SUBMISSION BY THE DEEP SEA MINING CAMPAIGN (DSMC) TO THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Docket No.: NOAA-NOS-2026-1751
Subject: Opposition to The Metals Company (TMC USA Inc.) Consolidated Application for Deep Seabed Mining Exploration License and Commercial Recovery Permit under the Deep Seabed Hard Mineral Resources Act (DSHMRA)
Filing Organization: Deep Sea Mining Campaign (DSMC)
Date: October 19, 2026

We submit this formal comment to the National Oceanic and Atmospheric Administration (NOAA) in absolute opposition to the consolidated application submitted by TMC USA Inc., a subsidiary of The Metals Company (TMC), for an exploration license and commercial recovery permit in the Clarion-Clipperton Zone (CCZ) under the Deep Seabed Hard Mineral Resources Act (DSHMRA). Part I of this submission is our narrative opposition; Part II lists relevant resources we have created or contributed to, providing a summary and relevance to NOAA's evaluation of this application for each. Part III lists other resources on which we have relied herein. Each listed resource is also attached to this submission, for your review.

TMC's application (TMC's Consolidated Application) represents an unprecedented, premature attempt to initiate commercial-scale industrial extraction in international waters under a unilateral national permitting scheme. Further, the application relies heavily on research conducted in the international contract areas of Nauru Ocean Resources Inc. (NORI) and Tonga Offshore Mining Ltd. (TOML)—the corporate subsidiaries through which TMC accessed the seabed via the International Seabed Authority (ISA). This reliance, and Naeoro and Tonga's ongoing relationship with TMC, may contravene international law, and/or expose those nations to potential liability.

NOAA's statutory mandate under DSHMRA unequivocally forbids issuing permits if proposed operations cause a "significant adverse effect" or "irreparable harm" to marine ecosystems. Grounded in rigorous scientific evidence and guided by the precautionary principle, DSMC writes to inform you that approval would unleash long term and effectively irreversible harm (relative to human timeframes)on fragile abyssal plains, contaminate marine food webs with metals and radioactive isotopes, expose marine organisms to chronic and acute toxicity as a result of the same, violate Indigenous rights, undermine multilateral international ocean law under UNCLOS, and burden U.S. taxpayers with the fallout of an economically unviable and unproven business proposition.

PART I: DEEP SEA MINING CAMPAIGN'S REASONED OPPOSITION TO TMC'S CONSOLIDATED APPLICATION

1. Deep Sea Mining Campaign's Expertise

The Deep Sea Mining Campaign (DSMC) collaborates with NGOs and citizens from the Pacific Islands, Australia, Canada, Europe and USA concerned about the likely impacts of DSM on marine and coastal ecosystems and communities. The DSMC is a Project of The Ocean Foundation, supported by Mining Watch Canada, a Partner of Mission Blue/Sylvia Earle Alliance and an active member of the Deep Sea Conservation Coalition.

Over the past 15 years, we have spearheaded rigorous, science-based reviews, economic evaluations, legal analyses, and community consultations to expose the profound environmental, social, and cultural risks of DSM.

2. Profound Ecological Risks, Absence of Baselines, and Marine Food Web Impacts

The abyssal plains of the Clarion-Clipperton Zone (CCZ), situated 3,000 to 6000 meters deep, are biodiverse sanctuaries essential to global ocean health. Polymetallic nodules provide irreplaceable hard surfaces formed over millions of years for thousands of specialized, unique organisms,including abyssal octopuses, glass sponges, and deep-sea corals (Predicting the Impacts of Mining of Deep Sea Polymetallic Nodules in the Pacific Ocean, p. 14). TMC's heavy floor-crawling collectors will destroy t extremely stable benthic ecosystems across thousands of square kilometers annually (Luick, J., 2022), inflicting effectively permanent ecological devastation (Predicting the Impacts of Mining of Deep Sea Polymetallic Nodules in the Pacific Ocean).

Furthermore, TMC's mining operations will generate sediment plumes at the seafloor and discharge particulate-laden wastewater into the midwater column (The Metals Company, 2025; Luick, J., 2022). Oceanographic modeling reveals that benthic plumes will travel over areas much larger than the direct mining footprint, smothering filter-feeders and choking surrounding habitats (Luick, J., 2022). Benthic plumes could affect ecosystems beyond the seafloor, including midwater communities (Drazen et al., 2020). Discharged midwater plumes carrying metals and fine particulates can spread for hundreds to thousands of kilometers across open ocean (Peacock and Ouillon, 2023; Luick, J., 2022). Suspended particles will clog the breathing and feeding mechanisms of midwater creatures, block light penetration, and could trigger pelagic food web collapses (Navigating the Depths: Finance, Biodiversity, and the Threat of Deep Sea Mining). High-value pelagic species vital to Pacific food security, community livelihoods, and national economies—such as yellowfin, skipjack, and bigeye tuna— are likely to face severe habitat degradation, heavy metal and radiation toxicity, affecting their individual and population health altering migratory routes which will already be impacted by warming sea temperature.

(Predicting the Impacts of Mining of Deep Sea Polymetallic Nodules in the Pacific Ocean, p. 25; Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining).

