

Scott Wilson Ltd
in association with
Det Norske Veritas

China Resources Petrochems (Group) Co. Ltd

**Proposed Development Phase IV
at CRC Oil Terminal, Tsing Yi -
Refrigerated Storage Tanks for
Liquefied Gas**

Project Profile

July 2005

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1. BASIC INFORMATION

1.1. PROJECT TITLE

“Proposed Development Phase IV at CRC Oil Terminal, Tsing Yi – Refrigerated Storage Tanks for Liquefied Gas.”

1.2. PURPOSE AND NATURE OF THE PROJECT

In Hong Kong, the Government has been promoting the use of Liquefied Petroleum Gas (LPG) since Year 2000 as an attempt to improve the air quality of the whole Territories. As a result, the number of vehicles using LPG as primary fuel has been increased. By the end of 2003, nearly all taxis in Hong Kong have switched to LPG and 80 percent of newly registered public light buses were LPG powered. This creates a growing demand on the steady supply of this clean fuel and suppliers are currently facing a primary problem to keep up with this growing demand in terms of import and storage capacity.

Referenced to international practice, the security reserve of LPG varies between 25 days (in Taiwan) and 70 days (in Japan) in order to prepare for any contingencies as a consequence of shortage in energy supply. As reflected in the latest statistics, the current level of LPG storage in Hong Kong can only supply for only 11 days.

In view of this, China Resources Petrochems (Group) Co. Ltd. (CRPC) proposed to increase their current LPG storage capacity as well as the associated daily throughput by constructing another alternative design of LPG storage tanks. Since any installation which stores LPG at a level of 25 tonnes or more belongs to a Potentially Hazardous Installation (PHI) according to the Hong Kong Planning and Standard Guidelines (HKPGS), potential sites currently available are carefully reviewed. The vacant land located within the west end boundary of CRC Oil Terminal on Tsing Yi Island is concluded to be an appropriate site for the LPG storage expansion. The total area of the subject site is about 9,100 sq m (D20 of 3,500 sq m and D30 of 5,600 sq m). **Figure 1** shows the site location and the proximal facilities.

At present, CRPC has three mounded bullet tanks, providing a total capacity of 4,000 cu m for LPG storage. It is CRPC’s intension to safeguard a continuous supply of this clean fuel for not less than 25 days by providing an extra 60,000 cu m refrigerated tank storage capacity.

Liquefied gas carriers of the type as illustrated in **Figure 2** deliver liquefied propane and butane to the receiving Tsing Yi CRC Oil Terminal where it is stored. The liquefied gas carrier has been specially constructed with several low-temperature steel cargo tanks to safely transport liquefied gases at -48°C. A number of potential marine routes for the transportation of the liquefied gas are depicted in **Figure 3**, subject to further analysis under the Environmental Impact Assessment Ordinance (EIAO) process.

Land based full containment tanks are one of the potential storage options to be used for the purpose of this Project since this would occupy the least land space. This type of tanks are capable of independently containing the refrigerated liquid stored and would eliminate any undesirable vaporized phase of gas thus would also enhance safety for the surrounding areas. Subject to detailed design of the proposed refrigerated storage tank, further analysis will be conducted under the EIAO process. An illustration of a typical full containment tank is presented in **Figure 4**.

Upon the commissioning of the proposed refrigerated storage tanks, the daily throughput will propose to increase from 250 tonnes to over 500 tonnes to meet the demand of the total consumption of Hong Kong for any contingencies as a consequence of shortage in energy supply.

In addition to building two refrigerated tanks at D20 and D30, minor land-based piping works, and upgrading of ancillary facilities for gas distribution, installation of loading facilities at the existing jetty and the additional mixing and pre-heating plants will have to be undertaken. No civil works is expected for the existing jetty.

1.3. NAME OF PROJECT PROPONENT

Mr. Tsui Tso See, Director of Oil Terminal
China Resources Petrochems (Group) Co Ltd
CRC Oil Terminal
53-67 Tsing Yi Road
Tsing Yi Island, N.T,
Hong Kong
Tel: 2436 3690
Fax: 2436 3717

1.4. LOCATION AND SCALE OF PROJECT AND HISTORY OF SITE

The proposed project location will occupy an area of 9,100 sq m on the west end area, previously reserved for lubricating oil manufacturing as CRC Phase IV Development Site (D20 and D30), in the existing CRC Oil Terminal.

The subject site is currently designated under the Outline Zoning Plan for Industrial Use under the Draft Tsing Yi Outline Zoning Plan (OZP number S/TY/20, dated 15 October 2004) for the development of dockyards, boatyards and oil storage, that require direct marine access.

In this Project, two full containment tanks for holding propane and butane are proposed for construction subject to further detailed design to be conducted. The Project will also involve minor land-based piping works, installation and upgrading of the following ancillary facilities.

- Heat exchange components;
- Boil Off Gas (BOG) compressors and condensers;
- Refrigerated gas loading pumps and unloading arm;
- Vapour return blowers and return line; and
- A smokeless, sightless Ground Thermal Combustor.

