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Civil Engineering and Development Department
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Kowloon Development Office

Supplemental Agreement No. 1 to Agreement No. CE 42/2000 (CE)

South East Kowloon Development
Infrastructure at North Apron Area of Kai Tak Airport
Design & Construction

Aesthetic Design of Sewage Pumping Station PS1A (Ref: 0179-01)

December 2010

ARUP

Civil Engineering & Development Department

Supplemental Agreement No. 1 to Agreement No. CE 42/2000 (CE) South East Kowloon Development Infrastructure at North Apron Area of Kai Tak Airport – Design and Construction

Aesthetic Design of Sewage Pumping Station PS1A

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CONTENTS

1 PROJECT BACKGROUND

1.1 Project Background

1.1.1 In June 2008, Ove Arup & Partners Hong Kong Ltd (Arup) was commissioned by the Civil Engineering and Development Department (CEDD) to undertake the Design and Construction of Infrastructure at North Apron Area of Kai Tak Airport for the South East Kowloon Development under Supplemental Agreement No.1 to Agreement No. CE 42/2000(CE). The infrastructure works at the North Apron Area are being implemented by three stages under Package B – Phase 1 Housing Sites and Government Offices.

1.1.2 One major infrastructure development to be completed under Package B Stage 2 Works of the Supplemental Agreement No. 1 is to construct a Sewage Pumping Station PS1A and associated gravity sewers and rising mains.

1.1.3 The Sewage Pumping Station PS1A will be operated and maintained by the Drainage Services Department (DSD). In the pursuit of achieving DSD's commitment to deliver world class quality drainage and sewerage facilities to the public, Arup adopted an aesthetical approach to integrating sustainability into the pumping station design for a good balance in aesthetic, functional, environmental, economic, social and maintenance and operation performances. This design approach ensures that the proposed sewage pumping station building meets the needs of the DSD for management, operation and maintenance of the pumping station and at the same time beautifies the landscape of the area where the pumping station is located and obtain acceptance of the public for the existence of such building structure within their community.

1.2 Site Location

The proposed infrastructure development for Package B Stage 2 Works is located at the North Apron Area of the former Kai Tak Airport. It is bounded on the northeast and northwest by two pedestrian walking streets, the southeast by Road D2 and the southwest by site 1J–3. The Stage 2 infrastructure works at North Apron Area is shown on Drawing No. 23462/SK/1252 (Rev.A) and the location of PS1A is shown on Figure 1.

2 PRINCIPALS OF THE AESTHETIC DESIGN

2.1 Design Standards and Manuals

2.1.1 The design shall be carried out in accordance with the prevailing technical standards and specifications as listed below:

- DSD Guidelines on Aesthetic Design of Pumping Station Buildings;
- DSD TC No. 9/2006 Vetting Committee on Aesthetic Design of Pumping Station Building;
- ETWB TCW No. 16/2005 Adoption of Energy Efficient Features and Renewable Energy Technologies in Government Projects and Installations; and
- DB TC No. 5/2009 / EB Circular Memorandum No. 2/2009 Green Government Building

2.1.2 Based on the abovementioned design standards and guidelines, a checklist for aesthetic design of the proposed sewage pumping station contained in Appendix A was formulated as the design framework.

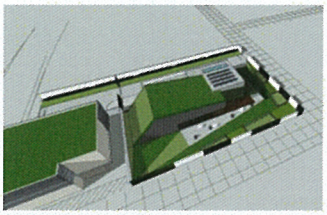
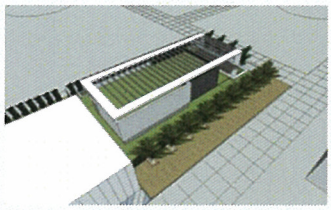
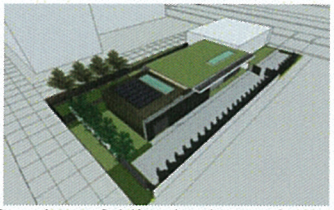
2.2 Holistic Strategy

2.2.1 In preparing the aesthetic design of new buildings, Arup have given holistic consideration to

the aesthetic design in order to minimise their visual impact in recognition that the Kai Tak Development is a core infrastructure project attracting high public attention. The location of the proposed sewage pumping station PS1A is dictated by the practical and functional drainage requirements and the pumping station is often regarded as visually intrusive by the general public. In order to make the sewage pumping station PS1A a "socially responsible development", the following design strategies are to be adopted:

- Provision of amenities for general public;
- Adoption of landscaping works;
- Incorporation of sustainable design elements;
- Architectural Treatment;
- Incorporation art into structures; and
- Adoption of natural materials.

2.2.2 Three architectural design schemes were developed for the Sewage Pumping Station PS1A. The architectural layouts of the three schemes are shown in Figures 2 and 3 and their pros and cons are also summarised in the following table.

2.2.3	**Scheme 1 ''Folding Green''**	**Scheme 2 ''Screening''**	**Scheme 3 ''Green Screening''**
	 The green at grade level is folding up to form the building mass, the building in the continuity with the landscape is perceived as a whole with its context	 A more passive approach, the architectural elements are used to visually shield the building from the surrounding environment from both street level and aerial level	 Creating a folding landscape from the building enclosure that covers the base of the rectangular box. The green and the metal structure creates a screening effect
PROS	• Interesting and elegant form • The building as a folded landscape become itself a landscape to be seen. • The shape give a more light feeling that break the image of heavy and massive pumping stations. • The green ratio is maximized. • The building, the landscape treatment, shape, the fences, all elements can be understood as one whole. • A skylight on the roof top allows natural lighting to penetrate in the building.	• The layering of materials on the facades break down the massive scale of the building. • The open space for the public is wide and clear.	• The layering of materials on the facades break down the massive scale of the building. • The green ratio is maximized. • As an alternative of scheme 2, this option introduces more green visually, that helps to break down the scale successfully when seen from the top. • The green folding form the boundary to cover the top of the building give it a dynamic movement that avoid a monotonous effect. • A skylight on the roof top allows natural lighting to penetrate in the building.
CONS	•	• The screening of horizontal louvers on the roof is increasing the total building height. • The idea of screening is overprotective and might reveal an even stronger impact of the building than if it was not there. • The building scale is still massive.	• Unlike scheme1, here the green is folding from another direction which gives the building an important width at the place where the green covers the building. That makes the building look bulky from the pedestrian path. • It is hard to see the logic and the reason why the green is folding from the fence and does not seem to have a connection with the green at grade level unlike scheme 1.

2.2.4 Scheme 1 is proposed for the Sewage Pumping Station PS1A and the architectural design for this scheme is shown in Figures 4 to 10.

2.3 Amenities for General Public

2.3.1 The roof, walls and in particular boundary fences of the proposed Sewage Pumping Station PS1A may have a significant visual impact on the public in nearby high rise buildings, traffic running on adjacent roads at ground level and on elevated roads, passengers on helicopters, as well as pedestrians.

2.3.2 Roof Top Greening

As the proposed sewage pumping station PS1A is located in an urban environment, roof top greening is recommended to provide visual amenity to the occupants and residents of the nearby high rise commercial and residential buildings.

The roof garden will adopt perennial plants and ground covers to enhance greenery, pebble paths for maintenance and drainage, as well as an irrigation system to create an amenity area which provides visual relief to the community and improves the thermal insulation and energy saving performance of the building. Special consideration will be given to the roof top water-proofing system of the sewage pumping station building. It is suggested that routine maintenance of the roof garden should be carried out throughout the life cycle of the sewage pumping station building.

Sky window is a visually attractive and environmentally friendly feature that can be introduced and integrated into the roof garden design of the sewage pumping station building that allows the penetration of natural sun light into the building and reduce the energy demand.

2.3.3 Vertical Greening

In order to avoid visual obstruction created by the proposed Sewage Pumping Station PS1A, it is important to minimize the actual height of the building structure within practical constraints. It is also critical to reduce the apparent height of the structure using various techniques such as introducing creeper planting on climbing timber mesh; suspended planter trays; low level toe planters with vertical climbers; shrub plantings; and groundcover plantings. Vertical greening can help to soften the roof line and the building mass of the proposed sewage pumping station.

Thermal insulation provided by vegetation growing on the building façade can cool the building and help to reduce energy consumption.

Plant species, especially creepers on climbing mesh, may be changed from time to time to create long term variety which can further enrich the façade design.

2.3.4 Boundary Fence/ Wall Treatment

Visual diversity of the proposed sewage pumping station PS1A can be achieved by adopting one or more of the following treatments to the boundary fences/ walls:

- Create a wall layering effect by using different materials for different visual planes;
- Adopt materials, details and texture with visually recessive character which blend with the surrounding environment;
- Set back fences from site boundary to expose existing trees and allow screen plantings;
- Provide an opportunity for community art or historical theme; and
- Adopt terraced or raised planters.

Greening of the boundary fences/ walls can soften the structure itself and provide a harmonising effect. The boundary fences/ walls of the proposed sewage pumping station will have the greatest visual impact on the passers-by and the achievement of visual diversity is considered to be a crucial element of the aesthetic design of the sewage pumping station to

gain public acceptance.

2.4 Landscaping Works

2.4.1 The landscape design of sewage pumping station PSA1 aims to give an impression of a garden but without affecting the operation and maintenance of the sewage pumping station. The landscape strategy will preserve existing mature trees as much as possible to minimise the need for tree felling and transplanting. Evergreen plants/ trees will be selected and automatic irrigation facilities will be provided for the landscape works to help maintaining the plants in good condition at all times.

2.4.2 The landscaping works will be carried out in phrases such that some landscaping works can be established at early stages of the sewage pumping station construction to achieve gradual greening effects on the site.

2.4.3 In addition to maximising roadside landscaping, the greening of boundary fences/ walls will further enhance the pedestrians' experience. Trees with appropriate sizes will be selected to soften the monolithic effects of the buildings; fences; walls and associated structures.

2.4.4 The introduction of a roof garden will provide an enhanced visual amenity for the residents of adjacent high rise buildings. As the provision of a roof garden involves recurrent costs, it is suggested that a long-term commitment of the maintenance party is required. An agreement of the maintenance parties will need to be sought at the design stage for the future maintenance for the roof garden.

2.5 Sustainable Design Elements

2.5.1 By adopting an appropriate selection of the following design elements, the proposed sewage pumping station PS1A can become a sustainable development in the environmental, social and economic context:

- use of natural cross ventilation with low level louvers and roof ventilators;
- provide natural lighting to reduce dependence on artificial lighting by incorporating more windows, glass blocks on walls and prismatic roof lights;
- adopt roof and elevation greening to improve thermal insulation of the structure;
- adopt photovoltaic or LED lights for outdoor illumination;
- provide timer control, photo-sensor and bypass switches for external lighting where appropriate;
- adopt occupancy sensors for indoor lighting and air-conditioning control;
- use low energy consumption signs (e.g. exit signs, direction signs, occupancy signs etc.);
- provide shading features to reduce heat gain;
- use cladding/ painting/ finishes which have long lasting new appearance to reduce cleaning frequency;
- use commonly available construction materials to facilitate future maintenance;
- adopt automatic mechanical raked screens to reduce human resources required for maintenance and improve hygiene and safety at work;
- reduce the generation of waste as much as possible at all stages of the pumping station's life cycle; and
- encourage the use of certified environmentally sustainable building materials or those with high recyclable content.

2.6 Architectural Treatment

2.6.1 An appropriate selection of the following architectural treatments will be adopted to enhance the aesthetic appearance of the proposed Sewage Pumping Station PS1A:

- allow variation in structural forms to avoid a perception of a dull image by the public, if there is enough space;
- avoid installation of pipelines, ducts, conduits, cat-ladders, railings etc. on external walls of the building structure. These utility services and plumbing shall be accommodated inside the sewage pumping station as far as possible whilst external pipes and vents shall be concealed for better appearance;
- encourage the use of warm tone colours to avoid presenting a cold appearance of the building in the community;
- use a colour scheme which harmonizes with the surrounding environment;
- shield ventilation openings and air conditioners and provide screening facilities to screen parking spaces and handling vehicles through architectural features, landscaping or plantation;
- provide external lighting to improve the aesthetic effect on the exterior of the sewage pumping station during night time; and
- adopt appropriate direction of fall in the building structure which helps drain rainwater away to avoid staining problem caused by rainwater dripping along external surfaces.

2.7 Incorporating Art into Structures

2.7.1 There is an opportunity to incorporate art themes to the boundary fences/ walls to enhance the experience of the public passing by the proposed sewage pumping station PS1A:

- sculptures created by local famous artists or element of natural history could form the centrepiece to a fence/ wall of the sewage pumping station building;
- bas-relief depicting some historical scene or building relevant to the particular location where the sewage pumping station is located;
- graphics displaying information related to the site; and
- water features such as a waterfall wall could as well be introduced.

