Territory Development Department Hong Kong 拓展署
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WEST KOWLOON RECLAMATION

COMPREHENSIVE TRAFFIC ANALYSIS REVIEW &

ENVIRONMENTAL IMPACT ASSESSMENT

EIA - EXECUTIVE SUMMARY

September 1997

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EIA-125.1/BC

EIA-125.1/BC

Environmental Impact Assessment [EIA]
Executive Summary

Table of Contents

LISTS OF FIGURES

1. INTRODUCTION

Need for the study

Since the completion of the West Kowloon Reclamation Planning and Urban Design Study (WKRPUDS) in 1992, numerous proposals have been put forward to deal with increasing housing demand, Kowloon Station Comprehensive Development Area(CDA), Tak Kok Tsui Station CDA, the West Kowloon Passenger Terminus, the Port Rail Terminus and Cheung Sha Wan Wholesale Market (CSWWM) Phase II. These proposals would have generated traffic and environmental constraints on the overall planning framework for WKR. It was essential therefore to conduct a comprehensive traffic and environmental assessment to investigate the impacts and to determine the necessary mitigation measures.

TDD commissioned the EIA of all aspects of the proposed developments on the study area which comprised newly formed land on the West Kowloon Peninsula. Particularly important is its role as a transport corridor through Kowloon and accommodating the West Kowloon Expressway (WKE), the Lantau and Airport Railway (LAR) and the Western Corridor Railway. Consequently, identifying potential solution spaces to accommodate additional population was complicated by potential transport/residential interfacing. The study area was also constrained environmentally due to:

- a range of new and relocated marine uses;
- the Cheung Sha Wan Wholesale Market;
- interface with some of the world's most densely populated urban areas;
- the proposed West Kowloon Passenger Terminal MTR stations and Port Rail Terminal; and
- major expansion of the road network in Kowloon.

The above have a major potential impact in terms of noise and air quality and impose significant development constraints particularly in relation to meeting environmental guidelines for residential areas. The EIA considered both imminent construction impacts, construction phasing and the long term cumulative impacts of operational phases after construction.

Other aspects considered a waste management strategy, focusing in particular on site developments such as Cheung Sha Wan Wholesale Market, water quality impacts of any site construction activities and environmental monitoring and audit schedules for construction.

Project Description

The planning stage of the study identifies four areas having the potential for intensification of residential developments.(see Fig. 1) The locations are:

- Tsim Sha Tsui West (see Fig. 2)
- Mong Kok West (see Fig. 3)
- Tak Kok Tsui West (see Fig. 4)
- Yen Chow Street (see Fig. 5)

The EIA investigates environmental feasibility of all sensitive uses in the WKR and recommends any necessary mitigation for each site. The study also examined the environmental implications of siting the Port Rail Terminal(see Fig. 6) next to CT8.

The Study Process

The development of the Outline Development Plan (ODP) and its associated infrastructure, landscape and other proposals was undertaken through a multi-disciplinary, iterative design process which has gradually merged such principal planning concerns as land use, development density, urban form and landscape design, with parallel considerations of environmental quality, traffic and transportation requirements, and ultimately with infrastructure/utilities provision.

WKR will be dominated by major new transport infrastructure, much of which is already under construction and therefore imposes fixed constraints. WKE runs elevated for most of the length of the reclamation as a dual 3-lane road, with major interchanges at Yau Ma Tei and Lai Wan. Underneath the WKE are the tracks for the LAR services and flanking these are the split carriageways of Road P1, the major north-south primary distributor road throughout WKR and itself a high standard road of between two and four lanes in each direction.

The main environmental interface problems are results of the extensive network of infrastructure (road and rail) links currently being developed in the study area. The fixed elements of the current road and rail contracts are the constraints requiring significant environmental setbacks to achieve compliance with HKPSG criteria. The extent of direct noise mitigation measures (barriers and low noise road surfacing) is also fixed in these road contracts. The possibility of the impingement of both traffic and local industry on air quality around some areas has also arisen as a constraint.

Opportunities for intensification of residential development have as a result been focused on areas which were more distant from noise and pollutant emission sources, whilst rezoning has been seen as advantageous where non-sensitive uses could be re-deployed so as to provide buffers or barriers to noise and emission, particularly from traffic.

Given the relatively low plot ratios applied in WKRPUDS, almost all sites currently zoned residential have the potential to accommodate higher levels of population. Exceptions to this are the MTRC Tai Kok Tsui CDA Sites B and C, which are understood to be at an advanced stage in the property tendering process. The resulting opportunity sites are the Kowloon Station CDA, the West Kowloon

Passenger Terminal, the Mongkok West Public Housing, the Sandwich Class Housing project, the waterfront private residential area the Cheung Sha Wan West Public Housing Estate.

2. KEY ISSUES

2.1. AIR QUALITY

2.1.1. Background

In the vicinity of WKR there are numerous chimneys to the north and to the east. Air quality impacts are dominated by these chimneys and by vehicular emissions from roads all over the reclamation. In addition, the dust levels in the vicinity are aggravated by the construction activities nearby and on the reclamation itself. The container terminals, shipyards, CSWWM and CRC godown / container handling yard are potential nuisances, but are generally located away from sensitive receivers (SRs).

An assessment of air quality over the WKR site has been undertaken using the known industrial emissions and motor vehicle data to determine whether the air quality in the vicinity of developments will meet Air Quality Objectives (AQO's) for NO_2 and SO_2.

Atmospheric emissions from traffic flows predicted in 2011 were assessed by using a computer model. Although individual vehicle emissions would be higher in 2006, the increase of traffic flows in 2011 would lead to greater overall emissions. The AM traffic flows have a greater proportion of diesel fuelled vehicles and checks showed that a emission from the 2011 AM traffic would represent the worst possible scenario. 2011 was deemed the most appropriate year to model to assess the worst possible case.

The modelling results illustrate concentrations are not sufficient to bring about any exceedance of the AQOs near the SRs but there are exceedances of the AQOs with respect to NO_2 very near the main roads at ground level and in the vicinity of the Central Kowloon Route ventilation stack.