The preliminary layout of the refrigerated storage facilities is illustrated in **Figure 5**, subject to further detailed design to be conducted.

While no civil works to the existing jetty are anticipated, there will be minor E&M works for installing the loading facilities required for the storage facilities.

1.5. NUMBER OF TYPES OF DESIGNATED PROJECTS TO BE COVERED BY THE PROJECT PROFILE

Only one Designated Project is covered in this Project Profile.

In accordance with Item L.1 in Part 1 of Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (Cap. 499), this project is a Designated Project as it involves “a storage, transfer and trans-shipment of liquefied petroleum gas facility with a storage capacity of not less than 200 tonnes”.

With respect to the EIAO-TM, a Hazard Assessment (HA) will also need to be conducted as part of an EIA study as risk to life is a key issue for the proposed Project.

1.6. NAME AND TELEPHONE NUMBER OF CONTACT PERSON

Mr. Tsui Tso See, Director of Oil Terminal	Tel: 2436 3690
China Resources Petrochems (Group) Co Ltd	Fax: 2436 3717
CRC Oil Terminal	
53-67 Tsing Yi Road	
Tsing Yi Island, N.T.	
Hong Kong	

2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1. RESPONSIBILITIES OF PARTIES

China Resources Petrochems (Group) Co. Ltd. (CRPC) is the Project Proponent with overall responsibility for the planning, design, construction and operation of the Project. An engineering consultant will be appointed by the Project Proponent to undertake the engineering design work, and an environmental consultant to conduct an EIA Study. The Project will be implemented at stages by Contractor(s) to be appointed by the Project Proponent.

2.2. PROJECT TIME TABLE

Construction is scheduled to begin in 2006 for completion in 2008.

2.3. INTERACTIONS WITH OTHER PROJECTS

There are no other projects likely to interact with this Project.

3. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

3.1. Land Environment

The subject site is located within the existing CRC Oil Terminal on Tsing Yi Island and is reserved previously for CRPC's Phase IV extension for the manufacturing lubricating oil. According to the Tsing Yi OZP No. S/TY/20, the proposed project area is designated for industrial use. Current developments in proximity to the project site include oil terminals, dockyards, as well as a chemical waste treatment centre.

The nearest potential environmental sensitive receivers comprise factories, an educational institute as well as a private housing development located at a distance of 1.3km.

4. POSSIBLE IMPACT ON THE ENVIRONMENT

4.1. General

A Preliminary Environmental Review and Preliminary Risk Assessment have been conducted for the proposed Project. Subject to detailed design of the liquefied gas storage tanks as well as further study to be conducted in the EIA stage, potential impacts on the environment as well as the associated risk arising from the activities during construction and operation of the Project have been identified and are outlined below.

4.2. Construction Phase

4.2.1. Air Quality

Construction dust impact could arise during the foundation works for the two storage tanks. Representative Air Sensitive Receivers (ASRs) within 500m of the Project limit have been identified according to the criteria set out in the Technical Memorandum on Environmental Impact Assessment Process (TM-EIA) and through site inspections. The two identified ASRs are namely, Tien Chu Industries Centre (ASR1) and Dow Chemical Works (ASR2) and their locations are shown in **Figure 6**.

In view that the Contractor shall strictly follow the mitigation measures stipulated in the Air Pollution Control (Construction Dust) Regulations of Air Pollution Control Ordinance (APCO), it is expected that no adverse air quality impact would be resulted.

4.2.2. Noise

The key potential construction noise impacts will be related to the noise generated from mobile plants engaged in tank erection and pipe laying works.

However, no Noise Sensitive Receivers (NSRs) are identified within 300m of the proposed site. The closest NSRs located about 1.3km away to the northeast, include an education institution (NSR1) and a residential development (NSR2). In view of the remote location of NSRs, no adverse construction noise impact is expected. Locations of the NSRs are shown in **Figure 6**.

4.2.3. Water Quality

Possible impacts on water quality are construction runoff to the marine environment. Based on the fact that all construction works would be land-based, on an existing piece of land, and

no civil works is expected on jetty, thus direct impacts on marine water quality is not anticipated.

The potential impacts could be controlled and reduced through effective mitigation measures on-site to within acceptable levels.

4.2.4. Waste

During the construction period, this Project will involved the demolition of a 4-storey old office building as well as relocation of the LPG cylinder filling plant and 4 bulk LPG lorry loading bays, it is expected that there will be limited amount of construction and demolition material (C&DM) generated. This material may include debris and rubbles from demolition works; wood from formwork and falsework; material and equipment wrapping; unusable/surplus concrete/grouting mixes; and damaged/contaminated/surplus construction materials.

The contractor and waste collector will follow the general practices for the collection and management of waste within the Project site and the transportation and disposal of waste to landfill/public fill in accordance with the Waste Disposal Ordinance.

