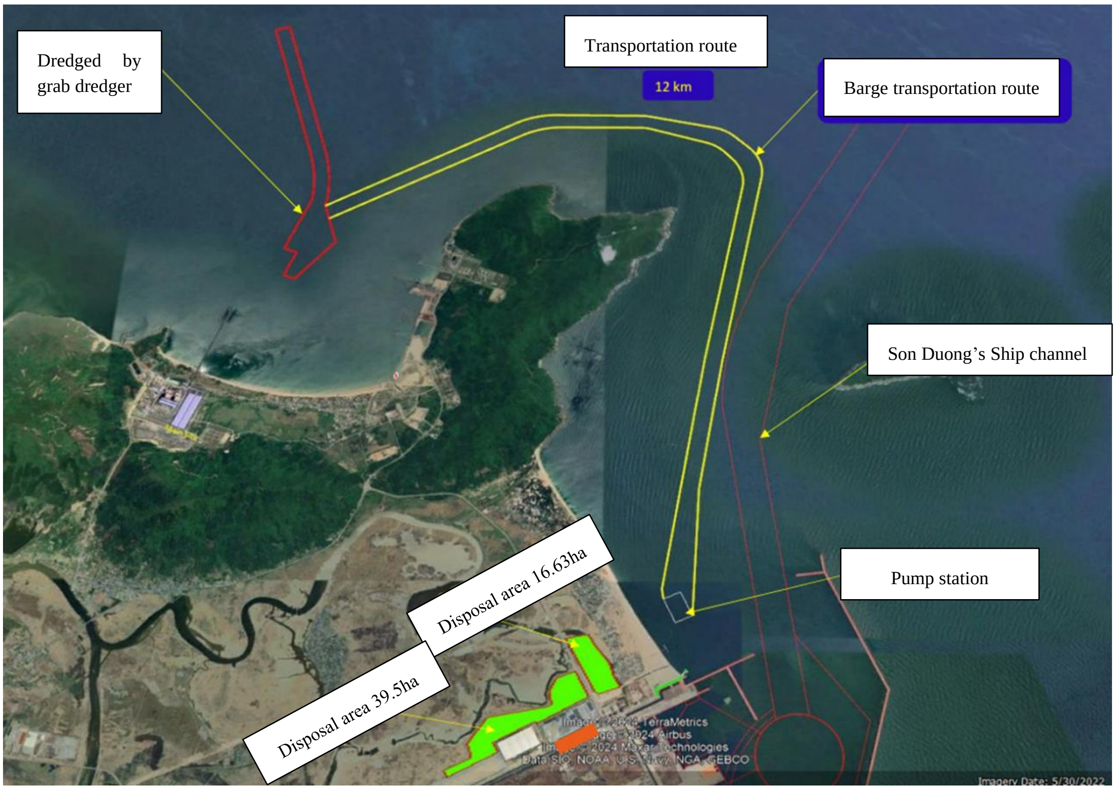


Figure 1.14. Illustration transported canel for dredged materials from dredged area to pump stations

Figure 1.15 Illustration of the layout of the pumping stations

Figure 1.16 Illustration of the transport route of dredged materials from the dredging area to the pumping stations (about 12km)

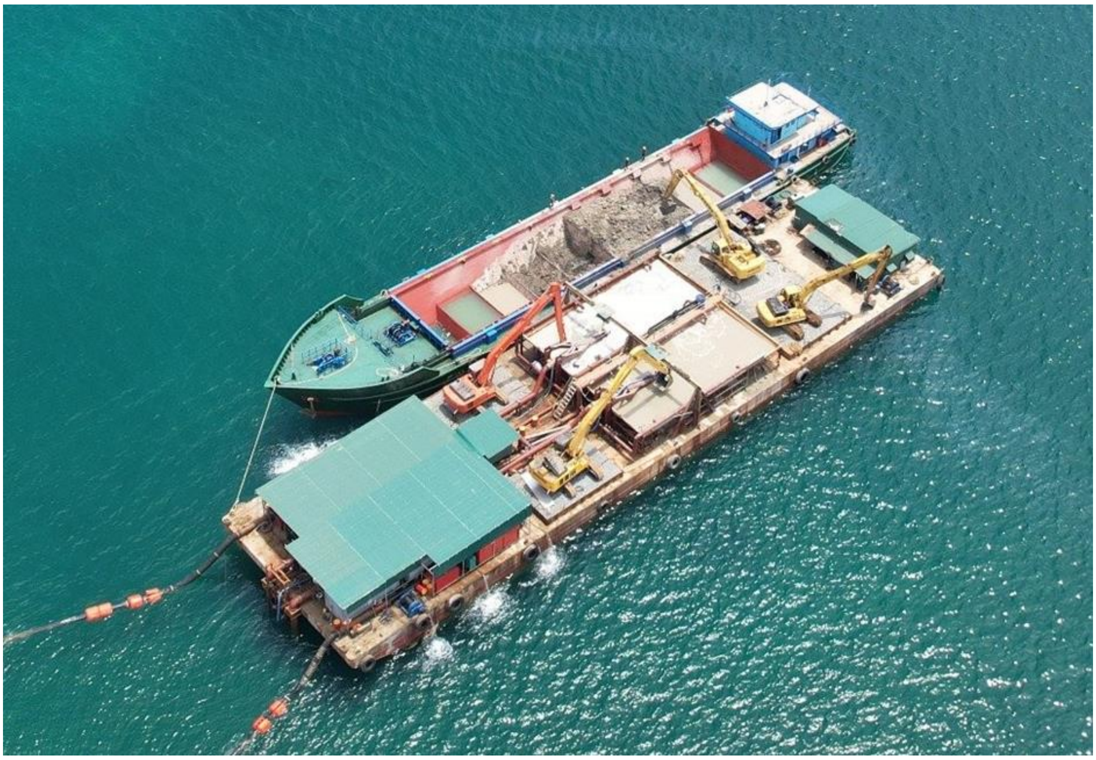


Figure 1.17 Dredged material transport ship approaching the pumping station

Figure 1.18 Pumping dredged material to storage area (actual image)

According to the actual testing of the pump system: The average productivity of the pump system is estimated at 1413 m³/day/station. The estimated construction equipment, construction time, and volume of dredged materials pumped to the storage site are shown in the table below:

Table 1.34 Number of construction vehicles and equipment

Vehicle type	Capacity	Estimated quantity
Pump system	350 m^3/h	4
Dragline excavator	≤ 10 m^3	3
Barge	≤ 2500 m^3	8
Tugboat	450	2
Pipeline	HDPE 300 mm	6,000 m

Table 1.35. Estimated productivity and construction volume

Equipment		Workforce		Productivity of one station (m^3/day)	Number of working days (Days)	Construction volume (m^3)
Equipment type	Quantity	Work location	Quantity (persons)			
Pump station	4	Pump station operators	60	1413	65	367,380
Clamshell excavator	3	Steersman + sailors	18			
Transport barge	8	Sailors on transport barge	72			
Tugboat	2	Sailors on tugboat	12			

Thus, with 04 pumping stations, from July 15, 2024, to October 30, 2024, about 65 working days can be achieved, with an estimated dredged materials volume of about 367,380 m^3 being pumped to the shore.

b. Measures using trucks (construction point 1,3 and 4)

In addition to the option of pumping dredged materials to the storage site, the project owner proposes 03 loading points for dredged materials to be transported to the storage site by truck. Among them: 01 loading point is within the main plant (construction point 1), and 02 loading points are at the beach of Tan Phuc Thanh village (construction point 3 and 4).

Bảng 0.1. Tọa độ vị trí điểm bốc xúc gần Formosa

Table 1.36. Coordinate of unloading location near Formosa.

Corner point	VN-2000 Coordination, central meridian 105°30', 3° projection zone.	
	X (m)	Y (m)
1	1998659,052	598888,733
2	1998720,201	598809,608
3	1998799,326	598870,758
4	1998738,177	598949,883

Table 1.37. Coordinate of unloading location near pump station.

Corner point	VN-2000 Coordination, central meridian 105°30', 3° projection zone.	
	X (m)	Y (m)
1	1999175,184	598459,657
2	1999262,422	598410,774

3	1999311,305	598498,012
4	1999224,068	598546,895

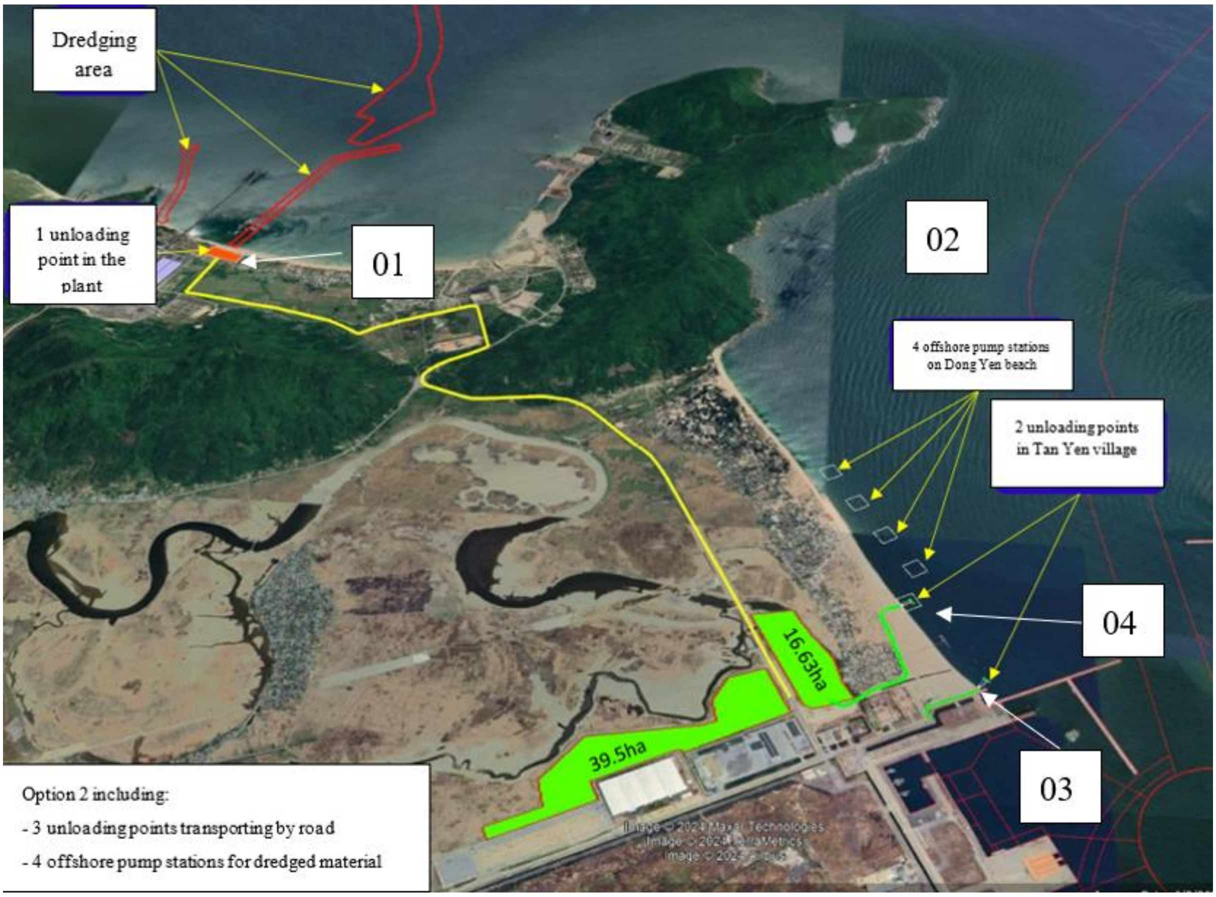


Figure 1.19 Diagram illustrating the position of 4 construction fronts, where fronts 01, 03, and 04 use trucks to transport dredged material to the storage yard.

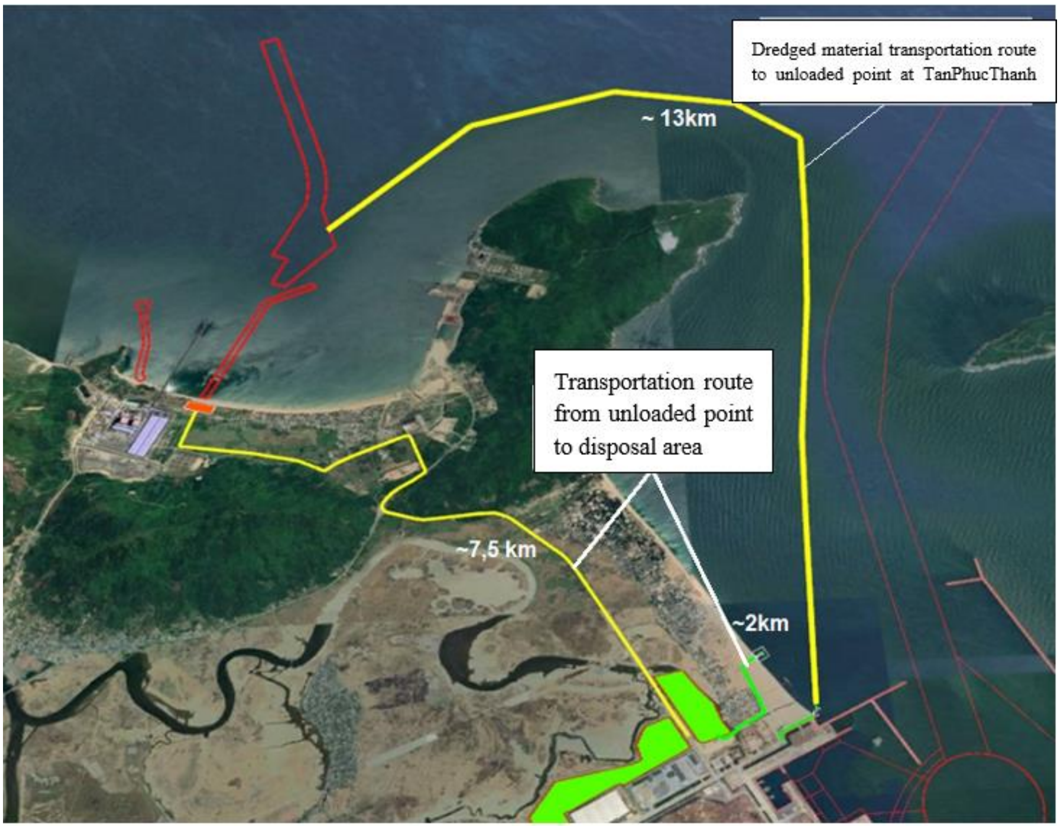


Figure 1.20 Diagram illustrating the transportation route of dredged material when using excavation onto trucks and transporting to the storage yard.

Similarly to the pumping plan for dredged material to the storage yard, dredged material is excavated using bucket dredgers, then transported by ships to transfer station 03. The distance from the dredging area to the transfer stations on the coast of Tan Phuc Thanh village is approximately 13km.

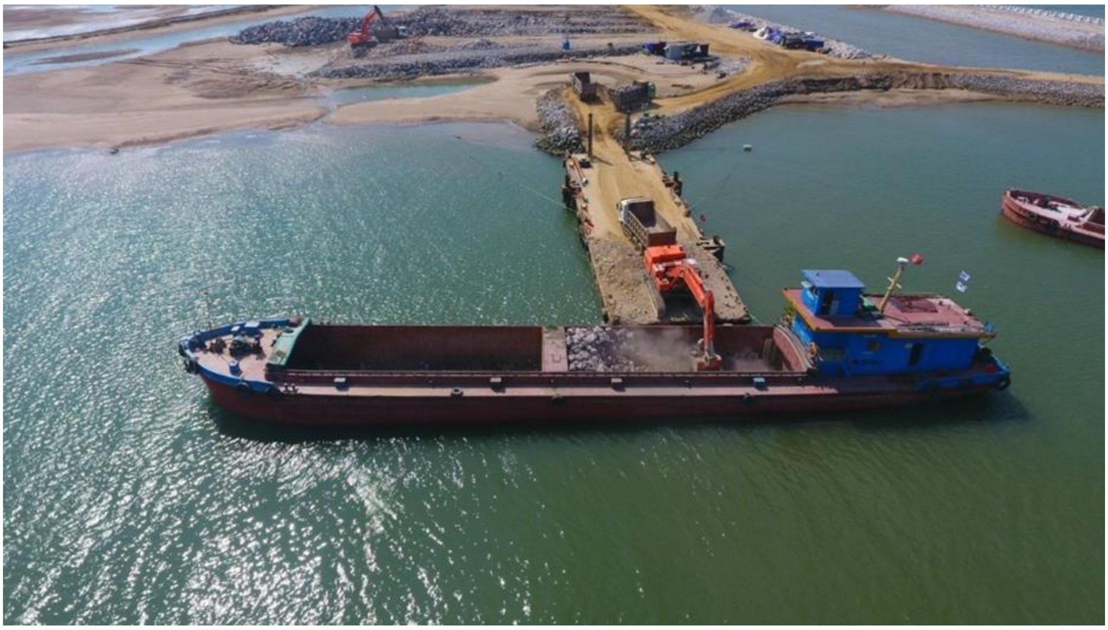


Figure 1.21 Illustration of the dredged material transfer station (reference photo).

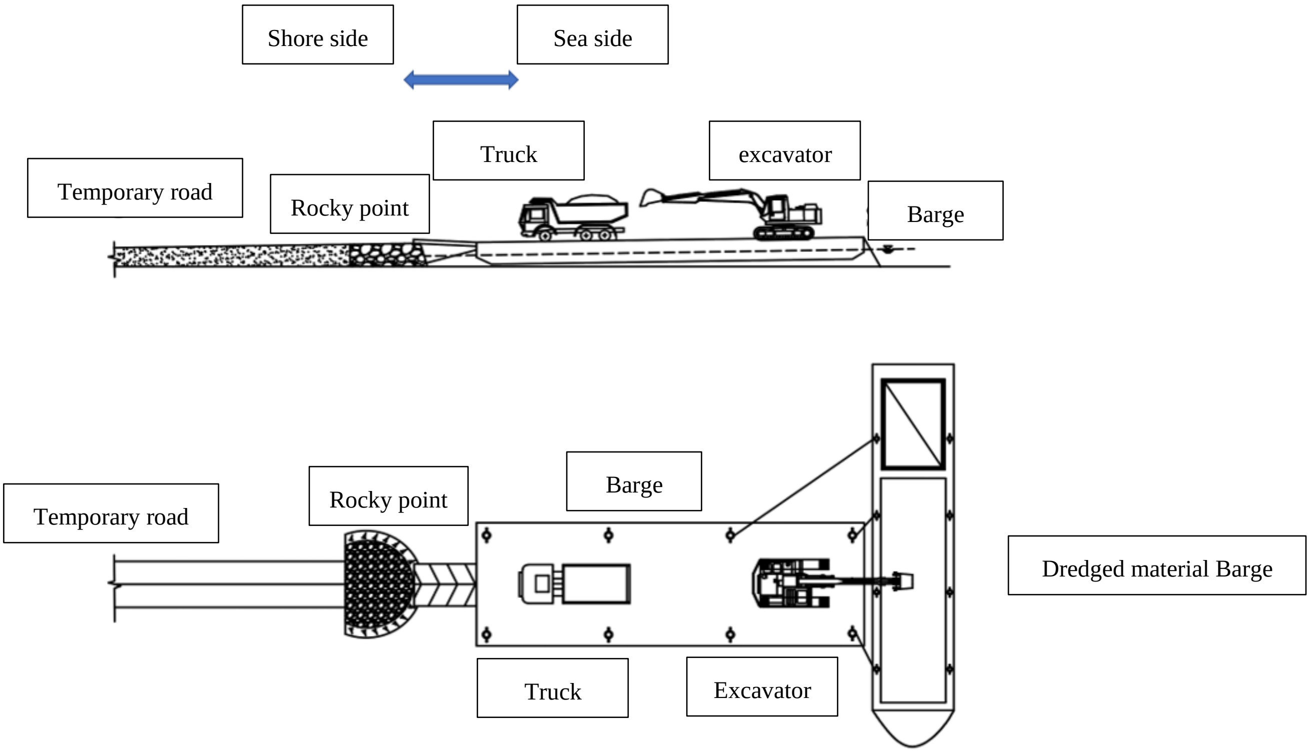


Figure 1.22 Illustration of the dredged material transfer process from the barge to trucks.

At the transfer stations, dredged material is unloaded from barges onto the shore using excavators, then further loaded onto 14 m^3 trucks and transported to the storage yard. The transportation distance to the storage yard is approximately 7.5 km from the transfer station at the main plant area or 2 km from the transfer station at the coastal area of Tan Phuc Thanh village.

When the trucks arrive at the storage yard, they dump the dredged material here and proceed with leveling using graders and excavators.

Figure 1.23. Illustration of the dredged material dumping and leveling process at the storage yard.

Details of the transportation route for construction front 01 from the main plant transfer point:

- Length of transportation route: 7.5 km

- Route includes: Internal roads of the plant, 2 km long, 7 m wide; inter-communal road managed by the Commune People's Committee of Ky Loi (6 m wide, 1 km long, section managed by the Economic Zone Management Board, 4.5 km long)

- The section of road managed by the Economic Zone Management Board (Nguyen Chi Thanh Road) is currently under expansion and not yet completed. The existing roadbed can still be used for transportation.

Figure 1.24 Description of the route for construction front 01 from the main plant transfer point to the storage yard.

For the two excavation sites at Tan Phuc Thanh village, the project proposes temporary roadways in the area adjacent to the Formosa Plant and the land of Naval Division 2. The scope of the temporary roadways 01 and 02 is entirely under the management of the Commune People's Committee of Ky Loi. Specifically:

Proposal for temporary road route to excavation site 01:

- Temporary road 01 is constructed parallel to the coastline of Tan Phuc Thanh village, circling behind Tan Phuc Thanh village into the storage yard. Proposed initial design specifications for temporary road 01:

- Length: 1100 m
- Width: 7 m
- Height above existing ground: 0.5 m
- Land use area: 7700 m²

Proposal for temporary road route to excavation site 02:

- Temporary road is constructed 1 m from the wall of Formosa Plant; the construction area of the temporary road site belongs to the management of the Commune People's Committee of Ky Loi, with a width of approximately 7 m measured from the wall of Formosa Plant extending to the coastline about 420 m. Proposed initial design specifications for temporary road 02:

- Length: 420 m
- Width: 7 m
- Height above existing ground: 0.5 m

- Land use area: 2940 m²

After completing the construction objectives of the two temporary road routes, the project will hand them over to local management.

Figure 1.25. Proposal for temporary road routes 01 and 02.

The road transportation route for the loading position in the main plant is a combination of the internal project road approximately 1.7 km long and the road managed by Ky Loi Commune in coordination with the Vung Ang Economic Zone Management Board, which is approximately 5.8 km long.

The estimated construction equipment, construction time, and volume of dredged materials transported to the storage site by truck are shown in the table below:

Table 1.38 Estimated productivity and construction schedule

Description	**Equipment**		**Workforce**		**Daily efficiency (m^3/day)**	**Construction time (days)**	**Construction volume (m3)**
	Equipment type	**Quantity (items)**	**Position**	**Quantity (persons)**			
Loading point 03	Excavator	2	Excavator driver	4	1520.36	65	98,823.6
	Truck	10	Truck driver	20			
	Barge	2	Crew	18			
	Clamshell excavator	1	Operator + crew	6			
	Tugboat	1	Crew	6			

Loading point 01	Excavator	2	Excavator driver	4	1,520.36	65	98,823.6
	Truck	5	Truck driver	10			
	Transport barge	2	Crew	18			
	Clamshell excavator	1	Operator + crew	6			
	Tugboat	1	Crew	6			
Loading point 02	Excavator	2	Excavator driver	4	1,520.36	65	98,823.6
	Truck	5	Truck driver	10			
	Barge	2	Crew	18			
	Clamshell excavator	1	Operator + crew	6			
	Tugboat	1	Crew	6			

Thus, it is estimated that with 03 loading points, from July 15, 2024, to October 30, 2024, about 65 working days can be achieved, with an estimated dredged materials volume of about 296,471 m³ being transported to the shore using trucks.

c. Excess Seawater Treatment System

The area of the dredged material storage yard onshore is equipped with a system of embarkments dividing the area into sections suitable for the construction site conditions. Locations for settling ponds and drainage channels for excess seawater are arranged to meet safety and environmental protection requirements as stipulated. These measures adhere to environmental safety guidelines approved by the Ministry of Natural Resources and Environment in Document No. 6636/BTNMT dated November 1, 2021, regarding adjustments to water intake pipelines, discharge for cooling water, dredged material storage yards, and coal unloading equipment for the "Vung Ang II Thermal Power Plant" project, and Document No. 4028/TCMT-TD dated November 7, 2022, from the General Department of Environment concerning changes in the location of dredged material and ash storage yards for the Vung Ang II Thermal Power Plant project in Ha Tinh province.

The embarkments are constructed using on-site land filling, lined with impermeable nylon to ensure stability and to contain both dredged material and seawater within the storage yard, preventing seepage into the environment. Additionally, settling ponds and spillway gates are also installed.

The settling ponds are constructed with brick structures, lined with waterproof mortar inside the ponds. The total area of the settling ponds is D x R = 30 x 10 = 300 m², with a depth of 2 meters. Excess seawater after passing through the three-level settling pond flows through open channels and returns to the sea. The spillway gates consist of wooden bars, adjusted according to the thickness of the sediment layer deposited within the pond.

Figure 1.26. Embarkment and impermeable nylon lining of the storage yard.

Figure 1.27 Three-compartment settling pond for treating runoff water from the storage yard.

Figure 1.28 Open channel receiving water after the settling pond.

1.5.2.1. Construction Method for offshore disposal

Trailing suction hopper dredgers and self-propelled split-hopper barges will store and transport the dredged material to the approved disposal site.

When the dredgers and barges arrive at the disposal site, they will open their bottom doors to release the dredged material. The entire transport route from the dredging area to the disposal site will be plotted on a navigation system so that the dredgers and barges can travel both day and night.

At the disposal site, buoys will be placed to signal the disposal area for the dredgers and barges.

The construction equipment, construction time, and the volume of dredged material to be disposed of are shown in the table below:

Table 1.39. The expected plan for dredging and offshore disposal.

<table>
<tr><th colspan="2">Equipment</th><th colspan="2">Personel</th><th rowspan="2">Daily productivity (m3/day)</th><th rowspan="2">Construction duration (days)</th><th rowspan="2">Total volume (m3)</th></tr>
<tr><th>Type</th><th>Quantity (items)</th><th>Work location</th><th>Quantity (persons)</th></tr>
<tr><td>Clamshell Dredger</td><td>15</td><td>Operator + Crew</td><td>30</td><td rowspan="2">27,096</td><td rowspan="2">65</td><td rowspan="2">1,761,232</td></tr>
<tr><td>Barge</td><td>27</td><td>Crew</td><td>243</td></tr>
</table>

Trailing suction hopper dredger	2	Crew	60			
Tugboat	5	Crew	30			

The estimated volume of material to be disposed of by trailing suction hopper dredgers and split-hopper barges is as follows:

Table 1.40. The volume of dredged material to be dumped

Equipment Type	Volume	Units
Trailing Suction Hopper Dredger	400,000	m^3
Clamshell Dredger combined with split-hopper barge	1,361,232	m^3

1.6. Construction schedule, total investment, management, and project implementation

1.6.1. Project Implementation Schedule

The anticipated project implementation schedule is as follows:

- Construction commencement: October 2021 (already executed)

- Onshore construction (February 2024 – June 2025): 17 months

- Continuation of construction activities in the main plant area: February 2024 – June 2025.

- Continuation of construction activities in the ash disposal site area: February 2024 – August 2024.

- The expected schedule for dredging and dredged material handling activities is as follows:

- Dredging – marine disposal: The investor plans to carry out the marine disposal project activities over approximately 12 months, which includes around 4 months of direct construction time, preparation, rectification, acceptance, handover, and non-construction time due to weather conditions.

- Dredging – onshore disposal: From August 2024 to October 2024: construction time is about 4 months.

- Commercial Operation of Unit 1: June 2025.

- Commercial Operation of Unit 2: October 2025.

1.6.2. Total Investment

The total project cost is estimated to be around 2.4 billion US dollars. The project funding sources include 75% to be mobilized from the Japan Bank for International Cooperation (JBIC) and international commercial banks, with the remaining 25% being equity capital contributed by the participating parties.

The cost for key environmental protection works is projected to be around 245 billion VND.

1.6.3. Project Management and Implementation Organization

1.6.3.1. Project Management Organization during Construction Phase

- VAPCO is the project owner. During the construction phase, VAPCO will sign a contract with an engineering, procurement, and construction (EPC) contractor. This contractor will be responsible for the design and management/supervision of the construction under VAPCO's oversight. VAPCO will directly sign contracts with construction companies and suppliers to implement various work packages.

- The current general contractor for the construction phase is: Doosan Enerbility Vietnam Co., Ltd. The residential area for operational and maintenance staff and the first phase of the ash disposal site are undertaken by Pacific Corporation. The general contractor is responsible for organizing the accommodation for workers during the construction phase. There will be no accommodation for workers at the construction sites of the project.

1.6.3.2. Project Management Organization during Operation Phase

During the operation phase, VAPCO will directly manage and operate the plant. This structure will be reviewed and adjusted based on work needs, particularly during construction and operation phases.

For operational and maintenance tasks requiring high skills, VAPCO will employ experienced personnel. If necessary, VAPCO will organize training for local workers. VAPCO will recruit as many local workers as possible. Simple or low-skill tasks will be handled by local labor.

VAPCO ensures the arrangement of accommodation for all its staff during the project's phases.

Operational staffing: The project will have about 300 operational staff working at the plant.

Staffing arrangements depend entirely on factors such as labor scheduling, outsourcing services, overtime rates, and some assumptions such as:

- Operations arranged in 3 shifts, each 8 hours, with 5 crews so that 2 crews can rest and train;

- Solid material handling operations (coal, ash) arranged in 2 shifts, each 12 hours, with 4 crews for coal handling in the plant;

- Coal port unloading performed by the plant's coal operations staff, receiving 1 coal ship per week. Unloading labor for each coal ship is 4 people per shift, with unloading time of 30 hours, and shifts can rotate 8, 10, or 12 hours each;

- All other plant staff work regular hours, a 40-hour workweek;

- Overtime rate is projected at 10% of total working hours;

- Ash transportation staff projected to be 7 people working 40 hours a week. Each trip transporting ash from the silo to the ash disposal site and back is estimated to be 30 minutes;

- Major shutdowns are scheduled alternately;

- Major maintenance and repair tasks are outsourced;

- Plant control, instrumentation, and control (I&C), and maintenance mainly performed by plant staff;

- Projected capacity factor is 85% and average availability factor is 90%;

- Operations and maintenance (O&M) staff are capable of cross-training for each other's tasks;

- Decentralized administrative organization...

CHƯƠNG 2. NATURAL, SOCIO-ECONOMIC CONDITIONS AND CURRENT ENVIRONMENTAL STATUS OF THE PROJECT IMPLEMENTATION AREA

2.1. Natural, economic and social conditions

2.1.1. Natural condition

2.1.1.1. Geological and topographical conditions of the project location

a. Onshore Topographical Conditions

The project area is bounded by Vung Ang Bay to the east, the Sang Mountain range to the northwest, and the Bo Can Mountain range to the south. The Quyen River is the main river flowing through the project area. The terrain elevation of the project area is more than 10 meters along the foothills to the north and 5 meters in the central area. Most of the project area has an elevation ranging from 3 meters to 5 meters (Figure 2.1).

The topography of the area is divided into different types:

- High Mountain Area: Rugged terrain with the Hoanh Son mountain range reaching heights from 700 meters to 900 meters, with narrow and heavily dissected valleys at the foothills, having natural elevations from 65.5 meters to 235.5 meters.

- Midland Area: Part of the Tri River and Quyen River basins, this area has gentle hills with terrain sloping from the southwest to the northeast, heavily dissected by rivers, streams, and small creeks, with natural elevations from 12.4 meters to 47.5 meters.

- Lowland Area: Natural elevations range from 1.25 meters to 8.5 meters. The estuarine regions of Cua Khau, Vinh River, and along the Quyen River are flood-prone areas with elevations from -0.3 meters to 0.95 meters. This area is also a major agricultural zone of the district, surrounded by sea embarkments and river embarkments belonging to Ky Long, Ky Phuong, Ky Loi, and Ky Thinh communes. It is an area prone to salinization and frequently experiences water shortages during the dry season.

- Coastal Area: Natural elevations range from -0.9 meters to 5.5 meters. There are also some high mountains such as Do Mountain, Cao Vong Mountain, Bo Can Mountain, and Con Tre Mountain with elevations from 32.5 meters to 415.7 meters, and a long sand dune range located to the southeast with elevations from 3.5 meters to 20.2 meters.

b. Seabed Topographical Conditions of the Dumping Area

The proposed disposal location area covers approximately 200 hectares, situated about 22-25 kilometers northeast of the dredging area of the project.

Based on the results of terrain surveys, combined with analysis of 1:100,000 scale nautical charts and 1:50,000 scale seabed topographic maps, the disposal location area, within the 200-hectare scope, appears relatively smooth and flat, with depths ranging from 43 to 44 meters.

The footage captured of the seabed terrain in August 2023 also indicates a relatively flat terrain at the disposal location area, with a soft seabed. There are no distinctive ecosystems presentResultsResults.

This marine area is not within the scope of the Vietnam coastal conservation system planning approved by the Prime Minister in Decision No. 742/QD-TTg dated May 26, 2010; it does not fall within the scope of temporary restricted fishing areas as regulated in the consolidated document No. 21/VBHN-BNNPTNT dated December 30, 2022, of the Ministry of Agriculture and Rural Development on guidance for protecting and developing fisheries resources; it does not overlap with the planned marine conservation areas, fisheries resources protection areas, or temporary fishing prohibition areas in the Draft Plan for Fisheries Protection and Exploitation for the period 2021-2025, with a vision to 2050.

c. Geological conditions of the main plant

According to the specialized geological survey report conducted by Pory Energy Ltd in 2009, the Vung Ang II thermal power plant construction area is located on the northeastern edge of the Kontum uplift, with the geological structure of the project area consisting of the following stratigraphic units:

Mesozoic Era - Jurassic System - Muong Hinh Formation (Jmh): In the project area, the Muong Hinh Formation is not widely distributed and is exposed on the surface in high hill ranges to the west of the study area. The composition includes conglomerate, breccia, sandstone, and acidic volcanic rocks. The lithological characteristics are described as follows:

- Breccia: Brownish-gray, brown color; thick stratification, breccia structure; diverse clastic composition, cemented by silt and clay.

- Sandstone: Gray, gray-brown color; stratified structure, medium-grain texture; mainly quartz sand composition, cemented by small sand grains, silt, and clay.

- Acidic Volcanic Rock - Rhyolite: Light gray rhyolite, massive structure, microcrystalline and porphyritic texture; composed of quartz, feldspar, mica, and other minerals.

Cenozoic Era - Quaternary System (Q): The Quaternary system in the study area includes eluvi-deluvi formations and mixed fluvial-marine sediments:

- Mixed Fluvial-Marine Sediments (amQ): These sediments are widely distributed in the study area, composed of silty clay, sandy clay, medium to fine-grained sand, and soft plastic, plastic clay. The geomorphology is characterized by narrow coastal plains.

- Eluvi-Deluvi Formations (edQ): These formations result from the weathering of bedrock.

The project area is a low coastal land interspersed with swamps, agricultural land, and some forested areas. The project site lies on exposed rhyolite rock of the Muong Hinh stratigraphic unit. Above these exposed rocks are weathered rock layers covering the mountainsides and valleys. The soil in the project area is upper Holocene soil, comprising sand, alluvium, clay, gravel, and peat, originating from marine and fluvial sources.

Based on the geotechnical studies in the geological survey report of the Vung Ang II Thermal Power Plant, the detailed description of the weathering layers in the study area is as follows:

- Layer 1a: Sandy clay, yellow-gray, gray-brown color, mixed with black-gray humus, thickness from 1 m to 3.5 m.

- Layer 1b: Black-gray, slightly green clay of marine origin, thickness from 5 m to 7 m.

- Layer 2a: Similar to layer 1a but described as an inclined sedimentary layer, thickness from 1.5 m to 5.5 m.

- Layer 2b: Green-gray, dark gray clay, sticky to hard, thickness from 2.5 m to 8 m.

- Layer 3: Yellow-gray and white-gray foundation sand, saturated, medium density, clearly stratified, thickness from 2 m to 5 m.

- Layer 4: Soft coastal bottom clay, light brown, gray to black-gray, thickness from 1 m to 5 m.

- Layer 5: Black-gray gravel mixed with sand, sandy clay, tightly compacted, thickness from 1.5 m to 10 m.

Beneath layer 5 are fractured and weathered rock layers identified as follows:

- Highly to Completely Weathered Rock IA1: No rock structure visible, decomposed into sticky sandy clay, thickness from 2 m to 20 m.

- Highly to Completely Weathered Rock IA2: Still contains rock fragments (breccia) within the clay matrix, thickness from 1 m to 5 m.

- Moderately Weathered Rock IB: Shows cracks and fractures, intact rock fragments, discolored and partially covered with clay.

- Slightly to Recently Weathered Rock IIA: New rock fragments, medium to highly fractured, discolored fractures. The rock in this area is hard and stable for construction purposes.

Due to the characteristics of lightly and recently weathered rock IIA, with new rock fragments, medium to highly fractured, discolored fractures, the project owner has coordinated with the Institute of Foundations and Underground Works to conduct a geological survey of the dredging area using high-resolution seismic methods. The results obtained show:

The project is located in Ky Anh District, Ha Tinh Province. The terrain surface is relatively flat, not yet sedimented. The elevation ranges from +2.16m to +4.16m above sea level.

According to the 1/50,000 geological map of the area established by the General Department of Geology and Minerals of Vietnam, there are two main rock formations encountered in the area as follows (arranged from oldest to youngest):

- Quaternary Sediments (mvQIV3): Includes fluvial and alluvial sediments, alluvium, and marine deposits (sand, silty clay, silty sand, silt, clay, etc.).

- Jurassic (Muong Hinh Formation, Jmh): Includes conglomerate, breccia, sandstone, and acidic volcanic rocks (rhyolite).

Based on the characteristics of the reflection wave fields obtained on the high-resolution shallow seismic bands, the following sediment layers distributed on the seabed are identified:

- Layer 1: Identified by the R1 reflection boundary and seabed surface, characterized by medium amplitude reflection wave field, parallel reflection form, relatively homogeneous, representing clay, sandy clay sediments. The R1 reflection boundary is interrupted in some locations due to exposed bedrock on the seabed surface.

- Layer 2: Identified by the R2 and R1 seismic reflection boundaries, characterized by mound-shaped, chaotic reflection wave field, weak seismic reflection amplitude, relatively homogeneous, representing sand, sandy clay sediments. In some locations, these sedimentary deposits are interrupted due to protruding bedrock on the seabed.

- Layer 3: Identified by the R3 and R2 reflection boundaries, characterized by chaotic seismic reflection, strong seismic reflection amplitude, representing fine-grained to coarse-grained sedimentary deposits corresponding to sand, gravelly sand, clearly visible near the fractured and weathered bedrock areas.

Survey Area 1A

- Number of Cross-Sections: 02 cross-sections.

- Results: From the seabed downwards, the following 03 layers are identified on the cross-sections:

- Layer 1: Low-plasticity clay mud, fluid to soft-plastic state, poorly graded silt-sand, porous structure. Layer thickness from 1.09 m to 4.43 m.

- Layer 2: Low to medium plasticity clay, low-plasticity sandy silt, fluid-plastic to stiff-plastic state. Layer thickness from 0.25 m to 9.48 m.

- Layer 3: Poorly graded silt-sand mixed with gravel, occasionally sandy clay, low-plasticity silt-sand, medium to dense state, low-plasticity clay, low-plasticity sandy clay. Layer thickness from 3.59 m to 9.14 m.

In the area, there are two high bedrock zones exposed on the seabed.

Survey Area 2A

- Number of Cross-Sections: 04 cross-sections.

- Results: From the seabed downwards, the following 03 layers are identified on the cross-sections:

- Layer 1: Low-plasticity clay mud, fluid to soft-plastic state, poorly graded silt-sand, porous structure. Layer thickness from 0.43 m to 4.69 m.

- Layer 2: Low to medium plasticity clay, low-plasticity sandy silt, fluid-plastic to stiff-plastic state. Layer thickness from 0.14 m to 9.43 m.

- Layer 3: Poorly graded silt-sand mixed with gravel, occasionally sandy clay, low-plasticity silt-sand, medium to dense state, low-plasticity clay, low-plasticity sandy clay. Layer thickness from 1.46 m to 11.73 m.

In the area, there are no high bedrock zones exposed on the seabed.

Survey Area 3A

- Number of Cross-Sections: 02 cross-sections.

- Results: From the seabed downwards, the following 03 layers are identified on the cross-sections:

- Layer 1: Low-plasticity clay mud, fluid to soft-plastic state, poorly graded silt-sand, porous structure. Layer thickness from 1.64 m to 3.21 m.

- Layer 2: Low to medium plasticity clay, low-plasticity sandy silt, fluid-plastic to stiff-plastic state. Layer thickness from 0.3 m to 6.33 m.

- Layer 3: Poorly graded silt-sand mixed with gravel, occasionally sandy clay, low-plasticity silt-sand, medium to dense state, low-plasticity clay, low-plasticity sandy clay. Layer thickness from 2.72 m to 9.93 m.

In the area, there are no high bedrock zones exposed on the seabed.

Thus, the main material components are poorly graded sandy silt and clayey silt in a soft to hard plastic state. In particular, weathered rock appears in the dredging area near the cooling water intake with an estimated volume of about 3,500 m³.

2.1.1.2. Climatic and meteorological conditions

The project is located in a tropical monsoon climate zone, characterized by hot and dry weather with strong winds. According to the observational data from the Ky Anh meteorological station, the climate conditions of the project area are as followsResults:

a. Temperature

The average air temperature in the project deployment area in 2022 was 26.0°C. The climate is divided into 2 seasons throughout the year:

- The dry season extends from April to October, with the hottest weather occurring from May to August.

- The rainy season lasts from October to March of the following year.

The summarized temperature data over the years in the project deployment area is detailed in the following table:

Table 2.1 Average monthly air temperature (2018- 2022) (°C)

Month	**2018**	**2019**	**2020**	**2021**	**2022**
Jan	19.7	18.6	18.8	21.0	20.7
Feb	19.3	17.4	23.1	21.2	21.3
Mar	22.1	22.0	23.6	24.1	22.6
Apr	25.2	24.1	28.2	23.1	24.9
May	27.2	29.1	29.7	29.7	28.5
Jun	30.8	30.6	32.6	32.3	32.7
Jul	29.0	29.3	31.2	31.6	31.5
Aug	29.7	29.6	29.7	29.6	30.1
Sep	29.2	28.2	27.5	29.3	28.5
Oct	25.0	25.8	26.2	24.5	25.4
Nov	21.3	23.6	23.0	23.1	27.1
Dec	18.7	20.8	20.3	18.3	19.7
Average	**24.8**	**25**	**26.2**	**25.7**	**26.0**

(Source: Ky Anh Hydrometeorological Center, 2022)

b. Humidity

The relative humidity is relatively high, averaging about 85% annually. During the early winter season, the average humidity is over 80%, while for the rest of the months, it remains mostly above 70%. The period with the lowest air humidity is in June and July, corresponding to the peak activity of hot and dry west winds. The relative humidity is summarized in the table below:

Table 2.2 Characteristics of air humidity at Ky Anh station

Month	**2018**	**2019**	**2020**	**2021**	**2022**
Jan	93.0	89.0	90.0	89.0	87.0
Feb	89.0	87.0	88.0	88.0	91.0
Mar	90.0	87.0	89.0	89.0	91.0
Apr	85.0	87.0	79.0	87.0	86.0

Month	2018	2019	2020	2021	2022
May	85.0	81.0	79.0	80.0	70.0
Jun	73.0	75.0	67.0	68.0	69.0
Jul	84.0	83.0	72.0	69.0	76.0
Aug	80.0	84.0	80.0	81.0	81.0
Sep	85.0	84.0	88.0	85.0	84.0
Oct	90.0	88.0	91.0	90.0	84.0
Nov	89.0	88.0	90.0	89.0	90.0
Dec	90.0	89.0	87.0	89.0	90.0
Average	**86.1**	**85.2**	**83.3**	**83.7**	**83.3**

(*Source: Ha Tinh Hydrometeorological Center*)

c. Rainfall

The project area experiences uneven distribution of rainfall throughout the year. During the winter and spring seasons, rainfall is low, accounting for only about 25% of the annual precipitation. The majority of rainfall, approximately 75% annually, occurs during the summer and autumn seasons, with particularly heavy rainfall often observed towards the end of autumn. The total annual rainfall typically ranges from 2,557.3 to 3,505.2 mm/year (during the period 2018-2022).

The average number of rainy days per year in Ky Anh is also quite high, where there are at least 120-130 rainy days a year, in many places it can be up to 180-190 days, the most common is 150-160 days.

In general, rainfall is unevenly distributed and concentrated in the summer months and often ends late. The total rainfall in the 5 winter months only accounts for 26% of the yearly rainfall. The months with the highest rainfall are September, October and November, with the least amount of rain being February and March.

Table 2.3 Monthly average rainfall (2018- 2022) (mm)

Month	2018	2019	2020	2021	2022
Jan	187.1	95.2	118.7	154.5	125.1
Feb	95.2	50.8	37.5	82.8	74.2
Mar	178.0	46.2	107.9	99.7	23.7
Apr	45.8	178.1	14.2	154.4	51.7
May	274.8	39.7	90.1	145.0	89.7

Month	2018	2019	2020	2021	2022
Jun	40.1	28.2	7.8	4.1	122.2
Jul	507.7	360.8	191.3	49.5	22.2
Aug	215.6	56.3	193.3	571.1	126.2
Sep	359.7	440.7	1074.9	163.1	369.3
Oct	698.3	190.0	582.1	1634.7	1276.6
Nov	761.2	288.4	411.0	330.7	741.3
Dec	141.6	782.9	116.6	245.5	170.0
Average	**3505.2**	**2557.3**	**2945.4**	**3635.1**	**3192.2**

(*Source: Ha Tinh Hydrometeorological Center*)

d. Wind

Wind is a factor in dispersing pollutants into the atmosphere. The extent of pollutant dispersion depends on the speed and direction of the wind. Ha Tinh experiences distinct monsoon wind patterns:

- During the winter months (December, January, February), the prevailing wind direction is Northeast (Northeast). Towards the end of winter, from March onwards, the wind direction gradually shifts from Northeast to East.

- Typically starting from mid-May, the prevailing wind direction is Southwest and West

Table 2.4 Average wind speed (m/s) at Ky Anh station

Direction / Month	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Jan	3	2	0	0	2	2	3	2
Feb	2	2	3	3	1	0	3	2
Mar	2	3	3	2	1	1	2	1
Apr	2	0	2	3	0	4	4	2
May	2	2	3	3	3	0	3	3
Jun	2	2	3	2	3	4	4	2
Jul	1	4	3	1	3	3	2	2
Aug	2	2	2	2	2	4	5	4
Sep	4	4	5	1	2	2	3	3

Direction / Month	North	Northeast	East	Southeast	South	Southwest	West	Northwest
Oct	3	3	4	0	1	1	2	2
Nov	4	4	5	2	1	1	3	3
Dec	4	0	5	0	2	1	3	3

(Source: Ha Tinh Hydrometeorological Center)

According to wind data from the Ky Anh meteorological station, the average annual wind speed is approximately 2.3 m/s, with the highest average monthly wind speed occurring in June.

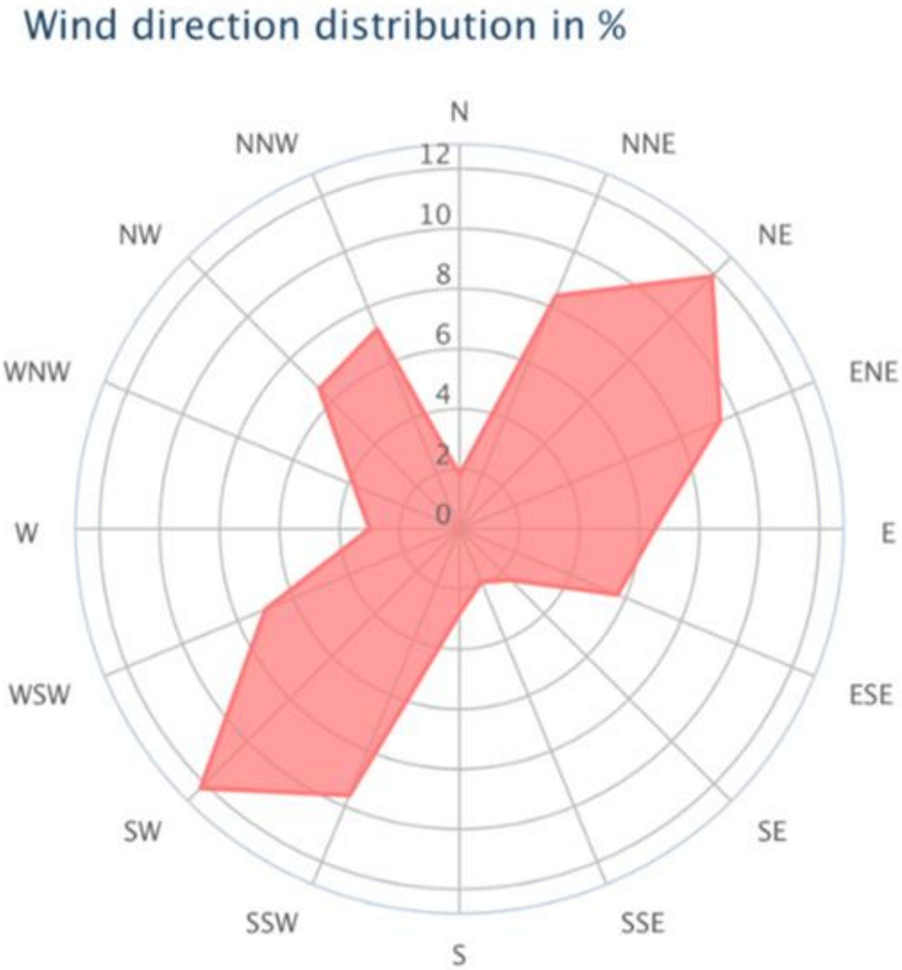


Figure 2.1 Wind rose showing the average wind direction frequency over several years in the Project Area.

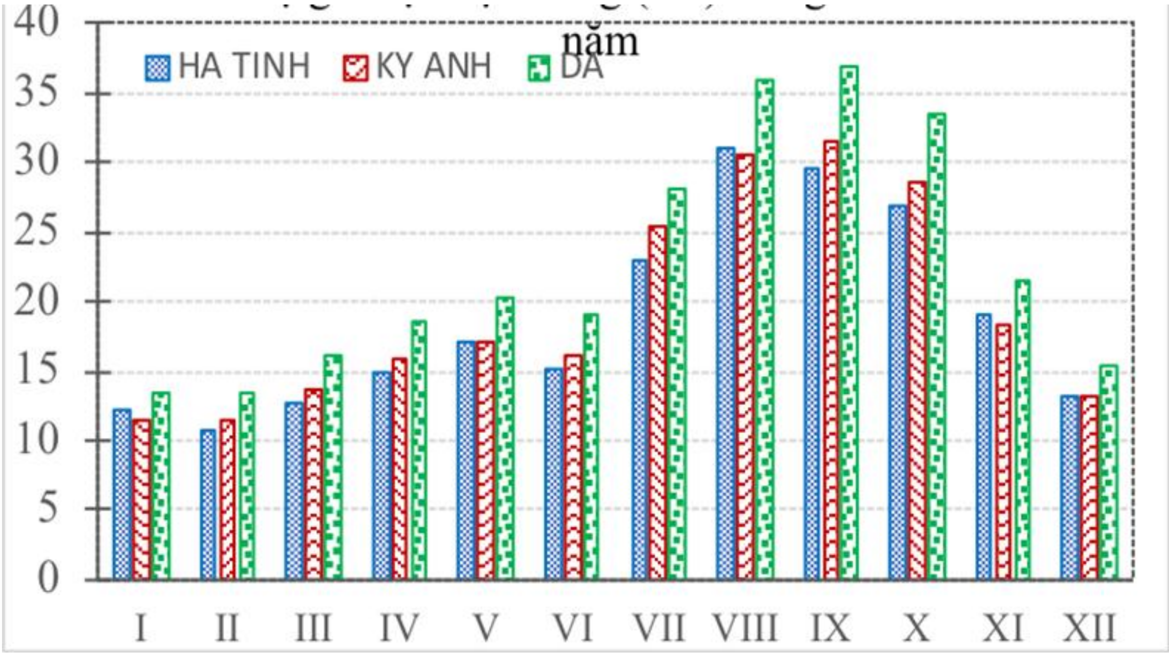


Figure 2.2 Maximum monthly wind speed (Vx) calculated as the long-term average for each month.

Considering wind directions, the most characteristic wind seasons in the project area are the Northeast Monsoon (from North-Northeast to East-Northeast), accounting for nearly 30% of the days, and the Southwest Monsoon (from West-Southwest to South-Southwest), also comprising around 30% of the days. During the transition periods, the Northwest and North-Northwest winds also become prevalent, constituting about 15% of the days. Therefore, prevailing winds in the project area are the Northeast Monsoon blowing in the winter (from November to January) and the Southwest Monsoon blowing in the summer (from June to August). Simulation results based on wind direction models also yield similar findings.

During the construction process in the project area, which may extend over time, extreme wind conditions need to be considered on a monthly scale. Here, the average monthly maximum wind speed values over several years are taken into account. Analysis of monthly maximum wind speeds shows that from July to October, the Vx extreme wind speed is significantly higher compared to other months. Extreme wind speeds can reach over 25m/s (in July) up to over 35m/s (in September). The highest extreme wind speeds coincide with the period of typhoon activity in the East Sea in general and in the Ha Tinh sea area in particular. During transitional months, monthly extreme wind speeds remain relatively stable, fluctuating between 10 to below 20 m/s. It is noteworthy that although the extreme wind speeds during the Northeast Monsoon season (from November to March of the following year) are not excessively high, the average wind speeds remain relatively high. This is due to the stable nature of the Northeast Monsoon winds, so marine activities should avoid this period.

e. Sunshine and radition

The average number of sunshine hours per year ranges from 1,574.8 to 2,056.8 hours/year. The period with the most sunshine hours is from March to July. The months with fewer sunshine hours are from August to January of the following year.

- The sunniest months are June and July.
- The least sunny months are November and December.

Table 2.5 Average number of sunshine hours during the period 2018 - 2022 (hours).

Month	2018	2019	2020	2021	2022
Jan	39.0	55.6	34.5	134.6	39.3
Feb	87.1	40.6	150.6	129.4	90.2
Mar	86.6	102.8	108.9	97.9	52.0
Apr	160.0	178.4	227.9	266.1	157.7
May	173.0	283.5	215.4	315.9	256.6
Jun	252.1	219.2	290.9	325.9	264.7
Jul	189.0	146.6	276.3	325.7	270.8
Aug	210.2	178.4	195.1	205.2	185.9
Sep	220.5	206.2	172.7	211.2	150.8
Oct	89.9	190.5	194.8	73.5	130.1
Nov	33.0	133.7	110.5	102.9	63.9
Dec	34.4	75.4	79.2	31.6	29.5
Average	**1574.8**	**1810.9**	**2056.8**	**1973.9**	**1692.5**

(Source: Ha Tinh Hydrometeorological Center \)

The total average daily radiation is highest at around 5.234 kWh/m2/day, and the annual average is 3.489 kWh/m2/day.

f. Evaporation

Evaporation is high throughout the province due to the high temperatures, abundant sunshine, strong winds, and low air humidity. As of 2021, the highest measured evaporation was 1129.7 mm/year. During the dry season, evaporation ranged from 0.2 mm on March 19th to a maximum of 12.6 mm on December 10th.

Table 2.6 Evaporation amount in the project area (mm)

Month	2018	2019	2020	2021	2022
Jan	22.8	35.9	25.0	49.1	26.4
Feb	27.1	33.0	40.6	50.0	42.5
Mar	28.6	42.9	34.5	48.1	25.4
Apr	69.6	48.4	80.3	39.8	47.9
May	68.9	99.0	135.3	113.9	105.2
Jun	183.6	191.8	229.8	235.5	187.1
Jul	124.3	151.4	201.4	205.7	167.6
Aug	136.1	143.3	155.3	140.0	115.8
Sep	95.7	84.8	80.9	94.2	65.4
Oct	54.0	66.5	69.6	61.4	48.3
Nov	28.6	56.7	61.7	49.9	32.0
Dec	57.6	29.4	66.6	42.1	36.6
Average	**906.9**	**983.1**	**1181.0**	**1129.7**	**900.2**

(*Source: Ky Anh Hydrometeorological Center, 2022*)

g. Unusual weather conditions

The project area in general is heavily influenced by a variety of extreme weather phenomena, particularly heatwaves, storms, typhoons, cold spells, floods, and inundation. Consequently, it is also prone to almost all types of natural disasters existing in our country, but with higher frequency and complexity due to the unique geographical terrain and the occurrence of numerous extreme weather patterns.

Heatwaves:

Heatwaves are caused by the foehn effect of the southwest monsoon wind after crossing the Truong Son mountain range. Heatwaves are characterized by days with a maximum temperature > 35°C and minimum relative humidity < 65%. They can occur from March to September, but are most prevalent during the summer months (May to August), averaging about 6-17 days per month.

Thunderstorms, Tornadoes, and Heavy Rain:

Thunderstorms typically occur from March to October, peaking from May to September with approximately 6-15 days of thunderstorms per month. Tornadoes are also associated with these thunderstorms. Both thunderstorms and tornadoes are weather events triggered by similar dynamic thermal conditions, often causing heavy rain and strong winds.

Fog and Frost:

Due to its geographical features and the influence of the Northeast monsoon wind, Ha Tinh Province is not spared from fog and frost, particularly affecting hilly areas. Tropical depressions combined with cold air masses can lead to significant rainfall exceeding 100 mm.

Typhoons, Tropical Depressions, and Floods:

Ha Tinh Province, including Ky Anh district, is frequently affected by typhoons. Typhoons generally occur from August to November, with statistical data indicating 3 to 6 typhoons passing through the province annually, of which 2 to 4 directly impact the region.

Typhoons typically make landfall in Ha Tinh from late June to December, with 70% occurring in August, September, and October. Typhoons of intensity level 9 or higher occur 44% of the time, with a return period of 23 years. Typhoons of intensity level 12 or higher occur 10% of the time, with a return period of 10 years. Approximately every 10 years, a typhoon of intensity level 12 or higher makes landfall in Ha Tinh, causing severe damage to coastal areas, embankments, and river mouths.

Typhoons making landfall in Ha Tinh bring strong winds, with gusts reaching up to 40 m/s or more, capable of causing house collapses and roof damage. They are often accompanied by heavy to very heavy rainfall, leading to widespread flooding and inundation, and sometimes resulting in loss of life.

According to a report by the Institute of Meteorology, Hydrology, and Climate Change (2016), from 1961 to 2015, Ha Tinh Province experienced 44 typhoons affecting the region, including 26 directly making landfall and 18 indirectly impacting the province. Most typhoons form in the Pacific Ocean and move into the East Sea (South China Sea) in their final stages. Typhoons originating in the East Sea are generally weaker but have complex and unstable paths, often affecting Ha Tinh and neighboring provinces with less intensity.

Table 2.7 Statistics of cyclones in the coastal area from Nghe An to Quang Binh

No.	Storm name (international name)	Appearance time	Level
1	Saudel	22/10/2020	Level 13 (>133 km/h)

No.	Storm name (international name)	Appearance time	Level
2	Sinlaku	01/8/2020	Level 8 (60 - 75 km/h)
3	Podul	30/8/2019	Level 11 (103 - 117 km/h)
4	Bebinca	17/8/2018	Level 9 (75 - 88 km/h)
5	Son Tinh	19/7/2018	Level 8 (60 - 75 km/h)
6	Doksuri (no 10)	15/9/2017	Level 15 (167-183 km/h)
7	Talas (no 2)	15/7/2017	Level 8 (60 - 75 km/h)
8	Vam Co	14/09/2015	Level 8 (60 - 75 km/h)
9	Rammasun	16/7/2014	Above level 14 (>165 km/h)
10	Haiyan (no 14)	10/11/2013	Above level 18 (>230 km/h)
11	Sơn Tinh (no 8)	26/10/2012	Level 13 (>133 km/h)
12	Mindulee	21/8/2010	Level 10 (89 - 102 km/h)
13	Tropical depression	13/10/2008	Level 7 (50 - 61 km/h)
14	Mekkhala	27/9/2008	Level 9 (75 - 88 km/h)
15	Lekima	27/9/2007	Level 11 (103 - 117 km/h)
16	Kaitak (no 8)	28/10/2005	Level 9 (75 - 88 km/h)
17	Vivente (no 6)	15/9/2005	Level 9 (75 - 88 km/h)
18	Hagupit (no 4)	10/9/2002	Level 6 (39 - 49 km/h)
19	USAGI (no 5)	10/8/2001	Level 8 (62 - 74 km/h)
20	Wukong (no 4)	05/9/2000	Level 10 (89 - 102 km/h)
21	EVE (no 9)	15/10/1999	Level 8 (62 - 74 km/h)
22	Tropical depression	11/3/1996	Level 6 (39 - 49 km/h)
23	Luke (no 8)	08/09/1994	Level 6 (39 - 49 km/h)
24	Fred (no 6)	12/8/1991	Level 10 (89 - 102 km/h)
25	Becky (no 5)	25/8/1990	Level 12 (118 - 133 km/h)
26	Tropical depression	21/7/1990	Level 6 (39 - 49 km/h)
27	Brian (no 7)	29/10/1989	Level 12 (118 - 133 km/h)

No.	Storm name (international name)	Appearance time	Level
28	DAN (no 9)	08/10/1989	Level 13 (>133 km/h)
29	Cary (no 3)	13/8/1987	Level 9 (75 - 88 km/h)

(*Source: Institute of Science and Technology*)

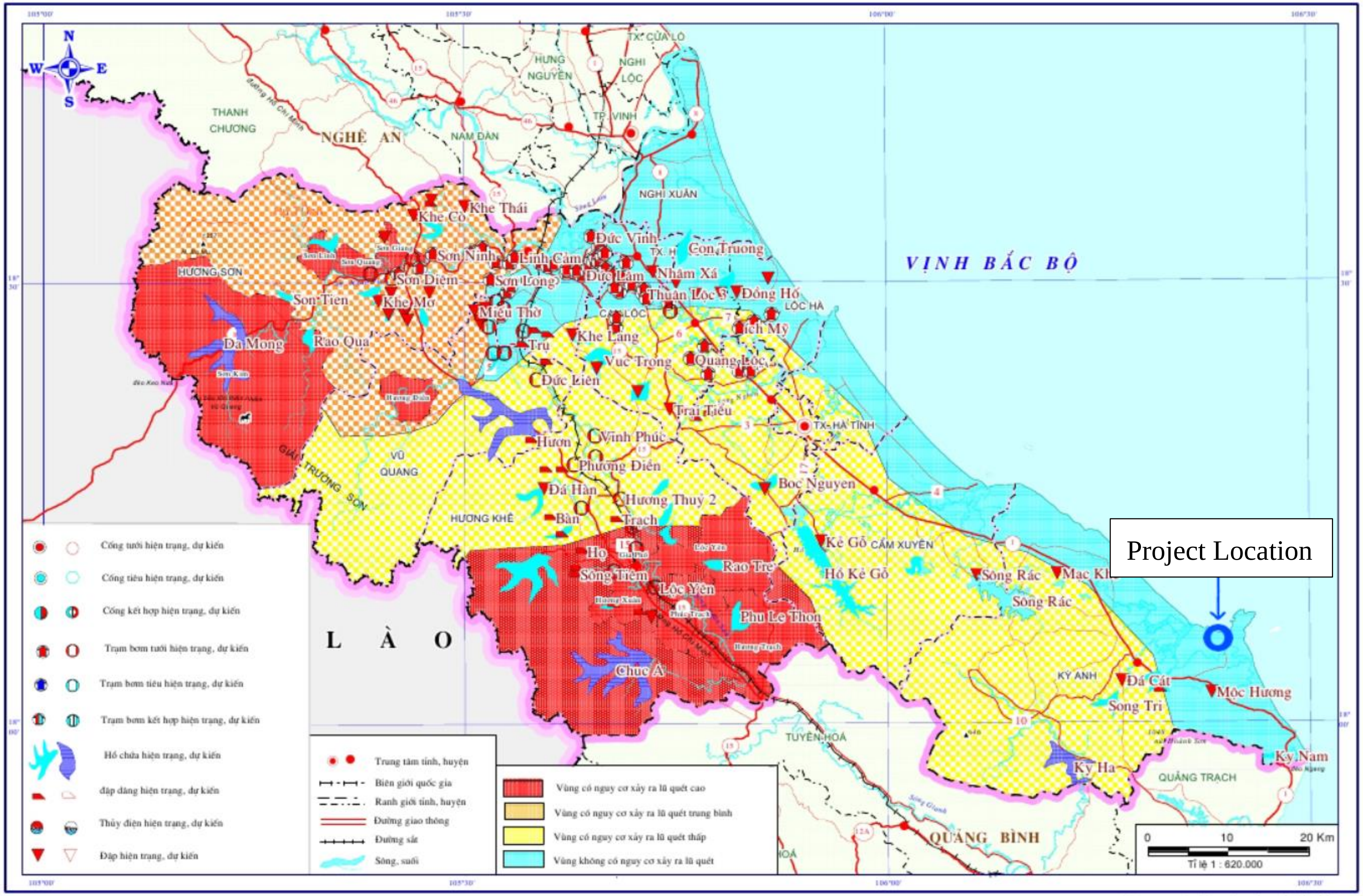


Figure 2.3 Map of flash flood risk in Ha Tinh province area

2.1.1.3. Hydrological and oceanographic conditions

a. Hydrological conditions

In Ky Anh, the network of rivers and streams is quite dense, with rivers such as the 32 km long Garb River mainly flowing in the West-East direction. The Tri River flows between the two mountain ranges of Yen Ma, Da Bac and Rú Ba Hoi in the Northwest - Southeast direction and flows into the Quyen River at the Nam Hai estuary. The narrow basin with a catchment area of 58 km2 has a length of 39 km.

The Tri River watershed has irrigation lakes that store water to serve agriculture, forestry, fishery and community activities during the dry season: Kim Son Lake, Ky Hoa commune, located on Ho stream with a basin area of 25 km2, The open surface area is 175 hectares, the largest capacity is about 17 million m3. Tri River Lake (Ky Hoa) has a basin area of 56 km2, open surface area of 48 hectares, capacity of about 2.8 million m3, irrigating 700 hectares. Quyen River has a length of 34 km. The upstream section is called Khat rock slot and flows in a southwest direction. The section from Da Hat bridge downstream is called Quyen river with a river basin area of 150 km2. Cau Quen River flows through National Highway 1A, through Ky Trinh ward, joining the end of Tri river in Dong Tien lagoon area. This river branch has a very small basin, mainly draining the areas of Hung Loi, Hung Thinh (Ky Hung commune) and part of Ky Trinh ward downstream of Tri river. The rivers in the project area are mainly used for agricultural irrigation, drainage, and navigation.

Khe Cau Da is a branch of the Cai River originating from Da Bac Mountain, flowing into the Cai River in the South-North direction. On the river there is Da Cat Lake (Ky Tan) with a basin area of 11 km2, the open surface area of the lake is about 87 km. 5 hectares, the largest capacity is about 3.4 million m3, irrigating 300 hectares.

Rao Tro River is a tributary of Rao Nay River (in Quang Binh province). Rao Tro originates from Ky Thuong commune and flows through Ky Son, Ky Lam, and Ky Lac. Rao Tro River in Ky Anh is 51 km long, the river's meandering is quite large, the basin area is 480 km^2.

Table 2.8 Characteristics of rivers in Ha Tinh area

No.	River name	Length (km)	Basin area (km2)	Purpose Usage	Notes
1	La	13	3.221	Irrigation, water	Confluence of the Ngan after and Ngan Pho rivers at Tam Soa port (Linh Cam), flowing into the Lam River at Trang market
2	Ngàn Sâu	31	2.064	Irrigation, water transportation	Merging with the La River at Tam Soa port
3	Ngàn Phố	76	1.065	Irrigation, waterway traffic	Located within the boundaries of Huong Son district; merged by Rao Tre River, Con River

No.	River name	Length (km)	Basin area (km2)	Purpose Usage	Notes
4	Đồng Kèn	24	73	Water transportation, drainage	
5	Nghèn	60	556	Irrigation, daily life, NTTS	Enters the Rao Cai river at Ho Do commune
6	Già	11	25,5	Watering	Located between Thach Ha and Can Loc districts
7	Cày	10	20,2	Watering	A tributary of the Nghe River
8	Rào Cái	63	51	Water drainage, waterway traffic	The upstream has Ke Go Lake
9	Cửa Sót	8	1.349	Water drainage, waterway transportation, NTTS	The confluence of Rao Cai and Nghen rivers at Ho Do
10	Rác	32	167	Irrigation	Confluence with Cua Nhuong river at Hon Du mountain in Cam Loc commune
11	Quyền	34	150	Watering and irrigation, water transportation	Exported through Ky Ninh border gate
12	Trí	39	57	Watering and irrigation	On the river, the Song Tri dam and the Upper Song Tri lake have been constructed.
13	Rào Trổ	54	488	Watering, supplying water for production and daily life	

Figure 2.4 Hydrological map of the project area

b. Oceanographic conditions

➢ ***Tides:***

The tidal characteristics in this area share common features with the tidal regime in the Ha Tinh region, which exhibits irregular semidiurnal tides, with nearly half of the days each month experiencing two high and two low tides. The sea level fluctuations based on observational data over several years are as follows:

Table 2.9 Water levels corresponding to cumulative frequencies at Vung Ang

(Hydrographic elevation - cm)

P%	1	3	5	10	20	50	70	90	95	97	99
Phour	223	211	203	190	175	139	109	67	52	46	34
Hpeak	243	232	228	220	210	191	179	162	154	151	142
Hbottom	121	109	103	94	82	61	49	34	27	22	13
H ave	173	164	160	153	144	131	125	116	111	109	104

➢ ***Wave***

The Vung Ang area is an open bay facing north, thus experiencing significant impacts from waves coming from the north and northeast. The average wave height (H) ranges from 0.17 to 1.0 meters, with wave crests reaching up to 6.0 meters during storms. Long-term data from 2010 to the present shows the statistical distribution characteristics of specific wave directions as follows: northeast (NE) direction accounts for 18.4%, north (N) direction accounts for 15.42%, southeast (SE) direction accounts for 7.59%, and southwest (SW) direction accounts for 5.18%.

Analyzing the wave characteristics in the submergence area reveals that from January to December, during a one-year period, the most frequent wave height is less than 0.9 meters, accounting for 47.89%. Wave heights ranging from 0.9 to 1.8 meters account for 44.26%, while those from 1.8 to 2.7 meters account for 7.21%. Wave heights from 2.7 to 3.6 meters have a smaller proportion of 1.52%. Wave heights above 3.6 meters have the smallest proportion at 0.22%, mainly concentrated during the windy season from November to March of the following year.

Regarding wave direction, during a one-year period, waves predominantly come from the southeast, east, and northeast directions, with the southeast direction accounting for 37.29%, and the northeast and east directions accounting for 26.44% and 25.60%, respectively.

The characteristics of coastal waves indicate that the wave regime in the Ha Tinh coastal area is relatively consistent with the wind regime. Offshore, the direction of the waves nearly coincides with the direction of the two main monsoon wind systems.

However, closer to the shore, the wave direction and height vary according to latitude due to the influence of the seabed topography and shoreline morphology. The wave patterns can be divided into two main seasons as follows:

- Winter season: The predominant wave direction is Northeast with a frequency of 40%. The average wave height ranges from 0.8 to 0.90 meters. In the first three months of winter, the average wave height is approximately 1.1 to 1.20 meters. The maximum wave height is around 2.0 to 2.50 meters.

- Summer season: The predominant wave direction is Southeast, with significant contributions from North and Northeast waves. The average wave height ranges from 0.6 to 0.70 meters. The maximum wave height is around 3.0 to 3.50 meters. From June to August, the predominant wave direction is Southwest, with an average height of approximately 0.6 to 0.70 meters. During major storms in this area, wave heights can reach up to 6.0 meters.