With regards to the introduction of art, enlisting the help of local schools, artists or poets will make the theme more suitable for to the local environment.

2.8 Adoption of Natural Materials

2.8.1 With the principle of minimising visual impact incurred by the proposed sewage pumping station PS1A on the surrounding environment, it is generally appropriate to use low-key materials with earthy tone for the external finishing of the sewage pumping station facade, which provide a suitable backdrop for vertical planting.

2.8.2 The use of the following natural materials is encouraged:

- Natural granite for external finishing for the sewage pumping station building façade and the boundary walls in colours such as grey, beige, fawn or light brown are preferred. Reconstructed granite tiles could be used as an alternative depending on the site location. Although these materials cost more than spray paint which is often used for DSD building structures, they are much more durable and can last for the whole life of the building with very limited maintenance requirement, and thus offer good long term value for money.

- Natural wood battens mounted on steel bars with various colours can be used to form boundary fences which allow a certain degree of visibility while maintain an appropriate level of security in the sewage pumping station. Another advantage of using natural wood battens fencing is that it blends in with adjoining street planting areas.
- Night time feature lighting is recommended for boundary fences/ walls to emphasise the rustic materials and lush planting.

3 DESIGN LAYOUT AND PERSPECTIVE

3.1 The general layout of the proposed sewage pumping station PS1A is shown in Drawings No.23462/29211 to 29213 and 23462/29221 to 29224.

3.2 The ventilation system of the proposed sewage pumping station PS1A is shown in Drawings No. 23462/28381 and 28382.

3.3 Colour perspectives of schemes for aesthetic design of the proposed sewage pumping station PS1A are shown in Figures 2 and 3.

3.4 Colour perspectives of the recommended scheme 1for aesthetic design of the proposed sewage pumping station are shown in Figures 4 to 9.

APPENDIX A

Checklist for the Aesthetic Design of Sewage Pumping Station

Checklist for the Aesthetic Design of Sewage Pumping Station

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
1) Site Context	**a)** Choose a location for the sewage pumping station not conflicting the site context.	✓	**a)** Not to locate sewage pumping station close to shrine, ancestral worshiping hall, etc.
	b) Identify a location for the sewage pumping station not contrasting prominently with other buildings.	✓	**b)** Sewage pumping station building should not be taller than +15mPD as stipulated in OZP S/K22/2 and the surrounding buildings.
2) Structural Form	**a)** If space allows, variation in structural forms should be chosen to avoid dull image to the public.	✓	**a)** Avoid pragmatic structural form.
3) Facade	**a)** External elevations of the building should give aesthetic pleasing looks and match with the surrounding premises or environment.	✓	**a)** Incorporate features, such as louvers, strips, windows, openings etc.
	b) The facade should be designed to facilitate future maintenance and cleaning by ordinary means of access.	✓	**b)** By exposing structural elements of the building to create interesting geometrical / vivid effects.
			c) Avoid monotonous appearance caused by extensive / massive walls.
			d) Avoid installing pipelines, ducts, conduits, cat-ladders, railings etc. on the external walls.
4) Greening	**a)** Roof garden is encouraged.	✓	**a)** Green vegetation and colourful flowers to give an impression of a garden on the roof of the sewage pumping station.
	b) Vegetation should be provided to soften the building structure.	✓	**b)** Provision of trees and shrubs within the sewage pumping station compound or roof of the sewage pumping station.
	c) Concern about inspection and maintenance of waterproofing on the roof.	✓	**c)** The use of potted plants may be an alternative to planting walls or in-situ tree-planting.
5) Choice of Material	**a)** Facilitate future maintenance.	✓	**a)** Commonly available construction materials should be used.
			b) Cladding / painting / finishes which have long lasting new appearance should be used to reduce cleaning frequency.
6) Colour	**a)** Owing to cultural preferences, some sensitive colours (such as blue, red and yellow) should be used with care.	✓	**a)** The use of warm tone colours to avoid presentation of the building a cold appearance of the building in the community.
	b) Colour scheme which gives harmony to the environment is mostly preferred.	✓	
7) Culture	**a)** Respect local culture and tradition in the design and construction of building in rural areas.		**a)** Consult the concerned local representatives for the aesthetic design of the sewage pumping station.
	b) Consult the concerned rural committees and local representatives as soon as the preliminary design of the sewage pumping station is completed.	✓	
8) Scale and Proportion	**a)** All exterior elements such as facade, doors, sills, canopy, windows and louvers shall be proportionate to each other.	✓	**a)** All exterior elements shall be designed to proportionate to each other.

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
9) E&M Equipment	Pumps		
	a) The footprint of the sewage pumping station is normally determined by the types and number of pumps required.	✓	**a)** Adequate space will be provided for equipment installation and future operation and maintenance of the selected type of pumps.
	b) If available site area is severely limited, one should consider providing only one standby pump on site, and to store off-site, in a convenient location, the remaining standby pumps and all accessories including power cables.	✓	**b)** Excessive space and headroom allowance will be avoided in order not to unnecessarily increase the overall height of the plant room.
	c) A standby pump is essential and indispensable in the operation of sewage pumping station.	✓	**c)** Size and headroom of the sewage pumping station building will allow for lifting/ transversing of the pumps for maintenance purpose.
	Trash Screening and Removal		
	a) Trash Screens are normally installed at the inlet of the sewage pumping station for screenings removal and to protect the pumps from damage and clogging by huge foreign objects.	✓	**a)** Adopt automatic mechanical raked screens to reduce human resources required for operation and maintenance and improve hygiene and safety at work.
	b) Properly design the plant room to comfortably accommodate the screens.	✓	**b)** Optimise the headroom and space requirements to provide the trash screening and removal facilities.
	c) Screenings removal facilities including the parking space for screenings handling vehicle should be located indoor, under cover, shielded or screened through architectural features, landscaping or plantation.	✓	
	d) If large volume of screenings is expected, equipment to wash screenings and to reduce screenings volume should be provided.	✓	
	Lifting Appliances		
	a) Lifting appliances such as mobile cranes will normally be installed in the sewage pump house to facilitate maintenance of heavy equipment.	✓	**a)** Select the type of lifting appliances, which require minimum vertical clearance, to facilitate the maintenance of E&M equipment.
	b) To improve the outlook and optimise the overall headroom of the plant room.	✓	**b)** Consider the provision of mobile elevated platform to access equipment installed at height to improve the outlook and optimize the overall headroom of the plant room.

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	Internal Lighting		
	a) Excessive headroom will unavoidably be required to accommodate the high bay lighting.	✓	**a)** Consider using wall-mounted floodlight and fluorescent light tubes instead of high bay lighting to avoid the requirement of excessive headroom.
			b) Cabling for the lighting or other building services equipment should be installed in concealed conduit as far as practicable.
	External Lighting		
	a) In addition to normal external lighting such as street lighting for general illumination, special exterior lighting shall be provided.	✓	**a)** Consider providing external lighting for improving the aesthetic effect of the exterior of the sewage pumping station during night time.
			b) External lighting, especially floodlights, should be located and orientated to avoid inducing glare effects on the neighbourhood or nearby road users.
			c) Lighting for both security and particular O&M purposes should be provided.
			d) Timer control, remote control, photo-sensor and bypass switches for the external lighting should be provided where appropriate.
			e) Cabling for external lighting should be accommodated inside the building or concealed as far as possible.
	Power Supply		
	a) Dual-feed electricity supply is preferred to Diesel Generators for emergency electricity back-up for minimizing land intake requirements.	✓	**a)** Balance between the capital cost for provision of dual feed power supply; the benefits of minimizing the land intake requirements; benefits of the aesthetic appearance of the sewage pumping station; and the reliability of the dual power supply in the region where the sewage pumping station is to be built.
	b) However, if the capital cost is too high or the reliability of the dual power supply in the region where the sewage pumping station is to be built is low, an emergency generator should be chosen.	✓	**b)** Visual intrusion caused by the exhaust gas vent of the diesel engine and noise nuisance caused by operation of the diesel engine should be minimized if emergency generator is eventually selected.

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	Ventilation and Air-conditioning		
	a) Any exposed ventilation fans and air conditioners should be provided with aesthetic features.	✓	**a)** Air ductwork should be located inside the pumping station.
			b) Air intake / exhaust of the ventilation system should be installed on the building faces / walls not facing the public. Otherwise, their shape and colour should be carefully chosen to tune down their intrusive effect.
			c) Silencers and louvers should be provided.
	Odour Treatment Facilities		
	a) Heights, footprint requirements and outlooks of different types of deodorizing equipment should be considered.	✓	**a)** Separate openings or outlets from sensitive receivers and incorporate ornamental features to lessen the visual effects of the openings on the public.
	b) Deodourizer should be located indoor, under cover, shielded or screened through architectural features, landscape work or plantation.	✓	
	c) Ventilation openings and outlets of odour treatment facilities should be oriented in a direction away from the sensitive receivers (e.g. residential premises and pedestrian walkways).	✓	
	d) Ornamental features should be provided for these ventilation openings to reduce their visual impact.	✓	
	Renewable Energy Equipment		
	a) Adoption of energy efficient features and installation of renewable energy equipment should be seriously considered (some examples include solar heating, Photovoltaic system and wind turbine).	✓	**a)** Adoption of energy efficient features and installation of renewable energy equipment would be considered in accordance with ETWB TCW No.16/2005.

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	b) Any use of PV panels or other renewable energy equipment mounted on the roof of the sewage pumping station should be screened / shielded.	✓	**b)** Careful planning for the installation of renewable energy equipment at the sewage pumping station to maintain the aesthetic design.
10) Civil and Structural Elements	Boundary Fences and Walls		
	a) Visually permeable fences such as metallic fencing with screen planting shall be used to screen the sewage pumping station.	✓	**a)** Solid boundary walls with suitable architectural features may be considered for the sewage pumping station where the operational activities may create environmental nuisance or are visually intrusive.
	b) Colour, material and architectural pattern of the main gate should match with the boundary fences or walls.	✓	**b)** Boundary walls and fences shall be located carefully to avoid impairing existing urban / rural landscape elements such as mature trees.
			c) Choices of materials, details and textures of the boundary walls and fences should be visually recessive and in a style that fits with the surrounding environment / buildings.
			d) If metallic fences are used, colour with low chromatic intensity shall be considered to reduce the contrast between the fences and their background.
			e) Glass block panels can be adopted to make the solid boundary walls look less massive, but should be avoided in the area where the sewage pumping station is prone to vandalism (e.g. remote area, unmanned sewage pumping station).
	Roof		
	a) Roof garden shall be implemented to reduce solar heat and soften the building mass. Alternatively, potted plants are also acceptable.	✓	**a)** Special consideration should be given to the roof water-proofing system and other maintenance requirements (advice from ArchSD on the design of the roof garden may be sought).
	b) Perennial plants are preferable for the unmanned sewage pumping station and better appearance in dry seasons.	✓	**b)** Sky window can introduce natural light into the interior of the sewage pumping station and could be an attractive feature when properly designed.
			c) Parapet walls of suitable height / size should be provided. It can also act as a safety protection for the maintenance personnel and visitors entering the roof garden.
			d) Cat ladder, which is considered to be visually intrusive, should be installed on the sewage pumping station roof garden.

