Northern Territory
Environment Protection Authority

DIRECTION TO PREPARE A SUPPLEMENT

Direction given under section 12 (3) (a) of the Environmental Assessment Administrative Procedures 1984

Proposal	Fountain Head Gold Project
Proponent	PNX Metals Limited
Proposed action	Resumption of mining the Fountain Head pit with an expansion of the current void using conventional drill and blast mining techniques. Gold will be extracted from the ore via a leaching circuit that includes carbon-in-pulp to produce gold doré. The Project life is approximately 3.5 years.
Direction	The proponent is directed to: • consider any submissions received on the draft environmental impact statement during the consultation period; and • prepare a supplement to the draft environmental impact statement to address issues raised in the public submissions, and the comments from agencies (Attachment A) that relate to the assessment of potentially significant environmental impacts.
Submission period	The additional information must be submitted to the NT EPA within 12 months of the date of this Direction.
Person authorised to give direction	
Name and position	Dr Paul Vogel AM – Chairperson, Northern Territory Environment Protection Authority Delegate of the NT EPA under section 36 of the *Northern Territory Environment Protection Authority Act 2012*
Signature	
Date of direction	24 September 2021

Attachment A – Additional information – Supplement to the Draft Environmental Impact Statement

PNX Metals Limited - Fountain Head Gold Project

Section of Draft EIS	Comment	Requested information in the Supplement to address matters raised in submissions received
Terrestrial environmental quality		
Waste rock and geochemistry	For the Fountain Head Gold Project, the criteria based on Total Sulphur (S) was selected as the best potential option for routine classification of Acid Rock Drainage (ARD) rock types (waste). Non Acid Forming (NAF) samples can be differentiated from Potentially Acid Forming (PAF) and Potentially Acid Forming - Low Capacity (PAF-LC) samples by applying a Total S cut-off of 0.2%S and derivation of Total S has been by portable X-Ray Fluorescence (pXRF). However, there is very poor correlation of pXRF sulphur data with Total S data suggesting the pXRf data were of insufficient quality to allow an estimate of the volume of PAF rock to be made.	The waste material of concern includes ARD rock types (NAF/PAF), leachate (metals and metalloids) and Arsenic (As). Describe the management strategies, processes and actions that will be implemented to effectively discriminate and segregate the waste material. Describe the sulphur testing program or geological controls adopted to classify and characterise waste rock. The measures taken should minimise the generation of waste and its discharge into the environment. As defined in the *Environment Protection Act, 2019* (EP Act), waste should be managed in accordance with the waste management hierarchy of approaches in order of priority: a) avoidance of the production of waste b) minimisation of the production of waste c) re-use of waste d) recycling of waste e) recovery of energy and other resources from waste f) treatment of waste to reduce potentially adverse impacts g) disposal of waste in an environmentally sound manner.
Rehabilitation and closure		
The Hayes Creek Project and the Fountain Head Project mine closure plan	The Fountain Head Gold Project is described throughout as inextricably linked to the Hayes Creek Project and opportunities may exist for synergies between the two projects including tailings storage and processing options.	The Terms of Reference has a requirement to include two conceptual mine closure plans. These are to address the potential scenarios where: 1. the Hayes Creek project proceeds within a short period after completion of mining in this project; and 2. the Hayes Creek project is delayed or does not proceed.

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	Iron Blow and Mt Bonnie which form the Hayes Creek Project is a volcanogenic massive sulphide (VMS) zinc-gold-silver deposit. It is stated that the Hayes Creek Project was to utilise the Fountain Head site for ore processing and tailings storage, and the Hayes Creek Project will now be developed (subject to approval) following the Fountain Head Gold Project. Tailings generated from that process would be deposited sub-aqueously in the Fountain Head pit lake to prevent oxidation of reactive materials. The draft EIS including the mine closure plan and the supporting studies e.g. Geochemical Characterisation of Waste Rock and Ore (Appendix 6) and Geochemical Characterisation of Fountain Head CIL Tailings (Appendix 7), does not address material from the Hayes Creek Project.	Clarify the relationship between the two projects as part of the proposal description. Provide clear explanation and justification why the mine closure plan does not address scenario 1 - that the Hayes Creek Project proceeds within a short period after completion of mining in this project.
Terrestrial ecosystems		
Weeds	Declared weeds are noted to be present in the project area and will have an impact on the landscape and the surrounding environment.	Describe measures to avoid, minimise and mitigate and control the spread of gamba and other declared weeds. Address the threat of gamba and other declared weed species including management and controls for bushfires, seed production, and seed spread.
Flora and fauna	Threatened species that were moderately or highly likely to occur were not recorded during the terrestrial flora and fauna survey of the project area and the risk to threatened species is considered to be low. While the risks are considered low, Appendix 8 of the Draft EIS includes a recommendation for a site walkover to be	Provide results of additional surveys to identify any occurrence of *Acacia praetermissa* and *Stylidium ensatum* ensuring the site walkover is prior to clearing by experienced personnel, and ensure surveys are undertaken at the appropriate survey time for *Stylidium ensatum* (mid-late dry season).