Key Areas

2.1.2. Tsim Sha Tsui West

Exceedances of AQO of hourly average NO_2 of 300 $\mu g/m^3$ due to traffic on nearby roads are not anticipated at any level of the developments intended for residential use or the school site. There are high concentrations of NO_2 at the main roads but traffic emissions do not present a constraint to the development sites in the vicinity of WKE, P1 or D1 in the Tsim Sha Tsui West Area. Likewise the school sites to the south do not experience air quality exceeding the AQO criterion. Nevertheless in order to obtain air least affected by traffic emissions it is recommended that the A/C intakes for air conditioned buildings be located away from main roads or above podium level for optimum air quality.

Moderate traffic intensity and the adequate provision of breezeways is advantageous and detailed modelling indicated that AQOs will not be exceeded by traffic emissions at the facades of the residential developments. Industrial sources are too far from the area to be a significant impact. Industrial and traffic emissions and are not predicted to exceed the AQOs at any of the air quality SRs.

Port Rail Terminal and Mei Foo

The main air pollutants resulting from the operation of the Port Rail Terminal (PRT) will come from the mechanical equipment, shunting locomotives and tractors, however, the emissions will be small in comparison to the emissions from traffic moving on roads nearer the air quality SRs.

Tractors moving containers will be spread out over the freight handling areas of the PRT. Emissions will therefore be effectively dispersed. In addition, the separation of the receivers such as at Mei Foo will allow sufficient dilution of diesel emissions as not to be detectable.

Modelling of Respirable Suspended Particulate (RSP) shows the predicted RSP concentrations from traffic emissions at the SRs are not likely to exceed 50% of the AQO at any site.

Emissions from traffic associated with the PRT will be distant from Mei Foo Sun Chuen due to the 150m wide environmental set back.

Exceedances of AQO of hourly average NO_2 of 300 $\mu g/m^3$ are not predicted at any level of the reclamation developments intended for residential use. There are high concentration of NO_2 at the main roads but predicted air quality deterioration due to traffic fumes does not present a major constraint to the developments in the area.

The traffic circulating in the area does not exceed the AQO and the recommended course of action is for the ongoing Central Kowloon Route Study to identify technical modifications to the ventilation of the tunnel sections such that the amount and concentration of fumes ventilated from the stack is decreased.

Due to the scale, distance and low intensity of existing industrial emissions to the east and unlikely inclusion of heavy fuel burning industry in the vicinity, industrial emission modelling indicates that air quality near air quality SRs in this area will not be seriously affected by industrial sources. Modelling has indicated that whereas there may be some minor exceedances of AQOs at ground level near the major highways, the AQOs will not be exceeded at any of the residential developments or schools.

Tai Kok Tsui

Exceedances of AQO of hourly average NO_2 of 300 $\mu g/m^3$ are not anticipated at any level of the developments intended for residential use. However the indoor recreational centre is overlapped by the 300 $\mu g/m^3$ contour. In order to introduce a safety margin it is recommended that the A/C intakes be located at or above 20m

above ground level as far from P1 as possible. The school sites are not predicted to experience air quality which exceeds the AQO.

Yen Chow Street

Housing is not located close to WKE consequently traffic noise and vehicle emissions are not as intrusive as for other study areas. Air quality will not exceed AQOs at the residential developments or schools. Recommendations are made to locate the A/C intakes for the Indoor Amenity Centre are as far from the WKE/P1 interface as possible and above 25 mPD in order to assure compliance with the HKPSG.

The worst air quality occurs nearest to the WKE. Exceedances of AQO of hourly average NO_2 of 300 $\mu g/m^3$ are anticipated at ground level close to the WKC and WKE but exceedances are not anticipated at any level above 10 m for the air quality SRs. The AQO is exceeded at up to 10 m at the sampling point.

In order to introduce a safety margin it is recommended that the A/C intakes for commercial developments be located at or above 20m above ground level and as far away from the roads as possible. The school sites do not experience air quality which exceeds the AQO.

There are high concentrations of NO_2 at the main roads WKE, P1, D2, WKC, D5 and D6 but these do not exceed the AQO over the sites. The constraint is not so severe as to prevent development in reasonable proximity to these roads.

Industrial sources in Lai Chi Kok/Cheung Sha Wan have been modelled and do not present any constraint to this area. Modelling indicates that no exceedance of the AQOs is anticipated at heights up to 105 mPD. A small area of the former shipyard site will require careful location of air conditioning intakes and is therefore constrained but not so as to prevent development. Detailed air quality modelling for traffic emissions in this area did not indicate any significant impact.

2.1.3. Recommended Mitigation

The impacts from industrial sources are limited to the I/O sites on the former shipyards at Cheung Sha Wan. Whereas no severe exceedance of the AQOs is anticipated it is recommended that central air conditioning be introduced for these developments and that the intakes be located between 20m and 50m or above 90m and away from the north east corners of the site and as far away from the busy Lai Chi Kok Road as possible.

The options for mitigating the impact of air quality from roadside traffic emissions on the developments have been included by careful location for the sensitive blocks in all the new developments. None of the existing developments experiences adverse air quality. Whereas it is not strictly required, as a mitigation measure to achieve the AQO, it is prudent and good practice to locate A/C intakes as far from the main roads as possible. This applies to schools, commercial blocks and GI/C facilities, so as to obtain the best quality air in the vicinity.

The ventilation stack for the Central Kowloon Route (CKR) may require mitigation measures in detailed design stages since the current preliminary design, although not directly influencing development on the Sandwich Class Housing site, does have a potential cumulative effect with traffic emissions at street level. At present the cumulative vented and street emissions are not predicted to exceed the AQO. However this may require re-evaluation if the predicted traffic flows in the CKR are increased further.

