

1.0 INTRODUCTION

1.1 Policy

1.1.1 The Engineer's Representative (ER) and the Contractor shall adopt the Environmental Policy/Statements in order to foster a sound Environmental Monitoring and Audit (EM&A) programme to protect the environment. The following policy statements shall be adopted:

- C** establish a commitment to environmental excellence in all activities arising from the development project;
- C** encourage the adoption of environmental management principles to prevent potential impacts and minimise adverse impacts; and
- C** commit to the recommendations in the Environmental Impact Assessment (EIA) study report and related EM&A process requirements.

1.2 Objective of the Manual

1.2.1 The objective of this EM&A Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the construction of the sewerage connection works for the Tuen Mun Eastern Coastal Sewerage Extension.

The purposes of this EM&A programme shall also include the following:

- C** to clarify and identify sources of pollution, impact and nuisance arising from the works;
- C** to confirm compliance with legal, contract specifications and EIA study recommendations;
- C** to provide an early warning system for impact prevention;
- C** to provide a database of environmental parameters against which to determine any short term or long term environmental impacts;
- C** to propose timely, cost-effective and viable solutions to actual or potential environmental issues;
- C** to monitor performance of the mitigation measures and to assess their effectiveness, whenever necessary, identify any further need for additional measures;
- C** to verify the EIA predicted impacts;
- C** to collate information and evidence for use in public, District Board and Government consultation; and
- C** to audit environmental performance.

1.2.2 The Hong Kong SAR Government's applicable environmental regulations for noise and air quality, water quality, waste management and heritage protection, the Hong Kong Planning Standards and Guidelines and recommendations in the EIA study have served as guidance documents in the preparation of this Manual. This EM&A Manual fulfills the requirements of the Study Agreement, Clause 6.6, and follows the approach recommended in the Environmental Protection Department's (EPD's) Generic EM&A Manual, Annex 21 of the Technical Memorandum on the EIA Process and EPD's *EM&A Guidelines for Development Projects in Hong Kong*.

1.2.3 This EM&A Manual provides the following information as specified in the Agreement:

- (i) description of the project;
- (ii) identification and recommendations for monitoring requirements for all phases of development, including:
 - C identification of sensitive receivers;
 - C monitoring locations;
 - C monitoring parameters and frequencies;
 - C monitoring equipment to be used;
 - C programmes for baseline monitoring and impact monitoring; and
 - C data management of monitoring results.
- (iii) the organisation management structure, and procedures for auditing of the Project and implementation of mitigation measures that are recommended for the Project;
- (iv) the environmental quality performance limits for compliance auditing for each of the recommended monitoring parameters to ensure compliance with relevant environmental quality objectives, statutory or planning standards;
- (v) organisation and management structure, and procedures for reviewing the design submissions, monitoring results and auditing the compliance of the monitoring data with the environmental quality performance limits, contractual and regulatory requirements, and environmental policies and standards;
- (vi) event and action plans for impact and compliance procedures;
- (vii) complaints handling, liaison and consultation procedures;
- (viii) interim notification of exceedances, reporting procedures, report formats and reporting frequency including periodical quarterly summary reports and annual reviews to cover all construction, post-Project and operational phases of the development; and
- (ix) implementation schedules, summarising all recommended mitigation measures as shown in Appendix A.

1.2.4 This Manual is considered to be a working document and should be reviewed periodically and revised once substantial changes have been made.

1.2.5 A flow chart of the general construction phase EM&A activities is shown in Drawing 1.1.

1.3 Background Information

1.3.1 The Tuen Mun Sewerage - Eastern Coastal Sewerage Extension (the Project) is to be implemented under the Tuen Mun Sewerage Stage I Phase IV and Stage II in accordance with

the recommendations of the Tuen Mun Sewerage Master Plan (EPD, 1993), (TMSMP). The proposed extension to the Tuen Mun sewerage system includes the connection of the village sewerage in the Tai Lam Chung valley and the area of So Kwun. The works also involve the construction of six new pumping stations at:

- Tai Lam Correctional Institution;
- Luen On San Tsuen;
- Tai Lam Chung Tsuen;
- Tai Lam Valley;
- So Kwun Wat Tsuen; and
- Castle Peak Villas.