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	undertaken to identify any *Acacia praetermissa* and *Stylidium ensatum*. Appropriate survey times for *Stylidium ensatum* are during the mid-late dry season when the plant is flowering/fruiting. *Acacia praetermissa* can be surveyed at any time of year.	Demonstrate how the environmental decision making hierarchy (as defined in the EP Act) has been applied for significant impacts.
Hydrological processes		
Water extraction	The extraction of surface water from the Fountain Head pit and ponds/dams will trigger licensing requirements. A surface water extraction licence under section 45 of the *Water Act 1992* will likely be required.	Provide additional/updated details on the proposals water requirements for dust suppression, construction processing plant, power station, laydown areas, access roads and infrastructure. Include details of water demand, sources and supply, estimated water use in mega litres (ML) per month for each beneficial use, and extraction point. As defined in the EP Act, the waste management hierarchy (avoid, minimise, re-use and recycling of wastewater) will apply.
Groundwater	The surface water and groundwater system is not well understood beyond the flooded pit and the current existing network of monitoring bores is not optimised for assessing the local groundwater system and potential impacts to the downstream environment. Given the relatively short life of mine, certainty in understanding the behaviour of the local groundwater system is required to assess potential impacts to the downstream environment. The hydrological regime (behaviour of groundwater) and environmental values of the proposal area and receiving environment including groundwater dependent ecosystems	Demonstrate that any potential impacts to groundwater, surface water, and the downstream environmental values (including GDE's), and cultural and heritage values, is in accordance with the environment decision making hierarchy to avoid, minimise, and mitigate. 1. Identify and characterise the hydrogeological regime and environmental values of the receiving environment particularly downstream of the site 2. Review and describe the existing groundwater monitoring network 3. Revise, expand and improve the local monitoring (groundwater and surface water) network for better modelling outcomes (predictions) and to reduce model uncertainty/assumptions

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	(GDE's) such as rivers, wetlands and waterholes that may be impacted by the proposal has not been adequately characterised, and where it is appropriate, quantified. The conceptual model describes alluvial and fractured rock aquifers in the region and a water table within 5 m of the natural surface. It is assumed that the regional groundwater flow direction is to the northeast. The groundwater studies show July 2019 levels and flow direction, and describes the monitoring bore network as being centred tightly around the pit and does not extend to the downstream areas. The monitoring bore network adopted for the project (FHMB01 to FHMB06) and the data from the network is limited. An analytical solution to match groundwater inflow rates to the pit as it has recovered over time since last being dewatered was used to develop and build the modflow groundwater model. Calibration of the model was to the historical pit water level (recovery) data. No specific study of the groundwater system and hydrogeology has been presented. Models were constructed to be used for: • groundwater inflow predictions • determination of the solute concentrations of the post mining Pit Lake and Fountain Head Lake, and • assessment of impacts to the downstream environment.	4. Review and refine the model input data such as estimates of hydraulic conductivity (*k*H and *k*V) 5. Monitor and collect an appropriate baseline dataset to evaluate the surface water and groundwater interactions with a focus on developing post closure monitoring of the groundwater system 6. Refine the conceptual model and improve the numerical model. Given the relatively short life of mine, also address the limitations and uncertainties in the models in the EIS, and propose approaches to model refinement to improve predictions for surface/groundwater interactions and solute concentrations in the proposed pit lake with a focus on developing post closure monitoring of the groundwater system.