2.2. NOISE

2.2.1. General

The purpose of the noise assessment is to evaluate the potential noise impacts on the existing and future developments at the operational phase and to recommend mitigation measures. Noise from road traffic is a key issue. Traffic noise impacts are assessed based on the revised traffic figures. Lantau Airport Railway (LAR) travelling though the WKR area have the potential to cause noise impacts. Whilst these impacts have been assessed in the LAR EIS and mitigation measures in the form of trackside barriers are recommended near Mei Foo and Nam Cheong Estate to meet the Noise Control Ordinance (NCO), rail noise from LAR is therefore presumed to be mitigated in this study. On West Corridor Railway (WCR), as no details except alignments are available at present, the study does not take as constraints.

Noise mitigation has been recommended in may areas from previous studies and may such measures are now in place, however there are limits to the feasibility of modifying or adding some types of mitigation. Mitigation measures are therefore chosen on a site specific basis due to local constraints.

2.2.2. Key Areas

Tsim Sha Tsui West

A reduced noise scheme, involving careful choice of podium design, some single aspect blocks (as proposed in the parallel planing study, WKRRDDP) and orientation of blocks away form major roads, showed that the HKPSG 70dB(A) L_{10} 1hr criterion can be achieved for all developments.

Mongkok West

Traffic noise mitigation form the Yau Ma Tei Interchange (YMTI) relies to some extent on the GI/C facilities. Traffic noise affecting the school sites is also potentially significant. The cruciform designs for the PSPS developments will require the use of acoustic windows and air conditioning to achieve the traffic noise criterion. The MTRC site B has minor exceedances. The recommendation is that the additional residential accommodation, in the north east of the area (9.14), is composed of reduced aspect buildings in line with the recommendations form the WKRRDDP parallel planing study. Non sensitive buildings are placed between the major noise sources (WKE,Pl,YMTI) in order to provide a barrier to the traffic noise.

Tai Kok Tsui West

Flow of traffic on D7 lead to some noise exceedance for the MTRC developments but not for the Tai Kok Tsui waterfront development proposed in this study. The water front development is protected by the non sensitive commercial uses fronting D7. Residential towers are also partially shielded form WKE by the sub-station and recreation centre. Schools have sensitive facades shielded form WKE and comply with HKPSG. In addition to potential traffic noise impacts, the location of the CRC site to the north may give rise to significant impacts particularly if night time operations are allowed. However at this stage CRC does not often operate at night and noise levels at such times are low. Nevertheless, such impacts will be controlled by the provisions of the Noise Control Ordinance.

Hing Wah Street/Yen Chow Street

The main traffic noise impacts on this study are emanate form the West Kowloon Corridor and Roads P1, D2, D5, D6 and D7. Iterative designs by Housing Authority progressively introduced on-site mitigation measures in the form of non sensitive single or reduced aspect buildings to control traffic noise impacts at the proposed residential sensitive receivers but residual impacts due to noise from the WKC remain. Noise can however be reduced to below the criteria if single aspect buildings are extended to form a barrier to noise from the WKC. Housing Authority have supported this type of development as it could potentially form another PSPS residential area.

Port Rail Terminal

The design of the PRT is yet to be finalised but the plan which the consultants have been required to include indicates environmental covers which will enclose the rail fan and sidings and reduce environmental impacts to an acceptable levels, particularly with respect to noise.

2.2.3. Recommended Mitigation

Direct noise mitigation measures such as barriers have been proposed in earlier studies and these are retained. Additional curbside barriers are not considered feasible by HyD on maintenance and safety grounds. Barriers at the boundaries of sites are not favoured on planing and urban design grounds. Although non sensitive uses in some locations are considered feasible. Both curbside barriers and barriers at the boundaries of sites would add little extra noise mitigation where high podia are used. Low noise road surfacing is laid and is included in the future specification for some roads in the vicinity of existing sensitive receivers. Also, HyD have instructed that further use of this type of surface is not to be recommended due to limited durability and performance. Traffic management schemes have been looked into but the options and effectiveness are very limited.

Other on-site mitigation measures proposed include the juxtaposition of noise non-sensitive buildings and the use of reduced and single aspect buildings. Non-sensitive buildings have been proposed as mitigation in earlier studies and in the current plans from Housing Authority. Reduced and single aspect buildings are also considered as an alternative to the use of indirect measures of air conditioning

and acoustic windows which may only be used as a last resort according to the HKPSG.

2.3. WATER QUALITY

Construction phases of development at the waterfront have the ability to produce very intrusive impacts, be they from construction runoff and drainage, workforce sewage arising or general construction work. Sites farther from the waterfront are less likely to impact on the marine water quality.

As with air and noise it is also difficult to predict the likely water quality impacts from all the construction activities. The major sources of potential water quality impacts will include:

- construction runoff and drainage
- general construction activities
- sewage from on-site construction workforce

All such activities will be controlled by the Water Pollution Control Ordinance (WPCO) in as much as they may give rise to site runoff. Discharge of liquid runoff from sites would need to comply with the requirements in the relevant Technical Memorandum for the Harbour Water Control Zone. Sewage arising would need to be directed to the nearest sewer and comply with the Standards for Effluents Discharged to Drainage and Sewerage Systems, Inland and Coastal Waters.

The main influence on water quality inshore near the reclamation is poor flushing capacity and very high pollution loading from sewage and industry in the hinterland. There is consequently difficulty in achieving the Water Quality Objectives for the Victoria Harbour Water Control Zone (VHWCZ) (Phase 1). Suspended solids, bacterial counts and nutrients are particularly high.

One outstanding issue is that of surface drainage. Potential impacts may arise from uncontrolled surface runoff which may entrain contamination from the paved areas of the sites. Potential sources of contamination include runoff from container de-stuffing, spillage of fuel or lubricating oils, container repair activities, spilt oil and diesel and general dust and debris.

The open nature of most of these sites makes the possibility of significant runoff likely and some of the runoff at least will be contaminated. Once contaminated by any site related activities this potentially contaminated runoff is also subject to control under the WPCO.