1.3.2 The project is designated under Schedule 2, section F3(b) and Q1 of the Environmental Impact Assessment Ordinance (EIAO). An Environmental Review of the Project has been completed by the Director of Environmental Protection and this has concluded that an environmental impact assessment (EIA) Study should be carried out. Mouchel Asia Environmental were commissioned to carry out at the EIA under Agreement No. CE 43/98 commencing on 14th October 1998 and in which the following criteria were assessed:

- C air quality;
- C noise;
- C water quality;
- C waste management;
- C ecology;
- C heritage; and
- C landscape and visual.

1.4 Project Description

Project Study Area

1.4.1 In accordance with the Tuen Mun Sewerage Master Plan, the extent of the proposed works includes 4 main packages covering the following areas and work components:

- (i) Eastern Coastal Extension (Part 1) comprising sewerage for Lok Chui Street and a pumping station at Castle Peak Villas;
- (ii) Eastern Coastal Extension (Part 2) comprising the Tai Lam Valley Pumping Station;
- (iii) Village Sewerage - comprising sewerage for the villages of Tai Lam Chung Tsuen, Luen On San Tsuen, Wong Uk and Wu Uk, with pumping stations at Tai Lam Correctional Institution, Luen On San Tsuen and Tai Lam Chung Tsuen; and
- iv) Village Sewerage - comprising sewerage for the villages of So Kwun Wat Tsuen/San Tsuen, with a pumping station at So Kwun Wat Tsuen.

1.4.2 The study area and the proposed sewer layout are shown on Drawings 1.2a-c.

1.5 Scope of Works

Construction Activities

- 1.5.1 The sewer layout has made full use of the road and footpath network between and within the villages for the sewer main installations. The installation of the main sewers will be carried out by open trenching and within the villages, small trenches will be constructed along village alleyways and pathways.
- 1.5.2 The construction of the village and main sewers will require the following activities:
- C concrete breaking, where existing paved surfaces need to be broken;
 - C excavation of soil material;
 - C compaction of earth and bedding material;
 - C installation of pipeline;
 - C backfilling of soil materials; and
 - C repaving.
- 1.5.3 The construction of the pumping stations will require similar activities as the sewer network, with the addition of constructing a small structure above ground to house the monitoring and electrical equipment. Sheet piling may be required at some of the proposed stations to support the excavations.
- 1.5.4 The equipment that will be required for the construction of the village sewerage project will include hand-held or pneumatic breakers; air compressor; excavator; truck; compactor; crane; lorry; and an asphalt paver.
- 1.5.5 It is anticipated that the majority of the construction and excavation works in the villages will be carried out using hand-held tools due to the limited space in the alleyways and the uncertainty of the location of many of the existing utility services. The construction of the main sewers will use powered mechanical equipment.

Construction Programme

- 1.5.6 The duration of the complete works will be approximately 24 months, with each pumping station taking some 12 months to complete. A tentative construction programme is provided in Drawing 1.3.

1.6 Environmental Monitoring and Audit Requirements

- 1.6.1 Based on the recommendation of the EIA Report, a Monitoring and Audit programme will be required for air, noise, water quality, waste, landscape and visual resources and heritage. Except for air and noise, most of these measures will be undertaken by supervision of the works rather than by quantitative measurements. The environmental monitoring and audit activities for this Project will be conducted in three distinct stages:

- C pre-construction (baseline);
- C construction phase impact; and
- C operational phase impact.

1.6.2 The operational phase works is relevant only to the audit of the maintenance and establishment period of the compensatory planting recommended by the EIA. The detailed EM&A requirements for each of the parameters are provided in the following sections and the approximate programme for the EM&A works included with the construction programme in Drawing 1.3.

1.7 Project Organisation

1.7.1 For the purpose of this EM&A Manual, the Drainage Services Department of the Hong Kong SAR Government is referred to as the “Employer” and the “Engineer”/Engineer’s Representative (ER) will be responsible for the supervision of the construction of the Project.

