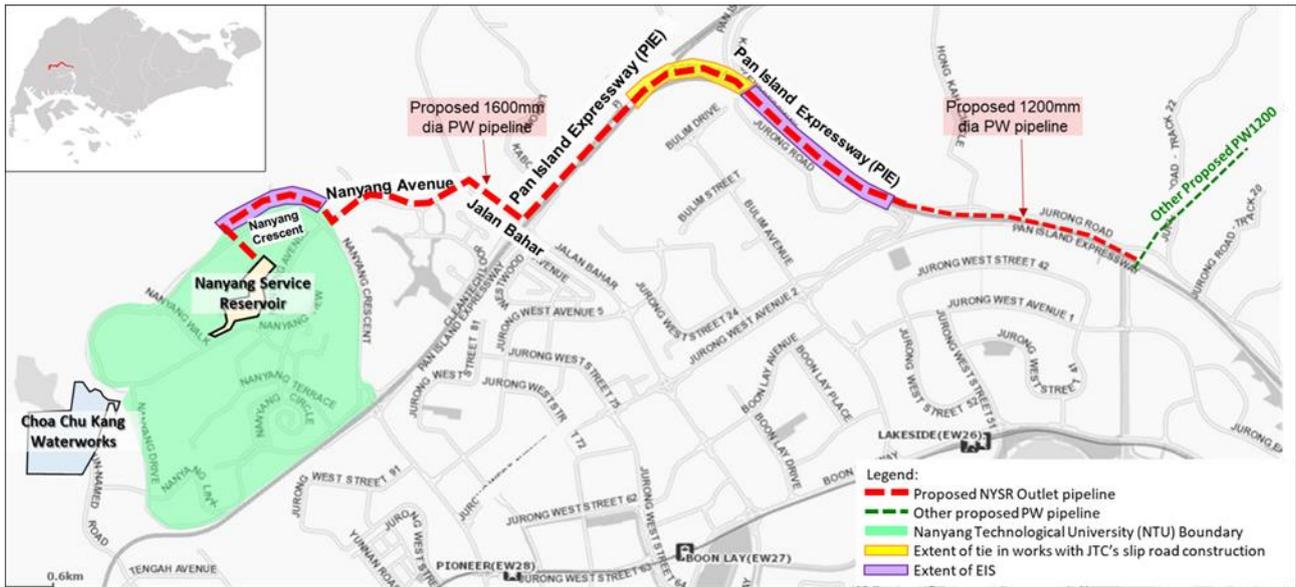


EXECUTIVE SUMMARY

Background

PUB, Singapore’s National Water Agency (PUB) has proposed a 1600/1200 mm diameter outlet Potable Water (PW) pipeline from the existing Nanyang Service Reservoir (NYSR) to Pan Island Expressway (PIE) in Singapore (henceforth referred to as “the Project”). The purpose of the Project is to improve the resiliency of potable water supply in Western Region of Singapore.

PUB has commissioned Fong Consult Pte Ltd (FC) on 1st December 2017 as the Engineering Consultant for the Project. A feasibility study and preliminary design for possible PW pipeline routes of the Project was conducted by FC. Relevant stakeholders on the possible PW pipeline routes were engaged by PUB and FC for comments. The final PW pipeline route selected for the Project, based on approval received from the relevant stakeholders, is shown in Figure ES-1.



Source: PUB, 2020

Figure ES-1 PWP Route Selected for the Project

EIS Requirements

PUB has submitted an environmental consultation for the Project to the Urban Redevelopment Authority (URA) and Technical Agencies comprising the National Parks Board (NParks), National Environment Agency (NEA), Agri-Food and Veterinary Authority (AVA), and the Maritime and Port Authority of Singapore (MPA) in 2019.

NParks has responded to the environmental consultation and required PUB to conduct an Environmental Impact Study (EIS) for **two study areas** as described below:

1. Study Area 1 (NTU forest), which is located at the fringe of Western Catchment Area bordered by MINDEF’s land at the north, Nanyang Crescent and Nanyang Avenue at the south. The Study Area 1 is approximately 31,423 square metres (sqm).
2. Study Area 2 (Tengah forest), which is located between the future Jurong Region Line (JRL) Depot (under construction) on the east, and the PIE on the west. The Study Area 2 is approximately 42,037 sqm.