2.4. WASTE MANAGEMENT STRATEGY

A Waste Management Strategy based on quantitative assessment of waste generation from the WKR is proposed and options for waste handling, treatment,

and disposal locations have been developed in consultation with EPD, and AFD covering municipal waste, market, chemical and construction waste.

Wastes arising in WKR are recommended preferably to be exported from the area by sea either via the WKTS to landfill or by barge to Public Dump. If this is not possible, removal by road to the WKTS must be the option. Excavated sand fill should be incorporated in the adjacent reclamation (i.e. Kowloon Point) as far as possible so as to minimise the quantity of waste to be transported through the urban area for disposal.

The opportunity to incorporate integrated waste management facilities in the residential and commercial developments including refuse chambers and off street collection points will reduce the need for street level collection and sorting of refuse at RCPs. Dedicated waste disposal facilities will be required for the CSWWM. The key elements of waste management strategy for WKR include:

- Domestic waste is collected primarily by USD and disposed at the WKTS.
- Commercial and industrial wastes collected by the private sector are disposed of initially at WKTS and in later years increasingly diverted to SENT landfill.
- Waste from CSWWM disposed of at WKTS.
- Chemical wastes produced by industry and other activities disposed of at the CWTC on Tsing Yi.
- Sand excavated from major infrastructure projects such as the KCR to be stockpiled for re-use in Kowloon Point Reclamation or transferred to public dump; preferably by barge.
- Excavated materials and construction waste suitable for public dump to be transferred to public dump by barge.

Consideration should be given to provision of a centralised barge loading facility in Area 8 to facilitate transfer of suitable construction waste to public dump.

2.5. CONSTRUCTION IMPACTS, CONSTRUCTION PHASING AND ENVIRONMENTAL MONITORING & AUDIT

The construction phase of the development can produce the most intrusive impacts, be they from noise, dust, or atmospheric emissions from construction equipment. Although transient, these can cause disturbance to work, speech, leisure and sleep. However, because of the nature of the sources there is usually considerable scope for mitigating the impacts.

Development Phasing

The development phasing is critical to the extent and intensity of construction impacts. The development across WKR will be carried out in various phases by different authorities. Therefore at this stage it is envisaged that the individual development authorities, be they Housing Authority, Housing Society, MTRC,

KCRC or private developers will be able to use the manual as a reference document to determine the monitoring and audit requirements for each site if necessary.

2.6. ENVIRONMENTAL MONITORING & AUDITING [EM&A]

Monitoring can be most concisely defined as the systematic collection of data through a series of repetitive measurements. It involves the measurement of environmental parameters during project construction and the early period of operation, as well as the identification of any changes in these parameters which may be attributed to the project. The EM&A process ensures that proactive mitigation measures are adopted to avoid the occurrence of adverse environmental impacts.

For WKR it is anticipated that EM&A will be required with respect to potential dust, marine water quality and noise impacts for the development of some sites. The EM&A Manual has been prepared in liaison with EPD.

3. CONCLUSIONS AND RECOMMENDATIONS

Air: The modelling results indicate that predicted concentrations of SO_2 from industrial chimney stacks do not approach AQOs for any of the development areas on the WKR although concentration are slightly higher in the north-eastern area. At heights of 40m, 60m, 80m and 100m above the main study area and particularly above the residential study areas the concentrations of SO_2 are less than 15% of the hourly and daily AQOs.

The pollutants emitted from vehicle exhausts decrease with height and predicted concentrations of NO_2 and RSP are expected to be within AQOs throughout the residential developments not only in the residential areas where population increases are planned, but also at the other developments which are committed or planned.

The ventilation stack for the CKR has not arisen as problematical at this stage despite the revised traffic modelling which indicates substantial and significant increases in the traffic in the CKR tunnels. Detailed design will need to take account of the potential impacts predicted in this report and the EIA of the CKR

Mitigation essentially requires the correct positioning of buildings such that they will not suffer poor air quality exceeding the AQOs.

Noise: The combination of indirect and direct measures is in most cases sufficient to achieve compliance with the noise criteria at the majority of sensitive receivers. The mitigation measures such as the barriers and low noise road surface are included but opportunity to modify these measures is limited. Where residual impacts remain on a small percentage of receivers, acoustic windows and air conditioning are proposed as the last resort.