Under the guise of adaptive management and digital twins, TMC seeks to self-regulate, establish its own impact thresholds, and conceal environmental damage from public view (Digital Twin Technology and Adaptive Management Systems for Deep Sea Mining, p. 9). TMC's culture of corporate non-disclosure was laid bare during TMC's 2022 test mining, when the company concealed an unauthorized surface wastewater spill containing sediment and toxic heavy metals until whistleblower footage forced public exposure (Bryan, 2023; Digital Twin Technology and Adaptive Management Systems for Deep Sea Mining, p. 9). Further, TMC's reliance on "Digital Twin" (DT) technology and "Adaptive Management Systems" (AMS) would provide a facade of environmental management whilst at the same time bypassing rigorous scientific research and baseline requirements. Deep-sea sensors deployed in freezing, high-pressure environments degrade quickly, introducing critical errors into real-time predictive models (Digital Twin Technology and Adaptive Management Systems for Deep Sea Mining, p. 8). DT technology lacks the capacity to simulate complex dynamic environments such as the ocean and adaptive management is inappropriate to manage the impacts of a destructive extractive industry. Rather it is a recipe for 'learning by destroying' (Digital Twin Technology and Adaptive Management Systems for Deep Sea Mining).

3. Radiation Toxicity Hazards: when Naturally Occurring Radioactive Materials (NORM) becomes Technologically Enhanced (TENORM)

A neglected hazard of deep seabed extraction is the mobilization of Naturally Occurring Radioactive Materials (NORM) thereby creating Technologically Enhanced NORM (TENORM) (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 1). Deep-sea polymetallic nodules naturally concentrate radioactive isotopes—including high-energy alpha emitters such as Radium-226, Thorium-230, Actinium-227, and Lead-210—over millions of years (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 5). The outer layers of nodules exhibit alpha radiation levels exceeding safety thresholds by orders of magnitude, posing extreme radiological risks when disturbed (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 6).

Mining nodules will mobilise radioactive particulates into benthic plumes (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 6). Subsequent dewatering on surface vessels and waste discharge at 1,000–2,000 meters depth will introduce radioactive slurry directly into the midwater column. Whilst the radioactivity of alpha isotopes can be blocked by barriers as thin as a sheet of paper, once internalised these elements are extremely toxic. Marine life can internalize alpha radiation through ingestion, respiration, and membrane transport (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 7).

Internalized alpha emitters can impair organ function and damage cells, DNA, and proteins (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 7). As radioactive isotopes bioaccumulate up the food web into pelagic species, they threaten human health, and food and economic security, particularly for Pacific and other communities reliant on seafood (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining, p. 8). TMC's filings completely ignore these radiotoxicity risks. Before TMC's application is considered, research is required to close critical knowledge gaps to enable NOAA to make informed decisions. Such research includes at a minimum: characterisation of the chemical forms and concentrations of radionuclides that would be released during TMC's proposed mining operation; the ways in which this mining would change the spatial distribution and dispersion of radionuclides in the marine environment; the radiation doses that marine organisms would be exposed to as a result of TMC's proposed operations; the short- and long-term impacts of such exposures on marine species, ecosystems, and food webs, including on the health of human consumers of seafood; the marine species most suitable as indicators of ecological health, and the natural radioisotope baseline levels within their tissues; the bioavailabilities, uptake pathways, and trophic transfer of radionuclides that would be mobilised by TMC's proposed activities; and the combined chronic and acute ecotoxicity of radioactive isotopes, metals and other contaminants mobilised by TMC's proposed activities. (Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining).

4. TMC's Disregard for Facts in Its Pre-Feasibility Study and Consolidated Application

An independent audit of TMC's Pre-Feasibility Study (PFS) proves that its corporate business model is fundamentally flawed, speculative, and non-compliant with U.S. financial standards (Implications of The Metals Company Pre-Feasibility Study). Under SEC Regulation S-K (Subpart 1300), a PFS must demonstrate financial viability based strictly on mineral reserves—resources proven to be economically mineable (Implications of The Metals Company Pre-Feasibility Study, p. 23). Violating SEC rules, TMC incorporated 113.1 million wet metric tons of unconverted mineral resources alongside 51 million metric tons of reserves (Implications of The Metals Company Pre-Feasibility Study, p. 47). Evaluated strictly on mineral reserves as required by law, TMC's project would shut down after eight years with zero profit and a crushing net loss (Implications of The Metals Company Pre-Feasibility Study, p. 47; Shifting Tides: TMC's U.S. Pivot, p. 7).

Furthermore, SEC rules require a comprehensive waste and tailings management plan in any Pre-Feasibility Study. TMC's PFS fails to plan for mine waste management (Implications of The Metals Company Pre-Feasibility Study, p. 40). TMC falsely claims that its sediment return water is not mine waste, while making unsupported assumptions that toxic metallurgical processing by-products of potential nodule processing—such as converter slag and ammonium sulfate fertilizer—can be fully sold in commercial markets (Implications of The Metals Company

Pre-Feasibility Study, p. 40). Because processing cannot eliminate heavy metals and radioactive isotopes, the ammonium sulfate by-product will contain toxic concentrations of arsenic, cadmium, lead, thallium, and alpha emitters, rendering it illegal to sell as fertilizer and creating millions of tons of uncosted hazardous waste liability (Implications of The Metals Company Pre-Feasibility Study, p. 41). The sediment return water is in fact equivalent to the tailings waste of terrestrial mines.

TMC's economic projections rely on overoptimistic financial assumptions that exaggerate revenues while underestimating capital costs (Implications of The Metals Company Pre-Feasibility Study, p. 51). Crucially, key PFS chapters on metal pricing and capital costs were authored not by independent experts, but by TMC corporate executives—including former officers of Nautilus Minerals, the deep-sea mining firm that declared bankruptcy in 2019 (Implications of The Metals Company Pre-Feasibility Study, p. 48). Realistic financial models incorporating standard capital costs and environmental compliance liabilities reveal that TMC's venture will generate a net loss exceeding $1 billion (Shifting Tides: TMC's U.S. Pivot, p. 7).