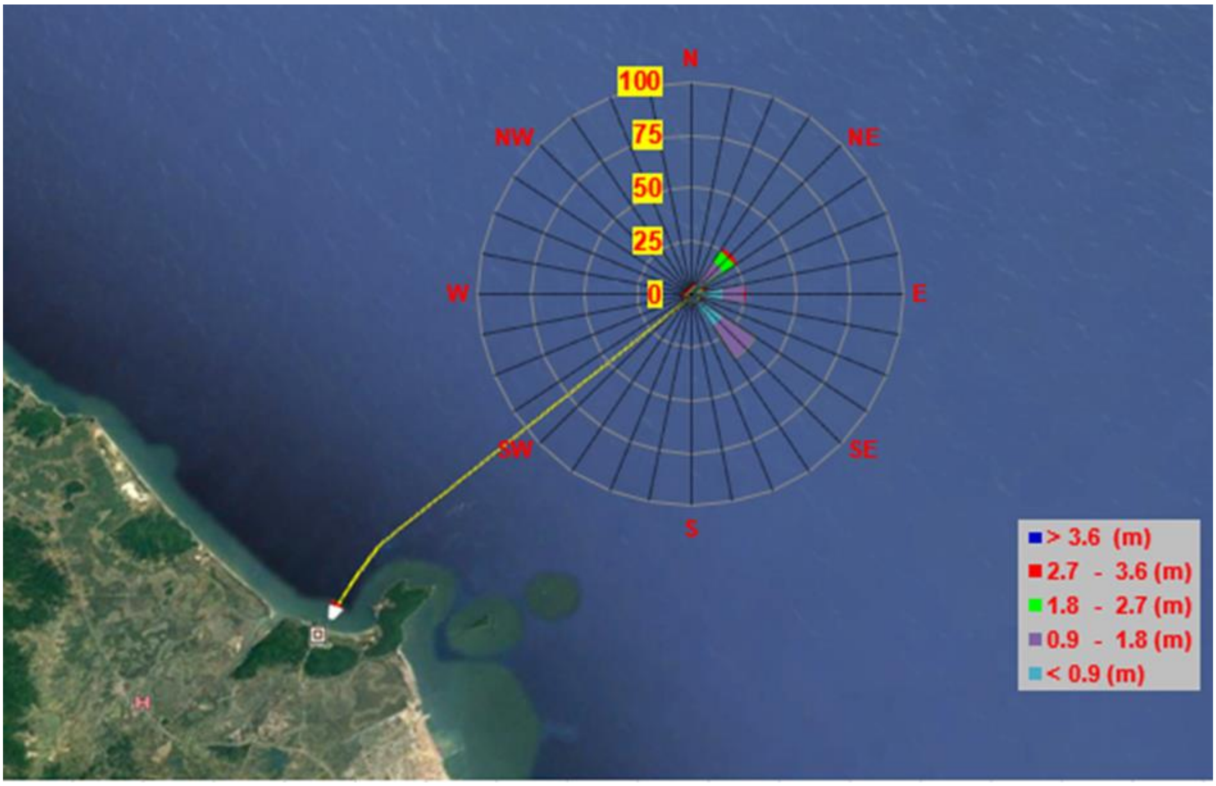


Figure 2.5 Wave spectrum in the submerged area from January 2010 to December 2019 (Source: NOAA Global Wave Data)

➢ ***Ocean currents and sea surface temperature***

Most of the current systems in the East Sea are wind-driven currents (surface currents). Therefore, the flow in the East Sea and in the Gulf of Tonkin changes according to the monsoon (Nguyen Chu Hoi, 2016). In winter, sea surface temperatures range from 18 ºC ÷ 24 ºC (January ÷ March) and about 30 ºC in summer (July ÷ September).

The main ocean current directions of Vietnam's coastal region are strongly influenced by the monsoon and the common ocean currents of the East Sea. During the northeast monsoon, ocean currents have a dominant direction from northeast-southwest (winter) and southeast-northwest in summer (southwest monsoon). Some areas of Vietnam have diverse ocean currents due to the influence of bays and islands. In Ha Tinh waters, there are two ocean currents with opposite directions, near-shore ocean currents in the northwest - southeast direction, and offshore ocean currents in the opposite direction. In the project area including the port area, the direction of ocean currents passing through the coastal waters of the project area is no different between winter and summer. However, ocean currents during the southwest monsoon (winter) go close to the shore, and during the southeast monsoon (summer) the ocean currents expand and go farther from shore. The average speed of ocean currents passing through the project area in winter tends to be smaller than in summer. The seasonal ocean currents in the East Sea coastal area in 2007-2008 and 2017-2018, and the seasonal surface sea water temperature field in 2017-2018 are presented in Figures 2.6a to 2.7.

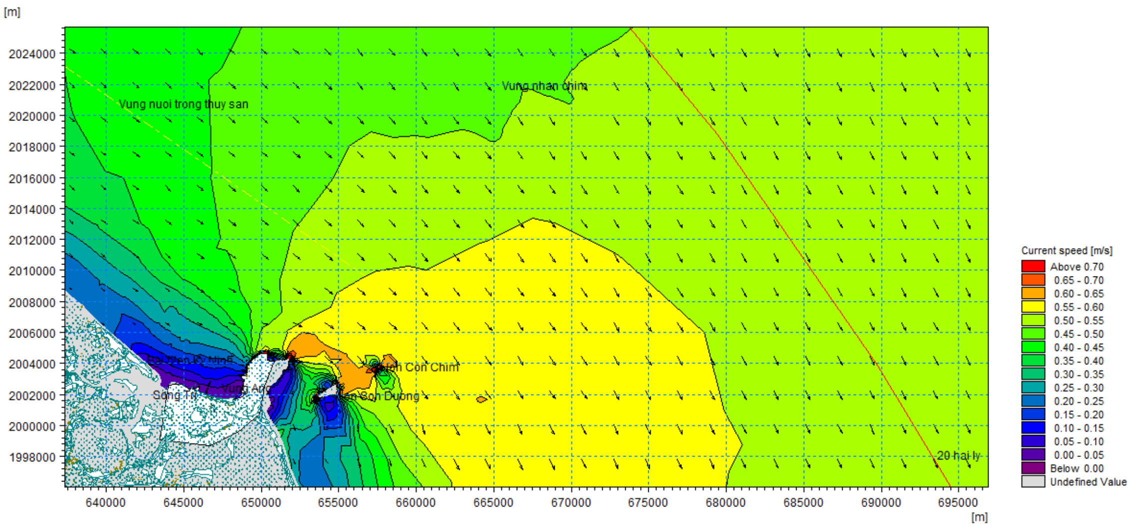
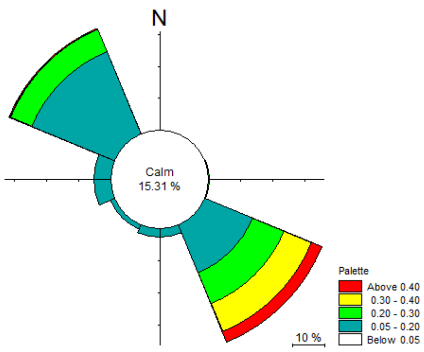
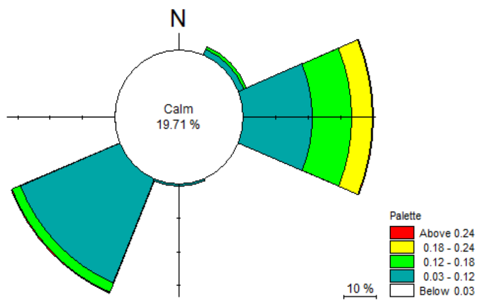


Figure 2.6.c. The seasonal ocean currents in the project area



Current roses in disposal area



Current roses in the coastal area

The sea area in Ha Tinh area is an open and unprotected sea area, so the storm's wind momentum when reaching the mainland without any obstruction is the main cause of coastal erosion and damage to the dyke system. embankment. However, the project area is located in the Vung Ang Bay area, works such as embankments and Vung Ang port will reduce the impact of erosion and will not have much impact on the shoreline in the area.

During the survey of sea depth, the speed and direction of the current was recorded at two survey points over a period of 50 hours through high tide and low tide. According to the vertical section, the recorded flow is 5 levels, from 0.5 m below sea level and at regular intervals according to depth at typical locations. Survey results show that the flow has a low speed of about 0.76 m/s at the top of the tide coming from the east and a lower speed at the bottom of the tide with no specific direction.

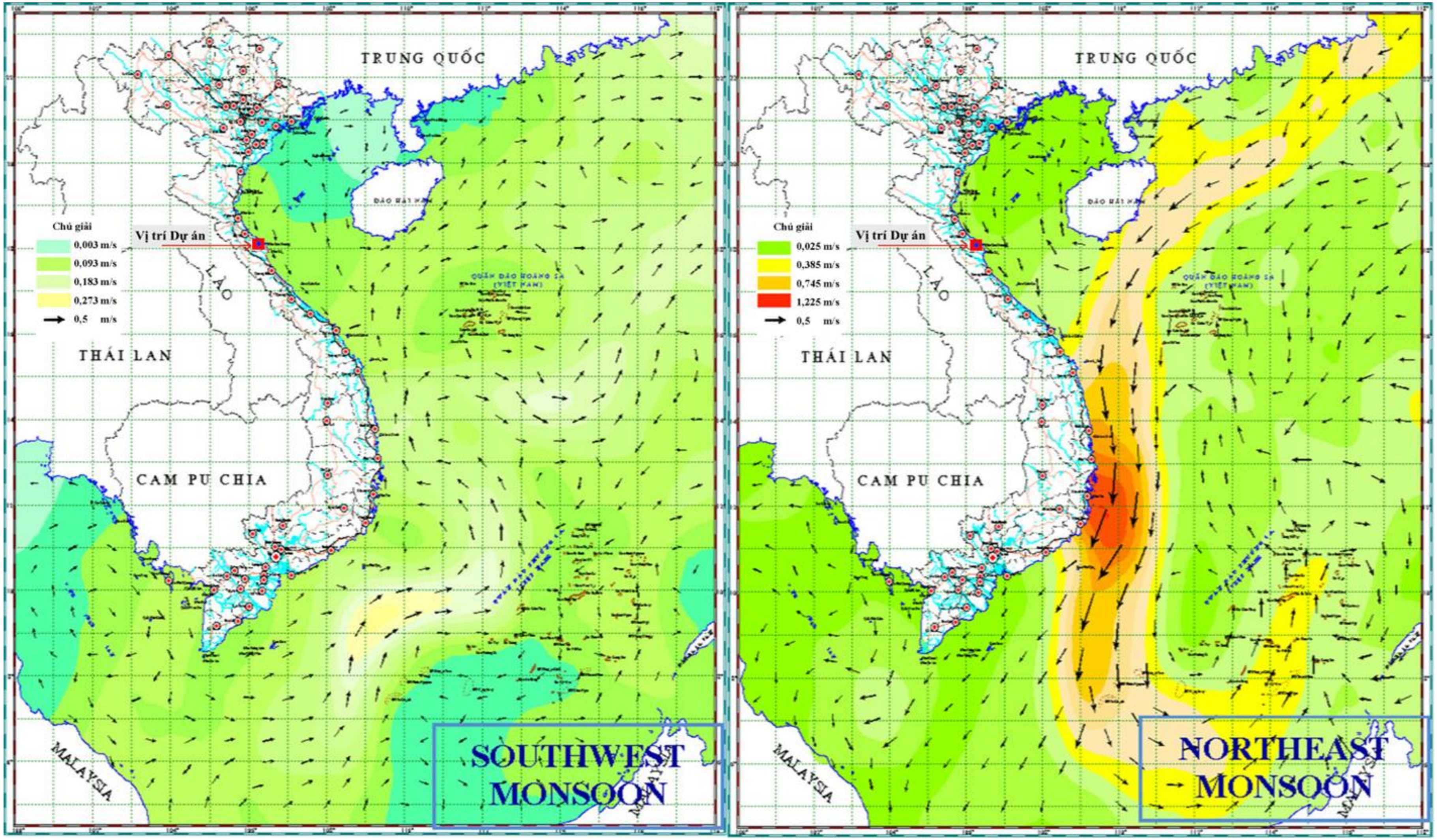


Figure 2.7 Seasonal ocean currents in the East Sea (2017-2018)1

Source: Aquatic Research Institute, 2018

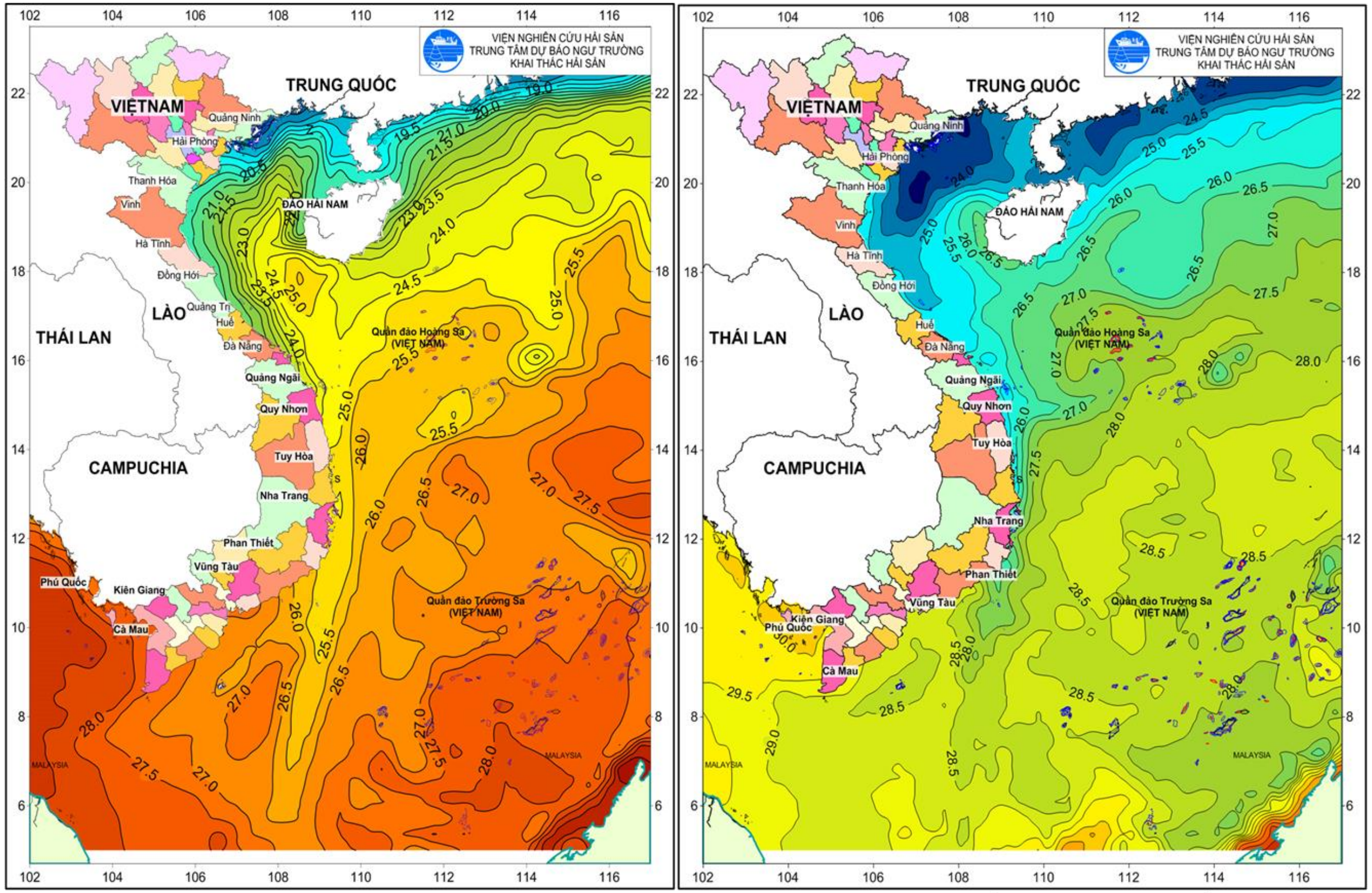


Figure 2.8 Sea surface temperature field in the East Sea region by season (2017-2018)2

Source: Aquatic Research Institute, 2018

c. Climate change, sea level rise

Report on Technical consultation and analysis of current and future climate for water resources management in Ha Tinh, conducted by the Institute of Hydro-Meteorological Sciences and Climte Change in 2016, this report is based on a series of numbers. Hydro-meteorological and oceanographic monitoring data from three stations Ha Tinh, Huong Khe and Ky Anh from 1961 to 2014 have drawn some conclusions as follows:

- Over the past 50 years, the average annual air temperature has tended to increase at a rate of about 0.1 ÷ 0.2°C/decade. Unlike temperature, the changing trend of rainfall is not uniform but there is an alternation between decreasing and increasing trends in different regions of Ha Tinh. Specifically, at Ha Tinh and Ky Anh stations, annual rainfall tends to decrease at a rate of about 44 ÷ 55.2 mm/decade, while annual rainfall tends to increase at Huong Khe station with an increase 26 mm/decade. For extreme rain, the largest one-day rainfall (Rx1day) tends to increase with an increase rate in the range of 5 ÷ 8.5 mm/decade. Meanwhile, the largest 5-day rainfall (Rx5day) has a changing trend similar to the trend of total annual rainfall. Regarding sea level in the Ha Tinh area, results of analysis of change trends from satellite data in the period 1993 ÷ 2013 show that: average sea level in the Ha Tinh area tends to increase with an increase in about 2.9 mm/year;

- Regarding climate change and sea level rise scenarios for the Ha Tinh area, the forecast assessment results show:

+ The average annual temperature tends to increase throughout the province, with the increase in the northern region of Ha Tinh region being larger than the southern region of the province, increasing the most in the summer and increasing the least in the winter . Specifically, according to the scenario, the average annual temperature in Ha Tinh area tends to increase throughout Ha Tinh province with an increase of about 0.6°C ÷ 0.9°C at the beginning of the century, increasing to 1.5°C. °C ÷ 2.0°C by mid-century and increase to about 2.1°C ÷ 3.8°C by the end of the century compared to the base period 1986 ÷ 2005;

+ Rainfall in Ha Tinh will increase in most seasons, annual rainfall tends to increase from 10.6 to 14.8% at the beginning of the 21st century compared to the baseline period. The increase in annual rainfall in the middle and end of the 21st century is 12.0% to 19.1% and 15.0% to 21.2%, respectively, in the Ha Tinh area;

+ Similar to the annual scale, autumn rainfall tends to increase in all 3 future periods, the increase in autumn rainfall at all 3 stations (Huong Khe, Ha Tinh, Ky Anh) ranges from 8 to 11.6% at the beginning of the 21st century. By the middle and end of the century, the autumn variability at Ky Anh station may increase to between 15.3% and 25.4%;

+ Sea level in the coastal area of Ha Tinh may increase depending on the scenarios: 52 cm by the end of the 21st century with a range from 32 to 75 cm; or sea level could rise by 72 cm with a range of variation from 49 to 101 .

2.1.2. Social and economic conditions

Referencing the report on economic and social development tasks for the first months of 2023, the direction and key tasks for the last 6 months of 2023 for various communes, the economic and social conditions in the region are as follows:

2.1.2.1. Socio-economic conditions of Ky Loi commune

a. Economic conditions

➢ ***Agriculture***

- The agricultural production value reached 88.803 billion VND, achieving 67% of the plan, equal to 68% compared to the same period in 2022.

- The rice cultivation area was 52 hectares, with an estimated yield of 44.8 tons per hectare, totaling 232.96 tons. (Of which, the planned area at the beginning of the year was 31 hectares, and the self-produced area was 21 hectares). The area for other crops was 2 hectares, with an estimated yield of 30 tons per hectare, totaling 60 tons. The area for various vegetables was 5 hectares, with an estimated yield of 8 tons per hectare, totaling 40 tons, valued at 2.833 billion VND.

- Livestock farming: There were a total of 521 cattle, 10,600 poultry, 182 pigs, 374 dogs, and 175 goats. The estimated meat production from various livestock (cattle, pigs, poultry) reached 7,450 tons, valued at 2.135 billion VND. Vaccination against common diseases among cattle achieved a 50% coverage rate, while vaccination for dogs reached 100% coverage.

- Fisheries and aquaculture: There were 701 fishing boats in the entire commune, a decrease of 93 boats compared to the same period in 2022. Among them, there were 26 boats with a capacity of over 90 horsepower, 14 boats with a capacity from 50 to 90 horsepower, 152 boats with a capacity from 20 to under 50 horsepower, and 507 boats with a capacity under 20 horsepower. The estimated total catch reached 1,546.6 tons, achieving 44% of the plan, equal to 51.36% compared to the same period in 2022. The total value was 74.520 billion VND.

- Forestry: The implementation of the "Planting Trees to Remember President Ho Chi Minh" campaign during the Spring of the Quy Mao year was successful, with over 200 scattered trees and shade trees planted in the commune's administrative area and schools. Forest protection and fire prevention activities were effectively carried out, with no forest fires or illegal logging incidents reported. The timber harvest reached 140 tons, valued at 126 billion VND.

- Disaster prevention and control: Proactive measures and plans were developed during the disaster prevention phase. Principle agreements were signed to mobilize resources and equipment for disaster response, ensuring readiness in case of disasters.

➢ ***Industry, Trade, and Construction :***

- The total value amounted to 14.3 billion VND, reaching 52% of the plan, equivalent to 53.75% compared to the same period in 2022.

➢ ***Trade and Services:***

There are 450 households engaged in individual business activities throughout the commune, generating a total value of 37 billion VND. Income from wages, salaries, and other revenues reached 181 billion VND, achieving 51% of the plan.

➢ ***Management of Natural Resources and Environment***

Procedures were carried out to issue, exchange, or reissue land use right certificates according to Government Decree 64 for 07 cases in Hai Phong 1,2 Village and Hai Thanh Village, submitted for approval. Subdivision and transfer, as well as land use right certificate issuance for 06 cases, were processed. Two sets of documents for initial land use right certificate issuance were submitted for approval for households. Rectification of land use right certificates due to incorrect names or plots was done for 05 cases. Completion of documents to reconfirm land area occupied before December 18, 1980, was conducted for 05 cases in Hai Phong 1,2 Village and Hai Thanh Village. Procedures for issuing land use right certificates were carried out for 14 households in Dong Yen receiving agricultural land. Handling of citizens' petitions related to land issues in the area was organized. Collaboration with urban environmental companies for waste collection and disposal within the area was facilitated. Meetings were organized to gather opinions from residents in various villages regarding land law amendments.

➢ ***Compensation, support, resettlement, and land clearance***

- During the first 6 months, the commune concentrated on implementing 6 main projects, primarily those carried over from previous years. The People's Committee of the commune, in coordination with the resettlement boards of the town and relevant departments, carried out these projects. They addressed lingering issues, raised awareness among the populace, and garnered consensus for land handover to project investors. The main focus was on the Vung Ang II Thermal Power Plant project, the central axis road linking National Highway 1 to the Vung Ang - Son Duong deep-water port, and the Giang Nam petroleum warehouse.

- For the Vung Ang II Thermal Power Plant project: Efforts were concentrated on addressing residual issues to hand over land for project execution. Inventorying, counting, and persuading residents to accept compensation for the land used as a material storage area and temporary construction road for the thermal power plant project have been essentially completed. Regarding the ash storage area of 15 hectares, the political system has mobilized and organized propaganda to gain consensus. As of now, 393 households have been inventoried, 357/393 households have been compensated, and land has been handed over to the investor for an area of 13.6 hectares. The remaining 12 agricultural households below the public road and 24 agricultural and forestry households above the public road are being inventoried, and efforts are being made to resolve any obstacles and persuade residents to accept compensation for the remaining land.

- For other projects, the commune's People's Committee cooperated with the town's Resettlement Council and relevant agencies to focus on resolving lingering issues and implementing projects in accordance with legal regulationsUnitUnit.

b. Social conditions

➢ ***Education and training***

Continuing to direct schools to effectively carry out teaching and learning activities, completing the 2022-2023 academic program and plan to achieve good results, with the quality of competitions and contests steadily improving.

- Middle School: With 269 students, 67 out of 68 graduated, achieving a rate of 98.75%. There are 8 provincial excellent students, 29 district excellent students, 16 school excellent students, and 54 advanced students. Out of 67 students participating in the 10th-grade entrance exam, 65 passed, achieving a rate of 97%.

- Primary School: With 1442 students, 28 provincial excellent students, 34 district excellent students, and 1,123 students commended by the school. All 249 students completed the primary school program, with 5 teachers awarded as district excellent teachers.

- Preschool: With 575 children, a decrease of 70 compared to the same period. Out of 262 preschoolers eligible for grade 1, 5 teachers are awarded as district excellent teachers, and regular and effective activities are maintainedResults.

➢ ***Health and population sector***

Successfully implementing the National Health and Population Target Program, ensuring food safety for the Lunar New Year and Spring Festival, and the Food Safety Month. Ensuring healthcare and health care for people in the commune. A total of 3332 medical examinations were conducted, including 2415 children under 15 years old, 535 medical insurance examinations, 172 prenatal examinations, 67 gynecological examinations, and 98% of health management records were completed. Blood pressure and diabetes screening achieved 95%.

- Population and Family Planning Work: Effectively implementing population and family planning policies, mobilizing mothers of childbearing age to implement population and family planning policies, coordinating reproductive health counseling for 60 women of childbearing age. The total population of the commune is 3052 households, 11,054 inhabitants, with an average population of 10,737. There were 59 births in the first 6 months of the year, with females accounting for 38% and males 62%. The crude birth rate is 5.4%, an increase of 1% compared to the same period in 2022. There were 29 births of two children, accounting for 49%, an increase of 0.3% compared to the same period in 2022. The death rate is 2.05%, the natural growth rate is 3.3%. The sex ratio at birth is 168% (for every 100 female births, there are 138 male births).

➢ ***Labor, employment, welfare, and social affairs***

Vocational training and job placement for workers are emphasized, coordinated with the Ha Tinh Job Introduction Center and related units to provide job counseling and referrals for workers and to advise on labor export demand. In the first 6 months, there were 215 new job applications and 58 applications for labor export. As of now, there are 892 workers working abroad. There were 289 workers registered for vocational training (such as sewing, embroidery, welding, and machine operation). Data on labor migration was surveyed for 4,722 cases.

Social welfare and policies for revolutionary contributors, social protection, and children are implemented in a timely, appropriate, and targeted manner. In the first 6 months, allowances were paid to 900 revolutionary contributors, totaling 1,770,084,000 VND. 7 policy cases for revolutionary contributors were processed electronically (funeral fees for 5 cases, worship for fallen soldiers for 2 cases), and 38 funeral fee applications for revolutionary contributors were completed, requesting social assistance for disabled people and elderly people over 80 years old through the electronic system. Data on revolutionary contributors was surveyed for 150 cases, social protection for 356 cases to serve and improve population data according to Government Project 06.

Social welfare on the commune is always emphasized: Focusing on reviewing, classifying, and making lists of revolutionary contributors, social protection beneficiaries, and poor households to organize gift-giving during the Lunar New Year: Receiving and organizing the distribution of 1,898 gifts, worth 518,640,000 VND. Out of these, 103 gifts were for central and local revolutionary contributors, totaling 66,300,000 VND. Gifts from units and businesses for poor households, social protection, and families facing special difficulties amounted to 333,200,000 VND for 635 gifts. The commune People's Committee distributed 160 gifts to various beneficiaries, totaling 119,147,000 VND. Reviewing and proposing the addition of 1 poor household.

2.1.2.2. Socio-economic conditions of Ky Trinh Ward

a. Economic conditions

➢ ***Agriculture***

- The area of spring rice cultivation reached 320/320 ha, achieving 100% of the plan, with a yield of 44 tons/ha and a total output of 1408 tons, reaching 102% compared to the same period in 2022. The area of summer-autumn rice cultivation was 55/55 ha, achieving 100%. Peanut cultivation covered an area of 87.5/87.5 ha, meeting 100% of the plan, with a yield of 33 tons/ha and a total output of 288.75 tons/ha, reaching 107% compared to the same period in 2022. Various vegetables such as sweet potatoes, cassava, sesame, beans, corn, and greens covered an area of 35/40 ha, achieving 87.5% of the set target.

- The total number of cattle and buffalo reached 461, with 325/461 animals registered for foot-and-mouth disease and self-bleeding prevention vaccination, achieving 70.5% of the plan; there were 117 pigs and 11,500 poultry. In the first 6 months of the year, 9 economic development models were established, such as aquaculture, growing flowers, and growing fruit trees, for proposal submission for recognition.

- Aquaculture: Coordinated with the town People's Committee to organize aquaculture training. The total area of aquaculture ponds was 230.5 ha (223 households), with 225 ha mainly for saltwater and brackish water aquaculture, yielding 7 tons/ha and producing 157.5 tons; 20 ha were for freshwater fish farming, with a yield of 12 tons/ha and a production of 24 tons. Natural aquatic product harvesting reached 190 tons, achieving 54.3% of the target.

- Forestry: Newly planted and afforested forest area on the harvested area reached 35 ha/70 ha, achieving 50% of the plan. Propaganda encouraged people to do well in forest care, protection, and fire prevention and to detect issues promptly.

➢ ***Small-scale Industry - Trade and Services***

There are currently 19 enterprises and 117 households engaged in trading and business activities, including 5 restaurants and 112 small trading households. The estimated revenue is 80 billion VND.

➢ ***Land Management - Land Clearance***

- Implemented procedures for land transactions, including: Issuing residential land certificates for cases with residential land plots used for housing before December 18, 1980, totaling 13 cases; Issuing, reissuing land use right certificates for 45 cases; Issuing land use right certificates for 130 cases; Registering land use right changes for 96 cases. Conducted meetings with eligible households in Hoa Loc hamlet, who have not yet cooperated in obtaining residential land certificates for residential land used before December 18, 1980. Granted construction permits for 12 cases; drafted minutes and completed documents submitted to the Kỳ Anh town People's Committee to issue decisions on penalties for violations of construction order in 03 cases.

- Coordinated participation in land compensation and site clearance work for projects such as the Viet Hai concrete mixing station, Kỳ Trinh Kindergarten, 220KV power lines, the southern belt road of Vung Ang Economic Zone, the tourism, sports, and recreation complex project in Vung Ang Economic Zone, the HBRE 110KV wind farm project, and addressed some other outstanding issues and obstacles in various projects.

b. Socio conditions

➢ ***Education***

- School administrators proactively implemented their tasks well during the first 6 months of the year. Specific results include: Kindergarten: Participated in the district-level excellent teacher competition with good results (4 First Prizes, 2 Second Prizes). Joined the "Family and Children's Playground" festival at the cluster level and achieved Second Prize. All 344 children received boarding meals at the school, and 344/344 children underwent regular health check-ups. Mobilized parents from Hoa Loc to support the renovation of the school grounds. Primary School: Inducted 03 comrades into the Party. Throughout the past academic year, the school continued to achieve many highly praised accomplishments by the authorities at all levels, earning trust from parents. Participated in the provincial-level competition for excellent homeroom teachers and won Second Prize, First Prize in the district-level competition, and 2 Consolation Prizes. The middle school participated in provincial-level competitions with 2 provincial excellent teacher awards, 11 provincial excellent student awards, 4 Good Teacher awards, and 77 Excellent Student awards at the district level.

➢ ***Policies***

Received, organized visits, and distributed gifts to individuals with contributions, poor households, near-poor households, social protection beneficiaries, orphans, elderly individuals living alone, and households facing difficulties, totaling 486 gifts worth 208,950,000 VND. Collaborated with Vinapho network to provide and install free internal network call packages and free 4G network usage for poor and near-poor households in 2023. Provided guidance on new application procedures for social assistance beneficiaries under Decree 20/CP with 27 beneficiaries. Reviewed and compiled a list of 17 poor and near-poor households capable of receiving breeding livestock under the livelihood model according to the Provincial People's Council's Resolution.

➢ ***Health and Population Control***

- Strengthened monitoring, inspection, and quarterly checks on food production and processing facilities, grocery stores, bakeries, confectionery shops, and slaughterhouses. Inspected 26 facilities, found 4 violations, imposed penalties on 1, and issued warnings to 3. No food poisoning incidents occurred in the area during the first 6 months.

- Conducted regular epidemic surveillance. During the first 6 months, a total of 110 rapid tests were conducted, detecting 12 F0 cases, all of whom received home treatment. Some infectious diseases included: seasonal flu: 151 cases, pneumonia: 62 cases, hand-foot-and-mouth disease: 125 cases. Regular vaccination was administered to children under 1 year old, with 120 children receiving vaccinations, and 70 children receiving complete vaccinations against 8 preventable diseases, reaching 6.21% coverage.

- Total outpatient visits numbered 2,248, including 590 covered by health insurance, 1,658 preventive visits, and 420 reproductive health check-ups. The quality of electronic medical records reached 96.8%.

- Population control: Reduced the crude birth rate to 13.2‰, lowered the proportion of third or higher order births to 36%, maintained the natural population growth rate at 9.5‰, and achieved a sex ratio at birth of 105 boys per 100 girls. All married couples who have had children according to regulations have implemented family planning measures. Reduced the underweight rate among children under 5 years old to less than 8% and the stunting rate to less than 13%.

2.1.2.3. Socio-economic conditions of Ky Long ward

a. Economic conditions

➢ *Agriculture and forestry sector:*

The estimated value of agriculture and forestry reached 5.4 billion VND (a decrease of 1.1 billion VND compared to the same period in 2022). Favorable weather conditions during the first six months were conducive to farming and animal husbandry, with effective disease prevention measures in place for livestock and crops. The efficient development of animal husbandry continued in various household gardens and on land in areas without reclamation projects for production. The total area for short-term crops and forage crops was approximately 8.2 hectares. The total number of cattle and buffalo was 350 (a decrease of 50 from the same period in 2022), while there were 100 pigs (a decrease of 30 from the same period in 2022) and 5,000 poultry (a decrease of 1,200 from the same period in 2022). The first round of vaccinations for livestock and poultry achieved an 87.2% coverage rate. Cultivation of raw material crops was organized over a total area of 8.4 hectares.

A conference was held to review disaster prevention, fire prevention, and forest firefighting in 2022, and tasks for 2023 were committed to by 32 households with forests and three administrative units. Two stone mining units also committed to forest fire prevention. A meeting was convened to allocate tasks for the rapid response and purchase of firefighting tools and equipment for forest fire prevention.

➢ *Industry and Construction Sector:*

The estimated value of industrial and construction production reached 162 billion VND (an increase of 19 billion VND or 13% compared to the same period in 2022). The focus was on developing the construction industry and businesses involved in electrical, electronic, and refrigeration goods, mechanical repairs, welding, turning, machinery repairs, private housing construction, and collective construction projects. They were also engaged in construction, supply of materials for projects, and construction in the Vung Ang Economic Zone and the district.

During the first six months of the year, permits were issued for 24 construction projects, including 22 private residential projects and 2 collective construction projects.

➢ *Trade and Service Sector:*

The value of production in the trade and service sector experienced growth, with a total revenue of 235 billion VND (an increase of 15 billion VND or 6.8% compared to the same period in 2022). Companies, enterprises, and individual businesses in the area demonstrated good development. Room rentals achieved an occupancy rate of 90-95%, while guesthouses and hotels had an occupancy rate of over 95%. Various convenience stores, mini-supermarkets, eateries, and beverage stalls in the area gradually expanded, ensuring diverse product offerings in terms of quantity and quality, catering to both local and non-local customer needs and the needs of the industrial zone.

b. Socio conditions

➢ ***Culture - Sports:***

Focus on propaganda and organizing activities to commemorate significant political events and national holidays: Hanging Party flags, national flags on main roads and Highway 1A, displaying 18 banners across roads, replacing old propaganda banners on Phan Boi Chau Street (Hop Tien), Le Van Thiem Street, Son Duong Port route, and the People's Committee headquarters. Organizing a public cultural performance; Organizing a women's volleyball tournament; Participating in 3 sports tournaments organized by the town and organizing many cultural and artistic programs to serve local political events.

- Directing units to review criteria to ensure the preservation of cultural titles, cultural families in 2023; issuing and implementing a framework plan to build urban civilized wards by 2023;

- Conducting audiovisual propaganda work to ensure the duration and content of broadcast and televised programs.

- Implementing management of advertising activities in the area, especially addressing classified advertisingUnit.

➢ ***Health, Population, Family Planning***

- Actively advising on disease prevention and control, timely prevention, and control measures to prevent diseases from occurring, spreading, and becoming complicated in the area.

- The total number of children under 1 year old vaccinated with immune vaccines reached 46, meeting the planned target; The malnutrition rate of children under 5 years old decreased to 8.9% (a decrease of 0.1% compared to 2022). The rate of stunting among malnourished children, based on height, was 14.8% (a decrease of 0.2% compared to 2022).

- No food poisoning incidents occurred in the area, and inspections were conducted, issuing food safety certificates for 40 households operating restaurants; Referring suspected cases to higher levels, resulting in the detection of 02 tuberculosis patients; Managing 05 mental patients, providing monthly medication for 01 patient, providing monthly medication for 02 epilepsy patients at the station, and 01 patient suffering from depression.

- Doing well in initial health care for the people in the first 6 months of the year, with 1186 people examined, 361 people receiving preventive check-ups, 335 poor people and other policy beneficiaries examined, treating 105 people at the station, and providing medication for insured subjects with a budget of 13.8 million VND.

➢ ***Cultural Policy***

- Implementing policies for people with meritorious services, social protection beneficiaries, the poor, and other social security policies in accordance with regulations; Receiving and distributing gifts to people with meritorious services, poor households, severely disabled individuals, and needy families on holidays and festivals, totaling 293 gifts with a total amount of 167.9 million VND; Receiving 22 files for people with meritorious services, 3 files for social protection beneficiaries, and 19 sets of documents for social assistance beneficiaries.

- Employed 1989/1989 laborers, accounting for 100% employment rate. The proportion of trained workers with vocational certificates was 1781 people, accounting for 89.54% (including technically skilled workers without certificates); Creating 87/45 new jobs, achieving 193% of the annual plan, including 38/20 newly exported laborers, achieving 190% of the annual plan.

2.1.2.4. Current status of waterway transportation in the area

In the first nine months of 2023, the Vung Ang area saw the following number of ship arrivals and cargo throughput:

- Number of ship arrivals: Vung Ang Port: 519 arrivals

Vung Ang Thermal Power Plant Port: 229 arrivals; Vung Ang Oil Port: 265 arrivals

- Cargo throughput: Vung Ang Port: 2.9 million tons; Vung Ang Thermal Power Plant Port: 2.9 million tons; Vung Ang Oil Port: 300 thousand tons

- Largest ship that can dock at Vung Ang Port: According to the official permit, the largest ship that can dock at Vung Ang Port has a deadweight tonnage (DWT) of 67,671.

2.1.3. Identification of affected objects, sensitive environmental factors in the project implementation area.

- Coastal areas around the dredging and landfilling construction sites of the project

- Current residential areas of Hai Phong and Tay Yen villages near the project

2.2. Current status of environmental quality and biodiversity in the project implementation area

2.2.1. Assessment of current environmental components

2.2.1.1. Environmental status data through regular monitoring results during the construction phase

Refer to the regular monitoring results in the fourth quarter of 2023, the analysis results of environmental components show:

Figure 2.9. Diagram of seawater monitoring locations

- Coastal seawater quality at the Vung Ang II Thermal Power Plant construction area is monitored at 4 locations NB1, NB2, NB3, NB4 and is assessed/compared according to QCVN 10:2023/BTNMT - National technical regulation on coastal seawater quality. Sampling and analysis of coastal seawater quality in nearby areas of

Vung Ang II Thermal Power Plant are within permissible limits as regulated by QCVN 10:2023/BTNMT. The marine environment in the area shows no signs of pollution.

Figure 2.10. Diagram of construction wastewater monitoring locations

The quality of construction wastewater generated at the construction site of the Vung Ang II thermal power plant after treatment is monitored at 2 locations: TXD1 and TXD2, and is evaluated/compared according to QCVN 40:2011/BTNMT - National Technical Regulation on Industrial Wastewater Quality. The results of the analysis of construction wastewater quality after treatment at the construction site of Vũng Áng II thermal power plant compared with the limits specified in QCVN 40:2011/BTNMT are as follows: All analyzed parameters are within the permissible limits. Construction wastewater is collected and treated to ensure compliance before being discharged into the environment.

Figure 2.11 Diagram of domestic wastewater monitoring locations

The quality of domestic wastewater generated at the office area during the construction phase of the Vung Ang II Thermal Power Plant after treatment is monitored at location TSH1 and evaluated/compared according to QCVN 14:2008/BTNMT - National Technical Regulation on Domestic Wastewater Quality. The results of the analysis of domestic wastewater quality at the office area after treatment during the construction phase of the Vung Ang II Thermal Power Plant show that all analyzed parameters are within the permissible limits according to the regulation..

Figure 2.12 Diagram of surface water quality monitoring

Surface water quality is monitored at 4 locations: M1, M2, M3, M4. Based on the results of surface water quality sampling at the soil dumping area for the construction of Vung Ang II Thermal Power Plant, compared with the limit values specified in QCVN 08:2023/BTNMT, Table 1 and Table 2 (Level A). The specific results are as follows:

+ At all monitoring samples, most analyzed parameters are within the permissible limits according to QCVN 08:2023/BTNMT - National Technical Regulation on Surface Water Quality, Table 1 and Table 2 (Level A). Parameters for total oil and grease, Cd, Cu, Hg, As are below the quantification limits of the analytical methods.

+ At monitoring sample M4 (Quyen River downstream of the supplementary equipment yard), the TSS parameter does not meet the standard, exceeding QCVN by 1.08 times.

+ The iron (Fe) parameter at all four monitoring samples exceeds the standard from 2.6 times to 9.6 times. The Fe parameter in Quyen River exceeding the standard at certain times has been recorded in the monitoring network program of Ha Tinh province and some monitoring periods from 2022 to the present.

+ The coliform parameter at monitoring locations M2 (Quyen River downstream of the surface soil dumping area (Haa Loc Bridge)) and M4 (Quyen River downstream of the supplementary equipment yard) exceeds QCVN by 2.2 times and 1.7 times, respectively.

+ The fourth monitoring period in 2023 applies new environmental standards, particularly for surface water with higher quality requirements, hence the Fe and coliform parameters exceed QCVN. Specifically: for Fe, the applicable level in QCVN 08:2023/BTNMT is 0.5mg/l, QCVN 08-MT:2015/BTNMT is 2.0mg/l; for coliform, QCVN 08:2023/BTNMT is 1,000 MPN/100ml, QCVN 08-MT:2015/BTNMT is 5,000 MPN/100ml.

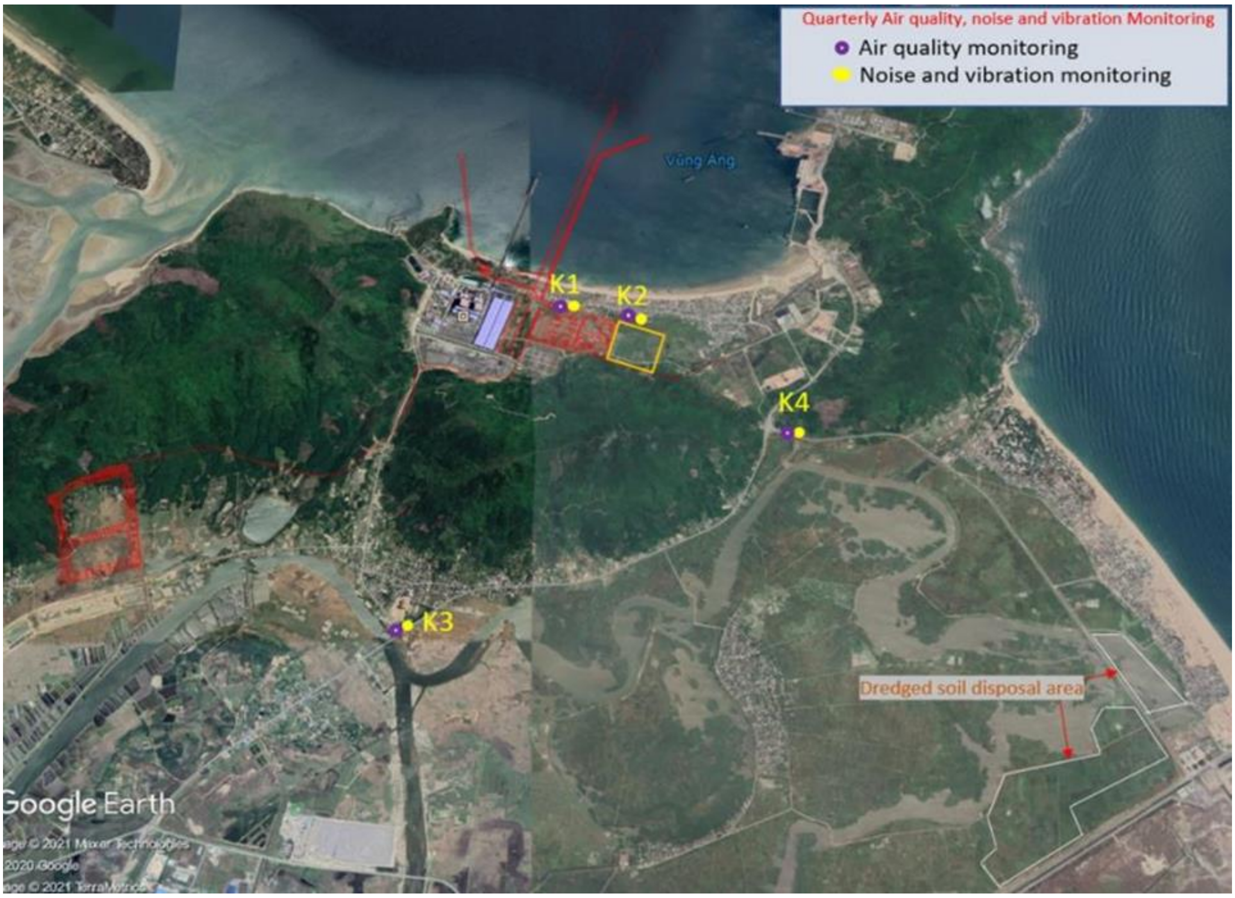


Figure 2.13 Diagram of ambient air quality monitoring locations

Ambient air quality at the construction areas of the Vung Ang II Thermal Power Plant is monitored at 4 locations: K1, K2, K3, K4 and evaluated/compared according to QCVN 05:2023/BTNMT – National Technical Regulation on Ambient Air Quality. The analysis results show that all parameters for ambient air quality are within the permissible limits according to QCVN 05:2023/BTNMT. Thus, the ambient air environment at the construction areas of the Vung Ang II Thermal Power Plant shows no signs of pollution.

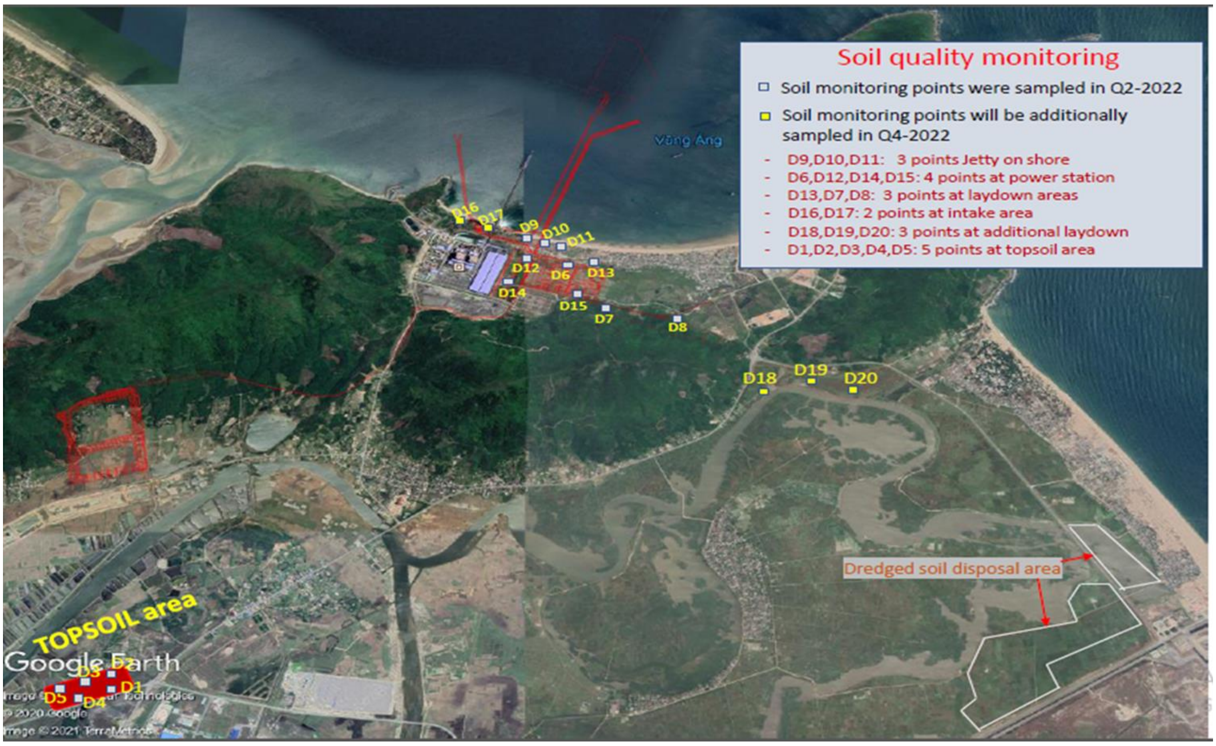


Figure 2.14 Diagram of soil quality monitoring locations

Soil quality at the construction areas of the Vung Ang II Thermal Power Plant is monitored at 20 locations from D1 to D20 and evaluated/compared according to QCVN 03:2023/BTNMT (National Technical Regulation on Permissible Limits of Some Heavy Metals in Soil), industrial soil column. The analysis results of heavy metals in soil (As, Cd, Pb, Zn, Hg, Cr, Cu) in the soil samples are all below the permissible limits according to QCVN 03-MT:2015/BTNMT, industrial soil column. Thus, the soil environment at the construction areas of the Vung Ang II Thermal Power Plant shows no signs of pollution.

Therefore, the implementation process of the project's items that have been and are being carried out up to now has not caused any environmental issues.

2.2.1.2. Data on the Assessment of Dredging Material Composition

To evaluate the composition of dredging material, the consulting unit used various data sources, including:

- Technical geological drilling data (28 boreholes) conducted by Fecon in 2020 and analyzed by the Institute of Foundation and Underground Works according to the certification of analysis laboratory number LAS XD 442, Ministry of Construction;

- Geological assessment data at 35 locations in the turning basin area taken by the contractor My Dung before planning the sand dredging for Phase 1, conducted in August 2021;

- On-site survey data at the cooling water intake on September 22, 2023, conducted by the inspection team led by the Department of Transportation;

- Additional sediment analysis data by the environmental consultant in collaboration with the International Construction Joint Stock Company according to the certification of analysis laboratory number LAS XD 737, Ministry of Construction, conducted in July 2023.

According to geological survey results, the geological characteristics of the dredging area consist of the following main layers:

+ Layer 5: SPM, SCL – Poorly graded silty sand, sometimes clayey sand, grey-green, grey-white, loose structure;

+ Layer 6a: CL, CL – Low to medium plasticity clay, dark grey, yellow-grey, flowable to plastic state;

+ Layer 6b: CL, MLS – Low plasticity clay, low plasticity sandy silt, dark grey, grey, soft plastic to stiff plastic state;

+ Layer 7: SCL, MLS – Poorly graded silty sand with gravel, sometimes clayey sand – low plasticity silty sand, yellow-grey, brown-grey, moderately dense to dense structure;

+ Layer 8: CL, CLS – Low plasticity clay, low plasticity sandy clay, white-grey, green-grey, semi-stiff to stiff state;

+ Layer 9: CLS, MIS – Completely weathered rhyolite into low plasticity sandy clay with gravel, yellow-grey, white-grey, stiff state;

+ Layer 10: Zone IA2 – Strongly weathered rhyolite into gravelly lumps, rock fragments with low plasticity clay, sandy clay, yellow-grey, brown-grey, stiff state;

+ Layer 11: Zone IB – Moderately to slightly weathered rhyolite, fractured, dark grey, green-grey, very hard rock.

Depending on the location and cross-section, the thickness and density of the layers vary. The physical characteristics of the dredging material were evaluated based on typical geological cross-sections along the three dredging areas: intake, discharge, and the turning basin with navigational channels, illustrated as follows:

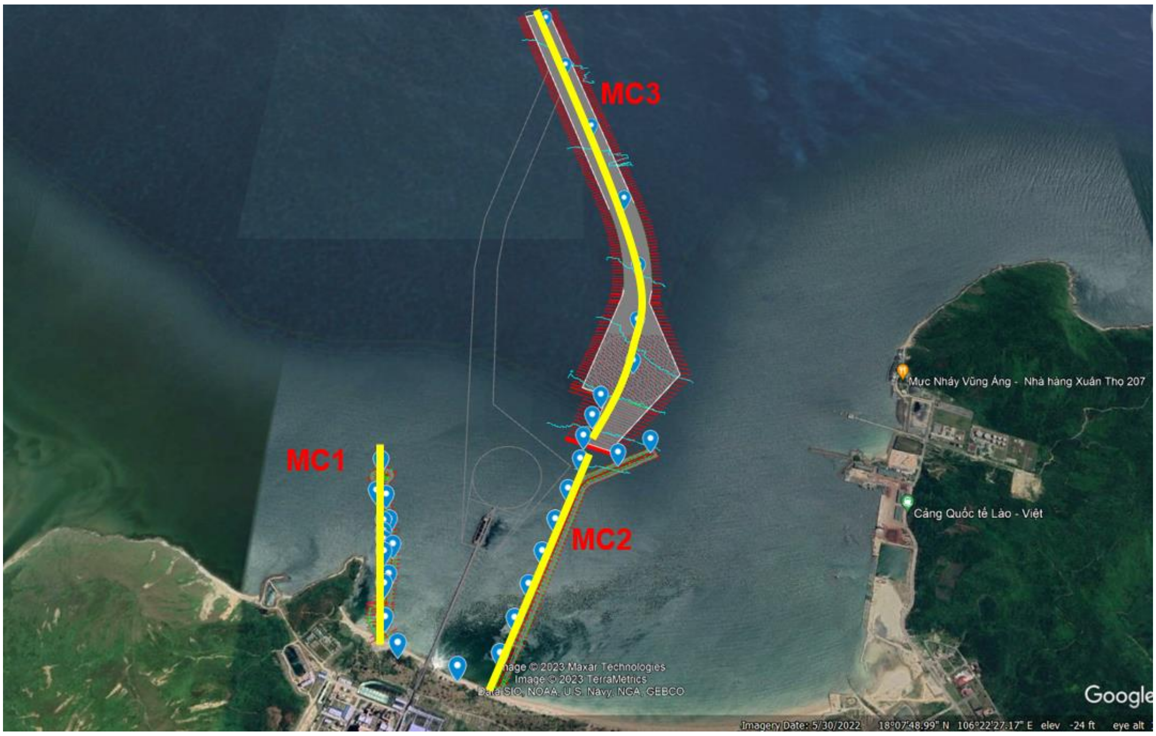


Figure 2.15. Schematic of cross-section lines evaluating the physical characteristics of dredged material

In the schematic of the cross-section lines, MC1 represents the intake area, MC2 represents the discharge area, and MC3 represents the turning basin and navigational channels.

According to geological drilling results by Fecon and the Institute of Foundation and Underground Works in 2020, the geological characteristics at typical cross-sections are as follows:

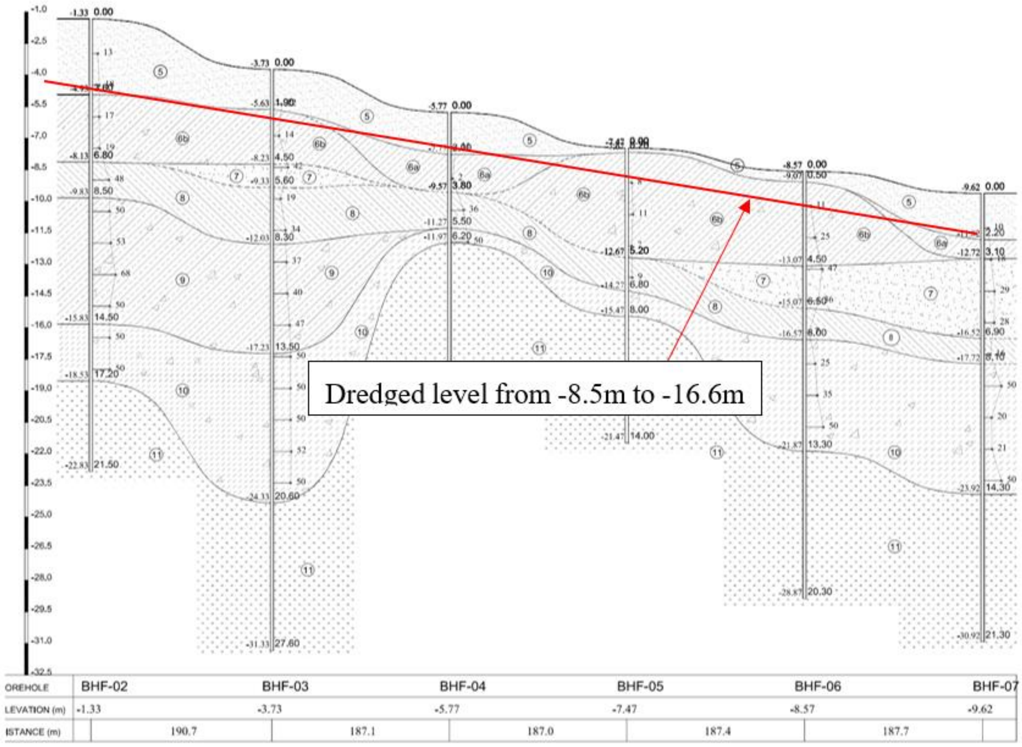


Figure 2.16 Typical cross-section of the intake area (MC1)

According to the typical cross-section analysis of the intake area (MC1), reviewing the design documents shows that along the discharge line from shore to sea, the dredging elevation changes from -8.5m to -16.6m. Comparing this with the typical geological cross-section, the intake area consists of layers 5, 6a, 6b, 7, 8, 9, and 10, with layer 5 occupying the largest proportion. The dredging records show that the dredging portion entirely comprises layer 5 in this area.

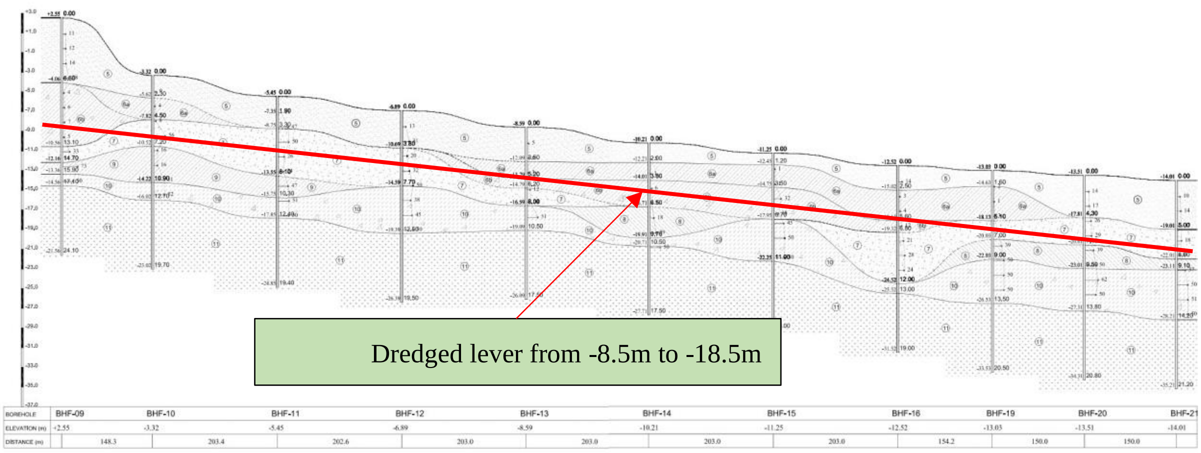


Figure 2.17. Typical cross-section of the discharge area (MC2)

According to the typical cross-section analysis of the discharge area (MC2), comparing with the design documents, the discharge area has a dredging elevation from shore to sea from -8.5m to -18.5m. Comparing this with the typical geological cross-section, the dredged layers include layers 5, 6a, 6b, and 7, with layer 5 being the most dominant.

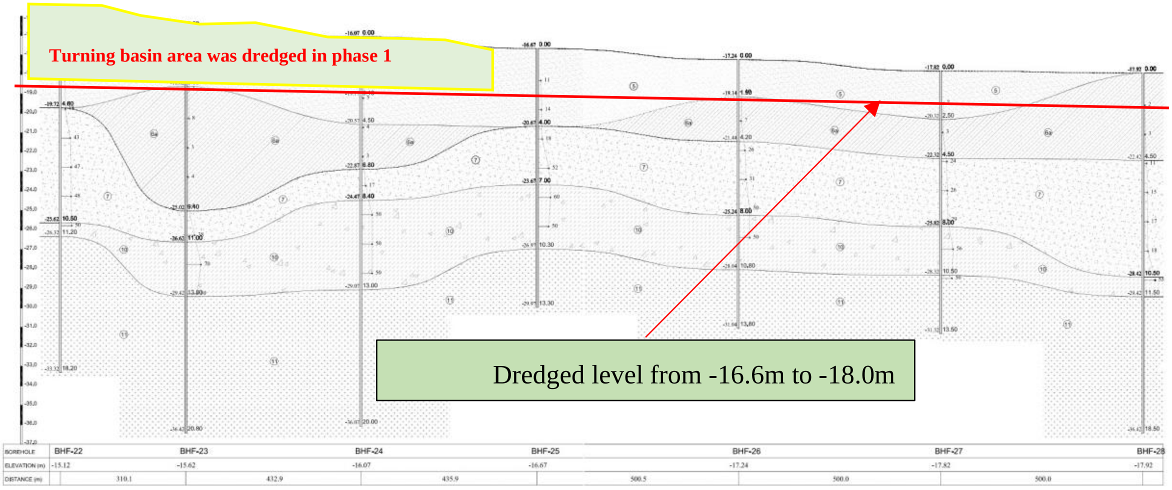


Figure 2.18. Typical cross-section of the turning basin and navigational channel area (MC3)

According to the typical cross-section analysis of the turning basin and navigational channel area (MC3), comparing with the design documents, this area has a dredging elevation along the route from shore to sea from -16.5m to -18.0m. Comparing this with the typical geological cross-section, the dredged layers include only layer 5, with layers 6a and 6b below it.

In layer 5, the percentage of gravel: sand: mud, clay is 3.9:82.7:13.34. In layer 6a, the percentage of gravel: sand: mud, clay is 0.3:27.3:72.4. In layer 6b, the percentage of gravel: sand: mud, clay is 2.3:32.2:65.5. The sand component mainly consists of poorly graded fine sand (50.6%/82.7% for layer 5; 20.1%/27.3% for layer 6a; and 16.8%/32.2% for layer 6b).

Based on the geological drilling survey data from 2021, it can be concluded that the geological characteristics of the dredging area mainly consist of layers 5, 6a, 6b, 7, 8, 9, and 10. Each cross-section has different layer densities. Specifically, the discharge area consists of layers from 5 to 10, while the intake area consists only of layers 5, 6a, and 6b, and the turning basin and navigational channel area mainly consist of layer 5.

However, layer 5, a material with poorly graded fine sand (approximately 50.6/82.7), shows that the distribution of this sand layer on the surface greatly depends on the hydrodynamic regime of the area. Therefore, before construction, the contractor took real samples to reassess the volume of layer 5, and the results showed a significant reduction in the thickness of layer 5 in the turning basin area at the time of construction. This finding was also confirmed during a field inspection on September 22, 2023, led by the Department of Transportation.

Figure 2.19. Results of the field inspection of dredged material in the intake area on the afternoon of September 22, 2023

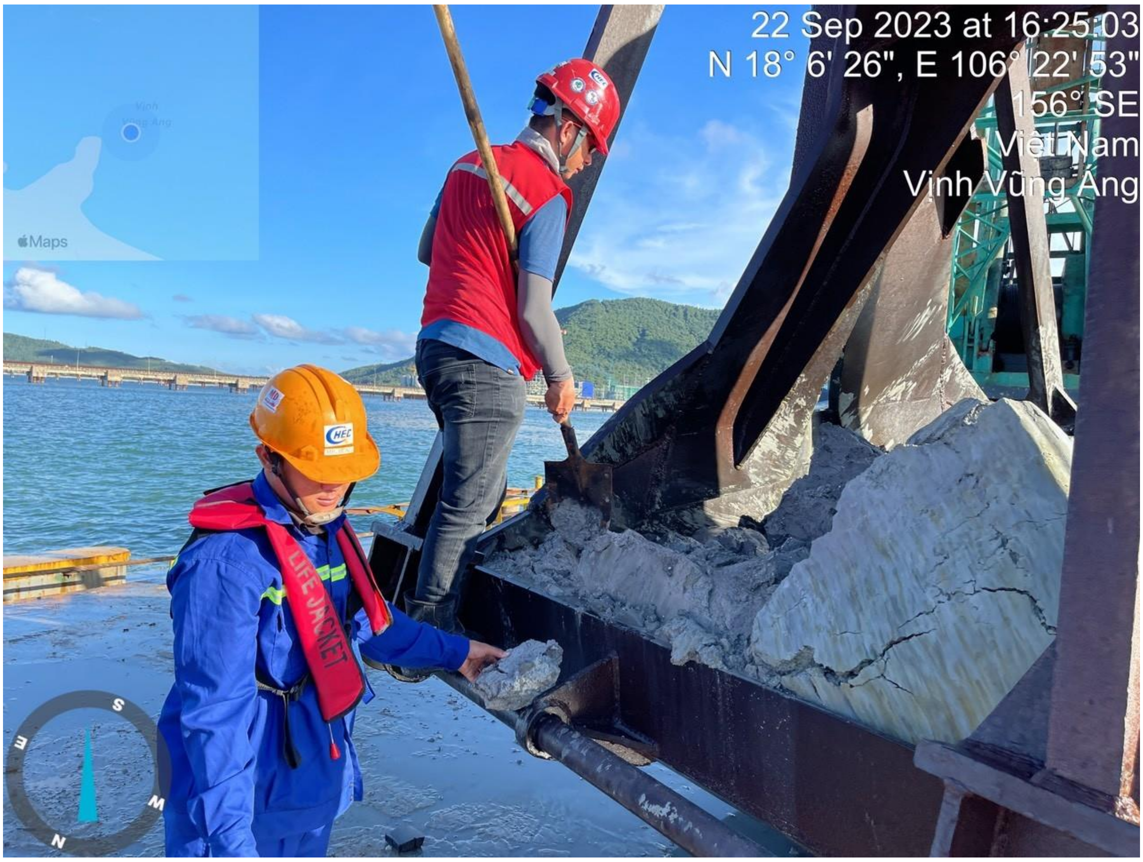


Figure 2.20. Results of the field inspection of dredged material in the intake area on the afternoon of September 22, 2023

The material extracted mainly consisted of grey clay mixed with sand (similar to the description of layer 5 but with a higher clay content) and hard clay. Thus, the field survey and phase 1 dredging process showed that the top layer 5 is variable.

Additionally, the analysis results of 41 sediment samples (updated in July 2023) showed the percentage of gravel: sand: mud, clay was 0.8:82.4:16.8, with poorly graded fine sand accounting for a large proportion (58.2%/82.4) of the sand component.

The combined results of the physical properties of layers 5, 6a, and 6b, and the 41 sediment samples (July 2023) showed an average sand: clay, mud ratio of 68.8%: 29.55%; small gravel content was about 1.65%. However, in the sand component, poorly graded fine sand accounted for a large proportion of about 46%/68.8%.

Moreover, according to the contractor's phase 1 dredging report, with the goal of extracting 890,000m³ of sand for land leveling, the contractor carried out dredging in the turning basin area, and the sand extraction ratio for land leveling was only about 16.26% of the total dredged volume. Therefore, the extraction rate of the material needs to be calculated based on actual implementation results.

2.2.1.3. Current status of environmental components

a. Current environmental status of dredging area

To assess the quality of the environmental components in the dredging area, the project owner, in collaboration with the consulting unit, conducted sampling of seawater, biology, and sediment; measurement and analysis of the environmental quality of the disposal area according to the regulations of the Ministry of Natural Resources and Environment (MONRE) on technical monitoring procedures (Circular No. 10/2021/TT-BTNMT dated June 30, 2021, on technical regulations for environmental monitoring and management of environmental quality monitoring information and data). The project conducted sampling as follows:

Table 2.10. Environmental Monitoring Parameters of the Dredging Area

No.	**Environment**	**Number of Samples**	**Batch**	**Parameter**
1	Seawater Symbol: NV1 to NV5	2 samples per position (surface layer, bottom layer) x 5 positions	1	NH4+_N, CN-, Mn, total Phenol, As, Pb, Zn, total Chromium, Hg, Cd, Cu, total oil and grease, coliform..

No.	Environment	Number of Samples	Batch	Parameter
2	Biology Symbol: NV1 to NV5	1 sample per position x 5 positions	1	Zooplankton, phytoplankton, benthic organisms
3	Surface sediemtn Symbol: TT1 to TT41	1 sample per position x 41 positions	1	As, Cd, Pb, Zn, Hg, Cr, Cu, PCB, organochlorine pesticides, polycyclic aromatic hydrocarbons (PAHs), dioxins and furans, total oil and grease, total hydrocarbons, total alpha and beta radioactivity.

/ Physical and Chemical Environmental Factors of the Marine Area for Dredging

The monitoring parameters include: Temperature, pH, salinity, BOD5, DO, TSS measured continuously for 15 consecutive days, from August 1, 2023, to August 15, 2023, Samples were taken at the coordinates 18.108318°N; 106.392142°E. The survey results of the physical and chemical environmental factors in the marine area of dredging for the project are presented in the table below:

Table 2.11 Analysis Results of Physical and Chemical Environmental Factors in the Marine Area for Dredging

No.	Measurement time	Sanility (‰)	BOD_5 (mg/L)	Temperature (oC)	pH	DO (mg/L)	TSS (mg/L)
1	8/1/2023	30	5	24.6	6.7	4.8	55
2	8/2/2023	39	6	25.2	6.9	5.2	21
3	8/3/2023	35	7	25.4	6.9	4.8	19
4	8/4/2023	37	8	25.3	6.8	4.9	23
5	8/5/2023	38	10	25.9	7.1	5.3	24
6	8/6/2023	35	7	24.8	6.9	4.8	19
7	8/7/2023	39	6	25.6	6.9	4.8	18
8	8/8/2023	26,3	7	38	4.7	5	19
9	8/9/2023	42	9	25.1	6.8	4.5	24
10	8/10/2023	33	10	24.3	7	4.6	19
11	8/11/2023	42	7	24.7	6.9	5.3	13
12	8/12/2023	39	9	24.8	7	4.9	15
13	8/13/2023	44	11	25.5	7.1	5.1	19
14	8/14/2023	37	9	26.1	7.1	5.3	15
15	8/15/2023	38	7	24.5	6.8	4.7	13

QCVN 10:2023/BTNMT (Table 1)	**-**	**-**	**-**	**6.5 - 8.5**	**≥5**	**50**

Note:

- QCVN 10:2023/BTNMT: National technical regulation on seawater quality.

- Table 1: Limit values of seawater quality parameters in coastal waters.

Observation:

The analysis results of the physical and chemical environmental factors in the marine dredging area show that all parameters are within the permissible limits of QCVN 10:2023/BTNMT (Table 1).