4.2.5. Ecology

There are no significant marine ecological resources identified in the proximity to the Tsing Yi Island. This Project is thus not considered to present any adverse ecological impacts.

4.2.6. Hazard to Life

A preliminary risk assessment has been conducted to investigate the additional risk impacts arising from the proposed refrigerated storage facilities as well as the associated risk level against the current level.

Two scenarios and the associated level of risk are determined, as tabulated in **Table 4.1**, for the construction phase of the proposed land-based LPG refrigerated storage facilities.

Table 4.1 Preliminary Risk Assessment for Construction Phase

Potential Event	⁺ Frequency	⁺⁺ Consequences	Risk
(1) Accidental release of flammable material in CRC Oil/ LPG Terminal as a result of construction activities	2	C	High
(2) Accidental release of flammable material in ExxonMobil East Terminal as a result of construction activities	1	C	Medium

⁺ Frequency is ranked from 1 to 3

⁺⁺ Consequence is ranked from A to C

Potential Event (1)

In accordance with the above table, the risk associated with accidental release of flammable material during construction phase is “high” as the construction activities may lead to the following undesirable events.

- Damaging of the nearby LPG and hydrocarbon facilities arising from the collapse of tall structure, such as crane;
- Damaging of the nearby LPG and hydrocarbon facilities arising from works-induced ground movement or landslide;
- Release of hydrocarbon into the atmosphere from broken pipelines as a consequence from works-induced vibration; and
- Collision of heavy vehicles associated with the construction works with the nearby LPG and hydrocarbon facilities.

Potential Event (2)

In view of the separation distance between the proposed sites and ExxonMobil East Terminal, it is unlikely that the collapse of tall structure and heavy vehicle activity at the project site would affect the facilities in ExxonMobil East Terminal. Thereby, a “medium” risk level is assigned for the accidental release of flammable material to the ExxonMobil East Terminal.

4.3. Operational Phase

4.3.1. Air Quality

Subject to detailed design to be conducted, the proposed refrigerated storage tanks are of full containment type with the most advanced technology currently available. The construction and operation of the proposed storage tanks will strictly follow the requirements of relevant international standards. Hence, no emission of volatile hydrocarbons to the atmosphere is expected.

During the normal operation of the refrigerated tanks, the operating pressure within the tank is maintained both by the boil-off compressor and gas/liquid supply. In case when the pressure increases to a value above the normal operating level, the gas will be released to the thermal combustor. There will thus be potential impact from the emission of the gas from the thermal combustor.

However, given the fact that both propane and butane are light hydrocarbons with high-energy efficiency and are well known as a clean fuel, no residue of propane and butane is expected from the thermal combustor. Routine monitoring of air emitted from the thermal combustor will be conducted, if necessary.

4.3.2. Noise

The major noise generating equipment associated with the Project, including compressors and pumps. As there are no NSRs within the 1.3km circle, no adverse operation noise impact is expected.

4.3.3. Water Quality

As no discharge to the marine environment is anticipated from the proposed project, no adverse operation marine water impact is expected.

4.3.4. Hazard to Life

The risk associated with a number of events arising from the operation phase of the proposed refrigerated storage facilities is preliminary assigned and depicted in **Table 4.2**.

Table 4.2 Preliminary Risk Assessment for Operation Phase

Potential Event	⁺ Frequency	⁺⁺ Consequences	Risk
(3 Liquefied propane and butane ship accidents along the shipping channel	1	C	Medium
(4 Accidental release of LPG from the proposed LPG refrigerated storage facilities	2	C	High
(5 Hazard interaction between CRC Oil Terminal and ExxonMobil East Terminal	1	C	Medium
(6 Road tanker accidents during transportation	1	B	Low

⁺ Frequency is ranked from 1 to 3

⁺⁺ Consequence is ranked from A to C

Potential Event (3)

At present, the number of LPG pressurized vessel visit to CRC Oil/LPG Terminal is approximately 90 per year. The corresponding visit number of these vessels will reach 170 for daily LPG throughput of over 500 tonnes. The ship frequency doubles and thus the associated ship accident risk.

By having a larger refrigerated type storage capacity at CRC Oil Terminal on Tsing Yi Island, it is possible that the number of vessel visits could significantly be reduced to approximately 10-20 visits/year. However, the consequence impact may increase as a result of deploying larger vessels. In this connection, a “medium” risk is assigned.

Potential Event (4)

The risk of accidental release of LPG from the addition of the proposed refrigerated storage facilities is assessed to be “high” as an increased risk of a major fire or an explosion event on-site may result from the following undesirable events.

- Leakage or spontaneous failure of refrigerated storage facilities;
- Accidents arising from process and delivery failure;
- External events such as external fire, collision, vibration and natural disaster, etc

With the incorporation of appropriate risk mitigation measures (details provided in Section 5), it is believed that the risk could be lowered from “high” to “medium” and in compliance with the Hong Kong Risk Criteria.