In another example of TMC's casual relationship with the facts, TMC refers to its 2022 pilot test without mentioning that an unauthorized surface wastewater spill containing sediment and toxic heavy metals occurred.[1] TMC also fails to explain why this test collected 4,500 tons of nodules but lifted only 3,000. Were further technical failures encountered - indicating the lack of technical feasibility for their proposed modus operandi?

TMC lacks domestic processing infrastructure on U.S. soil. Its PFS relied on speculative toll-smelting agreements with Pacific Metals Co. (PAMCO) in Japan and unverified smelters in Indonesia, followed by refining at an unbuilt U.S. plant. In its Consolidated Application, TMC mentions PAMCO more than twenty times, both in reference to past work, and implications that PAMCO would support TMC in the future. For example, TMC lists working with PAMCO as its "*Alternative Onshore Processing Strategy.*"[2] This is factually impossible, as PAMCO has explicitly stated it will not process TMC's nodules if they are sourced outside of "internationally approved channels to obtain the nodules." (PAMCO, 2026). Furthermore, processing nodules in Asian smelters reliant on coal-fired power grids completely contradicts TMC's public claims of sustainable, low-carbon operations.

See also, Letter of Complaint to the SEC Regarding The Metals Company.

[1] Consolidated Application, p. 47.
[2] Consolidated Application, pp. 303-304.

5. Undermining International Law, UNCLOS, and Sovereign Governance

TMC's attempt to obtain commercial recovery permits from NOAA in international waters is a direct violation of international law and multilateral ocean governance (Shifting Tides: TMC's U.S. Pivot, p. 2). Under UNCLOS, ratified by 168 states and the EU, the seabed beyond national jurisdiction is designated as the Common Heritage of Humankind, regulated exclusively by the International Seabed Authority (ISA) (Shifting Tides: TMC's U.S. Pivot, p. 1). The U.S. Department of State and NOAA itself have previously recognised that the U.S. issued licenses lack international recognition and do not secure any enforceable international rights or legal title.

The ISA Secretary-General and Member States have affirmed that unilateral permitting outside the UNCLOS framework violates international law (Implications of The Metals Company Pre-Feasibility Study, p. 10). In response to TMC's U.S. application, the ISA opened formal inquiries into TMC's subsidiaries (NORI and TOML), risking the suspension or cancellation of their ISA exploration contracts (Shifting Tides: TMC's U.S. Pivot, p. 7). TMC's own SEC filings acknowledge that foreign nations are legally bound to reject U.S.-issued permits, which could result in lack of port or market access as well as legal prosecution in foreign jurisdictions. (Shifting Tides: TMC's U.S. Pivot, p. 7).

See also, The Metals Company's Contract to Mine: A Deep Sea Fantasy?.

6. Disregard for Human Rights, Customary Ocean Rights, and Past Seabed Mining Failure

Deep seabed mining poses severe socio-economic and cultural threats to Pacific Island nations and coastal communities (Predicting the Impacts of Mining of Deep Sea Polymetallic Nodules in the Pacific Ocean, p. 2). For Pacific peoples, the ocean is a sacred, living space rooted in ancient lineage, cultural identity, and traditional stewardship (p. 11). Deep-sea mining threatens customary rights, traditional fishing practices, and Indigenous ocean governance. (The Socio-Political and Regulatory Context for Sea Bed Mining in Papua New Guinea, p. 24).

The failure of Nautilus Minerals' Solwara 1 project in Papua New Guinea (PNG) stands as a clear warning about the dubious financial viability of seabed mining. Solwara 1 was granted permits despite a flawed Environmental Impact Statement and lack of social consent (Out of Our Depth: Mining the Ocean Floor in Papua New Guinea, p. 3; Physical Oceanographic Assessment of the Nautilus EIS for the Solwara 1 Project, p. 24; Socio-Political and Regulatory Context for Sea Bed Mining in Papua New Guinea). The PNG government invested $120 million in public funds into the venture; when Nautilus collapsed into bankruptcy in 2019, the project left PNG with crushing public debt (Predicting the Impacts of Mining of Deep Sea Polymetallic Nodules in the Pacific Ocean, p. 43). Despite this financial disaster, corporate actors like Deep Sea

Mining Finance (DSMF)—operating out of tax havens—continue attempting to exploit Solwara 1 permits without transparency or local consent (Factsheet: Who is DSMF?, p. 1). NOAA should seriously consider the implications of this history for US tax payers in regard to TMC's U.S. application.

Gerard Barron, the co-founder, CEO and Chairman of The Metals Company (TMC), was an early investor and key promoter of Nautilus Minerals who turned an initial $226,000 investment into a $31 million payout before exiting prior to Nautilus's bankruptcy (Why the Rush? Seabed Mining in the Pacific Ocean, p. 9; Shareholder Advisory: Critical ESG and Financial Risks in the Proposed SOAC-DeepGreen Transaction, p. 21). Barron subsequently founded DeepGreen (which became TMC) alongside a network of former Nautilus executives—including Anthony O'Sullivan, former Chief Operating Officer at Nautilus who now serves as TMC's Chief Development Officer (Shareholder Advisory: Critical ESG and Financial Risks in the Proposed SOAC-DeepGreen Transaction, p. 21; The Metals Company Seeking to Clean Up on Deep Sea Mining: Corporate Ties & Executive Networks Infographic). This executive network reflects a troubling corporate pattern of generating speculative profits for insiders while leaving host governments, public taxpayers, and retail investors to shoulder the resulting risk.