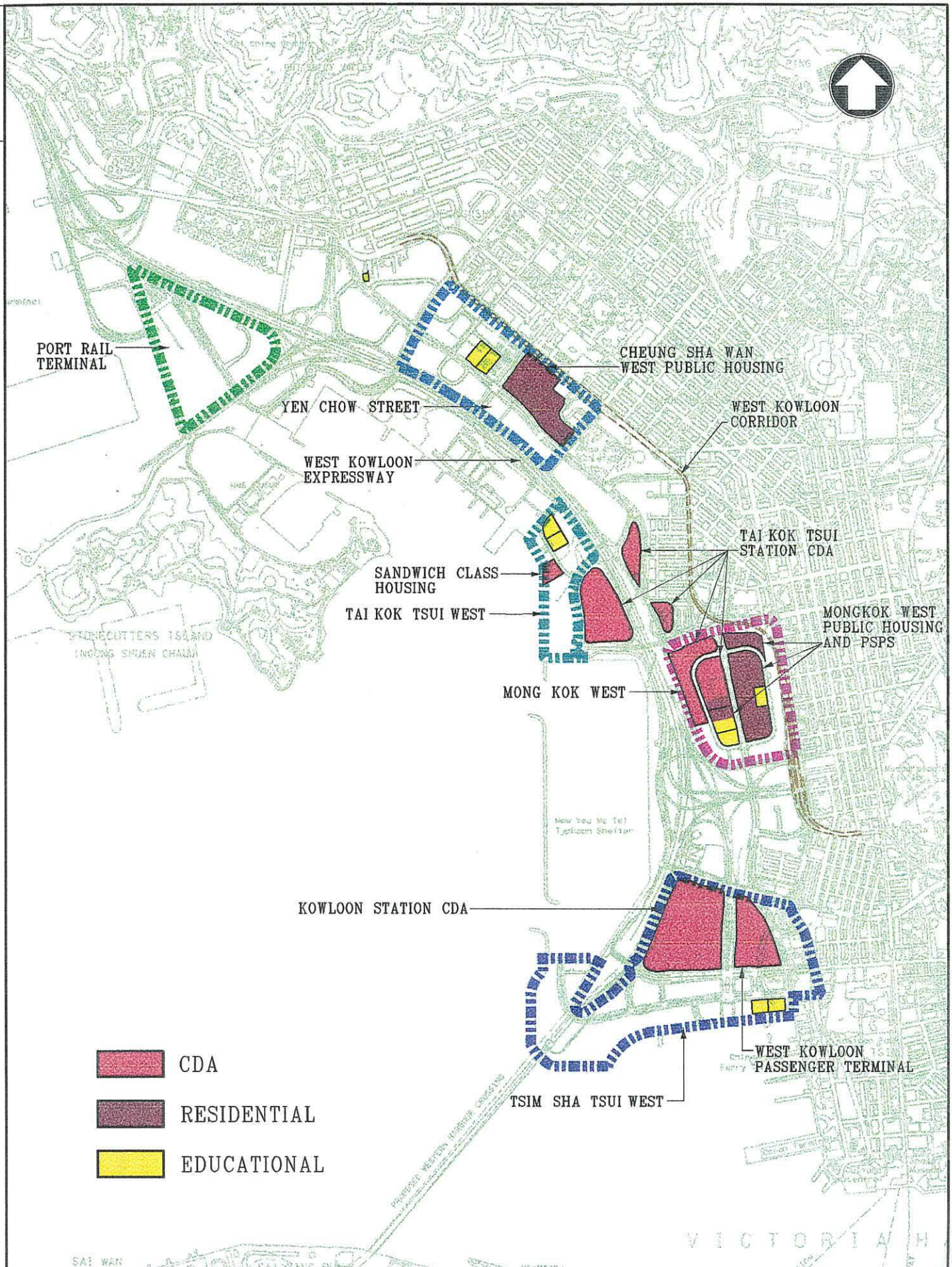
Water Quality: Water quality impacts have been assessed in comparison to the assessment made in the WKRPUDS study. The major improvement to the water quality in the West Kowloon area will be achieved by the completion of the works under the North West Kowloon Sewerage Master Plan. None of the modifications to land use propose any significant additional impact on water quality. In order to control the entrainment of oily or other site runoff from the port back up uses it is recommended that petrol interceptors be required on the drainage of the port back up sites. Control of any significant contaminated discharge from these sites would be achieved under the provisions of the WPCO.

Sites will require stormwater drainage and such drainage should be fitted with petrol interceptors to retain contamination on-site. Such interceptors will be required to be maintained and cleared by the operators. The contents of the interceptors should be disposed of as chemical waste.

Construction and Environmental Monitoring: Construction impacts have been evaluated and assumptions concerning the detailed methods of working have enabled assessment be carried out. Indicative figures regarding anticipated noise levels have been generated from generic plant inventories. Significant construction noise impacts are anticipated based on the preliminary phasing proposed . Recommendations on construction site mitigation, monitoring and audit as well as phasing are proposed to mitigate potential impacts.

A reference document for EM&A has been prepared for individual projects to adopt where necessary.

Cad Ref. FIG-02



acer Acer Consultants (Far East) Ltd.	AREA WITH POTENTIAL FOR INTENSIFICATION OF RESIDENTIAL DEVELOPMENT	TERRITORY DEVELOPMENT DEPARTMENT HONG KONG KOWLOON DEVELOPMENT OFFICE	Drg No.	Figure No. 1
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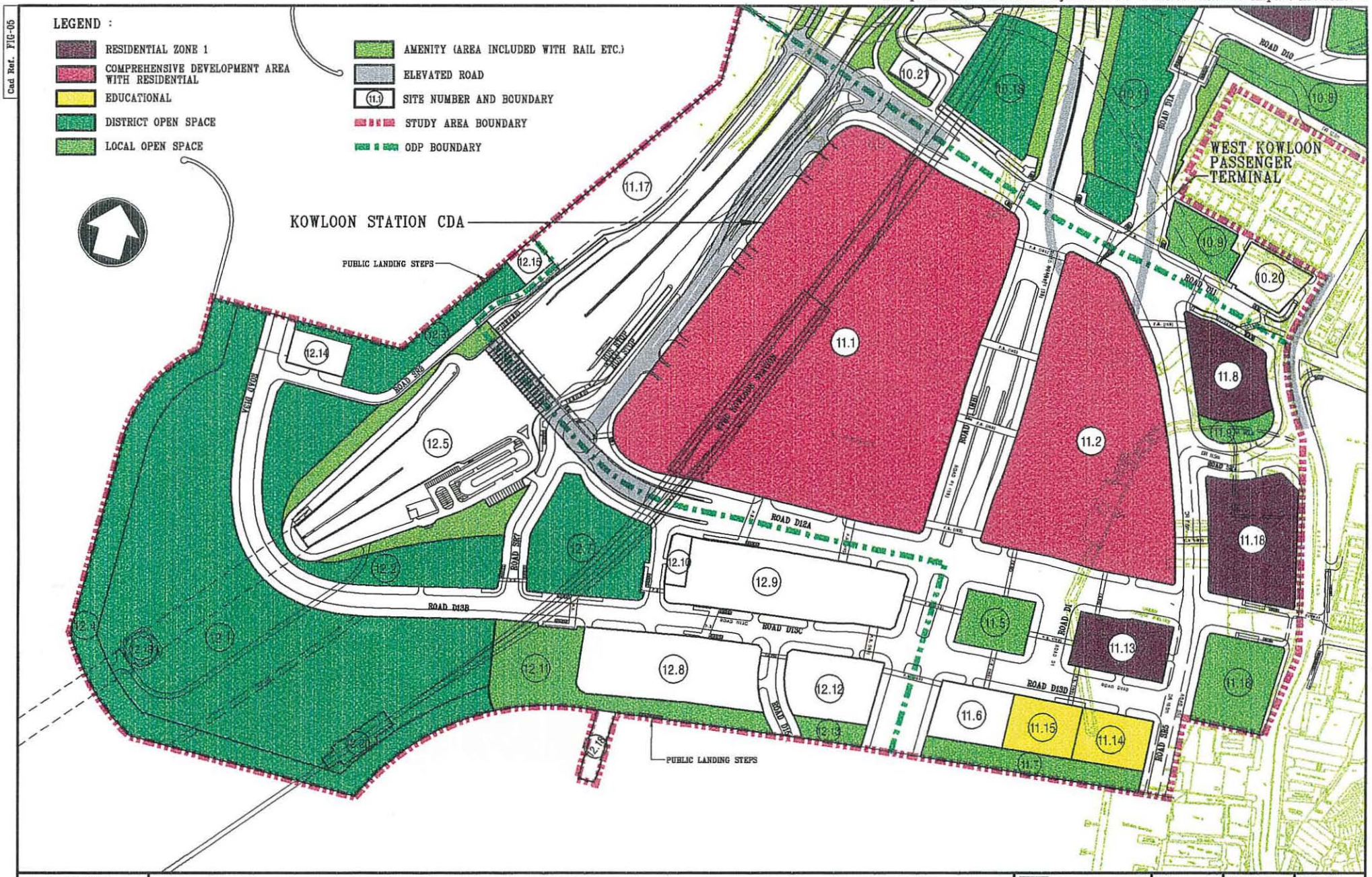
Cad Ref. FIG-05