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	Louvers, Window and Exterior Door		
	a) All exterior openings shall be provided with the same rectangular ratio as the building.	✓	**a)** The colours of the louvers, windows and doors etc. should match with the overall colour scheme of the sewage pumping station.
	b) Exterior openings shall be located away from the local sensitive receivers (e.g. residential and commercial buildings etc.).	✓	
	c) Window guards instead of exterior security bars should be used for the windows at ground level.	✓	
11) Utility Services and Plumbing	**a)** Utility services and plumbing should be accommodated inside the sewage pumping station.	✓	**a)** External pipes and vents shall be concealed for better appearance.
			b) Provide reserve utility services ducts or conduits to cater for possible additional utility services at later stages.
12) Landscaping Works	**a)** Evergreen plants / trees shall be selected.	✓	**a)** Landscaping works should be carried out in phases such that some landscaping works can be established at early stages of the sewage pumping station construction to achieve gradual greening effects.
	b) Existing trees shall be reserved and protected.	✓	**b)** Medium size trees / shrubs, instead of seedlings, should be planted shortly after the completion of the construction stage.
	c) Automatic irrigation facilities shall be provided.	✓	**c)** Climbers, flower racks and other vertical greening should be provided to beautify the external walls of the sewage pumping station and to keep the building cool.
13) Architectural Treatment	**a)** Operations that may have negative visual impact on the public (e.g., handling of screenings) should be located indoor, under cover, shielded or screened through architectural features, landscaping or plantation.	✓	**a)** Any outdoor equipment should be under cover, shielded or screened.
	b) Staining problem caused by rainwater dripping along the external surface should be avoided by the appropriate direction of fall which helps drain the rainwater away.	✓	
14) Administrative Measures	**a)** The requirements in DSD TC No.9/2006 shall be followed for sewage pumping stations which are designed and built by others and taken over by DSD for operation and maintenance.	✓	**a)** All consultation exercises should be properly documented in order to avoid future disputes.
	b) The pumping station design should be forwarded to the ArchSD's Design Advisory Panel for advice.	✓	
	c) The requirements stated in EWTB TC(W) No. 8/2005 shall be followed.	✓	
	d) Any change in the disposition and aesthetic design of the sewage pumping station during construction may result in resubmissions under Environmental Impact Assessment Ordinance and Town Planning Ordinance.	✓	

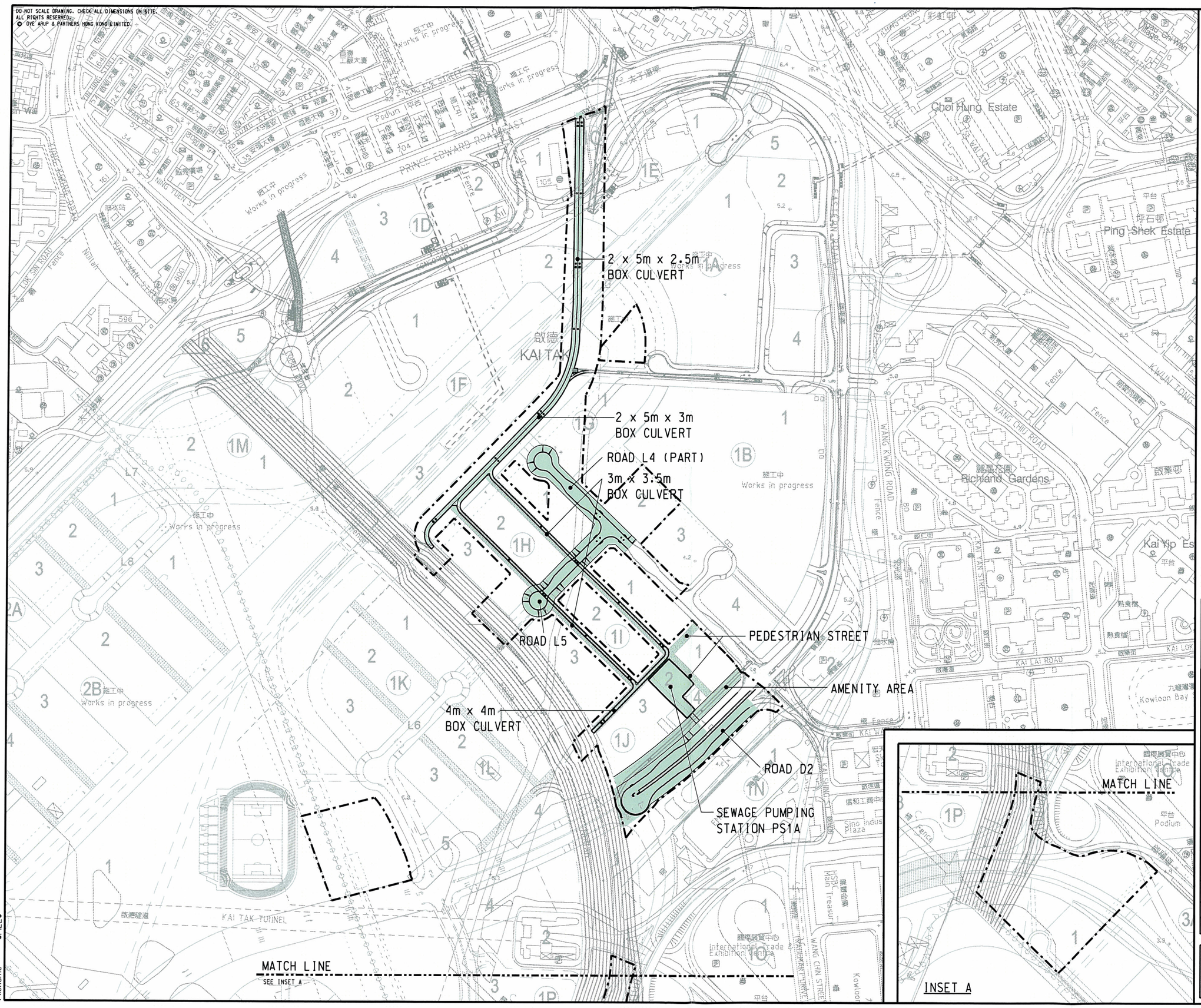
Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	e) Design revisions that would affect the external appearance of the sewage pumping station should be vetted by Head of the Project Division before issuing the revised construction details to the contractor.	✓	
	f) Before aesthetic and landscaping designs of the pumping station are finalized, relevant parties (District Council, Rural Committee, local representatives, etc.) shall be consulted.	✓	
15) Green Building Rating	**a)** New pumping station with construction floor area larger than 10,000m^2 should aim to obtain the second highest grade or above under an internationally or locally recognized building environmental assessment system such as the Leadership in Energy and Environmental Design Green Building Rating System (LEED) or Hong Kong Building Environmental Assessment Method (BEAM), and in due course the assessment system to be developed by the Hong Kong Green Building Council which will soon be established.	N/A	
16) Energy Efficient Features	**a)** New sewage pumping station with construction floor area larger than 10,000m^2 should aim to outperform the Building Energy Codes issued by the Electrical and Mechanical Services Department by at least 10%.	N/A	
	General Building Configuration		
	a) Building Orientation to be carefully chosen.	N/A	
	b) Building fabric materials to be carefully chosen.	N/A	
	c) Low thermal conductivity materials for building envelope insulation.	N/A	
	Building Energy Management System		
	a) Adopt programmable on/off control for lighting and air-conditioning system.	N/A	
	b) Optimum control and scheduling of air-conditioning plants.	N/A	
	c) Recording of energy consumption trends for energy audit.	N/A	

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
	Lighting Installation		
	a) Install electronic ballasts for fluorescent lamps.	N/A	
	b) Adopt T5 (or better) fluorescent lamps for general lighting.	N/A	
	c) Adopt T5 (or better) fluorescent tubes with parabolic diffusers for tall headroom locations.	N/A	
	d) Use lamps with high efficacy.	N/A	
	e) Use low energy consumption signs (e.g. exit signs, direction signs, occupancy signs etc.).	N/A	
	f) Use photo-sensors for independent control of lighting.	N/A	
	g) Use timer-operated lighting.	N/A	
	h) Adopt occupancy sensors for lighting control.	N/A	
	Air-conditioning Installation		
	a) Connection to District Cooling System.	N/A	
	b) Use chillers with high coefficient-of-performance (COP).	N/A	
	c) Adopt heat recovery chillers for reclaiming waste heat.	N/A	
	d) Adopt seawater cooled condensers.	N/A	
	e) Adopt evaporative cooling towers using fresh water as a cooling media.	N/A	
	f) Use total heat wheel to reclaim energy from exhaust air.	N/A	
	g) Adopt variable speed drives.	N/A	
	h) Adopt multi-zone variable air volume (VAV) system.	N/A	
	i) Adopt free cooling using outdoor air.	N/A	
	j) Demand control of fresh air supply.	N/A	
	k) Adopt variable secondary chilled water flow.	N/A	
	l) Minimize pipe losses.	N/A	
	m) Room temperature sensing devices (such as thermostats) should be properly located to more accurately reflect room conditions.	N/A	
	n) Adopt occupancy sensor control, e.g. for office rooms.	N/A	
	o) Adopt computerized / programmable control for the air-conditioning system.	N/A	
	p) Control air leakage level (positive building pressure).	N/A	
	q) Adopt automatic condenser tube cleaning equipment.	N/A	
	r) Due consideration about chiller part-load efficiencies.	N/A	

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
17) Adoption of Renewable Energy Technologies	Adoption of Photovoltaic (PV) Technology		
	a) For buildings with footprint area greater than 1,000m^2, photovoltaic (PV) panels should be installed where practicable with due consideration given to the shading effects caused by nearby buildings/structures.	N/A	
	b) Building-integrated photovoltaic (BIPV) panels on facades should be adopted, provided it is allowed by the structural and architectural design of the building, and will not be shaded by nearby structures.	N/A	
	Adoption of Wind Turbine Technology		
	a) For site of mean wind power density above 200W/m^2, without nearby obstructions to the flow of wind and having the advantage of height or exposure to the sea, wind turbines (e.g. rooftop turbines) should be installed where practicable with due consideration given to issues relating to noise, visual and safety.	N/A	
	Adoption of Bio-gas Electricity Generation Technology		
	a) For sites with bio-gas source available, the use of bio-gas as a fuel for heating and electricity generation should be adopted where practicable with due consideration given to the health risk impacts caused by the emission of flue gases.	N/A	
18) Greenhouse Gas (GHG) Reduction	**a)** New sewage pumping station with construction floor area larger than 10,000m^2 should aim to achieve reduction in GHG emission through lowering energy consumption by at least 20% below the average consumption level (in terms of kWh/sq.m/year) for existing sewage pumping station.	N/A	
	b) New sewage pumping station with construction floor area larger than 10,000m^2 to be completed after end-2011 should aim to carry out carbon audit and report the findings in the DSD's annual Environmental Performance Report.	N/A	

Item(s)	Consideration(s)	Items Applicable to the Proposed Sewage Pumping Station Building	Recommended Approach(es)
19) Waste Reduction and Management	**a)** The generation of waste should be reduced as much as possible at all stages of the pumping station's life cycle.	✓	**a)** Use more durable, environmentally sustainable, recyclable, repairable and replaceable materials and adopt modular construction as far as possible.
	b) The use of materials on site should be maximized.	✓	
	c) The use of certified environmentally sustainable building materials or those with high recyclable content should be encouraged.	✓	

DRAWINGS



STAGE 2

CONSTRUCTION ELEMENTS:

- PART OF ROAD L4
- ROAD L5
- PART OF ROAD D2
- PUMPING STATION PS1A
- MODIFICATION OF 2.5mx2.5m BOX CULVERT TO CONNECT WITH NEW 2x5mx3m BOX CULVERT
- 2x5mx2.5m/3m BOX CULVERT
- 2 NOS.3mx3.5m BOX CULVERT
- 4mx4m BOX CULVERT
- CONSTRUCTION OF ULTIMATE PHASE DRAINAGE AND SEWERAGE SYSTEM
- CONSTRUCTION OF ULTIMATE PHASE FRESH AND SALT SUPPLIES SYSTEM
- AT GRADE FOOTPATHS ALONG NEWLY CONSTRUCTED ROADS
- LANDSCAPING OF AMENITY AREAS

Rev	Description	By	Date
A	GENERAL REVISION	GK	09/10

Consultant
ARUP 奧雅納工程顧問 Ove Arup & Partners Hong Kong Limited

Project title
Contract No. KL/2010/03
Kai Tak Development - Stage 2
Infrastructure Works at North Apron
Area of Kai Tak Airport for Residential Development and Government, Institution or Community Facilities