1.7.2 As part of the resident site staff, an Environmental Specialist (ES) is to be employed by the Contractor. He shall ensure the Contractor’s compliance with the project’s environmental performance requirements during construction. The responsibilities of the specialist will include field measurements, sampling, analysis of monitoring results, reporting and auditing. The ES shall be approved by the ER and the DEP, shall be competent and shall have 7 years relevant environmental monitoring and audit experience on projects of a similar scale and nature, unless otherwise agreed with the DEP. The ES will require suitable support staff (the Environmental Team, ET), to carrying out the EM&A programme including the noise, dust, water quality and waste management monitoring and supervision. The duties of the team are:

- C sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements;
- C environmental site surveillance;
- C audit of compliance with environmental protection, and pollution prevention and control regulations;
- C monitor the implementation of environmental mitigation measures;
- C monitor compliance with the environmental protection clauses/specifications in the Contract;
- C review construction programme and comment as necessary;
- C review construction methodology and comment as necessary;
- C complaint investigation, evaluation and identification of corrective measures;
- C liaison with Independent Checker (Environmental) (IC(E)) on all environmental performance matters;
- C advice to the Contractor on environmental improvement, awareness, enhancement matter, etc., on site; and
- C timely submission of the EM&A report to the Employer and Director of the Environmental Protection (DEP).

1.7.3 Accordingly, a Landscape Architect with a minimum of 1-2 years on-site experience will be required on the ET to monitor and audit the landscaping installation works and landscape

protection measures.

1.7.4 In respect of the archaeological supervision works, a suitably qualified person, to the satisfaction of the AMO, shall be included in the ET to undertake this specialist task. The qualified archaeologist should possess professional qualifications such as an academic degree in archaeology, relevant experience in field archaeology at a supervision level and be familiar with the archaeology of Hong Kong and/or South China. The qualified archaeologist will also be required to obtain a licence from the AMO prior to undertaking the supervision works. The responsibilities of the specialist will be to oversee the construction activities, notify the Contractor, the AMO, the DEP and the ER of any findings and develop appropriate mitigation measures.

1.7.5 An Independent Checker (Environmental) IC(E) shall also be employed by the Contractor but shall not be in any way associated with either the Contractor nor the ES and his team. The IC(E) shall advise the ER on environmental issues related to the project. The role of the Checker shall be independent from the management of construction works, but the Checker shall be empowered to audit the environmental performance of construction. The IC(E) shall have project management experience in addition to the requirements of the ES specified in Section 1.7.2. The appointment of the Checker is subject to the approval of the ER. The main duty of the IC(E) shall include the followings:

- C review and audit all aspects of the EM&A programme;
- C validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
- C carry out random sample check and audit on monitoring data and sampling procedures, etc;
- C conduct random site inspection;
- C audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site;
- C review the effectiveness of environmental mitigation measures and project environmental performance;
- C on a needs basis, audit the Contractor's construction methodology and agree the least impact alternative in consultation with the Environmental Specialist and the Contractor;
- C check complaint cases and the effectiveness of corrective measures
- C review EM&A report submitted by the Environmental Specialist; and
- C feedback audit results to the ES by signing off relevant EM&A proformas (see Appendix B for reference).

1.7.6 An organisation chart showing the lines of communication with respect to the EM&A works is provided on Drawing 1.1.

1.8 Documentation

1.8.1 All documentation is required to be filed in a traceable and systematic manner. Site documents, such as, monitoring field records, meeting minutes, correspondences etc. (some examples are provided in Appendix B) shall be cross-referenced by the ES and be ready for

inspection upon request. All construction and operational phase EM&A results and findings shall be documented in the construction phase EM&A reports prepared by the ES and endorsed by IC(E), prior to disseminate to the Contractor, the ER, the AMO and the DEP.

1.8.2 All documentation to the DEP shall be in paper form and/or electronic (in the format in agreement with the Director) upon request. All documents and data shall be kept for at least one year after the completion of the construction contract. All submissions (reports, data and correspondences etc.) to the DEP shall be liable to use freely for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.

1.9 Terminology

1.9.1 To clarify the terminology for noise and air quality impact monitoring and audit, the following definitions are used throughout this Manual.

1.9.2 Monitoring refers to the systematic collection of data through a series of repetitive measurements. The stages of monitoring are defined in this document as follows:

- (i) Baseline Monitoring refers to the measurement of noise and air quality impact parameters during a representative pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change.
- (ii) Impact Monitoring involves the measurement of noise and air quality impact parameters during Project construction and implementation so as to detect changes in these parameters which can be attributed to the Project.
- (iii) Compliance Monitoring unlike Baseline and Impact Monitoring is not necessarily aimed at noise and air quality impact parameters, but takes the form of periodic sampling and/or continuous measurement of noise and dust levels to ensure that regulatory requirements are observed and standards are met. There are no requirements for compliance monitoring for this Project.