****/ Current Status of Seawater Quality in the Dredging Area***

Table 2.12 Seawater monitoring location in dredging area

Symbol	**Sample Type**	**Description**	**WGS-84 Coordinates**	
			E	**N**
NV1	Coastal seawater, biota	Area near the ship turning basin	106°33'3.21"	18°17'16.46"
NV2	Coastal seawater, biota	Area near the seawater intake channel	106°33'25.01"	18°16'54.88"
NV3	Coastal seawater, biota	Area near the seawater discharge channel	106°33'3.51"	18°16'33.61"
NV4	Coastal seawater, biota	West of the dredging area, near the Quyen River mouth	106°32'41.66"	18°16'54.19"
NV5	Coastal seawater, biota	East of the dredging area, near the dredged material transport line	106°33'4.21"	18°16'54.95"

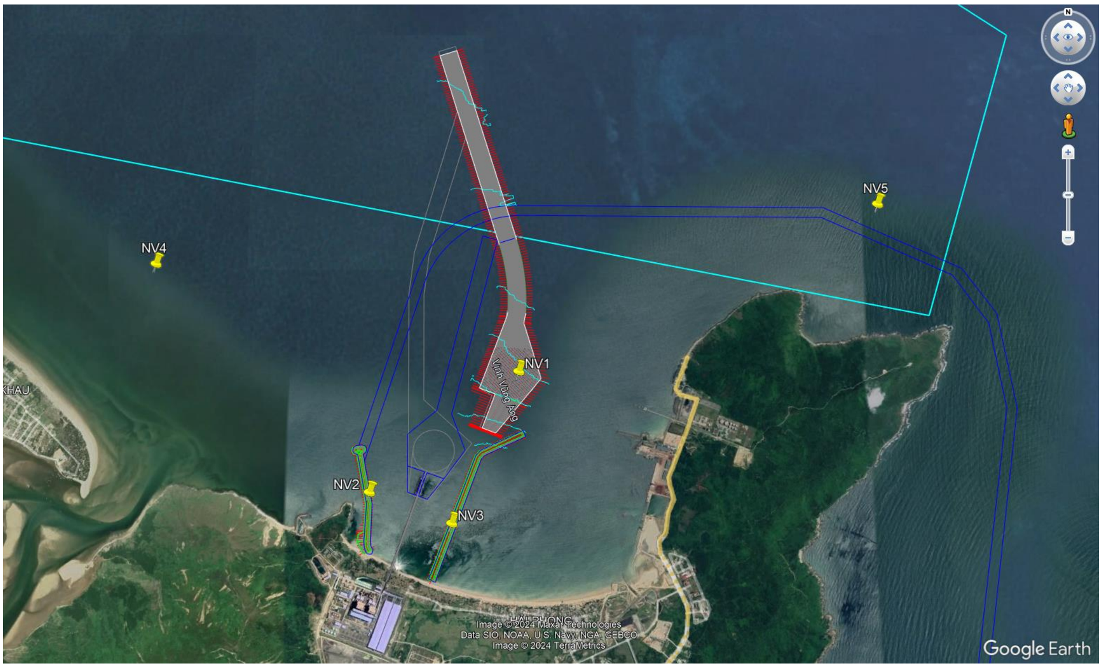


Figure 2.21. The correlation diagram of the seawater sampling locations in the dredging area.

The current status of seawater quality in the dredging area is presented in the table below:

Table 2.13 Analysis Results of Seawater Quality in the Dredging Area

Parameters	**Unit**	**NV-NB1**		**NV-NB2**		**NV-NB3**		**NV-NB4**		**NV-NB5**		**QCVN 10:2023/BTNMT (Table 1 and 2)**
		High tide	**Low tide**	**High tide**	**Low tide**	**High tide**	**Low tide**	**High tide**	**Low tide**	**High tide**	**Low tide**	
Ammonium (NH4+_N)	*mg/L*	0.14	0.18	0.18	0.21	0.22	0.23	0.18	0.24	0.21	0.17	***0.1***
Cyanide (CN-)	*mg/L*	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	***0.01***
Manganese (Mn)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	***0.5***
Total Phenol	*mg/L*	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	***0.03***
Arsenic (As)	*mg/L*	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	***0.02***
Zinc (Zn)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	***0.1***
Lead (Pb)	*mg/L*	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	***0.05***
Total Chromium	*mg/L*	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	***0.1***
Mercury (Hg)	*mg/L*	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	***0.0005***

Cadmium (Cd)	*mg/L*	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	430	ND (MDL=0.0002)	ND (MDL=0.0002)	***0.005***
Copper (Cu)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	***0.02***
Total Oil and Grease	*mg/L*	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	***5***
Coliform	*MPN/100mL*	380	410	450	430	460	400	470	ND (MDL=2)	470	490	***1000***

Note:

- QCVN 10:2023/BTNMT: National technical regulation on seawater quality.

- Table 1: Limit values of seawater quality parameters in coastal waters for the purpose of protecting underwater environments.

- Table 2: Limit values of seawater quality parameters in coastal waters.

- ND: Not detected.

Observation:

The analysis results of seawater quality in the dredging area show that all parameters are within the permissible limits of the QCVN 10:2023/BTNMT standards issued by the Ministry of Natural Resources and Environment.

****/ Current Status of Sediment Quality in the Dredging Area***

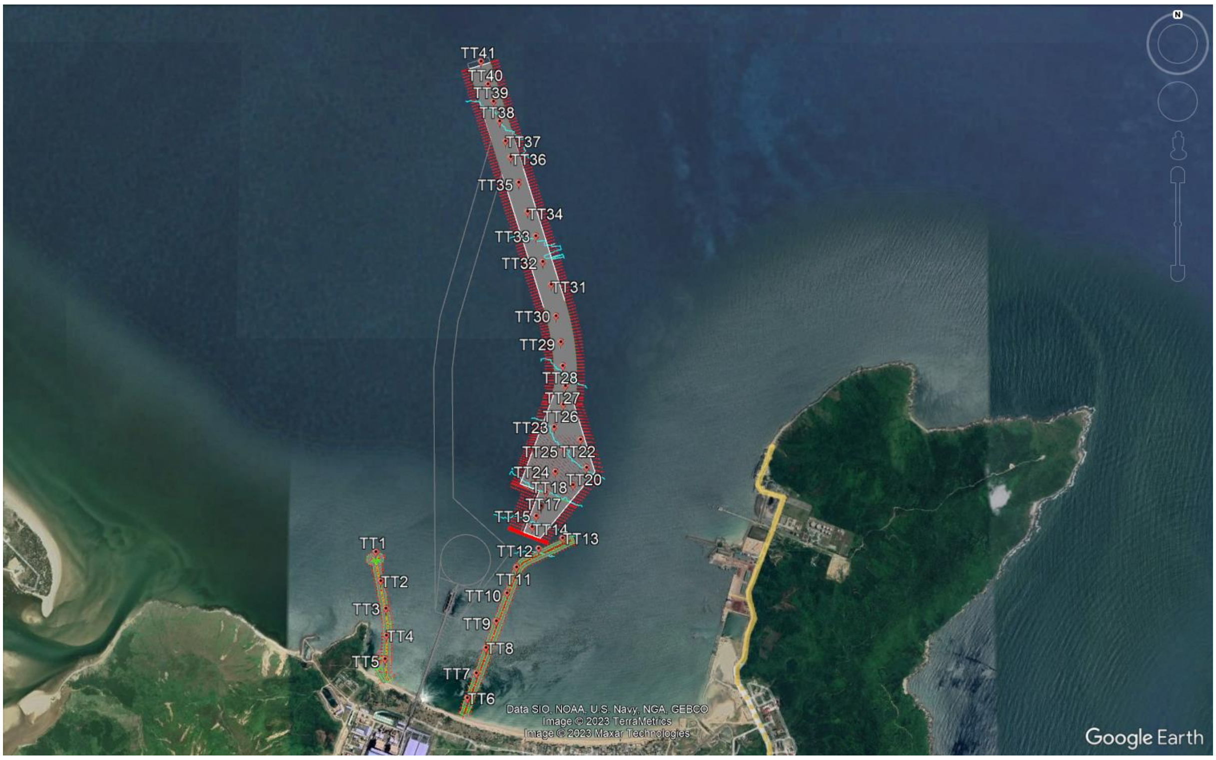


Figure 2.22. Location of sampling sediment in dredging area

Table 2.14. Analysis Results of Sediment Quality in the Dredging Area (from Sampling Points NV-TT1 to NV-TT8)

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT1	NV-TT2	NV-TT3	NV-TT4	NV-TT5	NV-TT6	NV-TT7	NV-TT8	
1	Arsenic (As)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***20***
2	Cadmium (Cd)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***1.5***
3	Lead (Pb)	mg/kg	14.8	12.6	15.8	18.6	11.7	13.2	12.7	16.3	***50***
4	Zinc (Zn)	mg/kg	19.4	23.5	21.6	23.7	21.5	24.8	25.3	24.3	***124***
5	Mercury (Hg)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***0.15***
6	Total Chromium (Cr)	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***80***
7	Copper (Cu)	mg/kg	18.6	21.6	22.8	15.8	21.8	22.1	24.6	19.8	***65***
8	Total Oil	mg/kg	7	5	7	6	8	7	7	7	***550***
9	Chlordane - Organic pesticide chemical										
	Cis-Chlordane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
	Trans-Chlordane	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
10	DDD - Organic pesticide chemical										
	2,4'-DDD	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2***
	4,4'-DDD	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2***
11	DDE - Organic pesticide chemical										
	2,4'-DDE	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
	4,4'-DDE	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
12	DDT - Organic pesticide chemical										

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT1	NV-TT2	NV-TT3	NV-TT4	NV-TT5	NV-TT6	NV-TT7	NV-TT8	
	4,4'-DDT	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***1.6***
13	Dieldrin	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2.8***
14	Endrin	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***10***
15	Heptachlor epoxide	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2,7***
16	Total Polychlorinated Biphenyls (PCB)										
	PCB 101	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 118	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 138	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 153	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 180	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 28	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 52	µg/kg	ND	ND	ND (MDL=0.0008)	ND	ND	ND	ND	ND	***23***
17	Naphthalene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***160***
18	Phenanthrene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***240***
19	Acenaphthene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***16***
20	Acenaphthylene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***44***
21	Anthracene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***85***
22	2-Methylnaphthalene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***70***
23	Benzo[a]anthracene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***261***

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT1	NV-TT2	NV-TT3	NV-TT4	NV-TT5	NV-TT6	NV-TT7	NV-TT8	
24	Chrysene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***384***
25	Dibenzo[a,h]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***63,4***
26	Fluoranthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***600***
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***665***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***19***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2,4-DDT	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**-**
31	Benzo[e]pyrene	*µg/kg*	<10	<10	<10	<10	<10	<10	<10	<10	***430***
32	Lindane (BHC - gamma)	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	***0.32***
33	Total α Radioactivity	*Bq/g*	0.06	0.04	0.06	<0.04	<0.04	0.06	0.05	<0.04	***35***
34	Total β Radioactivity	*Bq/g*	0.29	0.31	0.33	0.29	0.29	0.34	0.32	0.35	***35***
35	Dioxins and Furans	*ng/kg TEQ*	0.176	0.001	0.233	0.205	0.342	0.321	0.169	0.212	***21.5***

Table 2.15 Analysis Results of Sediment Quality in the Dredging Area (from Sampling Points (NV-TT 9 to NV-TT16)

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT9	NV-TT10	NV-TT11	NV-TT12	NV-TT13	NV-TT14	NV-TT15	NV-TT16	
1	Arsenic (As)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***20***

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT9	NV-TT10	NV-TT11	NV-TT12	NV-TT13	NV-TT14	NV-TT15	NV-TT16	
2	Cadmium (Cd)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.5***
3	Lead (Pb)	*mg/kg*	13.5	21.4	15.7	15.9	15.9	18.6	17.6	15.8	***50***
4	Zinc (Zn)	*mg/kg*	26.4	27.5	28.5	27.4	29.5	24.8	26.9	27.6	***124***
5	Mercury (Hg)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.15***
6	Total Chromium (Cr)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***80***
7	Copper (Cu)	*mg/kg*	23.7	25.4	24.9	24.8	28.7	21.5	24.1	25.3	***65***
8	Total Oil	*mg/kg*	9	8	7	9	5	8	10	7	***550***
9	Chlordane - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	Cis-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
	Trans-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
10	DDD - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
	4,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
11	DDE - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
	4,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
12	DDT - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	4,4'-DDT	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.6***

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT9	NV-TT10	NV-TT11	NV-TT12	NV-TT13	NV-TT14	NV-TT15	NV-TT16	
13	Dieldrin	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2.8***
14	Endrin	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***10***
15	Heptachlor epoxide	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***2.7***
16	Total Polychlorinated Biphenyls (PCB)		-	-	-	-	-	-	-	-	
	PCB 101	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 118	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 138	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 153	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 180	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 28	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 52	µg/kg	ND	ND	ND	ND	ND	ND	ND	ND	***23***
17	Naphthalene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***160***
18	Phenanthrene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***240***
19	Acenaphthene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***16***
20	Acenaphthylene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***44***
21	Anthracene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***85***
22	2-Methylnaphthalene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***70***
23	Benzo[a]anthracene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***261***
24	Chrysene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***384***
25	Dibenzo[a,h]anthracene	µg/kg	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***63.4***

No.	Parameter	Unit	Results								TT 28/2019/ BTNMT (Appendix 01)
			NV-TT9	NV-TT10	NV-TT11	NV-TT12	NV-TT13	NV-TT14	NV-TT15	NV-TT16	
26	Fluoranthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***600***
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***665***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***19***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2,4-DDT	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
31	Benzo[e]pyrene	*µg/kg*	<10	<10	<10	<10	<10	<10	<10	<10	***430***
32	Lindane (BHC - gamma)	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	***0.32***
33	Total α Radioactivity	*Bq/g*	0.05	0.05	<0.04	0.04	0.04	0.05	<0.04	<0.04	***35***
34	Total β Radioactivity	*Bq/g*	0.29	0.31	0.29	0.33	0.3	0.36	0.3	0.32	***35***
35	Dioxins and Furans	*ng/kg*	0.184	0.035	0.181	0.137	0.169	0.197	0.786	0.685	***21.5***

Table 2.16 Analysis Results of Sediment Quality in the Dredging Area (from Sampling Points (NV-TT 17 to NV-TT24)

TT	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT17	NV-TT18	NV-TT19	NV-TT20	NV-TT21	NV-TT22	NV-TT23	NV-TT24	
1	Arsenic (As)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***20***
2	Cadmium (Cd)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.5***
3	Lead (Pb)	*mg/kg*	11.7	16.4	13.9	18.9	17.5	15.8	20.4	19.7	***50***
4	Zinc (Zn)	*mg/kg*	25.9	26.7	28.7	28.9	27.6	29.7	26.8	31.5	***124***
5	Mercury (Hg)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.15***
6	Total Chromium (Cr)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	27.6	***80***
7	Copper (Cu)	*mg/kg*	24.9	24.1	26.4	25.8	23.9	25.9	25.9	29.7	***65***
8	Total Oil	*mg/kg*	9	7	9	12	8	12	11	9	***550***
9	Chlordane - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	Cis-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
	Trans-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
10	DDD - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
	4,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
11	DDE - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
	4,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
12	DDT - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	4,4'-DDT	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.6***
13	Dieldrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.8***
14	Endrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***10***

TT	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT17	NV-TT18	NV-TT19	NV-TT20	NV-TT21	NV-TT22	NV-TT23	NV-TT24	
15	Heptachlor epoxide	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.7***
16	Total Polychlorinated Biphenyls (PCB)		-	-	-	-	-	-	-	-	
	PCB 101	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 118	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 138	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 153	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 180	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 28	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 52	*μg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
17	Naphthalene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***160***
18	Phenanthrene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***240***
19	Acenaphthene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***16***
20	Acenaphthylene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***44***
21	Anthracene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***85***
22	2-Methylnaphthalene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***70***
23	Benzo[a]anthracene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***261***
24	Chrysene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***384***
25	Dibenzo[a,h]anthracene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***63.4***
26	Fluoranthene	*μg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***600***

TT	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT17	NV-TT18	NV-TT19	NV-TT20	NV-TT21	NV-TT22	NV-TT23	NV-TT24	
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***665***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***19***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2,4-DDT	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-
31	Benzo[e]pyrene	*µg/kg*	<10	<10	<10	<10	<10	<10	<10	<10	***430***
32	Lindane (BHC - gamma)	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	***0.32***
33	Total α Radioactivity	*Bq/g*	0.04	<0.04	0.05	0.06	<0.04	0.05	0.04	<0.04	***35***
34	Total β Radioactivity	*Bq/g*	0.29	0.31	0.33	0.36	0.33	0.31	0.34	0.28	***35***
35	Dioxins and Furans	*ng/kg*	0.07	0.074	0.028	0.041	0.151	0.007	0.122	0.02	***21.5***

Bảng 2.1. Results phân tích chất lượng trầm tích khu vực nạo vét (từ NV-TT25 đến NV-TT32)

Table 2.17 Analysis Results of Sediment Quality in the Dredging Area (from Sampling Points (NV-TT 25 to NV-TT32)

No.	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT25	NV-TT26	NV-TT27	NV-TT28	NV-TT29	NV-TT30	NV-TT31	NV-TT32	
1	Arsenic (As)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***20***
2	Cadmium (Cd)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.5***
3	Lead (Pb)	*mg/kg*	16.4	17.8	18.5	18.7	15.9	18.5	19.5	17.9	***50***
4	Zinc (Zn)	*mg/kg*	28.5	28.6	27.6	33.6	31.8	31.8	29.8	28.5	***124***
5	Mercury (Hg)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.15***
6	Total Chromium (Cr)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***80***
7	Copper (Cu)	*mg/kg*	25.9	24.8	32.8	27.5	26.9	28.7	25.8	32.8	***65***
8	Total Oil	*mg/kg*	13	8	9	7	6	14	9	8	***550***

No.	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT25	NV-TT26	NV-TT27	NV-TT28	NV-TT29	NV-TT30	NV-TT31	NV-TT32	
9	Chlordane - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	Cis-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
	Trans-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***0.5***
10	DDD - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
	4,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2***
11	DDE - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	2,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
	4,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.2***
12	DDT - Organic pesticide chemical		-	-	-	-	-	-	-	-	
	4,4'-DDT	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***1.6***
13	Dieldrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.8***
14	Endrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***10***
15	Heptachlor epoxide	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***2.7***
16	Total Polychlorinated Biphenyls (PCB)		-	-	-	-	-	-	-	-	
	PCB 101	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 118	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 138	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 153	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 180	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***

No.	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT25	NV-TT26	NV-TT27	NV-TT28	NV-TT29	NV-TT30	NV-TT31	NV-TT32	
	PCB 28	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 52	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	***23***
17	Naphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***160***
18	Phenanthrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***240***
19	Acenaphthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***16***
20	Acenaphthylene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***44***
21	Anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***85***
22	2-Methylnaphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***70***
23	Benzo[a]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***261***
24	Chrysene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***384***
25	Dibenzo[a,h]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***63.4***
26	Fluoranthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***600***
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***665***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***19***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2,4-DDT	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	***-***
31	Benzo[e]pyrene	*µg/kg*	<10	<10	<10	<10	<10	<10	<10	<10	***430***
32	Lindane (BHC - gamma)	*µg/kg*	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	***0.32***
33	Total α Radioactivity	*Bq/g*	0.04	0.05	<0.04	0.04	0.04	<0.04	0.06	<0.04	***35***

No.	Parameter	Unit	Results								TT 28/2019/BTNMT (Appendix 01)
			NV-TT25	NV-TT26	NV-TT27	NV-TT28	NV-TT29	NV-TT30	NV-TT31	NV-TT32	
34	Total β Radioactivity	*Bq/g*	0.26	0.34	0.3	0.31	0.35	0.32	0.32	0.29	***35***
35	Dioxins and Furans	*ng/kg*	0.15	0.128	0.12	0.025	0.053	0.112	0.132	0.087	***21.5***

Table 2.18 Analysis Results of Sediment Quality in the Dredging Area (from Sampling Points (NV-TT 33 to NV-TT41)

No.	Parameter	Unit	Results									TT 28/2019/BTNMT (Appendix 01)
			NV-TT33	NV-TT34	NV-TT35	NV-TT36	NV-TT37	NV-TT38	NV-TT39	NV-TT40	NV-TT41	
1	Arsenic (As)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***20***
2	Cadmium (Cd)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***1,5***
3	Lead (Pb)	*mg/kg*	21,4	20,6	17,9	17,3	22,6	24,7	16,9	18,5	17,3	***50***
4	Zinc (Zn)	*mg/kg*	31,8	31,5	34,7	24,6	28,9	32,6	26,8	31,7	28,7	***124***
5	Mercury (Hg)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***0,15***
6	Total Chromium (Cr)	*mg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***80***
7	Copper (Cu)	*mg/kg*	27,9	27,9	28,9	25,9	30,7	29,5	26,4	26,9	25,8	***65***
8	Total Oil	*mg/kg*	6	5	9	8	9	13	8	9	5	***550***
9	Chlordane - Organic pesticide chemical		-	-	-	-	-	-	-	-	-	
	Cis-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***0,5***
	Trans-Chlordane	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***0,5***
10	DDD - Organic pesticide chemical		-	-	-	-	-	-	-	-	-	
	2,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2***
	4,4'-DDD	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2***
11	DDE - Organic pesticide chemical		-	-	-	-	-	-	-	-	-	
	2,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,2***
	4,4'-DDE	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,2***

No.	Parameter	Unit	Results									TT 28/2019/BTNMT (Appendix 01)
			NV-TT33	NV-TT34	NV-TT35	NV-TT36	NV-TT37	NV-TT38	NV-TT39	NV-TT40	NV-TT41	
12	DDT - Organic pesticide chemical		-	-	-	-	-	-	-	-	-	
	4,4'-DDT	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***1,6***
13	Dieldrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,8***
14	Endrin	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***10***
15	Heptachlor epoxide	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,7***
16	Total Polychlorinated Biphenyls (PCB)		-	-	-	-	-	-	-	-	-	
	PCB 101	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 118	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 138	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 153	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 180	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 28	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
	PCB 52	*µg/kg*	ND	ND	ND	ND	ND	ND	ND	ND	ND	***23***
17	Naphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***160***
18	Phenanthrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***240***
19	Acenaphthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***16***
20	Acenaphthylene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***44***
21	Anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***85***
22	2-Methylnaphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***70***
23	Benzo[a]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***261***

No.	Parameter	Unit	Results									TT 28/2019/BTNMT (Appendix 01)
			NV-TT33	NV-TT34	NV-TT35	NV-TT36	NV-TT37	NV-TT38	NV-TT39	NV-TT40	NV-TT41	
24	Chrysene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***384***
25	Dibenzo[a,h]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***63,4***
26	Fluoranthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***600***
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***665***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***19***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2,4-DDT	*µg/kg*	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	-
31	Benzo[e]pyrene	*µg/kg*	<10	<10	<10	<10	<10	<10	<10	<10	<10	***430***
32	Lindane (BHC - gamma)	*µg/kg*	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	***0,32***
33	Total α Radioactivity	*Bq/g*	<0,04	0,04	0,05	0,04	0,05	<0,04	0,05	<0,04	<0,04	***35***
34	Total β Radioactivity	*Bq/g*	0,33	0,34	0,29	0,3	0,32	0,34	0,33	0,32	0,31	***35***
35	Dioxins and Furans	*ng/kg*	0,908	0,261	0,416	0,245	0,239	0,074	0,004	0,154	0,003	***21,5***

Note:

- Circular 28/2019/TT-BTNMT: Technical regulation on the assessment of dredged material and determination of disposal areas for dredged material in Vietnam's waters.

Observation:

The analysis results of sediment quality in the dredging area show that the detected radioactivity levels are very low, ranging from approximately 0.26 Bq/g to 0.36 Bq/g; concentrations of Dioxins and Furans range from 0.001 ng/kgTEQ to 0.908 ng/kgTEQ; metal, metalloid, and organic compound parameters all fall within the permissible limits of Appendix 01 of Circular 28/2019/TT-BTNMT. Therefore, the dredged material components are not contaminated with metals and metalloids, are safe in terms of radioactivity, show no signs of organic compound contamination, and pose no harm during dredging and disposal processes.

➢ *Results of biological sample analysis in the submerged area*

**** Phytoplankton***

At the time of the survey, 26 species of phytoplankton belonging to 12 families and 3 divisions of algae (Cyanophyta, Bacillariophyta, and Pyrrophyta) were identified at the monitoring sites. The predominant species were Aulacoseira sp. and Nitzschia sp., which accounted for 43.6% of the total cell density at the survey locations. The distribution of phytoplankton was relatively uniform across the survey sites, with an average density of 49,270 cells/L per site.

Table 2.19 Phytoplankton density at survey locations

Scientific Names	**Tên khoa học**	**NC-SH1**	**NC-SH2**	**NC-SH3**	**NC-SH4**	**NC-SH5**
Cyanophyta (Blue-green algae)	Ngành Tảo lam-Cyanophyta	6,150	5,620	5,820	5,620	5,930
Bacillariophyta (Diatoms)	Ngành Tảo Silic-Bacillariophyta	38,872	37,620	36,522	36790	33,410
Pyrrophyta (Dinoflagellates)	Ngành tảo Giáp - Pyrrophyta	7,380	6,637	7,040	6,810	6,130

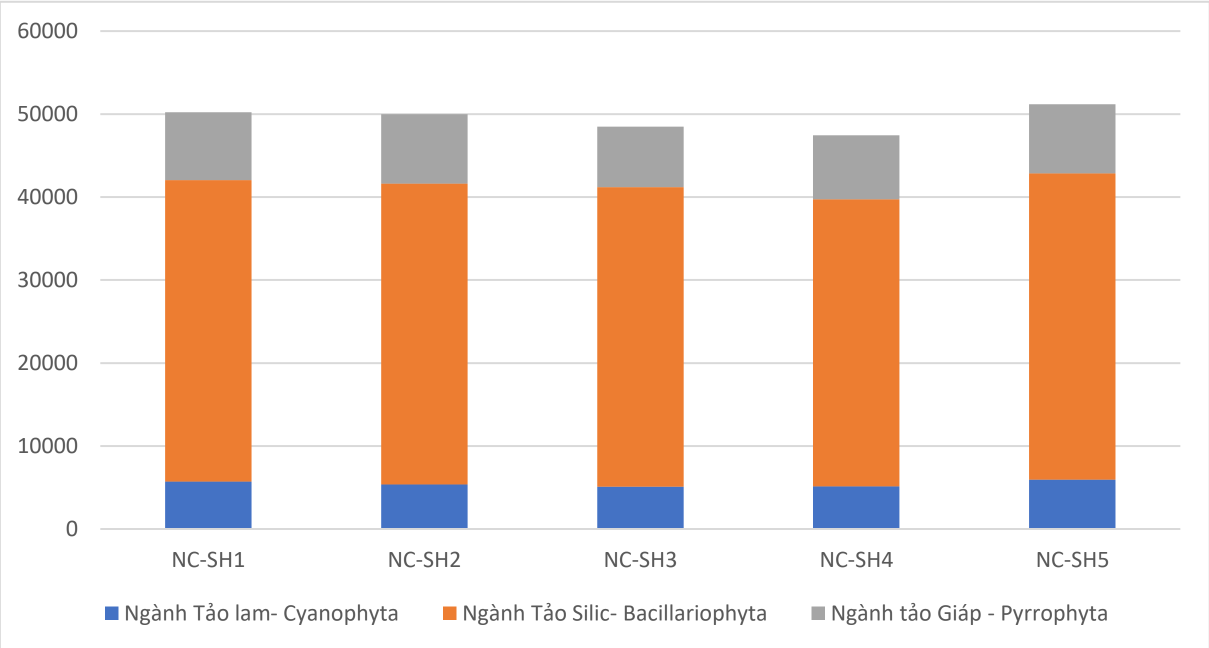


Figure 2.23 The proportion of phytoplankton density surveyed at various locations

**** Zooplankton***

At the time of the survey, 26 species of zooplankton were identified at the monitoring sites, with the majority comprising 20 species belonging to the classes Copepoda, Appendicularia, Hydrozoa, and 6 species belonging to other groups. Among them, Macrosetella sp. was the predominant species, accounting for 41.8% of the total cell density at the survey locations. The zooplankton density in this area was evenly distributed across the monitoring sites, averaging 22,199 cells/L per site.

Table 2.20. Zooplankton density at survey locations

Scientific names	NV-SH1	NV-SH2	NV-SH3	NV-SH4	NV-SH5
Lớp phụ chân mái chèo – Copepoda	19.700	18.147	18.000	19.020	16.500
Lớp Appendicularia	940	1.000	1100	710	620
Lớp sứa lược-Hydrozoa	2.200	2.100	2.700	1.900	2.200
Other classes	770	867	790	850	880

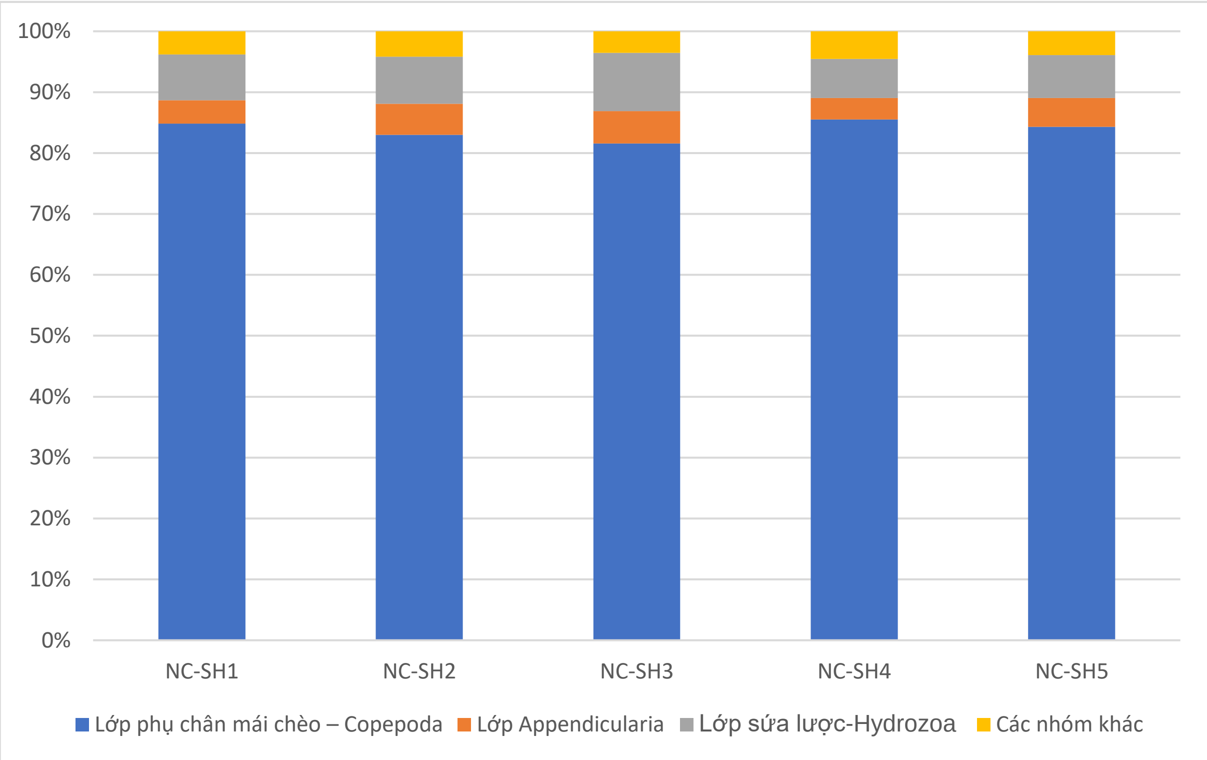


Figure 2.24. The proportion of zooplankton density surveyed at various locations.

** **Benthic animals***

The survey results obtained at the sampling location, at the time of observation, revealed relatively low diversity of benthic animals in this area. Only 5 species of benthic animals belonging to the classes Polychaeta and Echinoidea were found, with the majority of species belonging to the class Polychaeta. The density of benthic animals in dredged materials is low and evenly distributed, at 10 – 40 species/m2:

Table 2.21 Survey results of benthic animals in the submerged area

No.	Scientific names	Unit	Result				
			NC-SH1	NC-SH2	NC-SH3	NC-SH4	NC-SH5
	Class POLYCHAETA						
	Family Lumbrineridae						

1	***Species Lumbrinereis sp.***		40	25	36	35	30
	Family Glyceridae						
2	***Species Glycera sp.***		10	20	16	20	25
	Family Paralacydociidae						
3	***Species Paralacydonia paradoxa Fauvel, 1913***		10	20	10	30	10
	Family Nephtyidae						
4	***Species Aglaophamus sp.***		10	15	15	20	15
	Class ECHINOIDEA						
	Family Fibulariidae						
5	***Species Fibularia sp.***		10	20	24	14	15

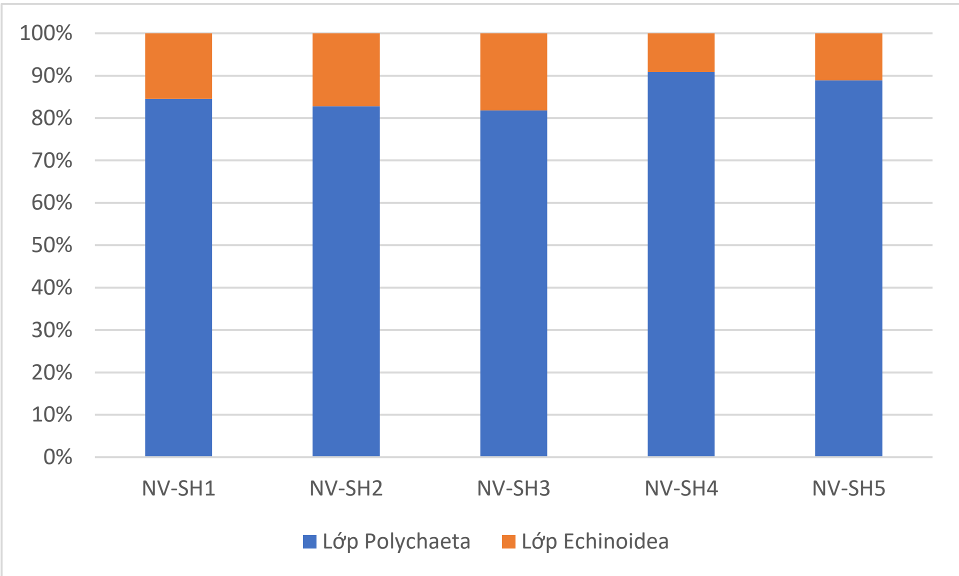


Figure 2.25 Benthic animal density at dredging survey locations.

b. Current environmental status of submerged area

To assess the quality of environmental components in the receiving submersion area, the investor collaborates with consulting units to collect samples of seawater, biota, and sediment; measure and analyze the environmental quality of the submersion area according to the regulations of the Ministry of Natural Resources and Environment (MONRE) on the technical procedure for environmental monitoring (Circular No. 10/2021/TT-BTMT dated June 30, 2021 of MONRE on Technical Regulations for Environmental Monitoring and Management of Environmental Quality Monitoring Information).

The survey locations for environmental quality assessment in the project area are selected based on the following criteria:

- The selected points represent the current state of the environment in the area.
- The hydrodynamic conditions of the project area.
- Characteristics of emission sources.
- Sensitivity of receiving objects.

To assess the current state of the environment and the status of biota in the proposed submersion area, the project conducts sampling as followsUnit:

Table 2.22 The environmental monitoring locations for submerged area

Symbol	**Sample types**	**Description**	**Coordination WGS-84**	
			E	**N**
NC1	Seawater near the shore, sediment, biota	Northern submerged area	106°33'3.21"	18°17'16.46"
NC2	Seawater near the shore, sediment, biota	Eastern submerged area	106°33'25.01"	18°16'54.88"
NC3	Seawater near the shore, sediment, biota	Southern submerged area	106°33'3.51"	18°16'33.61"
NC4	Seawater near the shore, sediment, biota	Western submerged area	106°32'41.66"	18°16'54.19"
NC5	Seawater near the shore, sediment, biota	Central submerged area	106°33'4.21"	18°16'54.95"

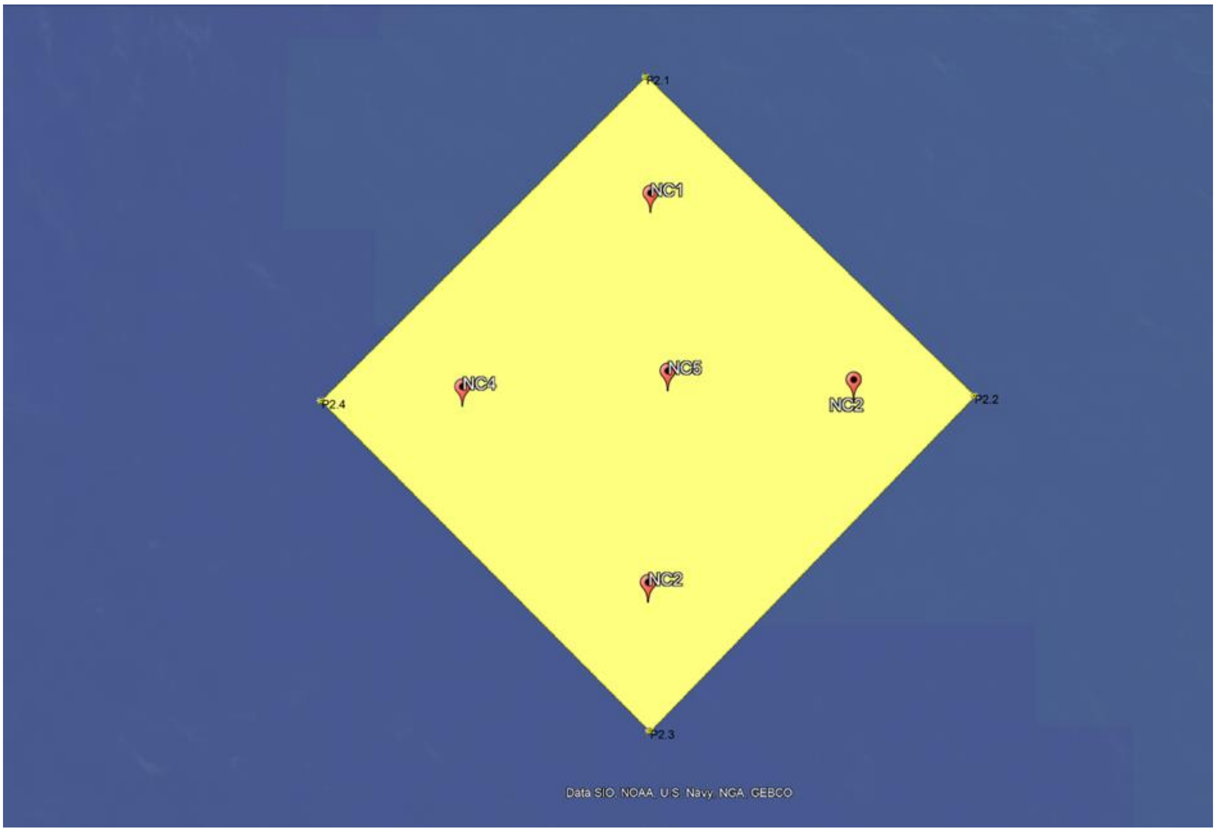


Figure 2.26. The correlation diagram of sampling positions in the submerged area

Table 2.23. Environmental monitoring parameters in the submerged area

No.	Environment	Number of sample	Batch	Parameters
1	Seawater Symbol: NC1 to NC5	2 sample/ 1 location (tầng mặt, tầng đáy) x 5 location	1	NH4+_N, CN-, Mn, Total Phenol, As, Pb, Zn, Total Chromium, Hg, Cd, Cu, Total oil, Coliform.
2	Biology Symbol: NC1 to NC5	1 sample/1 location x 5 location	1	Benthic fauna, Benthic flora, Benthic animals
3	Sediment Symbol: NC1 to NC5	1 sample/1 location x 7 location	1	As, Cd, Pb, Zn, Hg, Fe, Total Chromium, Cu, Total Hydrocarbons, Total Polychlorinated Biphenyls (PCB), Organic chlorine pesticides, Polycyclic aromatic hydrocarbons

No.	Environment	Number of sample	Batch	Parameters
				(PAH), Total hydrocarbons, Phenol, CN-, Moisture, Dioxins and furans.

➢ ***Results of seawater analysis in the submargence area***

Table 2.24. Rapid measurement results of physicochemical factors in the seawater of the submerged area of 200 hectares

No.	Measure time	Salinity (‰)	BOD_5 (mg/L)	Temperature (°C)	pH	DO (mg/L)	TSS (mg/L)
1	8/1/2023	35	6	24.1	7	4.5	52
2	8/2/2023	42	7	24.9	7.1	5	19
3	8/3/2023	36	7	25.3	7.1	4.4	21
4	8/4/2023	36	9	25.3	6.9	5	21
5	8/5/2023	41	7	25.8	6.9	5.2	22
6	8/6/2023	38	9	25.7	7	5	18
7	8/7/2023	40	10	25.2	6.7	4.9	23
8	8/8/2023	25.8	6.9	41	5	7	24
9	8/9/2023	39	11	25.1	6.9	4.4	19
10	8/10/2023	35	11	24.6	6.8	4.7	18
11	8/11/2023	41	11	24.9	7	5.2	18
12	8/12/2023	37	8	25.1	6.9	4.6	13
13	8/13/2023	43	13	24.9	7	5.4	21
14	8/14/2023	35	6	25.7	7	5.1	10
15	8/15/2023	40	10	24.9	6.9	4.9	18
QCVN 10:2023/BTNMT (Table 3)		**-**	**-**	**-**	**6.5 - 8.5**	**-**	**-**

Note:

- QCVN 10:2023/BTNMT: National technical regulation on seawater quality.

- Table 3: Limit values for seawater quality parameters in coastal areas.

Observation:

The analysis results of the physical and chemical factors in seawater at the dredging disposal area show that the current Total Suspended Solids (TSS) concentrations range from 10 mg/l to 52 mg/l. All parameters are within the permissible limits of QCVN 10:2023/BTNMT (Table 3).

Table 2.25 The analysis results of the water quality in the submerged area of 200 hectares

No.	**Parameter**	**Unit**	**NC-NB1**		**NC-NB2**		**NC-NB3**		**NC-NB4**		**NC-NB5**		**QCVN 10:2023/ BTNMT Table 3**
			SL	**BL**	**SL**	**BL**	**SL**	**BL**	**SL**	**BL**	**SL**	**BL**	
1	Ammonium (NH_4^+_N)	*mg/L*	0.12	0.14	0.11	0.18	0.15	0.21	0.18	0.19	0.17	0.16	-
2	Cyanide (CN^-)	*mg/L*	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	ND (MDL=0.003)	***0.005***
3	Manganese (Mn)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	-
4	Total phenol	*mg/L*	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	***0.03***
5	Arsenic (As)	*mg/L*	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	ND (MDL=0.0015)	***0.01***
6	Zinc (Zn)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	***0.05***

No.	Parameter	Unit	NC-NB1		NC-NB2		NC-NB3		NC-NB4		NC-NB5		QCVN 10:2023/ BTNMT Table 3
			SL	**BL**	**SL**	**BL**	**SL**	**BL**	**SL**	**BL**	**SL**	**BL**	
7	Lead (Pb)	*mg/L*	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	ND (MDL=0.002)	***0.05***
8	Total Chromium	*mg/L*	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	ND (MDL=0.01)	***0.1***
9	Mercury (Hg)	*mg/L*	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	ND (MDL=0.0003)	***0.001***
10	Cadmium (Cd)	*mg/L*	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	ND (MDL=0.0002)	***0.005***
11	Copper (Cu)	*mg/L*	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	ND (MDL=0.02)	***0.03***
12	Total grease and oil	*mg/L*	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	ND (MDL=0.3)	***5***
13	Coliform	*MPN/100 Ml*	780	810	790	820	700	680	910	840	820	790	-

Note:

QCVN 10:2023/BTNMT: National technical regulation on seawater quality - Table 3: Limit values for parameters of nearshore seawater quality.

SL: Surface layer; BL: Bottom layer.

"-": Not specified.

Observation*: The analysis results of the water quality in the submerged area indicate that all parameters are within the permissible limits according to QCVN 10:2023/BTNMT for nearshore marine areas*.

➢ ***Analysis results of sediment samples in the submerged area***

ResultsTable 2.26. Analysis results of sediment quality in the submerged area of 200 hectares

No.	Parameter	Unit	Result					QCVN 43:2017/BTNMT
			NC-TT1	NC-TT2	NC-TT3	NC-TT4	NC-TT5	
1	Arsenic (As)	*mg/kg*	ND (MDL=0.03)	ND (MDL=0.03)	ND (MDL=0.03)	ND (MDL=0.03)	ND (MDL=0.03)	***41.6***
2	Cadmium (Cd)	*mg/kg*	ND (MDL=0.4)	ND (MDL=0.4)	ND (MDL=0.4)	ND (MDL=0.4)	ND (MDL=0.4)	***4.2***
3	Lead (Pb)	*mg/kg*	16.9	17.6	16.8	18.9	19.6	***112***
4	Zinc (Zn)	*mg/kg*	25.9	28.5	32.8	28.7	27.5	***271***
5	Mercury (Hg)	*mg/kg*	ND (MDL=0.04)	ND (MDL=0.04)	ND (MDL=0.04)	ND (MDL=0.04)	ND (MDL=0.04)	***0.7***
6	Total Chromium (Cr)	*mg/kg*	ND (MDL=3.3)	ND (MDL=3.3)	ND (MDL=3.3)	ND (MDL=3.3)	ND (MDL=3.3)	***160***
7	Copper (Cu)	*mg/kg*	21.3	25.9	25.1	22.5	23.2	***108***

No.	Parameter	Unit	Result					QCVN 43:2017/BTNMT
			NC-TT1	NC-TT2	NC-TT3	NC-TT4	NC-TT5	
8	Total Petroleum Hydrocarbons (TPH)	*mg/kg*	6	5	5	6	7	-
9	Chlordane - Organochlorine Pesticide							
	Cis-Chlordane	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***4.8***
	Trans-Chlordane	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***4.8***
10	DDD - Organochlorine Pesticide	-						
	2.4'-DDD	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***7.8***
	4.4'-DDD	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***7.8***
11	DDE - Organochlorine Pesticide	-						
	2.4'-DDE	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***374***
	4.4'-DDE	*µg/kg*	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***374***

No.	Parameter	Unit	Result					QCVN 43:2017/BTNMT
			NC-TT1	NC-TT2	NC-TT3	NC-TT4	NC-TT5	
12	DDT - Organochlorine Pesticide							
	4.4-DDT	µg/kg	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***4.8***
13	Dieldrin	µg/kg	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***4.3***
14	Endrin	µg/kg	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***62.4***
15	Heptachlor epoxide	µg/kg	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	ND (MDL=1)	***2.7***
16	Total Polychlorinated Biphenyls (PCBs)							
	PCB 101	µg/kg	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
	PCB 118	µg/kg	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
	PCB 138	µg/kg	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
	PCB 153	µg/kg	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
	PCB 180	µg/kg	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***

No.	Parameter	Unit	Result					QCVN 43:2017/BTNMT
			NC-TT1	NC-TT2	NC-TT3	NC-TT4	NC-TT5	
	PCB 28	*µg/kg*	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
	PCB 52	*µg/kg*	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	ND (MDL=0.8)	***189***
17	Naphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***391***
18	Phenanthrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***544***
19	Acenaphthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***88.9***
20	Acenaphthylene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***128***
21	Anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***245***
22	2-Methylnaphthalene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***201***
23	Benzo[a]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***693***
24	Chrysene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***846***
25	Dibenzo[a.h]anthracene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***135***
26	Fluoranthene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***1494***

No.	Parameter	Unit	Result					QCVN 43:2017/BTNMT
			NC-TT1	NC-TT2	NC-TT3	NC-TT4	NC-TT5	
27	Pyrene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***1398***
28	Fluorene	*µg/kg*	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	ND (MDL=5)	***144***
29	Total Hydrocarbons	*mg/kg*	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	ND (MDL=30)	***100***
30	2.4-DDT**	*µg/kg*	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0.05)	-
31	Benzo[e]pyrene**	*µg/kg*	ND (MDL=10)	ND (MDL=10)	ND (MDL=10)	ND (MDL=10)	ND (MDL=10)	***763***
32	Lindane (BHC - gamma)**	*µg/kg*	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0.05)	ND (MDL=0,05)	***1***

Note:

QCVN 43:2017/BTNMT - National technical regulation on sediment quality, applicable to sediment in saline and freshwater.

"-": Not specified.

Observation: The monitoring results show that all measured parameters at the proposed submerged area are within the allowable limits of QCVN 43:2017/BTNMT - National technical regulation on sediment quality, applicable to sediment in saline and freshwaterResults.

➢ ***Results of biological sample analysis in the submerged area Results***

**** Phytoplankton***

At the time of the survey, 26 species of phytoplankton belonging to 12 families and 3 divisions of algae (Cyanophyta, Bacillariophyta, and Pyrrophyta) were identified at the monitoring sites. The predominant species were Aulacoseira sp. and Nitzschia sp., which accounted for 43.06% of the total cell density at the survey locations. The distribution of phytoplankton was relatively uniform across the survey sites, with an average density of 49,461 cells/L per site.

Table 2.27 Phytoplankton density at survey locations

Scientific Names	NC-SH1	NC-SH2	NC-SH3	NC-SH4	NC-SH5
Cyanophyta (Blue-green algae)	5720	5350	5110	5150	5930
Bacillariophyta (Diatoms)	36340	36290	36080	34600	36935
Pyrrophyta (Dinoflagellates)	8150	8350	7290	7680	8330

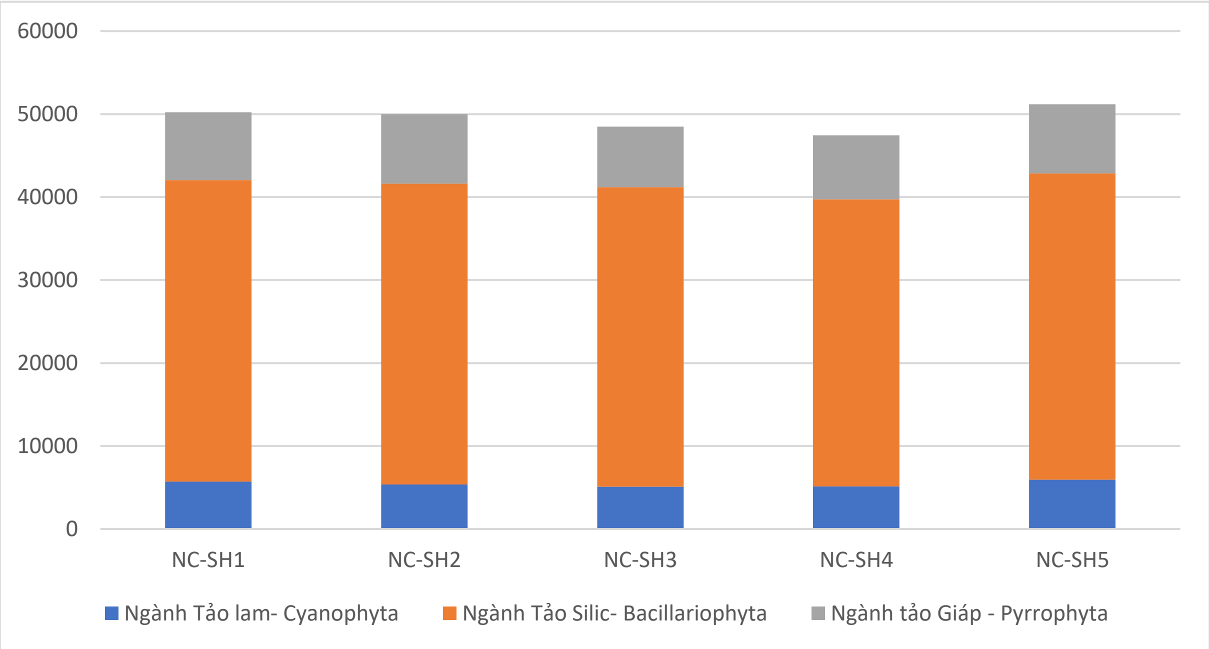


Figure 2.27 The proportion of phytoplankton density surveyed at submerged locations

**** Zooplankton***

At the time of the survey, 26 species of zooplankton were identified at the monitoring sites, with the majority comprising 20 species belonging to the classes Copepoda, Appendicularia, Hydrozoa, and 6 species belonging to other groups. Among them, Macrosetella sp. was the predominant species, accounting for 32.89% of the total cell density at the survey locations. The zooplankton density in this area was evenly distributed across the monitoring sites, averaging 20,614 cells/L per site.

Table 2.28 Zooplankton density at submerged locations

Scientific names	NC-SH1	NC-SH2	NC-SH3	NC-SH4	NC-SH5
Subclass Copepoda	18010	16140	17030	17350	17900
Class Appendicularia	820	1000	1100	720	1000
Class Hydrozoa	1600	1500	2000	1300	1500
Other groups	802	812	740	920	830

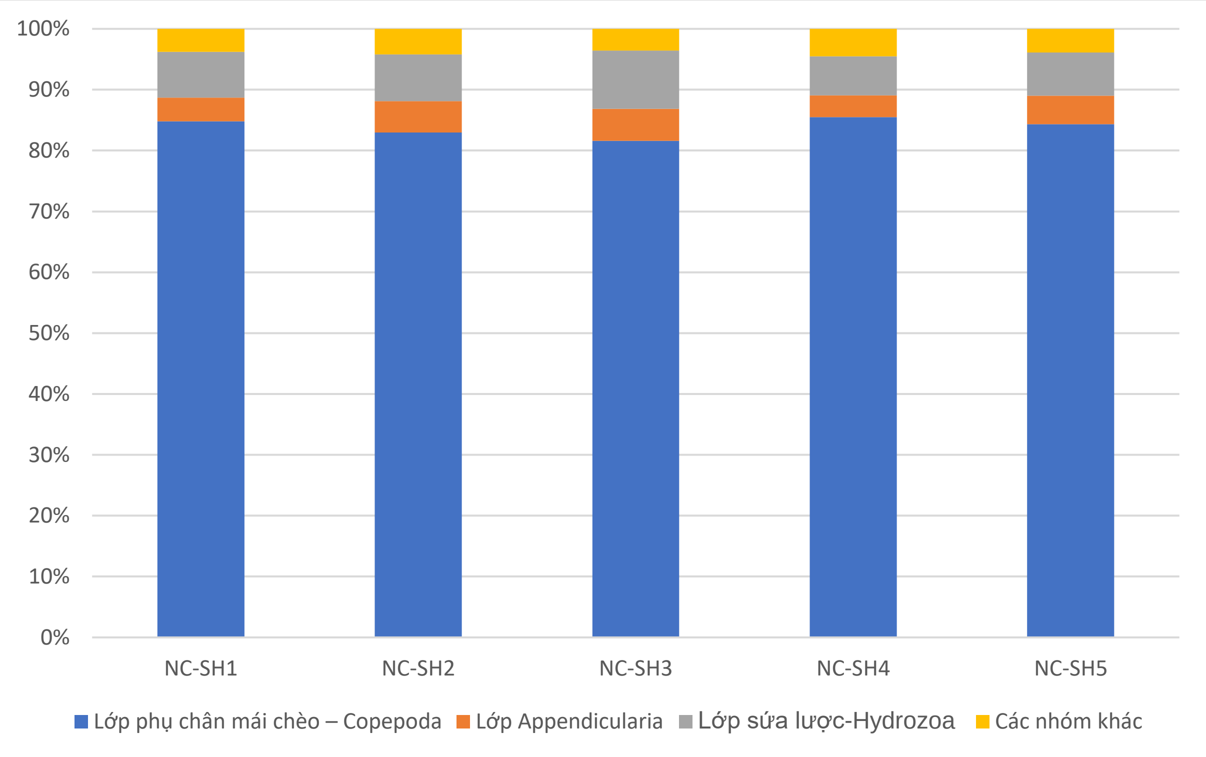


Figure 2.28. The proportion of zooplankton density surveyed at various locations.

* ***Benthic animals***

The survey results obtained at the sampling location, at the time of observation, revealed relatively low diversity of benthic animals in this area. Only 5 species of benthic animals belonging to the classes Polychaeta and Echinoidea were found, with the majority of species belonging to the class Polychaeta:

Table 2.29 Survey results of benthic animals in the submerged area

No.	Scientific names	Unit	Result				
			NC-SH1	NC-SH2	NC-SH3	NC-SH4	NC-SH5
	Class POLYCHAETA						
	Family Lumbrineridae						
1	***Species Lumbrinereis sp.***		40	25	36	35	30

	Family Glyceridae						
2	***Species Glycera sp.***		10	20	16	20	25
	Family Paralacydociidae						
3	***Species Paralacydonia paradoxa Fauvel, 1913***		10	20	10	30	10
	Family Nephtyidae						
4	***Species Aglaophamus sp.***		10	15	15	20	15
	Class ECHINOIDEA						
	Family Fibulariidae						
5	***Species Fibularia sp.***		10	20	24	14	15

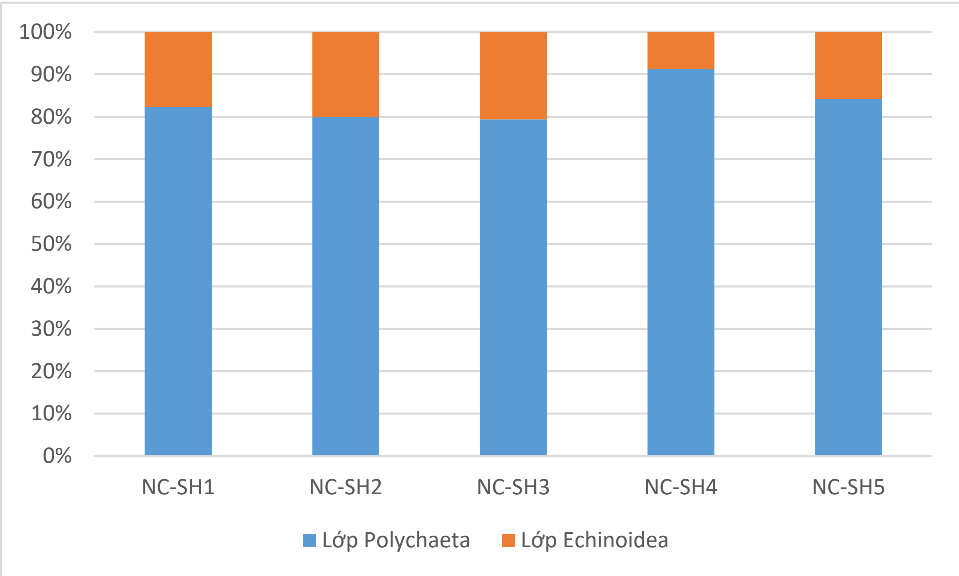


Figure 2.29 Density porportion of benthic animals in the submerged area

2.2.2. Current status of biodiversity

2.2.2.1. Current status of biodiversity in the area where the plant will be built on shore and in the coastal sea

The assessment of the current state of the project's biological environment is carried out based on the inheritance of research documents assessing the current ecological status of the project area in the EIA report of the Vung Ang II Thermal Power Plant Project (approved by the Ministry of Natural Resources and Environment in 2011, 2015,208) and combined with the results of additional field surveys in July 2023.

The project area is located in the coastal ecological zone of Ha Tinh. Ha Tinh coastal marine ecological zone extends over 137 km, with four large estuaries: Cua Hoi (Nghi Xuan district), Cua Sot (Thach Ha, Loc Ha districts), Cua Nhuong (Cam Xuyen district) and Cua Sot (Thach Ha, Loc Ha districts). Khau (Ky Anh district). In these areas, the exchange between two water sources (salt water from the sea and fresh water from inland rivers and streams) creates a diverse, unique ecological region with high biodiversity. Along the shore, there are mangrove plants living in ridges, clumps, mats, etc., which are the residence, living activities, and interactions of many animal species such as fish, crustaceans, bivalves, etc. .

The composition of aquatic organisms in coastal waters has not been focused on research. Initial data on the composition of coastal fish species in Ha Tinh province (Proceedings of the 7th National Scientific Conference on Ecology and Biological Resources, Vo Van Phu and Bien Van Quyen, 2017), has determined The presence of 151 species, belonging to 103 genera, 64 families and 15 orders. Among them, Perciformes is the most dominant with 89 species (58.94%), 57 varieties (55.34%), 33 families (51.56%), followed by Herring and Flounder. ,... Favorable physicochemical properties have created conditions for groups of floating organisms to thrive, leading to high biodiversity and a rapid increase in biomass of species. That is a rich source of aquatic resources, a lever to promote the development of coastal exploitation, fishing and aquaculture, thereby improving income and livelihoods for people in the region (Biodiversity Conservation Planning in Ha Tinh province until 2020 and orientation to 2030).

The expected implementation location of the Vung Ang II Thermal Power Plant Project is mainly in the area behind Vung Ang Bay and the flat land north of the Quyen River. Observations during the field trip showed that the study area has habitats including terrestrial habitats, freshwater habitats and marine habitats.

Terrestrial habitat in the study area, the backshore vegetation of Vung Ang Bay is mainly undiverse trees and sparse vegetation along the coast. South of Vung Ang Bay and south of Cao Vong Mountain are arable land for growing seasonal rice and fallow land (seaweed and grass). At the foot of Bo Can Mountain, Cao Vong Mountain and Sang Mountain are sparse forests, grass and shrubs growing on the slopes. These habitats are located near Hai Phong village and Tay Yen village, which will be affected by the project. This area has no coastal aquaculture activities.

Freshwater habitats include rivers, streams and ponds mixed with terrestrial habitats. The main freshwater systems in the Vung Ang Bay area are Quyen River and Kinh River (1.9 km and 4 km from the South and Northwest of the project area, respectively), there are also many streams and lakes such as Lo Dong artificial lake.

The habitat of the biological system in Vung Ang Bay is shallow, quite turbid and has sediment. Primary coastal habitats include estuaries and sandy and rocky shorelines. The development of Vung Ang Bay and human activities such as aquaculture, expanded agriculture, settlement and commercial industry (crushing factories) have affected these habitats.

The port of Vung Ang II Thermal Power Plant is located between the port location of Vung Ang 1 Thermal Power Plant and Vung Ang Seaport. The area where the port is expected to be built is coastal waters intended for industrial use, with a depth of about -17m.

Published research results, combined with a survey of the current status, show that the study area has environmental habitats including plantations, shrubs, grasslands, shrubs and grasslands, freshwater areas, streams, Cultivated land, villages/orchards and bare land areas.

There are about 150 plant species recorded in the study area. There are 116 plant species in the Project area, 71 species in the proposed ash dump area.

Plant species in the Project area and diverse terrestrial habitats include popular species such as Pinus merkusii, Eucalyptus sp, Acacia auriculaeformis, Casuarina equisetifolia; the shrub Melastoma septemnervium and the grass Cynodon dactylon. These species are commonly found in developed rural areas and disturbed habitats. There are no species in the study area that need to be conserved according to Vietnamese and international regulations.

Table 2.30 Common plant species recorded in terrestrial habitats in the Project area

NO.	Family	Species	Status in Vietnam
1	SCHIZEACEAE	Lygodium flexnosum	V
2	PINACEAE	Pinus merkusii	C
3	MIMOSACEAE	Acacia auriculaeformis	V
4	FABACEAE	Desmodium triflorum	V
5	MYRTACEAE	Eucalyptus tereticornis	V
6	ASTERACEAE	Eupatorium odoratum	V
7	EUPHORBIACEAE	Euphorbia hirta	V
8	TILIACEAE	Grewia paniculata	C
9	VERBENACEAE	Lantana camara	V
10	SCROPHULARIACEAE	Limnophila aromatic	V
11	MELASTOMACEAE	Melastoma sanguineum	V
12	MYRTACEAE	Syzygium bullockii	M
13	MYRTACEAE	Syzygium cumini	C
14	COMMELINACEAE	Commelina diffusa	V
15	COMMELINACEAE	Commelina paludosa	V
16	POACEAE	Cynodon dactylon	V
17	POACEAE	Dactyloctenium aegyptiacum	V
18	POACEAE	Eragrostis brizoides	V
19	ONAGRACEAE	Hygroryza aristat	V
20	PANDANACEAE	Pandanus tonkinensis	C

**Status in Vietnam: V = Very common, C = Common, M = Less common, R = Rare*

Source: Ecological environment survey report, 2013, 2014, 2017.

Most of the habitat in the study area is arable land and cropland. Artificial habitats or degraded natural habitats have limited plant diversity and complex structures.

Vung Ang II Thermal Power Plant area: The plant is under construction so there is almost no vegetation, the only common weeds in the area are penetrating grass, simplex, waterpipe grass, chicken grass... around.

Ash disposal area Phase 1: The ash disposal is under construction so there is almost no vegetation, only weeds and shrubs around.

Ash disposal area Phase 2: The ash disposal is located in a part of the field area of Hoa Loc village, Ky Trinh commune. The vegetation here is mainly artificial vegetation, poor in number of families and species (rice, shrubs and weeds). The ash and disposal area is located on agricultural land, at the time of the investigation the entire agricultural area had been harvested.

In addition, there are also common natural plants that grow around the edges of plots or along village roads and abandoned land areas. Shrubs also appear and grow in abandoned land areas. Of this species, there are plants of the castor bean family, kumquat, and iridescent plants that grow strongly. Thorny vines, such as lobster hooks, also appear. In addition, there are also common plants here, which are grasses growing around the edges of plots or along village roads and abandoned land areas. Shrubs also appear and grow in abandoned land areas. Of this species, there are plants of the castor bean family, kumquat, and iridescent plants that grow strongly. Thorny vines, such as lobster hooks, also appear.

Project construction site area: Temporary construction yards are located in areas surrounding the plant construction area to facilitate construction. Construction yards have been built, in addition, bushes and grass grow along the edges of fields and rivers.

Topsoil dumping area: In general, like the plant construction area, the vegetation here is also poor in species and affected by humans without high ecological value: mainly just weeds and surrounding shrubs.

2.2.2.2. Current status of biodiversity in the project coastal area

Refer to the October 2017 survey results of the Aquatic Resouces Research Institute in the coastal areas of 4 provinces: Ha Tinh, Quang Binh, Quang Tri and Thua Thien Hue. The results of the current status of biodiversity in the submerged area are as follows:

a. Ecological Habitat Distribution Status

The comprehensive synthesis and analysis of the ecological habitat distribution status indicate that the project area, including the dredging and sediment disposal areas, and the transportation routes, do not overlap with specialized ecosystems such as coral reefs, seaweed beds, or submerged rocky habitats. The overall diagram of adjacent ecological habitats around the project area is illustrated in the figure below.

Upon further examination within a radius of 150km from the project center, two main ecological habitats exist: coral reef ecosystems (7 regions) and submerged rocky habitats (1 region). It is noted that the closest distance from the project's submerged disposal area to the nearest coral reef ecosystem is approximately 23km. For the submerged rocky habitat, it is located about 120km away from the project area, with no seagrass ecosystems observed within this radius.

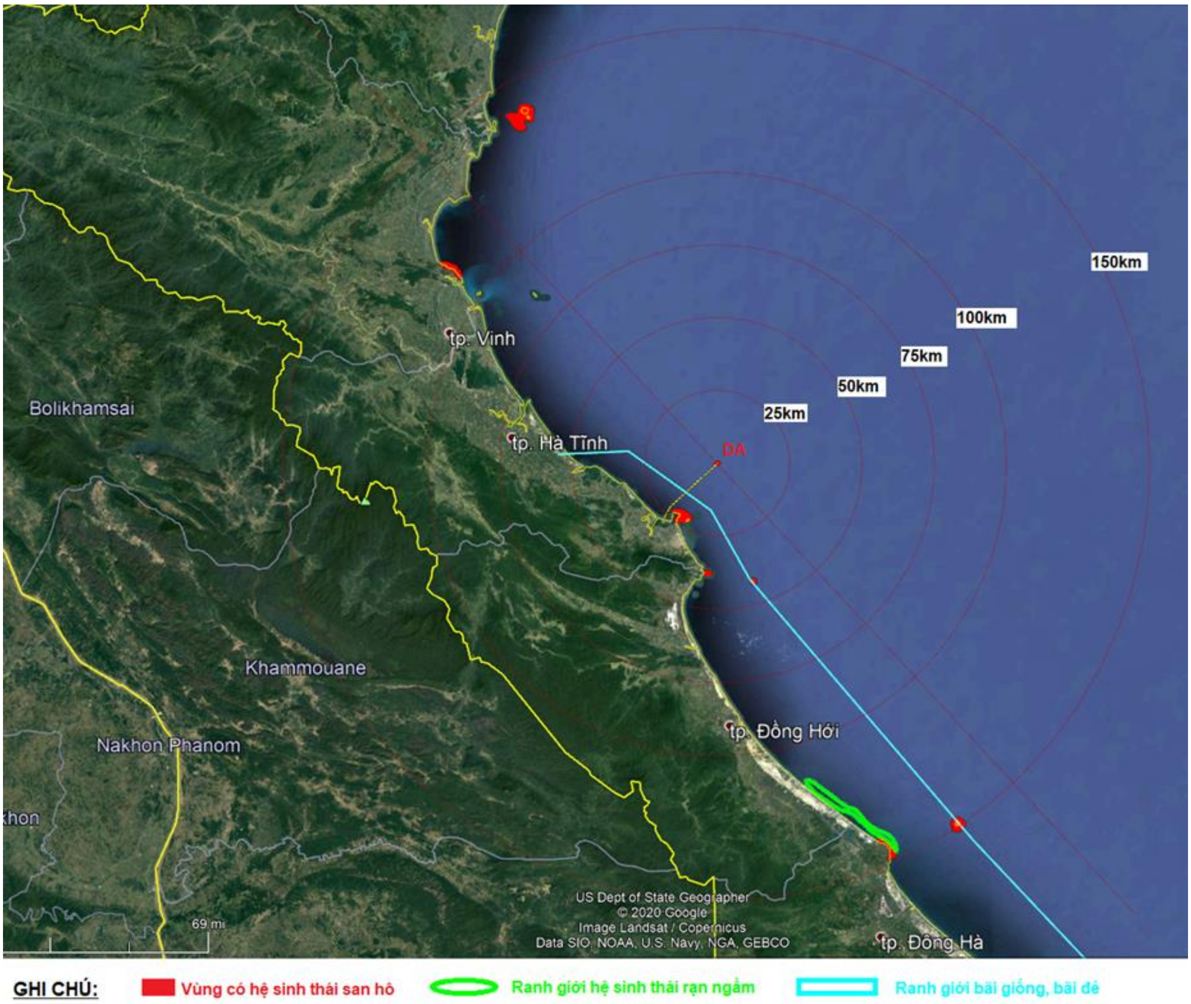


Figure 2.30. Diagram of specialized ecological habitat distribution adjacent to the project area

➢ ***Current Status of Coral Reef Ecosystem***

According to research conducted by UNICEP - 2010 and data collected by the Institute of Marine Research, the dredging, sediment disposal, and transportation routes of the project are confirmed not to intersect with coral reef ecosystems. However, nearby the project area, coral reef habitats have been identified at locations such as Hon Con Chim, Hon Son Duong, and Mui Dung. These areas are situated at varying distances from the dredging site, ranging from 5km to 30km, and from the disposal site, with the closest being 23km towards the shore.

The coral reef at Hon Con Chim exhibits the lowest diversity of hard coral species (24 species), followed by Chan May (25 species). Hon Son Duong, Hon La, and Hon Nom harbor between 32 to 37 coral species. The coral reefs at Con Co and Hai Van - Son Cha are the most species-rich, with 101 and 98 species respectively.

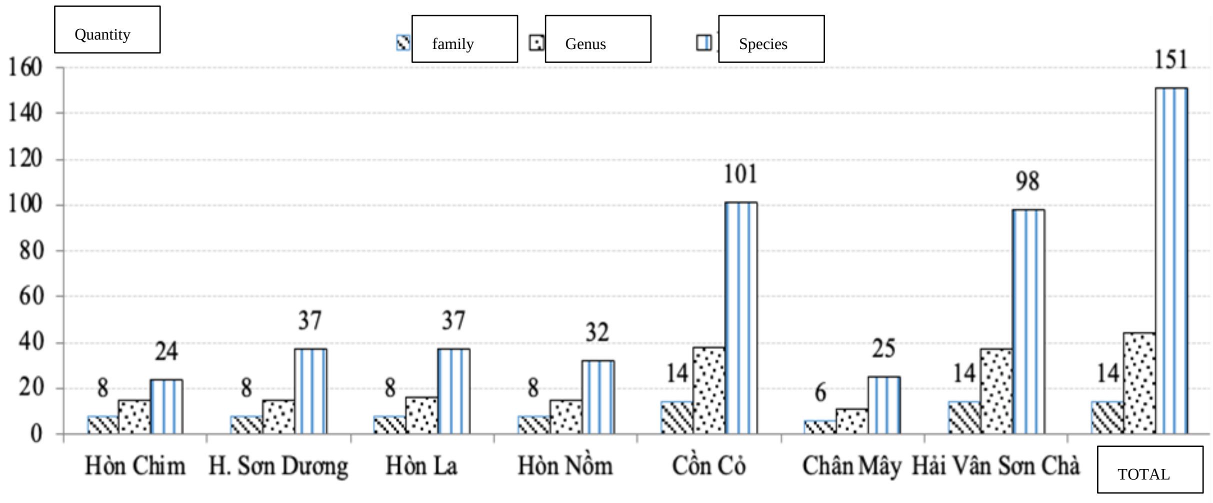


Figure 2.31. Diversity of hard coral reef species at specilized area

Evaluation of reef quality using the 5-tier scale by English et al. (1997) indicates that Hon Son Duong and Hon Con Chim have reefs classified as poor quality (covering 1-10% area). The best live coral coverage was observed at Con Co Island (40.73%), indicating a relatively healthy reef status. Other areas showed moderate reef quality, with coverage ranging from 17.81% to 20.69%. Overall, coral coverage at Hon Con Chim and Hon Son Duong is notably low.