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Preferred Land Use - Tsim Sha Tsui West

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KOWLOON DEVELOPMENT OFFICE

Scale	Drawing No.	Figure No.
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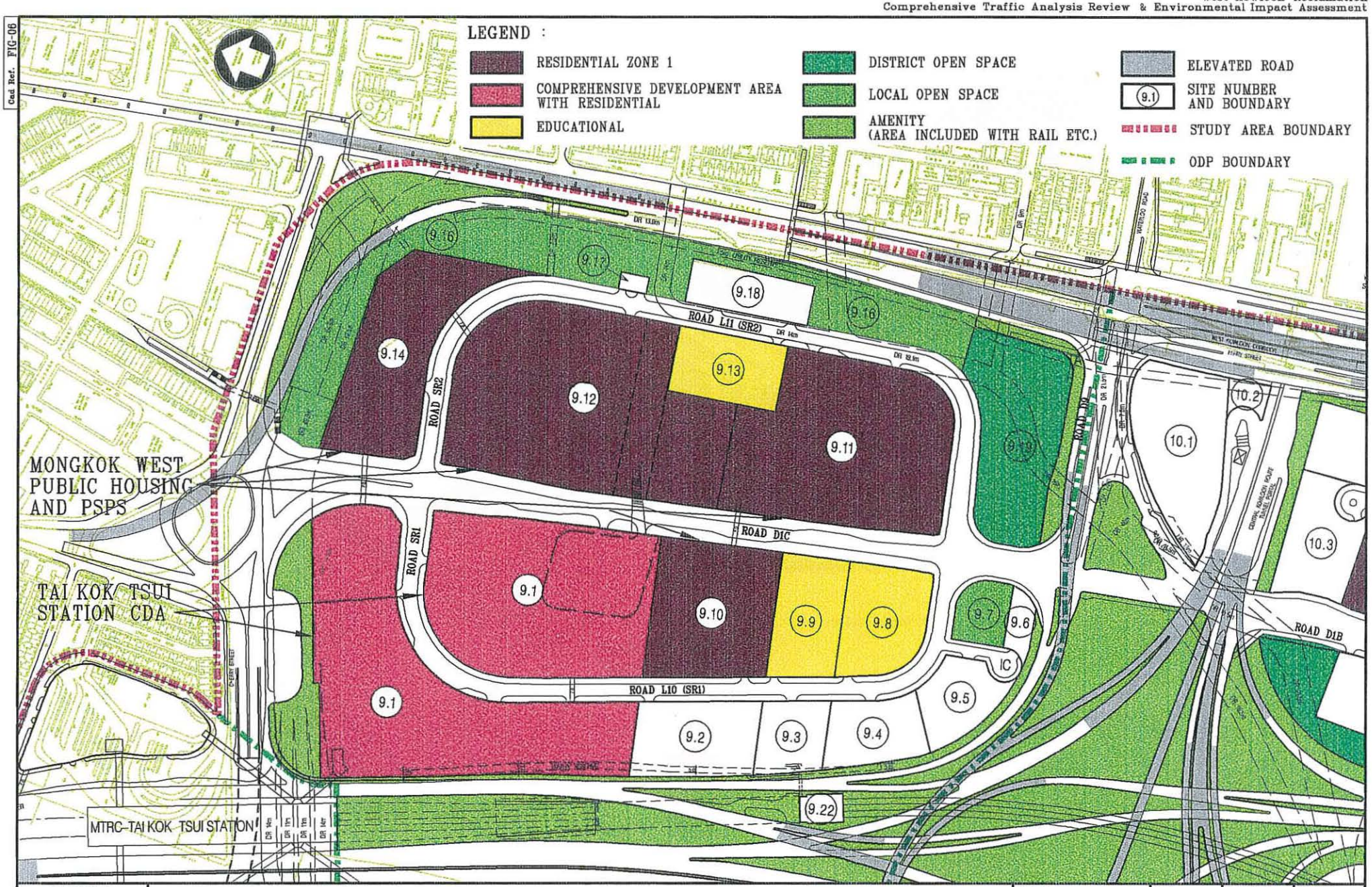
Cad Ref. FIG-06



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Preferred Land Use - Mongkok West