Drawing title
INFRASTRUCTURE WORKS
AT NORTH APRON PHASE 1,
STAGE 2

Drawing no.			Rev.
23462/SK/1252			A
Drawn	Date	Checked	Approved
WM	10/09	GK	LL
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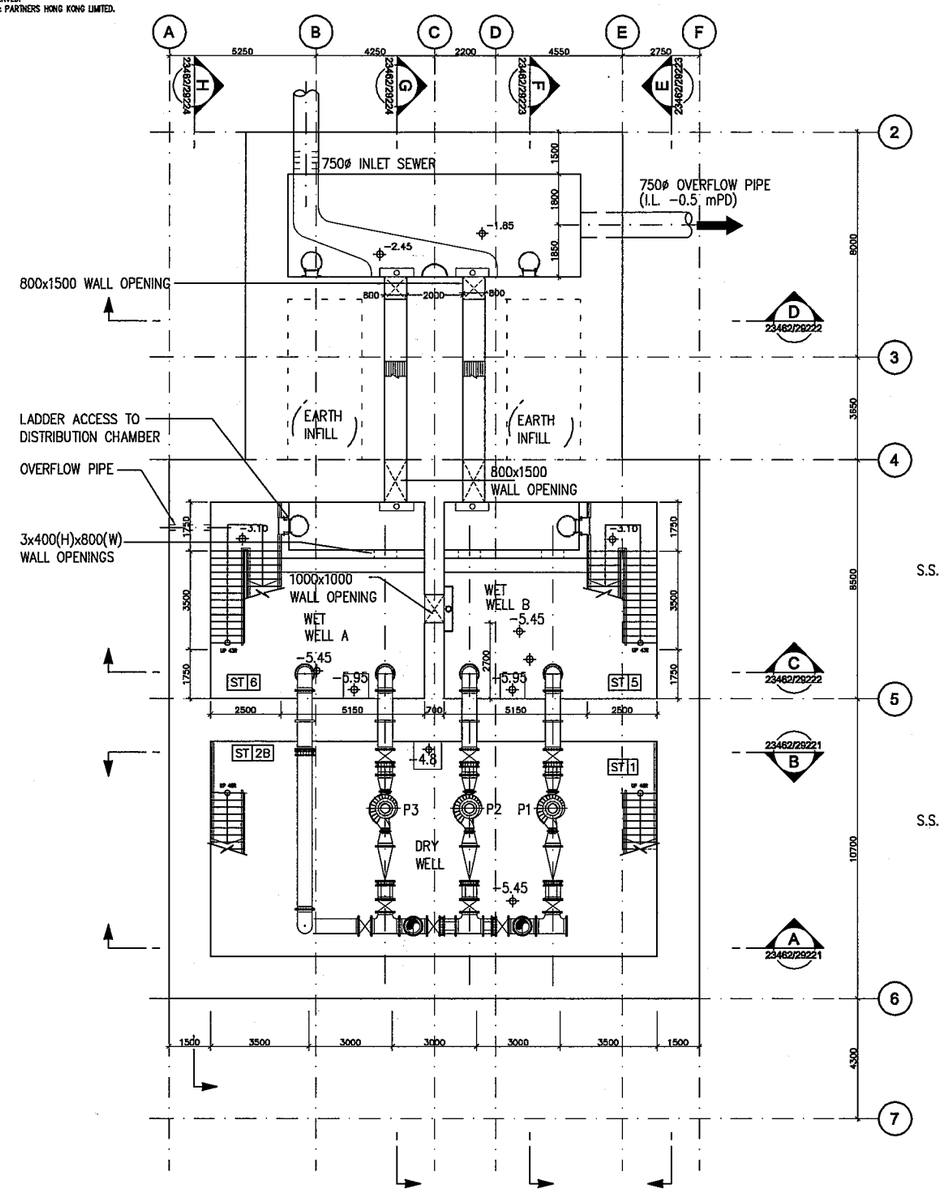

1 BASEMENT FLOOR PLAN
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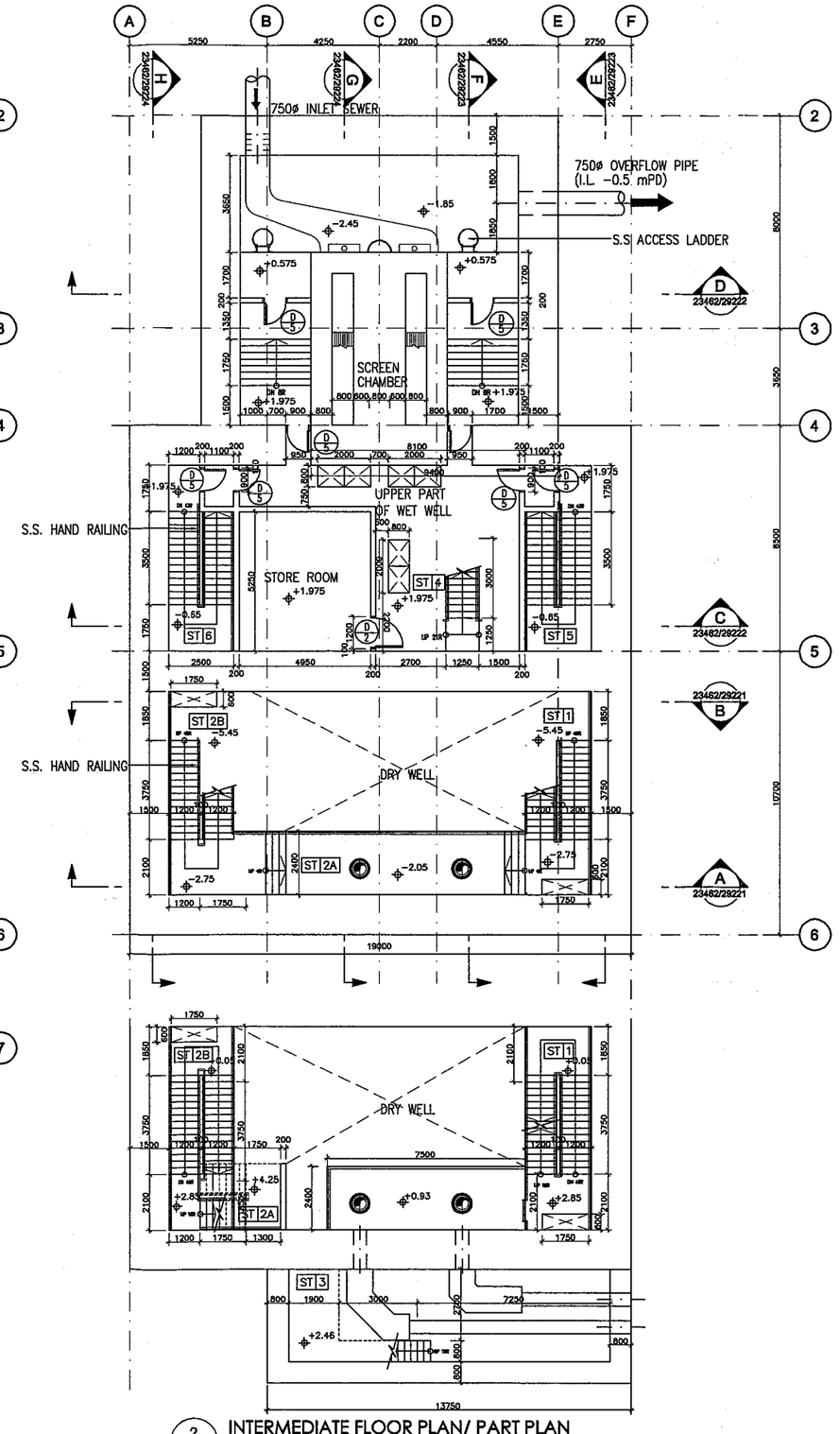

2 INTERMEDIATE FLOOR PLAN/ PART PLAN
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NOTES:

1. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. LEVELS ARE IN METRES RELATIVE TO PRINCIPAL DATUM (P.D.)

Rev	Description	By	Date

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ARUP 奧雅納工程顧問 Ove Arup & Partners Hong Kong Limited

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Infrastructure Works at North Apron Area of Kai Tak Airport for Residential Development and Government, Institution or Community Facilities.

Drawing title
SEWAGE PUMPING STATION PS1A
– FLOOR PLANS (SHEET 1 OF 3)

Drawing no.		Rev.
23462/29211		–
Drawn	Date	Checked / Approved
–	12/10	– / –
Scale	1:100	Status –

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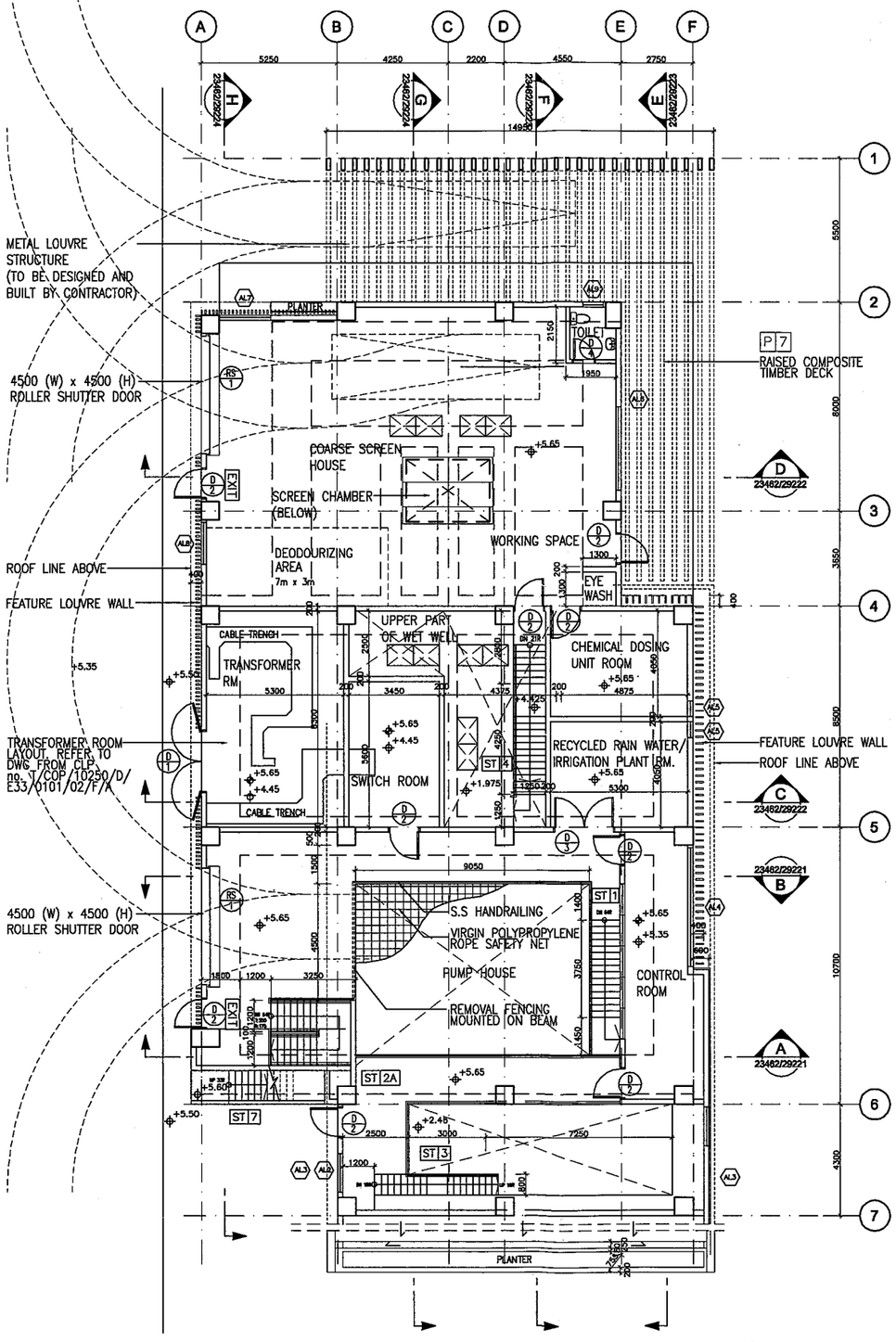
Printed by : 20/11/2010
Filename : SC1_D0_ELE_20101111



3 GROUND FLOOR PLAN
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NOTES:

1. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
2. LEVELS ARE IN METRES RELATIVE TO PRINCIPAL DATUM (P.D.)

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Project title
Infrastructure at North Apron Area of Kai Tak Airport - Design and Construction Stage 2 Infrastructure Works at North Apron Area of Kai Tak Airport

Drawing title
SEWAGE PUMPING STATION PS1A – FLOOR PLANS (SHEET 2 OF 3)