Among the coral reefs in the Ha Tinh coastal area, Hon Con Chim and Hon Son Duong are relatively small, covering 1.5 hectares and 5.5 hectares, respectively.

Hon Son Duong features mainly rocky substrates with significant slopes. The coral distribution is sparse, with low coverage, short and narrow reefs. This area, located south of the island, exhibits severe degradation following a past incident, with coral coverage as low as 5.06% and no signs of recovery noted, including ongoing bleaching incidents. The highest coverage area in Son Duong is found in the northern and eastern parts (15.09% coverage), though still with short and narrow reefs. Other areas have an average coverage of 7.72%, with a total of 37 coral species recorded in Hon Son Duong, dominated by 18 species in the northern part and fewer (10 species) in the southern part.

Hon Con Chim shares a similar terrain to Hon Son Duong, characterized by sparse coral distribution, short and narrow reefs. The reefs here are currently developing normally without impact from incidents. The coverage is approximately 14.25%, with predominant coral species such as Favia, Favidae, and Poritidae. A total of 24 coral species have been recorded at Hon Con Chim.

Table 2.31 Characteristics of coral reef distribution in Ha Tinh, Quang Binh

Location	Reef zone	Representative Section	Coral coverage (%)	Number of species	Distribution characteristic	Distribution (ha)
Hòn Con Chim	North, South	HC1, HC2	14,2	24	Non-concentrated	1,5
Hòn Sơn Dương	South of Son Duong	SD1	5,1	10	Concentrated, heavily degraded	5,5
	North of Sơn Dương	SD2	15,1	18	Non-concentrated	
	Other areas	SD5, SD6, SD3	7,7		Non-concentrated	

(*Source: Survey results from October 2017 - Institute of Marine Research*)

➢ ***Seagrass and seaweed resources***

According to research conducted by the Institute of Marine Research, no seagrass resources were found within the project area, including the dredging and sediment disposal zones, and transportation routes. Seagrass resources were identified in areas approximately 15km southeast from the project's dredging zone, specifically:

At Hon Son Duong and Hon Con Chim. The number of species recorded in each area was 8 species and 7 species, respectively. The survey sections along Hon Son Duong recorded fewer seagrass species, primarily Lobophora and Peyssonnelia, mostly distributed at depths of 7m and adhering to rocks or dead coral fragments. Generally, seagrass distribution in both areas is sparse, with small patches measuring less than 5cm in size.

➢ ***Reef ecosystem***

Although reef play a crucial role in the ecosystem, the closest location is situated far from the construction area, approximately 120-150km away. Therefore, this report does not include a detailed analysis of the current status or impact of the project on reef ecosystem.

b. Density of resource distribution

➢ ***Species Composition***

The Institute of Marine Research conducted a survey in October 2017 across four provinces: Ha Tinh, Quang Binh, Quang Tri, and Thua Thien Hue. They identified 129 species of marine organisms, categorized into different groups: 11 species of pelagic fish (8.33%), 26 species of reef-associated fish (19.7%), 45 species of typical bottom-dwelling fish (34.09%), 39 species of crustaceans (29.55%), 5 species of cephalopods (3.79%). Among these, the shrimp family (Penaeidae) had the highest number of species (21 species; 16.28%), followed by swimming crabs (9 species; 6.98%) and groupers (7 species; 5.43%). Other families had only 1 or 2 species each.

➢ ***Yield composition***

The majority of the yield composition came from typical bottom-dwelling fish (58.1% in terms of yield and 52.07% in terms of quantity), followed by reef-associated fish (18.4% yield and 9.34% quantity), crustaceans (3.45% yield and 33.54% quantity), and cephalopods (6.6% yield and 3.83% quantity). Pelagic fish contributed minimally to both yield (3.14%) and quantity (1.05%).

At the family level, the highest yield was from lizardfish (Synodontidae), followed by ponyfish (Leiognathidae), penaeid shrimps (Penaeidae), barracudas (Sphyraenidae), and squid (Loliginidae). There were 11 families contributing more than 2% of the yield and 53 families contributing less than 1% of the yield.

➢ ***Density distribution of resources***

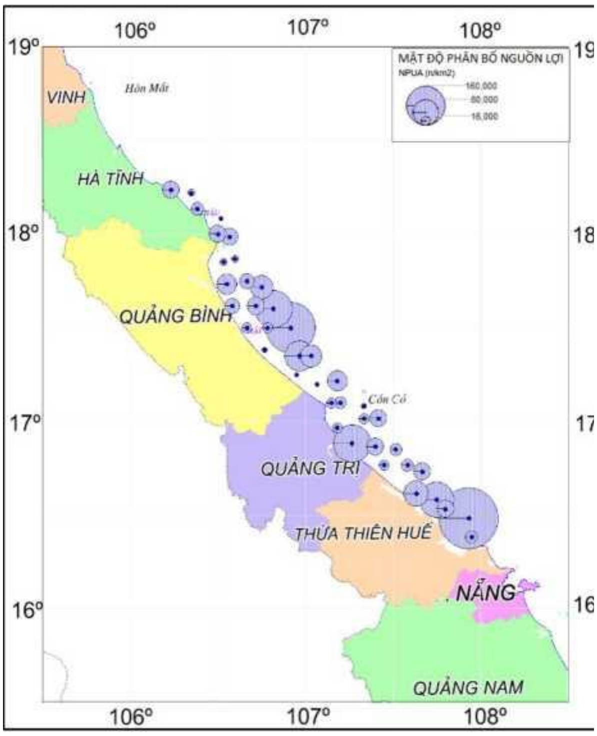


Figure 2.32. The density distribution of aauqtic resources (individuals/km2).

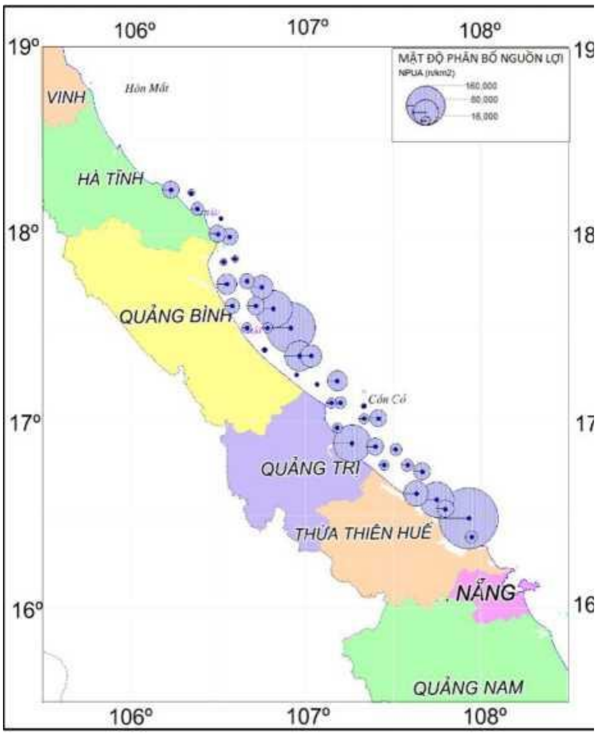


Figure 2.33. The density distribution of bottom-dwelling fish (individuals/km2).

Survey results in October 2017 show that the average distribution density of aquatic resources is about 268 kg/km2, corresponding to about 24,033 individuals/km2 (Table). Among them, the highest density is the typical bottom fish group with 158 kg/km2 (12,501 individuals/km2). Groups of reef fish (43 kg/km2, 2,242 individuals/km2) and crustaceans (39 kg/km2, 8,082 individuals/km2) also contribute a large proportion to the density of marine resources. Small pelagic fish group (9.1 kg/km2, 252 individuals/km2), cephalopod group (19.2 kg/km2 and 918 individuals/km2) and mollusk group (0.8 kg/km2 and 43 fish bodies/km2) accounts for a very low proportion.

- ***The current status of aquatic ecosystem***

According to the October 2017 survey conducted by the Institute of Marine Research:

- The average density of fish eggs recorded in October 2017 was 1,135 eggs/1000m3 and 203 juvenile fish/1000m3, higher than in October 2016 (482 eggs/1000m3 and 24 juvenile fish/1000m3) but still lower than before the incident.

- The average density of shrimp larvae was 1,573/1000m3 and 280 juvenile shrimp/1000m3, lower than in October 2016 and significantly lower than before the incident - in October 2015, it reached an average of 2,572 larvae/1000m3 and 1,359 juvenile shrimp/1000m3.

Marine shrimp are bottom-dwelling organisms with little migration, whereas most fish species exhibit migratory reproduction. Therefore, the distribution density of the shrimp group has not increased compared to before the incident, which may indicate that the environmental impact of the incident still persists for the bottom-dwelling aquatic in this area

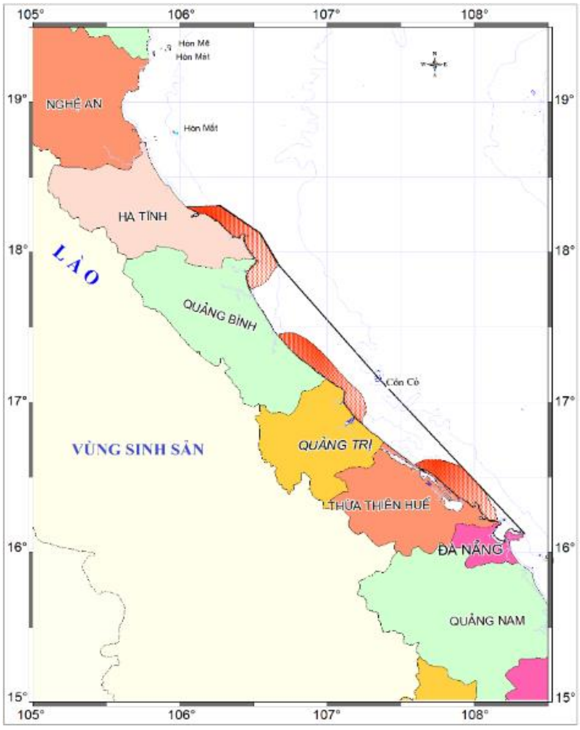
The analysis of the size of 1,262 specimens of shrimp larvae and juveniles from 8 species/groups of 2 typical economically important shrimp families revealed the following: In the family Penaeidae, the size of shrimp larvae is typically smaller than 4 mm, except for the species Parapenaeopsis tenella, which has larger larvae with a size of 9.36 mm. The average lengths of larvae of 6 economically important shrimp species/groups are all less than 2.5 mm, specifically reaching 1.27 mm (Atypopenaeus stenodactylus), 1.46 mm (Penaeus spp.), 1.49 mm (Metapenaeopsis barbata), 1.65 mm (Metapenaeopsis spp.), 2.02 mm (Parapenaeopsis spp.), and 2.45 mm (Parapenaeopsis tenella). In the family Palaemonidae, the size of encountered shrimp larvae ranges from 0.25 to 3.61 mm. Considering individual species, the average length is 1.48 mm for Leptocarpus potamiscus and 1.00 mm for species of Leander spp.. Shrimp are a group of aquatic animals living on the seabed and are often very sensitive to their environment.

The presence of small-sized fish and shrimp larvae in this area is evidence that it is a spawning ground and a natural nursery for fish and shrimp species in the four provinces of Central Vietnam.

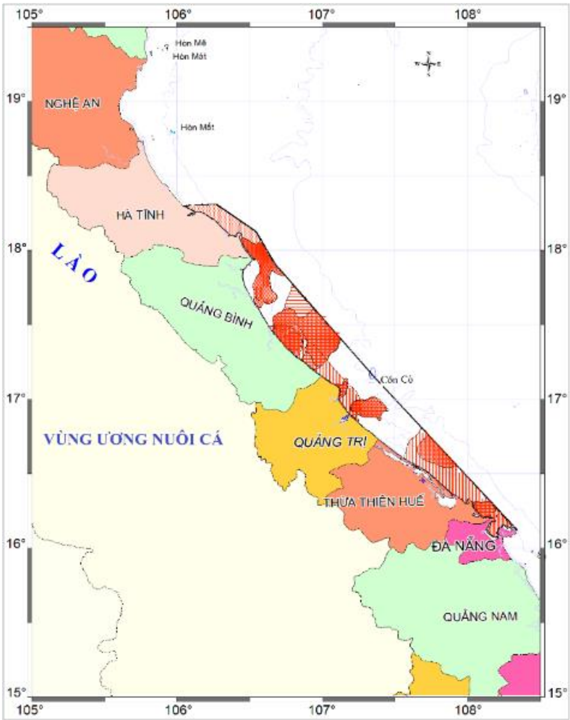
- ***Spawning and seedbed zoning***

The main spawning grounds for fish and shrimp in the coastal area from Ha Tinh to Thua Thien Hue are concentrated in three main areas: (1) the border area between Ha Tinh and Quang Binh; (2) the border area between Quang Binh and Quang Tri; and (3) the coastal area south of Thua Thien Hue province.

After the spawning season, juvenile fish and shrimp spread to adjacent areas, but the focus remains on the areas surrounding the main spawning grounds.

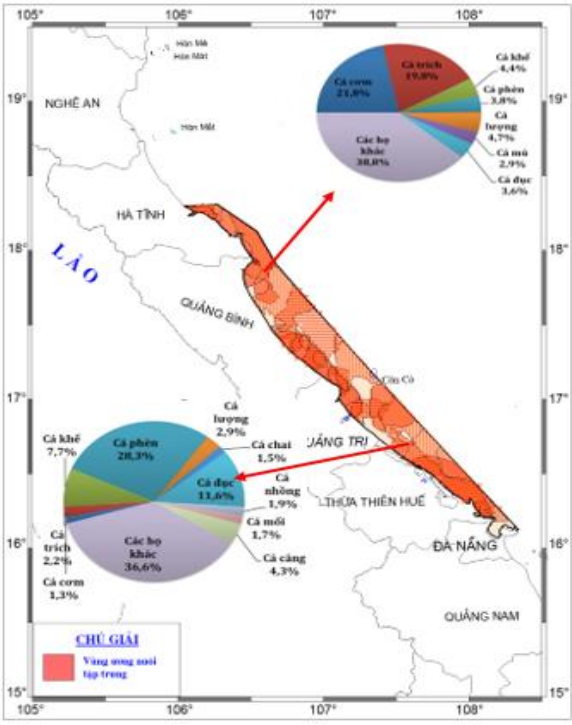


a. Spawning area



b. Seed breeding area for fish

c. Seed breeding area for shrimp



d. Integrated diagram of spawning and seed breeding areas for fish and shrimp

Figure 2.34 Spawning and seed breeding areas for aquatic resources in the researched marine area

Figure 2.35 Correlation between the dredging and dumping area of the project and the marine fisheries resource protection area from Cam Linh Commune to Ky Xuan Commune

The dredging area of the Project is approximately 8.5 km south of the marine fisheries resource protection area from Cam Linh Commune to Ky Xuan Commune.

The dumping area of the Project is approximately 12.9 km east of the marine fisheries resource protection area from Cam Linh Commune to Ky Xuan Commune.

2.3. Impacted objects and sensitive environmental factors in the project implementation area

- Coastal waters surrounding the dredging and submerging construction sites of the project
- Current residential area in Hai Phong village and Tay Yen village near the project

2.4. Suitability of the selected location for project implementation

The Vung Ang II Thermal Power Plant project, under the Vung Ang Power Center, is being implemented in the context where the Vung Ang Petrochemical Complex (VAPCO) has essentially handed over the "clean" land according to the land lease contract agreed upon between the Provincial Management Board of Economic Zones of Ha Tinh Province and VAPCO (with only the area of ash and ash residue in phase 2 to be handed over later depending on the actual conditions, which may reduce the volume of ash and waste by recycling and appropriate utilization according to legal regulations). The activities related to land clearance for the Vung Ang II Thermal Power Plant project have been coordinated between the People's Committee of Ky Anh town and the Provincial Management Board of Economic Zones of Ha Tinh Province. In the clearance area, there are no public works, cultural or historical sites, religious sites, or security-defense areas, and no plant or animal species listed in the red list requiring conservation or preservation within the project's land area. There are no households living on the entire land area occupied by the project. Resettlement and relocation issues do not arise for the project. The support, compensation, and resettlement policies for the project are established based on the current policies of the state and Ha Tinh province.

The intended location for the construction of the main plant of the Vung Ang II Thermal Power Project is situated in Hai Phong hamlet, Ky Loi commune, Ky Anh town, Ha Tinh province, under the Vung Ang Economic Zone. The investment in the Vung Ang II Thermal Power Project is based on the adjustment of the Seventh Electricity Planning, aligned with the overall planning of the Vung Ang Power Center. The feasibility study and investment plan for the Vung Ang II Thermal Power Project are also in line with Decision No. 1076/2007/QD-TTg approving the master plan for the construction of the Vung Ang Economic Zone, Ha Tinh province until 2025, issued by the Prime Minister on August 20, 2007, as well as in accordance with the overall socio-economic development planning of Ky Anh town and Ha Tinh province until 2020, with a vision to 2050, approved in Decision No. 1363/QD-TTg dated November 6, 2022 by the Prime Minister. The site selection for the Vung Ang II Thermal Power Project has been assessed during the site planning phase of the Power Center. In general, the selection of the site for the Vung Ang II Thermal Power Project has been carried out to optimize natural environmental conditions, socio-economic factors, and to minimize the negative impact on the natural environment, biodiversity, and socio-economic development.

Regarding the current environmental status, according to the results of the environmental status analysis in the area, as presented in section 2.2.1 of Chapter 2 of the report, the overall quality of the environment is relatively good, with no signs of pollution.

In terms of socio-economic aspects, the project area falls within the Vung Ang Economic Zone, which has been approved by Decision No. 1076/QD-TTg of the Prime Minister on August 20, 2007 regarding the approval of the general construction planning of the Vung Ang Economic Zone, Ha Tinh province until 2025 (Appendix MD04). The surrounding area has an available transportation infrastructure of Ky Anh town, which is well connected to Highway DT24 and National Highway 1A. The completion of the port area of Vung Ang 1 Thermal Power Plant has facilitated the transportation of raw materials during the construction of the project.

=> Therefore, the selected location for the project implementation is suitable in terms of natural, socio-economic, and environmental aspects. However, during the construction process and subsequent operation of the main plant and associated facilities, serious attention should be paid to the environmental issues arising from the project.

CHƯƠNG 3. ASSESSMENT AND FORECAST OF ENVIRONMENTAL IMPACT OF THE PROJECT AND PROPOSAL OF MEASURES AND WORKS FOR ENVIRONMENTAL PROTECTION AND RESPONSE TO ENVIRONMENTAL INCIDENTS

3.1. Impact assessment and proposal measures and works for environmental protection during the construction phase

3.1.1. Assessment and prediction of impacts

The Vung Ang II BOT Thermal Power Plant project is currently carrying out construction activities on the main plant site as per the Environmental Impact Assessment (EIA) approved in 2018. As of May 31, 2024, approximately 77.73% of the total work volume has been completed. After this EIA is re-established, the project will continue to complete the construction of the main plant, as well as dredging and offshore dumping activities.

The main sources of impact during the construction process are summarized in the table below:

Table 3.1. The main sources of waste generation during the construction process

No.	Source	Waste generation			Unrelated to waste	
		Dust and exhaust gases	Wastewater	Solid waste		
I. Construction of onshore components						
1	Implementing the first phase of the ash disposal site area floor construction	Dust, SO_2, CO, NO_2, VOC				The assessment of the impacts of these activities basically remains unchanged compared to the evaluations approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018. Additionally, the results of environmental quality monitoring during the construction phase from 2021 to the present indicate that no environmental issues have arisen in the project area, and no other
2	Transporting construction materials	Dust, SO_2, CO, NO_2, VOC			Noise pollution	
3	Constructing various plant components	Dust, SO_2, CO, NO_2, VOC	Wastewater	Construction waste	Noise, vibrations, ecosystem, animals, plants	
4	Operating construction machinery and equipment	Dust, SO_2, CO, NO_2, VOC	Wastewater	Waste oil and grease	Noise, ecosystem vibrations, animals, plants	
5	Transporting construction waste	Dust, SO_2, CO, NO_2, VOC	Wastewater from machinery and equipment cleaning	Waste oil and grease	Noise, vibration, increased traffic density.	

No.	Source	Waste generation			Unrelated to waste	
		Dust and exhaust gases	Wastewater	Solid waste		
6	Flushing pipelines and steam systems before test operation		Wastewater	Waste sludge	Pollution of the water basin receiving wastewater	incident risks have occurred (the results of the fourth quarter 2023 monitoring are presented in Section 2.2.1.1. Current Environmental Data through Periodic Monitoring Results during the Construction Phase). Therefore, no reassessment is conducted in this report.
7	Gathering workers on the construction site		Domestic wastewater.	Household solid waste	Increasing the consumption of food, groceries, and essentials for staff, construction workers, affected households, and increasing traffic density.	
III. Constructing different marine infrastructure projects						
1	Bridge system and coal port construction on the sea	Dust, CO, NO_2, SO_2, VOC	Wastewater	Construction waste	Noise, marine environment, waterway traffic	No changes compared to the assessments approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018; therefore, they are Not assessed in this Report.
2	Dredging of the water area in front of the wharf and the turning basin, the	Dust, CO, NO_2, SO_2, VOC	Wastewater	Dredged material, waste oil and grease,	Noise, marine environment, waterway traffic, suspended solid dispersion	Details will be evaluated in sections 3.1.1.1 and 3.1.1.2 below.

No.	Source	Waste generation			Unrelated to waste	
		Dust and exhaust gases	Wastewater	Solid waste		
	water area serving the connection of the navigation channel, the cooling water intake channel, the cooling water discharge channel, and the handling of dredged material			domestic solid waste		

3.1.1.1. Environmental impacts related to waste

a. Impact due to wastewater;

The construction process will impact the seawater quality in the project area. The primary pollution sources include domestic wastewater from construction workers, overflow from dredged material holding tanks on transport vessels, impact due to the increased spread of Total Suspended Solids (TSS) and turbidity during dredging and transporting dredged material, and dumping of dredged material, runoff from onshore dredged material storage sites.

- Impact due to domestic wastewater:

✓ *Wastewater from construction workers on shore facilities*

With approximately 3,000 workers currently on the construction site, the generated wastewater primarily comes from sanitary activities, such as washing and cleaning by the workers. There is no cooking or meal preparation on-site. The wastewater composition mainly includes residuals, suspended solids (SS), organic substances (BOD, COD), nutrients (N, P), and microorganisms.

According to Chapter I, the water demand for living activities is 135 m³/day in the construction area.

Wastewater equals 100% of the supplied water (Source: Item a, Clause 1, Article 39 of Decree 80/2014/NĐ-CP), resulting in 135 m³/day of wastewater.

Based on WHO documentation, the pollutant load in domestic wastewater per person per day, if untreated, is as follows:

Pollutant	**Weight (g/person/day)**	**Load (g/day)**	**Average Concentration (mg/l)**	**QCVN 14:2008/BTNMT (Column B)**
BOD5	45 - 54	135,000 - 162,000	2,200	**50**
COD	72 - 102	216,000 - 306,000	3,866.6	**-**
SS	70 - 145	210,000 - 435,000	4,777.7	**100**
Total N	6 - 12	18,000 - 36,000	400	**-**
Ammonia	2.4 - 4.8	7,200 - 14,400	160	**10**
Total P	0.4 - 0.8	1,200 - 2,400	26.7	**-**
Colifom	10^6 - 10^9 MPN/100ml			**5.000MPN/100ml**

Characteristics of domestic wastewater include a high content of suspended solids (SS), organic substances (BOD5), and Coli bacteria. If this wastewater is not collected and treated but discharged directly into the environment, it will cause pollution, affecting the aquatic ecosystem and the health of people using contaminated water.

High concentrations of suspended solids increase water turbidity in the receiving water body, affecting the mobility and feeding of aquatic organisms. Turbidity also impedes sunlight penetration, reducing photosynthesis in deep-water plants and algae.

High concentrations of organic substances (BOD5) decrease dissolved oxygen (DO) levels due to the decomposition process, promoting algal blooms, which can cause eutrophication.

Large numbers of E. coli and other pathogenic bacteria in the water can contaminate food sources like vegetables and fruits when irrigated or washed with this water, leading to serious diseases such as acute diarrhea and cholera.

- Affected subjects: 3,000 workers at the project site, water environment in the project area.

- Impact duration: During the construction phase.

- Impact scope: Coastal water environment around the construction area.

✓ *Wastewater from workers involved in dredging, disposal, and transporting dredged materials onshore*

The amount of domestic wastewater generated varies at different construction sites. Waterborne construction equipment is distributed per vessel.

Table 3.2. Wastewater Generation During Construction

No.	**Construction points**	**Construction Equipment**	**Number of Workers (persons/equipment)**	**Wastewater Generation Rate (liters/person/day)**	**Wastewater Generated (liters/equipment)**	**Number of Equipment**	**Total Wastewater Generated (m^3/day)**
1	**Point 1**	Excavator	2	45	90	2	0.18
		Truck	2	45	90	10	0.90
		Barge	9	45	405	2	0.81
		Clamshell Dredger	6	45	270	1	0.27
		Tugboat	6	45	270	1	0.27
2	**Point 2**	Pumping Station	15	45	675	4	2.70
		Clamshell Dredger	6	45	270	3	0.81
		Barge	9	45	405	8	3.24
		Tugboat	6	45	270	2	0.54

No.	Construction points	Construction Equipment	Number of Workers (persons/equipment)	Wastewater Generation Rate (liters/person/day)	Wastewater Generated (liters/equipment)	Number of Equipment	Total Wastewater Generated (m^3/day)
3	**Point 3**	Excavator	2	45	90	2	0.18
		Truck	2	45	90	5	0.45
		Barge	9	45	405	2	0.81
		Clamshell Dredger	6	45	270	1	0.27
		Tugboat	6	45	270	1	0.27
4	**Point 4**	Excavator	2	45	90	2	0.18
		Truck	2	45	90	5	0.45
		Barge	9	45	405	2	0.81
		Clamshell Dredger	6	45	270	1	0.27
		Tugboat	6	45	270	1	0.27
5	**Offshore dumping construction**	Clamshell Dredger	6	45	270	15	4.05
		Barge	9	45	405	27	10.94
		Suction Dredger	30	45	1,350	2	2.70
		Tugboat	6	45	270	5	1.35
Domestic wastewater from waterborne equipment workers							**28.56**
Domestic wastewater from vehicle and excavator operators							**4.16**
Total							**32.72**

Thus, the total domestic wastewater generated from dredging, dumping dredged materials, and transporting dredged materials to the onshore storage area is 32.72 m^3/day, mainly dispersed across waterborne construction equipment. All waterborne construction equipment is equipped with onboard toilets and wastewater tanks according to the standards set in QCVN 17:2011/BGTVT/SĐ2:2016.

The composition of domestic wastewater includes suspended solids, organic compounds, and microorganisms, which can pollute water, air, and landscapes if not properly treated. According to the WHO emission coefficients for developing countries, the pollutant loads in domestic wastewater are summarized in the following table:

Table 3.3. Pollutant loads in domestic wastewater

Pollutant	**Weight (g/person/day)**	**Load (g/day)**	**Average Concentration (mg/l)**	**QCVN 14:2008/BTNMT (Column B)**
BOD5	45 - 54	32,715 - 39,258	2,200	50
COD	72 - 102	52,344 - 75,154	3,866.6	-
SS	70 - 145	50,890 - 105,415	4,777.7	100
Total N	6 - 12	4,362 - 8,724	400	-
Ammonia	2.4 - 4.8	1,744.8 - 3,489.6	160	10
Total P	0.4 - 0.8	290.8 - 581.6	26.7	-
Colifom	10^6 - 10^9 MPN/100ml			**5.000MPN/100ml**

Domestic wastewater is heavily contaminated with organic matter, nutrients, oil and grease, and pathogenic microorganisms. However, since this wastewater is not concentrated in one place but rather dispersed across each waterborne construction equipment, the project's proponent will implement measures to prevent untreated domestic wastewater from being discharged directly into the surrounding environment. Mitigation measures for pollution impact due to domestic wastewater will be detailed in the subsequent sections of the report.

Affected Subjects: Coastal water environment in the construction area and adjacent areas.

Impact Level and Duration:

Impacting directly the water environment, the ecosystem in the project area, and the dredging material transportation route from the dredging site to the storage area. The impact on the water environment from project activities is considered moderate, causing an increase in TSS and turbidity in seawater only during the short construction period (approximately 65 days) and can be fully controlled by proper construction methods and technically approved construction equipment.

For Domestic Wastewater: Continuous impact during the construction phase. The report assesses that the impact of domestic wastewater generated during construction on the water environment is controllable, with mitigation measures proposed in the following sections of the report.

Domestic wastewater contains residuals, suspended solids (SS), biodegradable organic compounds (BOD5, COD), nutrients (N, P), and microorganisms. From the table above, it is clear that pollutant concentrations exceed QCVN 14:2008/BTNMT standards. If this wastewater is discharged directly into the environment, it will directly affect seawater quality and the surrounding landscape. Therefore, domestic wastewater must be treated before being discharged into the environment. Mitigation measures for pollution impact due to domestic wastewater will be detailed in the subsequent sections of the report.

- Impact due to the spread of suspended sediments during dredging and dumping activities

The project owner has collaborated with consultants to prepare a "Report on the Spread of Suspended Sediments During Dredging and Dumping Activities," utilizing the MIKE 21/3 Coupled model to simulate sediment dispersion during dredging and dumping operations.

Detailed content is presented in Appendix 2.2 of the Environmental Impact Assessment (EIA) report. This summary includes model results showing the dispersion of Total Suspended Solids (TSS) concentrations at three water levels: surface, mid-depth, and bottom. The simulations are based on actual construction phases. Using the construction timeline, the maximum and average dispersion ranges over the entire construction period were analyzed for all scenarios.

For dumping activities, scenarios were developed based on the following criteria:

- Dumping location: Identified according to relevant legal documents.

- Dumping period: Based on local meteorological and hydrological conditions.

- Implementation plan: Technical execution plans during construction, reflected in the average daily dumping capacity.

In this project, the owner proposes a maximum dumping period of 24 months, with approximately 4 months of direct construction time. The remaining time is allocated for preparation, acceptance, handover, and downtime. The dumping location scenario involves an area of approximately 200 hectares, approved for study by the Ha Tinh Provincial People's Committee, located outside the 6 nautical mile zone.

Meteorological and hydrological conditions were analyzed using long-term data, revealing two characteristic wind regimes: the Northeast monsoon and the Southwest monsoon. Therefore, two simulation scenarios were developed based on these regimes. The implementation plan's equipment structure is detailed in Section A.4.2 of the report, with a maximum construction capacity of 27,096 m^3/day.

Additionally, based on initial condition settings, scenarios include both zero baseline and average baseline conditions. From these analyses, four comprehensive scenarios were constructed to evaluate the spatial occupation and impacts of construction under various conditions.

Table 3.4. Combination of Calculation Methods

No	Scenario	Meteorological and oceanographic conditions	Initial TSS Concentration	Daily capacity
1	Scenario 1	Southwest Monsoon Season	0	27,096 m^3/day
2	Scenario 2	Northeast Monsoon Season	0	27,096 m^3/day
3	Scenario 3	Southwest Monsoon Season	Approximately 13 mg/l (average baseline condition)	27,096 m^3/day
4	Scenario 4	Northeast Monsoon Season	Approximately 13 mg/l (average baseline condition)	27,096 m^3/day

The calibration and validation results show that the sediment transport model of the Project has a good Nash index, meets the requirements for simulation prediction, and has high reliability. The model parameter set used for calculations is as follows:

Table 3.5 Model parameter set

Coefficient	Value	Unit
Wind friction (Zch)	0.002555	Dimensionless
Eddy viscosity	0.4	(m^2/s)
Convergence criterion (CFL)	0.8	Dimensionless
Wave breaking coefficient (γ)	0.8	Dimensionless
Ratio coefficient of horizontal diffusion	1.0	Dimensionless
Internal friction angle of sediment (φ)	30	(degrees)
Bottom roughness height	0.15	Dimensionless

The assessment of seawater volume occupancy resulting from the disposal of dredged materials is calculated based on the dispersion levels of the disposed materials, primarily Total Suspended Solids (TSS), in the seawater. The conclusions regarding the seawater volume occupancy are drawn based on two key points: the time during construction when TSS dispersion is at its maximum, and the time when the disposed material has fully settled. The seawater volume occupancy levels for different scenarios are as follows:

+ Scenario 1 – Southwest Monsoon, Baseline Conditions = 0

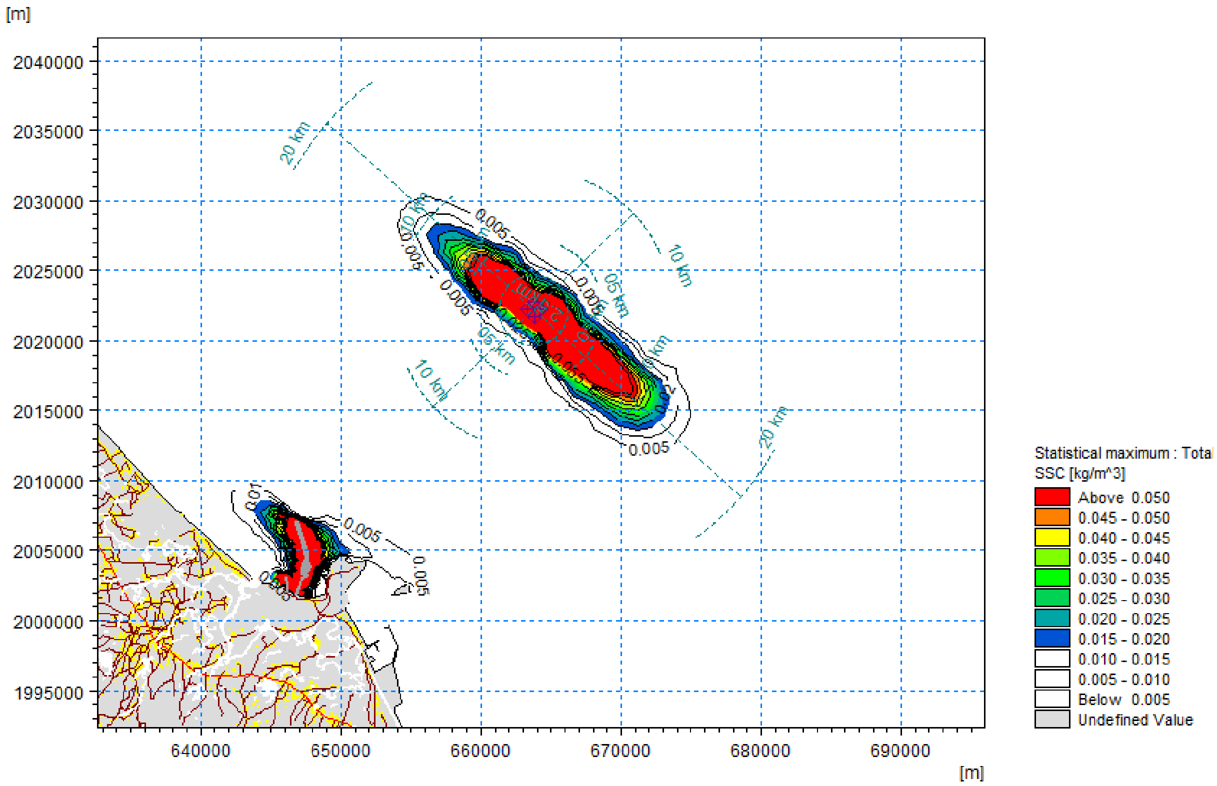


Figure 3.1. Maximum TSS Field over the entire construction period at the bottom layer

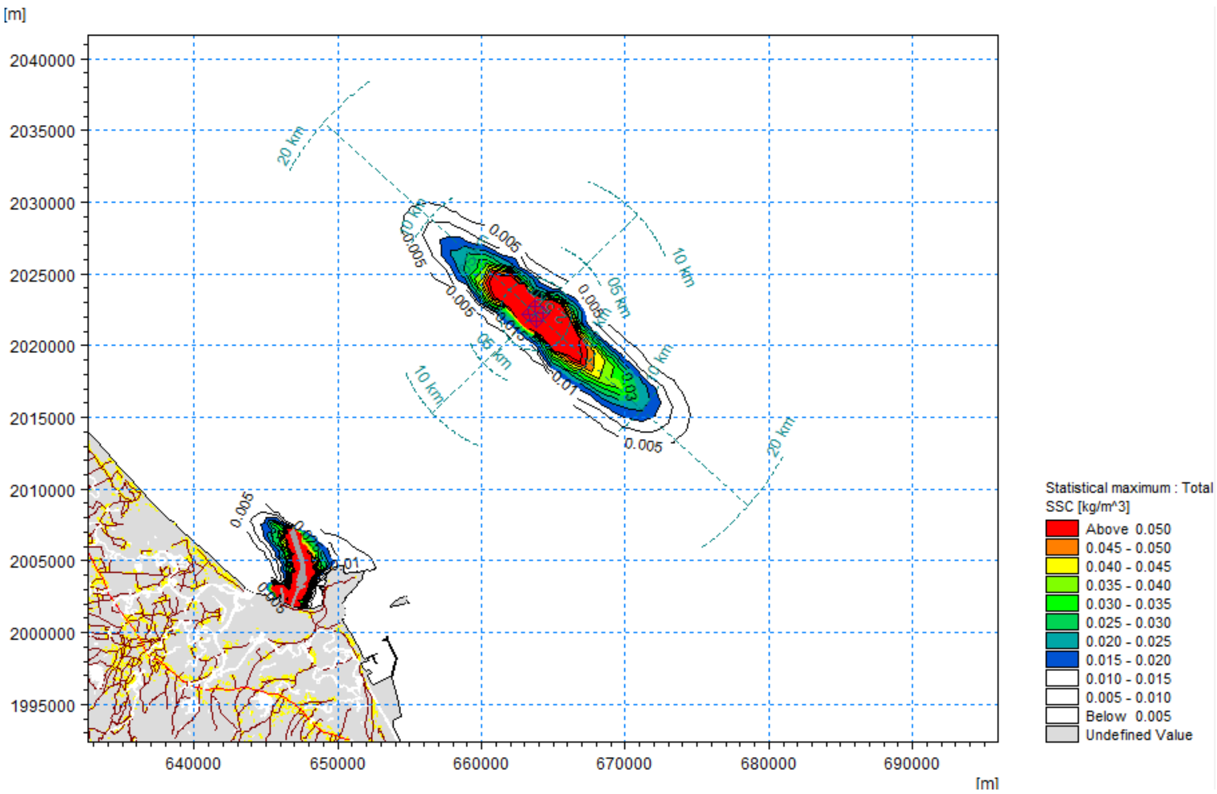


Figure 3.2. Maximum TSS Field over the entire construction period at the middle layer

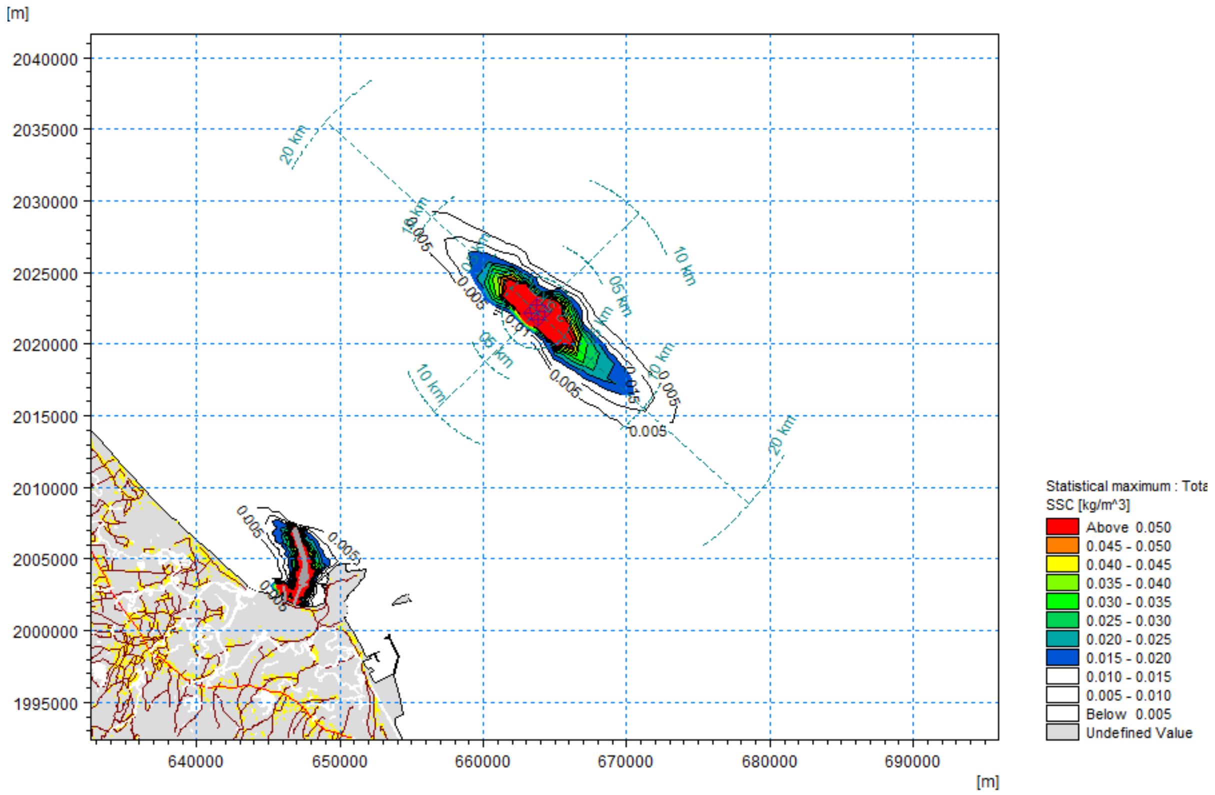


Figure 3.3. Maximum TSS Field over the entire construction period at the surface layer

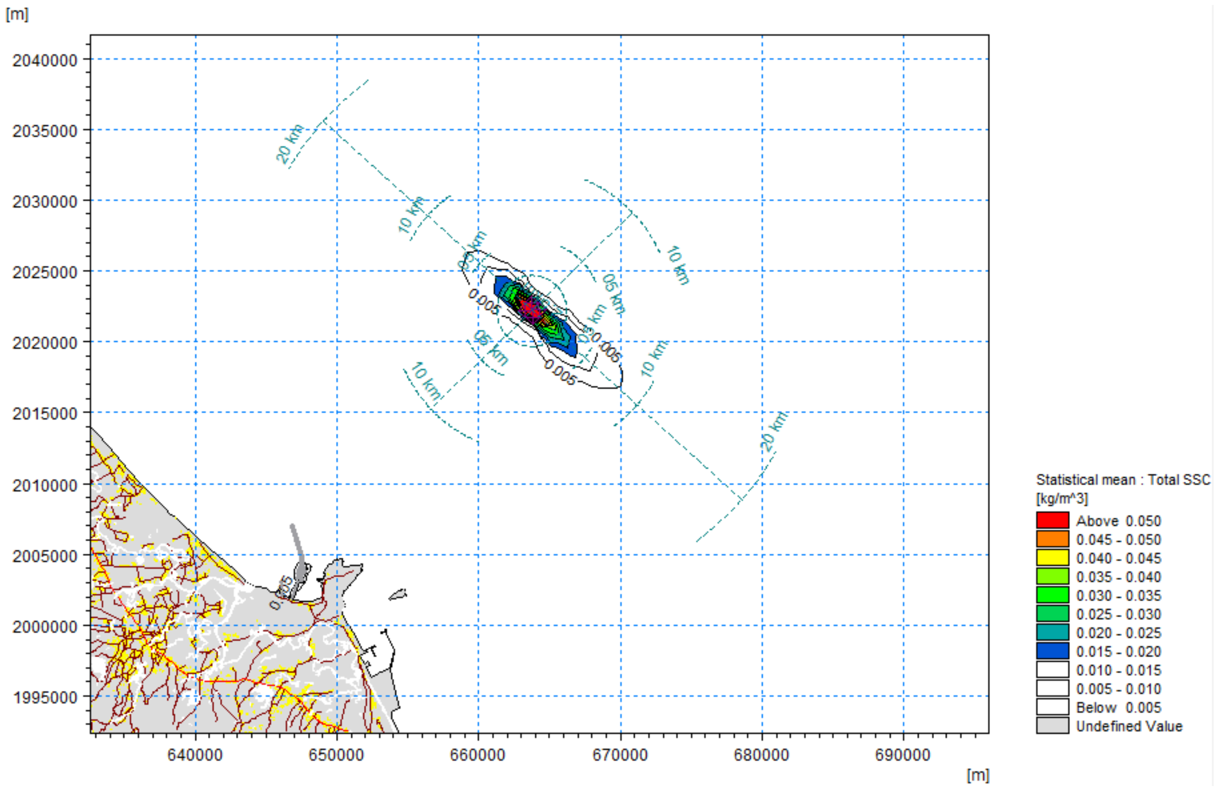


Figure 3.4 Average TSS Field over the entire construction period at the bottom layer

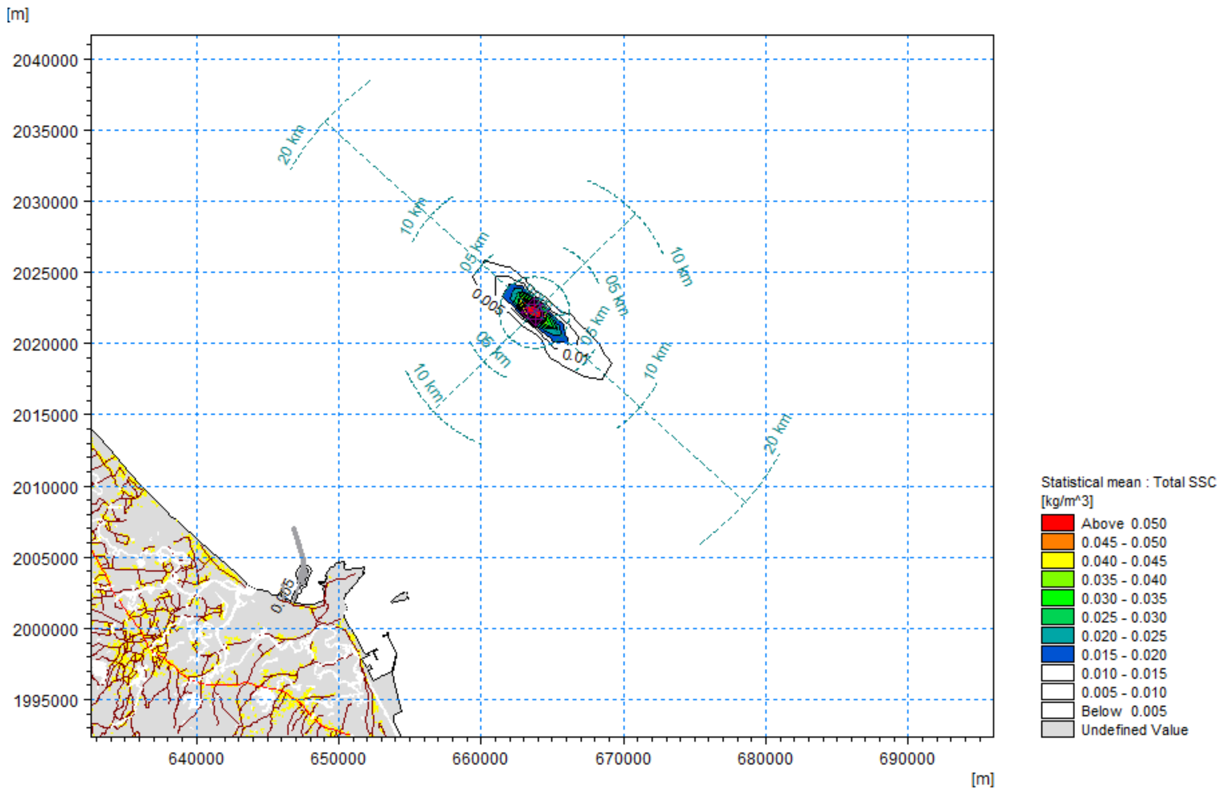


Figure 3.5 Average TSS Field over the entire construction period at the middle layer

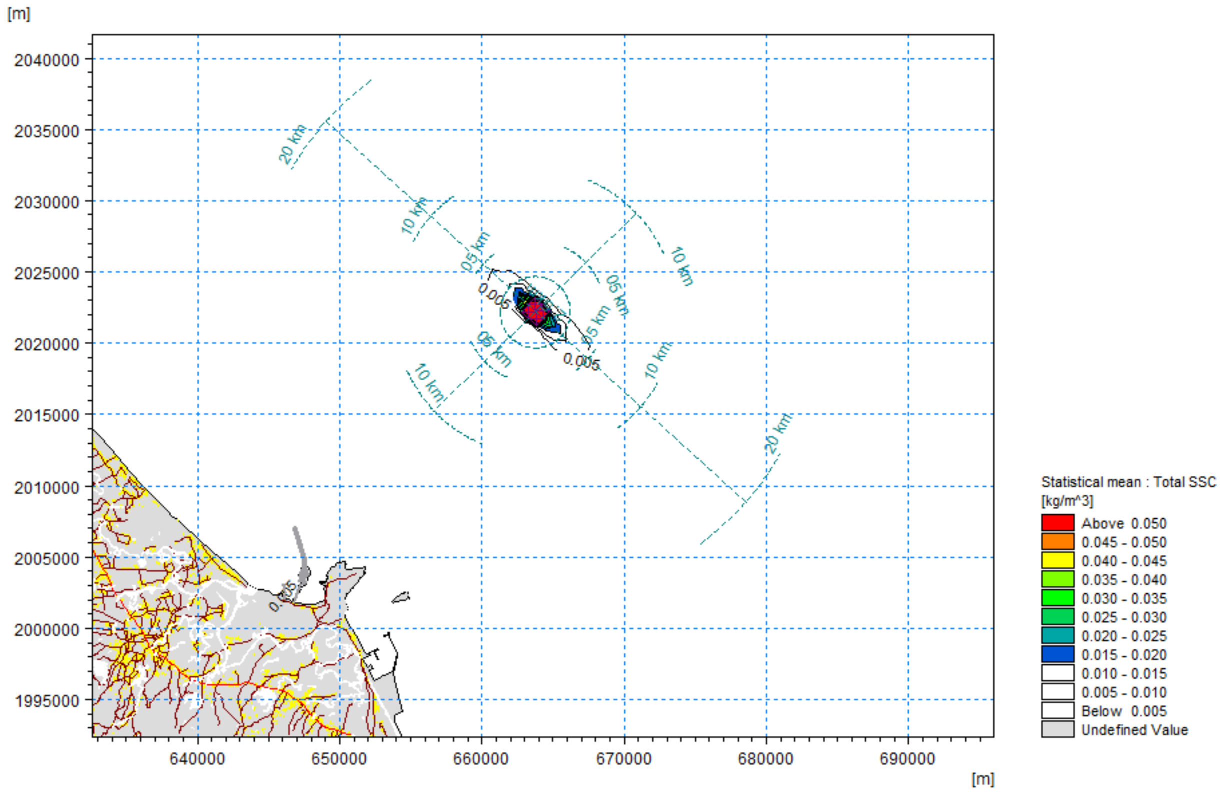


Figure 3.6. Average TSS Field over the entire construction period at the surface layer

The results of TSS dispersion for Scenario 1, the primary dispersion direction being North to South (parallel to the coastline), indicate that the dispersion range does not affect sensitive areas such as ecological zones, tourism areas, or aquaculture zones.

In the dredging area, the turbidity tends to spread towards the Tri River and Ky Ninh Beach with concentrations fluctuating from 0.01 to 0.04 kg/m3 (10 – 40 mg/l).

+ Scenario 2, Northeast Monsoon, Baseline Conditions = 0

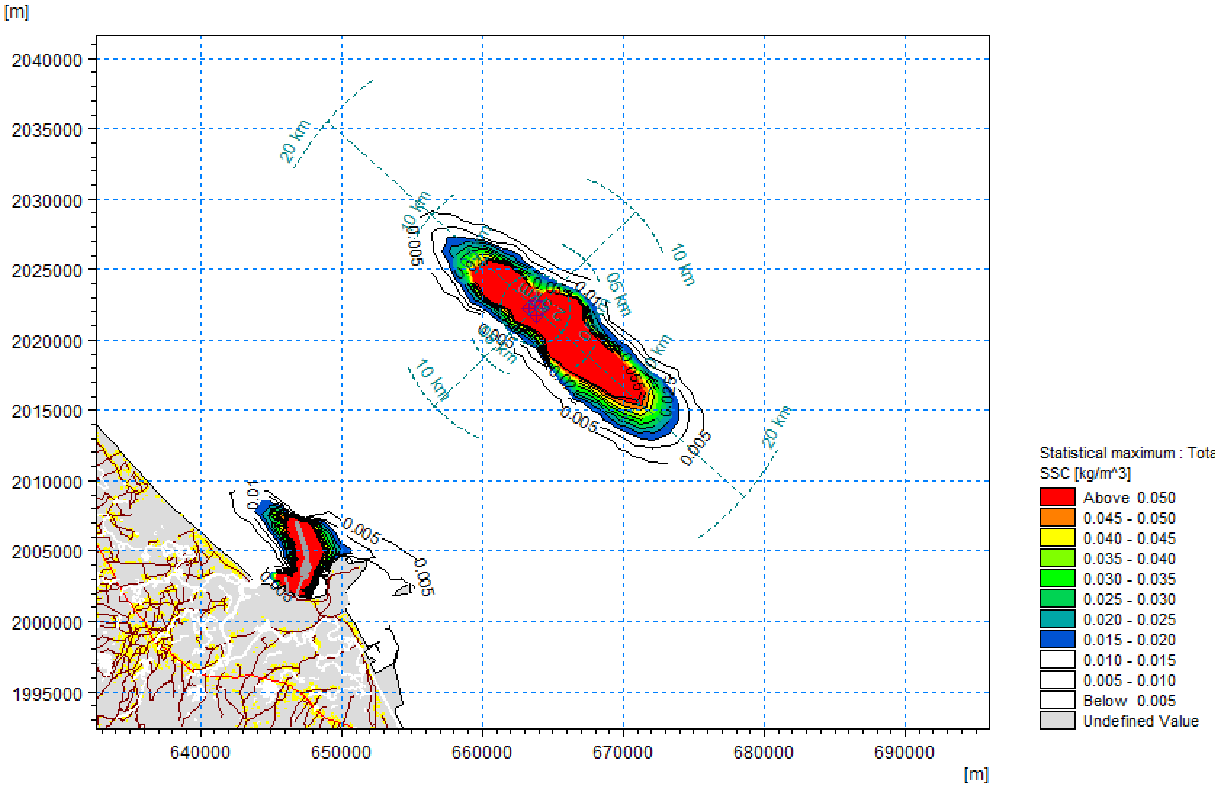


Figure 3.7 Maximum TSS Field over the entire construction period at the bottom layer

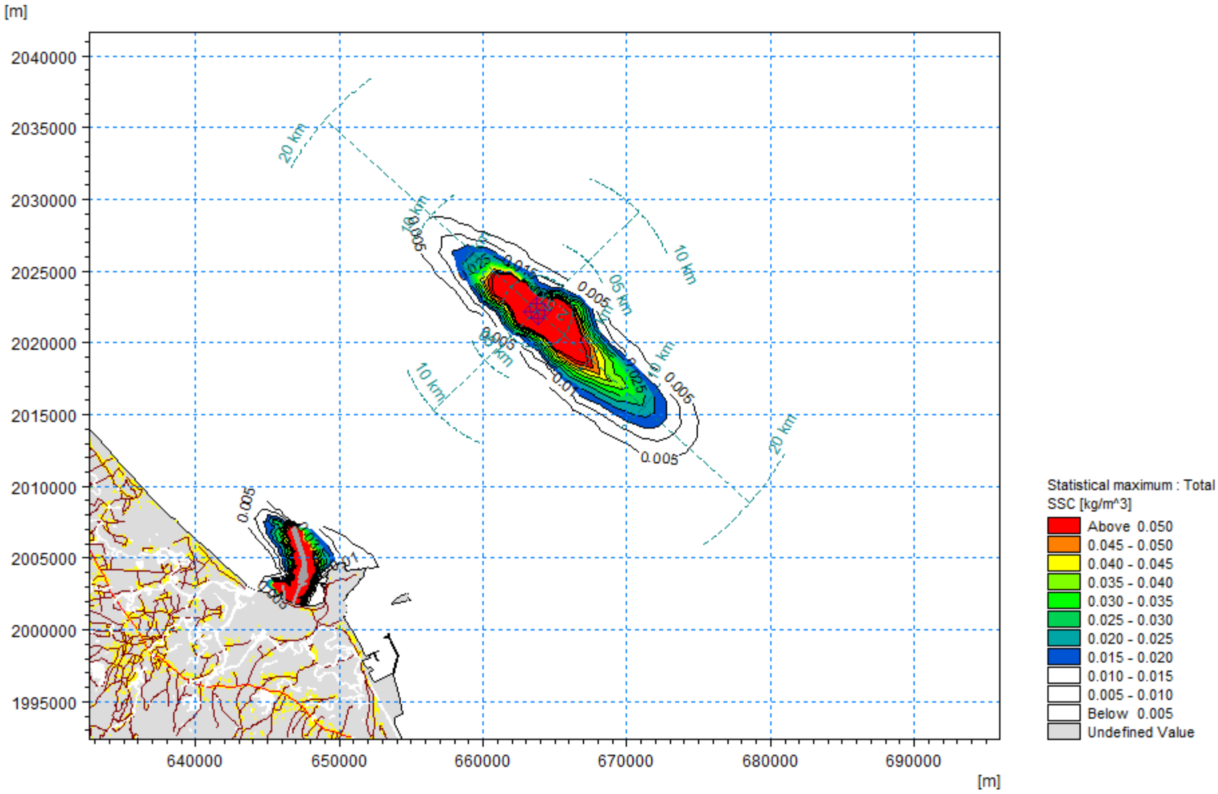


Figure 3.8. Maximum TSS Field over the entire construction period at the middle layer

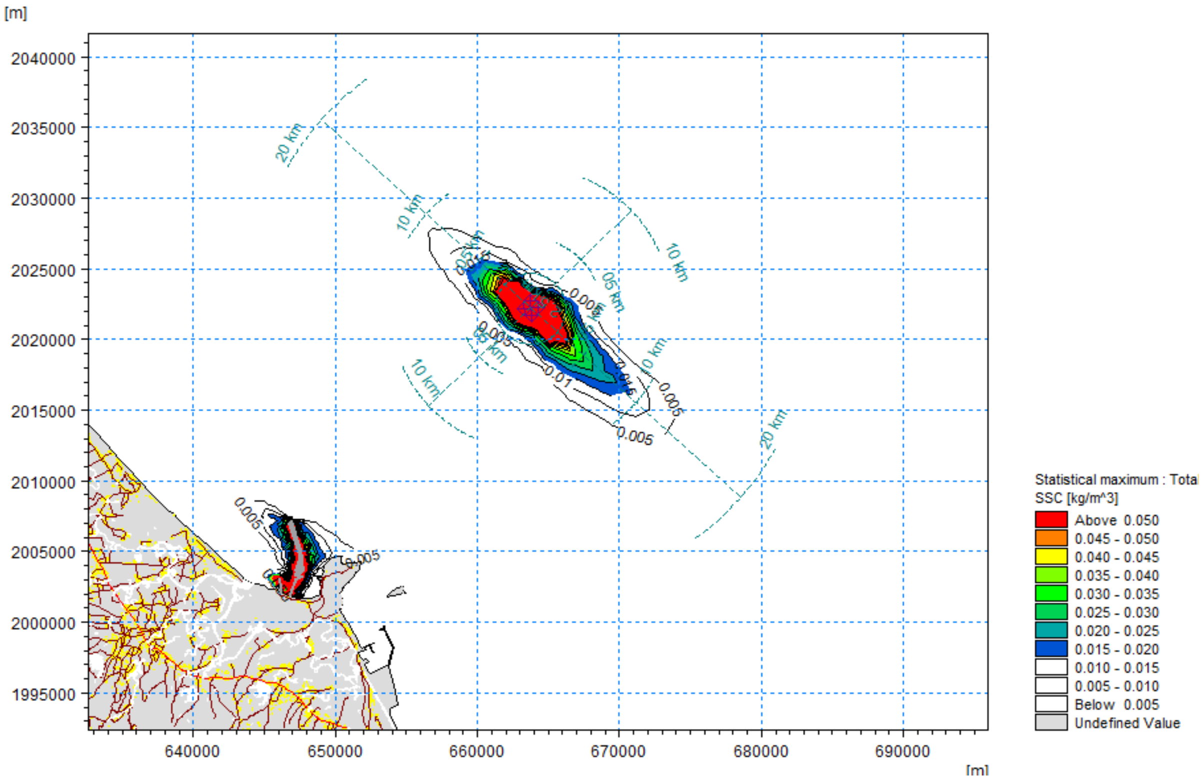


Figure 3.9. Maximum TSS Field over the entire construction period at the surface layer

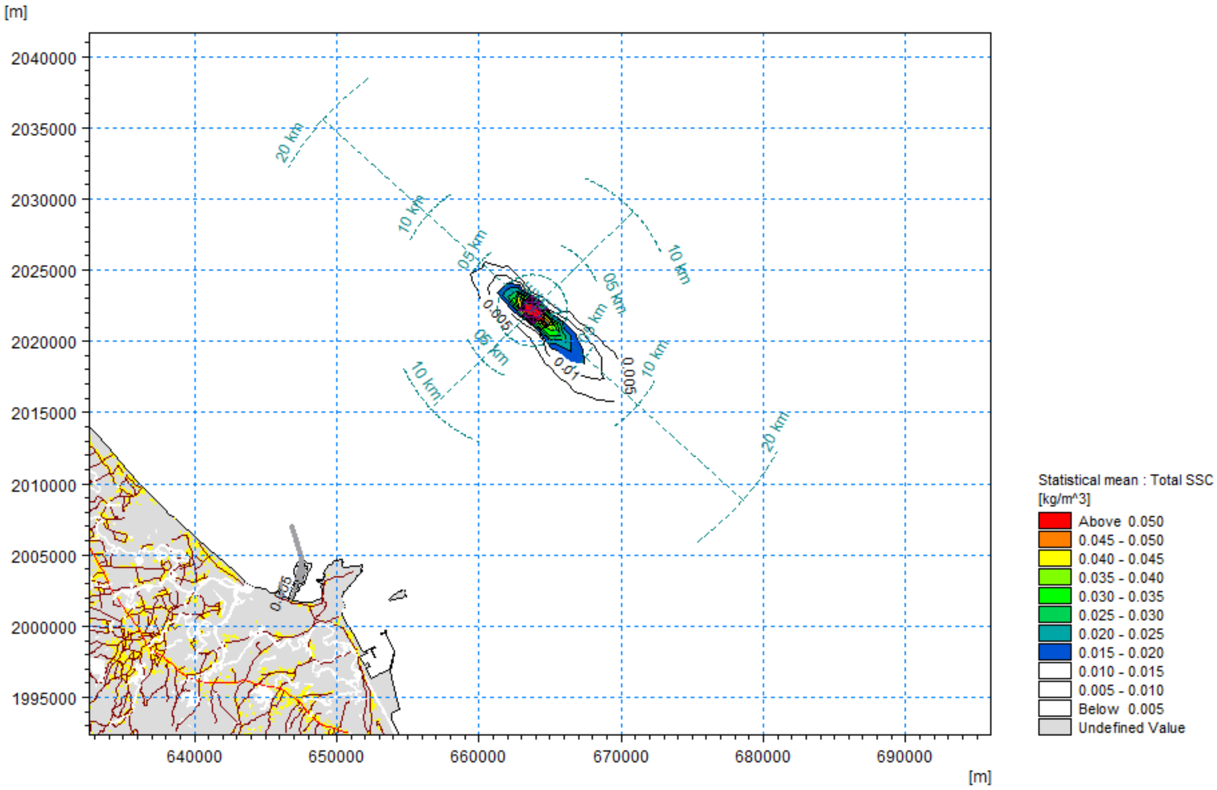


Figure 3.10 Average TSS Field over the entire construction period at the bottom layer

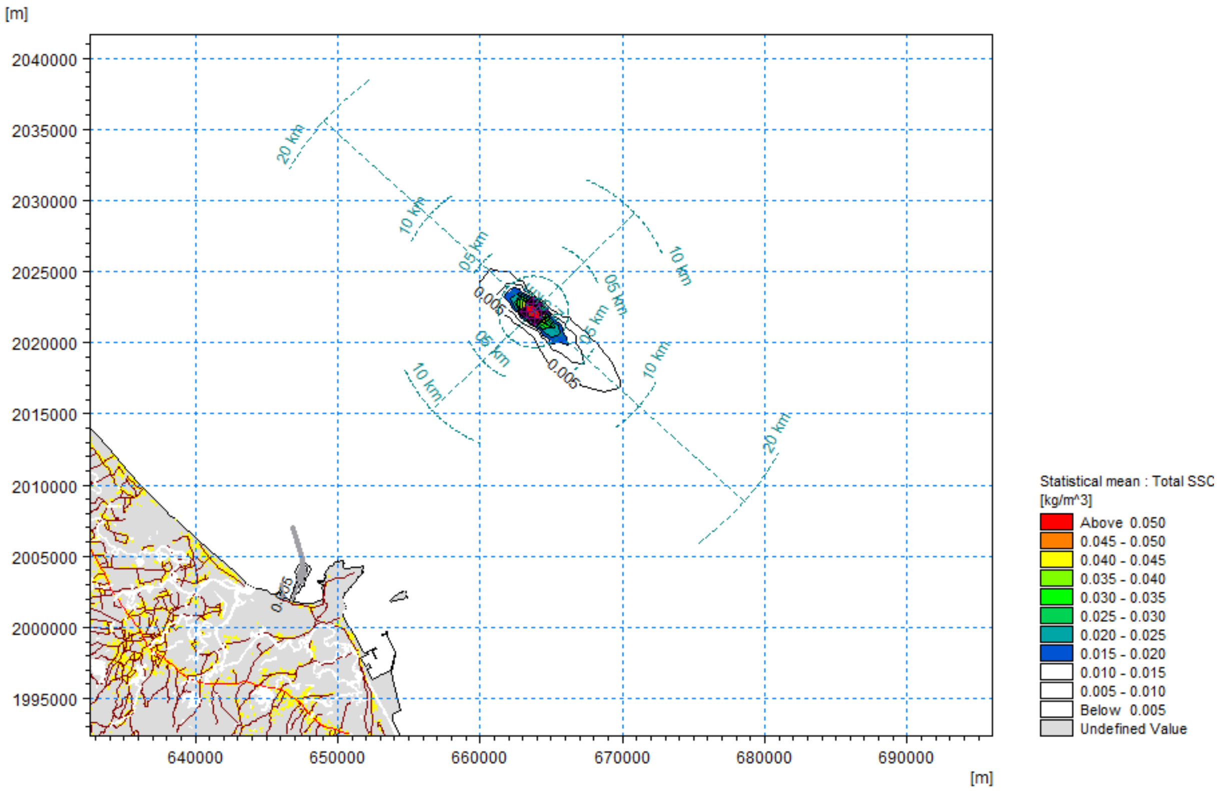


Figure 3.11. Average TSS Field over the entire construction period at the middle layer

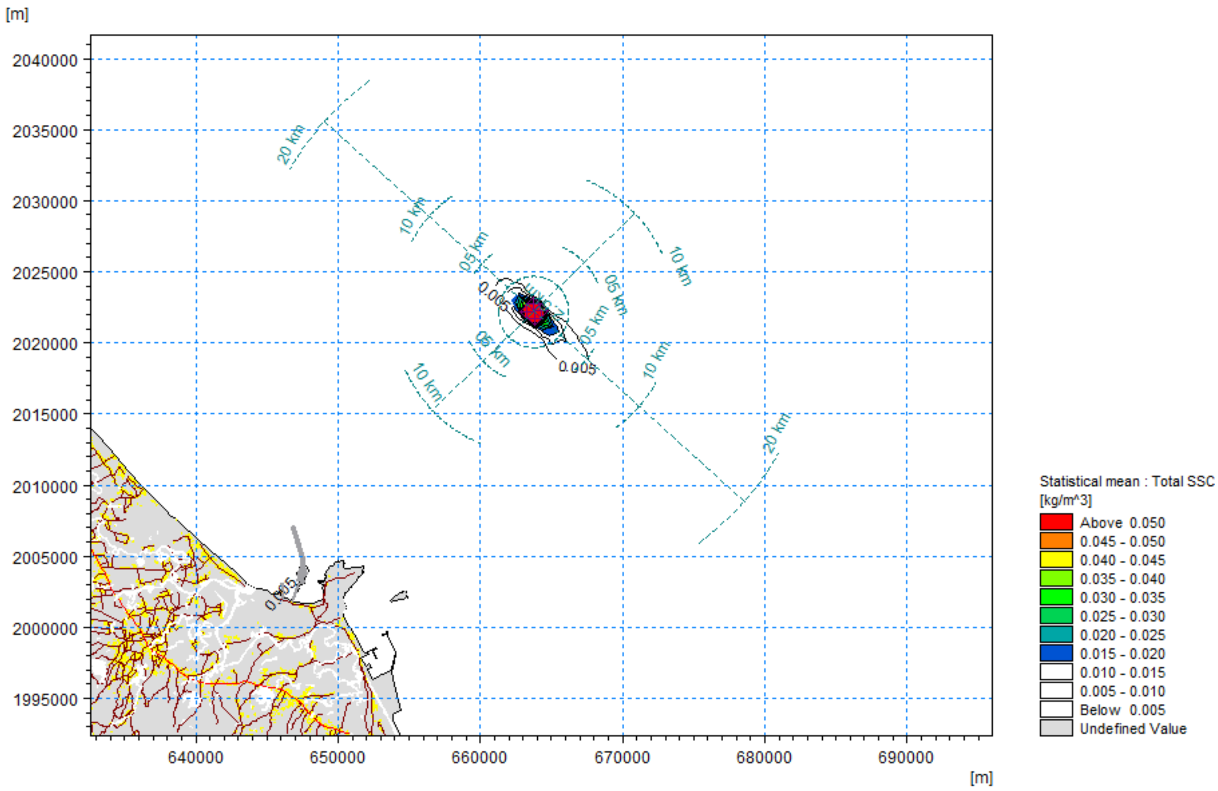


Figure 3.12. Average TSS Field over the entire construction period at the surface layer

The results of TSS dispersion for Scenario 2 show that in the primary dispersion area towards the North to South direction (parallel to the coastline), the dispersion range mainly stays around 18-20 km from the coast without affecting sensitive areas such as ecological zones, tourism areas, or aquaculture zones.