Potential Event (5)

As the CRC Oil Terminal and ExxonMobil East Terminal are located adjacent to each other without any set back distance in between, any accidental events arising from either one of the PHIs may impact the other.

Based on the potential hazards associated with liquid hydrocarbon and LPG, it is estimated that the following undesirable events may encroach the boundary between the two PHIs.

- Jet flame from a large leak or rupture scenario;
- Fireball from an instantaneous release; or
- Explosion causing overpressure or flying fragments

In view that both PHIs are involved in storing and handling of dangerous goods, the initial events would have a more extensive effect than the subsequent events. Hence, the increase in risk resulting from hazard escalation is negligible and a risk level of “medium” is given.

Potential Event (6)

The risk associated with LPG road tanker is assessed to be “low” as the drivers have undergone sufficient training. In addition, road accidents involving LPG road tankers are statistically rare.

As required under the Hong Kong regulatory requirements, a Quantitative Risk Assessment will be carried out during the EIA stage to ensure the potential risks of constructing and operating the proposed liquefied gas storage facility and its associated facilities are considered and fall under the levels stipulated in the Hong Kong Government Risk Guidelines.

5. ENVIRONMENTAL PROTECTION MEASURES TO BE INCORPORATED IN THE DESIGN AND ANY FURTHER ENVIRONMENTAL IMPLICATIONS

5.1. Mitigation Measures during Construction Phase

5.1.1. Air Pollution Control Measures

Any works that involve the handling of dusty materials are regulated under the Air Pollution Control (Construction Dust) Regulations and it is a requirement of the Contractor to observe and implement. In accordance with the requirements of the regulations, sufficient dust control / mitigation measures shall be implemented by the Contractor.

5.1.2. Water Pollution Control Measures

The Contractor shall fully comply with the requirements of the WPCO and its relevant regulations. The guidelines for handling and disposal of construction site discharges as detailed in EPD's Professional Persons Environmental Consultative Committee Practice Note (ProPECC PN) 1/94 "Construction Site Drainage" should be followed.

In general, the Contractor should ensure that all runoff arising from the works area are properly treated, e.g. by the used of sedimentation tank or silt trap, up to the discharge standards as stipulated by the technical memorandum made under the WPCO.

5.2. Mitigation Measures during Operational Phase

5.2.1. Hazard to Life

Amongst the six hazardous scenarios identified in the preliminary risk assessment, two of them impose "High" risk to the population in proximity to the CRC Oil Terminal, while the remaining are rated as either "Medium" or "Low".

To reduce the risks associated with the proposed refrigerated storage facilities, the following (but not limited to) risk mitigation measures are recommended.

- The Project Proponent should implement a Quality Assurance Plan to ensure the integrity of its facilities for their design life period. Verification, if necessary, from a reputable third party should be considered to ensure all integrity and safety issues related to this extension project have been fully taken care of;
- In order to maintain the risk at an As Low As Reasonably Practicable (ALARP) or lower level, it is essential that the proposed safety measures for the refrigerated storage facilities, particularly the detection system, isolation system, and fire fighting system etc., are properly maintained for the storage of LPG;
- Ensure the present Safety Management System (SMS) implemented at CRC Oil Terminal is properly revised and maintained to cater for the additional refrigerated storage systems.
- Review/update the existing off-site Emergency Response Planning (ERP) for CRC Oil Terminal. The off-site ERP should include involvement of the neighbouring commercial and industrial occupiers, and relevant government agencies. The Project Proponent should immediately notify the neighbours and governmental emergency agency, e.g. Fire Services Department, in order to evacuate the people at the surrounding if there is an event occurs beyond control.
- Once the proposed refrigerated storage facilities are commissioned, the Project Proponent should ensure the following measures are implemented properly in order to negate significant risk increment to the surroundings:
 - (1) To reduce the total stock capacity of existing three LPG pressurised vessels; and
 - (2) To limit the number of pressurised LPG ship visits.
- The Project Proponent should ensure that the operators for the proposed refrigerated storage facilities, particularly those responsible for daily maintenance and inspection,

should undergo appropriate and adequate trainings, as they may be exposed to frostbite hazards.