1.9.3 Audit is a term that infers the verification of a practice and certification of data. The types of audit are defined below:

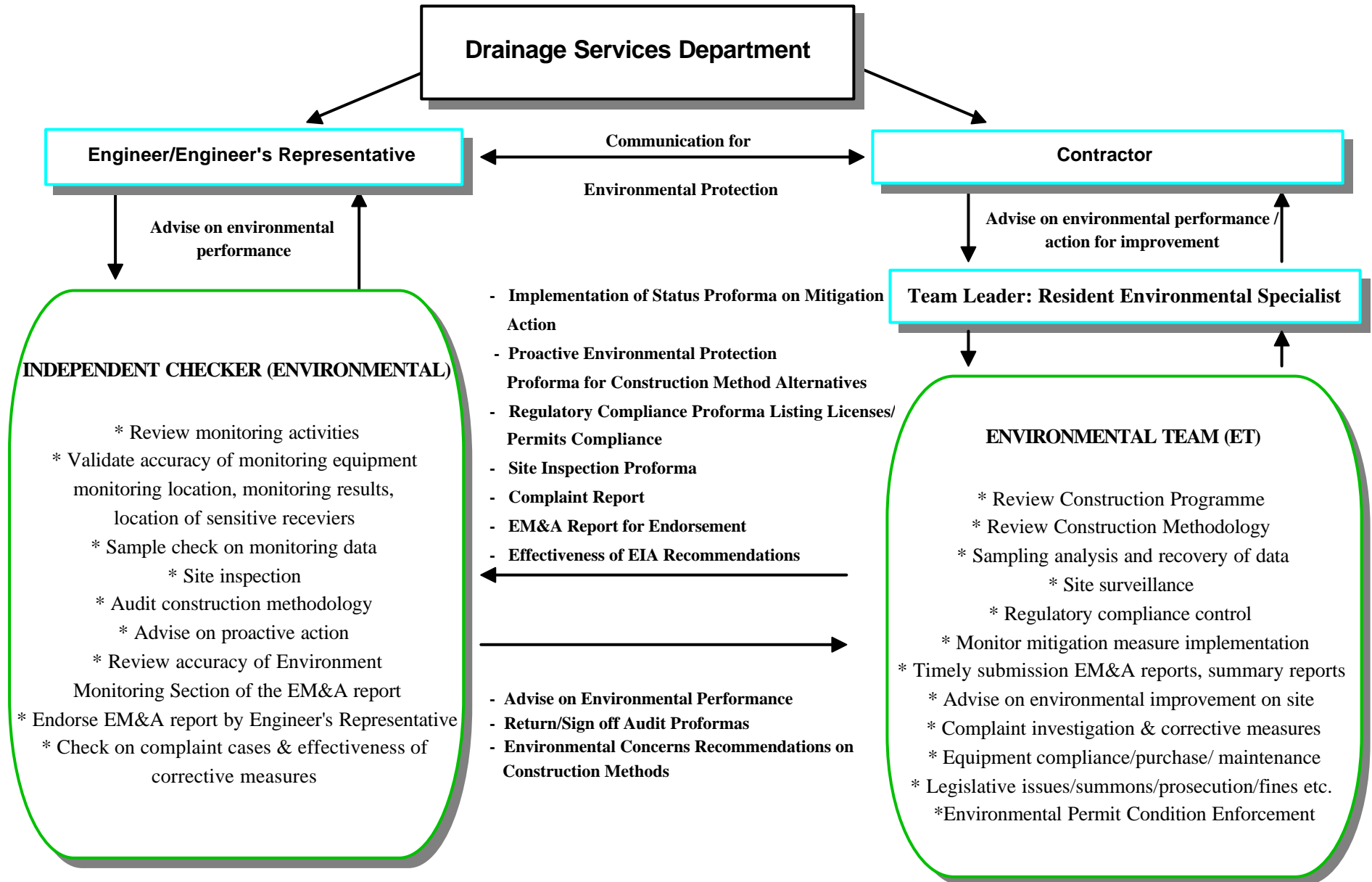
- (i) Compliance audit is defined as follows:
 - C The process of verification that all or selected parameters measured by a noise or air quality impact monitoring programme or levels of an operation are in compliance with regulatory requirements and internal policies and standards; and
 - C the determination of the degree and scope of any necessary remediation in the

event of exceedance of compliance.