Drawing no.		Rev.
23462/29212		–
Drawn	Date	Checked / Approved
–	11/10	– / –
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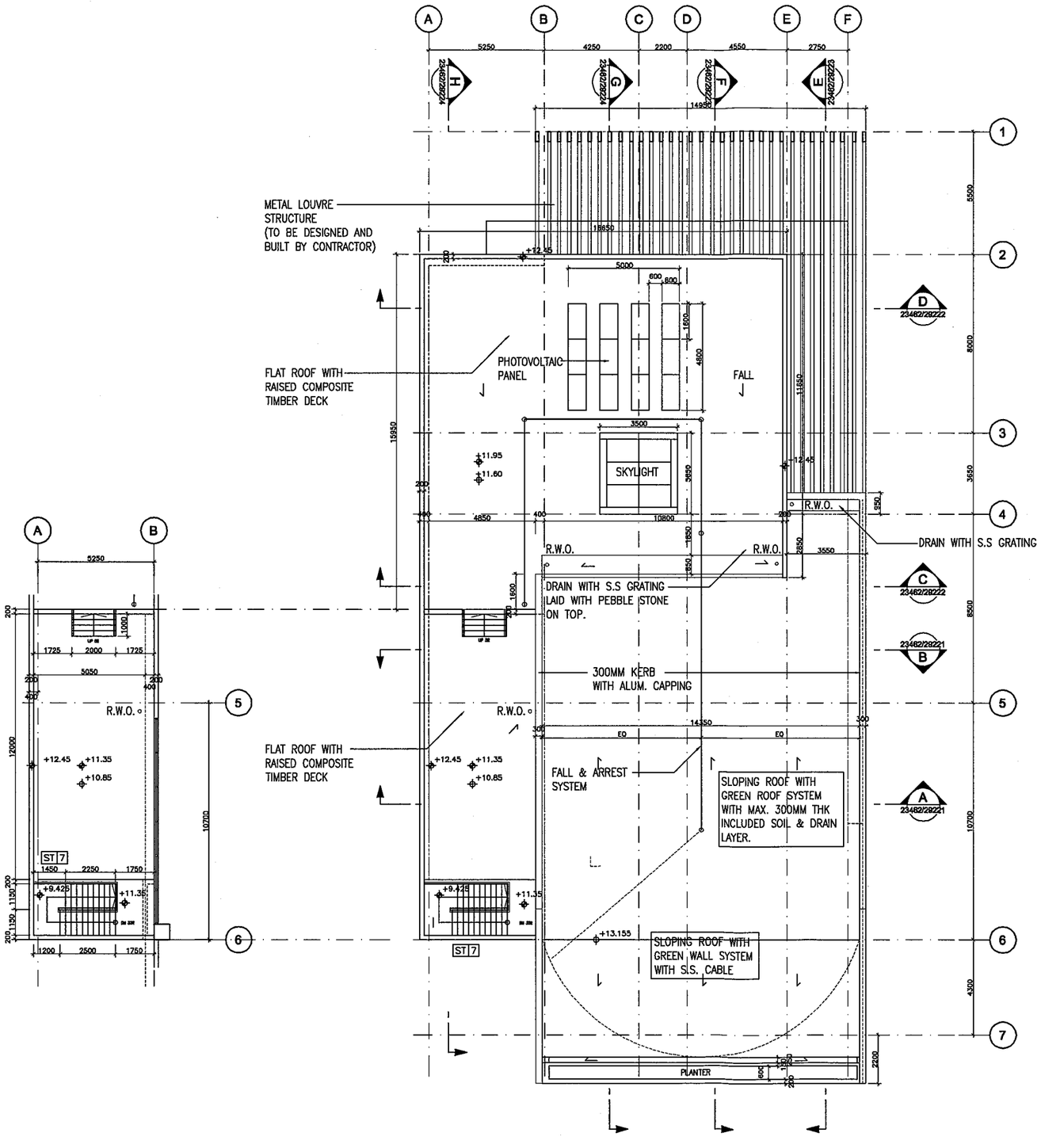

4 ROOF PLAN/PART ROOF PLAN

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NOTES:

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2. LEVELS ARE IN METRES RELATIVE TO PRINCIPAL DATUM (P.D.)

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Drawing title
SEWAGE PUMPING STATION PS1A – FLOOR PLANS (SHEET 3 OF 3)

Drawing no.		Rev.
23462/29213		–
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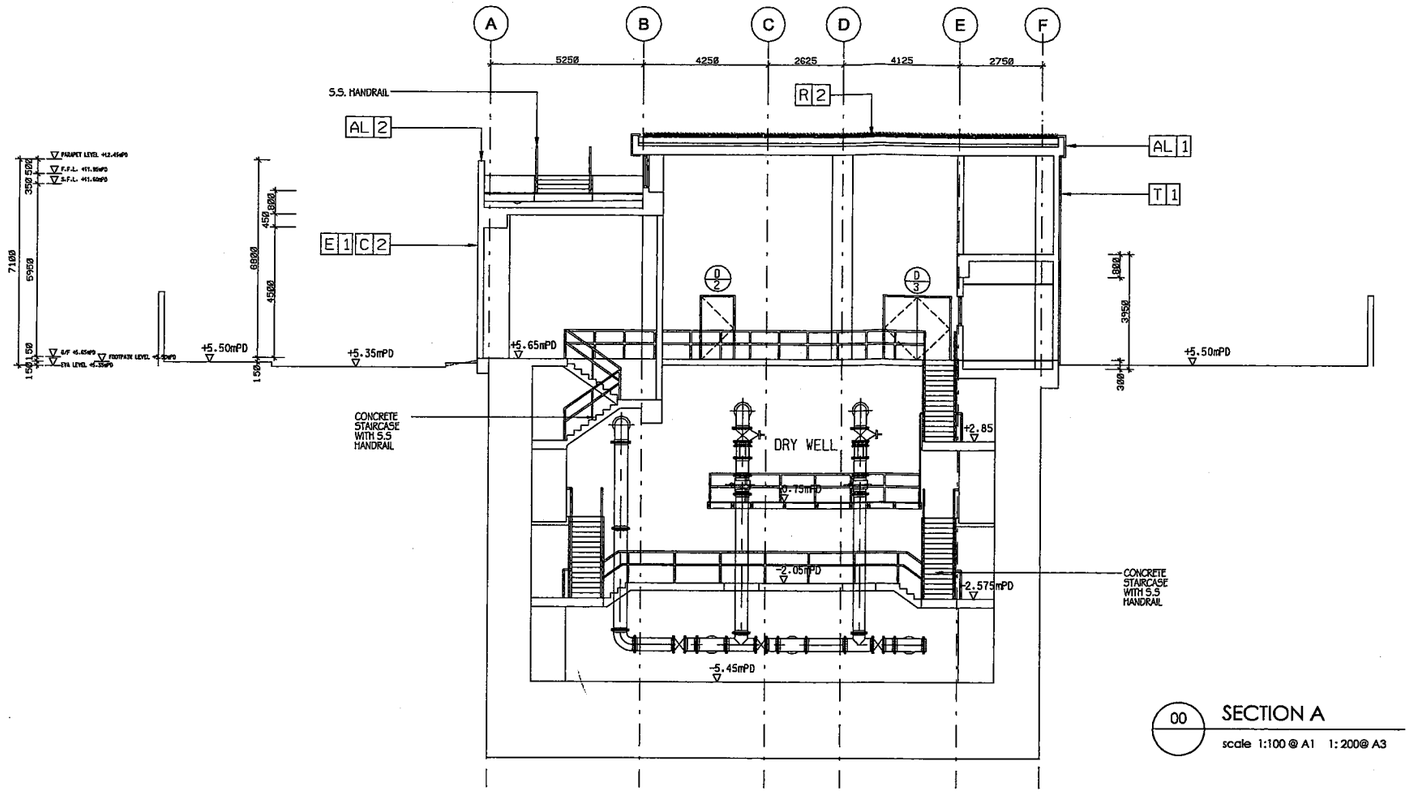

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Rev	Description	By	Date

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Drawing title
SEWAGE PUMPING STATION PS1A - SECTIONS (SHEET 1 OF 4)

Drawing no.		Rev.
23462/29221		–
Drawn: –	Date: 11/10	Checked: –	Approved: –
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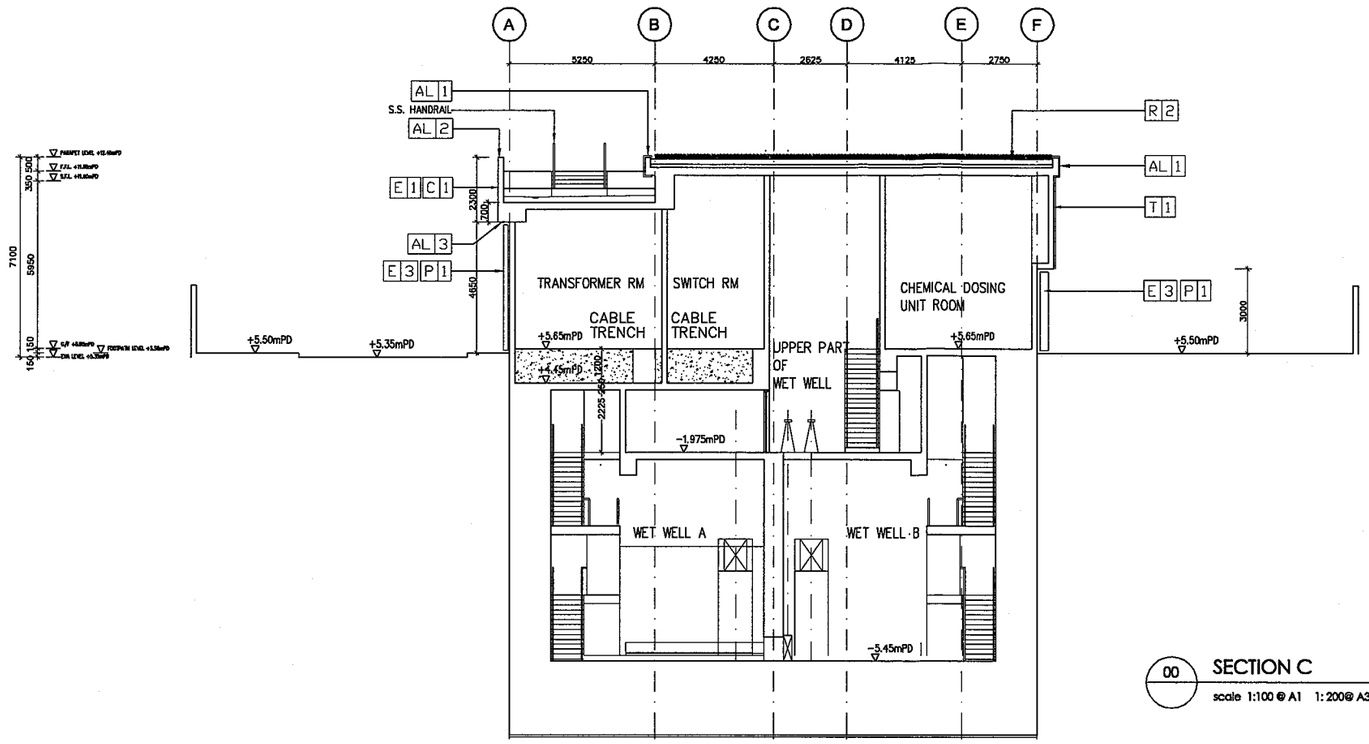

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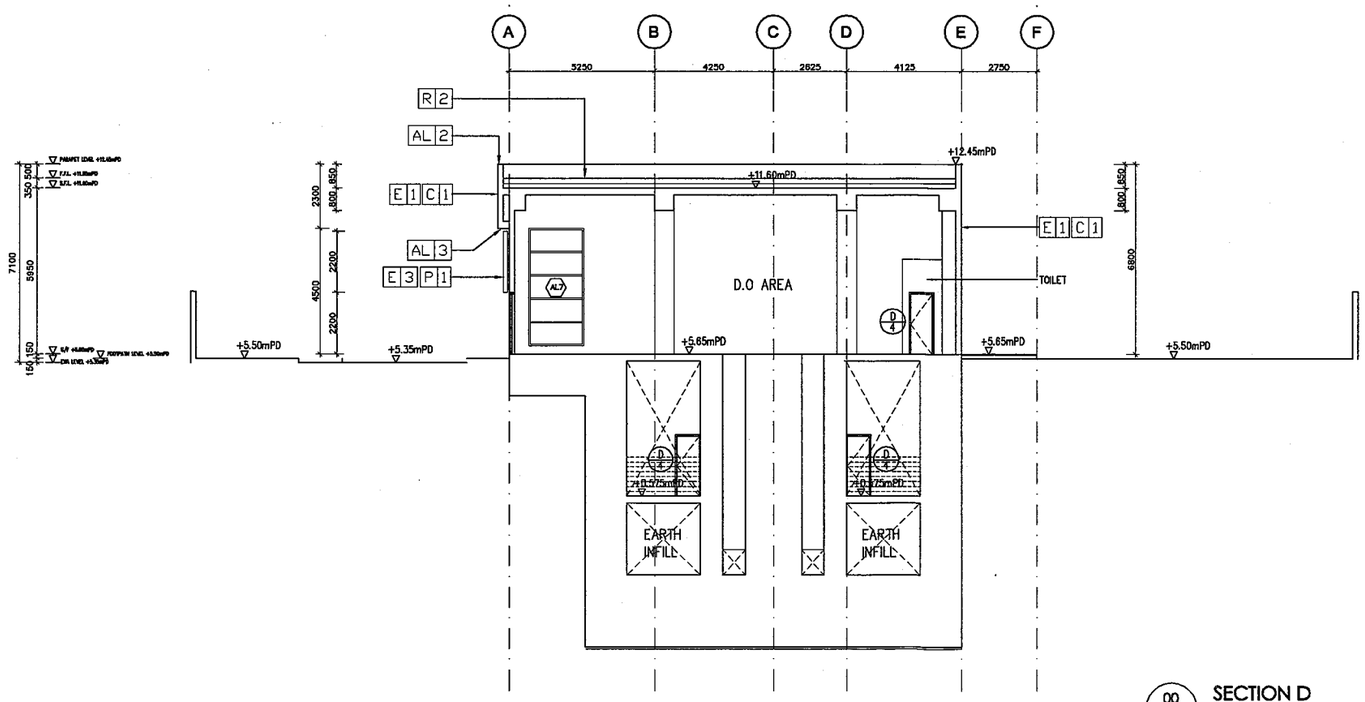