See also, The Solwara 1 Seabed Mining Project in the Bismarck Sea of Papua New Guinea.

7. Global Governmental, Scientific, Corporate and Financial Rejection of Deep Seabed Mining

A growing global consensus rejects deep seabed mining (Red Lines in the Abyss, p. 4). Forty-six sovereign nations have formally demanded a global moratorium, precautionary pause, or ban on seabed extraction in international waters, joined by subnational governments around the world. Four US states and two US territories, all in the Pacific on either side of the proposed mining site, have banned DSM in their waters. More than 1000 marine scientists from 75 countries also call for seabed mineral exploration to be "paused until sufficient and robust scientific information has been obtained to make informed decisions as to whether deep-sea mining can be authorized without significant damage to the marine environment and, if so, under what conditions." (Deep Sea Mining Science Statement, 2026).

Global financial and corporate sectors have also rejected seabed extraction. The UN Environment Programme Finance Initiative (UNEP FI) concluded that deep sea mining is fundamentally incompatible with the Sustainable Blue Economy Finance Principles due to unmanageable risks (Synthesis of UNEP FI's Position on Deep Sea Mining Briefing Paper, p. 1). Over 70 major corporations—including Apple, Google, Rivian, and Salesforce—have signed a public pledge refusing to source minerals from the seabed or finance deep-sea mining and major

financial institutions and insurers have instituted exclusion policies against seabed mining(Letter of Complaint to the SEC Regarding The Metals Company).

8. Conclusion and Formal Requested Remedy

The Metals Company's consolidated application under DSHMRA is legally, scientifically, and economically unviable. TMC has failed to establish environmental baselines, ignored radiation and metal toxicity hazards, presented a non-compliant and unprofitable financial model, omitted waste management plans, and attempted to bypass multilateral international law under UNCLOS.

Pursuant to DSHMRA mandates, NOAA must enforce federal environmental protection standards, recognize the inevitability of irreparable damage, and formally reject TMC USA Inc.'s application. The U.S. government should lead as a responsible state actor by aligning with international allies, leading corporations, and scientific consensus and backing a global moratorium on deep seabed mining.

PART II: COMPREHENSIVE SUMMARIES OF DSMC REFERENCE DOCUMENTS TAILORED FOR NOAA REVIEW

1. Environmental Justice Foundation (EJF), Deep Sea Conservation Coalition (DSCC), & Deep Sea Mining Campaign (DSMC) (2026). *A Financial Viability Reassessment of Deep-Sea Mining Under Realistic Cost and Price Assumptions: Summary Briefing*.

   Summary and Relevance: NOAA should consider this report because it examines TMC's Pre-Feasibility Study (PFS) for the NORI-D project building a financial model and testing it against the original data in the PFS. It substitutes figures for two scenarios, one which is more likely and one which is more conservative. Both point to a loss-making endeavour, with a rate of return for investors far below what is required given the risk of investing in the project. In scenarios, the Net Present Value (sum of all discounted cash flows across the lifetime of the project) is negative: -US$1.0 billion in the likely scenario, and -US$3.5 billion in the conservative scenario, compared to the US$5.5 billion projected in the NORI-D PFS itself. Essentially the financial projections in the PFS are overly optimistic to the point of not being credible. The analysis also likely understates the real risk as certain factors, such as geo-political risk, could not be easily quantified.

2. Emerman, S. H. (2026). *Implications of The Metals Company Pre-Feasibility Study for Next Steps by the Company*. Malach Consulting, Deep Sea Mining Campaign, Greenpeace International, & MiningWatch Canada.

Summary and Relevance: NOAA should conduct a thorough review of this technical and financial audit by Dr. Steven Emerman, which exposes fundamental non-compliance and financial flaws in TMC's Pre-Feasibility Study (PFS). The audit reveals that TMC's PFS violates SEC Regulation S-K (Subpart 1300) by incorporating 113.1 million tons of mineral resources into its economic model alongside reserves. When evaluated strictly on mineral reserves as required by the SEC, TMC's proposed project terminates after just eight years with zero profit and a massive net financial loss. Furthermore, the PFS contains zero plan for mine waste management, falsely asserting that return water is not mine waste, and that toxic smelting slag and ammonium sulfate by-products can be sold 100% as commercial products. Key PFS chapters regarding metal pricing, capital expenditures, and market analysis were authored by TMC employees rather than independent researchers. The evidence presented in this report directly refutes TMC's claims of financial viability.

3. Seas At Risk & Deep Sea Mining Campaign (2026). *Red Lines in the Abyss: Growing Financier Concern Over Deep-Sea Mining*. Brussels: Seas At Risk.

   Summary and Relevance: NOAA should examine this joint report to evaluate the overwhelming policy commitments across the global finance and corporate sectors excluding deep-sea mining from portfolios and supply chains. The study documents that 82 major financial institutions—representing over EUR 24 trillion in combined assets—have enacted formal exclusion policies or public statements against deep-sea mining due to uninsurable environmental and regulatory risks. Furthermore, over 70 leading global corporations, including market leaders Google, Samsung, Volkswagen, and BMW, have publicly committed not to source minerals from the deep seabed, to exclude such minerals from their supply chains, and not to finance deep seabed mining activities. The report specifically analyzes the regulatory and market risks stemming from unilateral permitting attempts by the United States that bypass the International Seabed Authority. This highlights the need for NOAA to recognize that TMC lacks a downstream commercial market for minerals it may produce. This evidence demonstrates to NOAA that approving TMC's consolidated application would back a commercially dubious enterprise, rejected by major international finance and insurance institutions.