A stretch of 600m of the proposed pipeline will be laid in the Bulim area (see area enclosed in yellow boundary line in Figure ES-2). The proposed pipe laying works at this stretch will be laid in tandem with JTC Corporation

(JTC)'s ongoing development to construct a slip road, which skirts around the existing bus depot at the southern side of the PIE. Barring any change to JTC's construction program, the proposed pipe laying works is scheduled to commence in 3Q 2021. The Bulim area where the pipeline is proposed, was excluded from the scoping of the EIS as the relevant authorities (i.e., URA, NParks, and NEA) have assessed that the environmental impact of works within this area is minimal.

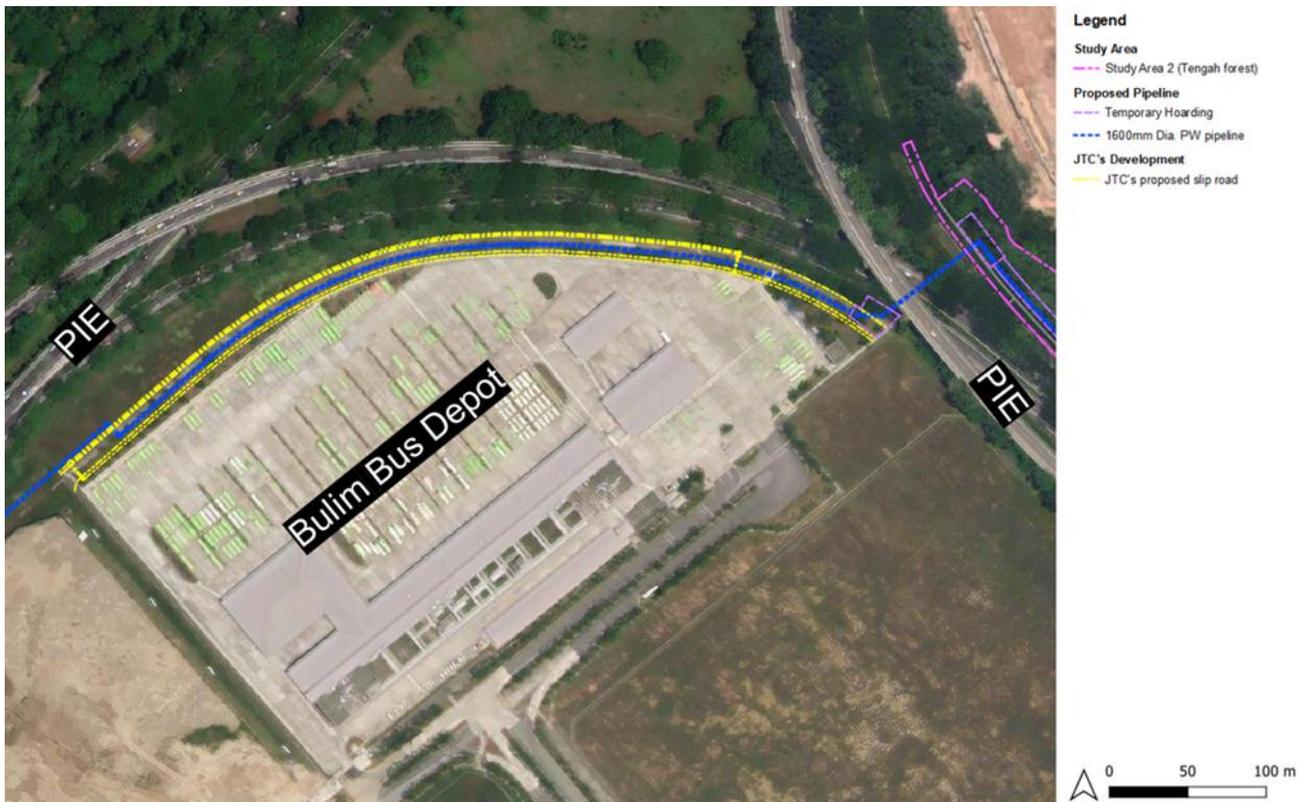


Figure ES-2 Proposed 1600mm Diameter Pipeline to be Laid in Bulim Area

Before the EIS was implemented, PUB consulted NParks in 2019 on the scope of the EIS for the two study areas. The EIS scope was established as follows:

1. Prepare and submit an EIS Scoping Report to NParks for approval before commencement of EIS.
2. Conduct baseline study to establish pre-construction conditions at the study areas for hydrology, water quality, biodiversity (i.e., arboriculture, flora, and fauna), noise, ground vibration and air quality.
3. Predict and evaluate potential impacts on hydrology, water quality, biodiversity, noise, ground vibration and air quality that could arise during construction and operation of the Project.
4. Develop relevant mitigation measures to avoid or minimise the impacts to as low as reasonably practicable (ALARP).
5. Develop an Environmental Management and Monitoring Plan (EMMP) for the Project construction.
6. Conduct nature group engagement on the EIS for the Project.
7. Submission and public disclosure of the EIS Report with reasonable alternatives which would avoid and minimise adverse impacts to the environment.

Arcadis was appointed by PUB as the EIS consultant on 1 April 2020. Arcadis submitted an EIS Scoping Report dated 30 June 2020, which was accepted by NParks, PUB and FC. The baseline study and field survey were conducted between 13 July 2020 and 18 September 2020 after obtaining NParks' permission to conduct the EIS. After completing the baseline study and field survey for the two study areas, Arcadis shared the outcomes of the EIS and presented the EMMP for the Project to URA, NParks, NEA, NTU, Nature Society (Singapore)

(NSS) and Jane Goodall Institute (Singapore)(JGIS) in December 2020. The engagement went smoothly with no adverse comments from the Nature Groups. Their feedback have also been incorporated in the EIS report.

Project Description

The Project’s construction works are anticipated to commence in Q2 2022 and complete around Q4 2025. Activities during construction phase include pipe laying by open cut, pipe jacking and/or pipe sleeving. Activities during the operation phase includes routine pipeline inspection, maintenance, and repair (in the event of leakage from the PW pipeline).

The original proposed pipeline design route before the EIS and alternative considerations for the pipeline route during the EIS at the two study areas are described below:

Original Pipeline Design at Study Area 1 (NTU Forest)

Approximately 940 m length of 1600 mm diameter outlet PW pipeline will be laid in Study Area 1 as shown in Figure ES-3. The PW pipeline alignment in Study Area 1 will commence from Shaft B4C at the north perimeter of a concrete canal which runs alongside to Nanyang Crescent road. The PW pipeline alignment then runs north until it reaches approximately 3 m before the boundary between NTU’s and MINDEF’s land. The PWP alignment then runs northeast, crossing beneath an earth stream, until it reaches Shaft B6. The pipeline alignment will maintain 3m away from the land boundary from Shaft B6 to B10 and then exits the Study Area 1 into Lorong Danau. The PW pipeline in Study Area 1 will be constructed using a combination of open cut, pipe sleeving, and pipe jacking methods.