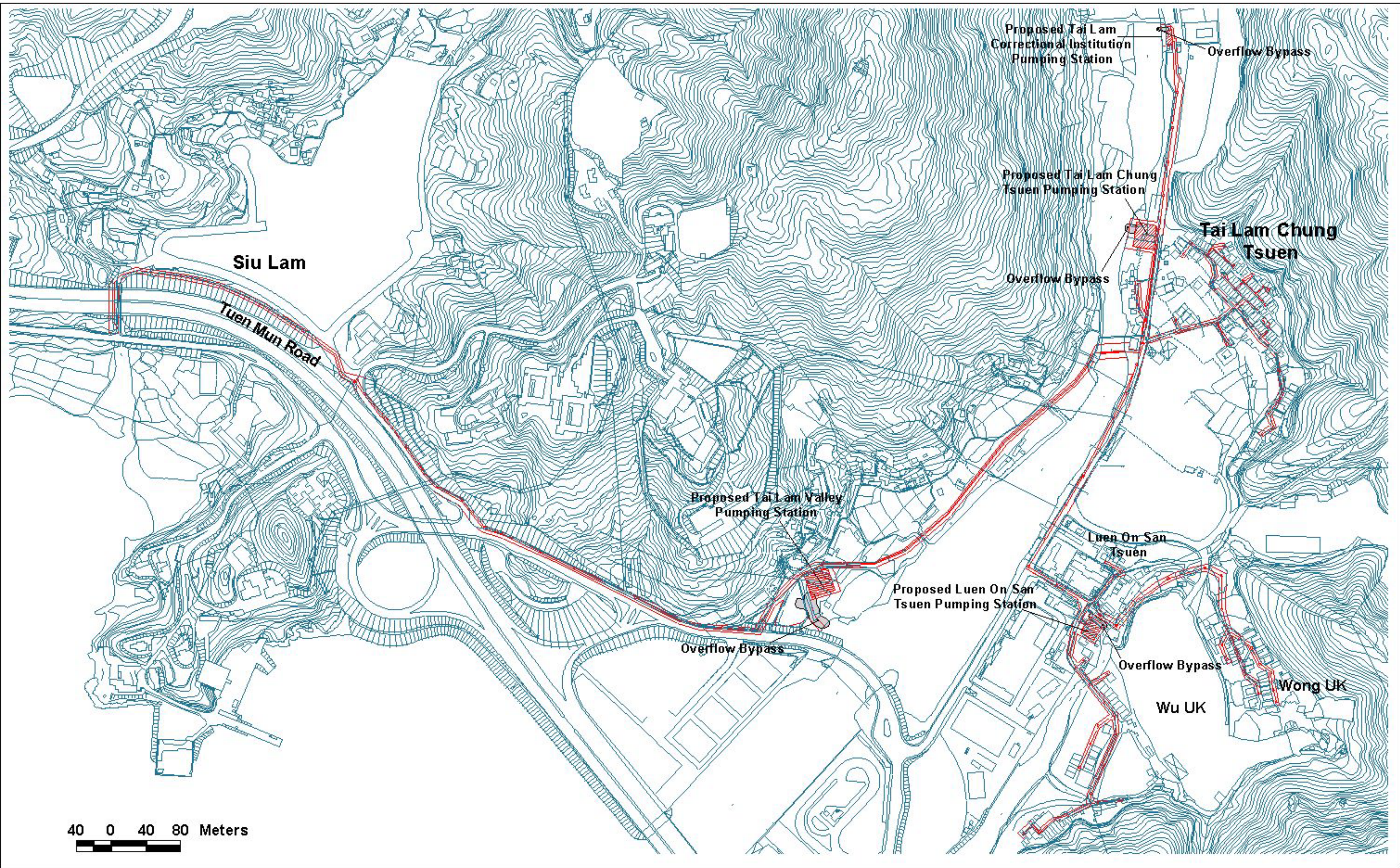
- (ii) Post Project Audit is carried out after the implementation and commissioning of a Project and was found not to be applicable to this Project.