4. Rosenbaum, H., Emerman, S. H., Lucko, O., Payette, J. G., & Thaler, A. (2026). *Critical Questions about the Risks of Radiation Toxicity from Deep Sea Mining*. Deep Sea Mining Campaign.

   Summary and Relevance: NOAA should thoroughly evaluate this groundbreaking scientific report, which uncovers the unstudied and potentially severe hazard of radiation toxicity that would be associated with deep-sea polymetallic nodule mining. The authors highlight that nodules naturally concentrate high activity levels of alpha-emitting

radionuclides—such as Radium-226, Thorium-230, Actinium-227, and Lead-210—on their outer surfaces through tens of millions of years of chemical scavenging. During seabed mining and midwater slurry discharge at 1,000–2,000 meters depth (as proposed by TMC), metals and radioactive alpha isotopes and would be mobilised into benthic and pelagic plumes. Once internalized alpha-emitting isotopes can impair cellular and organ function and damage DNA and proteins. Trophic transfer and bioaccumulation up oceanic food chains present a threat to species distant from mining operations including human seafood consumers. Before considering TMC's application, NOAA should require research to establish baseline radionuclide levels in the marine environment and indicator species, determine the chemical forms and concentrations of contaminants that mining would release. Research should also assess how these contaminants would disperse, how marine organisms would accumulate and transfer them through food webs, and the potential effects on ecosystems and human seafood consumers. These studies should evaluate the combined effects of radionuclides, metals, and other contaminants and establish whether the evidence is sufficient to assess the risks. Crucially, TMC's application to NOAA completely omits to consider radiation ecotoxicity as a risk. It fails to acknowledge the need for or commit to undertaking this critical research.

5. Deep Sea Mining Campaign (2025). *Shifting Tides: The Metals Company U.S. Pivot*.

   Summary and Relevance: NOAA should conduct a thorough review of this briefing paper, which directly analyzes TMC's strategic pivot toward seeking deep-sea mining permits under DSHMRA. The report reveals that TMC's U.S. pivot is not driven by scientific or technical readiness but rather a desperate cash flow situation, political lobbying, and its failed attempt to rush an international deliberative process at the International Seabed Authority. TMC spent over $1 million on U.S. lobbying to influence federal executive policy and promote a national security narrative around "critical mineral independence". Because the United States has not ratified UNCLOS, permits issued by NOAA under DSHMRA lack international legal recognition, exposing TMC to contract forfeiture, foreign port denial, and downstream market exclusion. Furthermore, the briefing details how TMC's Pre-Feasibility Study relied on flawed economic assumptions, zero U.S. royalty rates, and unbuilt domestic processing infrastructure.

6. Rosenbaum, H. (2025). *The Solwara 1 Seabed Mining Project in the Bismarck Sea of Papua New Guinea: A Resource Document for the PNG National Consultation on Seabed Mining*. Deep Sea Mining Campaign.

   Summary and Relevance: NOAA should consult this resource document by Dr. Helen Rosenbaum, which synthesizes fifteen years of scientific, legal, and socio-economic evidence regarding the Solwara 1 project in Papua New Guinea. The report documents ongoing environmental hazards, including hydrothermal vent destruction, toxic sediment

plume dispersion, heavy metal bioaccumulation, and unaddressed radiation risks. It evaluates severe economic losses inflicted on local marine tourism, artisanal coastal fisheries, and national food security alongside the PNG government's $120 million public debt burden - extremely significant for a small debt-heavy economy. This comprehensive synthesis demonstrates how commercial seabed mining ventures may fail to deliver national economic and public benefits while leaving negative environmental and financial legacies.

7. Rosenbaum, H. (2024). *Digital Twin Technology and Adaptive Management Systems for Deep Sea Mining: Limitations and the Risk of Self-Regulation*. Deep Sea Mining Campaign.

   Summary and Relevance: NOAA should carefully review this briefing paper by Dr. Helen Rosenbaum to critically evaluate TMC's proposal to substitute 'Digital Twin' (DT) software and 'Adaptive Management Systems' (AMS) for rigorous baseline and ongoing environmental research. The report demonstrates that DT models cannot accurately simulate complex, poorly understood deep-ocean ecosystems or predict multi-generational ecological collapse. Extreme subsea hydrostatic pressures and corrosive conditions degrade subsea sensors rapidly, introducing severe data inaccuracies that invalidate real-time operational monitoring. Furthermore, implementing adaptive management in abyssal environments rapidly impacted by DSM effectively treats the ocean floor as an experimental laboratory, allowing irreversible destruction to occur before mitigation can be attempted. NOAA must recognize that combining DTs with AMS creates a self-regulatory free-for-all, allowing TMC to set its own arbitrary impact thresholds and suppress negative environmental data.