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Drawing title
SEWAGE PUMPING STATION PS1A – SECTIONS (SHEET 2 OF 4)

Drawing no.	Rev.
23462/29222	–

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–	11/10	–	–

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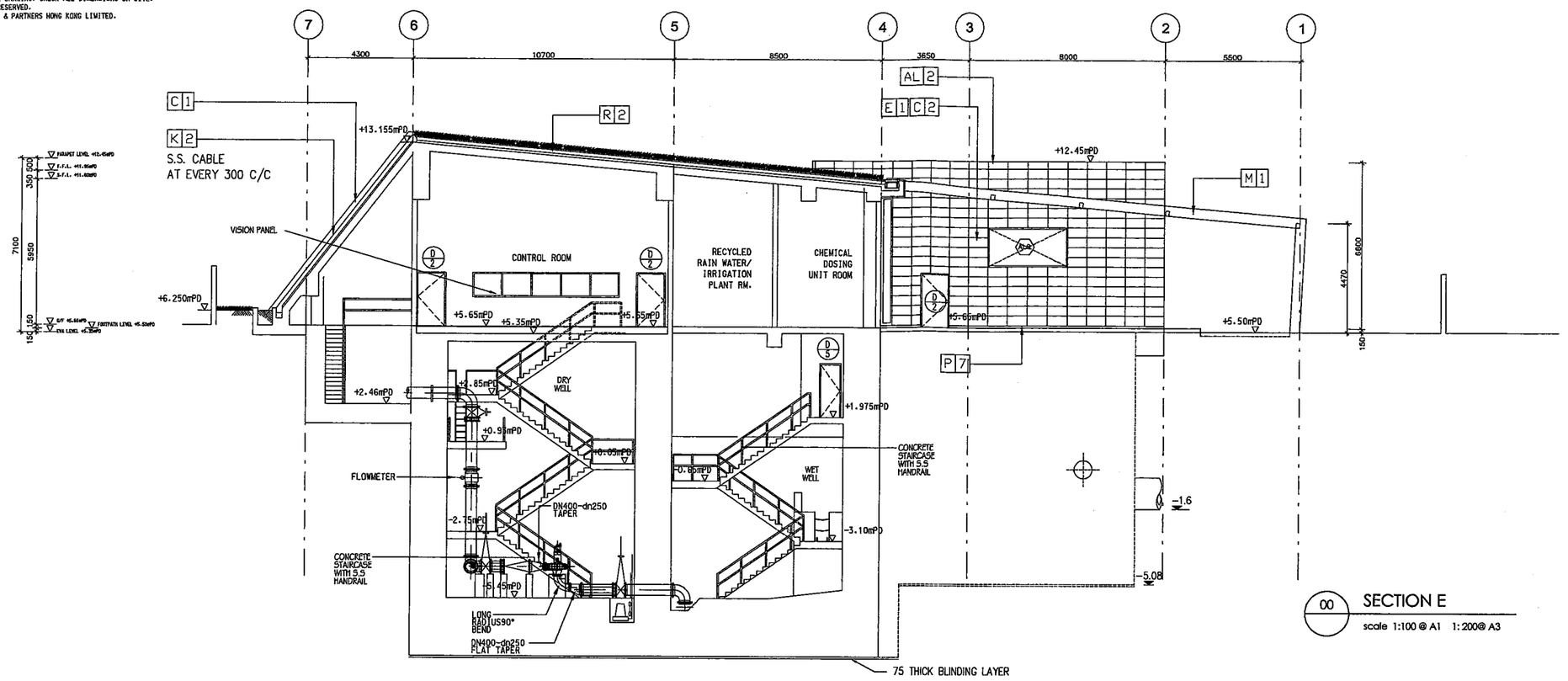

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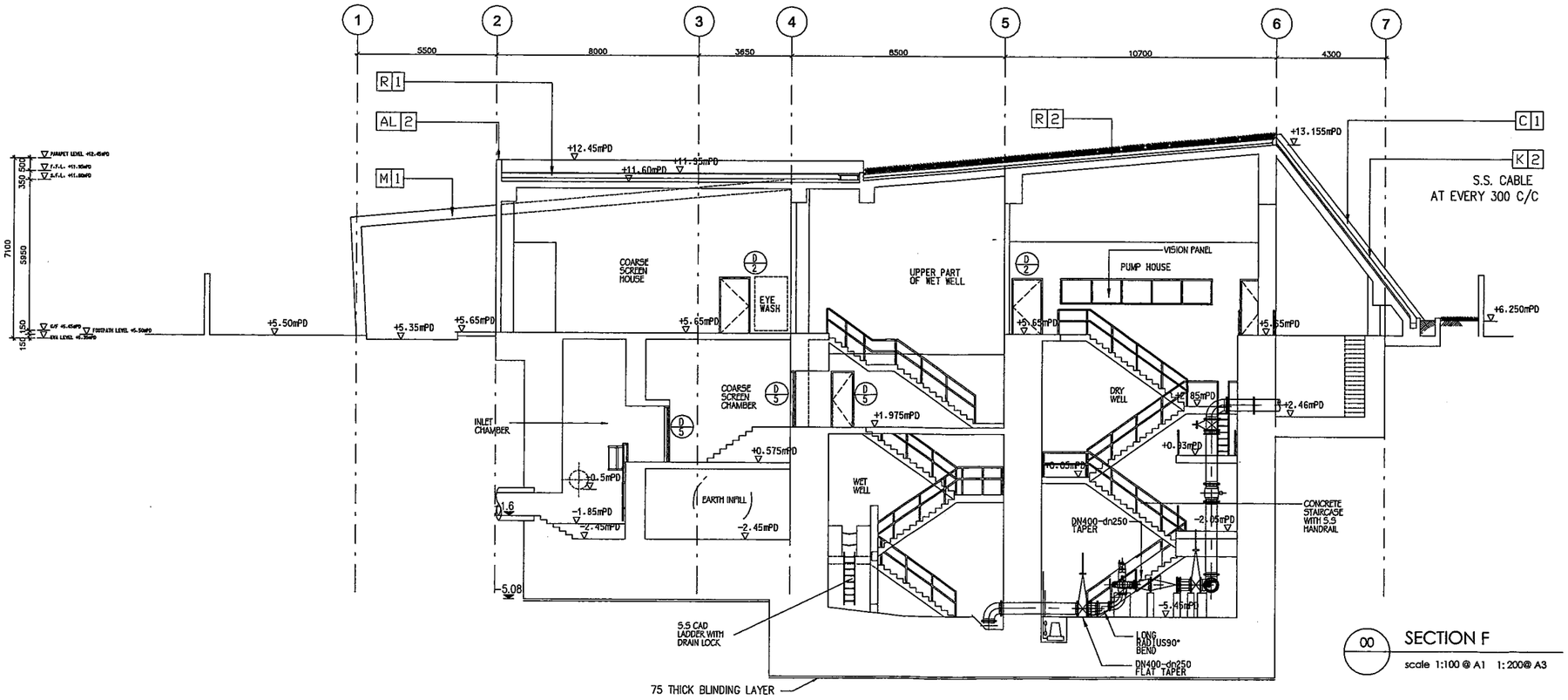

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Project title
Infrastructure at North Apron Area of Kai Tak Airport - Design and Construction Stage 2 Infrastructure Works at North Apron Area of Kai Tak Airport

Drawing title
SEWAGE PUMPING STATION PS1A - SECTIONS (SHEET 3 OF 4)

Drawing no.		Rev.
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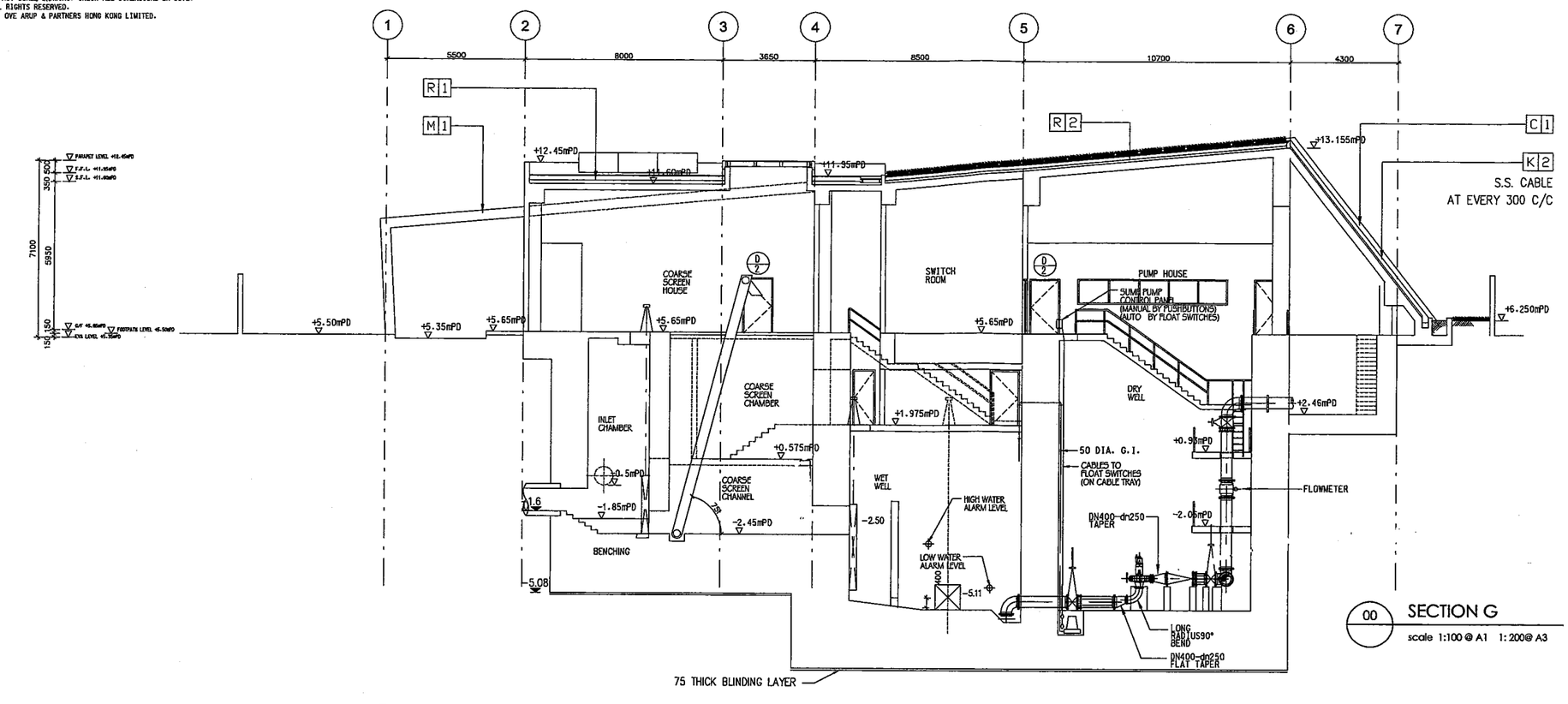