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KOWLOON DEVELOPMENT OFFICE

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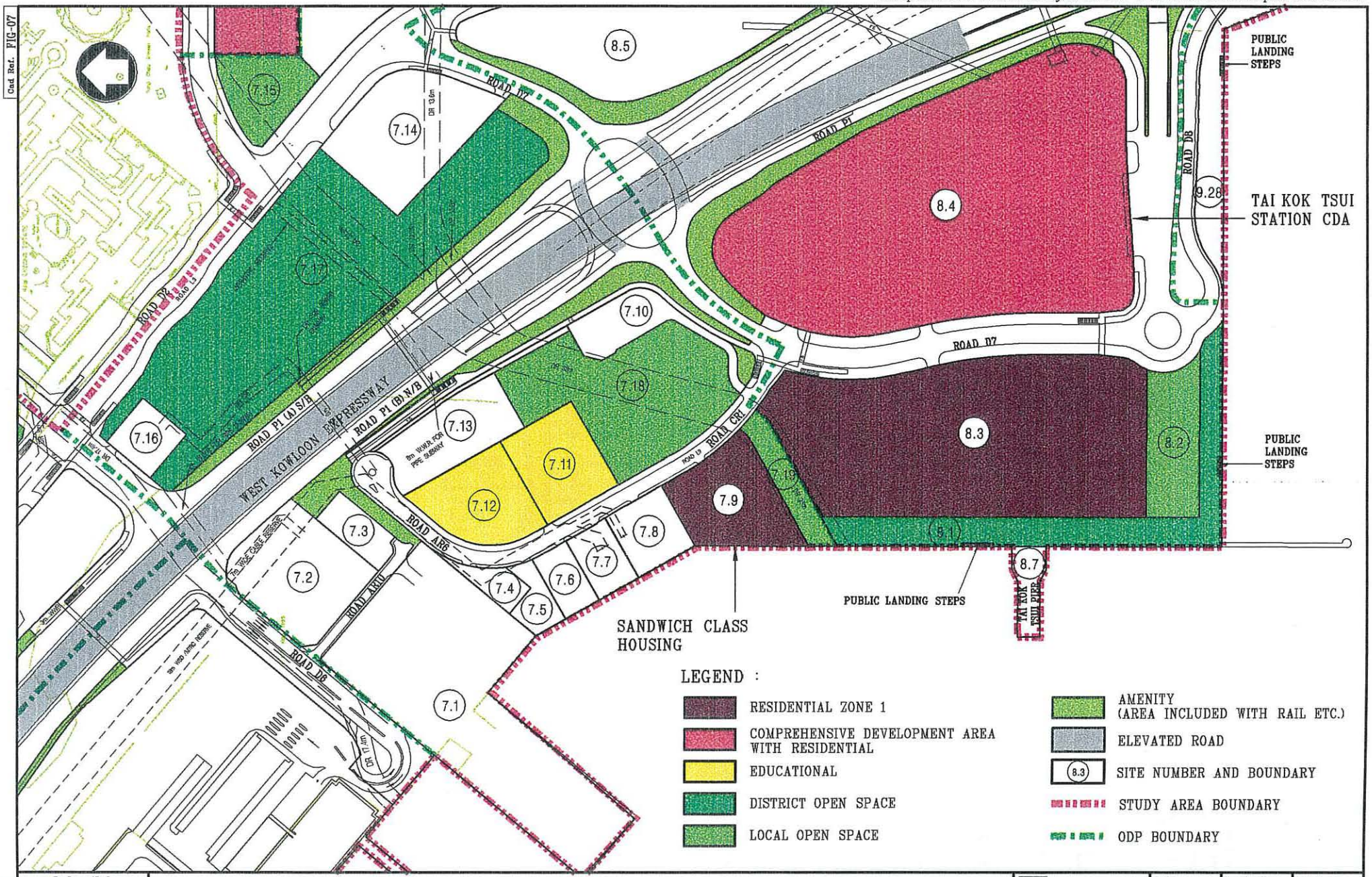
Cad Ref. FIG-07



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Preferred Land Use - Tai Kok Tsui West

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Scale	Drawing No.	Figure No.
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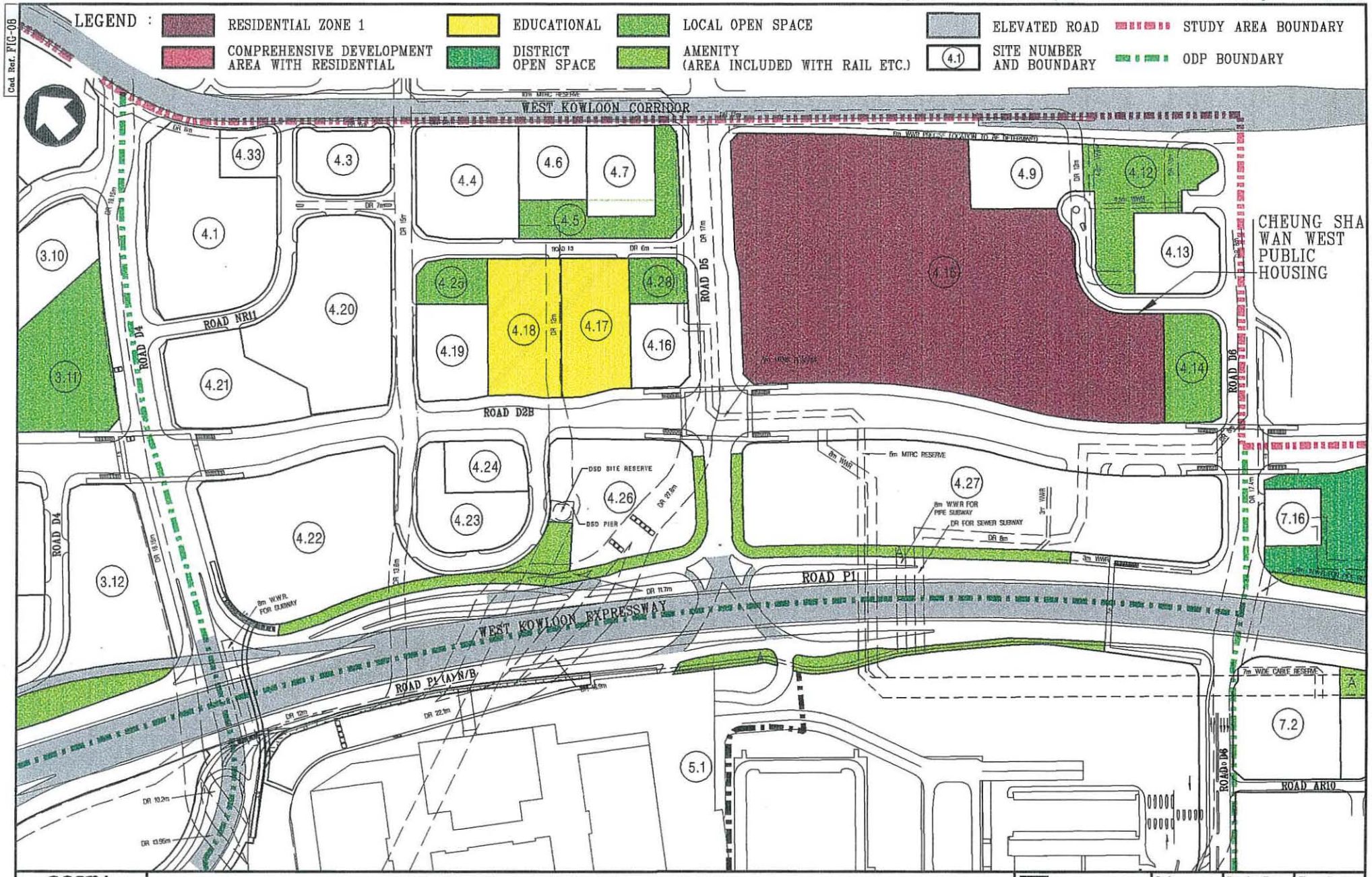
Cad Ref. FIG-08