+ Scenario 3, Southwest Monsoon, Average baseline conditions

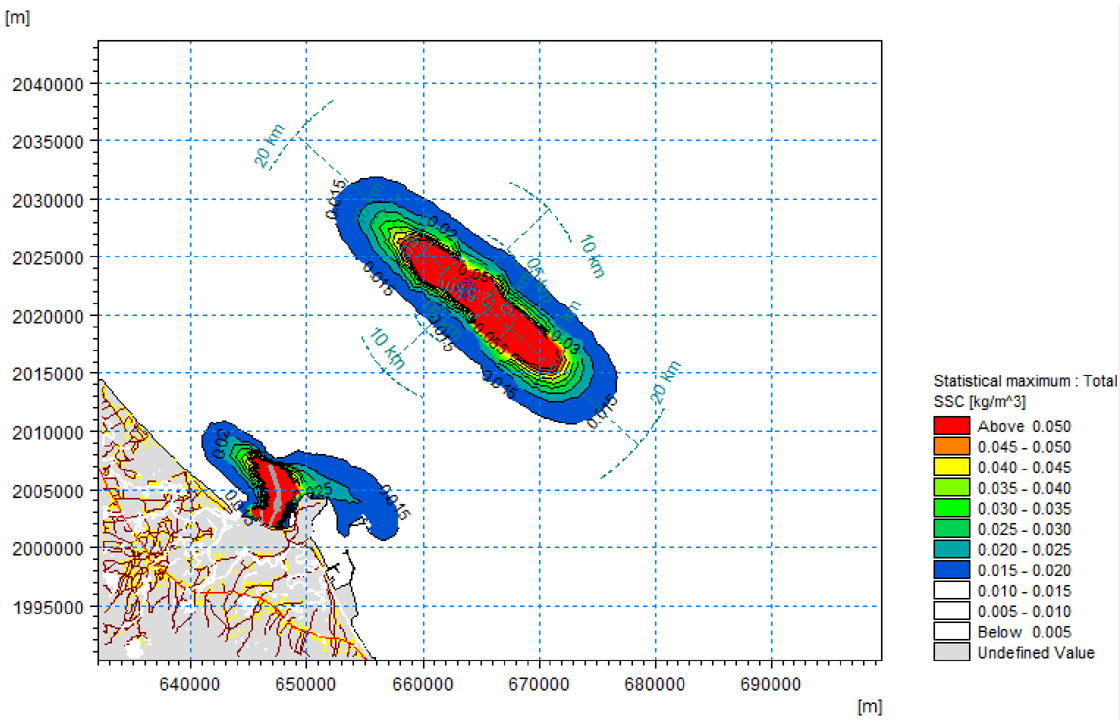


Figure 3.13. Maximum TSS Field over the entire construction period at the bottom layer

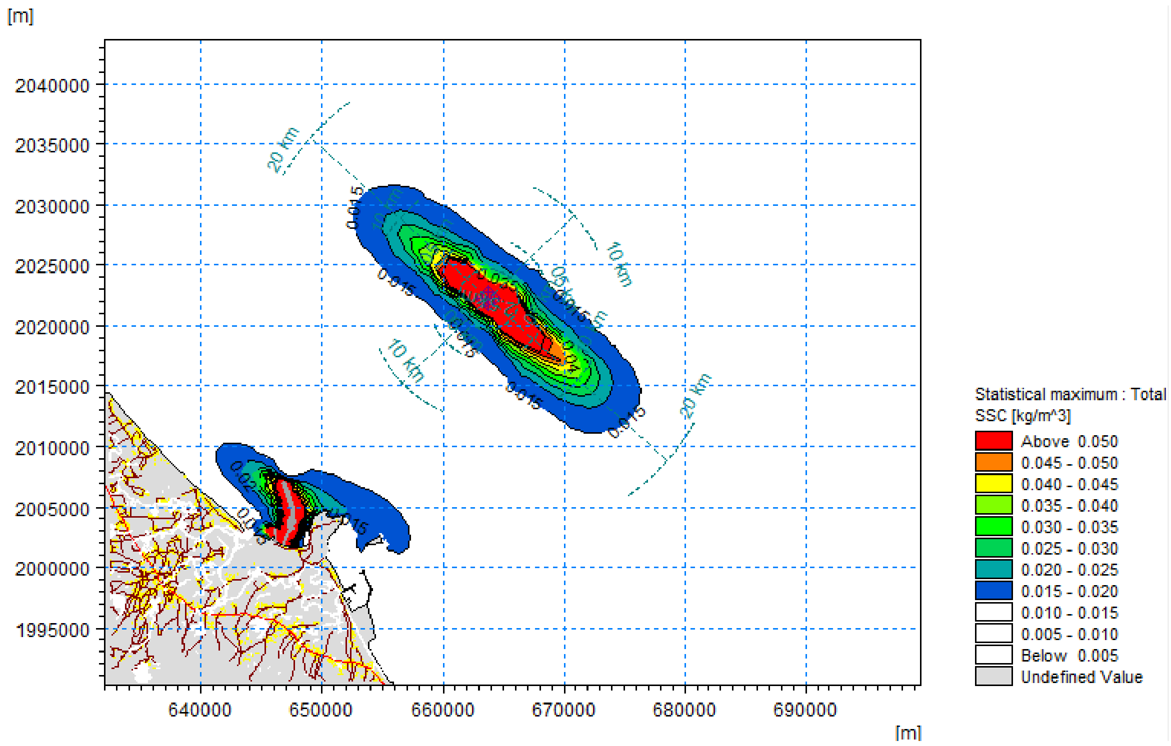


Figure 3.14. Maximum TSS Field over the entire construction period at the middle layer

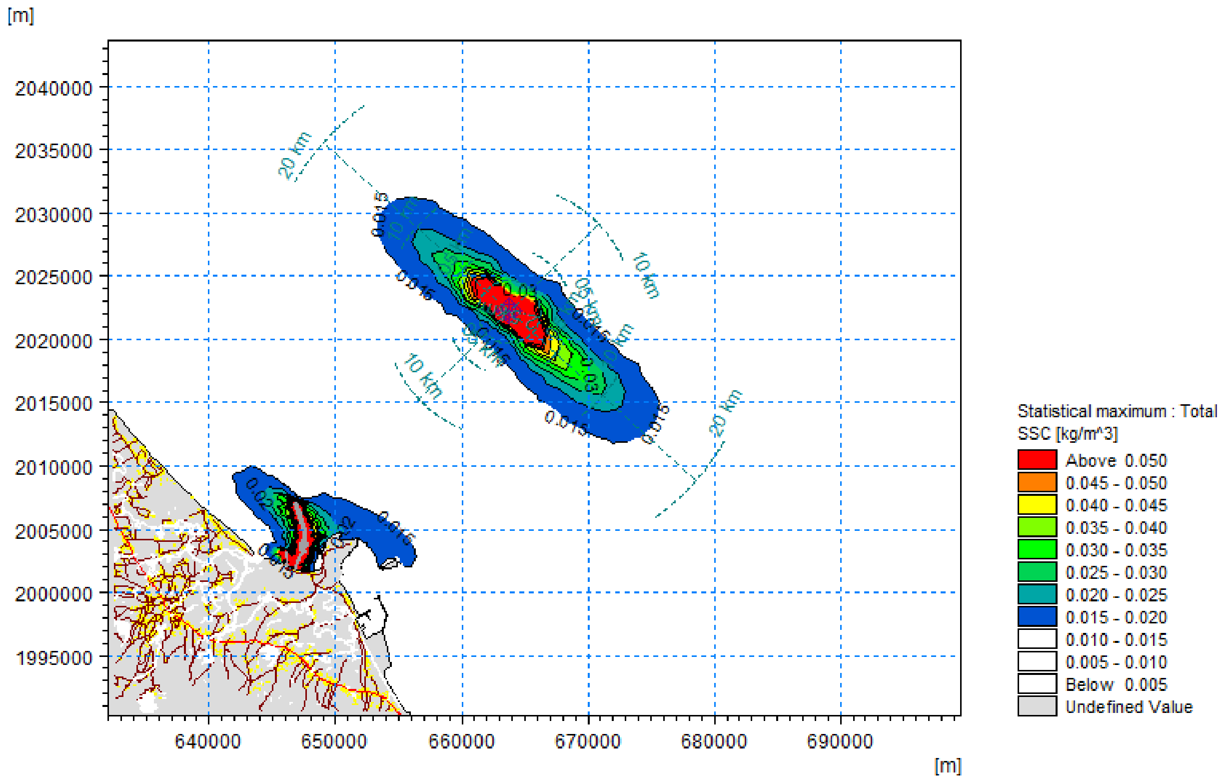


Figure 3.15. Maximum TSS Field over the entire construction period at the surface layer

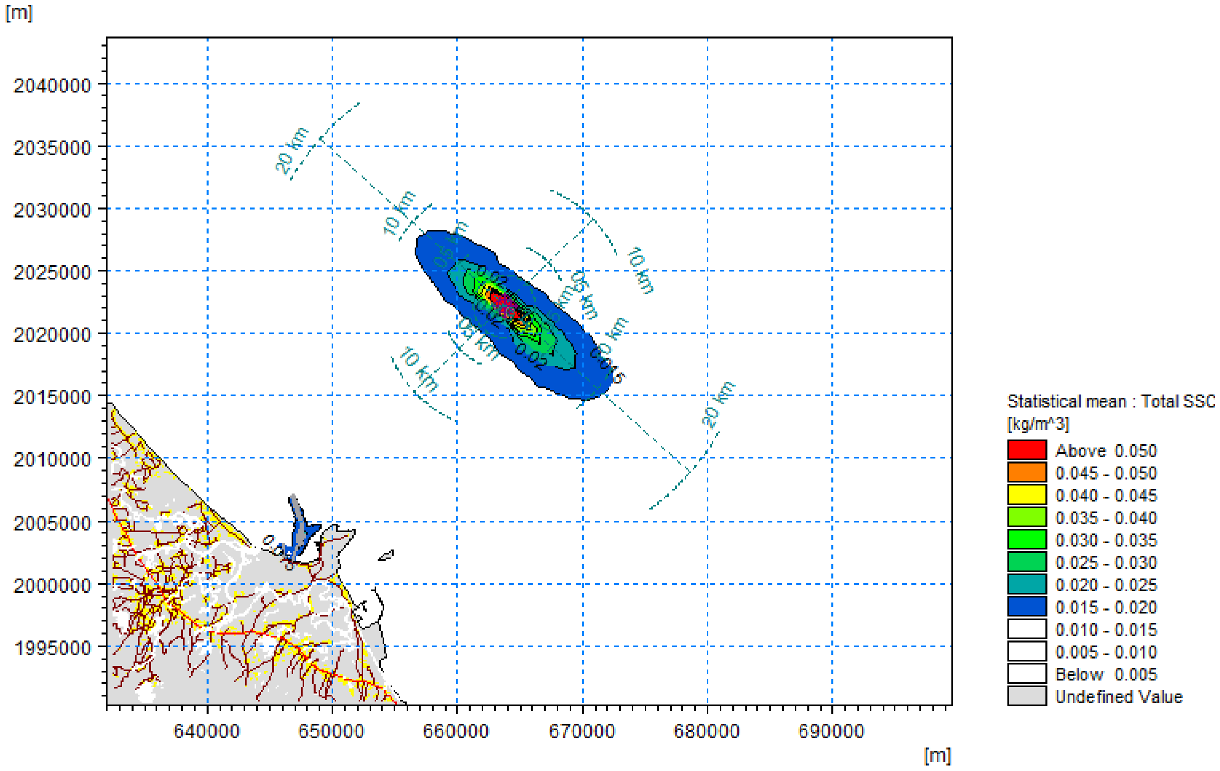


Figure 3.16. Average TSS Field over the entire construction period at the middle layer

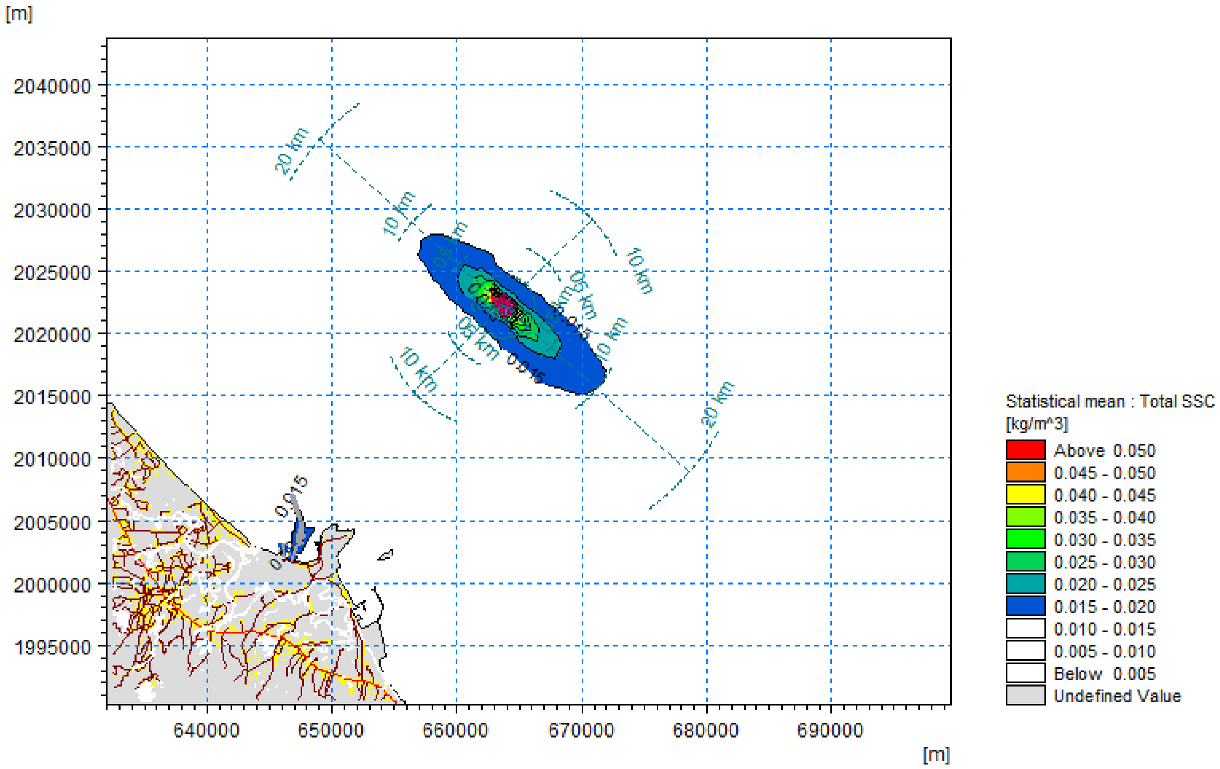


Figure 3.17. Average TSS Field over the entire construction period at the middle layer

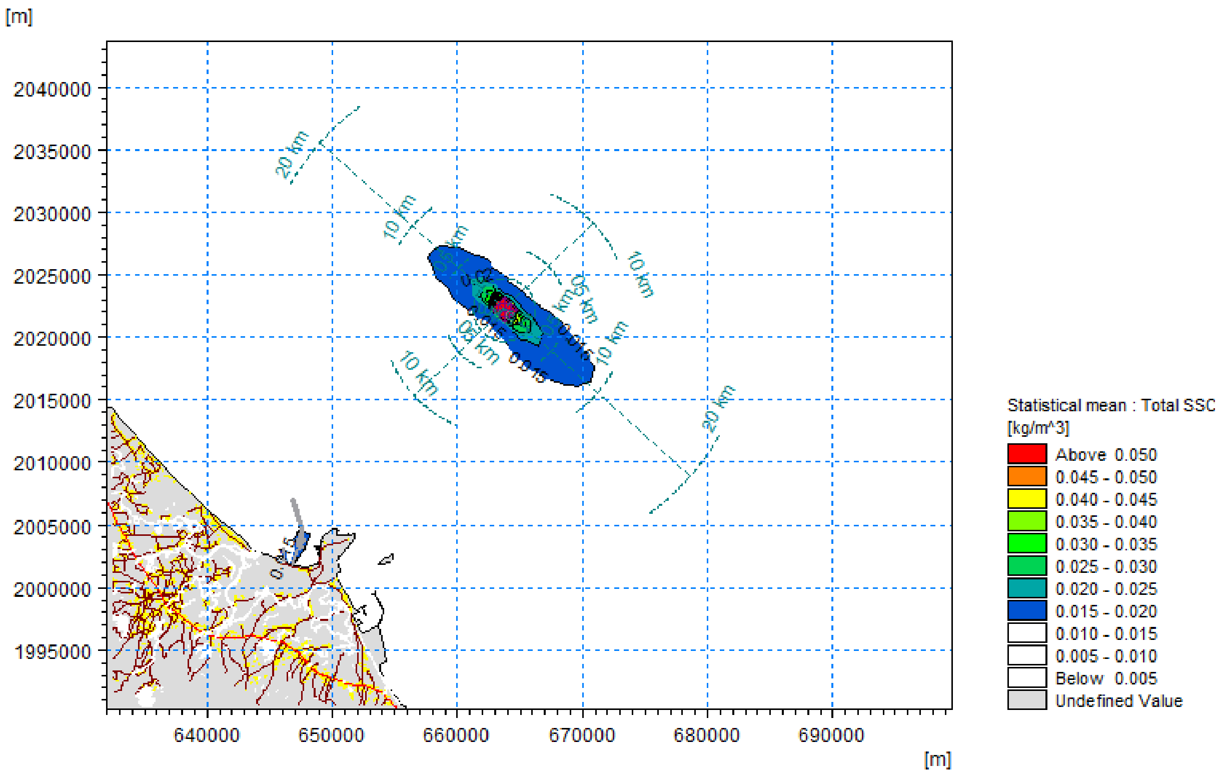


Figure 3.18. Average TSS Field over the entire construction period at the surface layer

+ ***Scenario KB4, Northeast Monsoon, average baseline conditions***

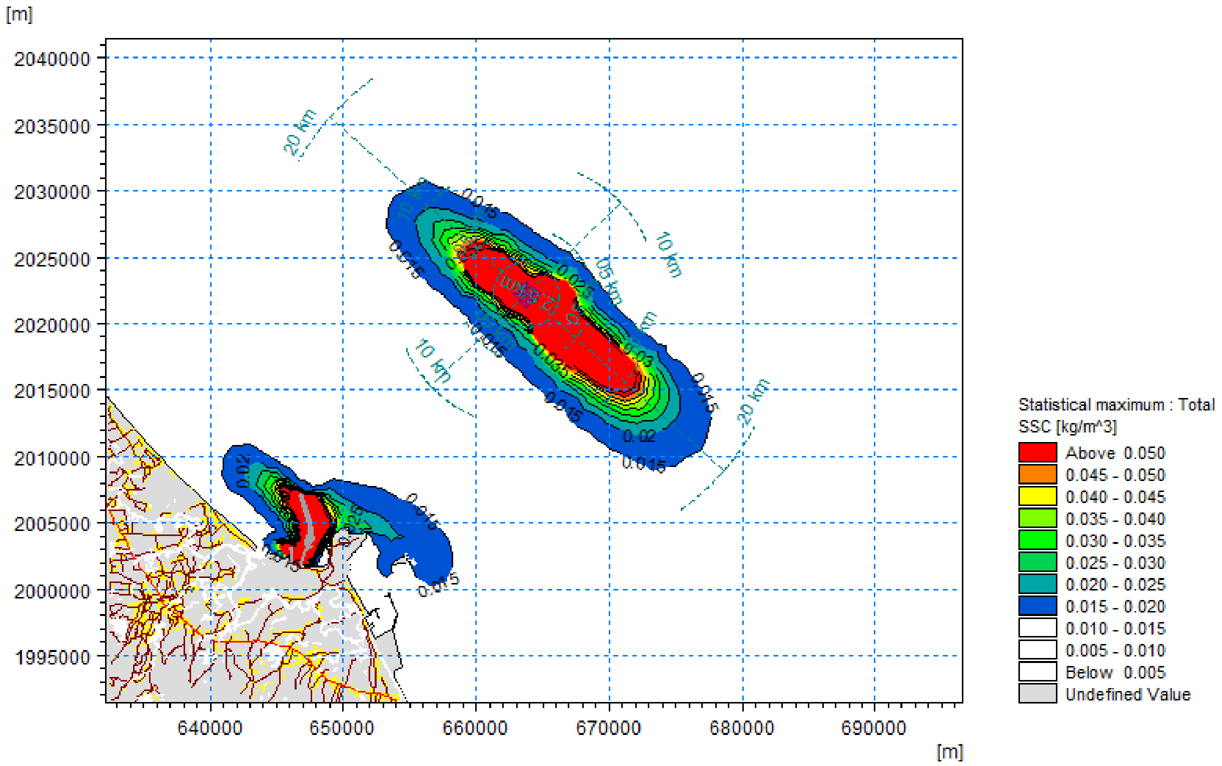


Figure 3.19. Maximum TSS Field over the entire construction period at the bottom layer

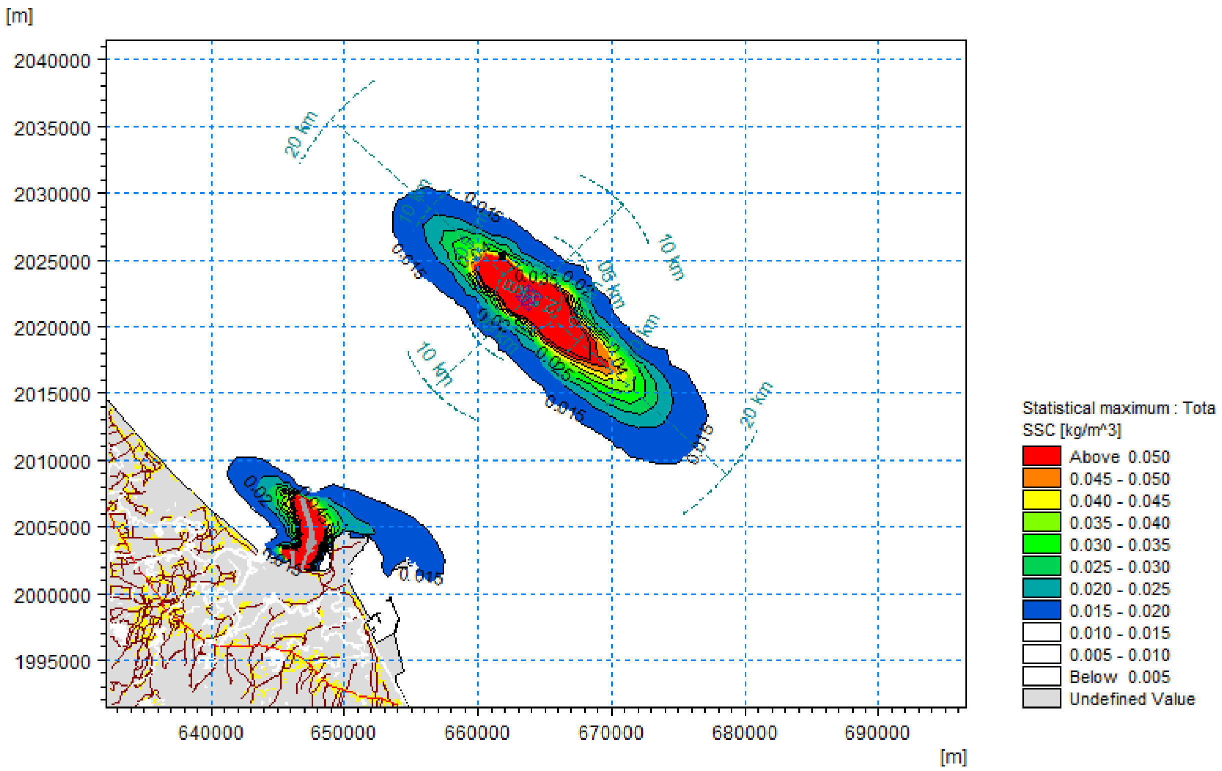


Figure 3.20. Maximum TSS Field over the entire construction period at the middle layer

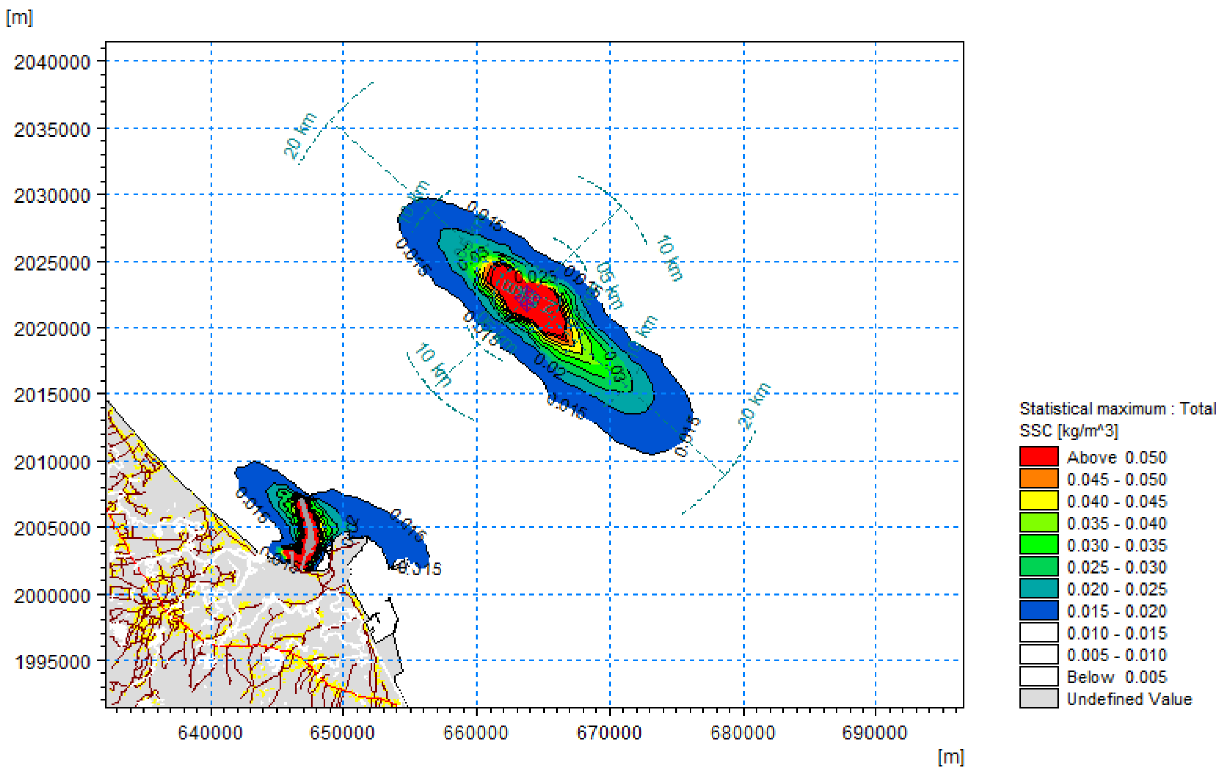


Figure 3.21. Maximum TSS Field over the entire construction period at the surface layer

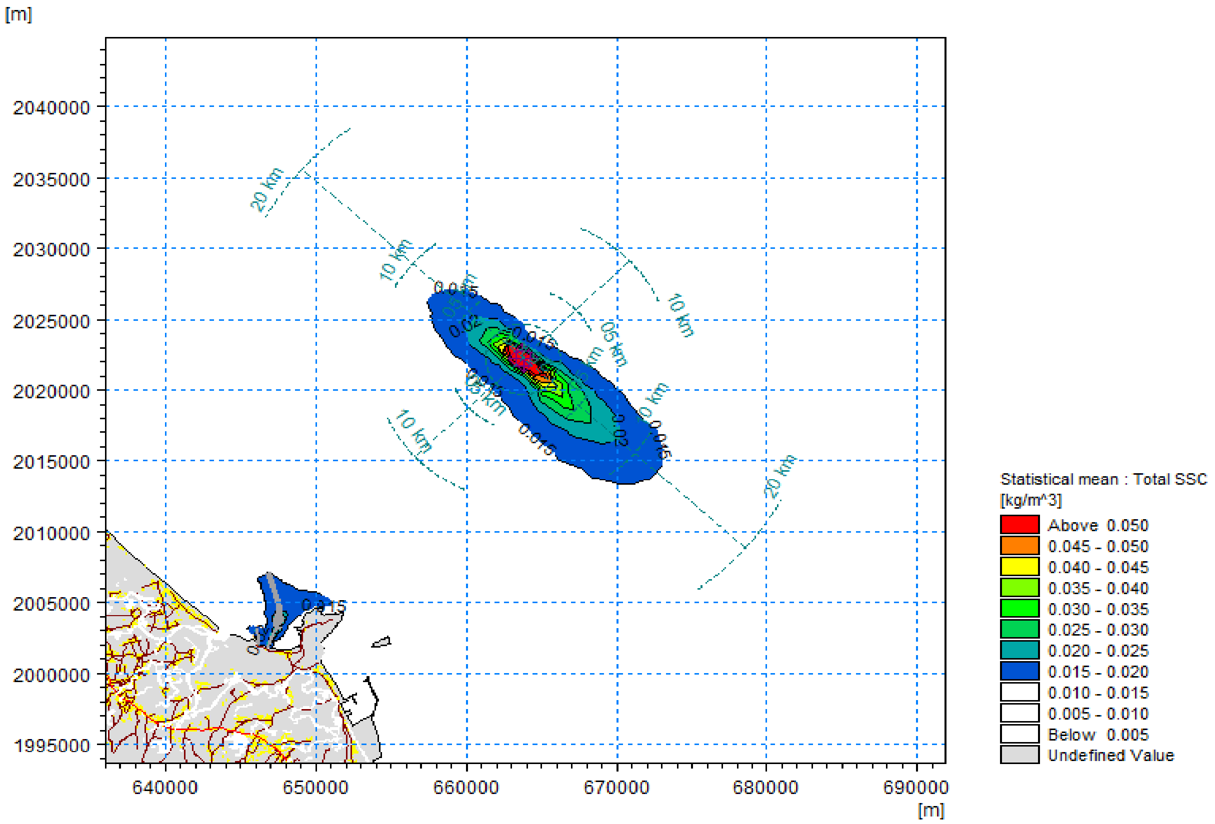


Figure 3.22. Average TSS Field over the entire construction period at the surface layer

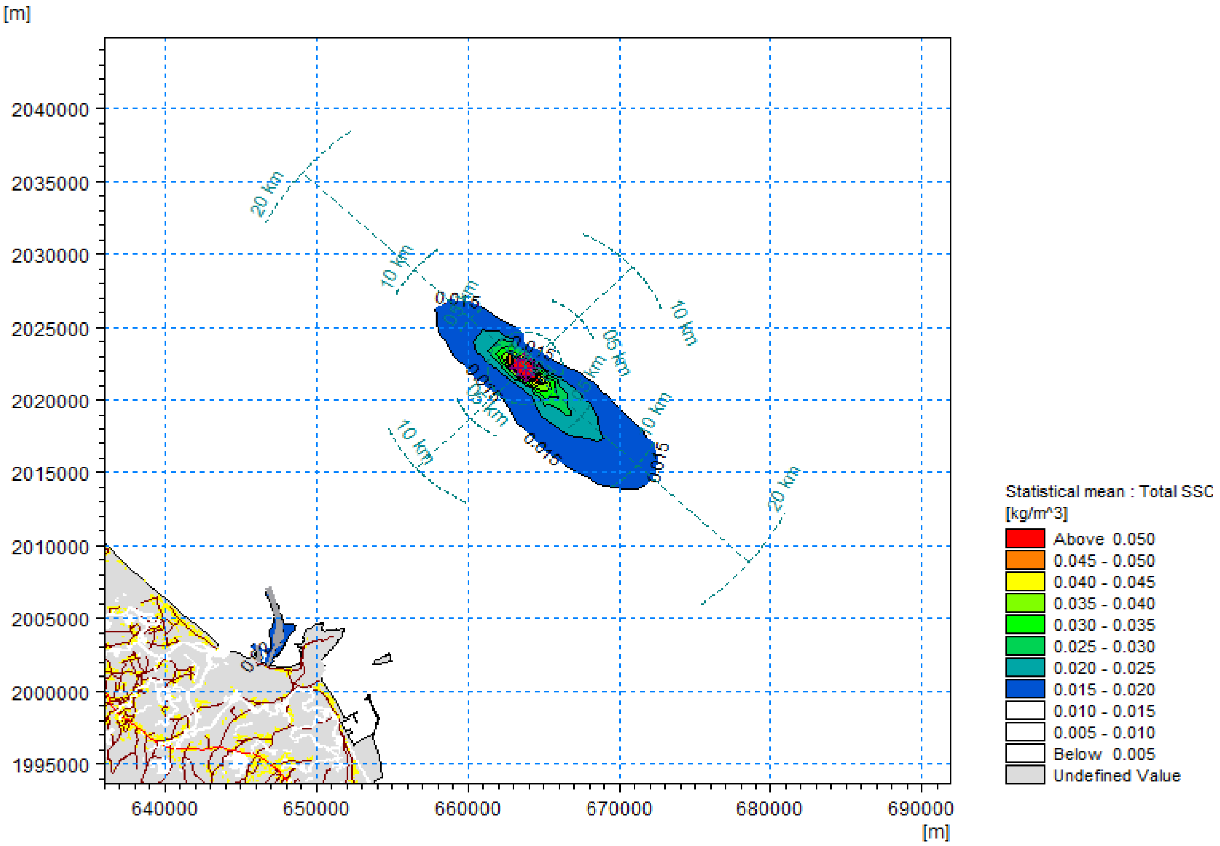


Figure 3.23. Average TSS Field over the entire construction period at the middle layer

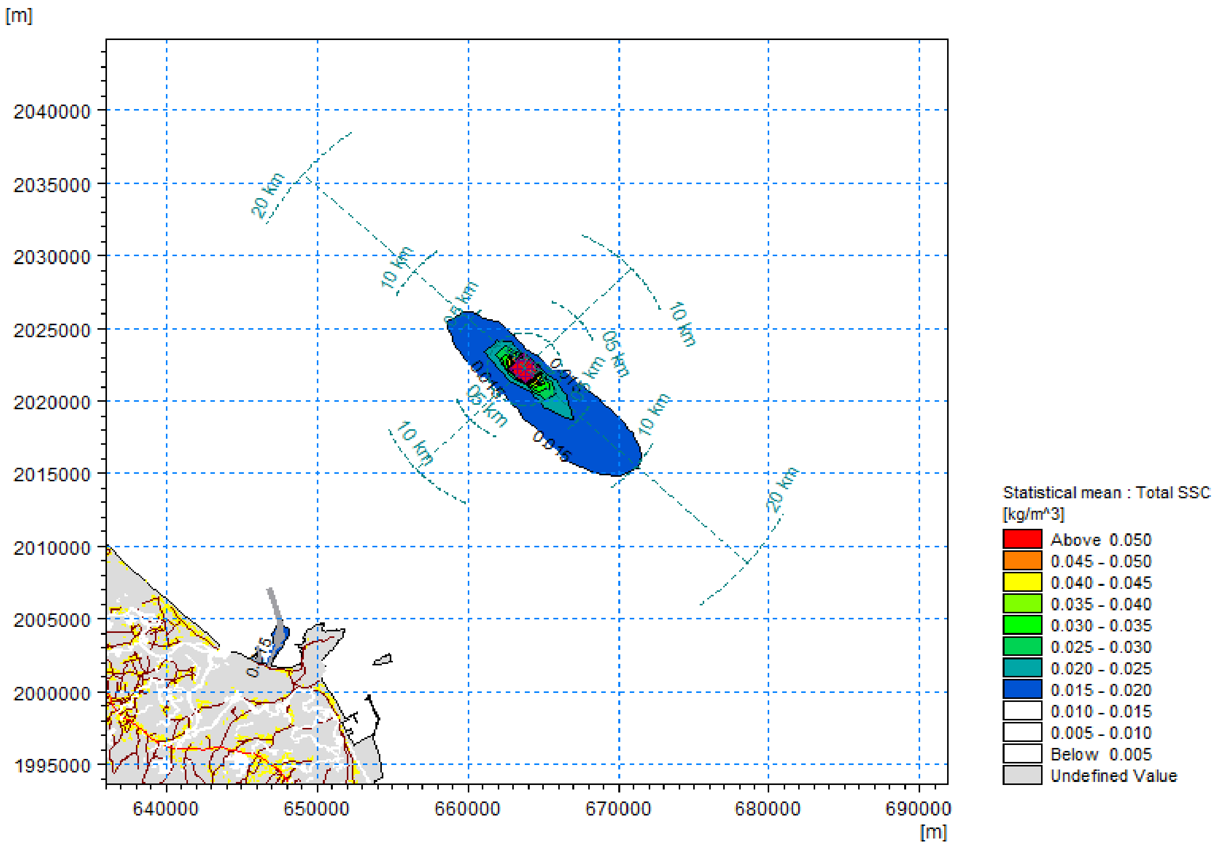


Figure 3.24. Average TSS Field over the entire construction period at the surface layer

Based on the maximum TSS dispersion results across all construction periods according to various scenarios, it was observed that: Simulation results of TSS concentration fields with 4 scenarios indicate that during the Northeast monsoon season, the dispersion tends to spread southward due to the influence of the Northeast monsoon winds. Conversely, during the Southwest monsoon season, the turbidity plume tends to push northward. The TSS turbidity plume during the Northeast monsoon season spreads more extensively than during the Southwest monsoon season, on average about 1.2 to 1.4 times depending on the simulation conditions.

Table 3.6. Comparison of TSS dispersion area extent

Scenarios	**Affected area(ha)**					
	Maximum			**Average**		
	Bottom	**Middle**	**Surface**	**Bottom**	**Middle**	**Surface**
Scenario 1 - Southwest Monsoon Season, Background Conditions = 0	814.67	589.20	334.56	2,620.10	1,250.17	847.45
Scenario 2 - Northeast Monsoon Season, Background Conditions = 0	821.04	605.78	402.10	2,773.25	1,468.24	935.18
Scenario 3 - Southwest Monsoon	926.37	683.26	356.14	2,980.56	1,462.70	941.58

Season, Average Background Conditions						
Scenario 4 - Northeast Monsoon Season, Background Conditions	1.004.98	698.53	467.15	3,015.50	1,711.22	1,050.42

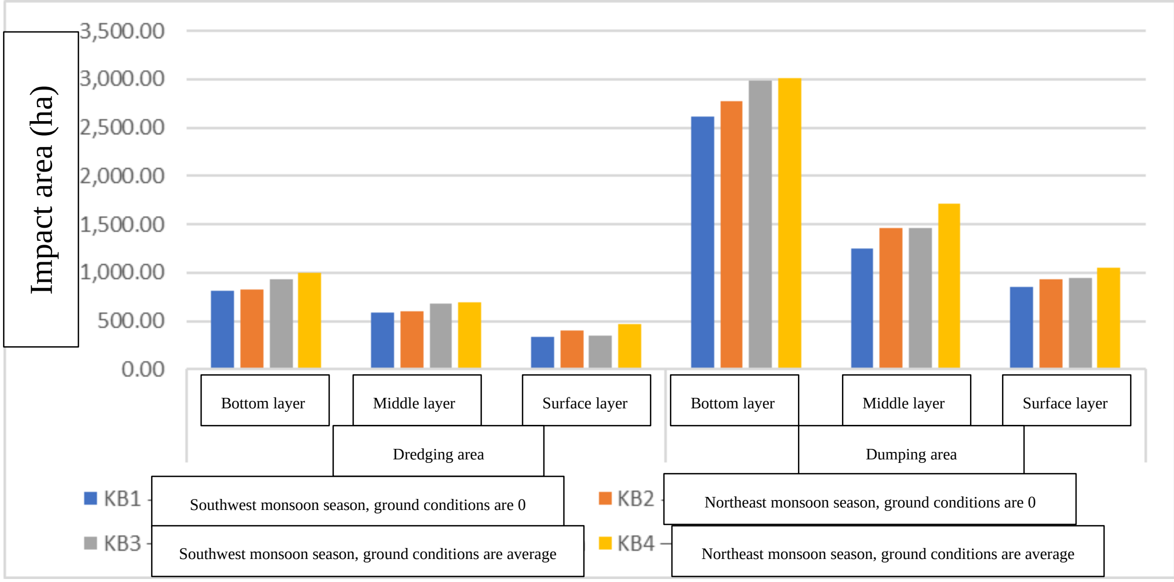


Figure 3.25. Chart comparing TSS dispersion area extent

Representing the maximum and average TSS field aims to assess the most negative impact on the largest statistical and assess the actual influence on the average. The results show that the average field type helps to assess the morphology and extent of real dispersion more accurately than the maximum field results. Conversely, the maximum field results help the project to clearly demonstrate the largest impact area possible for each construction scenario. In practical evaluation, it is necessary to rely on average simulation results.

When considering the TSS dispersion exceeding the threshold prescribed in QCVN 10:2023/BTNMT (≥ 50 mg/l):

+ At the submergence area: Under "0" baseline conditions: During the Northeast monsoon season, the maximum TSS dispersion extends approximately 10 km southeast, 2.5 km northeast, 5 km northwest, and 1.4 km southwest from the center of the submergence area; During the Southwest monsoon season, the maximum TSS dispersion reaches approximately 9.2 km southeast, 2 km northeast, 5.7 km northwest, and 1.3 km southwest from the center of the submergence area. Under average baseline conditions: During the Northeast monsoon season, the maximum TSS dispersion extends approximately 10.9 km southeast, 2.5 km northeast, 5.2 km northwest, and 2 km southwest from the center of the submergence area; During the Southwest monsoon season, the maximum TSS dispersion reaches approximately 10.3 km southeast, 2.4 km northeast, 7.4 km northwest, and 1.6 km southwest from the center of the submergence area.

+ In the dredging area, the area affected by TSS concentrations exceeding the maximum threshold reaches approximately 1,004.98 hectares over the entire construction period. The extent of increased TSS concentrations exceeding QCVN 10:2023/BTNMT (≥ 50 mg/l) from the dispersion zone extends approximately 0.5 – 1.1 km westward and 0.5 – 1.4 km eastward depending on the simulation conditions. Under average TSS conditions, the increased TSS concentrations of 0.15 - 0.25 mg/l spread to the Mui Ron area, coastal area of Ky Ninh, and Hai Phong beach, potentially impacting these areas.

Additionally, to assess the impact of turbidity plumes from dredging activities on sensitive areas around the project site, data extraction was conducted at several points as follows:

Table 3.7. Coordinates of data extraction points for assessing the impact of dredging and disposal activities

No.	Sample	WGS-84 Coordination		Description
		E	N	
1	NB01	106°36'32,40"	18°13'44,40"	Located on the main TSS propagation route
2	NB02	106°30'28,80"	18°19'22,80"	
3	NB03	106°30'37,50"	18°12'27,44"	Assess the impact of TSS propagation on the ecosystem of Hon Son Duong and Hon Con Chim
4	NB04	106°28'20,69"	18°07'53,43"	
5	NB05	106°27'00,17"	18°15'14,41"	Assess the impact of TSS propagation on the fisheries protection area along the coastline of Ha Tinh province from Cam Linh commune to Ky Xuan commune according to the Fisheries Resource Protection and Exploitation Planning for the period 2021-2030, vision to 2050
6	NB06	106°20'23,01"	18°13'18,26"	
7	NB07	106°25'44,54"	18°07'37,02"	Assess the impact of TSS propagation on the Mui Ron lighthouse area
8	NB08	106°24'25,88"	18°07'31,62"	Assess the impact of TSS propagation on the Vung Ang port area
9	NB09	106°23'59,87"	18°06'23,55"	
10	NB10	106°22'17,03"	18°07'19,31"	
11	NB11	106°20'22,88"	18°08'24,85"	Assess the impact of TSS propagation on the Ky Ninh beach area
12	NB12	106°23'25,73"	18°10'51,34"	
13	SH01	106°27'18,00"	18°06'21,60"	Assess the impact of TSS propagation on the Hon Son Duong area
14	SH02	106°25'01,20"	18°07'40,80"	Assess the impact of TSS propagation on the Vung Ang port area

No.	Sample	WGS-84 Coordination		Description
		E	N	
15	SH03	106°21'28,80"	18°06'21,60"	Assess the impact of TSS propagation on the Quyen river estuary area
16	SH04	106°18'50,92"	18°13'46,15"	Assess the impact of TSS propagation on the fisheries protection area along the coastline of Ha Tinh province from Cam Linh commune to Ky Xuan commune according to the Fisheries Resource Protection and Exploitation Planning for the period 2021-2030, vision to 2050

Figure 3.26. Location of data extraction points for assessing the impacts of the project.

The results show that in all simulated scenarios, the maximum and average increases in TSS levels at sensitive points are within the limits specified by QCVN 10:2023/BTNMT. Therefore, the project's activities are seen to have only minor impacts on coastal tourism, economic, and social areas.

Table 3.8 Variation in maximum TSS levels at extraction points

Point	Scenario 1 (mg/l)	Scenario 2 (mg/l)	Scenario 3 (mg/l)	Scenario 4 (mg/l)
NB01	23,37	25,74	40,18	43,22
NB02	24,21	17,18	38,24	37,76
NB03	0,03	0,03	13,14	12,17
NB04	1,32	1,35	16,52	12,06
NB05	0,02	0,02	5,48	6,52
NB06	0,01	0,00	5,35	7,24
NB07	8,27	8,27	20,21	21,35
NB08	32,91	35,43	47,21	45,34
NB09	18,79	10,79	35,27	28,49
NB10	1,69	0,95	11,20	12,49
NB11	0,26	0,18	6,73	6,18
NB12	0,23	0,16	3,24	3,48
SH01	2,34	2,45	5,20	4,97
SH02	14,52	12,74	3,76	4,54
SH03	0,45	0,36	4,75	6,17
SH04	0,00	0,00	4,26	3,21

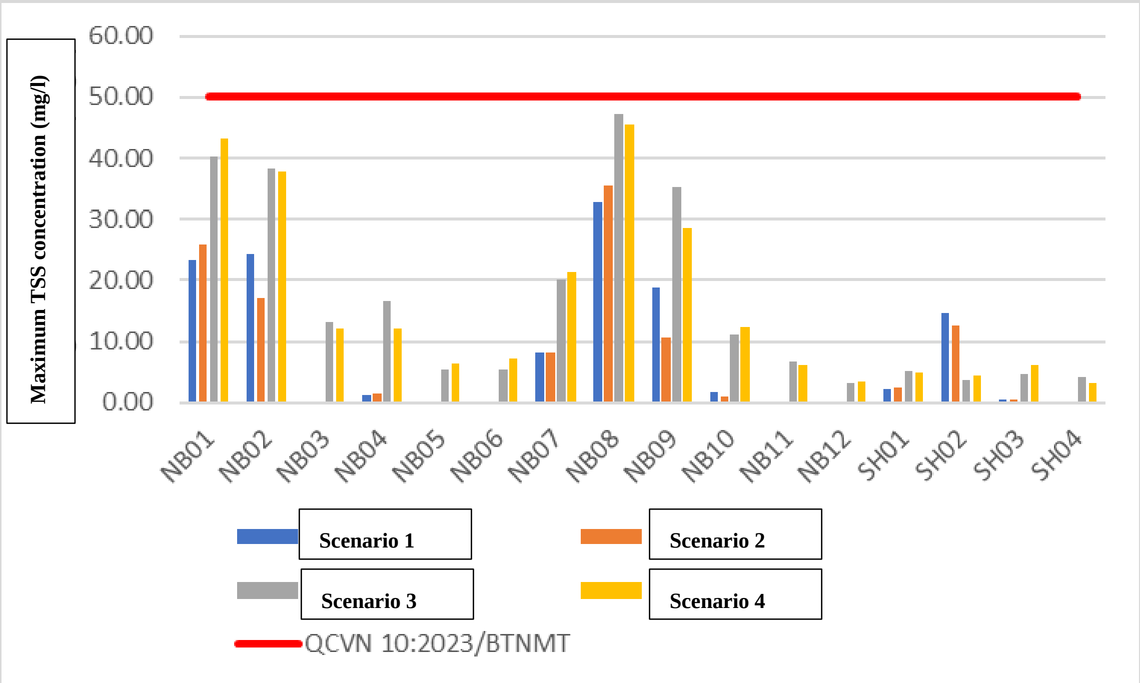


Figure 3.27 Maximum TSS levels in various simulation scenarios

Table 3.9. Variation in Average TSS Levels at Extraction Points

Point	Scenario 1 (mg/l)	Scenario 2 (mg/l)	Scenario 3 (mg/l)	Scenario 4 (mg/l)
NB01	1,72	2,59	10,34	11,27
NB02	4,30	2,23	12,72	7,85
NB03	0,00	0,01	2,34	2,54

Point	Scenario 1 (mg/l)	Scenario 2 (mg/l)	Scenario 3 (mg/l)	Scenario 4 (mg/l)
NB04	0,07	0,07	2,78	2,21
NB05	0,00	0,00	3,21	3,45
NB06	0,00	0,00	1,68	1,70
NB07	0,63	0,64	6,48	5,24
NB08	1,39	1,45	17,29	20,30
NB09	0,33	0,16	9,42	7,56
NB10	0,05	0,03	3,21	3,45
NB11	0,01	0,01	1,20	1,15
NB12	0,02	0,01	0,64	0,69
SH01	0,14	0,14	1,20	1,31
SH02	0,90	0,93	1,12	1,01
SH03	0,00	0,00	0,97	0,98
SH04	0,00	0,00	1,01	0,92

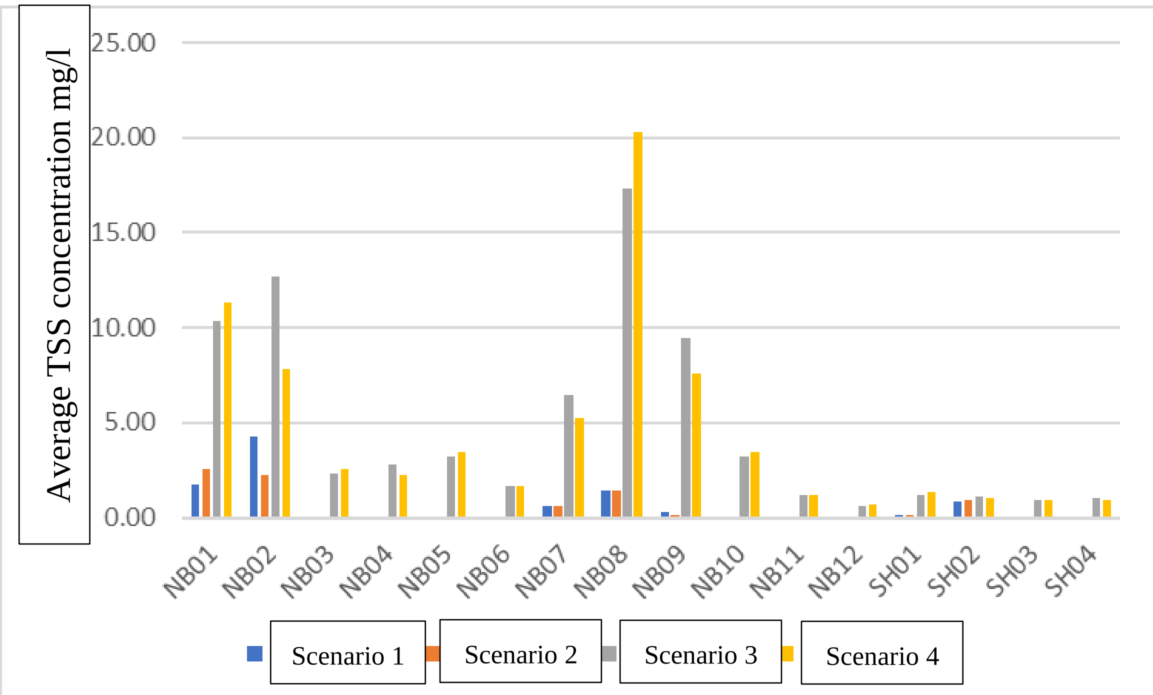


Figure 3.28 Average TSS levels in various simulation scenarios

Therefore, it can be concluded that the project activities impact the dredging area, disposal site, and have minor effects on neighboring areas. This impact primarily affects the operations of vessels near the area, increasing turbidity in the seawater, hindering the photosynthesis process of benthic plants and seaweed, and harming the marine ecosystem, affecting benthic organisms and benthic vegetation, reducing their numbers and species composition. However, the project's impact is limited and will cease when dredging and disposal activities stop, allowing the natural ecological environment to fully recover immediately after the project ends without significant damage.

❖ ***Impact of dredging and material disposal activities on the storage site***

➢ *Source of impact*

- Increased turbidity and suspended solids from dredging activities in front of the wharf, the turning basin, the water area for channel connection, the cooling water intake channel, the cooling water discharge channel, and dredged material handling.
- Overflow water from the cargo hold of barges transporting dredged material.
- Water drained from dredged material.
- Water generated from the dredged material receiving area (storage site).
- Domestic wastewater from construction workers.

➢ *Calculation load*

✓ *Overflow water from the cargo hold of barges transporting dredged material*

Dredged material is loaded onto barges by a grab dredger. Therefore, the amount of water draining from the dredged material into the cargo hold of the barge is negligible, accounting for about 3-5% of the total volume of dredged material, equivalent to about 2964.708 m^3 to 4941.18 m^3 at each construction site 1, 3, and 4, corresponding to 2.28 m^3/hour to 3.8 m^3/hour at each construction site.

At construction point 2, the amount of water draining from the dredged material into the cargo hold of the barge is about 8.478 m^3/hour to 14.13 m^3/hour.

Overflow water from the cargo hold of barges transporting dredged material with high suspended solids concentration can occur over 65 days of construction of the service channel from the grab dredger location to the area of the dredged material transfer stations to trucks or pumping stations.

✓ *Water generated from the dredged material storage site*

+ Construction points 1, 3, 4: Dredged material is kept to drain water on the bucket excavator before being dumped into a barge to be transported to the transfer point and then excavated onto trucks to be transported to the reception site. This construction method only produces a small amount of water overflow from the barge's hold, as evaluated in the previous section. At the dredged material reception site, the amount of generated water is negligible, and water drained from the reception area will naturally infiltrate at the storage site. Therefore, the impact of water drained from the reception area of the dredged material is insignificant.

+ Construction point 2: After the dredged material is transported from the dredging site to the pumping station, it will be cut and pumped along with seawater into the storage site (through a 6000m long HDPE D300 pipeline system). Therefore, drainage water will be generated at the storage site from this dredged material.

- The dredging volume at point 2 is 367,380 m^3. Based on practical experience from other dredging projects, the mud/water ratio when pumped to the storage site is 30/70.

- The amount of drainage water from the storage site (with an area of 16.63 ha) due to construction at point 2 is: 367,380 × 70/30 = 857,220 m^3.

With the construction period at point 2 being about 65 days, the amount of water overflowing to the reception area is 857,220 / 65 = 13,188 m^3/day (equivalent to 549.5 m^3/h).

Water from the dredged material storage site has high turbidity, and without mitigation measures, it will affect the water source near the discharge outlet and the ecosystem near the dredged material disposal area. However, the project owner will implement measures to mitigate these impacts..

✓ *Construction wastewater*

Construction wastewater from vehicle and equipment washing is approximately 23.8 m^3/day. The project owner has constructed a two-compartment sedimentation tank, consisting of one sedimentation compartment and one water holding compartment (8.0 m^3) to settle soil and sand and filter oil and grease. The sedimentation pit is equipped with SOS fabric to filter oil and grease. The SOS fabric containing oil and grease is collected and treated as hazardous waste. The treated water is recycled for road sprinkling, dust suppression, and vehicle washing, with no discharge into the external environment.

b. Impact from dust, emissions;

- Impact from Dust and Emissions from Dredging Equipment, Dumping, and Pumping Stations

The source of the impact on air quality is the dust and emissions generated from the fuel combustion process of construction vehicles, producing gases such as dust, NOx, CO, SO2, hydrocarbons, etc.

Emissions from vehicles used in dredging and transporting dredged materials are limited to the construction period of one day. The maximum daily fuel requirement for the project is approximately 93,566 liters of DO/day. The density of DO oil is 0.836 tons/m^3. The amount of oil consumed is: 93,566/1,000×0.836 = 78.3 (tons of DO/day).

According to the WHO emission factors, the pollution load from dredging equipment consuming 1 ton of diesel oil will release into the atmosphere approximately 0.71 kg TSP; 20S kg SO2 (S=0.05%); 9.62 kg NO2; 2.19 kg CO and 0.791 kg HC. The scope of the emission source (up to the dumping site) calculates the amount of dust and toxic gases generated from the equipment involved in the dredging process.

➢ Impact Assessment:

During the dredging phase, emissions are generated from bucket dredgers, barges, suction dredgers, tugboats, and canoes. These construction devices are not concentrated in one area and the travel routes span from the dredging area to the wide and open dumping area with no surrounding structures. The chimney height of these devices is higher than the breathing height (1.5m), allowing the emissions to quickly disperse into the surrounding atmosphere.

During Material Transportation: The average distance for transporting dredged materials from the dredging site to the dumping area is about 26 km. With a wide, open space, the dispersion speed of dust and emissions is fast. The main transportation equipment includes barges and self-propelled suction dredgers. All equipment is inspected before use, so the impact on air quality is negligible.

Impact Scope: Construction activities will impact the air environment primarily within the project area, along the dredging route, and will spread around the project area.

Probability of Occurrence: It depends on the activity of the construction vehicles, with an average operating frequency of 20 hours/day. The impact duration is short-term during the construction period. After the completion of each shift (daily) or the entire project, the air environment will immediately recover.

❖ ***Impact of dredging and material disposal activities on the storage site***

➢ Source of generation

Dust and exhaust emissions from:

- The process of excavating and filling soil for temporary road construction. (construction site 3, construction site 4)

- Transporting dredged material by truck to the storage site (construction site 1, construction site 3, construction site 4)

- Operation of pumping stations, pumping dredged material to the storage site. (construction site 2)

➢ Pollution load

✓ *Dust from the process of excavating and filling soil for temporary road construction*

According to the data in chapter 1, the temporary road of construction site number 3 is 1100m long, 6m wide, and 0.5m thick; the temporary road of construction site number 4 is 420m long, 5m wide, and 0.5m thick..

Table 3.10. Emission factors for excavation and filling activities

No	Cause of pollution	Estimated emission factor
1	Dust generated from the process of excavating soil, leveling the ground, and being blown by the wind	1÷100 g/m^3

(Source: "Techniques for Rapid Environmental Pollution Assessment" by the World Health Organization WHO, 1993)

According to the schedule, the excavation and filling of temporary roads for each construction site is about 10 days, with about 14 working hours per day. The total amount of dust emissions from the excavation and filling activities for temporary roads is as follows:

Table 3.11. The total amount of dust emissions from the excavation and filling activities

No.	**Cause of pollution**	**Area (m2)**	**Excavated/ fill volume (m^3)**	**Selected emission factor** (g/m^3)	**Dust generated (kg)**	**Construction time (days)**	**Dust generated ($mg/m^2/s$)**
1	Site 3	6600	3300	70	231	10	0,069
2	Site 4	2300	1150	70	80,5	10	0,024

- ✓ *Dust from transporting dredged material to the storage site (spilled on the road and blown by the wind*

According to the World Health Organization WHO, 1993, the estimated emission factor for dust being blown by the wind when transporting construction materials by truck is 0.1 ÷ 1 g/m^3.

The amount of material is averaged equivalent to 1.5 $tons/m^3$.

The construction period is about 65 days at all 4 construction sites.

The affected volume $V = S \times H$, where S is the affected area (m^2) and H is the affected height, H = 10m.

The average hourly dust concentration (mg/m^3) from transporting dredged material to the storage site, spilled on the road and blown by the wind, is summarized in the following table:

Table 3.12. The total amount of dust emissions from the transportation of dredged material activities

Cause of pollution	**Transported dredged material volume (m^3)**	**Selected emission factor (g/m^3)**	**Construction period (days)**	**Construction time per day (hours)**	**Dust generated (g/hour)**	**Affected area (m^2)**	**Affected volume (m^3)**	**Dust generated (mg/m^3)**

Site 1	98,823.60	1	65	20	76.0182	45000	450000	0.169
Site 3	98,823.60	1	65	20	76.0182	6600	66000	1.152
Site 4	98,823.60	1	65	20	76.0182	2300	23000	3.305

Comparing with QCVN 05:2023/BTNMT, the hourly average limit value for TSP is 0.3 mg/m³, showing that the dust from transporting dredged material to the storage site (spilled on the transport road and blown by the wind) at construction site number 1 is within the permissible limit and exceeds the permissible limit for construction sites number 3 and 4

✓ Dust and exhaust emissions from the operation of machinery and equipment (using diesel oil)

The operation of machinery and equipment includes: the operation of grab dredgers loading dredged material onto barges, transporting dredged material to shore by barges, excavators transferring dredged material from barges to trucks, trucks transporting dredged material from transfer stations to the storage site, and the operation of the cutter and pump combination pumping dredged material to the storage site.

The machinery and equipment use diesel oil, and the exhaust emissions from the combustion of diesel oil include TSP, SO2, NO2, CO.

Calculating the dust and toxic gas emissions during construction leveling: the emissions are calculated based on the total amount of diesel oil consumed (tons) and the WHO, 1993 emission factors according to the formula:

$$Q_{\text{leveling}} = \text{Diesel oil consumption} \times \text{WHO, 1993 emission factor}$$

Where:

- Q_{leveling} is the amount of dust or toxic gas generated during construction leveling (kg)

- WHO, 1993 emission factor

Table 3.13. Emission factors for construction and machinery leveling activities

No.	**Parameter**	**Emission factor (kg/tons)**
1	TSP	4,3
2	SO_2	20S
3	NO_x	55
4	CO	28
5	HC	12

(Source: WHO, 1993, part 1)

Note: The S content in diesel oil is S = 0.05%. NO2/NOx = 0.2.

For each construction site, the type and quantity of equipment used are different. The dust and toxic gas emissions from each dredging activity and transporting dredged material to the storage site are assessed as follows:

***/ Laydown area No. 1:**

The diesel oil demand for machinery at Laydown area No. 1 is as follows:

Table 3.14. Fuel demand at Laydown area No. 1

No.	Machinery and equipment	Shifts/machine per day	Fuel consumption rate (liters of diesel oil/shift)	Diesel oil demand (liters/day)
1	Excavator	02 shifts x 02 machines	95	380
2	Truck	02 shifts x 10 machines	57	1140
3	Barge	02 shifts x 02 machines	1008	4032
4	Clamshell dredger	02 shifts x 01 machines	164	328
5	Tugboat	02 shifts x 01 machines	714	1428
	Total diesel oil demand			**7308**

The daily diesel oil consumption is 7308 liters/day = 7.3 m^3/day. Each day operates for 20 hours.

The density of diesel oil is 0.87 tons/m^3. The diesel oil consumption is 6.36 tons/day, equivalent to 0.32 tons/hour. The construction area is 45000 m^2.

Dust and gas emissions:

$Q_{TSP} = 0,32 \times 4,3 = 1,376$ (kg)

$Q_{SO2} = 0,32 \times 20 \times 0,05\% = 0,0032$ (kg)

$Q_{NOx} = 0,32 \times 55 \times 0,2 = 3,52$ (kg)

$Q_{CO} = 0,32 \times 28 = 8,96$ (kg)

$Q_{HC} = 0,32 \times 12 = 3,84$ (kg)

Dust and gas emission rates:

$E_{TSP} = 1,376 \times 10^6 / (45000 \times 3600) = 0,0085$ ($mg/m^2/s$)

$E_{SO2} = 0,0032 \times 10^6 / (45000 \times 3600) = 2 \times 10^{-5}$ ($mg/m^2/s$)

$E_{NOx} = 3,52 \times 10^6 / (45000 \times 3600) = 0,022$ ($mg/m^2/s$)

E_{CO} = 8,96 × 10^6 / (45000 × 3600) = 0,055 (mg/m^2/s)

E_{HC} = 3,84 × 10^6 / (45000 × 3600) = 0,024 (mg/m^2/s)

***/ Laydown area No. 2:**

The diesel oil demand for machinery at Laydown area No. 2 is as follows:

Table 3.15. Fuel demand at construction site no.2

No.	Machinery Equipment	Machine Shifts / Day	Fuel Consumption Rate (liters of diesel oil / machine shift)	Diesel Oil Demand (liters/day)
1	Pump system 350 m3/h	02 shifts x 04 machines	3211	25688
2	Excavator with bucket capacity ≤10 m3/h	02 shifts x 03 machines	164	984
3	Barge ≤2500 m3/h	02 shifts x 08 machines	1008	16128
4	Tugboat	02 shifts x 02 machines	714	2856
	Total diesel oil demand			**45.656**

The daily diesel oil consumption is 45,656 liters/day = 45.656 m³/day. Each day operates for 20 hours.

The density of diesel oil is taken as 0.87 tons/m³. The diesel oil consumption is 39.72 tons/day, equivalent to 1.98 tons/hour. The construction area is approximately 300,000 m² (pipe length 3000m / pipeline x 2 pipelines; width about 100m).

Dust and gas emissions:

Q_{TSP} = 1,99 × 4,3 = 8,56 (kg)

Q_{SO2} = 1,99 × 20 × 0,05% = 0,0199 (kg)

Q_{NOx} = 1,99 × 55 × 0,2 = 21,89 (kg)

Q_{CO} = 1,99 × 28 = 55,72 (kg)

Q_{HC} = 1,99 × 12 = 23,88 (kg)

Emission loads:

E_{TSP} = 8,56 × 106 / (12 × 1000 × 3600) = 0,0198 (mg/m/s)

E_{SO2} = 0,0199 × 106 / (12 × 1000 × 3600) = 4,6 x 10-5 (mg/m/s)

E_{NOx} = 21,89 × 106 / (12 × 1000 × 3600) = 0,051 (mg/m/s)

E_{CO} = 55,72 × 106 / (12 × 1000 × 3600) = 0,129 (mg/m/s)

E_{HC} = 23,88 × 106 / (12 × 1000 × 3600) = 0,055 (mg/m/s)

***/ Construction Site No. 3:**

Point 3 is divided into 2 segments:

- Segment 1: From the dredging site to the transfer point with a transportation distance of 13km. The construction equipment includes: 01 bucket dredger, 02 barges, 01 tugboat.

- Segment 2: From the transfer point to the storage site, which has an area of 6600 m^2. The construction equipment includes: 02 excavators, 05 trucks.

DO usage demand of construction equipment at construction point no. 3:

Table 3.16. Fuel demand at construction site no.3

No.	Equipment	Shifts per Day	Fuel Consumption Standard (liters of DO oil/shift)	DO Demand (liters/day)
I	**Segment from dredging site to transfer point**			**5788**
3	Barge	02 shifts x 02 machines	1008	4032
4	Bucket Dredger	02 shifts x 01 machine	164	328
5	Tugboat	02 shifts x 01 machine	714	1428
II	**Segment from transfer point to storage site**			**950**
1	Excavator	02 shifts x 02 machine	95	380
2	Truck	02 shifts x 01 machine	57	570
	Total DO Oil Demand			**6738**

DO consumption:

+ Segment 1: Consumes 5788 liters of DO oil/day = 5.788 m^3/day. The DO oil consumption is tons/day, equivalent to 0.252 tons/hour. The construction area has a length of 12km.

Dust and Exhaust Emissions:

Q_{TSP} = 0.252 × 4.3 = 1.083 (kg)

Q_{SO2} = 0.252 × 20 × 0.05% = 0.00252 (kg)

Q_{NOx} = 0.252 × 55 × 0.2 = 2.77 (kg)

Q_{CO} = 0.252 × 28 = 7.05 (kg)

Q_{HC} = 0.252 × 12 = 3.02 (kg)

Dust and emission Rates:

E_{TSP} = 1.083 × 10^6 / (13 × 1000 × 3600) = 0.0231 (mg/m/s)

E_{SO2} = 0.00252 × 10^6 / (13 × 1000 × 3600) = 5.38 x 10^{-5} (mg/m/s)

E_{NOx} = 2.77 × 10^6 / (13 × 1000 × 3600) = 0.059 (mg/m/s)

E_{CO} = 7.05 × 10^6 / (13 × 1000 × 3600) = 0.15 (mg/m/s)

E_{HC} = 3.02 × 10^6 / (13 × 1000 × 3600) = 0.064 (mg/m/s)

+ Segment 2: Consumes 950 liters of DO oil/day = 0.95 m³/day. The DO oil consumption is 0.8265 tons/day, equivalent to 0.041 tons/hour. The construction area has an area of 6600 m².

Dust and Exhaust Emissions:

Q_{TSP} = 0.041 × 4.3 = 0.177 (kg)

Q_{SO2} = 0.041 × 20 × 0.05% = 0.0004 (kg)

Q_{NOx} = 0.041 × 55 × 0.2 = 0.45 (kg)

Q_{CO} = 0,041 × 28 = 1,16 (kg)

Q_{HC} = 0.041 × 12 = 0.496 (kg)

Emission rates:

E_{TSP} = 0.177 × 10^6 / (6600 × 3600) = 0.0075 (mg/m^2/s)

E_{SO2} = 0,0004 × 10^6 / (6600 × 3600) = 1.74 x 10^{-5} (mg/m^2/s)

E_{NOx} = 0.45 × 10^6 / (6600 × 3600) = 0.019 (mg/m^2/s)

E_{CO} = 1.16 × 10^6 / (6600 × 3600) = 0.049 (mg/m^2/s)

E_{HC} = 0,.496 × 10^6 / (6600 × 3600) = 0.021 (mg/m^2/s)

***/ Construction Site No. 4:**

Similarly to construction point no.3, due to the type and number of construction machines being the same in each segment, the DO oil consumption is as follows:

+ Segment 1: Consumes 0.252 tons/hour. The construction area has a length of 13km.

Dust and Exhaust Emissions:

Q_{TSP} = 0,252 × 4,3 = 1,083 (kg)

Q_{SO2} = 0,252 × 20 × 0,05% = 0,00252 (kg)

Q_{NOx} = 0,252 × 55 × 0,2 = 2,77 (kg)

Q_{CO} = 0,252 × 28 = 7,05 (kg)

Q_{HC} = 0,252 × 12 = 3,02 (kg)

Emission Rates:

E_{TSP} = 1,083 × 10^6 / (13 × 1000 × 3600) = 0,0231 (mg/m/s)

E_{SO2} = 0,00252 × 10^6 / (13 × 1000 × 3600) = 5,38 x 10^{-5} (mg/m/s)

E_{NOx} = 2,77 × 10^6 / (13 × 1000 × 3600) = 0,059 (mg/m/s)

E_{CO} = 7,05 × 10^6 / (13 × 1000 × 3600) = 0,15 (mg/m/s)

E_{HC} = 3,02 × 10^6 / (13 × 1000 × 3600) = 0,064 (mg/m/s)

+ Segment 2: Consumes 0.041 tons/hour. The construction area has an area of 2300 m².

Dust and Exhaust Emissions:

Q_{TSP} = 0.041 × 4.3 = 0.177 (kg)

Q_{SO2} = 0.041 × 20 × 0.05% = 0.0004 (kg)

Q_{NOx} = 0.041 × 55 × 0.2 = 0.45 (kg)

Q_{CO} = 0.041 × 28 = 1.16 (kg)

Q_{HC} = 0.041 × 12 = 0.496 (kg)

Emission Rates:

E_{TSP} = 0.177 × 10^6 / (2300 × 3600) = 0.022 (mg/m^2/s)

E_{SO2} = 0.0004 × 10^6 / (2300 × 3600) = 5.0 x 10^{-5} (mg/m^2/s)

E_{NOx} = 0.45 × 10^6 / (2300 × 3600) = 0.055 (mg/m^2/s)

E_{CO} = 1.16 × 10^6 / (2300 × 3600) = 0.14 (mg/m^2/s)

E_{HC} = 0.496 × 10^6 / (2300 × 3600) = 0.06 (mg/m^2/s)

With the small amount of dust and exhaust emissions generated during dredging and transport activities, the air quality in the immediate dredging area is not affected. The impact is negligible.

➢ Impact Scope

The construction activities will primarily affect the air quality in the area where the project is implemented, along the dredging and transport routes, and the storage area, spreading around the project area.

➢ Probability of Occurrence

It depends on the activities of the construction vehicles with an average impact frequency of 20 hours/day. The duration of the impact is short-term (not continuous for 20 hours/day) during the maximum construction period of 65 days. After the end of each shift (daily) or the entire project, the air environment will recover immediately.

c. Impact due to solid waste

- ***Impacts from Dredging and Disposal Activities***

+ Construction Waste:

Various types of trash (impurities mixed with dredged material) will float to the surface during dredging and drift ashore, affecting the environment and the area's aesthetics. However, survey and construction results show that the amount of impurities is minimal, with the dredged material mainly consisting of sandy silt mixed with clay.

The project does not involve site clearance or demolition of old structures like other construction projects, so the generation of construction solid waste (such as wood, gravel, stones, concrete rubble, nylon, newspaper, packaging) is almost non-existent.

+ Domestic waste

It is estimated that each person generates about 0.5 kg of household waste per day. Therefore, with a maximum of 304 workers, the total household waste generated is approximately 152 kg/day. This waste includes inert and non-hazardous organic matter such as plastic bags, packaging, leftover food, vegetable scraps, and noodle wrappers. If not collected and treated, this waste could affect the environment, potentially falling into the sea and impacting seawater quality, marine life, and the aesthetics of the project area.

For waterborne vehicles: self-propelled barges, grab dredgers, tugboats: This solid waste is collected in specialized trash bins placed on the boats, which will be taken for disposal according to regulations when the boats dock.

For other vehicles (land-based like trucks, excavators): The amount of household solid waste generated is minimal. The project owner will arrange for household waste bins and contract with a local waste management service to transport and treat the generated household waste.

The report concludes that the impact of solid waste is minor and manageable.

d. Impact due to hazardous waste.

- ***Impacts from dredging and disposal activities***

Based on practical experience from similar projects, a small amount of hazardous waste is generated on construction vehicles such as oily sludge, grease-soaked rags from cleaning and maintenance, batteries, broken light bulbs, and waste oils. On average, marine vehicles operate about 2,000 hours before needing oil changes and regular maintenance. The waste oils from these activities are hazardous.

According to Circular No. 65/2015/TT-BGTVT dated November 5, 2015 by the Ministry of Transport, the consumption rates for steering system maintenance of inland waterway vehicles with a gross tonnage of 60 to 100 tons are: lubricating oil 60 liters/device/time; grease-soaked rags 0.2 kg/device/time.