1.9.4 For the purpose of noise and air quality impact monitoring and audit, the Action and Limit Levels are defined as follows:

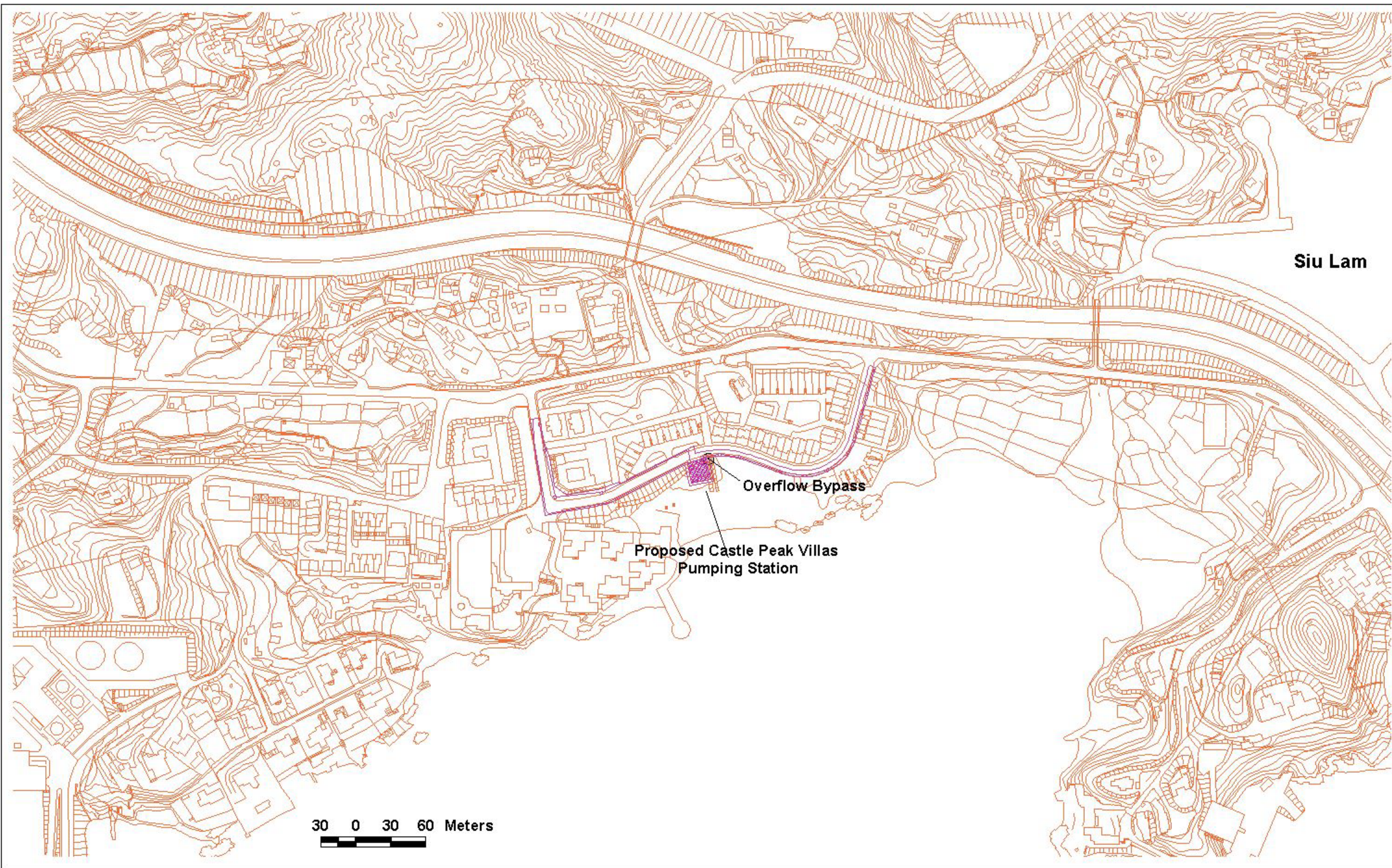
- (i) The Action Level is the level defined in which there is an indication of a deteriorating ambient level for which a typical response could be an increase in the monitoring frequency.
- (ii) The Limit Level is the level beyond the appropriate remedial pollution control ordinances, noise and air quality impact objectives or Hong Kong Planning Standards and Guidelines established by EPD for a particular project, such that the works should not proceed without appropriate remedial action, including a critical review of plant and work methods.