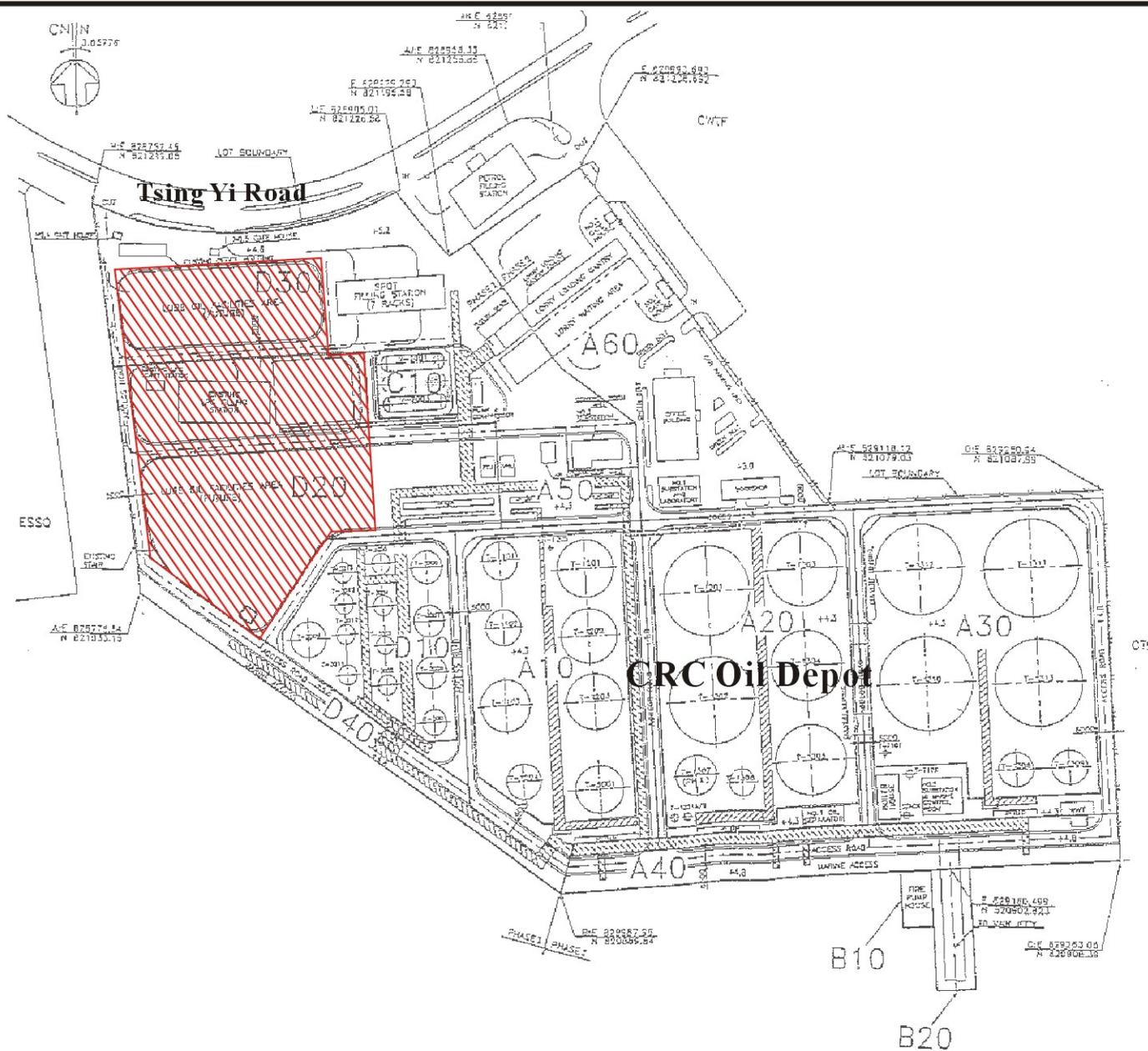
- The Project Proponent should select reputable contractor(s) to ensure all appropriate construction safety precautions as stipulated under the ordinance(s) are undertaken.
- A proper construction program should be developed and managed during construction phase in order to minimise any interruption to the normal operation of the CRC Oil Terminal. The potential hazards arising from the collapse of tall structure, vibration, ground movement/landslide, and heavy vehicle movement within the Project site etc. should also be addressed in the construction program.
- As required under the Hong Kong regulatory requirements, a Quantitative Risk Assessment will be carried out during the EIA stage to ensure the potential risks of constructing and operating the proposed liquefied gas storage facility and its associated facilities are considered and fall under the levels stipulated in the Hong Kong Government Risk Guidelines.

5.3. Possible Severity, Distribution and Duration of Environmental Effects

With the implementation of appropriate mitigation measures, no insurmountable environmental impacts are expected subject to detailed design of the proposed refrigerated storage tank as well as further analysis under the EIAO process.

6. USE OF PREVIOUSLY APPROVED EIA REPORTS

Previous pre-EIA report entitled “Operational Phase Key Issues Assessment of CRPC South East Tsing Yi Petroleum Terminal, Tsing Yi Island, Hong Kong” completed in 1993 will be used as reference.