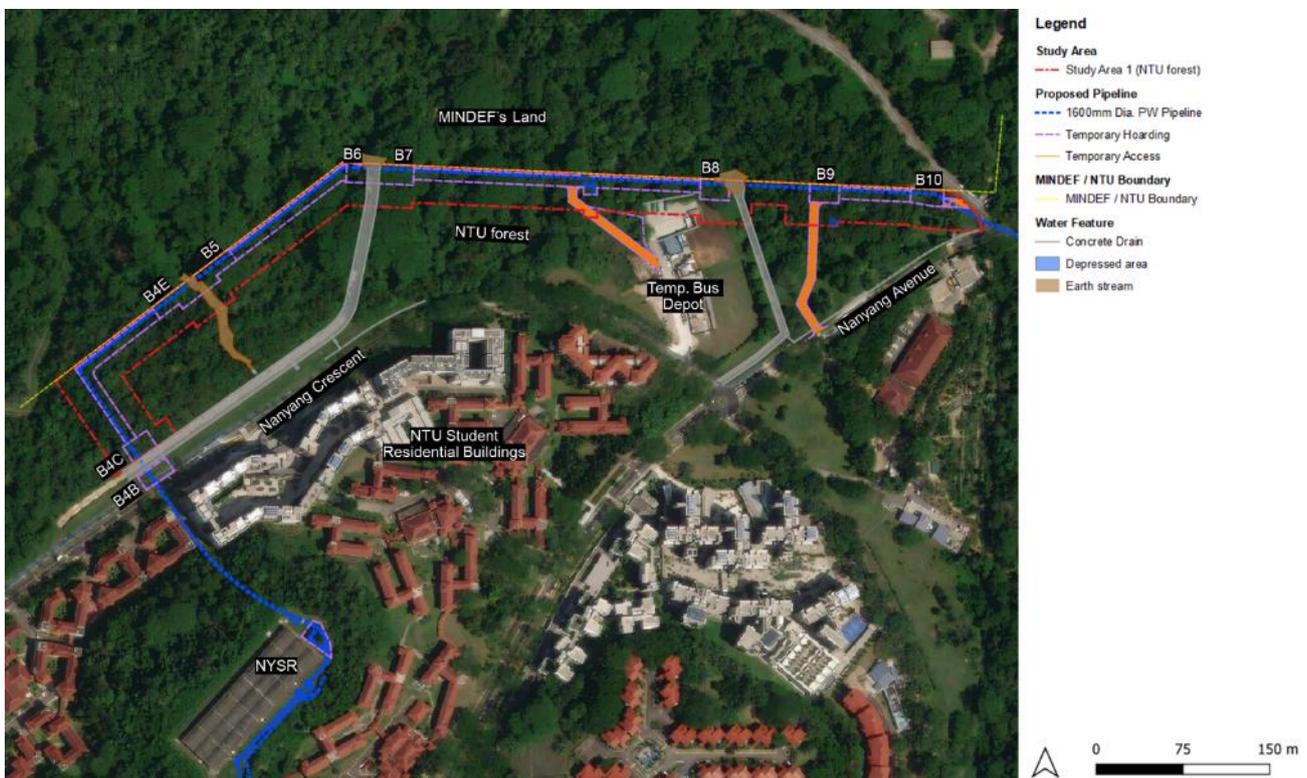


Figure ES-3 Original Pipeline Design at Study Area 1 (NTU forest)

Original Pipeline Design at Study Area 2 (Tengah Forest)

Approximately 776 m length of the 1600 mm diameter outlet PW pipeline will be laid in the Study Area 2 as shown in the Figure ES-4. The PW pipeline alignment in Study Area 2 commences from the eastern perimeter of a concrete drain at Shaft C5B which is abutting the PIE near Tengah Flyover. The PW pipeline alignment then runs southwards along the Tengah forest until it reaches the Shaft B6A, and then exits the Study Area 2

into a canal, which is under construction near the Hong Kah Flyover. The PW pipeline in Study Area 2 will be constructed mainly by open cut method.