Drawing 1.1 Construction Phase Environmental Monitoring & Audit Procedure



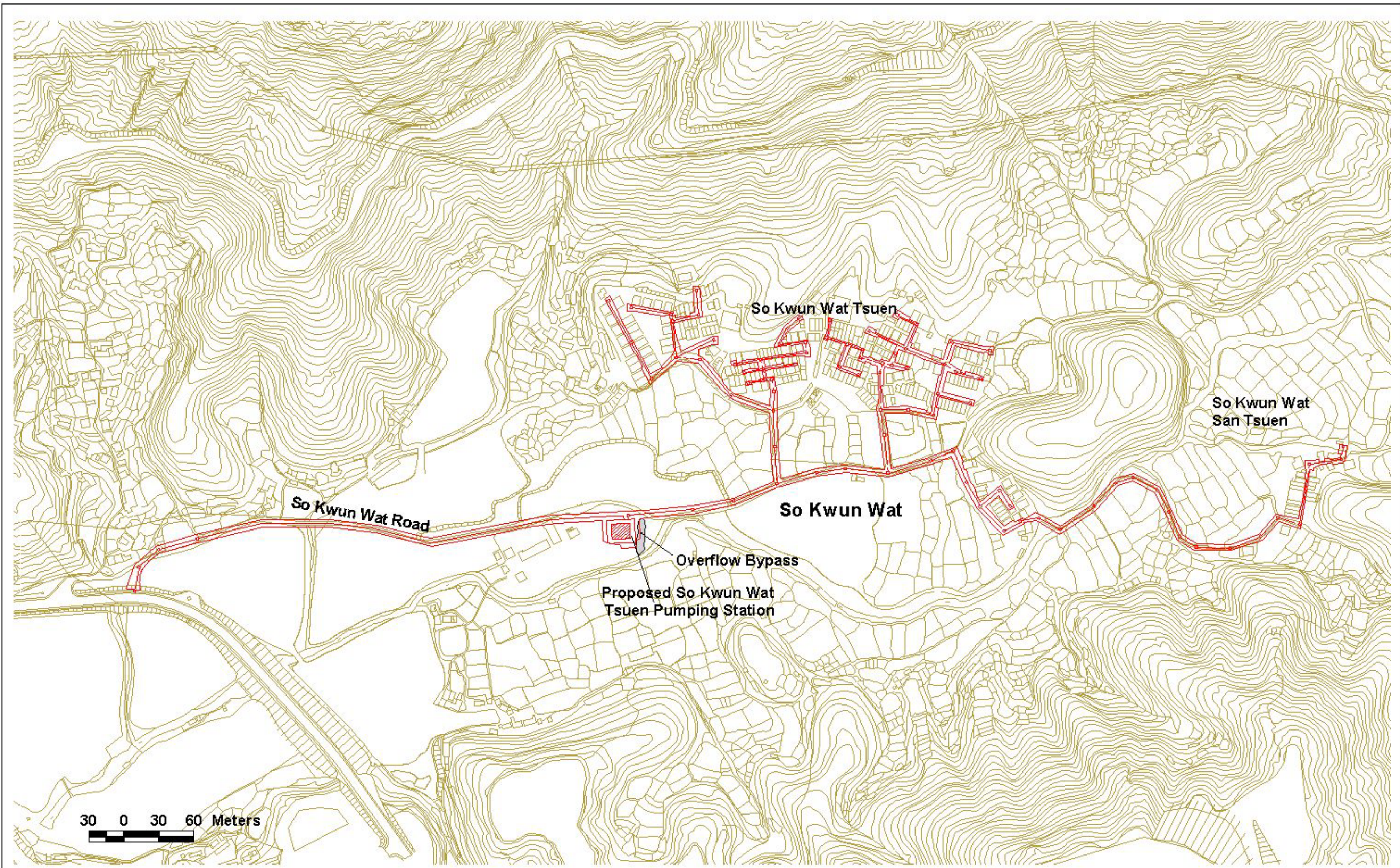
The Study Area and Proposed Sewer Layout