Assuming each major vehicle undergoes maintenance and oil change once during the construction phase, additional grease-soaked rags from daily cleaning of moving parts and other equipment on vessels would total approximately 1.8 kg/day. Additionally, about 7.2 kg of grease-soaked rags and 2,160 liters of waste oil are estimated to be generated from maintenance activities.

However, due to the limited operational time at maximum capacity, the actual hazardous waste generated is expected to be less than estimated.

- Oil leakage: On marine vessels, there is often a residual amount of oil-contaminated water in the bilges. This water originates from various sources, including:

(1) Bilge water retained in the bilge wells.

(2) Lubricating oil and diesel leakage from cleaning engines, leaks from fuel lines, and lubricating oil.

According to document No. 1784/BCD-VP dated August 16, 2007, concerning the norms of material consumption in construction, the norm of diesel oil loss is 0.5% compared to the original amount.

The hazardous composition of solid waste: The maximum hazardous composition in household waste is up to 1.0% (Source: According to the 2016 National Environmental Report - Solid Waste section).

With the estimated daily generation of domestic solid waste during the construction phase of the project being 296 kg/day, the total estimated maximum amount of hazardous waste is 2.96 kg/day → the amount generated is insignificant.

If this source of waste were to spread outside, it would pollute the aquatic environment at various levels. When oil-soaked rags fall into the water environment, the oil immediately separates and spreads over the water surface. After floating for some time, the oil-soaked rags will sink to the seabed, posing a risk of water pollution due to dispersed oil, which reduces the ability to dissolve oxygen from the environment into the water, thereby affecting the respiratory processes of bottom-dwelling organisms. There is also a risk of accidents for marine vessels due to floating rags entangling propellers, settling and accumulating on sediment surfaces, causing damage to bottom-dwelling animals.

However, this waste source from construction activities is minimal. All types of waste are collected in labeled oil residue tanks and managed according to Circular No. 41/2017/TT-BGTVT dated November 14, 2017 by the Ministry of Transport on the management, collection, and treatment of waste from vessels within port waters. The project owner contracts with local authorities to handle these wastes in accordance with regulations. Therefore, this waste source has little negative impact on the surrounding environment and can be effectively controlled.

❖ ***Impacts from Dredging and Transporting Dredged Material to Disposal Sites***

Based on practical experience, a small amount of hazardous waste such as oil sludge, oily rags from cleaning and repairing machinery, batteries, broken light bulbs, and waste oil is generated from construction equipment.

Oily Rags: There are no repair activities for watercraft during the construction period, except for regular maintenance of the steering system. According to Circular No. 65/2015/TT-BGTVT dated November 5, 2015, by the Ministry of Transport on the promulgation of economic and technical norms for repairing specialized vehicles in inland waterway management and maintenance, the amount of oily rags ranges from 0.1 to 0.2 kg per vehicle. Additionally, during operation, there is a quantity of oily or non-oily rags generated from regular cleaning of moving parts and other equipment on the ship. However, the amount of these rags cannot be quantified as it depends on the level of depreciation of the vehicle and the operator's skills. Experience shows that the amount of such rags is usually small.

Waste Oil from Periodic Engine Oil Changes: Watercraft typically change engine oil every 2,000 hours (according to Circular No. 65/2015/TT-BGTVT). Waste oil from this activity is hazardous waste. Assuming all main vehicles undergo one oil change during the construction period, based on Circular No. 65/2015/TT-BGTVT, the maintenance oil consumption for inland waterway vehicles with a payload capacity P≤20 tons is: Lubricating oil: 20 liters/device/change; Oily rags: 0.1 kg/device/change.

Daily Cleaning Oily Rags: During the construction period, oily rags are generated from daily cleaning of construction equipment, estimated at 0.05 kg/device/day.

Summary of Waste Oil Generation:

Table 3.17. Predicted volume of waste oil generation

No.	Point	Construction machines	Quantity (items)	Maintainance activities		Amount of Cleaning Rags Generated Daily (kg)
				Amount of rags generated (kg/turn)	Waste oil (liters/turn)	
1	Point 1	Barge	2	0.2	40	6.5
		Excavator	1	0.1	20	3.25
		Tugboat	1	0.1	20	3.25
2	Point 2	Pump station	4	0.4	80	13
		Clamshell dredger	3	0.3	60	9.75
		Transport barge	8	0.8	160	26
		Tugboat	2	0.2	40	6.5

3	Point 3	Barge	2	0.2	40	6.5
		Excavator	1	0.1	20	3.25
		Tugboat	1	0.1	20	3.25
4	Point 4	Barge	2	0.2	40	6.5
		Excavator	1	0.1	20	3.25
		Tugboat	1	0.1	20	3.25
	TOTAL			**2,9**	**580**	**94.25**

The total estimated hazardous waste generated is 2.9 kg of oily rags and 580 liters of waste oil. However, since the operation time of the construction equipment is about 65 days, with a working time of 20 hours per day, the total working hours are 65 x 20 = 1300 hours, so the probability of periodic oil changes is low.

Daily cleaning oily rags: The amount of oily rags from daily cleaning is about 94.25 kg during the 65-day construction period.

Other Construction Equipment: For other construction equipment such as excavators, dump trucks, and loaders, hazardous waste includes waste oil and oily rags. It is estimated that oil is changed every 3-6 months, with about 7 liters/machine per oil change. During the 65-day construction period, each machine is expected to have one oil change. The total amount of waste oil generated during the construction period is summarized as follows:

Table 3.18. The total amount of waste oil generated during the construction period

No.	Point	Construction machines	Quantity (items)	Maintainance activities	Oil Change Norm (liters/machine/cha	Number of Oil Changes	Waste Oil Generated (liters)
1	Point 1	Loader	2	7	1	14	6.5
		Truck	10	7	1	70	32.5
2	Point 3	Loader	2	7	1	14	6.5
		Truck	5	7	1	35	16.25
3	Point 4	Loader	2	7	1	14	6.5
		Truck	5	7	1	35	16.25
	TOTAL					**182**	**84.5**

The total amount of waste oil generated from oil changes is about 182 liters, and the amount of oily rags from daily cleaning is about 84.5 kg during the 65-day construction period.

Battery Lifespan: The average battery lifespan is 2 years. During the project's construction period (1 year), it is predicted that no batteries will need replacement on the construction site.

- Oil Leakage: On watercraft, there is usually a small amount of oil-contaminated water accumulated in the ship's bilge. This water is generated from various sources, including:

+ Leaks at pipelines, seals on pumps, valves, engine rooms, propulsion systems, and overflow from cooling systems, boilers, etc. This water collects in the bilge.

+ Oil and diesel leakage from oil purifiers and fuel and lubrication systems. According to Official Letter No. 1784/BCD-VP dated August 16, 2007, on material consumption norms in construction, the diesel oil loss norm is 0.5% compared to the base oil quantity.

- Hazardous Components in Household Waste: The maximum hazardous component in household waste is estimated to be 1% *(Source: National Environment Report 2016 – Solid Waste section).* With an estimated 152 kg/day of household waste generated during the construction phase of the project, the maximum hazardous waste is estimated at 1.52 kg/day, which is negligible.

If these waste sources are released into the environment, they can cause soil and water pollution at varying levels. Oil floating on the water surface reduces the photosynthetic ability of aquatic plants, decreases the solubility of oxygen from the environment into the water, thus affecting the respiration process of benthic organisms. However, this waste from the construction process is quite minimal. The project owner will have plans to collect all these types of waste into labeled oil residue tanks separately on construction ships and provide specialized containers for hazardous waste, managing according to Decree No. 08/2022/NĐ-CP dated January 10, 2022, by the Government on detailing the implementation of the Law on Environmental Protection and Circular No. 02/2022/TT-BTNMT dated January 10, 2022, by the Ministry of Natural Resources and Environment on detailing the implementation of the Law on Environmental Protection.

The project owner will also contract with a licensed local waste management service for proper treatment. Therefore, this waste is unlikely to cause significant negative impacts on the surrounding environment and can be controlled.

3.1.1.2. Environmental impacts unelated to waste

a. Impact from Noise.

❖ ***Impacts from Noise Generated by Machinery and Equipment during Dredging and Disposal at Sea***

✓ *Noise sources*

Noise can be generated from the operation of construction equipment such as clamshell dredgers, self-propelled hopper dredgers, barges, and canoes.….

✓ *Affected Subjects*

The noise directly affects the officers and workers participating in the construction throughout the project's implementation period.

✓ *Impact Level*

During construction, the operation of equipment such as clamshell dredgers, self-propelled hopper dredgers, barges, and canoes will produce loud noise that affects the health of the workers and reduces work productivity.

Vessels are arranged at a distance from each other in each flow area, turning basin, and waterfront area, so each operating vessel is an independent noise source. The impact of noise can be forecasted according to distances in the logging area (Reference document: Pham Ngoc Dang - Air Environment, Science and Technology Publishing House, 2003) as follows:

Thus, the noise level forecast for sources according to the formula:

$$L_{\Sigma} = 10\lg\sum_{i}^{n} 10^{0,1.Li}$$

Table 3.19 Typical noise of construction equipment at a distance of 15m

Typical noise of construction equipment at a distance of 15m		
No.	**Equipment**	**Noise (dBA)**
1	Cable excavator	80 – 93
2	Self-propelled suction dredger	80 – 93
3	Self-propelled barge	80 – 85
4	Support vessels (23CV Cano, tugboats)	83 – 94
QCVN 26:2010/BTNMT		70 dBA (from 6 to 21 o'clock),
QCVN 24:2016/BYT		Regular area

(Assessment of Sources of Air, Water, and Land Pollution Park I – WHO, Geneva, 1993)

Note: Support vessels have equivalent typical noise levels to tugboats.

- Cable excavators have equivalent typical noise levels to cranes.

The noise generated by equipment such as clamshell dredgers, self-propelled hopper dredgers, barges, and canoes exceeds the permissible standards, affecting workers within a 15-meter radius. According to the Ministry of Health's Decision No. 3733/2002/QĐ-BYT, the noise level in the working environment is limited to 85 dBA.

However, due to the open and spacious area of the construction site at sea, the impact of noise is significantly reduced, mainly affecting only the workers directly involved. The project owner will implement specific noise mitigation measures as detailed in the later sections of the report.

❖ ***Noise Impact from Machinery and Equipment during Dredging and Storage Operations***

✓ *Noise sources*

Noise is generated from the operation of construction equipment such as clamshell dredgers, self-propelled barges, tugboats, canoes, backhoes, cranes, and dump trucks …

✓ *Affected subjects*

The noise directly affects the officers and workers participating in the construction throughout the project's implementation period.

✓ *Impact level:*

During the construction phase, the operation of equipment such as clamshell dredgers, self-propelled barges, tugboats, excavators, dump trucks, and pumping systems will produce loud noise that affects the health of workers and reduces work productivity.

According to the noise levels reported in the Suisun Marsh Habitat Management, Preservation, and Restoration Plan in California, the noise levels of various equipment and vehicles are as follows:

Table 3.20. The noise levels of various equipment and vehicles

No.	**Machinery and Equipment**	**Noise level at distance (dBA)**						
		15m	**25m**	**30m**	**60m**	**90m**	**120m**	**150m**
1	Excavator	87	83	81	75	71	69	67
2	Clamshell Dredger	81	78	77	72	70	67	62
3	Self-propelled Barge	85	81	79	73	69	67	65
4	Tugboat	86	82	80	74	72	70	68
5	Pumping System	86	82	80	75	71	69	67
6	5T Dump truck	83	80	77	75	69	67	65

(Source: Suisun Marsh Habitat Management, Preservation, and Restoration Plan, California Department of Fish and Wildlife, November 2011).

The noise generated by construction equipment exceeds the permissible standards within a 15-meter radius, impacting workers directly. According to the

Ministry of Health's Decision No. 3733/2002/QĐ-BYT, the noise level in the working environment is limited to 85 dBA.

However, due to the open and spacious construction site, the noise impact is significantly reduced, mainly affecting only the workers directly involved. The project owner will implement specific noise mitigation measures as detailed in the later sections of the report.

✓ *Impact range*

According to the data in the table above, the noise level of most construction equipment exceeds the permissible standards within a 15-meter radius (81-87 dBA). This primarily impacts the workers involved in the construction. The noise levels from construction machinery beyond a 25-meter distance meet the permissible standards (<85 dBA).

Noise may also impact residents around the area. However, since the construction site is far from residential areas, the impact is negligible.

The most affected groups by the noise during this phase are the workers directly involved in on-site construction and nearby residents. Higher than standard noise levels can lead to health impacts such as insomnia, fatigue, psychological discomfort, reduced labor productivity, and health issues for those affected. Prolonged exposure to high-intensity noise can lead to hearing impairment and deafness. However, due to the expansive and open construction area, the impact on surrounding residential areas is significantly reduced. The project owner will implement specific measures to minimize the adverse effects of noise in the subsequent part of the report.

b. Impact from Sedimentation and Erosion

During dredging operations, if the construction unit does not adhere strictly to the design, exceeding the designed depth can create steep slopes, combined with the hydrodynamic processes of the area, which can potentially cause erosion of the shoreline and adjacent structures. Furthermore, the transportation activities of large vessels can generate large waves impacting both sides of the shore, potentially leading to shoreline erosion in areas with weak geological foundations. This impact depends greatly on the extent of dredging, the slope of the dredged slopes, and the depth and relative levelness of the seabed after dredging. The impact intensity is inversely proportional to the distance between dredging and the shoreline, and directly proportional to the dredging depth and the slope of the dredged slopes (angle between the dredged slopes and the vertical axis). In other words, the impact is stronger when the dredging distance encroaches deeper into the shore, the dredging depth is greater, and the dredged slopes are steeper.

Therefore, during implementation, the investor will conduct terrain and dredging depth checks according to regulations to avoid causing erosion, cracks, and land subsidence affecting the shoreline and nearby structures.

c. Impact from Rainwater Runoff

Rainwater runoff flows through the construction area, carrying with it various solids and spilled oils on the ground. The composition of the runoff is difficult to estimate and changes over the course of the rain. However, it can be predicted that the runoff will have high turbidity, contain high levels of suspended solids, and may carry spilled oils on the ground. If not collected and treated appropriately, the runoff will pollute the surface water quality of the receiving water bodies, affecting the surrounding environment.

According to WHO statistics, the typical pollutants in rainwater runoff are as follows: 0.5 - 1.5 mg N/liter; 0.004 - 0.03 mg P/liter; 10 - 20 mg COD/liter; and 10 - 20 mg TSS/liter.

During project construction, surface runoff is generated by rain. The amount of runoff depends on the area's rainfall pattern. The flow varies seasonally, and during heavy rains, the runoff will carry dust, soil, and stones from the surface.

The runoff flow rate for the project area is calculated using the limited intensity method (standard TCVN 7957:2023/BXD – Drainage, external networks, and works - Design standards):

No.	Location	Rain Intensity (l/s.ha)	Basin Area (ha)	Runoff Coefficient	Rainwater Flow (m^3/s)
1	Main plant construction area	102.46	36.29	0.37	1.38
2	Ash disposal area 1	102.46	15.00	0.37	0.57
3	Proposed phase 2 ash disposal area	102.46	34.40	0.37	1.30
4	Construction site area 1	102.46	2.15	0.37	0.08
5	Construction site area 2	102.46	23.73	0.37	0.90
6	Dredged material storage area	102.46	55.33	0.37	2.09
7	Organic waste disposal area	102.46	8.30	0.37	0.31
8	Staff housing area	102.46	3.06	0.75	0.24

Rainwater itself does not pollute the environment, but it can carry waste and solid debris from the surface to lower-lying areas. The substances that may be washed away by rainwater at the project site are mainly soil, sand, sediment, and some spilled oils from machinery and equipment, which can pollute the soil and water in the receiving areas.

d. Impact on Traffic

- Impact on waterway traffic

Waterway traffic may be affected by dredging activities, material transport, sediment reception, and installation of maritime signal traffic. The affected objects are vehicles on the waterway traffic line, the route for transporting dredged materials from the dredging area to the reception area—places with frequent ships; traffic vehicles in and out of ports; cargo ships, fishing boats of fishermen, passenger ships traveling in the area.

Specific impacts: It may hinder waterway traffic, making it more difficult for vehicles to move, affecting economic efficiency, and the progress of related works. Construction projects also increase the risk of waterway traffic collisions. Depending on the degree, it can cause damage to people and property, potentially leading to oil spills polluting water sources in the area, affecting the local ecosystem. These impacts occur frequently during construction.

Impact level: Construction projects increase the density of waterway traffic in the area. However, the project owner has agreed with the local authorities on site planning, ensuring space for other waterway transport activities, so the impact is insignificant. Additionally, these impacts are considered medium-term and will end when the dredging process is completed.

By implementing approved maritime safety plans, regulating traffic in a reasonable manner, the impact of dredging activities on waterway traffic is minor, without conflicts and traffic collisions occurring.

- Impact on road traffic:

+ Noise Sources

The noise is generated from the transportation activities of moving dredged materials from the transfer point to the storage site.

+ Affected Subjects

Vehicles participating in traffic on these routes and the project's construction vehicles; Activities near the transport routes used for moving dredged materials by trucks.

+ Impact Level

The volume of dredged material that needs to be transported during the construction phase is 296,471 m^3 (excluding the volume transported at construction site number 2), using 14 m^3 trucks (equivalent to a load capacity of 2 tons). Therefore, the required number of trips is 148,235. With an estimated transportation period of 65 days, the number of vehicle trips (to and from) on the roads will increase by 148,235/65x2=4,561 trips/day, equivalent to 228 trips/hour (assuming 20 hours of operation per day).

Since the transportation route for the dredged material also includes other activities in the surrounding area, the movement of trucks carrying dredged materials will affect the traffic of other vehicles, increasing the risk of traffic accidents. Additionally, the increased number of vehicles on the transportation route will increase the load on the road, raising the possibility of subsidence, cracking, and potholes, thus reducing the quality of the road infrastructure. This also leads to the generation of dust during transportation, reducing visibility and increasing the risk of traffic accidents.

However, the truck routes are as follows:

Route 1: Trucks travel on the existing road, approximately 7.5 km long and 6-7 meters wide. This is a poorly maintained dirt road with no residents and very few passing vehicles. Only the final section is on Nguyễn Chí Thanh road, which separates the two storage sites.

Route 2: Dredged material is pumped into the 16.63 ha storage site, and the dredged material pipeline does not cross Nguyễn Chí Thanh road.

Routes 3 and 4: These are temporary roads constructed for the project to facilitate truck movement, with no other traffic. At construction site number 3, the dredged material is deposited in the 16.63 ha storage site without crossing Nguyễn Chí Thanh road. At construction site number 4, the dredged material is deposited in the 39.5 ha storage site, and trucks must cross Nguyễn Chí Thanh road to reach the opposite storage site.

Therefore, the current traffic impact is primarily on Nguyễn Chí Thanh road. Due to the high frequency of truck trips (20 trucks with a density of 228 trips/hour), the quality of the existing road will be affected. The impact on road quality and the movement of residents and businesses in the area is considered moderate.

+ Impact Range

The impact area includes:

The existing road from the main plant area to the storage site.

Temporary roads from transfer points 1 and 2 to the dredged material storage site..

e. Impact on Port Activities

The project area includes operational ports such as Vung Ang Port, Son Duong Port, and Viet Lao Port. During dredging operations, there will be certain impacts on navigation activities, berthing and cargo handling of ships entering and leaving ports, potentially delaying schedules, reducing the number of vessel arrivals, and increasing collision risks among ships along the fairway and in turning basins.

The project owner will implement a plan to ensure maritime safety during construction to minimize impacts on port activities.

f. Impact on Aquatic Ecosystems

During project implementation, various types of waste can affect the aquatic life in the area:

- Domestic waste discharged directly into the water environment can cause water pollution, promoting algal blooms, excessive growth of phytoplankton and changes in species composition. Additionally, it may affect some ecosystems in areas where aquaculture of aquatic products is conducted near the dredging channel.

- Dredging activities will alter the sediment composition, stir up bottom sediment layers, increase suspended silt and sand, and abruptly change the living environment of benthic animals. In dredging and receiving areas, changes in seabed topography significantly alter habitats and nesting grounds of species such as fish, shrimp, and crabs, forcing them to move and adapt to new habitats. This alteration affects the structure and function, reducing the number of species in the local aquatic ecosystem.

Moreover, dredging and sediment reception processes cause turbidity, hindering the photosynthesis of phytoplankton, seaweed, and harming marine ecosystems, affecting bottom-dwelling organisms and benthic species diversity. However, these organisms have short life cycles (7-30 days), thus they can recover rapidly once the seabed stabilizes after construction completion.

The impact extent is localized around the dredging and sediment reception areas. The seabed environment will recover quickly after the construction phase, providing favorable conditions for the continued development of benthic organisms. The dredging and sediment reception areas of the project are located outside Vietnam's spawning grounds and nursery areas in its seas, and are not within potential fishery resource protection zones. Therefore, the project's impact on natural aquatic ecosystems can be assessed as directly affecting areas with moderate biodiversity without negatively impacting important marine areas.

h. Impact on soil environment at the dredged material storage area

The impact on the soil environment at the dredged material storage area is understood as the effects that change the land morphology, as well as the changes in the physical and chemical indices of the soil in the receiving area. According to this approach, the impact is specifically described as follows:

- Change in Land Morphology: The area receiving dredged material has a low-lying terrain. The reception of dredged material will change the terrain of the storage area to reach an elevation of +3.0m. This elevation has been reviewed and approved by the competent authorities, so the impact on the land morphology is acceptable.

- Change in Physical Characteristics: The soil area will undergo changes in physical characteristics due to the surface layer being occupied by dredged material. Currently, there are no regulations on filling materials, so there is no basis for assessing the impact of this content. However, with the agreement of the People's Committee of Hà Tĩnh Province regarding the need for filling materials, the social impact of changing physical characteristics is acceptable.

- Change in Chemical Characteristics: The dredged material contains saline water, so the highest risk is salinization of the surface soil layer. This risk is assessed as low because, according to the land use plan approved by the People's Committee of Hà Tĩnh Province, the entire land area is designated for industrial use.

i. Impact on Groundwater Environment at the Dredged Material Storage Area

The impact on groundwater quality is unavoidable; however, the impact on groundwater is insignificant because this area is adjacent to the sea. Most of the seawater is processed through sedimentation tanks and drainage channels that flow back to the sea. Therefore, the impact of groundwater salinization is negligible.

Moreover, this area is planned as an industrial land area, so the future impact of salinization is minimal.

3.1.1.3. Possible environmental incidents in the project.

During project implementation, the following incidents may occur: waterway traffic accidents, road traffic accidents, labor accidents, oil spills, embankment collapses, breaches of containment embarkments at the dredged material storage site, and ruptures of dredged material transport pipelines from the pumping system.

Areas with high potential for incidents include:

- Waterway transport routes from the dredging location to the dumping site and transfer point to bring dredged material ashore: This route involves the operation of transport barges, with an increase in the number of barges (sites 2, 3, and 4) to 12 units, with a capacity of ≤2500 m^3/h, making water traffic accidents likely.

- Dredging construction areas: Concentration of construction equipment (involving 5 tugboats, 6 clamshell dredgers, and 14 barges receiving dredged material from clamshell dredgers across all 4 construction sites) obstructs flow and increases collision risks.

- Road transport routes from transfer points to storage sites: Increased road traffic density of 20 trucks (14 m^3 each) raises the risk of vehicle collisions.

- Locations of dredged material pumping systems at Laydown area No. 2 (4 pumping systems with a capacity of 350 m^3/h), transfer points of sites 3 and 4. These locations are close together with a relatively high density of construction vehicles including 4 pumping systems with a capacity of 350 m^3/h, 12 barges ≤2500 m^3/h, 2 excavators, 10 14 m^3 trucks, 4 tugboats, and 2 HDPE pipelines D3000 for transporting dredged material, 3000m/pipe. Therefore, the risk of accidents is high.

- Dredged material storage area: Concentration of a large number of trucks, up to 20 trucks of 14 m^3 each. This area also receives a large volume of dredged material (663,851 m^3), posing a risk of breaches in containment embarkments.

a. Oil spill incident

There is a risk of oil spills occurring during the project due to various reasons associated with construction vehicles during dredging, material transport, and other activities. These reasons include:

- The fuel system of construction equipment, including tanks, reserves, fuel lines, joints, valves, etc., may leak if not properly sealed.

- Collisions between construction vessels and oil-carrying vessels can lead to vessel sinking. This is a highly dangerous cause not only resulting in economic and environmental losses but also endangering human lives.

An oil spill incident is a serious accident with significant impacts on the environment and living conditions. When such incidents occur, the spread of oil can be extensive. Oil spills can adversely affect ecosystems such as benthic organisms, planktonic organisms, fish and larvae, water quality, and aquaculture and fisheries activities.

Oil spill incidents may occur at any time during construction process.

The risk of oil spills occurring is assessed at the operational level (< 20 tons) based on the total fuel volume used in the project, divided among various construction vehicles. Therefore, in the event of a collision, there is a possibility of a regional-scale oil spill — the worst-case scenario.

With suction dredgers, barges operating continuously, and cargo ships, passenger ships frequently passing through the channel area, Vung Ang II BOT thermal power plant port, along with maritime ships in the East Sea, there is a risk of oil spills.

When an oil spill occurs, it will affect the marine environment if not promptly addressed. To guide the response if an incident occurs, the unit has forecasted the spread direction and scale of the oil slicks through a mathematical model simulating the spread of oil slicks when an incident occurs. The oil spill incident is assumed to be due to a ship accident in the Project area.

The unit uses the Mike 21/3 Couple model to simulate oil spreading in the turning basin area and the dumping area with an average oil spill level, equivalent to an oil spill amount of 20 m^3 - 500 m^3. According to Decision 12/2021/QD-TTg dated March 24, 2021, for an average oil spill level, oil containment must be deployed within 24 hours.

Accordingly, the model simulates the incident for 24 hours to forecast and assess the spread range of the oil spill in the project area.

The calculation model includes basic schemes, which are the motion equation to simulate incompressible fluid flow in a swirl mode, the continuity equation, the state equation, the convection-diffusion equation of temperature and salinity, the Boussinesq approximation, and the hydrostatic approximation. The theoretical basis of the model according to cross-sections (offshore calculation points using 3-D flow results calculated by the finite element method) uses the basic equations of Csanady (1928) - cited from Jeffries' (1923) work. Wave parameters are calculated using Airy wave theory, and wave-current interaction is determined from the bottom boundary layer model of Grant and Madsen (Grant and Madsen, 1979).

Applying real conditions at the research area, simulating the transport behavior of oil slicks according to two wind seasons: the Northeast monsoon with wind speed of 12 m/s and the Southwest monsoon with wind speed of 5 m/s. The simulation scenarios are as follows:

- Scenario 1: Oil spill incident during the Northeast monsoon

- Scenario 2: Oil spill incident during the Southwest monsoon

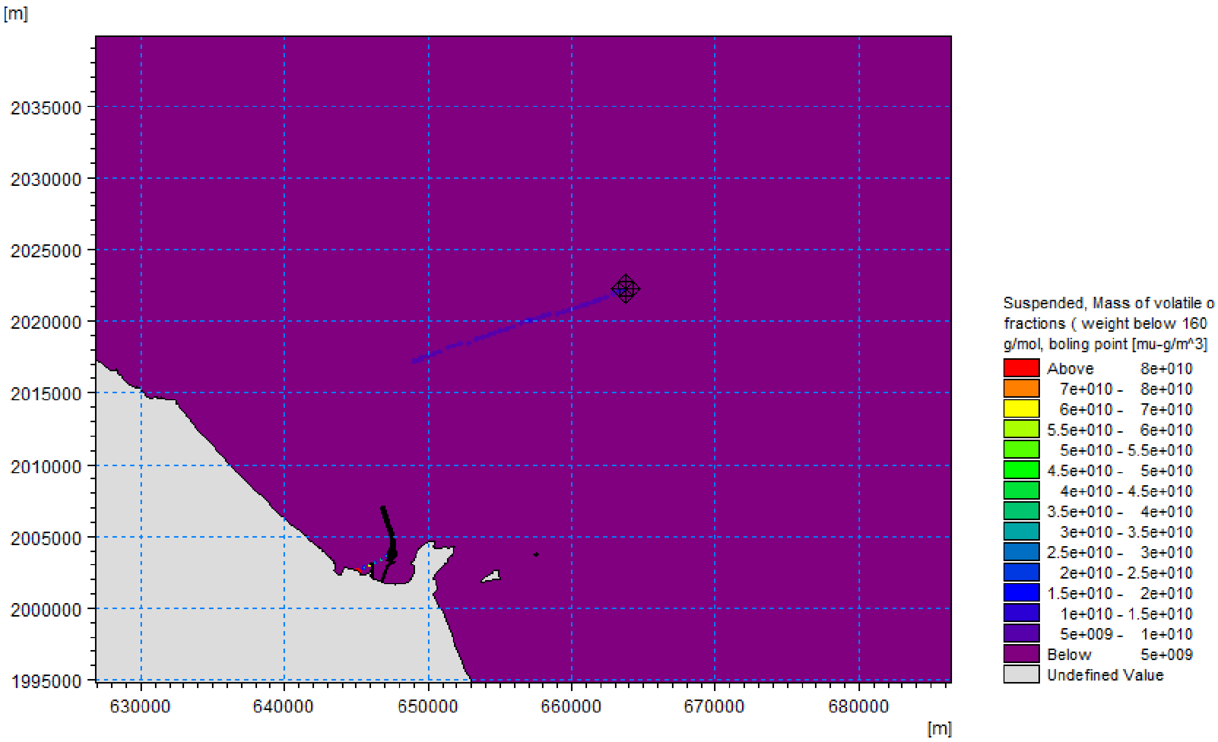


Figure 3.29. Oil slick after 6 hours of the incident during the Northeast monsoon

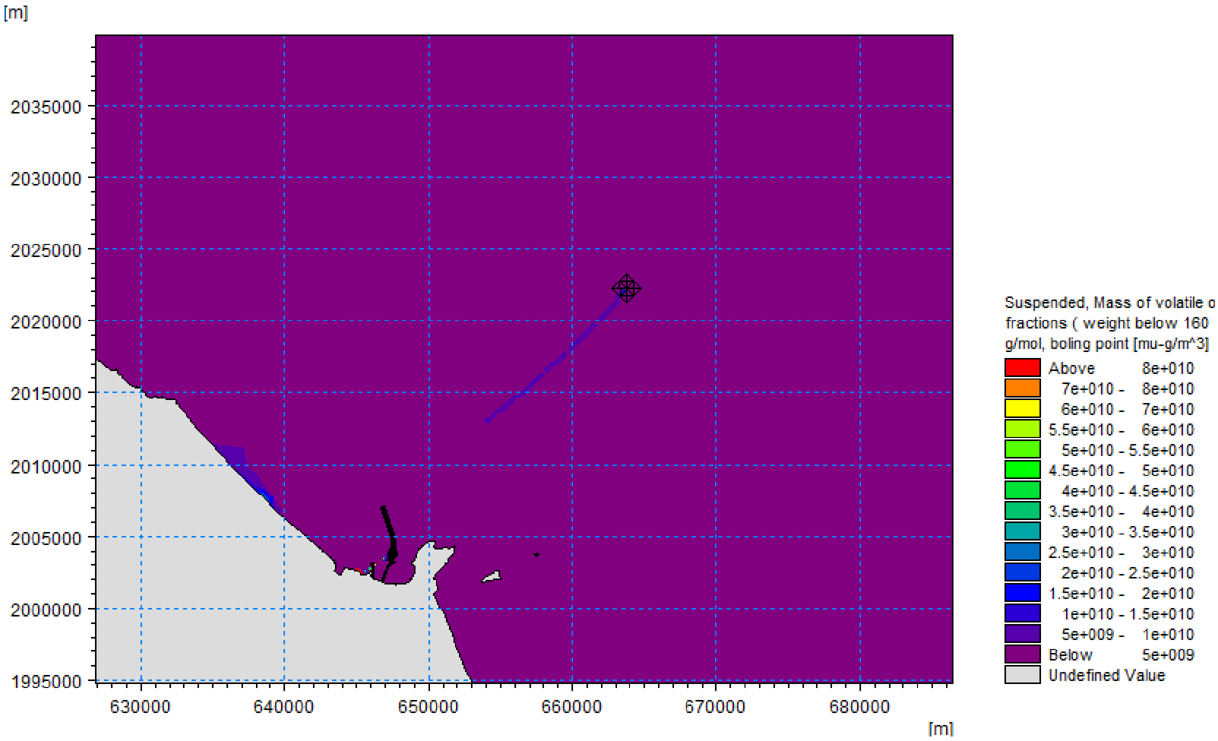


Figure 3.30. Oil slick after 12 hours of the incident during the Northeast monsoon

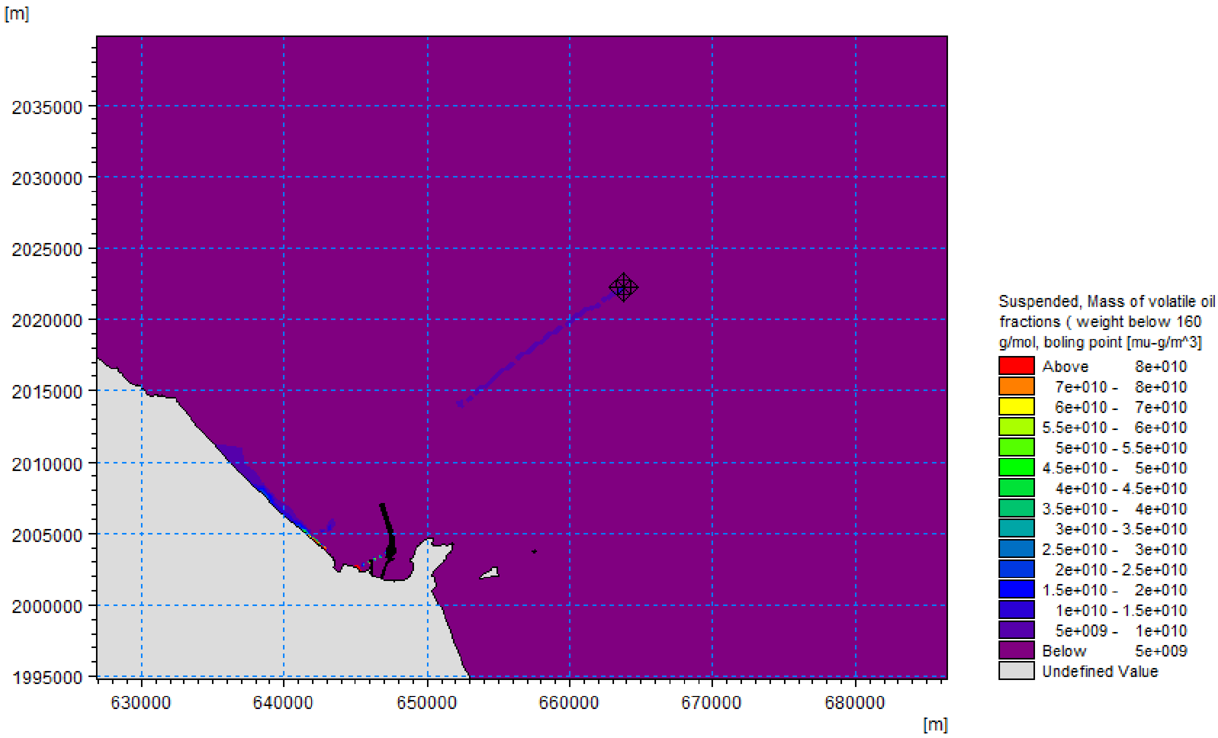


Figure 3.31. Oil slick after 18 hours of the incident during the Northeast monsoon

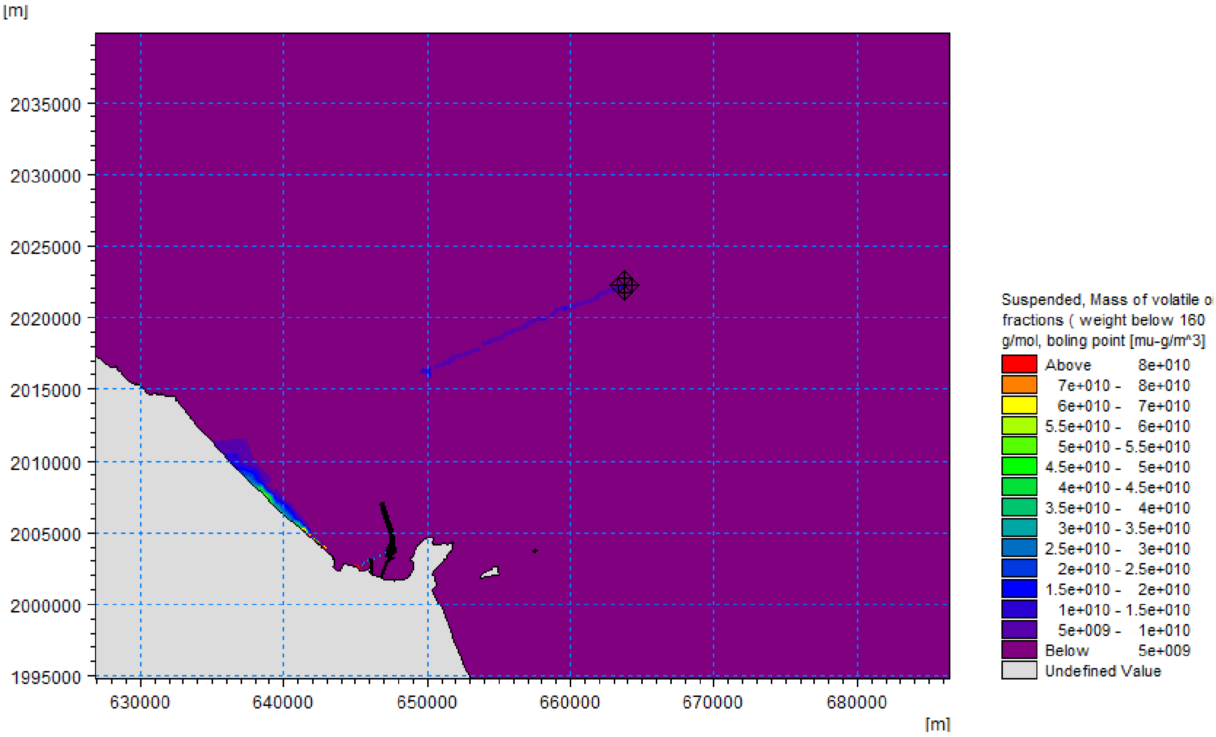


Figure 3.32. Oil slick after 24 hours of the incident during the Northeast monsoon

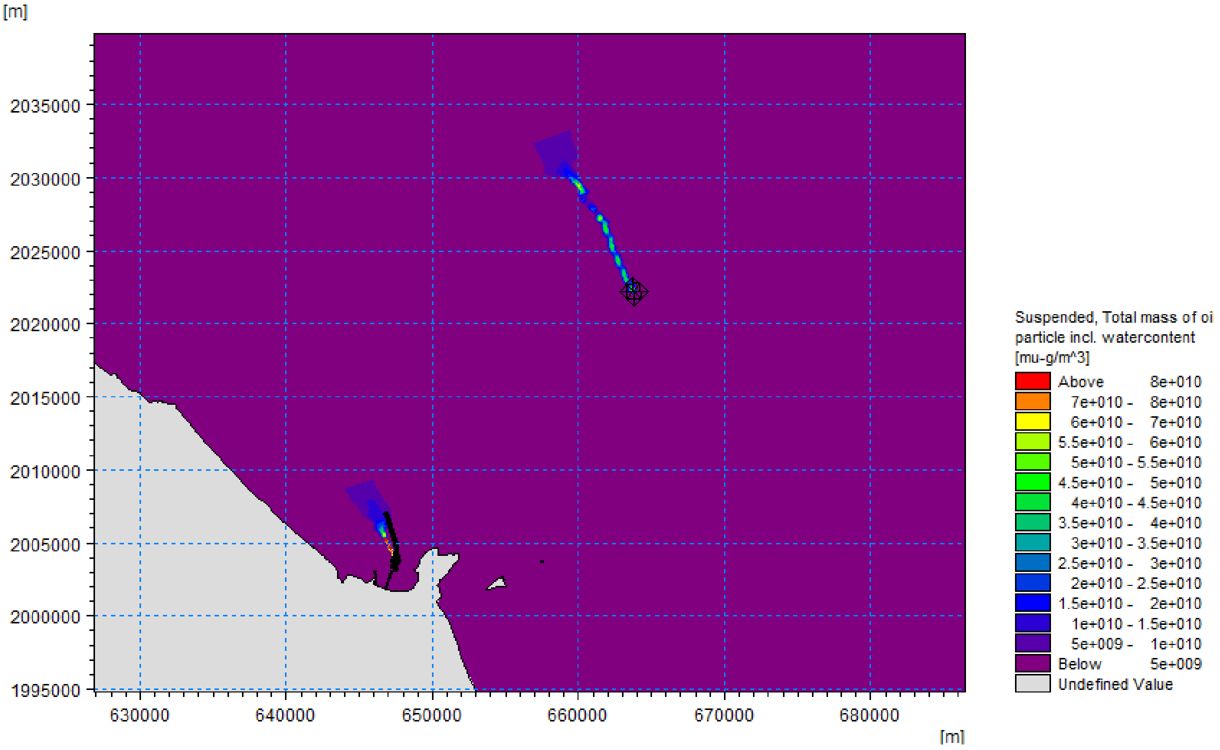


Figure 3.33. Oil slick after 6 hours of the incident during the Southwest monsoon

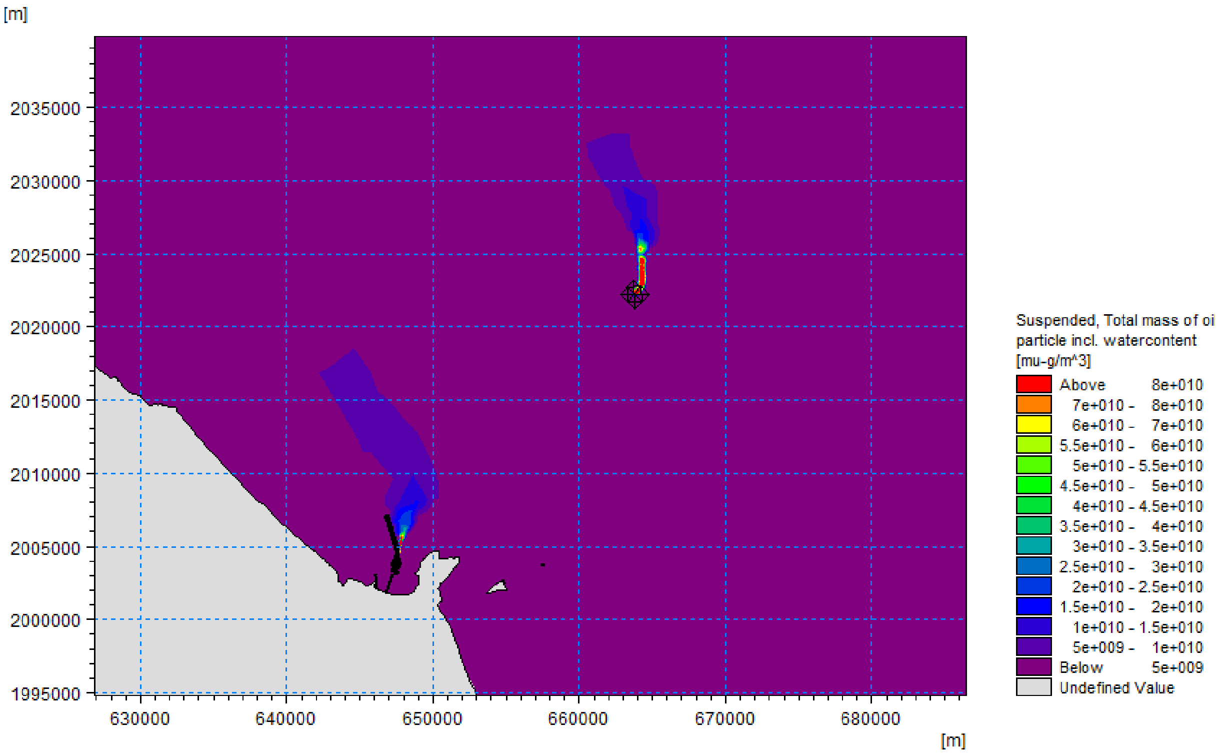


Figure 3.34. Oil slick after 12 hours of the incident during the Southwest monsoon

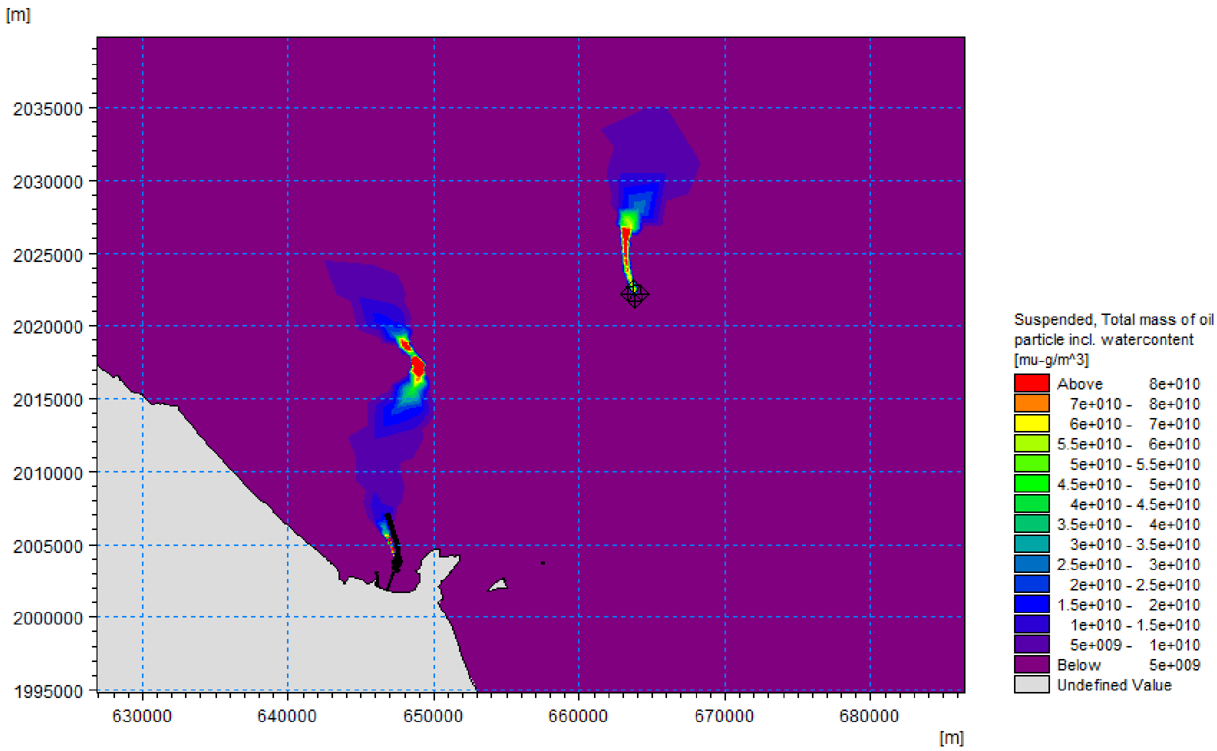


Figure 3.35. Oil slick after 18 hours of the incident during the Southwest monsoon

Hình 3.1. Vệt dầu loang sau 18h xảy ra sự cố trong mùa gió Tây Nam

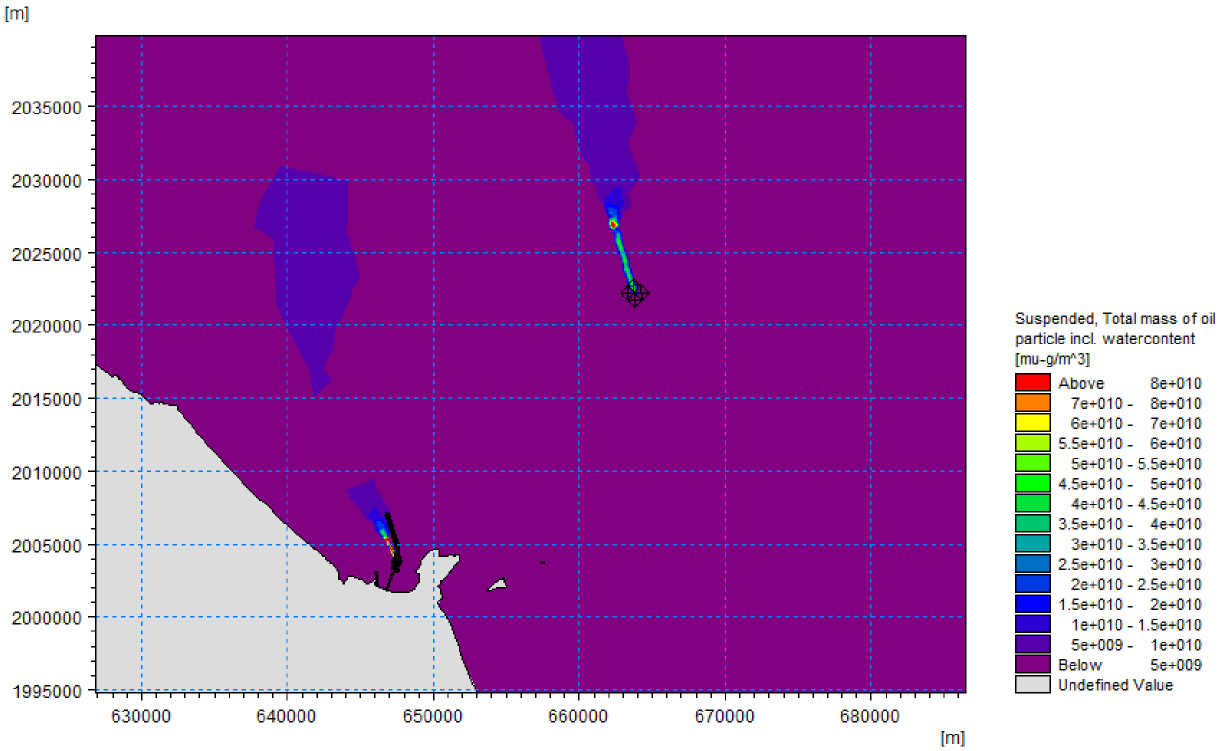


Figure 3.36. Oil slick after 24 hours of the incident during the Southwest monsoon

Simulation results show that when an oil spill occurs, the diffusion process will gradually carry the oil slick according to the rising tide. The offshore area has a larger oil slick impact range than the turning basin area.

During the Northeast monsoon, the oil slick tends to spread towards the Southwest. In the dredging area, the oil slick tends to spread towards the coastal area of Ky Ninh commune. During the Southwest monsoon, the oil slick tends to spread parallel to the shore, towards the North.

Preventive measures to minimize the impact of oil spills during construction:

- All waterway traffic involved in the project must be approved by the Ha Tinh Maritime Administration. Daily construction schedules are communicated to ensure maritime traffic management and regulation.

- Construction vessels are equipped with oil containment booms for tanks, engines, equipment maintenance areas, etc., to manage and prevent oil spills effectively. They are equipped with oil pollution prevention systems as per the equipment's inspection requirements to limit oil spillage (Decision No. 12/2021/QD-TTg).

- Strict control of vessel movements to adhere to navigation channels and signage to prevent collisions. During dredging operations, anchors must be securely moored to prevent drifting. Transport vessels must comply with anchoring regulations.

- Regular inspection of fuel tanks, strict control of fuel storage locations, and entry-exit vehicles to promptly detect and prevent fuel leaks. Regular inspection of machinery and equipment to prevent oil leaks.

- Spilled oil must be absorbed using absorbent pads rather than directly rinsing into the water, and stored in designated containers.

- Establishment of a rapid response team comprising management and rescue personnel equipped with mobile phones for immediate communication in case of accidents.

- Project owner along with contractors will closely coordinate with relevant local authorities before construction begins to prepare for and respond to oil spill incidents, minimizing negative impacts on the environment and local ecosystems.

In case of an oil spill incident:

- The project owner and construction contractor will mobilize all resources for immediate response, prioritizing activities to rescue victims and protect the environment. Proactive measures will be taken to contain and prevent oil spills from spreading into the environment. Close monitoring of the risk of oil spreading to shorelines will prioritize and implement protective measures for critical protection areas.

- In the event that the oil spill incident exceeds the project's response capacity, the project owner and contractor will contact local authorities: Ha Tinh Maritime Administration (marine operations management unit), Provincial Command of Natural Disaster Prevention and Search and Rescue, and Ha Tinh Provincial Border Guard Command (standing unit) for support and efficient resolution of the incident.

The project owner and construction contractor will closely coordinate with relevant agencies to prevent and respond to oil spill incidents.

- Identification of the source of the oil spill, its location, and its causes will be promptly communicated to leadership and the designated unit for immediate guidance.

- Quickly mobilization of vehicles, equipment, and materials will be deployed within one hour to contain oil spills under 20 tons. Ready availability of vehicles, equipment, and materials to participate in coordinated response and remediation efforts as required by authorized agencies.

- Collaboration with the regional maritime search and rescue center to simultaneously conduct rescue operations for personnel and vessels involved in accidents.

- Ha Tinh Maritime Administration will promptly deploy vessels and vehicles for rescue operations, coordinating with relevant agencies to monitor and respond to oil spill incidents at sea.

Implementation Principles:

+ Ensuring safety, fire prevention, and explosion prevention during oil spill response.

+ Unified command, coordination, and strict contract management of all forces, vehicles, and equipment involved in response operations.

+ Active participation in post-incident recovery efforts, with the contractor responsible for compensating damages caused by oil spills according to legal provisions.

These minimization measures are feasible and appropriate to the project's practical conditions and capabilities. The project owner will diligently implement the proposed measures.

b. Workplace Accident Incident

- *Causes of occurrence:* Accidents at work may occur on board, typically from slipping and falling into the water or from electrical shocks. Workplace accidents can also happen on shore, such as falling from shore into the water at loading points and pumping stations for dredged material onto shore, accidents during operation, use of mechanical construction equipment, accidents during the movement of vehicles carrying dredged material, with causes often due to workers not complying with labor rules and regulations, lack of proficiency, experience, or inadequate safety equipment and protective gear.

- *Affected parties:* Workers, sailors on construction vessels.

- *Extent and duration of impact:*

There is a risk of occurrence at any time during the construction process.

The project owner will implement measures to minimize the impact of work accident incidents and labor protection measures, ensuring effective control of work accident incidents.

Overall, workplace accidents often result in significant human and property losses, with long-term repercussions for families, communities, and society. Therefore, to prevent and respond to workplace accidents, the project owner will apply appropriate construction techniques, scientifically mobilize machinery and vehicles, and ensure labor safety regulations for workers participating in construction activities on the site.

c. Fire and explosion incidents

- *Causes of occurrence:*

Fuel and electrical systems on construction equipment pose significant risks of fire and explosion due to worker negligence, collisions between construction vehicles, or natural disasters (rain, lightning, heat causing electrical sparks and explosions).

- *Affected parties:*

Workers, sailors on construction vessels, and construction vehicles, ships, and equipment.

- *Extent and duration of impact:*

When they occur, these incidents can severely affect human health, lives, construction vehicles, property, delay project progress, and cause damage to the project owner. This incident can occur at any time during the construction process.

In general, fire and explosion incidents can lead to significant economic losses and have a profound impact on natural environments and community health during construction. Since fire and explosion incidents can occur at any time, the project owner will ensure the application of specific safety prevention and response measures for fire sources throughout the project construction period.

d. Traffic Accidents

- Road Traffic Accidents

+ Causes of occurrence:

Road traffic accidents occur due to trucks transporting dredged materials from excavation points to the storage area. The high density of trucks (approximately 20 vehicles with a traffic rate of 228 trips per hour) increases the risk of collisions and road accidents significantly. These collisions can lead to vehicle overturning, damage to construction equipment, and impact the health and lives of vehicle operators and surrounding individuals.

Road traffic accidents result from lack of responsibility and carelessness in the driving process of truck drivers during transportation.

+ Affected objects:

Vehicles involved in traffic within the area, along the route transporting dredged materials from excavation points to the storage area.

+ Extent and duration of impact:

There is a risk of occurrence at any time during the construction process. The extent of impact depends on the adherence to labor discipline by workers on the construction site.

However, these incidents can be effectively prevented by regular technical inspections of transportation and construction vehicles; proper scheduling of vehicle operations to reduce environmental pollution, alleviate pressure on local infrastructure, and minimize health impacts on the community; enhanced awareness campaigns to ensure compliance with traffic laws among workers and vigilance during traffic operations.

- Water Traffic Accidents

✓ *Causes of occurrence*

Marine traffic accidents occur due to dredging excavator operations, support tugboats, and dredging vessels transporting dredged materials when navigating in the area, colliding with each other and with dredging vehicles and floating dredged materials. These collisions can lead to vessel capsizing, damage to construction equipment serving the dredging operation.

Marine traffic accidents result from lack of responsibility and negligence in the operation by the ship captain and crew during transportation.

✓ *Affected parties:*

Vehicles involved in traffic within the area, the route transporting dredged materials to the shore.

✓ *Extent and duration of impact:*

There is a risk of occurrence at any time during the construction process. The extent of impact depends on the adherence to labor discipline by workers on the construction site.

When marine traffic accidents occur during project execution, they often lead to vessel sinking, causing significant losses in human lives, property, environmental pollution, and biodiversity decline due to oil spills. However, the Project Owner proposes and implements effective measures to minimize the impact of marine traffic accident incidents, thus these incidents can be controlled.

d. The project will fully implement measures

Incidents with the pipeline used for pumping dredged material to the containment area can occur, such as blockages; pipe bursts, or pipeline dislodgements, causing dredged material to spill into the environment. Such incidents directly affect marine water quality, the underwater ecosystem, and the area's landscape.

Although such incidents are rare, they can have serious environmental impacts, delay the dredging project's progress, and cause significant harm to the project owner and local aquatic ecosystems.

The project owner and contractor will implement preventive measures and seriously mitigate the impacts of such incidents, ensuring they are controllable.

f. Incidents due to the project and contractor

This incident can occur when the volume of dredged material mixed with water exceeds the safe threshold of the containment embarkment, causing it to break. Additionally, a high concentration of dump trucks (about 20 trucks) dumping dredged material into the containment areas can cause conflicts during movement, reversing, and dumping, potentially leading to embarkment breakage.

Such incidents can directly affect the water source surrounding the containment area, impact seawater quality, and nearby households, and potentially cause severe damage.

However, there are no fish cages or aquaculture ponds around the containment area. The containment areas for dredged material have been designed and constructed to meet standards, with a capacity sufficient for the entire volume of dredged material from the project (two containment areas of 16.63 ha and 39.5 ha, with a capacity significantly greater than the project's dredged material volume of about 663,850.8 m3), ensuring safety and sustainability. Therefore, the probability of embarkment failure is low.

The project owner will implement effective preventive measures to minimize the risk of embarkment failure, regularly monitor, and control the dumping process to ensure this incident is controllable.

g. Incidents due to strong waves and wind

- *Causes:*

Extreme weather conditions such as storms, floods, and tornadoes.

- *Affected subjects:*

Impacts on construction activities, damage to construction equipment such as collisions, breakages, sinking ships, machinery damage, and erosion of unfinished embankments.

- *Severity and duration of impact:*

Incidents can occur at any time, especially during the rainy season. If incidents occur, they will affect the quality of construction equipment and the project, potentially causing severe damage, delaying progress, and resulting in losses for the project owner. Storms causing collisions and sinking ships may result in oil spills, impacting the environment, and affecting the health and safety of construction workers. Natural disasters can also destroy the project, causing significant losses for the project owner.

3.1.2. Measures for waste collection, storage, treatment, and other negative impact reduction on the environment

3.1.2.1. Wastewater collection and treatment solutions

For domestic wastewater

- No on-site accommodation or dining for construction workers. The project arranges accommodation in nearby residential areas for workers through contracted construction firms.

- Implement regulations for managing domestic solid waste at construction sites and surrounding areas, strictly prohibiting dumping garbage, domestic wastewater, or urine inappropriately on-site.

- The project owner or through contractors appoints supervisors to manage waste at construction sites, regularly liaising with local environmental authorities for proposals and advice on waste management.

- Promote environmental hygiene awareness among construction workers, requiring them not to litter and to collect household waste in designated containers.

- Install 13 portable toilets on the construction site, each with a waste storage tank capacity of approximately 6.0 m^3. These will be periodically transferred to a licensed service provider for collection, transport, and disposal according to regulations.

- Construct and operate a domestic wastewater treatment system for the construction site's office area with a capacity of 60 m^3/day-night. The treatment process is as follows: Wastewater → collection tank → equalization tank → anoxic tank → aerobic tank → sedimentation tank → intermediate tank → MBR tank → disinfection tank → treated wastewater meets QCVN 14:2008/BTNMT (column B, coefficient K = 1.2) → drainage ditch (discharge point coordinates: X(m) = 2001791.710 and Y(m) = 594248.650).

*/ For underwater construction vehicles:

- Equip all vessels with toilets that meet the standards specified in QCVN 17:2011/BGTVT/SĐ2:2016 - National technical regulation on the prevention of pollution by inland waterway vessels - Part on wastewater, and must be inspected by the Vietnam Register.

- Vessels are only permitted to operate if they are equipped with toilets and water tanks as mentioned above.

- Establish regulations for staff and workers to ensure no random defecation and no direct discharge of wastewater into the surrounding environment.

- Waste holding tanks in the toilets must be periodically transported and treated by a licensed unit according to legal regulations when the vessel docks.

Reducing water pollution from hydraulic construction activities

- During the construction of underwater structures (port, cooling water intake canal, cooling water discharge route), there may be impacts on the water environment in the area. To minimize this source of pollution, construction units must follow proper procedures, use modern dredging equipment, and only dredge within the project scope as specified in the following measures:

+ Require ship and barge owners to manage, collect, and treat wastewater in compliance with discharge standards into the environment. Ship owners are not allowed to clean the decks of ships and barges in the port area to prevent wastewater discharge that could increase water pollution within the port area.

+ During dredging operations, organize traffic control and flow regulation at the construction site. Deploy buoys and install temporary signal posts during construction, including underwater buoy systems and onshore signal posts.

+ Dredging activities must follow the designed dredging route, which should be positioned using a global GPS system. The dredging route should also be checked using visual markers (placed in shallow water areas) or marker buoys (in deep water areas). The buoy and signal marker system must be sturdy, with marker heights sufficient to remain above water during high tides, ensuring visibility for the dredging equipment operators. Markers must be painted in red and white, with attached signs and signal lights for nighttime visibility.

- Bilge water from construction ships: The contractor must equip the necessary storage devices and is responsible for hiring a service provider to collect and treat the water according to the regulations of Circular No. 41/2017/TT-BGTVT dated November 14, 2017, by the Minister of Transport and Circular No. 02/2022/TT-BTNMT dated January 10, 2022, by the Minister of Natural Resources and Environment.

- Vehicle washing wastewater at the main plant site: Construct a sedimentation tank with a capacity of 8.0 m^3 to settle soil and sand and filter oil and grease. The tank has two compartments (one for sedimentation and one for water storage). The sedimentation tank is equipped with SOS fabric to filter oil and grease. The oil-contaminated SOS fabric is collected and treated as hazardous waste. The treated water is recycled for road spraying, dust suppression, and vehicle washing, with no discharge into the environment.

For excess seawater and runoff water from the process of dumping dredged material onshore into the containment area:

The containment area has surrounding embankments. The embankments are built from local soil, covered with waterproof plastic sheets to ensure stability and contain dredged material mixed with seawater within the containment area.

The settling tank is built with a brick structure, coated with waterproof plaster inside the tank. The total area of the settling tank is L×W = 30×10 = 300m^2, with a tank depth of 2 meters. Excess seawater, after passing through the three-stage settling tank, flows through an open channel and out to the sea.

Figure 3.37 Containment area embankment and waterproof plastic liner

Figure 3.38 Three-stage settling tank for treating runoff water from the containment area

Figure 3.39 Open channel receiving water after the settling tank.

b. Measures to reduce dust and exhaust emissions;

- For transportation activities

+ Contractors are required not to use outdated or expired construction vehicles and equipment. Usage calculations must align with the actual construction needs of the project. All transportation vehicles, machinery, and equipment must undergo emissions testing according to Vietnamese standards for CO, hydrocarbons, and particulate matter (TCVN 6438-2001).

+ Preference is given to fuels with low sulfur content to reduce SO2 emissions.

+ Vehicles must be registered for transportation, and permission for port gathering must be obtained from relevant state authorities as per regulations.

+ Strictly adhere to speed limit regulations within the construction area to ensure traffic safety and minimize dust: Maximum speed on internal roads is < 10 km/h. Signage indicating ongoing construction and personnel to guide traffic through construction zones are required to ensure safety.

+ Underwater construction vehicles must comply with the Inland Waterway Traffic Law No. 23/2004/QH11 dated June 5, 2004.

+ Vehicles transporting raw materials must adhere to designated load capacities. Enclosed trucks or tarpaulins must cover all transport vehicles to minimize material spillage during transportation.

+ Implement vehicle cleaning before exiting the construction site. Establish an area for vehicle washing at the entrance to the construction site.

+ Coordinate with local authorities to establish monitoring teams to ensure compliance with transportation regulations.

+ In case of material spillage along the route, drivers are responsible for stopping and clearing all spilled materials before continuing their journey.

+ Fully implement an environmental monitoring program and submit monitoring reports during project construction.

+ Implement a strict water spraying regime regularly, multiple times a day (especially during the dry season, 2-4 times/day), for example, in the morning, afternoon, and evening, and spray water in dusty areas. The number of water trucks will be arranged according to actual needs, particularly on the transport route from the main plant to the containment area and the two temporary routes from the transfer points in Tan Phuc Thanh village to the containment area.

+ Limit excavation activities on windy days.

+ Provide full protective gear for construction workers and require strict adherence to protect workers' health.

Measures to reduce dust and emissions from construction machinery and equipment

+ Regulate the number of machines operating simultaneously and maintain sufficient distance between machines to meet the following requirements:

+ Calculate and use the appropriate number of machinery and equipment to minimize environmental impact on the air quality of the area.

+ Avoid using outdated construction machinery to minimize dust and exhaust emissions.

+ Use vibration-reducing bases for machines that generate significant vibration, such as pile drivers, concrete cutting machines, and air compressors.

+ Before commencing construction activities on the project, all types of vehicles, machinery, and equipment must undergo inspection, registration, and technical safety certification to ensure compliance with environmental hygiene regulations.

+ Regularly maintain vehicles and construction machinery to minimize air pollution.

+ Implement an environmental monitoring program for air quality, noise, and vibration in the construction area, and apply additional restrictive measures when necessary.

+ Limit the simultaneous operation of multiple types of machinery within the project area and prioritize the use of low-sulfur fuel.

+ Restrict the operation of machinery during periods of high wind intensity to minimize the dispersion of dust and emissions.

+ Turn off the engines of equipment when not engaged in excavation work.

+ Adhere strictly to the transportation route to the dumping area for submerged fill acceptance.

c. Measures for collection, storage, management, and treatment of solid waste

- Domestic solid waste

+ Domestic solid waste generated at the project site is collected and deposited into designated trash containers placed around the construction area. The contracting parties arrange plastic containers with capacities ranging from 100-120 liters for collecting domestic waste. The operational office areas of the contractors are also equipped with appropriate numbers and sizes of waste bins.

+ A common domestic waste storage area covering approximately 24.0m2 is designated on the construction site for temporary storage of domestic waste.

+ The domestic waste generated at the project is contracted with a service provider located in the area to collect and transport the waste for proper disposal as per regulations, with a frequency of 1-2 days per collection. Currently, the project's main contractor, DOOSAN Enerbility Vietnam LLC, has signed contract number VA2-AD-2022-003 dated May 3, 2022, with Industrial Waste Processing Co., Ltd. Ha Tinh to handle this waste.

- Construction solid waste

+ The project owner requires construction contractors to strictly adhere to the regulations on management of construction solid waste (CSW) under Circular No. 08/2017/TT-BXD dated May 16, 2017 throughout the project construction phase.

+ Construction solid waste includes various items such as wooden formwork, cement packaging, and damaged construction materials. These wastes are collected, categorized, and handled as follows:

- Wooden formwork, cement packaging, etc., are collected and sold to recycling facilities for scrap recovery.
- Other types of construction solid waste (bricks, stones, concrete, etc.) that cannot be reused are hired out to environmental sanitation service providers for proper disposal as per regulations.

+ Specific environmental protection regulations are established on the construction site and disseminated to each worker: Prohibition of open urination within the construction site, prohibition of littering.

+ Strict penalties are imposed on violators of these regulations.

+ Sludge generated from domestic wastewater treatment plants and waste from septic tanks are contracted with environmental sanitation service providers within the locality for collection and disposal.

Currently, the main contractor of the project, DOOSAN Enerbility Vietnam LLC, has signed contract number VA2-AD-2022-003 dated May 3, 2022, with Industrial Waste Processing Co., Ltd. Ha Tinh to handle this waste.

- Organic soil removal

Organic soil removed from the site will be collected and transported to an organic material disposal area of 83,061 m² located in Ky Trinh Ward, Ky Anh Town, Ha Tinh Province, as per the land handover record on May 18, 2021, between the Ha Tinh Province Economic Zone Management Board. The removed soil will be leveled immediately after dumping, and a temporary earth drainage system with dimensions of W x H = 0.8 m x 0.6 m will be constructed around the storage area to collect rainwater runoff.

- Dredged materials

+ Dredged materials (sludge, sediment) with an estimated volume of about 1.761 million m3 will be excavated by excavators onto barges and transported to the dumping site at a submerged disposal area covering 200 hectares located approximately 22-25 km east of the project area. The proposed depth for dumping ranges from -43m to -44m according to the national altitude datum. The proposed areas are outside aquaculture zones and are active fishing grounds, so dredging activities in these areas will minimally impact the fishing conditions of local residents.

- A portion of the dredged material will be transported by barge to the pumping station and loading points located about 12-13 km from the dredging area by waterway. From there, it will be cut and pumped into the containment area or loaded onto trucks (for weathered rock) to be transported to storage areas with a total area of 56.13 ha, located about 7.5 km from the main plant by road.

The onshore dredged material storage area is arranged with a system of embankments dividing the containment areas according to construction site conditions. The locations of the settling tanks and excess seawater discharge channels are arranged to ensure safety and environmental protection requirements as per regulations. Safety and environmental protection measures approved by the Ministry of Natural Resources and Environment will be implemented, as stated in documents No. 6636/BTNMT dated November 1, 2021, regarding the adjustment of the water intake and cooling water discharge pipelines, dredged material containment area, and coal unloading equipment of the "Vung Ang II Thermal Power Plant" project, and document No. 4028/TCMT-TĐ dated November 7, 2022, from the General Department of Environment regarding the change in the location of the dredged material storage and ash disposal areas of the Vung Ang II Thermal Power Plant project in Ha Tinh province.

Regarding the capacity to receive dredged material from the project: Survey results of the material reception area show that the total actual area is about 56.13 ha, with an average elevation of +0.5 m. To reach the required elevation of +3.0 m to +3.5 m, an additional layer of dredged material needs to be evenly spread over the area, achieving a layer thickness of about 2.5-3.0 m. Therefore, the site can receive an additional approximately 1.68 million m^3. Meanwhile, the project's dredged material to be brought onshore is 663,851 m^3. Thus, the site can fully accommodate the entire volume of dredged material from the project while ensuring the safety of the site and the embankment system.

+ No sand and silt to be spilled during transport to the dumping site, requiring the construction contractor to adhere to the correct design load of the landing craft.

+ To ensure that dredged sludge is dumped in the designated area, in addition to monitoring construction according to regulations, the project owner will require the main contractor to equip GPS positioning systems on transport barges for dredged waste and closely monitor the dumping locations through this positioning system.

When implementing the conventional management solutions for solid waste as described above, the environmental impact is minimal due to the solid waste being collected, stored, and transferred to competent entities as per regulations.

+ Regarding organic soil: being stored at a designated organic waste disposal site in Ky Trinh Ward, Ky Anh Town, Ha Tinh Province, covering an area of 83,061 m2, approximately 10 km west of the project site. The project owner has already conducted an on-site handover with the Management Board for KKT, according to the minutes of the handover dated May 18, 2021. The entire area of organic soil will be used for planting green trees as part of the project's environmental commitment.

d. Measures for collection, storage, management, and treatment of hazardous waste.

- Hazardous and non-hazardous waste classification

- Implement management measures to minimize the quantity and types of waste;

- Store hazardous waste temporarily in a proper manner to prevent contamination of soil, water, and air as follows:

+ For underwater construction vehicles, the hazardous waste collection and storage plan is as follows:

- ✓ The fuel storage area and the area for storing used oil and oil-containing waste awaiting transfer will be appropriately arranged on the vessel to prevent oil spills.