8. Deep Sea Mining Campaign, The Ocean Foundation, & Blue Climate Initiative (2024). *Letter of Complaint to the U.S. Securities and Exchange Commission Regarding The Metals Company.*

   Summary and Relevance: NOAA must examine this formal regulatory complaint to understand the systemic pattern of material misrepresentations and financial volatility that characterizes The Metals Company's corporate reporting. When evaluating TMC’s consolidated application under DSHMRA, NOAA is statutorily required to assess whether the applicant possesses the financial and technical capability to conduct commercial recovery without causing irreparable environmental harm or abandoning operations mid-project. This complaint demonstrates that TMC obscures severe cash flow shortages, relies on outdated commodity price forecasts, and misleads regulators regarding the true commercial demand for deep-sea minerals given the global industry transition toward nickel- and cobalt-free LFP battery chemistries. Furthermore, the document exposes how TMC falsely portrays its supply chain as domestic while relying

on foreign, coal-fired smelting facilities in Asia. By reviewing these findings, NOAA will recognize that TMC lacks the financial stability and corporate transparency required for a commercial recovery permit, presenting unacceptable risks of insolvency and unbudgeted liability.

9. Deep Sea Mining Campaign (2024). *Navigating the Depths: Finance, Biodiversity, and the Threat of Deep Sea Mining*.

   Summary and Relevance: NOAA should read this briefing paper to evaluate how deep-sea mining conflicts with emerging global biodiversity frameworks and international financial risk management standards. The report documents how seabed extraction drives irreversible biodiversity loss through seafloor habitat removal, toxic plume dispersion, and underwater noise and light pollution. These ecological disruptions directly violate global biodiversity commitments established under the Kunming-Montreal Global Biodiversity Framework and the Convention on Biological Diversity. The briefing highlights how leading financial institutions, asset managers, and insurance underwriters and companies are adopting precautionary exclusion policies against deep-sea mining due to regulatory, environmental and reputational liabilities. NOAA must consider whether authorizing seabed extraction undermines broader federal goals and exposes U.S. markets to stranded asset risk.

10. Deep Sea Mining Campaign (2024). *The Metals Company's Contract to Mine: A Deep Sea Fantasy?*.

    Summary and Relevance: NOAA should examine this briefing paper to understand the legal, political, and procedural barriers that obstruct TMC's claims of an imminent commercial mining start. The report analyzes TMC's aggressive strategy to force permit processing through Nauru's invocation of the ISA 'two-year rule,' contrasting corporate public statements with official regulatory realities. Furthermore, the briefing details TMC's cash flow vulnerability and history of repeatedly missed operational milestones, illustrating how financial desperation drives its regulatory lobbying. This analysis proves that TMC's pivot to U.S. permitting is a speculative attempt to bypass international legal deadlock and provides reason to view TMC’s claimed timelines with skepticism.

11. Deep Sea Mining Campaign (2024). *Factsheet: Who is DSMF (Deep Sea Mining Finance)*.

    Summary and Relevance: NOAA should review this factsheet to investigate Deep Sea Mining Finance Ltd (DSMF), the corporate entity that acquired Nautilus Minerals' assets following its landmark bankruptcy. The factsheet reveals that DSMF is registered in the British Virgin Islands, a secrecy jurisdiction that conceals beneficial ownership, corporate

accounts, and financial transparency. Furthermore, the document details close corporate connections between DSMF's financial backers and past regulatory convictions and multi-million dollar fines for commodity fraud. DSMF inherits Nautilus's severe legacy of uncosted environmental damage, unverified technical capacity, and widespread community opposition in Papua New Guinea. This investigation is relevant because it illustrates how speculative deep-sea mining assets are shuffled through opaque offshore entities to evade accountability. NOAA must enforce strict corporate transparency and financial scrutiny, ensuring that speculative offshore entities are denied commercial recovery permits in international waters.

12. Luick, J. (2022). *Oceanographic Modelling of Benthic and Midwater Plumes Predicted for Deep Mining Planned by The Metals Company in the Clarion Clipperton Zone of the Pacific Ocean* (Blue Peril Technical Paper). Austides Consulting & Deep Sea Mining Campaign.

    Summary and Relevance: NOAA should review this technical paper to grasp the physical oceanographic dynamics governing the vast spatial scale and long-distance transport of mining-generated sediment plumes. Utilizing internationally accepted hydrodynamic numerical modeling and OpenDrift particle tracking, Dr. John Luick demonstrates that benthic plumes created by TMC's seafloor collectors will spread across thousands of square kilometers beyond contract boundaries. Furthermore, the study illustrates that midwater waste plumes discharged at around 1,000 meters depth will remain suspended in ocean currents for prolonged periods, dispersing fine particulate matter across extensive pelagic corridors. This evidence is directly relevant to NOAA's statutory mandate under DSHMRA to evaluate whether proposed mining operations will cause a 'significant adverse effect' on marine life and water column clarity. The modeling proves that TMC's operational waste cannot be physically contained, threatening filter-feeding fauna, midwater ecosystems, and transboundary marine species. It is presented in the visual investigation Blue Peril, available at https://dsm-campaign.org/blue-peril/.

13. Deep Sea Mining Campaign (2022). *Financial Institutions and Deep Sea Mining: Reputational, Operational, and Market Risks Briefing Paper*.

    Summary and Relevance: NOAA should examine this briefing paper to understand why the global financial sector increasingly views deep-sea mining as an uninsurable, high-risk sector incompatible with sustainable finance. The document details how major commercial banks, asset managers, and institutional investors are instituting strict exclusion policies against seabed extraction due to unmanageable operational, legal, and reputational risks. NOAA must evaluate TMC's financial capacity under DSHMRA, taking into account that the company faces extreme capital constraints, stock price

instability, shareholder class-action litigation, and a lack of institutional backing. The report highlights the historic bankruptcy of Nautilus Minerals as a primary warning regarding the severe financial fragility of offshore mining start-ups. NOAA must recognize that issuing a commercial permit to a financially vulnerable entity creates a substantial risk that U.S. taxpayers will be left bearing liabilities.