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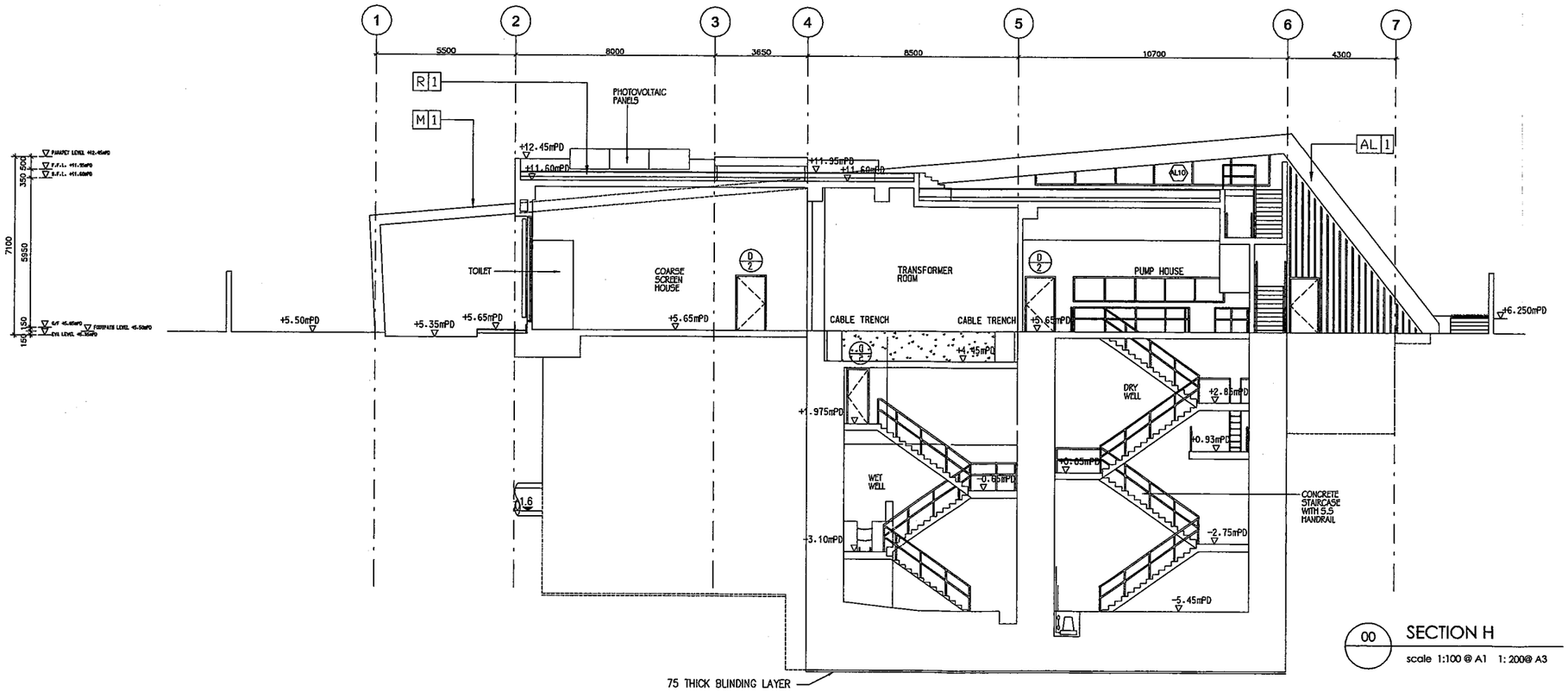

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Project title
Infrastructure at North Apron Area of Kai Tak Airport - Design and Construction Stage 2 Infrastructure Works at North Apron Area of Kai Tak Airport

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SEWAGE PUMPING STATION PS1A – SECTIONS (SHEET 4 OF 4)

Drawing no.		Rev.
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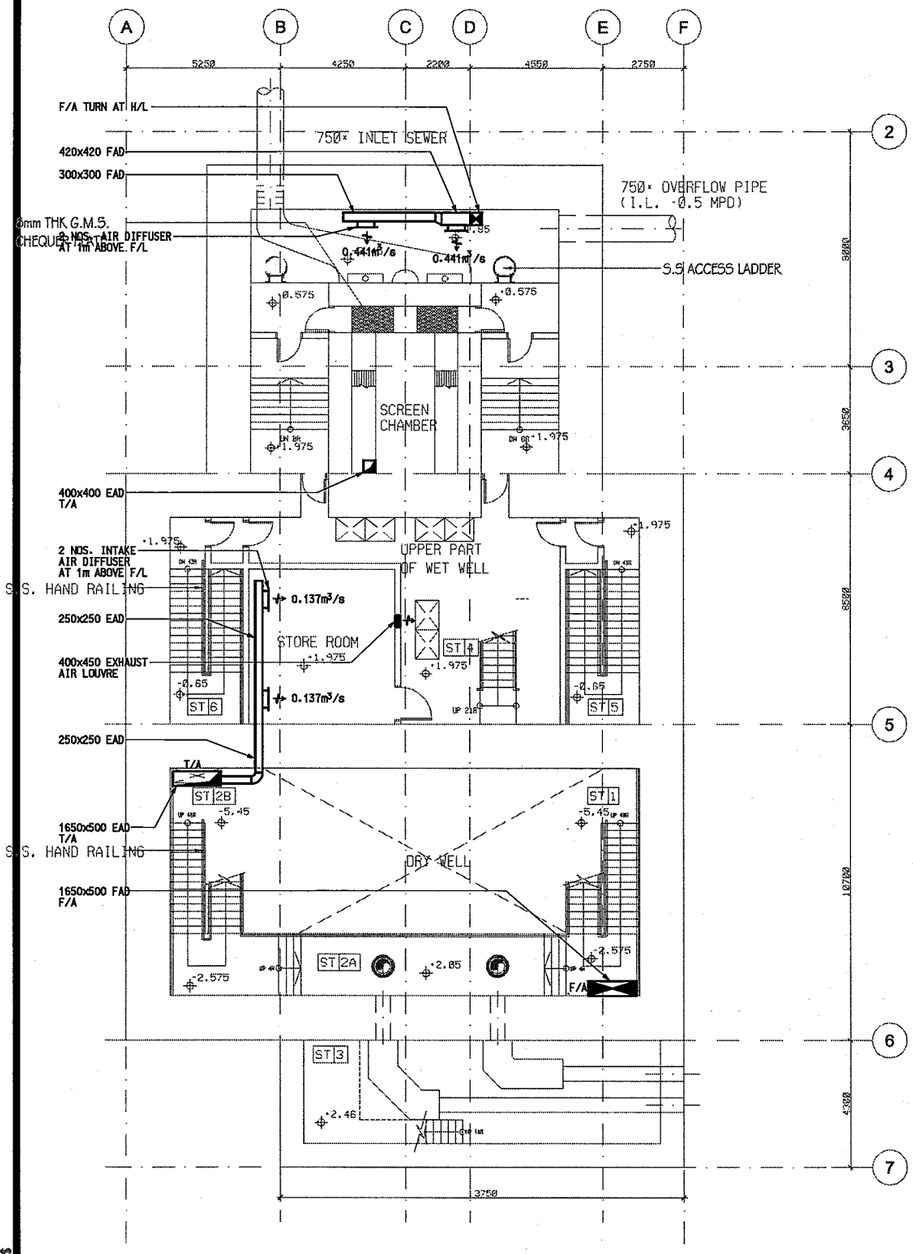

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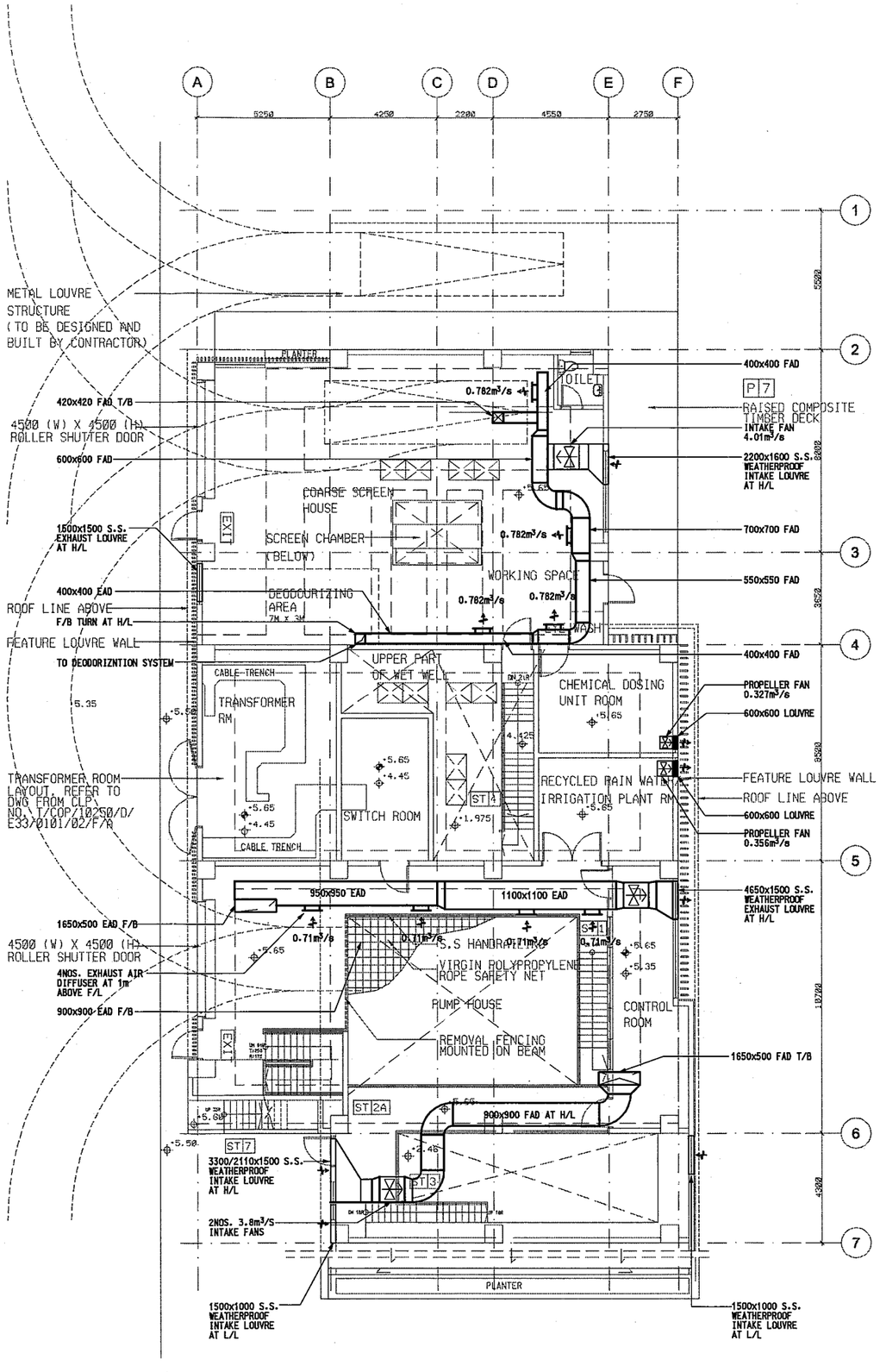

3 GROUND FLOOR PLAN
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Rev	Description	By	Date

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Project title
Contract No. KL/2010/03
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Infrastructure Works at North Apron Area of Kai Tak Airport for Residential Development and Government, Institution or Community Facilities

Drawing title
PUMPING PUMPING PS1A – VENTILATION SYSTEM (SHEET 1 OF 2)

Drawing no.	Rev.
23462/28381	–

Drawn	Date	Checked	Approved
KTM	12/10	GK	LL

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Civil Engineering and Development Department

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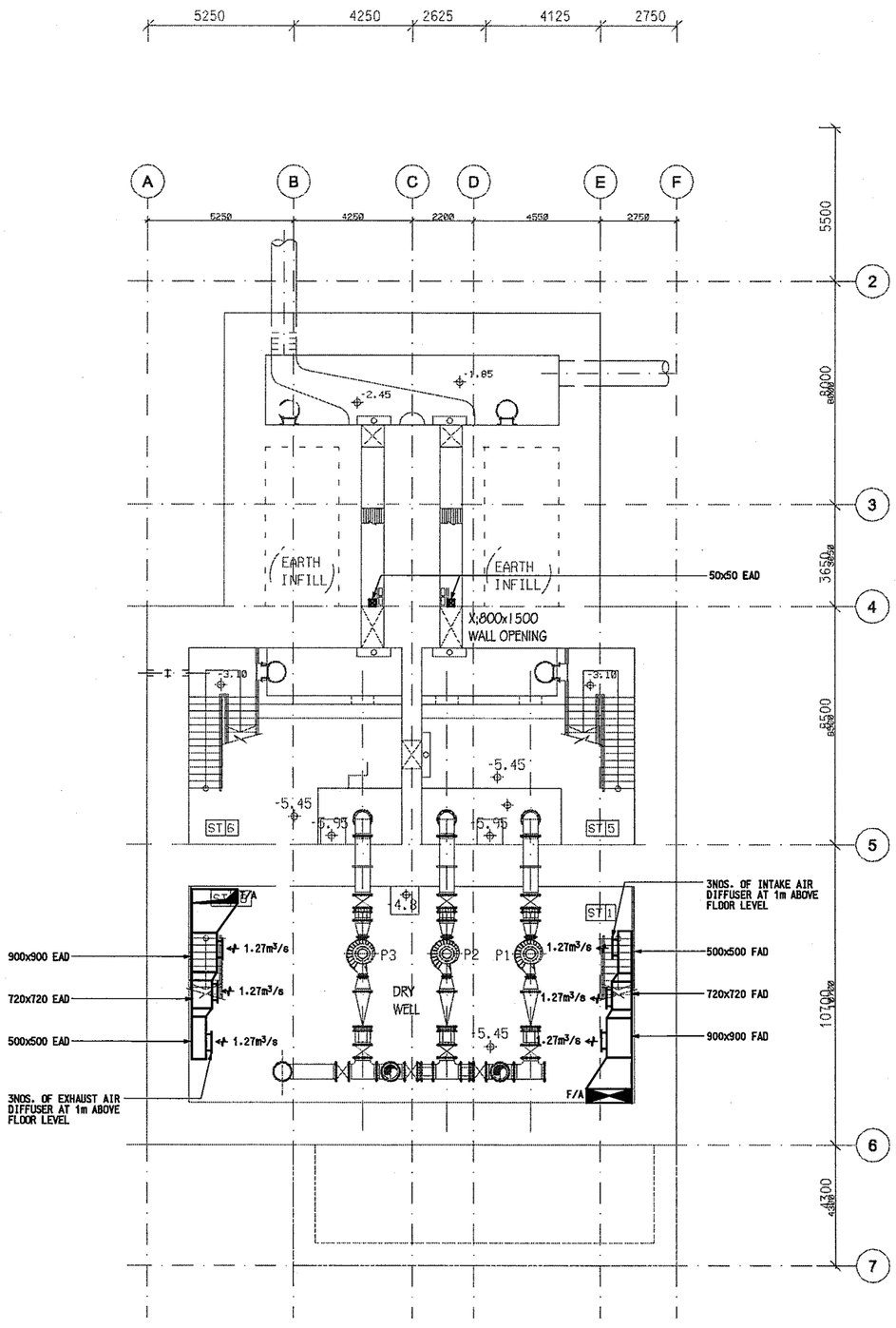