The Study Area and Proposed Sewer Layout

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Drawing 1.2b



The Study Area and Proposed Sewer Layout

uen Mun Sewerage - Eastern Coastal Sewerage Extension

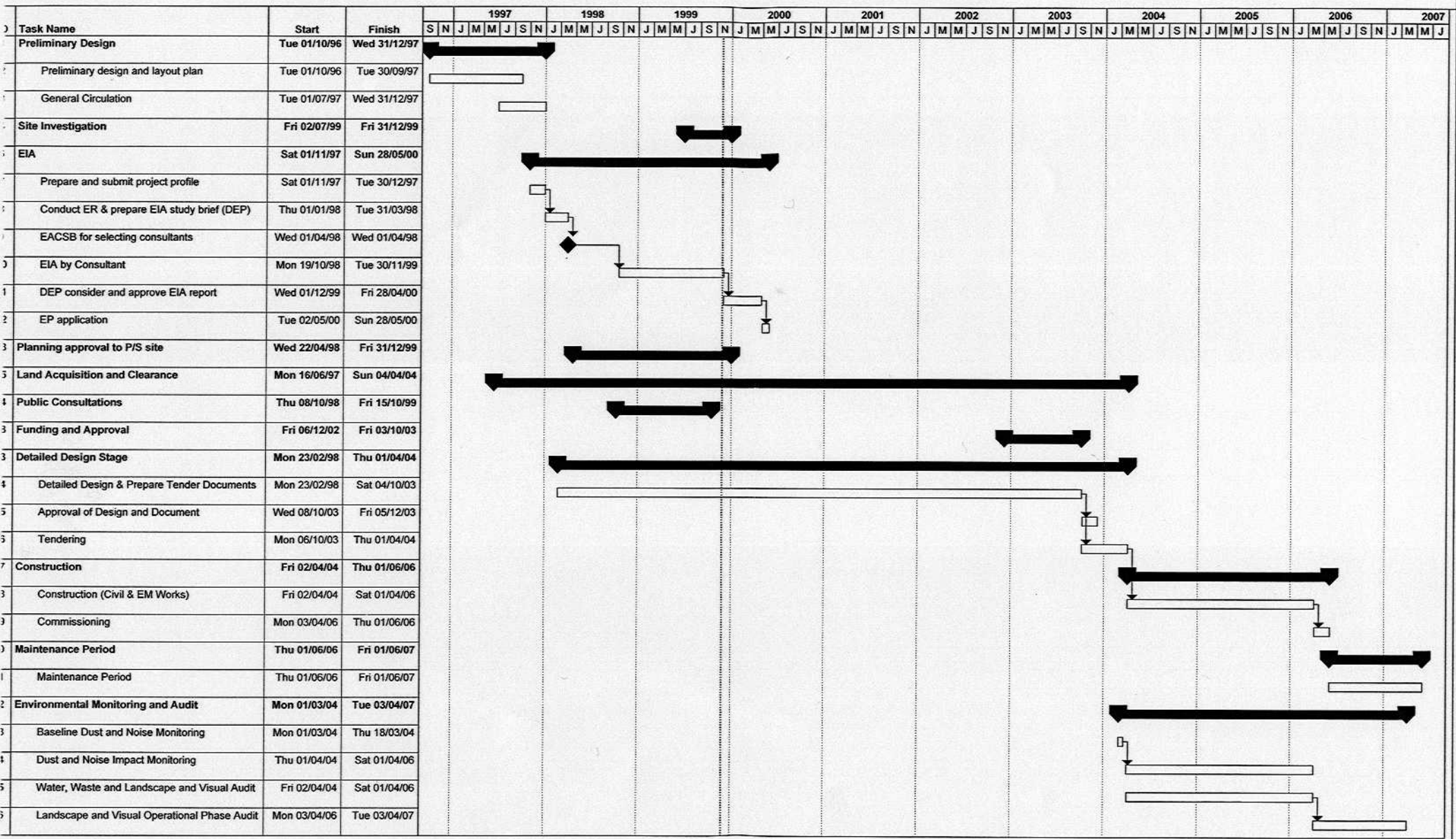


Figure 1.3 Tentative Construction and EM&A Programme