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Preferred Land Use - Yen Chow Street

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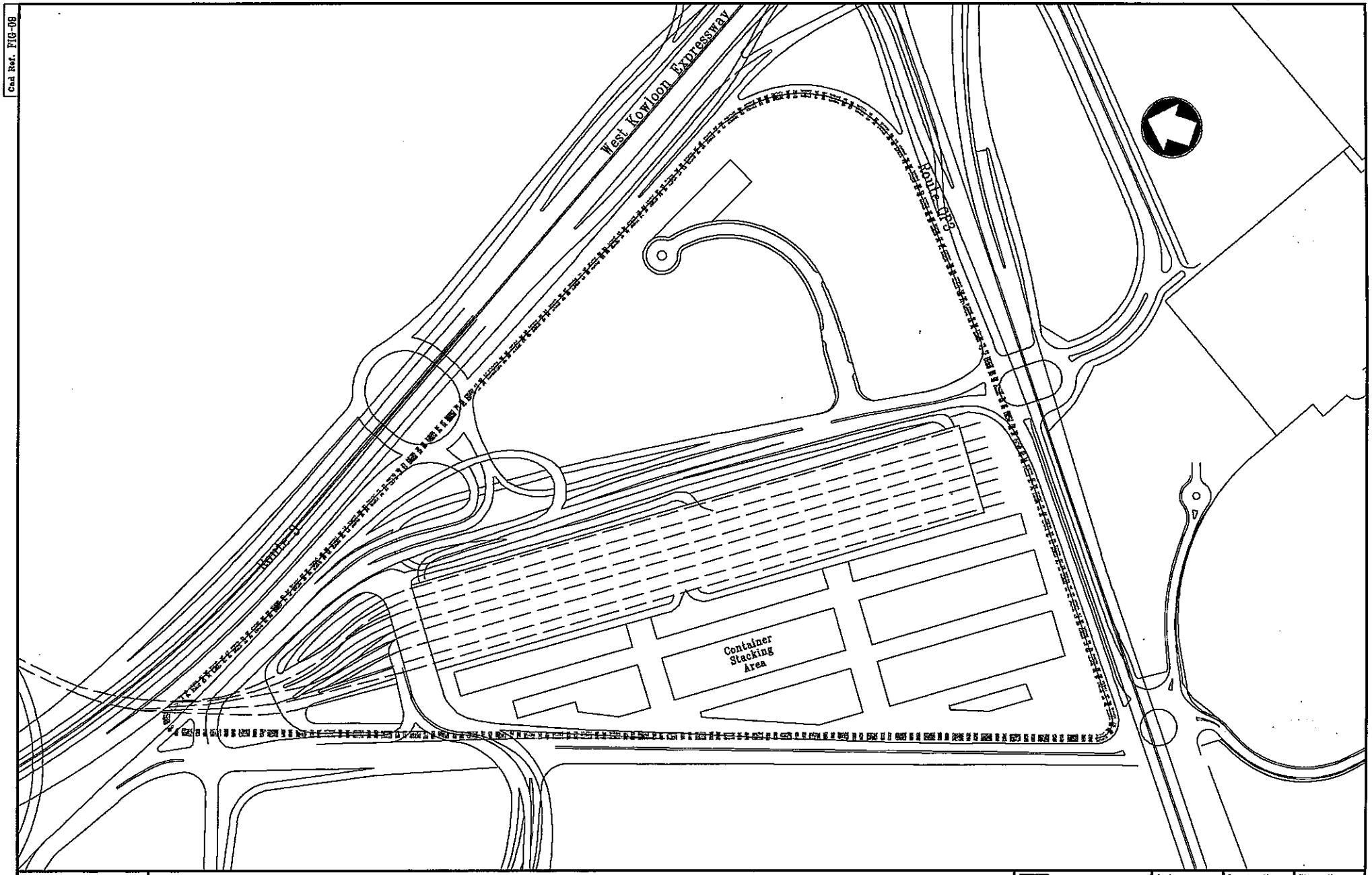
Cad Ref. FIG-08



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Port Rail Terminal

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Scale	Drawing No.	Figure No.
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