Legend

 Project Area



China Resources Petrochems (Group) Co., Ltd.
 Proposed Development Phase IV at CRC Oil Terminal, Tsing Yi - Refrigerated Storage Tanks for Liquefied Gas

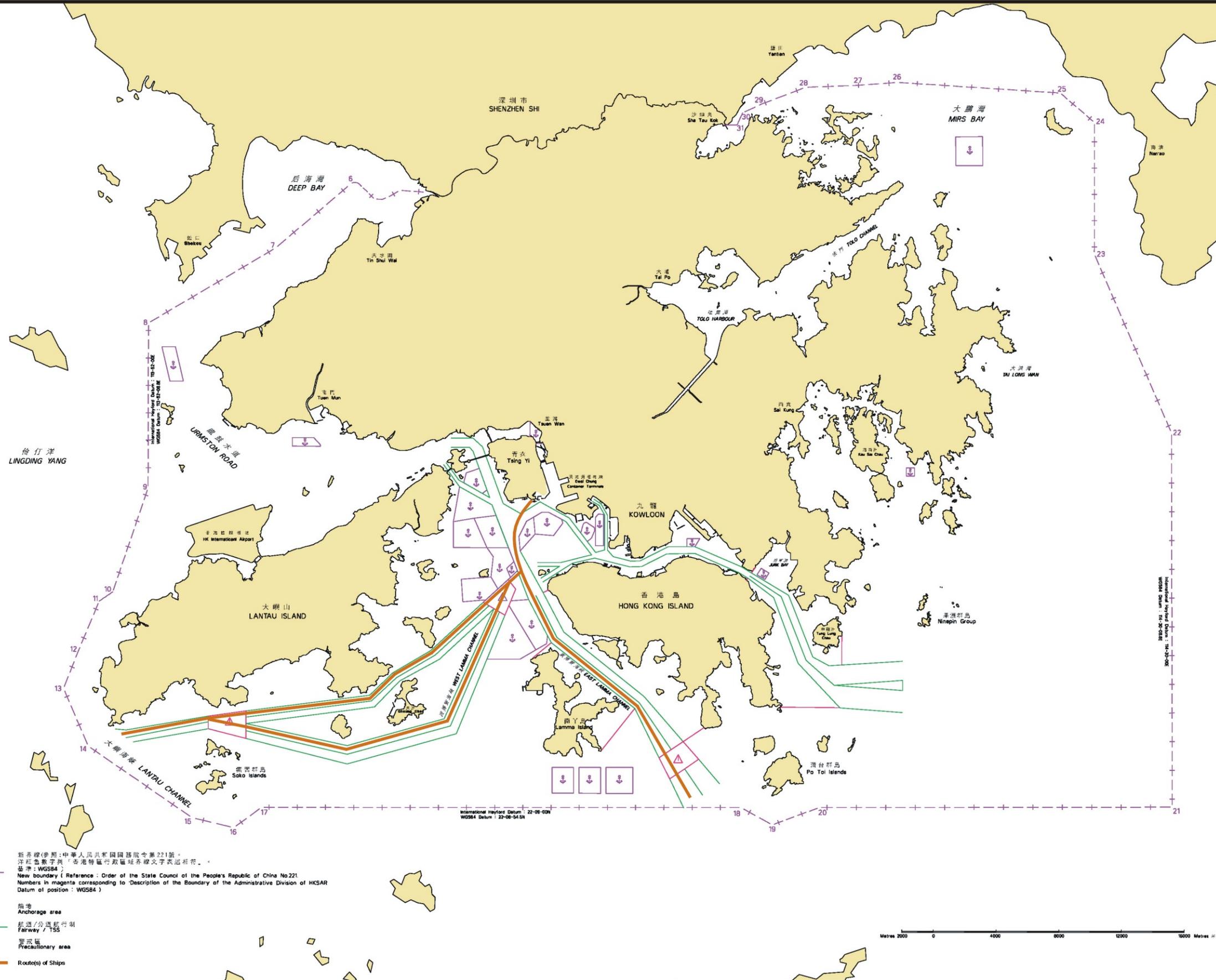
Location of the Proposed Site

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Drawn	CLWY	Checked	HTHL
Scale	NTS	Date	Jun 05
		Date	Jun 05
		Status	Draft
		Approved	AC

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Figure 2 Liquefied gas carrier for transportation of liquefied gas



圖例
Legend

- New boundary (Reference: Order of the State Council of the People's Republic of China No.221. Numbers in magenta corresponding to 'Description of the Boundary of the Administrative Division of HKSAR Datum of position: WGS84')
- Anchorage area
- Fairway / 公海航行制
- Precautionary area
- Route(s) of Ships



Proposed Development Phase IV at CRC Oil Terminal, Tsing Yi - Refrigerated Storage Tanks for Liquefied Gas

Route(s) of Ships to CRC Tsing Yi Oil Terminal

Drawing No.	3		
Drawn CLWY	Checked HTHL	Approved CPSJ	
Scale	Date Jun 05	Date Jun 05	
	Status Draft		