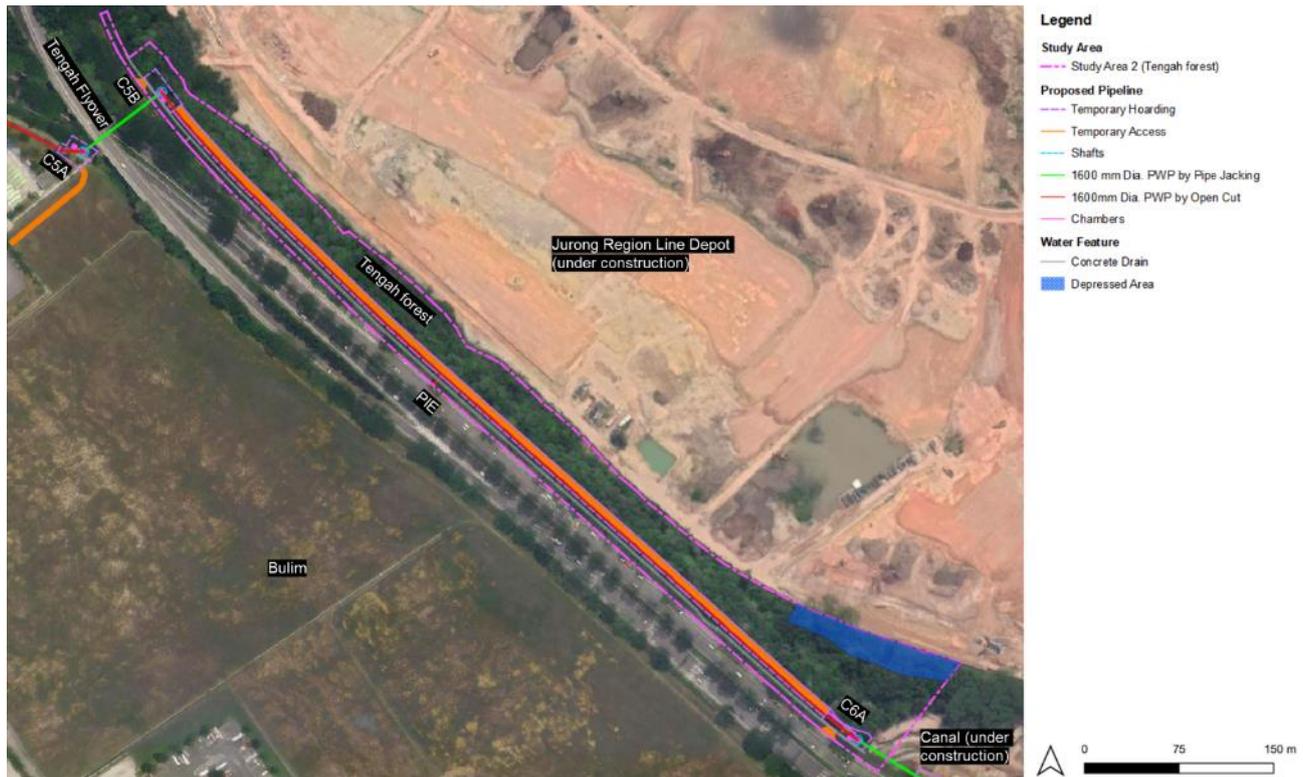


Figure ES-4 Original Pipeline Design at Study Area 2 (Tengah forest)

Environmental Impact and Mitigation

Prediction and evaluation of potential environmental impact using Rapid Impact Assessment Matrix (RIAM) Method for hydrology, water quality, biodiversity, noise, ground vibration and air quality associated with the proposed construction and operation of the Project at the two study areas were performed.

Mitigation measures were developed to minimise the potential environmental impacts of the Project at the two study areas to As Low As Reasonably Practicable (ALARP), and residual impacts (after mitigation measures are considered) were evaluated as part of the EIS. The mitigation measures proposed include:

1. Facilitated integration of environmental considerations into the routing and design process, and construction methods selection of the pipeline;
2. Minimise temporary working space and access;
3. Biodiversity mitigation measures to minimise adverse impacts to flora and fauna especially those of conservation significance;
4. Pollution control measures to minimise deterioration of air and water qualities, as well as reduce noise and vibration emissions.

Details on prediction and evaluation of potential environmental impacts, proposed mitigation measures, and residual impacts (after mitigation measures are considered) are described in Sections 6 to 10 of the EIS Report.

Environmental Management and Monitoring Plan (EMMP) was developed as part of the EIS to guide PUB and contractors to proactively manage and monitor potential environmental impacts of the Project during the construction phase at the two study areas. Details of the EMMP are described in Section 11 of the EIS Report.

Key Environmental Impact at Study Area 1 (NTU forest)

The original pipeline design involves site clearance, temporary access construction, hoarding installation, pipe laying by open cut, and chambers construction at a native-dominated secondary forest between Shafts B4C to

B4E (see Figure ES-3). The original plan could result in some losses of conservation significance habitat (i.e., approximately 0.58 hectare [ha] of native-dominated secondary forest) and affect an estimated 57 conservation significance flora species (i.e., 1 Presumed Extinct Flora Species, 20 Critically Endangered Flora Species, 7 Endangered Flora Species, and 29 Vulnerable Flora Species) at the native-dominated secondary forest between Shafts B4C and B4E.

To minimise the potential environmental impacts to a native-dominated secondary forest between Shaft B4B and B4E (see Figure ES-5), an alternative pipeline alignment using pipe jacking construction method was proposed. This alternative pipeline design could avoid the loss of a conservation significance habitat (i.e., 0.58 ha of native-dominated secondary forest) and reduce the number of affected conservation significant species to estimated 23 species (i.e., 7 Critically Endangered, 7 Endangered, and 9 Vulnerable).