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	Model results suggest that during active dewatering, the groundwater drawdown extent of 1 m or above is estimated to occur approximately 2.5 km from the pit.	
Hydraulic Modelling	The Fountain Head Gold Project Flood Assessment and Surface Water Management Strategy explores the likelihood and extent of flooding in the vicinity of Fountain Head pit and proposed infrastructure to inform operational constraints and potential mitigation options. The results are derived from un-calibrated models. Flood studies show that the western cell of the evaporation pond is impacted by flooding at 1% Annual Exceedance Probability (AEP).	Demonstrate that the proposed erosion protection, such as rock armour protection along the outer toe of the proposed Integrated Waste Landform (IWL) and, western and northern toe of the proposed Evaporation Pond is adequate to withstand the impact of flooding. Provide information for source material for erosion protection and diversion structures. As defined in the EP Act, the environmental decision making hierarchy to avoid, mitigate and minimise impacts to the environment must apply.
Evaporation dam	The Evaporation Pond is modelled where inflows consists of rainfall/runoff and dewatering from the pit. The outflows are natural evaporation, forced by evaporators, and groundwater infiltration/seepage. Investigations indicate seepage rates are highly variable through the silty sands and clayey silts of the floor and the water table is estimated to be within 5 m of the natural surface. A high degree of uncertainty remains regarding the seepage and infiltration rates through the floor of the Evaporation Pond and this has major implications for the structural integrity of the	Demonstrate that the Evaporation Dam is constructed and operated with a high degree of certainty that the dam can withstand impacts from flooding, dam break is avoided, and contaminated water does not enter groundwater and the downstream environment. As defined in the EP Act, the environmental decision making hierarchy to avoid, mitigate and minimise impacts to the environment must apply.

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	dam wall as well as contaminant transport through the floor to groundwater.	
PAF stockpile runoff dam	The PAF stockpile runoff dam is preliminarily sized with a capacity to contain a 1:100 year 72 hour duration storm. The estimated storage volume of the PAF stockpile runoff dam is approximately 16.7 ML. The PAF stockpile dam overflows to the proposed Evaporation Pond where it can provide additional water storage.	Clarify that any drains channelling contaminated water will be lined and contingencies are in place for greater than 1:100 storm events.
Mine Closure Plan and management of long-term surface flows	The Draft EIS states that redirecting surface water flows into the pit to enable the pit to be flushed each wet season and prevent ongoing deterioration of pit water quality is currently under evaluation.	Provide the complete evaluation of the option of redirecting surface water flows into the pit to enable the pit to be flushed each wet season and prevent ongoing deterioration of pit water quality and potential impacts to the downstream environment. Include a discussion on post closure monitoring. Clarify if this will form part of the mine closure plan for Fountain Head.
Development of the proposed post-mining Fountain Head Pit Lake	Following dewatering of the pit (phase 1), as part of phase 2 of the project (construction, mining, processing, closure and rehabilitation), an unknown volume of PAF waste rock will be placed into the mined out pit. The post-mining Pit Lake water chemistry is likely to be altered when the PAF stockpile material is stored sub-aqueously and this has not yet been modelled or assessed in any detail.	Water quality of the pit has not been modelled/assessed with placement of PAF waste rock in the pit. Demonstrate that the selected option to place PAF waste rock in the pit presents an environmental improvement over the pre-existing conditions at the Proposal site. Demonstrate that there will be no ongoing costs borne by the community and government in future. This should be demonstrated with respect to the principles of ecologically sustainable development, and the environmental decision-making hierarchy as defined in the EP Act.

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Aquatic ecosystems		
Aquatic Ecology	The aquatic study (Appendix 9) was commissioned for the Hayes Creek Zinc, Gold and Silver Project, which included the Fountain Head Gold Project area. Seven locations were investigated during the survey. The sites s1, s2, s3 and s5 lie in the Margaret River catchment (site of Iron Blow and Mount Bonnie), and are not directly relevant to this project. The sites s7 and s6 are upstream of the project site, and s8 which is approximately 9 km downstream of the project site are relevant to Fountain Head. The relevant downstream site (s8) is sited on the Margaret River and proximal to Woolwonga mine, and would likely be influenced by Iron Blow, Mount Bonnie and Woolwonga. It is noted that: • The field survey was limited to a rapid assessment and provides a snapshot • Diversity and abundance of riparian vegetation was not recorded • The selection of survey sites was limited. It is acknowledged that the limitations to selection of suitable survey sites was the above average temperatures and the below average wet season in 2019.	Baseline characterisation, and identification of sensitive habitats and fauna species is deemed inadequate and requires greater sampling effort across environmental gradients, including the types of stream habitats, and across the degree of exposure to impacts from previous mining. More information is required on the rationale for site selection for the baseline characterisation, and justification why data from only three sites is adequate to meet stated objectives for both fish and macroinvertebrates. The biological monitoring program will require a hypothesis-testing framework that is structured to detect impact on, or declines in aquatic health. • Redesign the aquatic (biological) monitoring program to adequately characterise the baseline conditions for the Fountain Head Gold Project • Consider site selection and the likely influence of Iron Blow, Mount Bonnie and Woolwonga • Clarify the discrepancy in the SIGNAL score calculations (use of SIGNAL 2 weight factors) as applied in Appendix 9 and Appendix 20 • An adequate baseline characterisation would require a level of taxonomic resolution to species level.
Air quality		