14. Deep Sea Mining Campaign (2022). *Synthesis of UNEP FI's Position on Deep Sea Mining Briefing Paper*.

    Summary and Relevance: NOAA should read this synthesis to align its regulatory decision-making with established benchmarks for sustainable ocean finance. UNEP FI explicitly concludes that deep seabed extraction cannot be considered a sustainable economic activity under any framework due to unavoidable, unmitigable environmental damage. The briefing synthesizes findings on seabed habitat disruption, water column turbidity, heavy metal release, and socio-economic conflicts, demonstrating that deep-sea mining violates Sustainable Blue Economy Principles. The document emphasizes that responsible capital allocation must prioritize circular material flows, battery recycling, and terrestrial footprint reduction rather than opening new extractive frontiers in international waters.

15. Deep Sea Mining Campaign (2021). *Shareholder Advisory: Critical ESG and Financial Risks in the Proposed SOAC-DeepGreen Transaction*.

    Summary and Relevance: NOAA should carefully review this detailed investor advisory as a prior example of TMC's failure to disclose liabilities and use it to inform its current evaluation of the severe environmental, social, and governance (ESG) liabilities that TMC fails to disclose in its federal permit applications. The document provides rigorous analysis showing that nodule extraction will inflict multi-generational, permanent destruction on abyssal ecosystems while discharging toxic, sediment-laden return water into pelagic zones. NOAA must consider how these predicted ecological impacts threaten high-value commercial fisheries—such as Pacific tuna—and violate customary international ocean rights. The advisory also documents widespread rejection from sovereign nations, leading global corporations, and major financial institutions that explicitly exclude seabed minerals from their supply chains and portfolios. This evidence directly refutes TMC's assertions of commercial viability, including due to the risk of stranded assets for investors due to erroneous assumptions about future market demand.

16. Deep Sea Mining Campaign, MiningWatch Canada, & The Ocean Foundation (August 2021). *Request for SEC Scrutiny of SOAC-DeepGreen Proposed Transaction*.

Summary and Relevance: NOAA should review this regulatory submission to examine the persistent patterns of misleading public representations made by TMC corporate promoters regarding their business model. The letter provides evidence to federal regulators regarding misleading ESG statements, omitted environmental liabilities, and unverified commercial timeline claims made during when TMC was going public.

17. Deep Sea Mining Campaign, MiningWatch Canada, & The Ocean Foundation (June 2021). *Letter to the U.S. Securities and Exchange Commission Regarding Sustainable Opportunities Acquisition Corp. (SOAC / TMC)*.

    Summary and Relevance: NOAA should review this SEC submission to examine the historical misrepresentations made by TMC promoters regarding their environmental sustainability and commercial readiness. The signatories detail how TMC glosses over severe environmental liabilities, cumulative ecosystem impacts, and pelagic fishery threats predicted by independent scientific literature. The submission demonstrates a persistent corporate strategy of greenwashing designed to attract public capital while understating profound ecological hazards.

18. Deep Sea Mining Campaign (2021). *The Metals Company Seeking to Clean Up on Deep Sea Mining: Corporate Ties & Executive Networks Infographic*.

    Summary and Relevance: NOAA should review this investigative corporate infographic to map the interconnected executive, financial, and institutional networks driving The Metals Company. The visual analysis illustrates direct historical continuity between corporate personnel involved in the bankrupt Nautilus Minerals venture and current TMC senior executives. Key corporate figures—including Gerard Barron, David Heydon, and Robert Heydon—are mapped across interconnected entities such as DeepGreen, NORI, TOML, Low Carbon Royalties, and Impossible Metals. The infographic exposes revolving-door executive networks, offshore financial structures, and speculative promoter histories that prioritize short-term market speculation over environmental stewardship. NOAA must use these corporate mapping insights to exercise heightened regulatory scrutiny over TMC's application and protect U.S. interests from recycled corporate failures.

19. Deep Sea Mining Campaign (2021). *The Precautionary Principle Applied to Deep Sea Mining*.

    Summary and Relevance: NOAA should review this legal and policy briefing paper to evaluate the binding nature of the precautionary principle under international law and statutory ocean governance. The document details how the International Tribunal for the Law of the Sea (ITLOS) 2011 Advisory Opinion established precaution, best

environmental practices, and prior environmental impact assessments as strict legal obligations for states and contractors. Scientific consensus confirms that deep-seabed mining causes irreversible biodiversity loss and severe ecosystem degradation in the absence of scientific certainty and baseline data.

20. Chin, A., & Hari, K. (2020). *Predicting the impacts of mining of deep sea polymetallic nodules in the Pacific Ocean: A review of scientific literature*. Deep Sea Mining Campaign & MiningWatch Canada.

    Summary and Relevance: NOAA should consult this milestone scientific literature review, conducted by marine biologists from James Cook University, which synthesizes over 250 peer-reviewed and other articles examining nodule mining impacts. The report concludes that polymetallic nodule extraction in the Pacific Ocean will cause extensive, severe, and multi-generational ecological damage that is effectively permanent on human timescales. Abyssal ecosystems are highly specialized, slow-growing, and extraordinarily vulnerable to physical disturbance, sediment plume smothering, and metal toxicity. Furthermore, the review demonstrates that predicted economic gains for island nations are unsubstantiated , while risks to vital Pacific tuna fisheries, marine food webs, and coastal food security are material. This comprehensive synthesis directly addresses NOAA's statutory mandate under DSHMRA to determine whether proposed recovery operations will cause 'significant adverse effects' or 'irreparable harm' to the marine environment.