- ✓ For used oil and oily water: Construction vessels will be equipped with specialized containers and tanks, and they will be inspected and certified for environmental pollution prevention according to QCVN 17:2011/BGTVT/SĐ2:2016. The containers will have special labels.
- ✓ For oil-contaminated rags: Each construction vessel will be equipped with one specialized container with standard warning labels, and the containers will be placed in covered areas.
- ✓ Workers involved in construction are required to store hazardous waste in containers and tanks on the vessel; hazardous waste must not be discharged into the surrounding environment.
- ✓ Strictly supervise and inspect the classification, collection, storage, and management of all types of hazardous waste generated on each vessel during the project implementation; transfer and record the collection and transportation of hazardous waste with a licensed unit for proper handling according to Decree No. 08/2022/NĐ-CP dated January 10, 2022, detailing the implementation of certain provisions of the Environmental Protection Law, and Circular No. 02/2022/TT-BTNMT dated January 10, 2022, issued by the Ministry of Natural Resources and Environment, detailing the implementation of certain provisions of the Environmental Protection Law and other relevant current regulations on environmental protection.

Used oil container

Oil-contaminated rag container

Figure 3.40 Illustration of hazardous waste containers

+ Construct a temporary hazardous solid waste storage area awaiting treatment, with a roof, built during the construction phase;

+ The storage area must have labels and signage, and boundaries must be marked;

+ Label each container to provide information on the contents and composition of chemicals and waste inside;

+ Store hazardous waste properly to avoid contact between incompatible wastes and to facilitate monitoring of any leaks or spills;

+ Store hazardous waste in covered, sealed containers with warning labels, with a capacity of about 90 liters, and then transport them to the general hazardous waste storage facility built by the main EPCJV contractor. The area of the general hazardous waste storage facility is 90 m^2, with a roof to protect against rain and sun, a sealed concrete floor, warning labels for hazardous waste, and equipped with proper fire safety equipment.

+ Register, transport, and further treat hazardous waste: The project owner will contract with a licensed unit for the receipt and treatment of hazardous waste according to the regulations in Decree No. 08/2022/NĐ-CP dated January 10, 2022, and Circular No. 02/2022/TT-BTNMT dated January 10, 2022.

3.1.2.2. Measures to Mitigate Non-Waste-Related Impacts

a. Noise Mitigation Measures

*/ Mitigation Measures:

During the dredging construction phase, noise mainly originates from construction and transportation equipment. To minimize noise impact on workers' health and avoid increasing noise levels in the construction area and along transportation routes, the Project Owner will require the construction contractor to equip workers operating machinery on ships with personal noise protection devices.

- Use construction equipment that meets the approved quantity, type, and capacity and remains valid for registration by the Vietnam Register; the equipment must be inspected, certified for quality, technical safety, and environmental protection as per regulations.

- Adhere to the construction organization measures according to the approved construction drawing design.

- Environmental protection requirements related to noise should comply with QCVN 26:2010/BTNMT - National Technical Regulation on Noise.

*/ Effectiveness Evaluation of Mitigation Measures:

These measures have been applied in the construction of similar projects and, if implemented seriously, will yield high effectiveness and are technically feasible.

b. Mitigation Measures for Erosion and Sedimentation Impacts

*/ Preventive Measures:

To minimize potential adverse impacts such as seabed erosion affecting the geological structure of the area, shoreline erosion, and post-dredging landslides, the Project Owner will supervise and require the construction contractor to:

- Comply with the approved dredging design, ensuring dredging within the boundary, area, and volume limits. Verify the coordinates, elevations, and slopes of the dredging area as per the design documents, and check the seabed terrain. Construction areas will be marked with easily recognizable flags or lights at night. The dredging boundaries will be marked with buoys and signs.

- Develop a reasonable construction plan and strictly supervise the construction process.

- Avoid prolonged dredging at a single location with multiple participating vehicles.

- Regularly observe and monitor shoreline changes.

- In case of observed erosion:

+ The Project Owner will instruct the contractor to immediately halt construction.

+ Report the incident to relevant parties and coordinate to investigate the cause of erosion.

+ Adjust the construction method according to the actual situation if the erosion is determined to be caused by the project activities.

+ Deploy buoys, place warning signs, and protect the erosion area, preventing ships from passing through and affecting the erosion and mitigation work.

+ Coordinate with authorities to monitor the erosion site, track the situation, and assess the erosion condition to implement appropriate measures.

+ Compensate for damages as per legal regulations if the project causes erosion affecting embankments and nearby structures.

c. Mitigation measures for stormwater runoff

The following environmental management measures will reduce the impact of stormwater and runoff that could cause erosion or carry suspended solids:

- Pave or cover surfaces with materials to prevent erosion.

- Cover stockpiled materials with tarps or waterproof fabric during rain.

- Minimize the flow of mud and silt (including at wheel washing areas) using appropriate measures.

- Design a system of pipes and channels to collect stormwater.

- Design a temporary stormwater collection system with solid, cobblestone-paved foundations. These channels will have sedimentation pits to settle mud and reduce the risk of flooding in the project area.

- Regularly (especially during the rainy season) inspect and maintain the drainage system, prevent erosion, and remove sediment to ensure effective operation.

- Implement measures to prevent runoff into excavation pits. If excavation is necessary during the rainy season, excavate and pave short sections. Pump runoff from pits through sedimentation devices before entering the drainage system.

- Create bypass channels for water flow and reduce slopes as much as possible.

- Cover exposed areas.

- Prevent erosion of materials, soil, mud, and waste into the drainage system at material storage areas.

Typically, applying sedimentation pits can reduce TSS (total suspended solids) in wastewater by 30-40%, depending on settling time. The comprehensive application of these mitigation measures is estimated to reduce TSS in stormwater runoff by 35%. Thus, the impact of stormwater runoff on the coastal sea after applying these mitigation measures is minimal.

d. Measures to mitigate traffic impact in the area

*/ Mitigation Measures:

Since there will still be fishing boats and cargo ships entering and leaving the port during the construction process, ensuring traffic safety in the construction area is crucial throughout the project duration. To effectively manage this, the Project Owner will coordinate with the construction contractor to frequently communicate with the Ha Tinh Maritime Administration and channel operators to understand ship schedules and proactively plan construction activities, traffic regulation, and compliance with state regulations. Specific measures include:

- Develop a maritime safety plan and submit it to the Ha Tinh Maritime Administration for approval, strictly adhering to the approved plan.

- Prior to construction, the Project Owner will notify relevant agencies about the scope and timing of construction in the project area and will commence construction only after obtaining permission from the Ha Tinh Maritime Administration.

- Closely coordinate with relevant authorities and organizations in traffic regulation and ensure waterway traffic safety in the area.

- Schedule construction activities reasonably, avoiding dredging operations during high traffic density times.

- Install warning devices at construction areas and dangerous locations within the project area.

- Maintain 24/7 monitoring of the construction area throughout the construction period. The Project Owner and construction contractor will implement measures to ensure absolute safety for ships entering and leaving the construction area.

- Ensure construction vehicles comply with the following regulations:

+ All vehicles involved in construction must have all necessary permits as per Vietnamese inland waterway regulations and be equipped with communication devices, including VHF radios operating on channel 9, 24/7, along with other devices like signal lights, lifeboats, life buoys, and fire prevention equipment.

+ Construction vehicles must display visible signs during both day and night.

+ All construction vehicles and equipment must be registered and licensed to operate. They must be in good working condition and regularly maintained and repaired.

+ Construction equipment on-site must strictly comply with regulations on maintaining order and safety in inland waterway traffic.

- Implementation Period: The mitigation measures will be implemented throughout the dredging and dredged material disposal period.

- For road routes: Strictly comply with the Road Traffic Law No. 23/2008/QH12 dated November 13, 2008; use transport vehicles with the correct load and quantity as approved in the project documents. If the project causes damage to existing roads, such as subsidence or cracking, a timely repair plan must be implemented, and the road must be restored to its original condition.

*/ Evaluation of Mitigation Measures Effectiveness:

The mitigation measures are feasible and suitable for the actual conditions and capabilities of the Project Owner and the construction contractor. The Project Owner will direct the construction contractor to strictly implement the proposed mitigation measures.

e. Measures to Mitigate Impacts on the Aquatic Ecosystem

To minimize adverse effects on aquatic species and quickly restore the stability of their habitats, the Project Owner will:

- Choose a reputable and experienced contractor in executing dredging and sea disposal projects.

- Direct the construction contractor to perform synchronized dredging according to a unified process for all dredging areas, minimizing seabed irregularities post-dredging.

- Supervise and require the construction contractor to implement the following measures:

+ Conduct dredging and disposal within the permitted boundaries. Dredge according to the design, ensuring technical requirements, correct volume, and specified depth. Place buoys and signs at construction and disposal areas and transportation routes. Execute construction promptly and neatly, adhering to the schedule.

+ Avoid transporting and disposing of dredged material during rough sea conditions and storms. Increase inspections and impose strict penalties to prevent the contractor from disposing of dredged material in unauthorized locations.

+ Implement all measures to mitigate the impact of waste sources as detailed in previous sections (reducing turbidity, mitigating impacts from domestic wastewater, solid waste, etc.), ensuring no oil spills during construction.

+ Collaborate with functional units to monitor seawater quality and conduct periodic biological monitoring. If abnormal changes are detected during biological monitoring, immediately suspend construction, investigate the cause with relevant parties, and develop corrective measures. Adjust construction methods to prevent adverse impacts on local ecosystems.

*/ Evaluation of Mitigation Measures Effectiveness:

These measures can only mitigate and limit impacts, as the nature of dredging projects inherently affects the migration of aquatic systems and is an unavoidable impact. Upon completion of dredging, the Project Owner will require the contractor to remove buoys, signals, and move dredging equipment to other locations.

f. Measures to minimize the impact of increased TSS in seawater during dredging and dumping

- Implement dredging and dumping of dredged material according to the content specified in the construction drawing design description.

- Control construction vehicles:

+ Use dragline excavators, self-propelled suction dredgers, and bottom-opening barges to transport dredged material in the correct quantity, type, capacity, and within the approved dredging boundaries as per the construction drawing design documents and project budget. Do not dredge outside the approved boundaries or dredge additional volumes.

+ Prevent suspended solids in the runoff water from the dredged material holding compartment of the transport vehicle: Ensure each grab load and the capacity of the self-propelled suction dredger's holding tank are within the specified load limits to ensure efficient dredging operations; do not fill the dredged material holding tank to the brim, leaving at least 30 cm from the top of the dredged material to the overflow edge. All transport vehicles for dredged material will have settling compartments where water that separates from the dredged material can settle, and the clarified water can be released outside.

+ To prevent leaks of dredged material, position the grab bucket of the dragline excavator close to the barge to minimize the swing angle of the grab arm. When loading dredged material onto the barge, avoid overloading to prevent leaks and water pollution during transportation.

+ To ensure that the dredged material is dumped in the designated area, in addition to monitoring the construction process according to regulations, all transport vehicles for dredged material will be equipped with GPS systems. The project owner will closely monitor the transportation and dumping of dredged material using this system.

+ Self-propelled suction dredgers and barges are only allowed to carry the specified load and must follow the designated routes.

+ Check the opening and closing of the discharge doors of the dredged material holding compartments on self-propelled suction dredgers and barges to ensure they are sealed and safe during operation.

+ When discharging dredged material into the receiving area, ensure the correct dumping location and a reasonable door opening speed to minimize the spread of suspended solids.

+ Install filter nets at the overflow doors of self-propelled suction dredgers and bottom-opening barges to prevent leaks and the spread of dredged material during transportation; regularly check to ensure the effectiveness of the filter nets.

+ Enforce regulations requiring construction personnel to adhere to the load limits of self-propelled suction dredgers and bottom-opening barges.

- Control construction procedures:

+ Perform dredging and dumping operations strictly according to the construction method mentioned in the construction drawing design description and approved by the project owner.

+ Maintain a logbook for dumping dredged material during construction. The supervisor responsible for dumping dredged material must sign the logbook and take full responsibility if the dredged material is dumped incorrectly, affecting the surrounding environment.

+ Reduce dredging productivity when operating in the initial channel areas in Zone C and the inner areas near aquaculture cages to limit the spread of TSS.

+ Organize monitoring of TSS in seawater according to the approved program to detect any abnormalities early.

3.1.2.3. Measures to Mitigate Potential Environmental Incidents of the Project

a. Management, Prevention, and Response Measures for Oil Spill Risks and Incidents

*/ Preventive Measures:

The Project Owner will require the construction contractor to implement the following preventive measures:

- Comply with the waterway traffic safety plan approved by the Ha Tinh Maritime Administration during the construction process.

- Ensure that the watercraft involved in the construction have the capacity to respond to oil spill incidents as specified in Decision No. 133/2020/QD-TTg; equip oil containment booms for tanks, machines, equipment, and maintenance areas that use or generate oil on the ship's deck; fully equip the minimum means ready to respond to oil spill incidents and equip the ship’s oil pollution prevention system according to the regulations of QCVN 26:2016/BGTVT on each construction vehicle, and arrange oil absorbent equipment according to the device's registration to limit oil spills as per Decision No. 12/2021/QD-TTg.

- Operate watercraft according to the proper channels and signals to prevent collisions. During dredging operations, buckets must be securely anchored to prevent drifting; transport ships and barges must be anchored according to regulations.

- Regularly inspect fuel tanks, strictly control fuel storage areas, and monitor transportation to promptly detect oil leaks. To minimize oil leaks, regularly check machinery and equipment to ensure no oil leaks.

- For oil spills, do not wash them directly but absorb them with rags and store them in containers.

- Establish a rapid response team including management staff and rescue personnel to act immediately in case of an accident. Team members will be equipped with mobile phones for contact at any time.

- Construction vehicles must be inspected, licensed for operation by the registration agency, equipped with facilities, technical measures, and plans to prevent and mitigate oil spill risks and proactively respond to oil spill incidents if they occur.

- The Project Owner requires the construction contractor to contact a local or nearby functional unit before starting construction to be ready to respond to oil spill incidents, minimizing negative impacts on the environment and ecosystems in the project area. The oil spill response unit must be a functional unit that regularly conducts training for staff; identifies the level and severity of incidents to build an appropriate force and level of investment in equipment and resources; must develop an oil spill response plan approved by the competent authority before construction; fully invest in equipment and resources suitable to the level and severity of identified incidents; ensure sufficient forces and finances to implement incident response.

- Comply with the guidance of Decision No. 12/2021/QD-TTg dated March 24, 2021, of the Prime Minister on the Regulations on Oil Spill Incident Response Activities.

*/ Response to Oil Spill Incidents

In the event of an oil spill, according to Article 5 of Decision No. 12/2021/QD-TTg on the classification of oil spill incident response, when an oil spill occurs, the response plan at the local, national, or international level related to incident mitigation and coordination with organizations in handling situations is based on the severity of the oil spill incident, and the organization and implementation of the response are carried out at three levels, depending on the severity of the oil spill incident:

1. Facility Level:

- In the event of an oil spill at the facility: The facility owner must organize and command their forces, means, and equipment or those under contract for oil spill response to promptly implement the response. The facility owner where the oil spill occurs is responsible for on-site command.

- If the oil spill exceeds the facility's capacity and resources are insufficient for self-response, the facility must promptly report to the managing agency, the provincial People's Committee for assistance.

- In case of a serious oil spill or an oil spill occurring in a priority protection area, the heads of the agencies currently responsible for on-site command must report to the provincial People's Committee where the oil spill occurs and the National Committee for Search and Rescue for direction and timely response.

2. Regional Level:

- If the oil spill exceeds the facility's response capacity or the oil spill occurs for unknown reasons and drifts into the local coast, the provincial People's Committee where the oil spill occurs is responsible for directly leading and appointing an on-site commander to organize the response according to the local plan, and is allowed to urgently mobilize necessary resources from local facilities, ministries, sectors, and the Regional Oil Spill Response Center to respond.

- The main point of contact to assist the provincial People's Committee in organizing the oil spill response is the Provincial Flood and Storm Prevention and Search and Rescue Committee or the Provincial Oil Spill Response Command.

3. National Level:

- In the event of a particularly serious oil spill beyond the local capacity, the Provincial People's Committee where the oil spill occurs shall promptly report to the National Committee for Search and Rescue for direct guidance and coordination with relevant agencies to organize the response.

- If the oil spill exceeds the response capacity of domestic forces, the National Committee for Search and Rescue will propose to the Prime Minister to consider and decide on requesting international assistance.

During the organization of the oil spill response at the above-mentioned levels, the leading agency or on-site commander must proactively handle the situation, promptly report the incident's developments, propose necessary recommendations to the competent authority, and take responsibility for their decisions.

If an oil spill occurs in this project at the regional level, which is the highest possible level, the Project Owner and the construction contractor will first mobilize all resources for self-response, prioritizing activities to rescue victims and protect the environment.

- Proactively block the oil spill source to limit its spread to the environment. Closely monitor the risk of oil spreading to the shoreline to determine priorities and implement protective measures for priority areas.

- Identify the source of the oil spill, location, and cause; then immediately notify the leadership and the oil spill response unit for timely guidance.

- Report to relevant authorities for support and find ways to address the incident as quickly as possible.

If the oil spill exceeds the self-response capacity of the Project Owner and the contractor, they will contact local authorities: the People's Committee of Ha Tinh Province is responsible for directly leading or appointing an on-site commander to organize the response according to the province's emergency response plan. If the oil spill has the potential to or spreads to other provinces, the People's Committee of Ha Tinh Province is responsible for notifying the People's Committees of the affected provinces and cities for coordinated response, while also reporting to the National Committee for Incident, Disaster Response, and Search and Rescue to prepare support plans as necessary. Based on the developments of the oil spill incident, urgently mobilize necessary resources from local facilities, ministries, and sectors for response, specifically:

- The Ha Tinh Provincial Committee for Natural Disaster Prevention and Search and Rescue will lead the oil spill response according to the province's emergency response plan, mobilizing local forces and means as well as those from ministries and sectors in the area.

- The Department of Natural Resources and Environment will advise and guide environmental protection activities in incident remediation and shoreline cleanup, manage waste after collection; develop protection plans for sensitive areas; investigate, assess environmental damage, and develop environmental recovery programs after the oil spill; coordinate with relevant agencies to determine the cause of the oil spill.

- The Port Authority will advise on ensuring maritime and waterway traffic safety during the mobilization of ships and means participating in the oil spill response in the area.

- Relevant local departments, agencies, and key military units, local military units, Waterway Traffic Police, Fire and Rescue Police, and Environmental Crime

Prevention Police stationed in the area will advise on mobilizing forces to participate in response and mitigation of the consequences.

- The regional oil spill response center, regional maritime search and rescue coordination center, other rescue, salvage, and oil spill response units will participate in the province's emergency response plan and are responsible for coordinating rescue, salvage, and oil spill response activities when mobilized.

- Principles of implementation:

+ Timely mobilize means, equipment, and materials to deploy response activities when an oil spill occurs, aiming to contain the oil as quickly as possible.

+ Ensure safety and prevent fires and explosions during the oil spill response.

+ Maintain unified command and close coordination and cooperation among forces, means, and equipment participating in response activities.

+ Proactively and actively participate in consequence mitigation, with the contractor responsible for compensating for damage caused by the oil spill as per the law.

*/ Evaluation of the effectiveness of preventive and response measures:

The preventive and response measures are feasible and suitable to the actual conditions and capabilities of the Project Owner and the construction contractor. The Project Owner will require the construction contractor to strictly implement the proposed mitigation measures.

b. Measures to Prevent and Mitigate the Impact of Workplace Accidents

*/ Mitigation measures

To prevent and mitigate the impact of workplace accidents, the Project Owner and the construction contractor will implement:

- Have a plan to secure equipment safely, firmly position, and balance it during dredging operations.

- In terms of construction organization, the Project Owner requires the contractor to implement appropriate measures to prevent workplace accidents and maintain environmental hygiene. Specifically:

+ Comply with regulations on ensuring order and maritime traffic safety throughout the construction process.

+ Organize training and drills, equip with waterway traffic knowledge, fire prevention and control, labor safety, and environmental protection for captains and crew members involved in construction. Regularly clean barges and suction dredgers to prevent oil spills on the deck, which can cause slips and accidents.

+ Provide full protective equipment for workers.

+ Regularly monitor weather developments to plan construction accordingly. Do not perform dredging during the rainy and stormy season.

+ In case of an incident, promptly carry out rescue operations and report to the supervising officer.

- Ensure that officers and workers have knowledge about safety when working underwater to prevent drowning incidents.

- Regularly inspect life-saving equipment to ensure safe and timely rescue operations.

- Comply with water traffic safety regulations.

*/ Incident response

- Find ways to rescue victims from dangerous areas and quickly take them to emergency care.

- Notify local management agencies about the accident location to handle the aftermath.

- Coordinate with rescue units to address environmental pollution caused by the incident (if any). Construction will only continue once the incident has been resolved.

- Regulate traffic and guard both ends of the channel through the incident area.

*/ Evaluation of the effectiveness of preventive measures

The preventive and response measures are feasible and suitable to the actual conditions and capabilities of the Project Owner and the contractor. The Project Owner and the construction contractor will seriously implement the proposed mitigation measures.

c. Measures to Prevent and Mitigate the Impact of Fire and Explosion Incidents

*/ Management and preventive measures:

- Equip with adequate fire prevention tools: fire extinguishers, sandbags, gas masks, etc., post fire safety regulations, and fire warnings on dredging equipment at the construction site. Fire prevention equipment should be placed in easily visible and accessible locations. Fuel tanks on ships should be kept away from electrical sources or other flammable sources.

- To prevent the formation of fire sources in flammable environments, the contractor should pay special attention to the operation and use of machinery, equipment, materials, and products that can be fire sources in flammable environments.

- Implement lightning protection measures; do not use tools that produce sparks when working with flammable substances; avoid conditions that can lead to spontaneous combustion due to heat. Open flames are prohibited in flammable environments.

- Flammable liquids and materials such as gasoline, oil, grease, etc., must be stored in separate warehouses according to current fire prevention regulations. There should be strict regulations for work involving fire or heat sources.

- Use materials that do not produce sparks when struck or rubbed in explosive environments; use explosion-proof equipment; use quick-action protective devices to cut off power sources that can cause explosions.

- All officers and workers at the construction site should be trained in fire safety regulations and fire prevention and control. Smoking and any activities that could produce sparks are strictly prohibited in areas containing oil, grease, or other flammable materials.

*/ Incident response measures:

When a fire or explosion incident is detected, use the available equipment to extinguish the fire and immediately notify the Fire and Rescue Police Department of Ky Anh Town and Ha Tinh Province to coordinate in handling the incident. Evacuate people safely and coordinate with the firefighting unit to address the incident and mitigate the consequences.

d. Measures to Prevent and Mitigate the Impact of Traffic Accidents

*/ Preventive measures:

To prevent traffic accidents, the Project Owner will apply the following measures:

- Require the contractor to develop a maritime safety plan according to Decree No. 159/2018/NĐ-CP dated November 28, 2018, on the management of dredging activities in seaport waters and inland waterways; Decree No. 58/2017/NĐ-CP dated May 10, 2017, detailing some articles of the Vietnam Maritime Code on maritime activities management, and submit it to Ha Tinh Maritime Administration for approval as the basis for implementation during construction. Comply with regulations on ensuring order and maritime traffic safety throughout the construction process.

- Zone the construction area to ensure that ships can still enter ports in the area smoothly.

- All participating vehicles must have maritime signal lights at night as per QCVN 39:2011/BGTVT and QCVN 20:2015/BGTVT; comply with Circular No. 08/2020/TT-BGTVT issuing the National Technical Regulation on Vietnam inland waterway signaling;

- Regularly inspect and maintain the system of headlights and signal lights on ships. Equip with spare devices for timely replacement in case of incidents;

- Regularly inspect machinery and equipment before operation;

- During construction, determine the construction location with specialized maritime signaling buoys and use canoes and support ships to guide maritime vessels safely through the construction area;

- Regularly monitor meteorological and hydrological forecasts to arrange a suitable construction ship schedule;

- Provide information about the project, the location of the construction fleet, and maintain a 24/7 site presence.

- Mobilize, guide, and support ships navigating through the channel when encountering obstacles.

- Organize training and equip waterway traffic knowledge for captains and crew members involved in transportation.

- Widely announce on mass media, local authorities, ports in the area, etc., about the plan, progress, and scope of construction works; provide the contact list and phone numbers of the department responsible for ensuring maritime safety during construction.

- Install signaling buoys: Signal buoys and night protection lights will be installed within the construction site at entry and exit points to inform fishing boats and cargo ships of the safety corridor and prevent unnecessary risks and accidents.

- After construction, the contractor will clean up all machinery, remove obstacles, signaling buoys, and restore the site to its original state.

- For road vehicles:

+ Strictly comply with the Road Traffic Law No. 23/2008/QH12 dated November 13, 2008; use vehicles that transport the correct load and quantity as approved in the project documents.

+ For drivers: Enforce strict regulations on experience and ensure they hold the appropriate licenses for the vehicles they operate according to regulations.

+ For transport vehicles: Ensure that all vehicles are within their inspection validity period, and undergo regular checks, repairs, and maintenance to ensure they are always in good working condition.

+ When construction is carried out at night, ensure that the lighting system is functioning well.

*/ Incident response:

- In the event of an incident, immediately take all possible measures to rescue people and protect evidence at the scene. Find ways to rescue the victims from dangerous areas and quickly take them to emergency care.

- Notify local management agencies about the accident location to handle the aftermath.

- Implement oil spill response measures as described in the oil spill response plan.

- Salvage the ship's hull after addressing the oil and chemical spills.

- Regulate traffic and guard both ends of the channel through the incident area.

* Evaluate the effectiveness of preventive and response measures:

The preventive and response measures are feasible and suitable to the actual conditions and capabilities of the Project Owner and contractor. The Project Owner will require the construction unit to strictly implement the proposed mitigation measures.

e. Preventive measures to minimize impacts from pipeline ruptures during sediment disposal:

- For Construction point No. 2, sediment from the dredging vessel is directed through a cutting and pumping system to the disposal site via an HDPE D300 pipeline. The disposal site covers an area of 16.63 hectares located alongside Nguyen Chi Thanh road, avoiding the need for the pipeline to cross the road, thereby reducing the risk of damage from passing vehicles.

- Selection of design and construction consultancy with extensive experience: Choose a consulting and construction firm with substantial experience in similar contract packages.

- Calculation and Selection of Sediment Transport Pipeline: Calculate and select the appropriate pipeline diameter and material based on pumping capacity and sediment characteristics.

- Regular Inspection of Sediment Transport Pipelines: Regularly inspect the sediment transport pipelines from the cutting and pumping units to the disposal site.

- Regular Monitoring, Warning, and Signage: Regularly monitor, warn, and install signage for surrounding entities; restrict access to areas where sediment transport pipelines cross.

- Contingency Plan for Incidents: In case of incidents, the construction contractor will temporarily halt operations of the sediment pumping station.

- Check and Remediation of Incidents with Suction and Injection Pipelines: Check and rectify any incidents with the suction and injection pipelines before resuming construction to ensure compliance with technical standards.

f. Mitigation of incidents with suction and injection pipelines:

To prevent sediment spills, the project owner will require the construction contractor to implement the following measures:

- All construction and transport vehicles must adhere to specified load limits and not exceed 80% of the sediment containment tank's volume.

- Regularly inspect equipment to ensure sealed containers and prevent sediment leakage.

- When cutting and pumping sediment to the disposal site, adjust the position of the sediment transport pipeline and the sediment reception point at the disposal site to evenly distribute sediment across the entire site and avoid concentrating sediment in specific areas, which could cause spills into the environment.

- Construction processes must be monitored regularly with a logbook for tracking.

- In the event of an incident, the operators of sediment transport vehicles must temporarily halt operations, rectify the incident before resuming construction.

- Implement environmental quality monitoring according to the approved monitoring program to promptly detect anomalies and take corrective actions.

g. Preventive measures to minimize impact from levee breaks at disposal sites:

- The volume of sediment to be deposited (approximately 663,851 m3) will be divided between two disposal sites: Construction points 1 and 4 will deposit on a 38.33 ha site, while Construction points 2 and 3 will deposit on a 16.63 ha site to reduce load on each site.

- Construct levees for disposal sites to a height of +3.0 to +3.5 meters using in-place compacted soil. The levees will be lined with impermeable nylon to prevent seepage. Given a sediment height of 2.5 to 3.0 meters, the estimated sediment volume that can be contained within the disposal sites is approximately 1.68 million m3. This represents about 40% of the capacity of the disposal sites, ensuring a relatively high safety margin for the levees and disposal sites.

- Levee height calculation and design will consider safety factors to prevent overload and mud leakage into the surrounding sea areas.

- Ensure the construction and acceptance of levee systems for disposal sites according to the approved design.

- Proper sediment deposition techniques will be implemented to prevent spills into the environment and minimize impacts on surrounding areas.

- Regularly inspect and monitor the condition of levees and water levels within disposal sites relative to levee heights to implement appropriate reinforcement measures and minimize levee breach incidents.

- Temporarily halt sediment spraying onto disposal sites upon observing signs of levee cracks, fractures, or breaches. Before resuming spraying, reinforce levees to ensure safety.

- In the event of an incident, the construction team will temporarily halt sediment transport to disposal sites, reinforce levees with timber piles, lay geotechnical fabric, and apply sandbags, and verify quality to ensure safety before resuming construction.

Negotiate with local residents and authorities to compensate for any damages if necessary.

3.2. Impact assessment and proposals for environmental protection measures during operation phase

3.2.1. Impact assessment and forecasting

During the operation phase, the primary sources of impact are activities related to raw material supply, operation of plant components, maintenance, equipment cleaning, and personnel living at the plant. The sources of impact during this phase include:

- Operation of coal supply system
- Operation of boilers, turbines, and power generation
- Transport of ash and ash
- Operation of cooling systems
- Operation of wastewater treatment systems
- Operation of ash disposal sites

The summary table of emission sources and characteristics of impacts related and unrelated to waste in the operational phase is described in the following table:

Table 3.21. Main environmental impacts during the operational phase

No.	Source	Waste generation			Non-waste related generation
		Dust and emissions	Wastewater	Solid waste	
1	Operation of coal supply and transfer system	Dust			Noise
2	Operation of boiler, turbine for power generation	Dust, NO2, SO2...	Wastewater	Ash	Noise, marine ecology
3	Transportation of ash and ash	Dust, CO, NO_2, SO_2, VOC	Wastewater	Waste oil	Noise, road traffic
4	Operation of cooling system		Cooling wastewater		Marine environment
5	Operation of wastewater treatment system	H_2S, VOC...	Treated wastewater	Sludge	Odor pollution, receiving water bodies

No.	Source	Waste generation			Non-waste related generation
		Dust and emissions	Wastewater	Solid waste	
6	Concentration of workers for remaining tasks at main plant		Domestic wastewater	Solid domestic waste	Increased consumption of food, essentials by staff, workers, and affected households, increased traffic density
7	Regular dredging maintenance activities.	Dust, CO, NO2, SO2, VOC.	Wastewater	Oil grease waste, solid household waste.	Noise pollution, marine environment, waterway traffic, road traffic, spread of suspended solids.

These contents have been assessed in the Environmental Impact Assessment and approved under Decision No. 3055/QD-BTNMT dated October 8, 2018. The scope of adjusting the construction plan for handling dredged materials does not affect the operational phase, therefore no re-evaluation is required in this report. Below is a summary of the assessed contents in the 2018 EIA report:

a. Emissions

- Dust from coal unloading and ash transport by road.

- Dust and emissions from coal combustion in two power generation units with a maximum flow rate of approximately 3,100,000 m³/hour per unit. Key pollutants: Total dust, NOx, SO2.

- Emissions from auxiliary boiler burning LDO with a flow rate of approximately 55,560 m³/hour. Key pollutants: Total dust, NOx, SO2.

- Odor from drainage systems, waste storage facilities, and temporary waste collection areas before being transferred to specialized vehicles.

b. Wastewater

- Rainwater runoff from the main plant area, ash and slag storage area, and the port area with a flow rate of approximately 5.08 m³/s. Main pollutants: Suspended solids (SS); affected area: Coastal areas near the project.

- Domestic wastewater from staff and workers at the plant with a flow rate of approximately 104.4 m³/day. Main pollutants: Suspended solids (SS), BOD5, COD, nitrogen (N), phosphorus (P), coliform; affected area: Coastal areas near the project.

- Domestic wastewater from staff and workers at the housing area with a flow rate of approximately 140 m^3/day. Main pollutants: Suspended solids (SS), BOD5, COD, nitrogen (N), phosphorus (P), coliform; affected area: Khe Da Hat stream flowing into Quyen River.

- Cooling wastewater from the operation of two power generation units with a flow rate of approximately 4,971,148 m^3/day (of which approximately 796,800 m^3/day is used for the seawater flue gas desulfurization (SWFGD) system). Key pollutants: Temperature, residual chlorine.

- Wastewater from the seawater flue gas desulfurization (SWFGD) system with a flow rate of approximately 796,800 m^3/day. Key pollutants: Temperature, total sulfite ions (HSO3-, SO32-), pH, TSS, COD.

- Industrial wastewater (including coal-contaminated, chemical-contaminated, and oil-contaminated wastewater) with a flow rate of approximately 165 m^3/hour. Main pollutants: COD, TSS, oil and grease; affected area: Coastal areas near the project.

c. Solid Waste

- General solid waste generated at approximately 1,024 kg/day (464 kg/day from the main plant area and 560 kg/day from the worker housing area). Main components: Cans, pallets, newspapers, packaging, bottles, food containers, leftover food.

- Sludge from septic tanks, primarily consisting of organic-rich sludge with high microbial content.

- Sludge from the centralized domestic wastewater treatment plant: Biological sludge of approximately 1.08 tons/month (0.54 tons/month from the main plant area and 0.54 tons/month from the worker housing area), and physicochemical sludge of approximately 20.73 tons/month.

- Ash and slag from coal combustion in the boilers, with a mass of approximately 1,438 tons/day.

d. Hazardous Waste

- Hazardous waste from the operation of the main plant with a mass of approximately 130.7 tons/year. Main components: Waste oils and greases from machinery and equipment maintenance, oil-contaminated rags from cleaning machinery and equipment.

- Sludge from physicochemical treatment at the industrial wastewater treatment plant, with a mass of approximately 20.73 tons/month, classified as industrial solid waste requiring control.

- Hazardous waste from the worker housing area with a mass of approximately 20 - 30 kg/month. Main components: Batteries, accumulators, fluorescent bulbs.

e. Noise and Vibration

- Noise and vibration generated from engines, generators, and turbines.

f. Non-Waste Related Impacts

- Impact on coastal ecosystems.
- Impact due to thermal pollution.
- Impact on the local socio-economic environment.

g. Impacts due to environmental risks and incidents

- Fire and explosion incidents.
- Oil spill incidents.
- Incidents with the wastewater treatment system.
- Incidents with the air emission treatment system.
- Incidents at the ash and slag storage site.
- Earthquake incidents.
- Flood incidents.
- Ammonia (NH3) leakage incidents.

3.2.1. Structures, measures for collection, storage, treatment of waste, and measures to mitigate other negative impacts on the environment

The scope of adjustment for the construction method of dredged material handling does not affect the operational phase; the structures, measures for collection, storage, treatment of waste, and measures to mitigate other negative impacts on the environment during the operational phase basically remain unchanged from what was approved in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, and other related adjustment decisions. Below is a summary of the construction projects, waste management measures, and other mitigation measures approved in the 2018 EIA report and related documents:

a. Dust and Emission Treatment Facilities and Measures

- Installation of two flue gas treatment systems for boilers with a capacity of 3,100,000 m^3/h per system. The treatment process is as follows: Boiler flue gas → Selective Catalytic Reduction (SCR) → Electrostatic Precipitator (ESP) (2 units per boiler, each ESP with 4 fields) → Seawater Flue Gas Desulfurization (SWFGD) → Chimney, ensuring compliance with QCVN 22:2009/BTNMT (column B, Kp coefficient = 0.7 and Kv coefficient = 1.0) - National technical regulation on industrial emission standards for thermal power plants, and QCVN 19:2009/BTNMT (Kp coefficient = 0.8 and Kv coefficient = 1.0) - National technical regulation on industrial emission standards for dust and inorganic substances, with specific pollutant limits of Total Dust ≤ 50 mg/Nm^3, SO_2 ≤ 200 mg/Nm^3, NO_x ≤ 300 mg/Nm^3 as committed by the Project Owner.

- Traffic control measures will be implemented within the project to minimize the impact of dust and emissions from vehicles and reduce the risk of accidents.

- Environmental staff will be assigned to regularly spray water using the equipped water pumping and spraying systems in project areas (internal roads, landscaping areas) during hot, dry weather. The spraying frequency will be 1-2 times per day, or more frequently during the dry season.

- Greenery planting will be undertaken to reduce dust and noise pollution in the port docking area. Gardens, lawns, and greenery will be designed according to the plan to ensure the environmental landscape of the project area and reduce pollution.

b. Wastewater Collection and Treatment Facilities and Measures

- Compared to the report approved in 2018, the current system of wastewater collection and treatment facilities and measures has been adjusted to better match the actual conditions on the construction site, as summarized in the table below:

Table 3.22. Current status of works, measures for wastewater collection and treatment

No.	Project Item	According to the EIA report approved by Decision No. 3055/QĐ-BTNMT dated 08/10/2018 and Decision No. 132/QĐ-BTNMT dated 15/01/2020	Current implementation status (change in area, change in technology ... or remain unchanged)	Note
1	Domestic wastewater treatment system			
-	Domestic wastewater treatment system with a capacity of 150 m^3/day and night for the main plant	One system with the following technological process: Wastewater → Septic tank → Collection tank → Balancing tank → Biochemical tank (aeration) → Settling tank → Storage tank → Chlorine aeration	One system with the following technological process: Domestic wastewater → Septic tank/Grease trap → Trash screen → Equalization tank → Anoxic tank → Aerobic tank → Biological sedimentation tank → Disinfection tank	Additional adjustment includes the anoxic biological treatment step to enhance nitrogen treatment efficiency in wastewater.

No.	Project Item	According to the EIA report approved by Decision No. 3055/QĐ-BTNMT dated 08/10/2018 and Decision No. 132/QĐ-BTNMT dated 15/01/2020	Current implementation status (change in area, change in technology ... or remain unchanged)	Note
		→ Inclined plate filter of the main wastewater treatment system → Output wastewater meets QCVN 14:2008/BTNMT column B, coefficient K=1.2.	→ Post-treatment water storage tank → The output wastewater is pumped to the primary storage tank of the Industrial Wastewater Treatment System for further treatment.	
-	Domestic wastewater treatment system with a capacity of 150 m^3/day and night for the residential area of staff and workers		One system with the following technological process: Domestic wastewater → Septic tank/Grease trap → Collection tank → Equalization tank → Anoxic tank → Aerobic tank → Biological sedimentation tank → Disinfection tank → The output wastewater ensures compliance with QCVN 14:2008/BTNMT (Column A, K coefficient = 1.0) → Da Hat Stream	Added due to the inclusion of staff and worker housing in the project scope.

No.	Project Item	According to the EIA report approved by Decision No. 3055/QĐ-BTNMT dated 08/10/2018 and Decision No. 132/QĐ-BTNMT dated 15/01/2020	Current implementation status (change in area, change in technology ... or remain unchanged)	Note
			(Discharge point coordinates: X (m) = 1993232; Y(m) = 593800).	
2	Centralized industrial wastewater treatment system with a capacity of 200 m^3/hour (4,800 m^3 /day and night)	One system with the following technological process: Wastewater → Oil separator → Storage tank → Settling tank → pH control tank → Mixing tank → Neutralization tank → Post-treatment wastewater storage tank	One Industrial Wastewater Treatment System (XLNTCNTT) with a capacity of 200 m^3/h; technological process as follows: Industrial wastewater → Primary storage tank → pH adjustment tank → Coagulation tank → Flocculation tank → Sedimentation tank → Intermediate tank → Pressure filter tank → Activated carbon filter tank → Final pH adjustment tank → Post-treatment water storage tank → The output wastewater ensures compliance with QCVN 40:2011/BTNMT (Column B, Kq coefficient = 1.3 and Kf coefficient = 0.9)	Additional clarification of treatment steps including coagulation-flocculation, addition of pressure filtration, activated carbon filtration, pH adjustment steps to enhance treatment efficiency.

No.	Project Item	According to the EIA report approved by Decision No. 3055/QĐ-BTNMT dated 08/10/2018 and Decision No. 132/QĐ-BTNMT dated 15/01/2020	Current implementation status (change in area, change in technology ... or remain unchanged)	Note
			→ Discharge into the cooling water discharge system (at the discharge point with coordinates: X(m) = 2003603; Y(m) = 594666, located after the continuous automatic monitoring point of the cooling water discharge system).	

c. Solid waste collection, storage, management, and treatment projects and measures

- Arrange covered waste bins with a capacity of 20 - 200 liters at offices, workshops, dining areas, along roads, and in worker housing areas for temporary storage of household waste; regularly transfer it to a licensed collection, transport, and disposal service in accordance with regulations.

- Conduct research on solutions for reusing ash and slag following Directive No. 08/CT-TTg dated March 26, 2021, by the Prime Minister, which promotes the handling and use of ash, slag, and gypsum from thermal power plants, chemical plants, and fertilizer plants as materials for producing building materials and in construction projects.

- The project owner will contract with a local environmental sanitation service provider to transport and handle waste according to regulations.

- Construct one industrial solid waste storage facility. The warehouse design includes a steel frame, a corrugated iron roof, and a smooth concrete floor. Inside, there will be waste containers with lids.

- Design two ash and slag storage sites: Ash and slag storage site No. 1 (15 ha) located adjacent to the main plant, and ash and slag storage site No. 2 (34.4 ha) located in Ky Trinh Ward, Ky Anh Town, Ha Tinh Province.

+ Ash storage site No. 1: The crest width of the embankment is 5.0-7.0 meters with a compacted earth structure; the highest crest height is +23 meters. The outer embankment slope of 1:2 is planted with grass for slope protection, and the inner embankment slope of 1:1.75 is lined with geotextile and HDPE membranes for waterproofing.

+ Ash storage site No. 2: The crest width of the embankment is 3.0-8.0 meters with a compacted earth structure; the highest crest height is +32 meters. The outer embankment slope of 1:2 is planted with grass for slope protection, and the inner embankment slope of 1:1.75 is lined with geotextile and HDPE membranes for waterproofing.

+ Ash disposal method: If the ash and slag are utilized, they will be transported by purchased trucks directly from the storage silo. If not utilized, they will be discharged into the ash and slag storage site: Ash and slag are cooled, mixed with water inside the plant, and pumped through pipelines to be discharged inside the storage site. The slag discharge pipes are placed along the embankment, with discharge points evenly spaced and connected to pipes that discharge inside the storage area. The water in the slag will settle and accumulate in an area far from the ash and slag discharge point. The ash and slag will be moved from the discharge point to various locations by the flow of water from high to low, settling by their gravity. A water pumping system will be installed to collect the settled water within the storage site and pump it back to the plant to supplement the water used for mixing ash and slag, without discharging it into the environment.

+ Rainwater drainage system: The drainage system on the embankment is arranged with reinforced concrete channels with dimensions of B x H = 0.3 m x 0.6 m. The collected rainwater will be directed to the main channels at the foot of the embankment of the ash and slag storage site; the drainage system for the outside area and the embankment slopes down into reinforced concrete channels, including sections of channels with different sizes BxH = 2.5 x (1.8-2.0) m.

+ Ash and slag storage site's runoff water recovery pipeline system: A pumping station will be installed on a floating platform to collect runoff water from the ash and slag storage site through the recovery pipeline system for reuse in transporting ash and slag, ensuring no discharge into the environment.

- Regulatory compliance: Strictly adhere to the provisions of Decree No. 08/2022/ND-CP dated January 10, 2022, by the Government on detailed regulations for the implementation of several articles of the Law on Environmental Protection.

d. Hazardous Waste Collection, Storage, Management, and Treatment Projects and Measures

- Construction of a hazardous waste storage facility with an area of 200 m2

- Complying with Circular No. 02/TT-BTNMT dated January 10, 2022, including sealed floors, sun and rainproof roofs, equipped with fire protection equipment, warning signs, and absorbent materials.

- Contracting with authorized waste management service providers for transportation and treatment according to regulations.

e. Noise and Vibration Reduction Projects and Measures

- Use of well-maintained equipment.

- Installation of noise reduction equipment for noisy machinery (turbines, steam pipes, etc.) placed in shielded areas to reduce noise impact on neighboring areas.

- Installation of noise-reducing pads for high-capacity machinery.

- Planting trees and building noise barriers around the plant area.

- Regular maintenance of moving equipment such as lubrication of parts prone to wear.

- Installation of soundproofing equipment and low-noise devices where necessary (around turbine and boiler areas).

- Control rooms and operating areas in the production area constructed with soundproof walls and roofs.

f. Other Impact Mitigation Projects and Measures

- Coastal ecosystem impact: Strict implementation of wastewater, emission control, solid waste management, and hazardous waste management measures.

- Thermal pollution impact: Installation of ventilation and central air conditioning systems.

- Socio-economic impact on the region: Close cooperation with local authorities such as Department of Education and Training, Department of Health, and Department of Labor, Invalids and Social Affairs in planning and implementing education and healthcare programs to meet the needs of employees and their families.

- Impact of rainwater runoff:

+ Main plant area: Rainwater runoff is collected through a system of circular reinforced concrete pipes (sizes D200 - D1800) and reinforced concrete channels and ditches (sizes B300 - B5000) before being discharged into the sea.

+ Staff housing area: Rainwater runoff is collected through a system of covered reinforced concrete ditches (sizes B400 - B1000) before being discharged into the general drainage system along the roads in the area.

g. Works and measures to mitigate impacts from risks and environmental incidents

***/ Fire and explosion incidents:**

The Vung Ang II Thermal Power Plant will be designed to ensure a safe operating environment for humans and equipment. The equipment in the plant will be arranged to minimize the risk of fire and explosion, by selecting appropriate equipment and materials. To achieve this, the fire protection system in the plant must effectively perform the following tasks:

+ Early detection, warning, and extinguishing of fires;

+ Preventing fires from erupting or spreading;

+ Protecting workers in the plant;

+ Minimizing damage caused by fires.

Areas prone to danger in the plant include the boiler area, steam turbine area, air preheater area, coal storage, coal conveyor, oil pump station, oil tank, hydrogen house, cable trenches, and areas containing flammable substances. Particularly, areas storing and containing oil for ignition and supplementary firing when the plant operates at low load and the hydrogen production station for generator cooling are high-risk fire and explosion areas.

The basis for designing the fire protection system for the plant is to ensure fire prevention and firefighting safety, applying and complying with current TCVN (Vietnamese standards), especially when TCVN requirements are higher than international standards. For aspects not regulated by TCVN, relevant international standards such as NFPA (National Fire Protection Association) or other international standards like IEC 79-10 (International Electrotechnical Commission) will be applied. In such cases, the applied standards must be approved by the Fire Prevention and Fighting Police Department.

- When a fire or explosion incident occurs, using manpower and on-site fire protection equipment, the project's fire protection technical team responds according to assigned responsibilities and pre-trained and rehearsed skills.

- After the incident is resolved, a summary meeting will be held to analyze the cause, process, and results of the response to draw lessons for future prevention and response efforts.

- The response measures implemented during a fire or explosion incident must strictly follow the fire protection plan approved by the Fire Protection Police.

- Upon detecting small fires, immediately stop or notify to stop the operation of machinery and equipment in the area of the fire while notifying the Port's Fire Protection Command and using on-site handheld firefighting equipment to handle the situation.

- If the fire or explosion incident exceeds on-site response capabilities, promptly call and report the situation and developments to the Ha Tinh Province Fire Protection Police Department and seek assistance for timely firefighting and rescue. During this time, the officers and employees working at the port must actively cooperate and follow the orders of the Fire Protection and Rescue Command of the Fire Protection Police Department.

/ Oil spill incidents

- Develop a process for preventing and responding to oil spill incidents, submitted to competent authorities as required.

- Vessels operating in the project must regularly inspect and maintain machinery and equipment to meet safety and environmental standards to prevent incidents.

- Issue regulations ensuring operational safety at the port to prevent potential accidents that may cause ship sinking or oil spills.

- Upon receiving reports of oil spill incidents, the project owner will process the information as follows:

+ Evaluate the authenticity of the incident information.

+ Initially assess the nature, scope, extent, and potential consequences of the incident;

+ Report and notify relevant authorities about the information handling and specific coordinated response measures.

+ Inform organizations and residents in affected or potentially affected areas to proactively respond and mitigate the incident.

+ Organize on-site response: The project owner is responsible for organizing and commanding their forces, equipment, and facilities to promptly respond when an incident occurs, utilizing containment measures to isolate the spill area.

+ Coordinate with relevant units: In case of a severe oil spill, the project owner is responsible for field command, mobilizing necessary forces and equipment to respond immediately, and reporting to the management agency, Ky Anh Town People's Committee, Ha Tinh Province People's Committee, Vung Ang Maritime Administration, and Vung Ang Economic Zone Management Board for support.

- After the response activity, the project owner will arrange the area affected by the oil spill, monitor the post-incident environment to assess potential impacts on human health and the environment.

/ Traffic accident incidents:

- Prevent and respond to road traffic accidents:

+ Comply with the design, construction, and regular maintenance of the connecting and internal traffic systems throughout the project's operation.

+ Assign staff to guide vehicles entering and exiting the project.

+ Simplified diagram of the response process to congestion and traffic accidents: Quickly organize and mobilize necessary forces to rescue people —> Install necessary warning signs to inform vehicles of the accident area —> Assign personnel to guard and protect the scene, regulate traffic —> Notify relevant state management agencies to organize guidance and supervise the incident response process, etc.

- Prevent and respond to waterway traffic accidents:

+ Develop a maritime safety plan submitted to competent authorities for approval before commencing business operations.

+ Install a complete inland waterway signaling system (buoys, signs, lights). Signs are placed in visible positions from the direction of the ship's passage.

+ Plan regular maintenance of signaling systems. Educate and guide residents not to place fishing equipment within the waterway safety corridor.

+ Regularly monitor meteorological forecasts to schedule ship departures appropriately;

+ Ship operators must always navigate the ship according to designated routes, frequently observe and detect obstacles to adjust the ship's course accordingly. When operating ships at night, use spotlight systems to detect and avoid obstacles and equip signaling lights for other boats to see.

+ Mooring ships at the dock must equip and light signaling lights at night to avoid collisions with other ships passing through the area at night.

/ Flue gas treatment system incidents:

To limit adverse effects on the plant when dangerous conditions arise or parameters exceed limits, protection systems will be equipped for boilers, turbines, and generators. The protection system must have high reliability and avoid false shutdowns by using redundant signals.

The measurement and control system equipped for the Vung Ang II project is the Integrated Control and Monitoring System (ICMS), using a Distributed Control System (DCS) structure based on microprocessor technology, fully integrating control and data processing systems, also known as digital control systems. The system will integrate control and monitoring functions for the main technology equipment and other auxiliary equipment of the plant.

The integrated control and monitoring system ICMS will include a monitoring and control system for two identical unit blocks UCMS (Unit Control and Monitoring System) (each block has one 665MW supercritical pulverized coal boiler, one turbine), auxiliary systems for each block, and a station control and monitoring system SCMS (Station Control and Monitoring System) for the plant's auxiliary systems. The design description below is understood for one unit.

The plant's integrated control and monitoring system will meet the requirements for safe, reliable operation and high operational efficiency of the unit and common plant. Additionally, this system is responsible for coordinated control of the turbine and boiler,

boiler control, boiler auxiliary equipment control, turbine control, turbine auxiliary equipment control, boiler and turbine protection, coordinated control with auxiliary systems such as water treatment, wastewater treatment, coal supply, desulfurization, ash disposal, hydrogen station.

- Develop safe technical operation procedures, train system operators on technology transfer regulations, appoint specialized staff to check the operation of the flue gas treatment system (maintaining daily logs), ensure the system always operates according to the transferred technology.

- Regularly maintain machinery and equipment to detect potential technical faults during operation.

- Prevent and respond to incidents during ESP system operation:

+ Regularly inspect, maintain, and service the ESP system as required.

+ The ESP (Electrostatic Precipitator) dust filtration system is designed and manufactured with a control cabinet for the dust filter with the following functions:

++ Automatically adjust the AC voltage in the range of 0 – 220VAC or 0 – 380VAC supplied to the step-up transformer.

++ Automatically adapt the electric field for dust filtration according to the insulation capacity of the filter chamber.

++ Display the voltage supplied to the step-up transformer.

++ Display the current supplied to the transformer.

++ Display the voltage that can be supplied to the filter chamber.

++ Display the current supplied to the filter chamber.

++ Protect by cutting off the voltage supply to the transformer, alerting with lights and alarms when an incident occurs.

- Response measures when the flue gas treatment system encounters an incident:

+ Scenario 1: The treatment system operates normally, but post-treatment emissions exceed limits

++ The plant regularly inspects and maintains the flue gas treatment system according to manufacturer regulations and operational procedures.

++ Set early warning values for the automatic, continuous monitoring system. When emissions exceed permitted limits, the operation shift checks the NH_3 supply flow rate, air supply flow rate to the boiler, manual valves on the NH_3 supply line to the boiler, transformer field current, etc., according to system operation procedures. If equipment parameters comply with operational procedures, check measurement signals, identify the cause and scope of the incident to address it. If measurement equipment is not faulty, request load reduction and monitor for evaluation.

+ Scenario 2: The flue gas treatment system encounters an incident and needs to be temporarily suspended for repair (replacing faulty equipment):

+ For continuous automatic monitoring equipment: The plant performs calibration of measuring equipment, regularly inspects equipment, calibrates as needed, and has spare environmental monitoring equipment to replace in case of an incident.

+ In case of prolonged incidents, report to competent authorities to reduce load or stop unit operation to address the incident.

****/ Wastewater treatment system incidents:***

- Control the operation process, comply with design requirements and technical specifications; regularly inspect pipelines, pumps, machinery, equipment, and replace or repair when leaks or faults are detected.

- Prepare spare pumps, aeration equipment, and other backup equipment for immediate replacement when equipment fails.

- Assign qualified and specialized staff to operate and maintain the wastewater treatment station.

- For incidents due to pipe breakage, damage, or leaks: The company temporarily suspends operations to address the incident.

- For equipment failure incidents (wastewater pumps, air blowers, etc.): stop operating the treatment system and send the faulty equipment for repair or coordinate with the equipment supplier for warranty service.

- When the treatment system encounters an incident, the operating technical team will quickly identify the cause and resolve the issue as soon as possible. If the incident exceeds the company's capability, the company will invite wastewater treatment experts to inspect and adjust.

+ Temporarily store untreated wastewater in the system's storage tanks, halt the plant's operation, and after the issue is resolved, gradually pump the stored wastewater back into the treatment system to meet standards and resume plant operations.

+ After resolving the issue, closely monitor to ensure the system operates stably and effectively. When the system is stable, sample the output wastewater and send it to a qualified unit for analysis and inspection. If the wastewater still does not meet the standard, continue to rectify until it meets the standard.

+ In case of a severe incident, the company will report to the Ha Tinh Department of Natural Resources and Environment, the Ministry of Natural Resources and Environment, and temporarily halt production to resolve the issue.

****/ Ash storage site incidents***

Water leakage from the ash storage site:

During the operation of the ash storage site, water leakage incidents from the ash storage site to the environment may occur. Although the bottom of the ash storage site is lined with HDPE to ensure no leakage into the groundwater, there is still a risk of surface water leakage, mainly occurring during heavy rains that exceed the storage capacity of the ash storage site's water collection system. The leakage is primarily due to rainwater overflow. Therefore, when there are forecasts of heavy rain in the area, the ash storage site operation team needs to pump out water in the rainwater collection system within the ash storage site to ensure the useful capacity of the system. The ash storage site is equipped with 2 pumps with a capacity of 2x100m3/h to ensure continuous pump operation during heavy rains.

To extend the ash storage site's usage time, the plant will have policies and plans to reuse ash for other production purposes, such as selling ash to cement production facilities as additives.

Ash storage site landslide:

- The earth embankment must be solidly constructed to ensure the structure's stability and prevent rainwater from the ash storage site from leaking and seeping into the surrounding environment, causing water pollution in the area.

- The bottom of the ash storage site is compacted and covered with a thick layer of clay for waterproofing and lined with a suitable impermeable layer.

- Safety and industrial hygiene measures involve fully implementing the processes and regulations issued by the State, Ministries, and Sectors. Along with production engineering, electromechanics, and transportation departments, comprehensive measures are formulated.

- The dumping process complies with open-pit mining technical standards TCVN 5326-2008 and the solutions, design passports, and soil work standards (TCVN 5308-91).

- Have specific storm and flood prevention plans.

- Inspect the drainage system and water-blocking embankments.

- At the beginning of each rainy season, dredge the area in front of the culvert to ensure good drainage throughout the rainy season.

- Develop contingency plans for incidents: rescue work for people and equipment.

- When completing each dumping level, cover the slopes with common vegetation in the area and plant forests with acacia mangium trees.

- Implementing these measures comprehensively ensures the safety of the dumping process and prevents environmental issues caused by dumping activities.

- Workers involved in the ash storage site must not walk in areas where bulldozers are operating, especially not on the edges of the ash layers, particularly on rainy days and after heavy rains.

- Conduct weekly inspections, especially after heavy rains when large amounts of water gather in the environmental treatment pond. If there are signs of erosion or cracks in the dam surface in the environmental treatment pond area, immediately notify relevant departments for timely handling.

After the ash storage site is full, cover it with soil and plant trees on it to prevent ash dust from being blown away by the wind and ash from being washed away by rainwater, causing environmental pollution. It also improves the area's landscape and air quality.

The ash storage site is designed according to 261:2001/TCXDVN, with the ash storage site foundation consisting of 3 to 4 layers depending on the condition of the excavated or filled soil:

- Layer 1: For filled soil areas, the ground surface after filling to the design elevation will be compacted, meeting a compaction coefficient $k \geq 0.9$. For excavated soil areas, geotextile fabric can be directly laid on the excavated ground surface.

- Layer 2: Geotextile fabric (protecting the HDPE impermeable layer)

- Layer 3: 1.5 mm thick HDPE impermeable membrane

- Layer 4: 0.5 m thick protective soil layer.

Ash storage site management measures: The team operating and managing the ash collection and transportation system to the ash storage site belongs to the Safety and Environment Department. This team includes operators and supervisors with tasks related to ash transportation activities, such as:

- Adhering to the procedures for collecting and transporting ash to the ash storage site.

- Managing the security of the ash storage site to prevent unauthorized exploitation.

- Regularly operating and monitoring the ash storage site to detect and promptly address environmental incidents.

- Preparing weekly reports on the ash storage site's condition for the plant.

- Annually, there are 02 environmental quality monitoring reports for the ash storage site as required (reports are prepared for the entire plant's operations, including the ash storage site).

- Design and install a pipeline to recover water from the ash storage site and recycle it for the ash disposal system in the plant.

****/ Earthquake Incidents***

Vung Ang II Thermal Power Plant is designed according to Vietnamese standard TCXDVN 375:2006 "Design of structures for earthquake resistance," ensuring earthquake resistance for the area. According to the seismic risk assessment study (Vung Ang II Thermal Power Plant Feasibility Study Project), the peak ground acceleration (PGA) for the maximum credible earthquake (MCE) on the bedrock is 0.1698g, the maximum design earthquake (MDE) is 0.0926g, and the operating basis earthquake (OBE) is 0.0418g.

/ Flooding Incidents

- Regularly monitor weather forecasts, especially during the rainy season.

- Manage and operate the project's drainage system, dredging the project's drainage ditches to ensure the area's drainage capacity.

- Arrange water pumps to enhance drainage during heavy rain and address low-lying areas in case of flooding where necessary.

- Coordinate with local authorities to promptly prevent and mitigate consequences.

/ NH3 Leak Incidents

- Regularly inspect NH3 storage equipment.

- When ammonia is insufficient, the flow control valve needs to check the ammonia flow meter and related controllers; check the ammonia gas supply pressure.

- Poor ammonia distribution needs to adjust the ammonia spray grid regulator valves; check circulation to avoid clogging pipes and ammonia nozzles; check and calibrate gas analysis equipment for accuracy.

- To minimize the release of ammonia to the surroundings, the ammonia system is equipped with: NH3 leak detection system, water spray system, ammonia waste treatment. When an ammonia leak (exceeding regulations) is detected, it activates the control valve, and the automatic water spray system is supplied from the service water source to extinguish the incident. The wastewater is transferred to the ammonia waste dilution tank, then dispersed into the water and settles down. The ammonia is discharged through a submersible pump into the non-frequent wastewater storage tank.

- The plant regularly performs inspections, maintenance as planned, repairs, and replaces damaged parts that may affect the normal operation of the SCR system. Inspections and maintenance are conducted at different levels, either during operation or shutdown, daily, annually, or even per shift, depending on the system's operational needs and conditions.

- If there is dust accumulation on the catalyst plate surface, the plant will clean the catalyst plate surface by blowing dry air or vacuuming during the shutdown process.

Addtionally, during actual implementation, the project owner has adjusted some waste treatment processes to fit reality, specifically as follows:

Table 3.23. Current actual operation of waste treatment process

No.	Content	According to the approved EIA report in Decision No. 3055/QĐ-BTNMT dated October 8, 2018, and Decision No. 132/QĐ-BTNMT dated January 15, 2020	Actual implementation	Note
1	Technology process of the domestic wastewater treatment plant with a capacity of 150 m^3/day-night	Wastewater → Septic tank → Collection tank → Balancing tank → Biochemical tank (aeration) → Settling tank → Storage tank → Chlorine aeration → Inclined plate settling tank of the main wastewater treatment system → Output wastewater meets QCVN 14:2008/BTNMT column B, K=1.2	Wastewater → Septic tank → Collection tank → Balancing tank → Anoxic tank → Aerotank → Biological settling tank → Disinfection tank → Storage tank → Output wastewater meets QCVN 14:2008/BTNMT column B, K=1.2, and is pumped to the primary tank of the industrial wastewater treatment system for further treatment	Additional adjustment to include the anoxic biological treatment step to improve nitrogen treatment efficiency in wastewater.

2	Technology process of the industrial wastewater treatment plant with a capacity of 200 m^3/h (4,800 m^3/day-night)	Wastewater → Oil separation tank → Storage tank → Settling tank → pH control tank → Mixing tank → Neutralization tank → Post-treatment wastewater storage tank	Wastewater → Primary storage tank → pH adjustment tank → Coagulation and flocculation tank → Settling tank → Intermediate tank → Pressure filter tank → Activated carbon filter tank → pH adjustment tank → Post-treatment wastewater storage tank → Post-treatment wastewater meets QCVN 40:2011/BTNMT column B, Kq=1.3, and Kf=1.0, discharged into the sea along with cooling water and partially reused for ash and ash transportation system, moistening for dust suppression in coal storage area, dust control on internal roads.	Clarification added for coagulation and flocculation treatment steps, additional pressure filtration, activated carbon filtration, and pH adjustment steps to enhance treatment efficiency.

3	Sulfite concentration in wastewater from the SFGD system	0 mg/L	≤1.0 mg/L	Adjustment to fit actual technology, referencing European standards for sulfite concentration limits.
4	Boiler flue gas treatment process	Boiler flue gas → Electrostatic precipitator (ESP) system → Induced draft fan → SO2 removal system (FGD) → Chimney	Boiler flue gas → Selective Catalytic Reduction (SCR) system for NOx removal → Electrostatic precipitator (ESP) system → Induced draft fan → SO2 removal system (FGD) → Chimney	Addition of SCR system for NOx removal to ensure NOx concentration ≤300 mg/Nm^3. Approved in document No. 1721/BTNMT -TCMT dated April 1, 2020, by the Ministry of Natural Resources and Environment.

3.3. Implementation of environmental protection works and measures

3.3.1. List of environmental protection works and measures for the project.

The list of environmental protection works and measures serves to adjust changes in the construction method for handling dredged materials as presented in the following table:

Table 3.24. The list of environmental protection works and measures

No.	Environmental Protection Projects	Quantity	Technical Specifications	Implementation Progress
A.	**CONSTRUCTION PHASE**			
I. Solid Waste Management, Hazardous Waste				
1	Household Waste Containers	50	100-120L	Equipped
2	Household Waste Storage Warehouse	1 warehouse	24 m²	Constructed
3	Hazardous Waste Containers	10	90L	Equipped
4	Common Hazardous Waste Storage Warehouse	1 warehouse	90	Constructed
II. Wastewater Treatment				
1	Car Wash Settling Tank	1 tank	8	Constructed
2	Portable Toilets	13 units	2-compartment units	Installed
3	Central office construction site wastewater treatment system	1 system	30 m³/day.night	Constructed
B.	**OPERATION PHASE**			
I. Solid Waste Management, Hazardous Waste				
1	Household waste containers	10 bins	50-200L	2021-2025
2	Hazardous waste containers	10 bins	100-120L	2021-2025
3	Hazardous waste storage warehouse	1 warehouse	200 m²	2021-2025
II. Wastewater treatment				

No.	Environmental Protection Projects	Quantity	Technical Specifications	Implementation Progress
1	Plant area rainwater collection and drainage system	1 system	Concrete pipes D500-D1200 with sedimentation manholes	2021-2025
2	Port area rainwater collection and drainage system	1 system	Rainwater runoff flows along the road to the port, down the slopes on either side of the road, and into the sea	2021-2025
3	Ash disposal site no.1 rainwater drainage system	1 system	Concrete trench BXH = 0.3 x 0.3m on the dyke	2021-2025
4	Ash disposal site no.2 rainwater drainage system	1 system	Concrete trench BXH = 2.5 x 1.8m	Dependent on actual land handover progress
5	Domestic wastewater collection system	1 system	uPVC pipes D120-D150 for domestic wastewater collection	2021-2025
6	Rainwater Drainage System for Ash Storage Area 1	1 system	HDPE DN200	2021-2025
7	Coal-contaminated wastewater collection system	1 system	HDPE DN200	2021-2025
8	Rainwater Drainage System for Ash Storage Area 2	1 system	HDPE DN200	2021-2025
9	Production wastewater collection system	1 system	HDPE DN25-HDPE DN100	2021-2025
10	3-compartment septic tanks in WC	6 tanks	Volume 9.0-42 m^3	2021-2025

No.	Environmental Protection Projects	Quantity	Technical Specifications	Implementation Progress
11	Main plant area domestic wastewater treatment system	1 system	Capacity 150 m³/day	2021-2025
12	Staff residential area domestic wastewater treatment system	1 system	Capacity 150 m³/day	2021-2025
13	Production wastewater treatment system	1 system	Capacity 200 m³/h	2021-2025
14	Preliminary Treatment System for Oil-Contaminated Wastewater	1 system	Oil separator device 25 m³/h	2021-2025
III. Exhaust Gas Treatment				
1	Electrostatic Precipitator System for Unit 1		Each system has 2 ESPs operating in parallel. Treatment capacity 3,100,000 m³/h	2021-2025
2	Electrostatic Precipitator System for Unit 2		Each system has 2 ESPs operating in parallel. Treatment capacity 3,100,000 m³/h	2021-2025
3	Seawater Desulfurization System for Unit 1		1 absorption tower, 2 seawater supply pumps, 1 aeration tank	2021-2025
4	Seawater Desulfurization System for Unit 2		1 absorption tower, 2 seawater supply pumps, 1 aeration tank	2021-2025
5	Chimney		Chimney height 210m	2021-2025

No.	Environmental Protection Projects	Quantity	Technical Specifications	Implementation Progress
6	Bag Filter System		3 Bag Filter Systems at fly ash silo for units 1 and 2, capacity 7,500 m^3/h/system. 8 Bag Filter Systems at coal transport conversion tower	2021-2025
IV	**Fire Prevention and Fighting System**	01 system	Fire Alarm System by Hand	2021-2025
			Water Supply System for Fire Fighting	2021-2025
			On-Site Fire Fighting Equipment	2021-2025
			Lightning Protection and Grounding System	2021-2025
V	**Other Activities**	-	Training for risk prevention, fire fighting, chemical safety program, boiler safety	2021-2025

3.3.2. Organization and management of environmental protection works

The implementation plan for environmental protection works and measures is developed to ensure the control of environmental impacts and minimize damages. The objectives of environmental monitoring are:

Check the accuracy of the forecast of impacts and implement measures to mitigate adverse impacts;

Ensure that mitigation measures implemented during the project's phases are effective;

Detect newly arising impacts and take timely mitigation measures;

Ensure that projects comply with Vietnam's environmental protection laws, with different management contents for each impact and each type of project;

Based on project construction activities, environmental impacts, and environmental protection issues during the project preparation, construction, and operation phases.

The implementation plan for environmental protection works and measures of the project includes the organizational structure, a summary of environmental impact mitigation measures, and the implementation plan, presented in the following table::

Table 3.25. Implementation plan for environmental protection works and measures of the project

No.	Unit	Main Responsibilities
1	Project Owner (PO)	Overall responsibility for the project's environmental protection. Coordinate with contractors to supervise the mitigation measures on the contractors' environmental impacts. Monitor and evaluate the implementation of pollution mitigation measures mentioned in the Environmental Impact Assessment (EIA).
2	Contractors (C)	Coordinate with the project owner in implementing the environmental protection works and measures plan of the project. Implement the proposed environmental impact mitigation measures within the scope of the contract as stated in the EIA.
3	Independent Supervision Consultant (ISC)	Hired by the PO to supervise the implementation of environmental impact mitigation measures.

No.	Unit	Main Responsibilities
		Provide advice, support, and training to contractors in implementing measures to mitigate adverse environmental impacts.
4	Representatives of Competent State Management Agencies (MONRE, Ha Tinh DONRE, Ky Anh Town Division of Natural Resources and Environment)	Manage and inspect the compliance with the approved environmental impact mitigation measures in the EIA. Coordinate with the PO to handle sudden environmental issues, incidents, and risks.
5	People's Committee of Ky Anh Town and affected communes	Coordinate with the PO, state management agencies, and contractors to resolve environmental issues related to local residents (if any).

3.4. Comments on the level of detail and reliability of identification, assessment, and prediction results

3.4.1. Comments on the level of detail of assessment and prediction results

The report has outlined the project activities including preparation and construction phases. From this, it has forecasted and assessed the impacts caused by these activities. The scope of the Environmental Impact Assessment (EIA) is comprehensive, covering almost all potential sources of impacts, thus not omitting associated impacts.

The level of detail of assessments is demonstrated in the predictive calculations regarding the scale of emissions based on vehicle data, applied technologies, and state-prescribed standards and international organizations. In cases where such bases are unavailable, forecasts are based on summarized experiences.

The detail level of assessments is also reflected in predictive evaluations of impact intensity, established by comparing calculated and forecasted values against current standards and norms.

3.4.2. *Comments on the reliability of assessment and prediction results*

The report employs methods introduced in studies and environmental impact assessment guidelines from the Ministry of Natural Resources and Environment. Therefore, the reliability is fairly high. Specifically:

Statistical and comparative methods: The consulting unit conducting the EIA report has conducted multiple surveys and collected data on the project area from provided documents. The accuracy and reliability of quantitative results from this method depend on the information, data, and statistics gathered. Results are less reliable if existing information, data, or sources are outdated or unreliable.

Mapping methods: The report uses straightforward mapping methods to depict the current monitoring positions on map tools based on actual surveyed coordinates, providing an accurate image of the project's surrounding area.

Social survey methods, surveying, field measurement, analysis, and laboratory processing methods: These are executed according to procedures and regulations. The tasks are carried out by environmental experts and professionals capable of monitoring and analyzing data, ensuring reliability and authenticity. Additionally, the report proposes environmental monitoring contents for the project area before and during project execution, ensuring monitoring of environmental developments in the project area.

Rapid assessment methods: These adhere to World Health Organization (WHO) regulations and other organizations to determine pollution loads based on pollution coefficients for environmental components. This method has been applied in many reports and is regulated by management agencies, providing quick and fairly accurate results.

Expert assessment methods: Impact evaluations are based on the practical experience of experts in related fields from similar projects, ensuring high reliability.

Mathematical modeling methods: These use mathematical formulas to simulate the transformation and dispersion processes (dilution or concentration) in reality regarding the composition and volume of pollutants over space and time.

Synthesis analysis and evaluation methods: These are used to comprehensively assess project impacts on the environment, proposing feasible measures to minimize impacts and prevent and respond to environmental incidents. This method is subjective to the evaluator's expertise but is conducted by experienced environmental professionals, ensuring reliability.

The environmental impact assessment tools are as presented and evaluated above. The assessment results are reliable. Therefore, assessing the impacts and degree of impact of the project on the environment during each project phase is realistic. The project owner will detail commitments in this report to effectively implement measures to minimize and prevent pollution to ensure project development and protect the regional environment.