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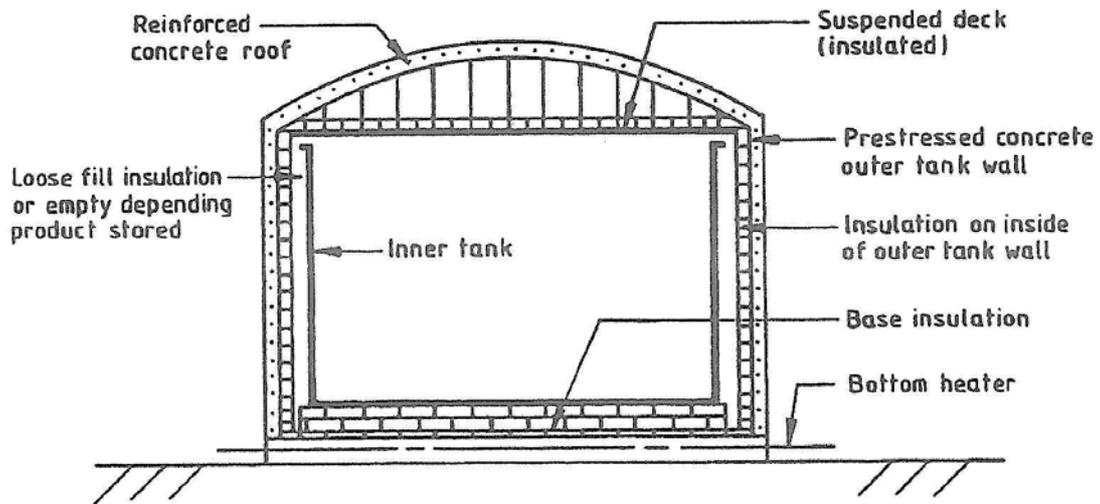
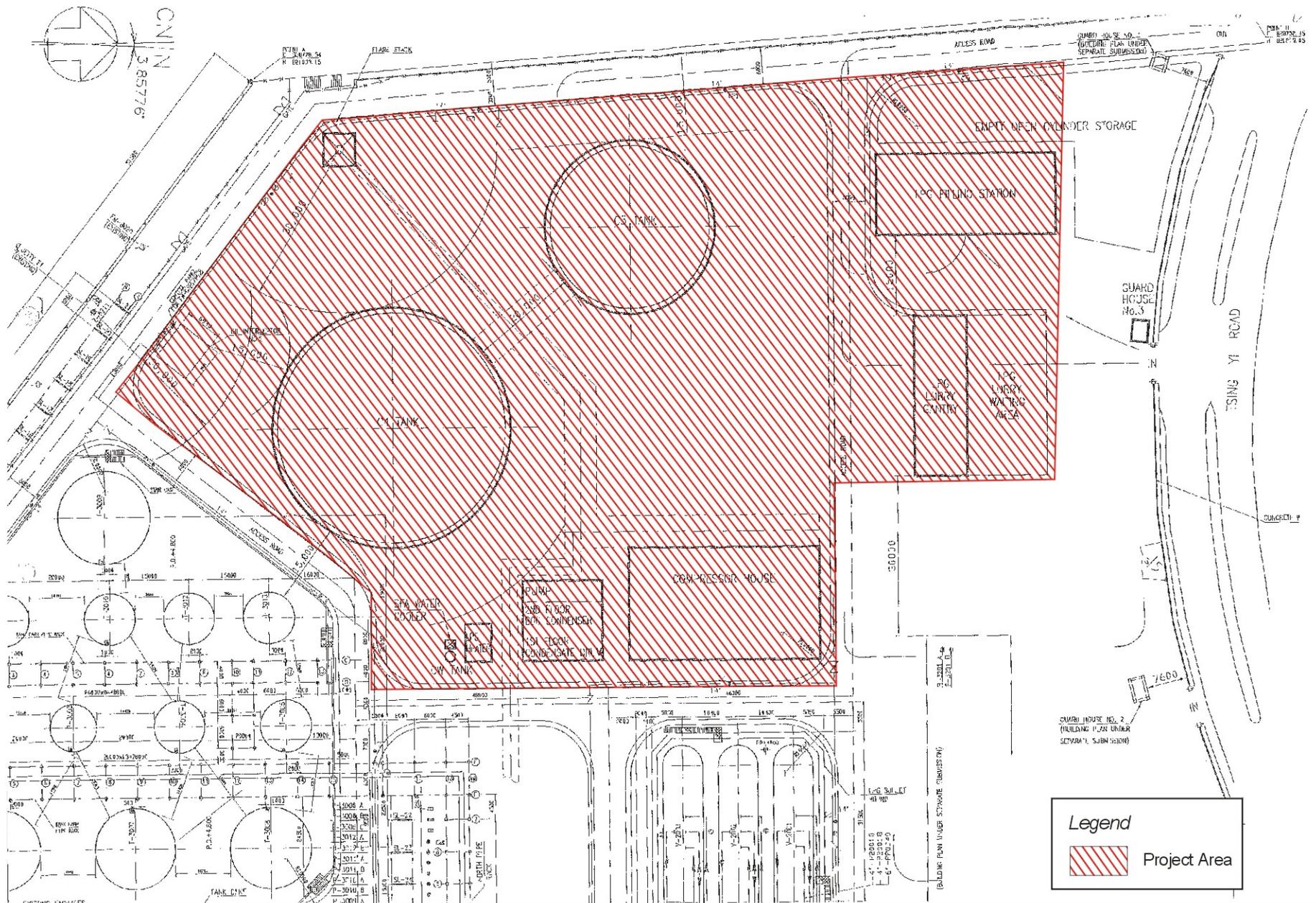