21. Deep Sea Mining Campaign, London Mining Network, & MiningWatch Canada (2019). *Why the Rush? Seabed Mining in the Pacific Ocean*.

    Summary and Relevance: NOAA should examine this investigative report to understand the speculative corporate, institutional, and political drivers pushing for rapid commercialization of deep-sea mining across the Pacific. The authors expose how frontier investors manipulate international bodies and regional organizations to advance commercial mining codes before scientific baseline research is completed.

22. Rosenbaum, H. (2016). *The Socio-Political and Regulatory Context for Sea Bed Mining in Papua New Guinea*. Deep Sea Mining Campaign.

    Summary and Relevance: NOAA should examine this field-based research report to understand the severe socio-political, legal, and institutional failures that accompanied the world's first licensed deep-sea mining project, Solwara 1 in Papua New Guinea. The study documents how mining leases were granted with no transparency and apparently without baseline environmental data, independent monitoring capacity, or the free, prior, and informed consent of local communities. Relevant environmental protection and

management legislation exists, yet until today the extent to which either the government or the company complied is unclear. Lack of transparency continues with the government's refusal to release relevant documents (despite court orders to do so). Local customary rights holders experience profound anxiety regarding heavy metal bioaccumulation in seafood, habitat destruction, and the collapse of artisanal fisheries. Furthermore, the report details how the PNG government's dual role as equity partner and regulatory authority created a severe conflict of interest that compromised environmental enforcement. This historical case study serves as a definitive warning against licensing offshore extraction without comprehensive baseline data for meaningful environmental monitoring indicators, independent research to establish monitoring criteria and indicators and social license.

23. Rosenbaum, H., & Grey, F. (2015). *Accountability Zero: A Critique of the Nautilus Minerals Environmental and Social Benchmarking Analysis of the Solwara 1 Project*. Deep Sea Mining Campaign, MiningWatch Canada, Economists@Large, Oasis Earth, & Earthworks.

    Summary and Relevance: NOAA should read this detailed critique to identify fundamental logical and methodological errors in corporate cost-benefit and natural capital accounting frameworks prepared for deep-sea mining. Authors Dr. Helen Rosenbaum and Francis Grey expose how corporate benchmarking studies inappropriately apply terrestrial metrics to marine environments, effectively valuing deep-sea natural assets and marine ecosystem services at zero. The analysis demonstrates that corporate risk assessments omit cumulative impacts, ignore secondary metal recovery failures, and rely on false comparisons with destructive terrestrial mines. This report is directly relevant as TMC frequently employs similar flawed economic and environmental benchmarking in its public communications and Pre-Feasibility Study.

24. Luick, J. L., & Rosenbaum, H. (Ed.) (2012). *Physical Oceanographic Assessment of the Nautilus Environmental Impact Statement for the Solwara 1 Project*. Austides Consulting & Deep Sea Mining Campaign.

    Summary and Relevance: NOAA should review this expert oceanographic evaluation to identify common methodological flaws, missing baseline data, and superficial risk modeling in commercial deep-sea mining Environmental Impact Statements (EIS). Dr. John Luick's review of the Solwara 1 EIS reveals critical omissions, including the failure to collect surface current measurements, flawed drift modeling, and the complete suppression of vertical upwelling velocity data. These technical deficiencies caused the mining company to severely underestimate the spatial extent, transport velocity, and midwater dispersion of toxic sediment plumes and acidic return water. This assessment provides a practical template for identifying incomplete hydrodynamic datasets and

overly optimistic environmental modeling. NOAA must ensure that TMC does not rely on flawed physical oceanographic assumptions that mask plume transport including into high-value pelagic fishing zones.

25. Rosenbaum, H. (2011). *Out of Our Depth: Mining the Ocean Floor in Papua New Guinea*. Deep Sea Mining Campaign, MiningWatch Canada, CELCOR PNG, & Oxfam Australia.

    Summary and Relevance: NOAA should examine this foundational report to understand the systemic environmental, social, and cultural risks associated with commercial seabed mining projects. The publication provides a detailed critique of the Solwara 1 project in Papua New Guinea, documenting severe physical impacts including hydrothermal vent chimney destruction, sediment plume dispersion, and heavy metal bioaccumulation. Dr. Helen Rosenbaum demonstrates that the mining company's Environmental Impact Statement contained superficial risk analysis, flawed oceanographic current assumptions, and no social or health impact assessments. NOAA should recognize the direct corporate continuity between this failed venture and TMC. TMC CEO Gerard Barron was an early investor and promoter of Nautilus Minerals who extracted $31 million from the venture prior to its bankruptcy, subsequently co-founding DeepGreen (now TMC). This executive overlap has resulted in a nearly identical corporate playbook where TMC's Pre-Feasibility Study relies on cherry-picked science and severe omissions—including a complete lack of a mine waste or tailings management plan, the total exclusion of radiation toxicity hazards, and insider authorship of key technical chapters by TMC employees.

PART III REFERENCES, ATTACHED

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F. The Metals Company Inc. (2025). Technical Report Summary of Prefeasibility Study of NORI Area D, Clarion Clipperton Zone p 309, p 384. https://metals.co/wp-content/uploads/2025/08/0225054-TRS-PFS-for-NORI-Area-D_31-July-2025_FOR-FILING.pdf