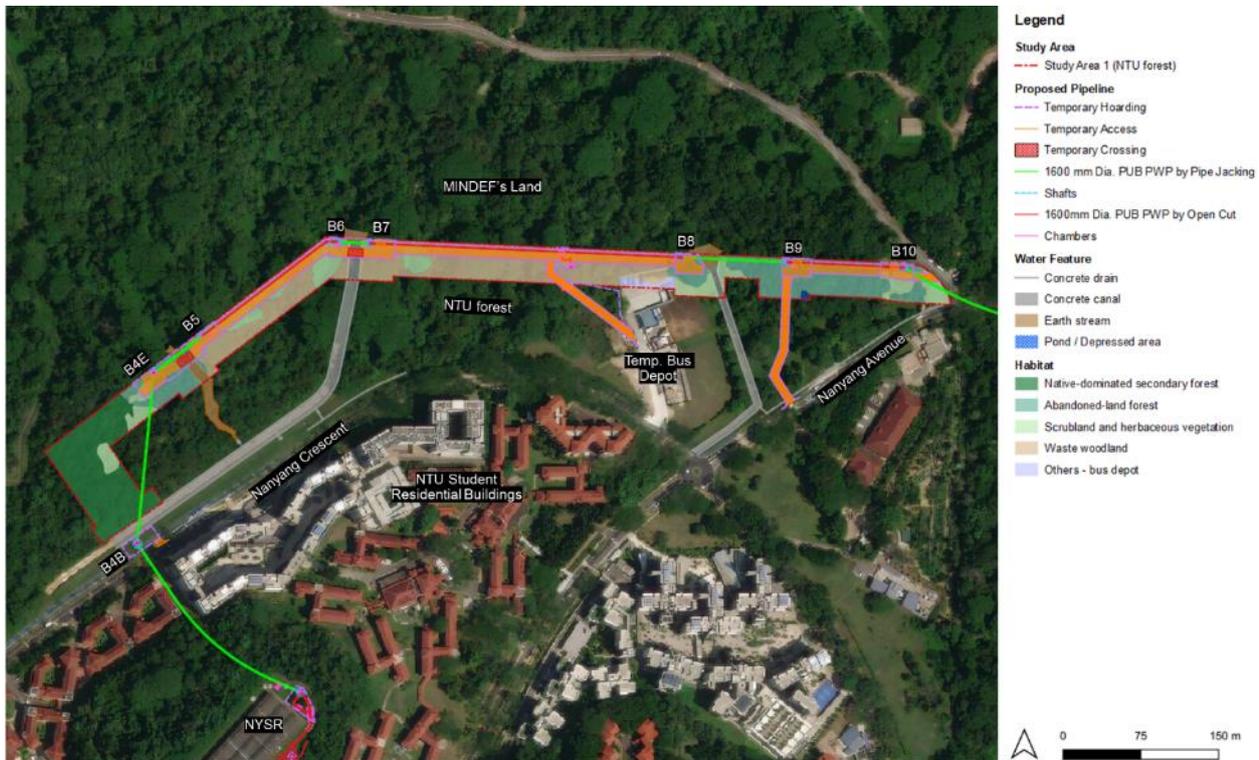


Figure ES-5 Alternative Pipeline Design at Study Area 1 (NTU forest)

Key Environmental Impact at Study Area 2 (Tengah forest)

The original pipeline design involves site clearance, temporary access construction, hoarding installation and pipe laying by open cut, and chambers construction at abandoned-land forest and scrubland between Shafts C5B to C6A (see Figure ES-4). The original plan could result in some loss of habitat (approximately 0.66 ha of mainly abandoned-land forest and scrubland) and affect estimated 5 conservation significance flora species (i.e., 3 Critically Endangered Flora Species, and 2 Vulnerable Flora Species).

An alternative to the original pipeline design is to lay the pipeline by pipe jacking from Shafts C5B to C6A with an intermediate Shaft C5C to minimise the potential environmental impacts (see Figure ES-6). The alternative pipeline design will reduce the loss of habitat to approximately 0.13 ha of mainly abandoned-land forest and scrubland, and no conservation significance flora species are expected to be affected.



Figure ES-6 Alternative Pipeline Design at Study Area 2 (Tengah forest)

Conclusion

The EIS has facilitated and integrated environmental considerations into the proposed pipeline routing, design process and construction methods selection of the pipeline at Study Area 1 and Study Area 2. During the EIS, alternative pipeline design at the two study areas were proposed as the alternative have significantly lesser environmental impact compared to the original pipeline design. Mitigation measures and EMMP have been developed to minimise the potential environmental impacts to ALARP. The Project is not expected to cause any potential major negative residual environmental impact at the two study areas with the adoption of the alternative pipeline design, proper implementation of the proposed mitigation measures and EMMP.