Figure 4 Schematic diagram of a full containment type liquefied gas storage tank

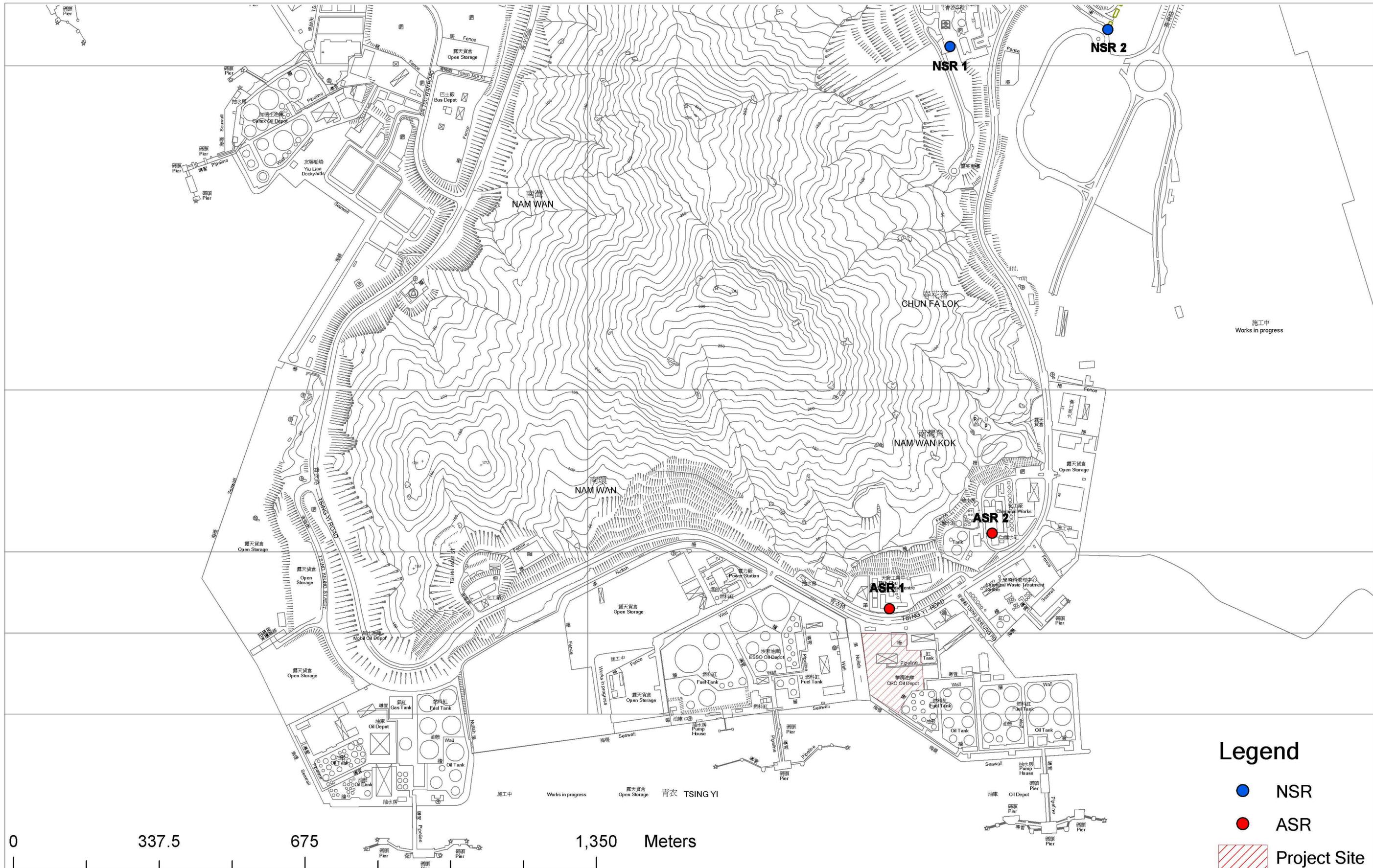


Proposed Development Phase IV at
CRC Oil Terminal, Tsing Yi - Refrigerated
Storage Tanks for Liquefied Gas

Preliminary Layout Plan of the Refrigerated Storage Facilities

Drawing No.	5		
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Scale	NTS	Date	Jun 05
		Date	Jun 05
		Status	Draft
		Approved	AC

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Legend

- NSR
- ASR
- Project Site

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 Proposed Development Phase IV at
 CRC Oil Terminal, Tsing Yi - Refrigerated
 Storage Tanks for Liquefied Gas

**Location of
 Sensitive Receivers**

Drawing No. 圖則編號	6	
Drawn 設計	Checked 複核	Approved 批准
HTHL	HTHL	AC
Scale 比例	Date 日期	Date 日期
1:7,000	Jun 2005	Jun 2005
Status 現況	Draft	

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