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Emissions	Although not a requirement in the terms of reference, the proponent has conducted an air quality and greenhouse gas assessment for the Fountain Head Gold Project to address emissions to the environment. Air quality impacts for the Project have been inferred from an air quality assessment for an approved mining activity under the *Mine Management Act 2001* (Mt Todd Mine) that is similar in nature and location to the Project. The air quality assessment (Appendix 1) compared modelling and model results with Mt Todd. The approach to assessing impacts to air quality for the Fountain Head Gold Project is not considered to be good practice.	Provide a review of the potential impacts (including cumulative impacts) to air quality for the Fountain Head Gold Project using appropriate methods, to determine whether an assessment of air emissions is required. If required, an assessment of the potential impacts (including cumulative impacts) to air quality for the Fountain Head Gold Project must be in accordance with the NSW best practice guidelines for modelling and assessment of air quality: Approved Methods for Modelling and Assessment of Air Pollutants in New South Wales. If required, review the use of the non-standard Gaussian Diffusion and Sedimentation model for emissions, include the evaporator emissions as stationary point sources, and model all emissions from the development using an approved air dispersion model. As the proponent has identified toxic air pollutants such as hydrogen cyanide and arsenic, these principal toxic air pollutants (listed in the NSW Approved Modelling Methods) are to be applied at and beyond the boundary of the facility. In addition to modelling the concentrations of arsenic and hydrogen cyanide, the following parameters must be modelled if emitted at the facility: TSP, PM10, PM2.5, NO_2, SO_2, CO, VOCs, metals and metalloids. The results must be presented as a table, and as contours against impact assessment criteria, including the 1-hour hydrogen cyanide assessment criterion. The results must demonstrate that source emissions at the development comply with relevant concentration limits specified in the Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW).

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		In addition to dust mitigation measures presented in the assessment, provide detailed emission control techniques and practices that will be employed for all other pollutants.
Community and economy		
Noise and vibration	Flyrock, air blast and ground vibrations from blasting has the potential to have an impact on stakeholders.	Provide an assessment of the project's potential impacts from blasting (flyrock, air blast and ground vibrations) to the Adelaide to Darwin railway line, the Ghan Passenger rail service, and other stakeholders, and provide additional information beyond '*Blasting will take place in daylight hours only and preferably during meal or shift breaks*' that accounts for the potential noise and vibration impacts to all stakeholders. Demonstrate the community consultation and stakeholder engagement for the project includes stakeholders listed below, and update the project stakeholder engagement plan. • The Ghan, Journey Beyond • Emerald Springs Roadhouse • Pine Creek Railway Resort • Lazy Lizard Caravan Park.
Noise and vibration - evaporators	An environmental noise assessment has been conducted for the proposed Fountain Head Gold Project using the CONCAWE noise propagation model where the nearest sensitive receiver is the Grove Hill Hotel (currently a residence) located 5.5 km east of the closest noise sources associated with the Project. Assessment criteria were developed for both operational and construction noise, and blasting and vibration impacts at the	Review the modelling and include all sources of noise and vibration emissions to demonstrate that noise and vibration from the evaporators does not have a significant impact to sensitive receptors (the Grove Hill Hotel, the Hayes Creek Wayside Inn and Caravan Park, and the Ban Ban Springs Homestead), and the local population. Ensure measures are in accordance with the environment decision making hierarchy to avoid, minimise, and mitigate as defined in the EP Act.

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	sensitive receptor and on pipework through the day, evening and night. Operation/construction noise and blasting were considered in the assessment and prediction models to evaluate changes to economic and social activity in regional centres that may have positive or negative impacts to the local population. Noise and vibration emissions from evaporators were omitted from the assessment and modelling. The use of evaporators and pump system is over 9 months to dewater the pit operating at a rate of 135 m^3/hr and 20.3 hr/day.	
Culture and heritage		
Impacts to sacred sites	The flood modelling indicates some flood impacts are expected north of the evaporation pond compared to existing conditions. Two recorded sacred sites including a water hole are recorded to be located approximately 550m and 1300m downstream (north) of the Project area. There is potential for biophysical impact on sacred sites from changes to water quality or hydrological processes that could result from the proposed activities.	Provide details on measures to be undertaken to avoid impacts on the sacred sites and demonstrate that potential impact to sacred sites and other cultural features as a result of flooding, accidental release or contamination of water and the downstream environment are avoided, with consideration to: • waterholes (and other GDE's) • termite mounds, and • Condition 5 of the AAPA certificate that states *"Within the area marked Restricted Works Area 1 (RWA1) on Annexure 'A', associated with sacred site 5271-7, no work shall take place or no damage shall occur"*.