CHƯƠNG 4. ENVIRONMENTAL RESTORATION AND REMEDIATION PLAN; BIODIVERSITY COMPENSATION PLAN

Based on Article 1 of the Biodiversity Law 2008, which states: "Organizations and individuals that disturb conservation areas, biodiversity conservation facilities, crop varieties, livestock, microorganisms, and rare and valuable fungi and species listed in the List of endangered, rare, and valuable species prioritized for protection, biodiversity corridors must compensate for damages according to the law."

According to the Biodiversity Status Report, the project area does not contain any species listed in the List of endangered, rare, and valuable species prioritized for protection, biodiversity corridors. Therefore, the project is not subject to biodiversity compensation.

CHƯƠNG 5. ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

5.1. Project owner's environmental management program

The project owner manages environmental protection activities through:

- Specifying the responsibilities of the construction contractor to comply with and implement environmental protection measures as stipulated in the project construction contract;

- Hiring an independent consulting organization to supervise and urge the construction contractor to implement environmental protection measures throughout the project construction period;

- Engaging an independent environmental monitoring organization to regularly conduct monitoring, sampling, and analysis of relevant environmental quality indicators in a laboratory throughout the project construction period;

- Establishing a specialized team to guide and disseminate environmental protection activities of the project to staff and workers involved in the construction; conducting weekly inspections and evaluations of the contractor's environmental compliance and maintaining records of evaluations as required.

- The project owner undertakes the dissemination of environmental protection activities to staff and workers involved in the project; monitoring and evaluating environmental compliance according to the guidelines in Circular No. 41/2017/TT-BGTVT dated November 14, 2017 of the Ministry of Transport regulating the management of waste from ships in coastal waters.

The environmental management program is established based on the synthesis of results from Chapters 1 and 3 in the form of the following table:

The environmental management program is synthesized in the form of the table below:

Table 5.1. The environmental management program during dredging and dredged material treatment process

Stages	Project activities	Environmental impact	Environmental protection measures and works	Implementing and completeteing duration
1	2	3	4	5
The activities of dredging, transporting dredged materials, and offshore disposal of dredged materials	- Dredging construction using a bucket dredger and self-propelled suction dredger. - Transporting dredged materials by self-propelled barges or directly using self-propelled trailer suction hopper dredgers. - Receiving and disposing of dredged materials into designated areas. - Bringing dredged materials ashore via pumping stations or trucks through	- Increased dust and emissions from construction vehicles. - Noise generated by construction vehicles.	- Construction vehicles are inspected for quality by the Vietnam Register. - Providing personal protective equipment for workers involved in construction (face masks, noise-canceling earplugs). - Regular maintenance and timely repair of machinery and equipment.	During operation process
		- Increased turbidity and Total Suspended Solids (TSS) in seawater due to dredging activities stirring up sediment. - Water overflow from hatches of ships, sanitary water on board. - Domestic wastewater from ship vehicles.	- Carry out construction efficiently and use appropriate construction equipment; Follow approved construction procedures/methods. - Install filter screens at the overflow openings of trailer suction hopper dredgers and self-propelled bottom-opening barges; regularly inspect to ensure the effectiveness of the filter screens. - Conduct regular monitoring of seawater quality during construction. - Control sediment dispersion during dredging operations to assess the spread of suspended solids to the dumping area and surrounding areas. Install mud baffles if sediment levels exceed permissible limits. - For domestic wastewater: Vehicles involved in construction must comply with QCVN 17:2011/BGTVT/SĐ2:2016. In cases where compliance with QCVN 17:2011/BGTVT/SĐ2:2016 is not possible, mobile sanitation facilities must be provided. - For bathing, hand washing, and eating: Waste should be separated, collected, temporarily settled, and then discharged into the environment.	-as above-

Stages	Project activities	Environmental impact	Environmental protection measures and works	Implementing and completeing duration
	loading points.	Generation of solid waste	- Equipped with 01 specialized containers for collecting domestic solid waste on each construction vehicle. Domestic solid waste is collected and stored in specialized trash bins, managed according to regulations in Government Decree No. 08/2022/NĐ-CP. - Scheduled every 2-3 days for transferring and handing over domestic solid waste to the designated unit responsible for collection, transportation, and disposal.	-as above-
		Generation of hazardous waste: oil spills, oil-soaked rags, etc.	- For oily waste water: Specialized containers or cabinets are arranged on maritime construction vehicles, inspected, and certified for environmental pollution prevention as per regulations. They are labeled with specific signage. - For oil-soaked rags: Each vehicle is equipped with 01 specialized container, labeled with warning signs according to regulations, and placed in a sheltered location. - Management follows the provisions of Government Decree No. 08/2022/NĐ-CP and Circular No. 02/2022/TT-BTNMT. A contract is made with a unit responsible for collection, transportation, and disposal services.	-as above-
		Impact of noise pollution	- Providing personal noise reduction protective equipment for workers operating equipment and machinery on board ships. - Using maritime vehicles in construction in the approved quantity, type, and capacity as certified and currently valid by the Vietnam Register. Ensuring technical safety and environmental protection as per regulations. - Ensuring compliance with environmental requirements under QCVN 26:2010/BTNMT.	-as above-

Stages	Project activities	Environmental impact	Environmental protection measures and works	Implementing and completeing duration
		Impact on waterway transportation	- Develop a plan to ensure maritime safety approved by the Vung Tau Maritime Port Authority. Strictly implement the approved maritime safety plan. - Adhere to Circular No. 42/2021/TT-BGTVT dated December 31, 2021, and QCVN 20:2015/BGTVT to ensure waterway traffic safety on the channel.	-as above-
		Impact on ecosystems and aquaculture activities	- Implement environmental protection measures for wastewater, solid waste, and hazardous substances throughout the dredging and disposal process. - Monitor environmental indicators of nearshore seawater according to the scheduled monitoring plan. - Notify the local authorities of the construction plan to enable residents to proactively adjust their production activities and mitigate potential impacts on aquatic farming activities.	-as above-
		Socio-economic impact on communities	- Coordinate with local authorities to enhance communication efforts aimed at ensuring residents understand the project's objectives and the socioeconomic benefits it brings. This includes primarily serving the local community. In the event of social conflicts, maintain calm and resolve issues peacefully to avoid disrupting social order and safety in the area.	-as above-
	Prevent risks and environmental incidents	Oil spill incidents	- Provide oil containment booms for oil storage tanks, machinery, equipment, maintenance areas, etc., that use or generate oil on the deck of the vessels. - Strictly implement the approved maritime safety plan submitted to the	-as above-

Stages	Project activities	Environmental impact	Environmental protection measures and works	Implementing and completeing duration
			Vung Tau Maritime Administration. - Require contractors to equip each construction vessel with equipment to respond to oil spill incidents. - Require contractors to negotiate with specialized units to organize responses to oil spill incidents during construction if they occur.	
		Fire and explosion incidents	- Fully equip firefighting facilities: fire extinguishers, fire hoses, gas masks, etc., with firefighting regulations and warnings posted on dredging vessels at the construction site. - Position firefighting equipment in easily observable and accessible locations. Keep fuel containers on ships away from ignition sources or easily combustible areas.	-as above-
		Waterway traffic accidents	- Develop and submit to the Vung Tau Maritime Port Authority for approval a maritime safety plan in accordance with regulations stipulated in Decree No. 159/2018/NĐ-CP and Decree No. 58/2017/NĐ-CP. - Develop a traffic routing plan and install signage in the construction area.	-as above-
		Shoreline erosion incidents	- Comply with and execute dredging according to the project design, ensuring dredging within specified boundaries, area, and volume. - Verify coordinates, elevations, and slopes of the dredging area as per the requirements of the design documents. - Regularly observe the shoreline; if erosion occurs, temporarily suspend construction, investigate the cause, reinforce the shoreline, and adjust the construction design to suit the reality (if determined that erosion is due to project activities).	-as above-

Stages	Project activities	Environmental impact	Environmental protection measures and works	Implementing and completeing duration
		Extreme weather-related incidents	- Ensure effective communication systems are in place for contingency plans during major incidents. - Adjust the construction schedule appropriately and flexibly: + The construction schedule will be adjusted flexibly and reasonably to ensure safety. Construction activities will only proceed when equipped to handle the safest weather conditions. + Emergency response equipment will be regularly inspected and maintained according to the schedule.	-as above-
		Outbreak of the pandemic	- Arrange a medicine cabinet with essential supplies on each vehicle. - Ensure hygienic eating conditions, providing clean, elevated, and well-ventilated living quarters. - Develop an action plan for implementing disease control procedures in offices, workplaces, and construction sites following government guidelines.	-as above-

Table 5.2. Environmental monitoring program during construction phase of the plant.

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
Construction phase (onshore plant construction activities)	TRansporting construction materials	Dust, SO2, CO, NO2, and VOC emissions causing air pollution Wastewater from cleaning machinery and equipment Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Spraying water to keep moisture on the transportation route	100	In construction phase	Construction contractor	Project owner
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
			Complying with machinery and equipment maintenance	-	In construction phase		
			Transportation vehicles are covered to limit dust	30	In construction phase		
			Not overloading beyond the permissible weight limit	-	In construction phase		
			Arranging vehicle washing areas outside the construction site	80	In construction phase		
			Clearly specifying transportation routes	-	In construction phase		
		Wastewater from cleaning machinery and equipment	Building a water drainage collection system and sedimentation pits in the vehicle washing area	50	In construction phase	Construction contractor	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Collecting oil-contaminated sludge	10	In construction phase		
		Noise and vibrations	Using machinery, equipment, and transportation vehicles as per registration regulations	-	In construction phase	Construction contractor	Project owner
			Limiting speed when passing through residential areas	-	In construction phase		
			Not overloading beyond the permissible weight limit	-	In construction phase		
		Increased traffic density and traffic accidents	Limiting speed when passing through residential areas	-	In construction phase		
			Installing traffic signs on the transportation route	30	In construction phase		
			Not overloading beyond the permissible weight limit	-	In construction phase		
			Clearly specifying transportation routes	-	In construction phase		
	Other components constr	Dust, SO2, CO, NO2, and VOC	Spraying water to keep moisture	30	In construction phase		Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		emissions causing air pollution	Using low-sulfur fuel	-	In construction phase	Construction contractor	
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
			Complying with machinery and equipment maintenance	-	In construction phase		
			Covering materials	50	In construction phase		
		Wastewater from cleaning machinery and equipment	Building a water drainage collection system and sedimentation pits in the industrial sanitation area	50	In construction phase	Construction contractor	Project owner
			Collecting oil-contaminated sludge	10	In construction phase		
		Construction waste	Sorting construction waste and collecting reusable construction waste	-	In construction phase		
			Contracting collection, transportation to designated landfill sites	50	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Noise and vibrations	Not simultaneously using multiple noisy machines and equipment in areas close to residential areas	-	In construction phase	Construction contractor	Project owner
			Using fences and mobile barriers for construction areas with high noise levels and near residential areas	160	In construction phase		
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
			Complying with machinery and equipment maintenance	-	In construction phase		
			Placing noisy machinery and equipment (concrete batching plants, generators, etc.) far from residential areas	-	In construction phase		
			High-noise work near residential areas should only be done during the day	-	In construction phase		

Project Operation Phase	**Project Activities**	**Environmental Impacts**	**Environmental protection works and measures**	**Implementation cost of environmental protection works and measures (million VND)**	**Implementation and completion time**	**Responsibility for Implementation**	**Responsibility for Supervision**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
			Using personal protective equipment for operating workers	310	In construction phase		
		Ecosystems, animals, plants	Controlling and managing construction within the designated land boundary	-	In construction phase	Construction contractor	Project owner
			Controlling and minimizing dust emissions affecting nearby ecosystems and vegetation	-	In construction phase		
	Transporting construction equipments and machines	Dust, SO2, CO, NO2, and VOC emissions causing air pollution		80	In construction phase	Construction contractor	Project owner
			Spraying water to keep moisture	-	In construction phase		
			Using low-sulfur fuel	-	In construction phase		
			Using machinery and construction equipment as per registration regulations	30	In construction phase		
		Industrial cleaning wastewater	Complying with machinery and equipment maintenance	50	In construction phase		Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Building a water drainage collection system and sedimentation pits in the industrial sanitation area	50	In construction phase	Construction contractor	
			Covering materials in storage areas	10	In construction phase		
		Waste oil, oily rags... increase in hazardous waste	Collecting oil-contaminated sludge	-	In construction phase	Construction contractor	Project owner
			Collecting hazardous waste, temporary storage areas at the construction site must be covered	100	In construction phase		
		Noise and vibrations	Contracting collection and transportation of hazardous waste with a functional unit	50	In construction phase	Construction contractor	Project owner
			Not simultaneously using multiple noisy machines and equipment in areas close to residential areas	50	In construction phase		
			Using fences and mobile barriers for construction areas with high noise levels and near residential areas	-	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Placing noisy machinery and equipment (concrete batching plants, generators, etc.) far from residential areas	-	In construction phase		
			High-noise work near residential areas should only be done during the day	-	In construction phase		
		Ecosystems, animals, plants	Using personal protective equipment for operating workers	-	In construction phase	Construction contractor	Project owner
			Controlling and managing construction within the designated land boundary	-	In construction phase		
	Transporting construction waste	Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Controlling and minimizing dust emissions affecting nearby ecosystems and vegetation	50	In construction phase	Construction contractor	Project owner
			Spraying water to keep moisture on the transportation route	-	In construction phase		
			Using machinery and construction equipment as per registration regulations	-	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Complying with machinery and equipment maintenance	-	In construction phase		
			Transportation vehicles are covered to limit dust	-	In construction phase		
			Not overloading beyond the permissible weight limit	80	In construction phase		
			Arranging vehicle washing areas outside the construction site	-	In construction phase		
		Wastewater from cleaning machinery and equipment	Clearly specifying transportation routes	50	In construction phase	Construction contractor	Project owner
			Building a water drainage collection system and sedimentation pits in the vehicle washing area	10	In construction phase		
		Waste oil, oily rags... increase in hazardous waste	Collecting oil-contaminated sludge	-	In construction phase	Construction contractor	Project owner
			Collecting hazardous waste, temporary storage areas at the construction site must be covered	100	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Noise and vibrations	Contracting collection and transportation of hazardous waste with a functional unit	-	In construction phase	Construction contractor	Project owner
			Using machinery, equipment, and transportation vehicles as per registration regulations	-	In construction phase		
			Limiting speed when passing through residential area	-	In construction phase		
		Increased traffic density and traffic accidents	Not overloading beyond the permissible weight limit	-	In construction phase	Construction contractor	Project owner
			Limiting speed when passing through residential areas	30	In construction phase		
			Installing traffic signs on the transportation route		In construction phase		
			Not overloading beyond the permissible weight limit		In construction phase		
	Pipeline cleaning	Wastewater	Clearly specifying transportation routes	-	Before commissioning	Construction contractor	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Hiring environmental sanitation service units to transport and handle waste according to regulations		Before commissioning	Construction contractor	Project owner
					Before commissioning	Construction contractor	Project owner
					Before commissioning	Construction contractor	Project owner
	Concentration of workers on construction sites	Domestic wastewater		2.600	Done	Construction contractor	Project owner
				-	In construction phase		
		Domestic solid waste		-	In construction phase		
			Building a domestic wastewater treatment system	100	In construction phase	Construction contractor	Project owner
		Increased consumption of food, essentials by	Raising awareness about water conservation among staff and workers	-	In construction phase	Construction contractor	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		staff and workers on site					
		Conflicts with local residents	Collecting and temporarily storing domestic waste	-	In construction phase	Construction contractor	Project owner
			Contracting with a functional unit for the collection, transportation, and treatment of domestic waste	-	In construction phase		
		Increased traffic density and traffic accidents	Managing logistics, providing food and necessities	-	In construction phase	Construction contractor	Project owner
			Managing administrative tasks, temporary residence registration	30	In construction phase		
			Raising awareness about communication culture with local residents	-	In construction phase		
Construction phase (offshore plant construction activities)	Dredging activities in port areas	Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Limiting speed when passing through residential areas	-	In construction phase	Construction contractor	Project owner
			Installing traffic signs on the transportation route	-	In construction phase		
			Raising awareness about traffic participation	-	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Using machinery and construction equipment as per registration regulations	50	In construction phase		
		Wastewater	Complying with machinery and equipment maintenance	-	In construction phase	Construction contractor	Project owner
			Clearly specifying the dredging implementation route within the designated boundary	100	In construction phase		
		Dredged materials	Installing signal buoys and dredging boundary signs	-	In construction phase	Construction contractor	Project owner
			Shipowners are not allowed to discharge waste into the sea	-	In construction phase		
			Wastewater must be collected and transported for onshore treatment by a functional unit	-	In construction phase		
			Using machinery and construction equipment as per registration regulations	200	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
		Waste oil, oily rags... increase in hazardous waste	Complying with machinery and equipment maintenance	-	In construction phase	Construction contractor	Project owner
			Clearly specifying the dredging implementation route within the designated boundary	50	In construction phase		
		Noise	Using containment nets to minimize turbidity when using construction ships for hard seabed areas	-	In construction phase	Construction contractor	Project owner
			Collecting hazardous waste, temporary storage areas on ships and transporting them for onshore treatment	-	In construction phase		
			Contracting collection and transportation of hazardous waste with a functional unit	-	In construction phase		
		Marine environment	Using machinery and construction equipment as per registration regulations	-	In construction phase	Construction contractor	Project owner
			Complying with machinery and equipment maintenance	-	In construction phase		

Project Operation Phase	**Project Activities**	**Environmental Impacts**	**Environmental protection works and measures**	**Implementation cost of environmental protection works and measures (million VND)**	**Implementation and completion time**	**Responsibility for Implementation**	**Responsibility for Supervision**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
			Clearly specifying the dredging implementation route within the designated boundary	-	In construction phase		
		Increased risk of water traffic accidents	Not discharging wastewater or waste directly into Vung Ang Bay	30	In construction phase	Construction contractor	Project owner
			Monitoring turbidity, and suspending construction if high turbidity is detected, to allow stabilization	-	In construction phase		
			Clearly specifying the dredging implementation route within the designated boundary	-	In construction phase		
			Installing signal buoys and signs along the dredging route	-	In construction phase		
			Developing and announcing the dredging plan to relevant units	-	In construction phase		
	Port construction	Dust, SO2, CO, NO2, and VOC	Not constructing during days with high waves and strong winds	-	In construction phase		Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		emissions causing air pollution	Using machinery and construction equipment as per registration regulations	-	In construction phase	Construction contractor	
			Complying with machinery and equipment maintenance	30	In construction phase		
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
		Wastewater	Complying with machinery and equipment maintenance	-	In construction phase	Construction contractor	Project owner
			Installing signal buoys and construction boundary signs	50	In construction phase		
		Construction waste	Only allowed to construct within the designated boundary	50	In construction phase	Construction contractor	Project owner
		Waste oil, oily rags... increase in hazardous waste	Shipowners are not allowed to discharge waste into the sea	50	In construction phase		
			Wastewater must be collected and transported for onshore treatment by a functional unit	50	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Noise	Collecting construction waste and transporting it to designated construction waste disposal sites	-	In construction phase	Construction contractor	Project owner
			Collecting hazardous waste, temporary storage areas on ships and transporting them for onshore treatment	-	In construction phase		
			Contracting collection and transportation of hazardous waste with a functional unit	-	In construction phase		
		Marine environment	Using machinery and construction equipment as per registration regulations	-	In construction phase	Construction contractor	Project owner
			Complying with machinery and equipment maintenance	-	In construction phase		
			Only allowed to construct within the designated boundary	-	In construction phase		
			Not discharging wastewater or waste directly into Vung Ang Bay	30	In construction phase		Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
		Increased risk of water traffic accidents	Monitoring turbidity, and suspending construction if high turbidity is detected, to allow stabilization	-	In construction phase	Construction contractor	
			Clearly specifying the dredging implementation route within the designated boundary	-	In construction phase		
			Installing signal buoys and construction boundary signs	-	In construction phase		
			Developing and announcing the construction plan to relevant units	-	In construction phase		
	Cooling water supple system construction	Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Not constructing during days with high waves and strong winds	-	In construction phase	Construction contractor	Project owner
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
			Complying with machinery and equipment maintenance	30	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
		Wastewater	Complying with machinery and equipment maintenance	-	In construction phase	Construction contractor	Project owner
			Installing signal buoys and construction boundary signs	100	In construction phase		
		Construction waste	Only allowed to construct within the designated boundary	100	In construction phase	Construction contractor	Project owner
		Waste oil, oily rags... increase in hazardous waste	Shipowners are not allowed to discharge waste into the sea	-	In construction phase	Construction contractor	Project owner
			Wastewater must be collected and transported for onshore treatment by a functional unit	100	In construction phase		
		Noise	Collecting construction waste and transporting it to designated construction waste disposal sites	-	In construction phase	Construction contractor	Project owner
			Collecting hazardous waste, temporary storage areas on ships	-	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			and transporting them for onshore treatment				
			Contracting collection and transportation of hazardous waste with a functional unit	-	In construction phase		
		Marine environment	Using machinery and construction equipment as per registration regulations	-	In construction phase	Construction contractor	Project owner
			Complying with machinery and equipment maintenance	-	In construction phase		
			Only allowed to construct within the designated boundary	-	In construction phase		
		Increased risk of water traffic accidents	Not discharging wastewater or waste directly into Vung Ang Bay	30	In construction phase	Construction contractor	Project owner
			Monitoring turbidity, and suspending construction if high turbidity is detected, to allow stabilization	-	In construction phase		
			Clearly specifying the dredging implementation route within the designated boundary	-	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Installing signal buoys and construction boundary signs	-	In construction phase		
			Developing and announcing the construction plan to relevant units	-	In construction phase		
	Cooling wastewater discharge system construction	Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Not constructing during days with high waves and strong winds	-	In construction phase	Construction contractor	Project owner
			Using machinery and construction equipment as per registration regulations	-	In construction phase		
			Complying with machinery and equipment maintenance	30	In construction phase		
			Use construction machinery and equipment according to registration regulations	-	In construction phase		
		Wastewater	Comply with machinery and equipment maintenance procedures	-	In construction phase	Construction contractor	Project owner
			Install signal buoys and boundary markers for construction zones	100	In construction phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Construction waste	Only perform construction within the designated boundaries	100	In construction phase	Construction contractor	Project owner
		Waste oil, oily rags... increase in hazardous waste	Boat owners are not allowed to discharge waste into the sea	-	In construction phase	Construction contractor	Project owner
			Wastewater must be collected and transported for treatment onshore by a licensed waste collection unit	100	In construction phase		
		Noise	Collect construction waste and transport it to designated disposal sites	-	In construction phase	Construction contractor	Project owner
			Collect hazardous waste, store temporarily on the boat, and transport for onshore treatment	-	In construction phase		
			Sign a contract with a licensed unit for the collection and transportation of hazardous waste	-	In construction phase		
		Marine environment	Use construction machinery and equipment according to registration regulations	-	In construction phase	Construction contractor	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Comply with machinery and equipment maintenance procedures	-	In construction phase		
			Only perform construction within the designated boundaries	-	In construction phase		
		Increased risk of water traffic accidents	Do not discharge wastewater or waste directly into Vung Ang Bay	30	In construction phase	Construction contractor	Project owner
			Monitor turbidity; if turbidity increases significantly, halt construction to allow stabilization	-	In construction phase		
			Only perform construction within the designated boundaries	-	In construction phase		
			Install signal buoys and boundary markers in construction areas	-	In construction phase		
			Develop and communicate construction plans with relevant units	-	In construction phase		
	Coal conveyor syste	Dust, emissions causing air pollution	Do not perform construction during high waves or strong winds	-	25 years	Project owner	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Use construction machinery and equipment according to registration regulations	-	25 years during operation phase		
			Comply with machinery and equipment maintenance procedures	-	25 years during operation phase		
		Noise	Use dust suppression water spraying systems (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
	Generator turbines and boilers operation	Dust, emissions through chimneys causing air pollution	Open coal storage areas must have windbreak walls and a green belt (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Use enclosed coal conveyor systems (annual operating cost)	-	25 years during operation phase		
			Use enclosed coal conveyor systems (annual operating cost)	-	25 years during operation phase		
		Wastewater	Install an ESP system (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Ash slurry	Install an SFGD system to treat SO2 (annual operating cost)	-	25 years during operation phase	Project owner	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Use low-NOx emitting burners (annual operating cost)	-	25 years during operation phase		
		Noise	Build a wastewater treatment system according to standards (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Plant trees covering 15% of the factory area (annual operating cost)	-	25 years during operation phase		
	Ash slurry transporation	Dust, SO2, CO, NO2, and VOC emissions causing air pollution	Spray water to keep the transport routes moist (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Use construction machinery and equipment according to registration regulations (annual operating cost)	-	25 years during operation phase		
			Comply with machinery and equipment maintenance procedures (annual operating cost)	-	25 years during operation phase		
			Specialized transport vehicles must be covered to limit dust (annual operating cost)	-	25 years during operation phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
			Do not exceed permitted load limits (annual operating cost)	-	25 years during operation phase		
			Locate the vehicle washing area outside the slag storage area (annual operating cost)	-	25 years during operation phase		
			Specify the transport routes clearly (annual operating cost)	-	25 years during operation phase		
		Wastewater from cleaning machinery and equipment	Build a drainage system and sedimentation pits in the vehicle washing area entering and exiting the slag storage area (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Collect sludge contaminated with oil (annual operating cost)	-	25 years during operation phase		
		Waste oil, oily rags... increase in hazardous waste	Collect hazardous waste (CTNH), store temporarily at the plant with a roof cover (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Sign a contract with a licensed unit for the collection and transportation of hazardous waste (annual operating cost)	-	25 years during operation phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Noise, vibrations	Use construction machinery, equipment, and transport vehicles according to registration regulations (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Limit speed when passing through residential areas (annual operating cost)	-	25 years during operation phase		
			Do not exceed permitted load limits (annual operating cost)	-	25 years during operation phase		
		Increased traffic density and traffic accidents	Limit speed when passing through residential areas (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Install traffic signs along the transport route (annual operating cost)	-	25 years during operation phase		
			Do not exceed permitted load limits (annual operating cost)	-	25 years during operation phase		
			Specify the transport routes clearly (annual operating cost)	-	25 years during operation phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
	Cooling system operation	Wwater intake head	Install nets to block fish and shrimp (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Cooling wastewater	Cooling water discharge systems must ensure the discharge velocity is within the regulatory limits (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Marine environment	Develop a plan to monitor and control thermal pollution (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
	Wastewater treatment system operation	Emissions of odorous gases H2S, VOC...	Prioritize locating the treatment system downwind of the dominant wind direction, away from other operational areas (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Treated wastewater	Control wastewater quality to ensure compliance with QCVN 40:2011/BTNMT (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Sludge	Collect sludge, transport, and treat according to regulations (annual operating cost)	-	25 years during operation phase	Project owner	Project owner

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
	Concentration of workers	Domestic wastewater	Build a wastewater treatment system (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Domestic solid waste	Collect and temporarily store domestic waste (annual operating cost)	-	25 years during operation phase		
			Sign a contract with a licensed unit for the collection, transportation, and treatment of domestic waste (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Increased consumption of food, essentials by staff and plant operators	Manage logistics, providing food and essential supplies (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
		Conflicts with local residents	Manage administrative tasks, register temporary residence and absence (annual operating cost)	-	25 years during operation phase	Project owner	Project owner
			Promote cultural communication with local residents (annual operating cost)	-	25 years during operation phase		

Project Operation Phase	Project Activities	Environmental Impacts	Environmental protection works and measures	Implementation cost of environmental protection works and measures (million VND)	Implementation and completion time	Responsibility for Implementation	Responsibility for Supervision
1	2	3	4	5	6	7	8
		Increased traffic density and traffic accidents	Limit speed when passing through residential areas (annual operating cost)	-	25 years during operation phase	Project owner	Project owner

(Details in Appendix IV. Environmental Impact Assessment Report 2018 approved by Decision No. 3055/QĐ-BTNMT dated October 8, 2018).

5.2. Environmental monitoring and supervision program of the project

The Environmental Monitoring and Supervision Program of the Project includes:

5.2.1. Monitoring Program during Construction Phase

5.2.1.1. Air Quality Monitoring Program

- Monitoring locations: 07 locations including:

+ K1: At the main factory construction site

+ K2: At the residential area in Hai Phong village near the project

+ K3: Near the Tay Yen intersection on the transportation route

+ K4: Laydown area No. 2

+ K5: Ash disposal construction site

+ K6: Near the material storage area during dredging operations

+ K7: Residential area in Dong Yen village

- Monitoring parameters: Total Suspended Particulates (TSP), noise, vibration, SO2, NO2, CO

- Monitoring frequency: Once every 3 months

- Comparison standards: QCVN 05:2023/BTNMT (National Technical Regulation on Air Quality); QCVN 26:2010/BTNMT (National Technical Regulation on Noise); QCVN 27:2010/BTNMT (National Technical Regulation on Vibration)

5.2.1.2. Surface water quality monitoring program

- Monitoring locations: 05 locations

+ NM1: Quyen River water near Laydown area No. 2

+ NM2: Quyen River water near the dredged material storage area

+ NM3: Quyen river water quality at upstream near the topsoil storage site

+ NM4: Quyen river water quality at downstream near the topsoil storage site

+ NM5: Quyen river water quality at dredged material storage site

- Monitoring parameters: pH, BOD5 TSS, DO, Total P, Total Nitrogen, Total Coliform, total oil, grease
- Monitoring frequency: Once every 3 months.
- Comparison standards: QCVN 08:2023/BTNMT (National Technical Regulation on Surface Water Quality)

5.2.1.3. Seawater quality monitoring program

a. *Seawater quality monitoring program in dredging and dumping area*

- Monitoring locations: 16 locations with the following coordinates:

Table 5.3 Coordinates of seawater quality monitoring point in dredging and dumping area

Symbol	VN 2000 Coordinate System, Central Meridian 105°30', 3° Projection		Description
	X(m)	Y(m)	
NB01	2016591,484	617094,146	Monitor and supervise the quality of seawater at the disposal site according to the prevailing wind directions.
NB02	2026934,216	606353,850	
NB03	2014164,937	606679,921	Monitor and supervise seawater quality and assess the impact of disposal activities on the ecosystem in the Son Duong Island and Con Chim Island areas.
NB04	2005718,624	602704,495	

Symbol	**VN 2000 Coordinate System, Central Meridian 105°30', 3° Projection**		**Description**
	X(m)	**Y(m)**	
NB05	2019264,375	600267,289	Monitor and supervise seawater quality and assess the impact of disposal activities on the fisheries protection area along the coastal region of Ha Tinh, from Cam Linh Commune to Ky Xuan Commune, according to the Fisheries Resource Protection and Exploitation Plan for the 2021-2030 period, with a vision to 2050.
NB06	2015636,281	588616,893	
NB07	2005190,390	598116,791	Monitor the impact of dredging activities on nearby areas: Ron Cape, Vung Ang Port, Hai Phong Beach, Ky Ninh Beach.
NB08	2005012,838	595805,245	
NB09	2002916,286	595050,849	
NB10	2004616,078	592019,231	
NB11	2006615,483	588654,330	
NB12	2011144,572	594007,274	

Table 5.4. Coordinate of biology monitoring points

No.	Symbol	VN 2000 Coordinate System, Central Meridian 105°30', 3° Projection		Description
		X (m)	Y (m)	
1	SH01	2002885,643	600876,266	Monitor plankton and benthic organisms in the areas of Son Duong Island, Dung Cape, Quyen River eastuary, and the fisheries resource protection area.
2	SH02	2005300,219	596842,147	
3	SH03	2002835,155	590609,655	
4	SH04	2016481,535	585907,432	

Figure 5.1. Seawater monitoring location

- The selection of monitoring location is as follow:

+ Route T1 (NB01-NB02): Monitoring seawater quality at the dumping site based on dominant wind directions

+ Route T2 (NB03-NB04): Monitoring seawater quality and assessing the impact of dumping activities on the ecosystem around Hon Son Duong and Hon Con Chim

+ Route T3 (NB05-NB06): Monitoring seawater quality and assessing the impact of dumping activities on the coastal fisheries protection area from Cam Linh to Ky Xuan according to the Fisheries Resources Protection and Exploitation Plan for 2021-2030, with a vision to 2050

+ Points NB07 to NB12: Monitoring the impact of dredging activities on nearby areas such as Mui Ron, Vung Ang Port, Hai Phong Beach, Ky Ninh Beach...

+ Monitoring points from SH01 to SH04: Monitoring of plankton and benthic animals at the areas of Hon Son Duong; Mui Dung; Quyen River estuary; and the aquatic resources protection zone.

- Monitoring times:

+ Continuous monitoring from 7 days before the start of dredging to 7 days after the end of dredging and dumping activities

+ For nearshore water monitoring stations (NB01, NB02, NB03, NB05), take 03 samples at each point from 3 water layers: surface layer (1m below the sea surface), middle layer (midway between the surface and the seabed), and bottom layer (1m above the seabed)

+ For coastal water monitoring stations (NB04, NB06, NB07 to NB12), take 04 samples at each point from 2 water layers: surface layer (1m below the sea surface) and bottom layer (1m above the seabed) at 2 times: high tide and low tide

- Monitoring parameters:

+ For nearshore points NB01, NB02, NB03, NB05: monitoring parameters include pH, TSS, As, Cd, Pb, Cr, Cu, Zn, Hg, CN-, Aldrin, Lindane, Dieldrin, Total DDT, Heptachlor & Heptachlorepoxide, Diazinon, Parathion, Malathion, Total Phenol, Mineral oil.

+ For coastal points NB04, NB06, NB07 to NB11: monitoring parameters include pH, DO, TSS, Total petroleum hydrocarbons, Total Coliform, NH4+, PO43-, As, Cd, Pb, Hg, Cu, Zn, Mn, Cr6+, CN-, F-, Fe, Total phenol, Mineral oil, Aldrin, Lindane, Dieldrin, Total DDT, Heptachlor & Heptachlorepoxide, Polychlorinated biphenyl (PCB), Diazinon, Parathion, Malathion, 1-1-1 Trichloroethane, Tetrachloroethylene PCE, Trichloroethylene, Dichloromethane, Benzene, Anionic surfactants.

- Number of Samples:

+ For water environment monitoring points near the shore (NB01, NB02, NB03, NB05): Each monitoring point collects 03 samples at 3 water layers: surface layer (1m below the sea surface), middle layer (midway between the sea surface and the seabed), and bottom layer (1m above the seabed). For oil and mineral grease parameters, only the surface layer is sampled, with 01 sample per location.

+ For water environment monitoring stations along the coast (NB04, NB06, NB07 to NB11), each monitoring point collects 04 samples at 02 water layers: surface layer (1m below the sea surface) and bottom layer (1m above the seabed) at 02 different times: high tide and low tide. For oil and mineral grease parameters, only the surface layer is sampled, with 01 sample per location.

- Monitoring duration: 7 days before the start of dredging and disposal operations, during the operations, and 7 days after the completion of operations.

- Monitoring Frequency: Once per day for parameters such as pH, Dissolved Oxygen (DO), and Total Suspended Solids (TSS), and once per week for other parameters.

- Applicable Standards: QCVN 10:2023/BTNMT - National Technical Regulation on Seawater Quality.

- Biological monitoring:

+ Collect samples of benthic animals, zooplankton, and phytoplankton;

+ Monitoring locations: SH01, SH02, SH03, SH04 (01 sample/point);

+ Frequency: once per location.

+ Monitoring Content: Benthic organisms, zooplankton, phytoplankton.

+ Conduct sampling once within 7 days before construction, during the construction period, and once within 7 days after the completion of dredging/disposal activities.

b. Sea water environment monitoring program in the onshore dredged material storage area

- Location: 08 locations (04 at material pumping and dredging stations; 03 at excavation points; 01 at sea, at the discharge point of excess seawater from the storage site).

- Number of Samples: 04 samples per location (at 02 water layers: surface layer (1m below the sea surface) and bottom layer (1m above the seabed) at 02 different times: high tide and low tide).

- Frequency: Once per week until 1 month after the completion of dredging.

- Monitoring Parameters: pH, Dissolved Oxygen (DO), Total Suspended Solids (TSS), mineral oil and grease; for oil and grease, only the surface layer is sampled, with 01 sample per location.

- Comparison Standard: QCVN 10:2023/BTNMT - National Technical Regulation on Seawater Quality.

5.2.1.4. Dredged material monitoring program

- Monitoring Location: Randomly select 03 locations within the area where dredging activities are being conducted.

- Monitoring Frequency: Once per week.

- Monitoring Parameters: Arsenic (As), Cadmium (Cd), Lead (Pb), Zinc (Zn), Mercury (Hg), Total Chromium (Cr), Copper (Cu), Total Hydrocarbons, Chlordane, DDD, DDE, DDT, Dieldrin, Endrin, Heptachlor Epoxide, Lindane, Total Polychlorinated Biphenyls (PCB), Polycyclic Aromatic Hydrocarbons (PAH), Iron (Fe), Phenol, Cyanide (CN), Dioxins and Furans, Total Oil and Grease, Total Alpha and Beta Radioactivity, Tributyltin.

- Comparison Standards: QCVN 43:2017/BTNMT – National Technical Regulation on Sediment Quality and Appendix 01 of Circular No. 28/2019/TT-BTNMT dated December 31, 2019, issued by the Minister of Natural Resources and Environment, stipulating technical regulations for assessing dredged materials and identifying dumping areas in the Vietnamese marine environment.

- Monitoring duration: From the start of construction activities until 1 week after the completion of the activities.

5.2.1.5. Wastewater monitoring program

a. Domestic wastewater monitoring program

- Monitoring Location: 01 location (at the outlet of the domestic wastewater treatment system with a capacity of 60 m^3/day-night).

- Monitoring Parameters: Flow rate, pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), BOD5, Ammonium (NH4+), Sulfide (H2S), Nitrate (NO3-), Phosphate (PO43-), animal and vegetable oils and fats, Total Surfactants, Total Coliforms.

- Monitoring Frequency: Once every 3 months.

- Comparison Standard: QCVN 14:2008/BTNMT - National Technical Regulation on Domestic Wastewater (Column B, coefficient K = 1.0).

b. Construction wastewater monitoring program

- Monitoring locations: 02 locations

+ NT1: Construction wastewater at the main plant

+ NT2: Construction wastewater at Laydown area No. 2 near Quyen River

- Monitoring parameters: pH, Suspended Solids (SS), BOD5, COD, Ammonium (NH_4^+), Nitrate (NO_3^-), Phosphate (PO_4^{3-}), Total Nitrogen (N), Total Phosphorus (P), Total Mineral Oils and Greases, Total Coliform, Arsenic (As), Lead (Pb), Iron (Fe), Copper (Cu).

- Monitoring Frequency: Once every 3 months.

- Comparison Standard: QCVN 40:2011/BTNMT (Column B) - National Technical Regulation on Industrial Wastewater.

5.2.1.6. Solid and hazardous waste monitoring

a. Domestic solid waste monitoring

+ Monitoring location: Areas generating domestic solid waste

+ Monitoring content: Composition, volume, waste collection and management

+ Monitoring frequency: Regularly

+ Management regulations: Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several provisions of the Law on Environmental Protection

b. Construction solid waste monitoring

+ Monitoring location: Areas generating construction solid waste

+ Monitoring parameters: Composition, volume, waste collection and management

+ Monitoring frequency: Regularly

+ Management regulations: Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several provisions of the Law on Environmental Protection, Circular No. 08/2017/TT-BXD dated May 16, 2017, of the Ministry of Construction on the management of construction solid waste

c. Hazardous waste

+ Monitoring location: Areas generating hazardous waste

+ Monitoring content: Composition, volume, waste collection and management

+ Monitoring frequency: Regularly

+ Management regulations: Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several provisions of the Law on Environmental Protection, Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Ministry of Natural Resources and Environment detailing the implementation of several provisions of the Law on Environmental Protection

5.2.1.7. Monitoring of Location, Route, and Volume

* *Monitoring Objects:*

- The disposal site, the transportation route of materials from the dredging area to the disposal area, and the environmental quality of the project area.

* *Monitoring Content:*

- Details on Disposal Monitoring Process:

All dredging equipment is equipped with positioning systems like GPS to provide evidence of activities. Suction hopper dredgers, tugboats, and barges carrying dredged material are equipped with Automatic Identification Systems (AIS) and recording systems.

It is crucial to control the offshore disposal of dredged material to avoid unauthorized dumping. To this end, the dredgers, push boats, and self-propelled barges must be equipped with appropriate systems to ensure proper disposal operations.

The following systems will be applied to the aforementioned equipment/vessels:

+ Camera/video systems as required in Vietnam.

+ AIS systems to determine the position and verify the proper disposal activities.

- Working Principles:

The "bottom discharge" method will be used with various capacity vessels and barges to perform the disposal as follows:

+ Dredged Material: The dredged material will be loaded onto self-propelled barges. Loading will cease once the barge is full.

+ Transport to Disposal Area: GPS equipment must be installed on the barges to confirm they have reached the approved disposal area.

+ Trip data will be stored and submitted to the Contractor's representative.

+ Disposal of Dredged Material: Disposal will be conducted by opening the bottom doors of the barge, allowing the material to drop into the designated disposal area due to its weight.

+ The barge returns to the dredging area.

- Details of the AIS System:

The monitoring system can track the position of the vessel, the image of the dredged material hold, and the general principles of the system include the following features:

+ The device is connected to a receiving antenna (GPS) to accurately determine the vessel's position during operations. Data is transmitted to the server at intervals ranging from 16 to 60 seconds, capable of tracking the position of the movements at different times.

+ The device is connected to a camera system capturing the entire hold. Images can be taken automatically over time or requested via software through the internet.

Offshore disposal activities must also be recorded by a camera system.

5.2.1.8. Other Monitoring

- Monitoring Transport Routes: Monitor the transportation routes for dredged materials using trucks to onshore storage sites; monitor the pipeline routes transporting dredged materials from pumping stations to onshore storage sites; monitor the containment systems at onshore storage sites.

- Incident Monitoring and Mitigation: Monitor and coordinate with construction units to implement risk reduction and incident response measures, including oil spills, fire and explosion incidents, landslides, breaches in the containment dikes at storage sites, pipeline ruptures transporting dredged materials from pumping systems, traffic accidents, workplace accidents, and incidents caused by natural disasters and extreme weather, in accordance with the established prevention and incident response plans.

5.2.2. Monitoring program during operation phase

5.2.2.1. Periodic Monitoring Program

a. Regular monitoring of industrial wastewater after treatment of 4,800 m3/day.night.

- Monitoring location: Before discharge into the cooling channel at the position after the aerator tank.

- Monitoring frequency: Every 3 months.

- Parameters monitored: Flow rate, Temperature, pH, Color, BOD5, COD, TSS, Residual chlorine, Total nitrogen, Total phosphorus (expressed as P), Arsenic (As), Mercury (Hg), Lead (Pb), Cadmium (Cd), Copper (Cu), Zinc (Zn), Manganese (Mn), Iron (Fe), Total mineral oils, Fluoride (F-), Sulfide, Ammonia (expressed as N), Coliform bacteria.

- Comparison standard: QCVN 40:2011/BTNMT column B, Kf=0.9; Kq=1.3.

b. Regular monitoring of exhaust gas

- Monitoring location: 2 positions corresponding to the smokestacks of 2 power generation units.

- Monitoring frequency: Every 3 months.

- Parameters monitored: Total dust, SO2, NOx, CO.

- Standards for comparison: QCVN 22:2009/BTNMT - National Technical Regulation on Industrial Exhaust Gas for Thermal Power Plants (Column B, Kp = 0.7; Kv = 1.0) and QCVN 19:2009/BTNMT - National Technical Regulation on Industrial Exhaust Gas for Dust and Inorganic Substances (Column B, Kp = 0.8; Kv = 1.0). (Plant commitments are less than the standard such as Total dust ≤ 50 mg/L; SO2 ≤ 200 mg/L; NOx ≤ 300 mg/L).

c. Environmental monitoring for air quality, noise and vibration during operation phase

- Monitoring locations: 09 locations

+ K1: Intersection at Tây Yên village.

+ K2: Intersection at the riverbank of Quyen.

+ K3: Tây Yên village area.

+ K4: 1 point at the southern part of the 15ha ash storage area.

+ K5-K9: 05 points in the residential area of Thôn Hải Phong, north of the ash area.

- Monitoring frequency: Every 3 months.

- Parameters monitored: Total suspended particulates (TSP), PM10, NO2, SO2, CO, noise, vibration.

- Comparison standards: QCVN 05:2013/BTNMT - National Technical Regulation on air quality, QCVN 26:2010/BTNMT - National Technical Regulation on noise; QCVN 27:2010/BTNMT - National Technical Regulation on vibration.

d. Groundwater Quality Monitoring:

- Location: 01 location at a well near the ash storage area No. 1 (15 ha).

- Monitoring Frequency: Once every 6 months.

- Monitoring Parameters: pH, Total Coliform, Nitrate (NO3- as Nitrogen), Ammonium (NH4+ as Nitrogen), Permanganate Index, Total Dissolved Solids (TDS), Hardness (as CaCO3), Arsenic (As), Chloride (Cl-), Lead (Pb), Mercury (Hg), Iron (Fe), Copper (Cu).

- Applicable Standard: QCVN 09:2023/BTNMT - National Technical Regulation on Groundwater Quality.

e. Surface Water Quality Monitoring:

- Monitoring Locations: 02 locations along the drainage river near the 15 ha ash and ash storage area.

- Monitoring Parameters: pH, BOD5, COD, Dissolved Oxygen (DO), Total Suspended Solids (TSS), Total Nitrogen (Total N), Total Phosphorus (Total P), Total Coliform.

- Monitoring Frequency: Once every 3 months.

- Comparison Standard: QCVN 08:2023/BTNMT – National Technical Regulation on Surface Water Quality.

f. River Sediment Quality Monitoring:

- Monitoring Locations: 02 locations along the drainage river near the 15 ha ash and slag storage area.

- Monitoring Parameters: Arsenic (As), Cadmium (Cd), Lead (Pb), Zinc (Zn), Mercury (Hg), Total Chromium (Cr), Copper (Cu), Total Hydrocarbons.

- Monitoring Frequency: Once every 3 months.

- Comparison Standard: QCVN 43:2017/BTNMT – National Technical Regulation on Sediment Quality..

5.2.2.2. Continuous automatic monitoring program

a. Continuous automatic monitoring of exhaust gas

- Monitoring Locations: 2 locations, corresponding to the chimneys of two power generation units.

- Monitoring Frequency: Automatic and continuous.

- Monitoring Parameters: Flow rate, pressure, temperature, O_2, Total dust, SO_2, NOx (as NO_2), CO.

- Applicable Standards:

+ QCVN 22:2009/BTNMT (Column B, Kp = 0.7, Kv = 1.0) - National Technical Regulation on Industrial Thermal Power Plant Emissions.

+ QCVN 19:2009/BTNMT (Column B, Kp = 0.8, Kv = 1.0) - National Technical Regulation on Industrial Emissions for Dust and Inorganic Substances, with specific limits: Total Dust $\leq$ 50 mg/Nm^3; $SO_2 \leq$ 200 mg/Nm^3; NOx $\leq$ 300 mg/Nm^3.

- Automatic Continuous Emission Monitoring System: The system must include a surveillance camera and transmit data directly to the Department of Natural Resources and Environment of Ha Tinh Province as per regulations. The automatic continuous emission monitoring system must be tested, certified, and calibrated according to current legal regulations on science and technology, standards, measurement, and quality.

b. Automatic continuous monitoring of treated industrial wastewater with a capacity of 4,800 m³/day-night.

- Location: 01 location for wastewater after treatment before discharge into the environment.

- Monitoring Frequency: Automatic, continuous, with camera monitoring and data transmission to the Ha Tinh Department of Natural Resources and Environment as required.

- Monitoring Parameters: Flow rate (inflow, outflow), temperature, pH, TSS, COD, NH4+.

- Applied Standards: QCVN 40:2011/BTNMT, column B (Kq coefficient=1.2; Kf =0.9).

c. Automatic Continuous Monitoring of Wastewater After Seawater Desulfurization System (SWFGD):

- Monitoring Locations: 02 locations at the end of the gas scrubber for each unit, before discharge into the cooling water discharge system.

- Monitoring Frequency: Automatic and continuous.

- Monitoring Parameters: Flow rate, temperature, pH, Total Suspended Solids (TSS), Dissolved Oxygen (DO), COD, Total Sulfite Ions (HSO3- and SO32-).

- Comparison Standard: QCVN 40:2011/BTNMT (Column B, Kf = 0.9, Kq = 1.3) - National Technical Regulation on Industrial Wastewater. Specific limits: Total Sulfite Ions ≤ 1.0 mg/l, Dissolved Oxygen (DO) > 2 mg/l, and pH > 6 as per project commitments.

d. Continuous automatic monitoring of cooling water quality

- Location: 01 location for cooling water after treatment before discharge into the environment.

- Monitoring Frequency: Automatic, continuous, with camera monitoring and data transmission to the Ha Tinh Department of Natural Resources and Environment as required.

- Monitoring Parameters: Flow rate, temperature, pH, TSS, Sulfite, Residual Chlorine.

- Applied Standards: QCVN 40:2011/BTNMT (Column B, Kf = 0.9, Kq = 1.3) - National Technical Regulation on Industrial Wastewater. Specific limits: Residual Chlorine ≤ 0.2 mg/l and pH > 6.

The system for continuous automatic wastewater monitoring must be quality controlled periodically once a year as prescribed in Circular No. 10/2021/TT-BTNMT dated June 30, 2021, by the Minister of Natural Resources and Environment. The company is exempt from periodic wastewater monitoring for parameters that have been automatically and continuously monitored as prescribed in Clause 4, Article 97, Decree 08/2022/ND-CP.

5.2.2.3. Other environmental monitoring program

a. Monitoring of domestic solid waste and hazardous waste

- Monitoring locations: Areas generating domestic solid waste and hazardous waste at the main plant area, port area.

- Monitoring parameters: Composition, waste quantity, waste collection, and management activities as prescribed.

- Monitoring frequency: Regularly (daily).

- Applied regulations: Decree No. 08/2022/ND-CP dated January 10, 2022, of the Government detailing the implementation of several articles of the Law on Environmental Protection, Circular No. 02/2022/TT-BTNMT dated January 10, 2022, of the Ministry of Natural Resources and Environment detailing the implementation of several articles of the Law on Environmental Protection.

b. Monitoring of other environmental issues

- Monitoring Locations: Main plant area, and the channel leading into the plant.

- Monitoring Content: Monitor for oil spills, fire and explosions, landslides, traffic accidents, workplace accidents, and incidents caused by natural disasters and extreme weather, in accordance with established prevention and incident response plans.

- Monitoring Frequency: Regularly (daily).

CHƯƠNG 6. CONSULTATION RESULTS

I. COMMUNITY CONSULATION

6.1. Process of organizing community consultation

6.1.1. Consultation via posting on the electronic information page:

- The agency managing the electronic information page: Ministry of Natural Resources and Environment.

**** First consultation:***

- Internet link to the content consulted:

https://thamvan.monre.gov.vn/XemChiTiet/XemChiTietDuAn?id=325

- Date and time of posting: October 5, 2023

- Consultation period: October 20, 2023.

After the first consultation period, on October 25, 2023, the Ministry of Natural Resources and Environment issued Document No. 1916/VP-TTTT regarding the submission of consultation results for the project. The result: 0 (zero) comments or recommendations from the public and businesses.

**** Second Consultation:***

- Internet link to the content consulted:

https://thamvan.monre.gov.vn/XemChiTiet/XemChiTietDuAn?id=2812

- Date and Time of Posting: June 10, 2024

- Consultation Deadline: June 25, 2024

After the second consultation period ended on June 25, 2024, the Ministry of Natural Resources and Environment issued Official Document No. 1047/VP-TTTT on June 26, 2024, regarding the consultation results of the project. The result: 0 (zero) comments or suggestions from residents and businesses.

6.1.2. Written consultation as prescribed (if any):

- On October 2, 2023, Vung Ang II Thermal Power Company Limited sent Official Letter No. VAPCO/KLPC/01150 for consultation during the process of implementing the project's environmental impact assessment report to the People's Committee, Fatherland Front Committee of Ky Loi Commune, Ky Trinh Ward, and Ky Long Ward.

- On November 14, 2023, Vung Ang II Thermal Power Company Limited sent Official Letter No. VAPCO/HTPA/01248 for consultation during the process of implementing the project's environmental impact assessment report to Ha Tinh Maritime Administration.

- On November 14, 2023, Vung Ang II Thermal Power Company Limited sent Official Letter No. VAPCO/HEZA/01247 for consultation during the process of implementing the project's environmental impact assessment report to the Management Board of Ha Tinh Economic Zone.

6.2. Community consultation results

Create a table showing the opinions and recommendations of the consulted subjects and explain the acceptance of consultation results, and finalize the environmental impact assessment report (arrange feedback according to the chapters and sections of the environmental impact assessment report), as detailed in the following table:

Table 6.1 Community consultation results

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
I	**Consultation through posting on the electronic information page**		
Chapter I	No comments (according to Official Letter No. 1916/VP-TTTT dated October 25, 2023, from the Office of the Ministry of Natural Resources and Environment)		
Chapter II			
Chapter III			
Chapter IV			
Chapter V			
Chapter VI			
Other opinion			
II	**Written consultation**		
1. The People's Committee of Ky Loi Commune replied with Official Letter No. 277/UBND dated October 10, 2023, giving feedback			
Other opinions	1. Regarding the project implementation location The People's Committee of Ky Loi Commune agrees with the project planning location and agrees with the project adjustments. The project has been approved by	- Appreciate the contributions and recommendations from local authorities and nearby households regarding environmental impacts and	- People's Committee of Ky Loi Commune

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	the Ministry of Industry and Trade in the Feasibility Study Report (3rd time) under Decision No. 131/QĐ-BCT dated January 30, 2023. The project is significant in promoting the socio-economic development of Ha Tinh province, creating jobs for local workers. 2. Regarding the environmental impact of the investment project The project owner has identified and fully assessed the impacts in each operational phase on the natural environment and socio-economics, detailed and specifically presented in the attached EIA report. 3. Regarding measures to mitigate adverse environmental impacts The People's Committee of Ky Loi Commune agrees with the measures to mitigate adverse environmental impacts proposed by the project owner in the attached Environmental Impact Assessment Report. The project owner is requested to fully and seriously implement the proposed measures.	mitigation measures in the project's Environmental Impact Assessment Report. - The project owner commits to strictly implementing environmental protection measures during the construction of both onshore and offshore components of the plant. - Coordinate closely with the construction unit to control noise, vibration, and dust impacts during transportation; arrange traffic guards at access points to the construction site. - Coordinate closely with local authorities during project implementation: inform construction schedules, traffic routing during construction, and report temporary residence and absence for workers as per regulations.	- Residents of Ky Loi Commune (with meeting minutes attached)

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	4. Regarding the environmental management and monitoring program; environmental incident prevention and response plan The People's Committee of Ky Loi Commune agrees with the environmental management and monitoring program; and the environmental incident prevention and response plan proposed by the project owner in the attached Environmental Impact Assessment Report. The project owner is requested to fully and seriously implement them. 5. Regarding other issues related to the investment project - The project owner is requested to promptly implement and complete the construction schedule as planned. For offshore dumping of dredged material, the project owner is only allowed to proceed when approved by the competent authorities. - The project owner is requested to closely coordinate with the local government during project implementation; ensure labor safety for workers on site,	- Operate waste treatment facilities stably and effectively during plant operation to comply with Vietnamese environmental protection regulations.	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	and report temporary residence and absence to local authorities for management, not affecting local security and order. - The project owner is requested to place signage and signal lights at the construction site to ensure traffic safety, avoiding congestion and impacts on other roads intersecting with the project. - The project owner must regularly inspect and urge the construction unit to adhere to environmental protection commitments and promptly address local and resident concerns. - The project owner is requested to prevent and strictly prohibit any activities harming the surrounding ecosystem during onshore, dredging, and offshore dumping construction activities. - During operation, the project owner is requested to strictly implement measures to treat emissions and wastewater from the project. Fly ash from the plant must be collected at disposal sites with solutions to ensure safety as per the approved design.		

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
2. The Fatherland Front Committee of Ky Loi Commune replied with Official Letter No. 50/MTTQ dated October 10, 2023, giving feedback			
	- Request the project owner to closely coordinate with local authorities during compensation and site clearance as per legal regulations. - Have a solution to ensure traffic flow for residents during project construction. - Research to create job opportunities for nearby residents to participate in project construction, using local materials for the project. - Request the project owner to ensure labor safety for workers on-site, report temporary residence and absence to local authorities for management, not affecting the project's security and order. - Request the project owner to inform the local authorities of the schedule for transporting materials in and out of the project. - The project owner must manage and treat construction waste to maintain environmental hygiene	Commit to coordinating closely with local authorities during compensation and site clearance as per legal regulations. Commit to ensuring labor safety for workers on-site, reporting temporary residence and absence for workers. Before construction, submit the material transportation plan to local authorities. Commit to fully implementing the proposed pollution mitigation measures.	- Fatherland Front Committee of Ky Loi Commune

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	and prevent clogging during the rainy season, affecting the surrounding environment. - The project owner must strictly implement environmental protection measures proposed in the report.		
3. The People's Committee of Ky Trinh Ward replied with Official Letter No. 129/UBND-VP dated October 3, 2023, giving feedback			
	1. Regarding the project implementation location The People's Committee of Ky Loi commune agrees with the project planning position and accepts the project adjustments. The project has been approved by the Ministry of Industry and Trade in the Feasibility Study Report (3rd revision) under Decision No. 131/QD-BCT dated January 30, 2023. The project holds significant importance in promoting the socio-economic development of Ha Tinh province, creating employment opportunities for local labor. 2. Regarding the environmental impact of the investment project The project owner has identified and fully assessed the impacts in each operational phase on the natural	- Appreciate the contributions and recommendations from local authorities and nearby households regarding environmental impacts and mitigation measures in the project's Environmental Impact Assessment Report. - Commit to implementing land clearance procedures as per regulations, discharge waste within the cleared land area. - Coordinate closely with local authorities during waste discharge:	- People's Committee of Ky Trinh Ward - Residents of Ky Trinh Ward (with meeting minutes attached)

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	environment and socio-economics, detailed and specifically presented in the attached EIA report. 3. Regarding measures to mitigate adverse environmental impacts The People's Committee of Ky Trinh Ward agrees with the measures to mitigate adverse environmental impacts proposed by the project owner in the attached Environmental Impact Assessment Report. The project owner is requested to fully and seriously implement the proposed measures. 4. Regarding the environmental management and monitoring program; environmental incident prevention and response plan The People's Committee of Ky Trinh Ward agrees with the environmental management and monitoring program; and the environmental incident prevention and response plan proposed by the project owner in the attached Environmental Impact Assessment Report.	inform the discharge schedule to local authorities for monitoring. - Ensure traffic safety during project construction and waste discharge. - Operate waste treatment facilities stably and effectively during plant operation to comply with Vietnamese environmental protection regulations.	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	The project owner is requested to fully and seriously implement them. 5. Regarding other issues related to the investment project - The project owner is requested to promptly implement and complete the construction schedule as planned. - The project owner is requested to closely coordinate with local authorities during compensation and site clearance; construct the ash disposal area within the ward's jurisdiction. - The project owner is requested to ensure labor safety for workers on-site, report temporary residence and absence to local authorities for management, not affecting the project's security and order. - The project owner is requested to place signage and signal lights at the construction site to ensure traffic safety, avoiding congestion and impacts on other roads intersecting with the project. - The project owner must regularly inspect and urge the construction unit to adhere to environmental protection		

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	commitments and promptly address local and resident concerns. - The project owner is requested to prevent and strictly prohibit any activities harming the surrounding ecosystem. - Design, construct, and operate the ash disposal area as per the approved design, preventing erosion and ensuring the surrounding environment's safety. - Implement the environmental management and monitoring program fully as committed.		
4. The Fatherland Front Committee of Ky Trinh Ward replied with Official Letter No. 103/MTTQ dated October 15, 2023, giving feedback			
	- The project owner is requested to closely coordinate with the local authorities during the process of compensation and resettlement in accordance with the law. - The project owner is urged to ensure labor safety for workers at the construction site during execution, and to register temporary residence or absence with the	- Commitment to collaborate with local authorities in the process of compensation and resettlement according to legal regulations. - Commitment to ensure labor safety for workers at the construction site,	- The Fatherland Front Committee of Ky Trinh Ward

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	local authorities for convenient management, ensuring no adverse impact on project security or order. - The project owner should notify the local authorities of the transportation schedule for materials entering and leaving the project site. - The project owner must strictly implement the proposed environmental protection measures as outlined in the report.	and to register temporary residence or absence for workers. - Submission of the transportation plan for materials to the local authorities before commencing construction. - Commitment to fully implement the proposed environmental pollution reduction measures.	
5. The People's Committee of Ky Long Ward has issued document No. 162/UBND dated October 4, 2023 in response to the consultation			
	1. Regarding the project implementation location: The People's Committee of Ky Long Ward agrees with the project's urban planning location. The project has previously been approved by the competent authority of the Ministry of Industry and Trade for the feasibility study report and technical design assessment. 2. Regarding the environmental impact of the investment project:	- Appreciate the contributions and suggestions from the local authorities and neighboring households regarding the environmental impacts and mitigation measures outlined in the Environmental Impact Assessment report. - Commitment to provide the construction schedule to the local	- People's Committee of Ky Long Ward - Residents of Ky Long Ward (with meeting minutes attached)

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	The project owner has fully identified and evaluated the environmental and socio-economic impacts in each operational phase as detailed in the attached Environmental Impact Assessment report. 3. Regarding measures to minimize adverse environmental impacts: The People's Committee of Ky Long Ward agrees with the project owner's proposed measures to minimize adverse environmental impacts as outlined in the accompanying Environmental Impact Assessment report. The project owner is requested to fully and seriously implement the proposed measures. 4. Regarding the environmental management and monitoring program; prevention and response plan for environmental incidents: The People's Committee of Ky Long Ward agrees with the project owner's environmental management and monitoring program, as well as the prevention and response plan for environmental incidents presented in the attached Environmental Impact Assessment report.	authorities and ensure traffic safety with the deployment of security personnel. - The project owner commits to strictly implementing environmental protection measures during the construction phases onshore and offshore at the plant. - Close coordination with the local authorities during the operation of the residential area, registering temporary residence or absence for workers on-site in accordance with regulations, and strict implementation of environmental protection and firefighting measures in the area. - Study and prioritize the recruitment of local labor for employment at the project.	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	The project owner is requested to fully and seriously implement these measures. 5. Regarding other relevant content related to the investment project: - The project owner should schedule construction activities appropriately and inform the local authorities and residents to arrange travel routes accordingly. Security personnel should be stationed to manage transportation entering and leaving the project. - Implement the environmental management and monitoring program during both the construction and operational phases as committed. - The project scope within Ky Long Ward involves land for housing staff (approximately 3.06 hectares) once the project is operational. The project owner should implement measures for labor management and maintain security and order in the residential area, including registering temporary residence or absence for workers from other localities to facilitate local administrative management and security on-site.	- Ensure stable and efficient operation of waste treatment facilities at the plant, adhering to Vietnam's environmental protection laws.	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	- The residential area must have measures in place to treat domestic wastewater to meet environmental standards and must be equipped with firefighting and prevention equipment as required before operation. - The project owner is urged to study and create favorable conditions for local residents to work at the project site.		
6. The People's Committee of Ky Long Ward, official letter No. 06/UBMTTQ dated October 9, 2023 in response to consultation comment			
	- Request the project owner to notify the local authorities about the transportation schedule of raw materials to and from the project site. - Request the project owner to facilitate local recruitment and training for the children of the locality when the factory starts operating. - The project owner must strictly implement the proposed environmental protection measures as stated in the report.	- Commit to closely coordinate with the local authorities during the construction process, notifying them of the transportation schedule of raw materials to and from the project site. - Commit to supporting local recruitment and training for the children of the locality when the factory starts operating.	- The Fatherland Front Committee of Ky Long Ward

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	- Request the project owner to closely coordinate with the local authorities in ensuring security and order in the area.	- Commit to strictly implementing the proposed environmental protection measures as stated in the report. - Commit to closely coordinate with the local authorities in ensuring security and order in the area.	
7. Ha Tinh Maritime Port Authority has document number 1290/CVHHHT-TTATANHH dated November 21, 2023, responding to consultation comments.			
1	Waste from construction vehicles on the shore must be collected and treated in accordance with the provisions of Decree No. 08/2022/NĐ-CP dated January 10, 2022 of the Government detailing a number of provisions of the Law on Environmental Protection and Circular No. 41/2017/TT-BGTVT dated November 14, 2017 regulating the management of waste collection and treatment from ships within port waters.	The project owner commits to comply with the provisions of Decree No. 08/2022/NĐ-CP dated January 10, 2022 of the Government detailing certain provisions of the Law on Environmental Protection and Circular No. 41/2017/TT-BGTVT dated November 14, 2017.	
2	The dredging process must comply with the regulations in Decree No. 58/2017/NĐ-CP dated May 10, 2017 of the Government detailing a number of provisions of the Vietnamese Maritime Law on the management of	The project owner commits to comply with the regulations in Decree No. 58/2017/NĐ-CP dated May 10, 2017 of the Government detailing certain	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
	maritime operations and Decree No. 159/2018/NĐ-CP dated November 28, 2018 of the Government regulating the management of dredging activities in port waters and inland waterways.	provisions of the Vietnamese Maritime Law and Decree No. 159/2018/NĐ-CP dated November 28, 2018 of the Government regulating the management of dredging activities in port waters and inland waterways.	
3	Strictly implement the proposed environmental management and monitoring program as outlined in the report, closely monitor changes in seawater quality near the dredging area and the disposal area to ensure no pollution of the marine environment.	They pledge to strictly implement the proposed environmental monitoring program.	
4	Impact on maritime traffic safety: During the construction and operation of the plant, there will be a significant increase in vessel density, increasing the risk to maritime traffic safety.	This has been supplemented in section 3.2.1.3.3 of the report.	
5	Risks and incidents due to storms, typhoons causing drifting, sediment trapping, damage, sinking of vessels, as well as damage to other maritime structures.	Dredging and construction activities at sea will not be conducted during	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
		the rainy season or adverse weather conditions.	
6	Risk of oil spills due to accidents, collisions between vessels, construction vehicles causing oil spills into the sea; or leakage during transportation and supply of fuel oil.	This has been supplemented in sections 3.2.1.3.2 and 3.2.1.3.3 of the report.	
7	Sources of pollution generated during the operation of transport vessels and construction vessels within the project area, such as ship emissions, coal dust during cargo handling, waste generated during vessel operation, exploitation, and maintenance.	This has been supplemented in sections 3.2.1.1.1 and 3.2.1.1.2 of the report.	
8	Incidents of ship and cargo fires within the project area.	This has been supplemented in section 3.2.1.3.1 of the report.	
8. Ha Tinh Economic Zone Management Board has document number 1553/KKT-TNMT dated November 23, 2023, responding to consultation comments.			
1	The request to VAPCO is to comply with and strictly implement the commitments as outlined in the environmental impact assessment report and related legal regulations.	The project owner commits to adhere to and strictly implement the commitments outlined in the	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
		environmental impact assessment report and related legal regulations.	
2	In the event that VAPCO's plan for offshore disposal is approved, it is necessary to fully assess the impacts and effects during the dredging and disposal process, and to implement appropriate mitigation measures. They should also carry out an environmental management and monitoring program, ensuring that monitoring data is updated and maintained for inspection by state environmental management agencies when necessary. Accuracy and legal responsibility must be ensured regarding the information, data, and calculation results in the environmental impact assessment report. It is essential to comprehensively evaluate incidents during both the construction phase and project operation to propose suitable preventive and responsive measures.	Upon approval of the offshore disposal plan, the project owner pledges to implement appropriate mitigation measures as committed in the environmental impact assessment report. They also commit to executing an environmental management and monitoring program, ensuring that monitoring data is updated and kept for inspection by state environmental management agencies when necessary. They further promise to ensure the accuracy and legal accountability regarding the information, data, and calculation results in the environmental impact assessment report.	

No.	Opinions	Content accepted, completed, or explained	Agencies, organizations/community/residents interested
		Additionally, the project owner has reviewed and fully assessed incidents during both the construction phase and project operation to propose suitable preventive and responsive measures in the project's environmental impact assessment report.	

II. EXPERT CONSULTATION, SCIENTIFIC ORGANIZATIONS, SPECIALIZED ORGANIZATIONS (as regulated in Clause 4 Article 26 of Decree No. 08/2022/NĐ-CP)

Regarding the adjustment assessment category of the project involving offshore disposal activities, however, the total volume of offshore disposal is below 5,000,000 m3, therefore according to Clause d, Clause 4, Article 26 of Decree No. 08/2022/NĐ-CP, the project proponent is not required to seek opinions from specialized organizations regarding the calculation results of the applied model. Additionally, the adjustment assessment category does not fall under the scope of categories b, c in Clause 4 Article 26 of Decree No. 08/2022/NĐ-CP, hence consultation with scientists, experts, and specialized organizations related to the project's activities is not necessary.

CONCLUSIONS, RECOMMENDATIONS, AND COMMITMENTS

1. CONCLUSIONS

Based on the detailed and comprehensive environmental impact assessment (EIA) of the project, the following conclusions can be drawn:

+ The report has assessed the potential impacts that may occur during the project's preparation phase, which is expected to be short-lived and insignificant.

+ For the construction phase, the report has compiled and evaluated most of the impacts caused by construction equipment, dredging transportation, dredged material disposal, and worker's activities. Drawing on domestic and international resources, the report quantifies pollution sources to assess the impact range and dispersion in the environment.

+ The report anticipates most potential incidents, including oil spills, occupational accidents, water traffic accidents, and fire and explosion incidents.

+ The pollution control and mitigation measures to minimize the project's adverse environmental impacts, as outlined in this EIA report, are feasible and comply with current standards and regulations related to the project's implementation phases.

However, the report may not have fully identified and assessed all potential adverse impacts of the project, such as natural bank erosion due to weather changes and unforeseen incidents during construction and operation that are beyond the investor's control.

In addition, the report proposes solutions and identifies potential supporting entities, including contractors, consulting firms, relevant agencies, and authorities, that can collaborate and assist in developing solutions for unforeseen incidents during construction and project operation that exceed the investor's capacity.

2. RECOMMENDATIONS

The investor proposes to the Ministry of Natural Resources and Environment to promptly review and approve the environmental impact assessment report of the project so that the investor can proceed with the necessary procedures and legal documents before finalizing the implementation of the dredging and disposal plan and putting the project into operation according to the schedule.

During the project implementation, the project investor highly anticipates the cooperation and support from the People's Committees, Fatherland Front Central Committee, and residents of communes and towns, as well as relevant authorities in land acquisition work to promptly secure the site for project deployment.

During the construction and operation of the road section, the project requires coordination and support from the provincial People's Committee of Ha Tinh, the People's Committee of Ky Anh Town, other relevant departments and agencies, as well as the People's Committees and Fatherland Front Central Committee communes and towns in the project area, together with local authorities to execute the environmental protection plan throughout the project implementation process.

3. COMMITMENT

The project owner commits to the following to ensure the accuracy and honesty of the information, data, and documents provided in the Environmental Impact Assessment report. Additionally, to ensure effective Environmental Protection and Management during the project implementation, the project owner pledges:

- Compliance with regulations on exploitation and environmental protection as stipulated in the Environmental Protection Law, Decrees, and accompanying Circulars.

- Implementation and completion of environmental protection measures in accordance with the phased plan outlined during consultations.

- Taking responsibility for the outcomes presented in the EIA report.

- Executing the project construction in accordance with the approved dredging design for ship channels, turning basins, and water intake/discharge lines, expediting construction progress, and completing the project promptly.

- Committing to use advanced and modern methods for sediment disposal to minimize environmental impact. Adopting construction methods suitable for regional weather conditions.

- Allocating sufficient resources to address environmental issues as outlined in the report, taking full responsibility for constructing and implementing the EIA report and all approved decisions by competent authorities.

- Prioritizing local labor recruitment, supporting local community development initiatives, and closely coordinating with local authorities in environmental protection and security management.

- Implementing an environmental management and monitoring program as detailed in Chapter 5 of this report, regularly reporting results to relevant authorities, and maintaining construction activity logs according to regulations.

- Commitmenting to ensure compliance with current QCVN standards regarding environmental emissions, occupational environment, and surrounding environment for the entire project.

- Properly compensating and addressing reasonable damages caused to local residents due to project activities (if any).

- Suspending all operations and promptly reporting to relevant authorities upon discovering any abnormal environmental monitoring results or incidents during project operations, followed by investigation, monitoring, and corrective actions.

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