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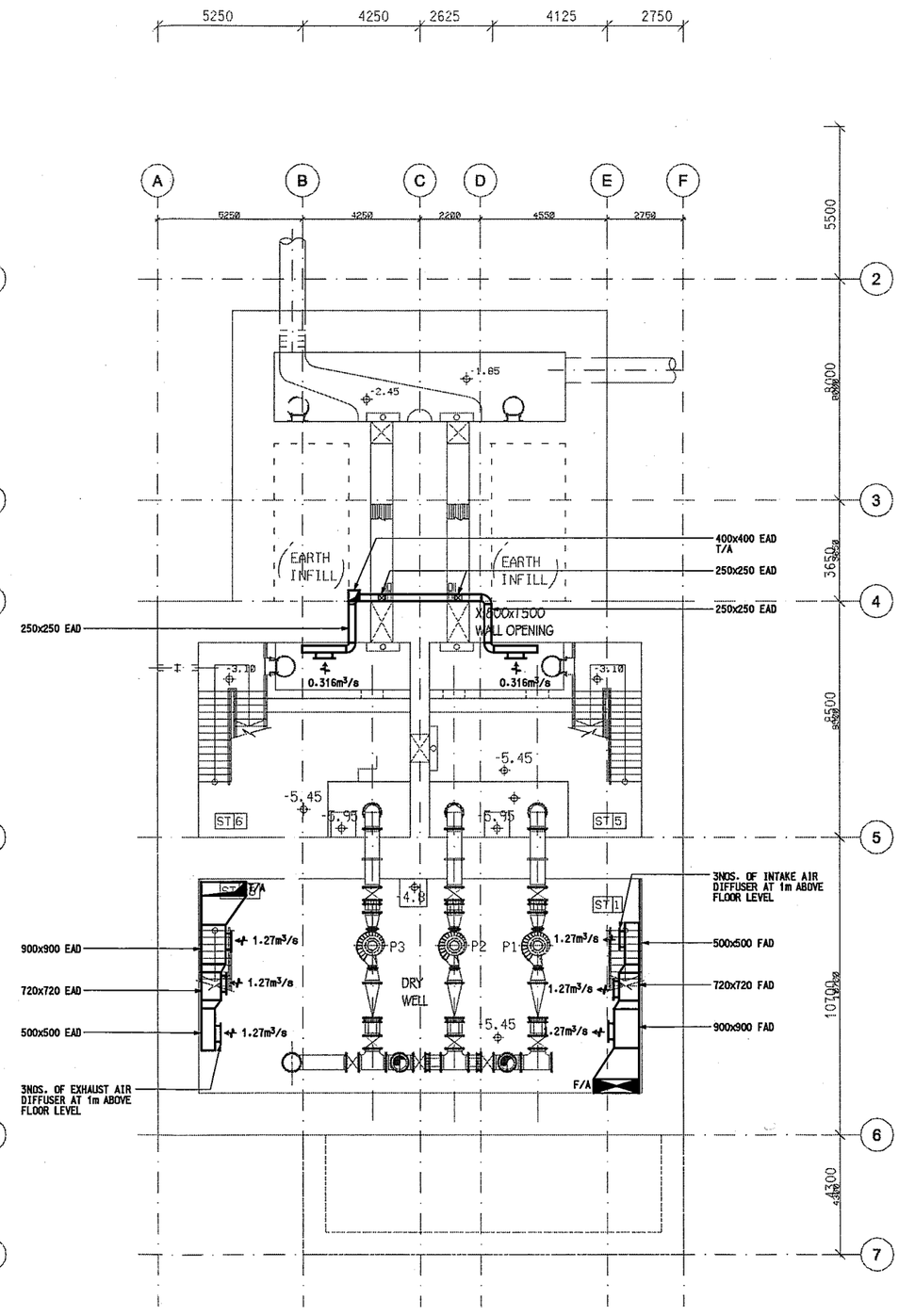

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Contract No. KL/2010/03
Kai Tak Development - Stage 2
Infrastructure Works at North Apron Area of Kai Tak Airport for Residential Development and Government, Institution or Community Facilities

Drawing title
PUMPING PUMPING PS1A – VENTILATION SYSTEM (SHEET 2 OF 2)

Drawing no.	Rev.
23462/28382	–

Drawn	Date	Checked	Approved
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Scale 1:100 @A1 Status PRELIMINARY

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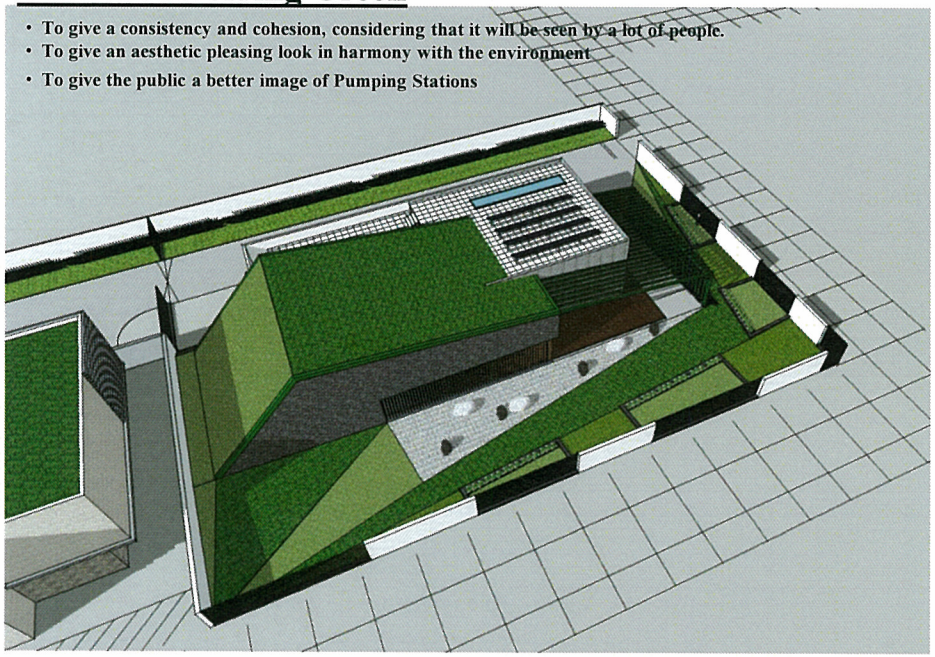
FIGURES

Kai Tak Master Layout Plan (North Arpon Area)

Figure 1

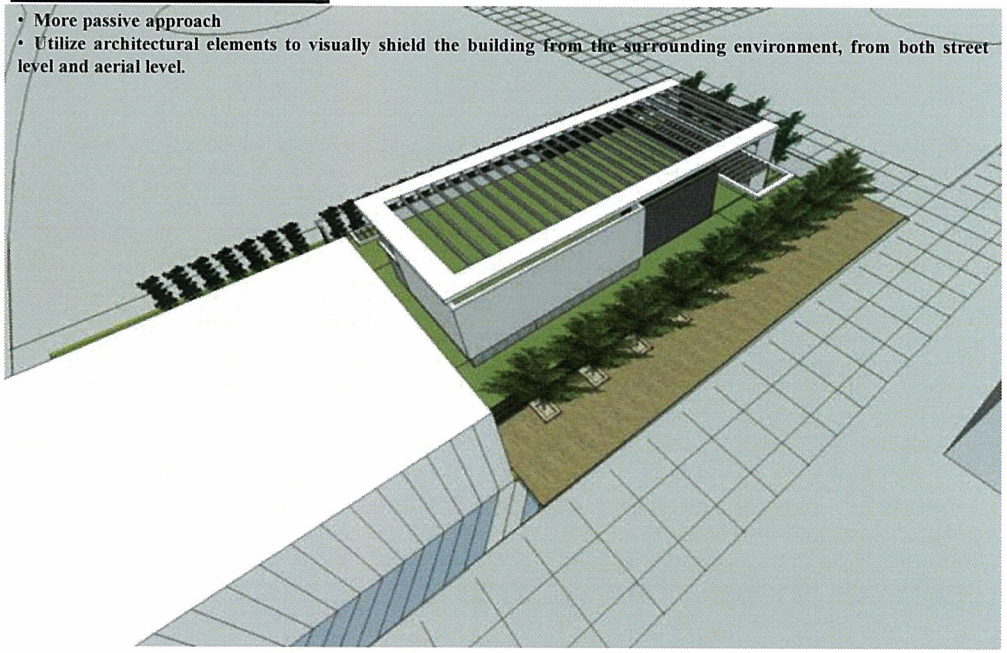
Scheme 1: Folding Green

- To give a consistency and cohesion, considering that it will be seen by a lot of people.
- To give an aesthetic pleasing look in harmony with the environment
- To give the public a better image of Pumping Stations



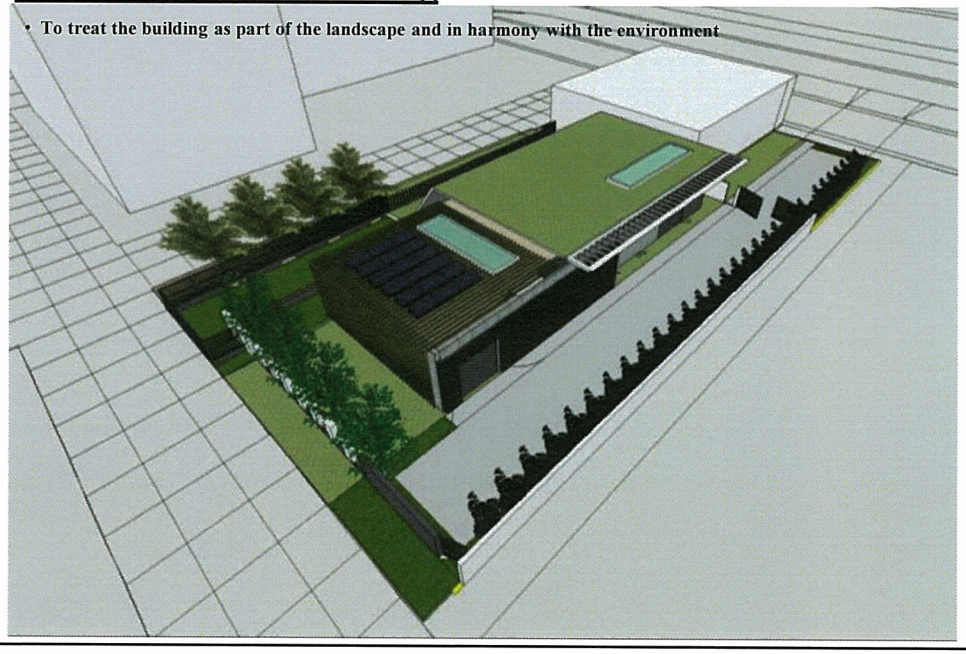
Scheme 2: Screening

- More passive approach
- Utilize architectural elements to visually shield the building from the surrounding environment, from both street level and aerial level.



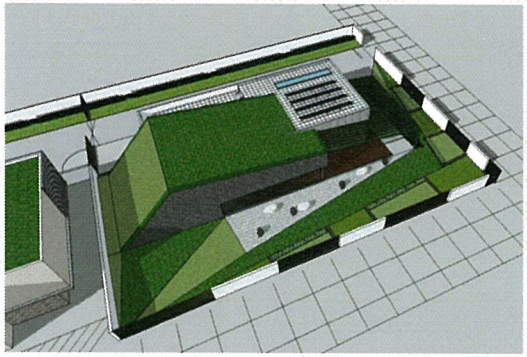
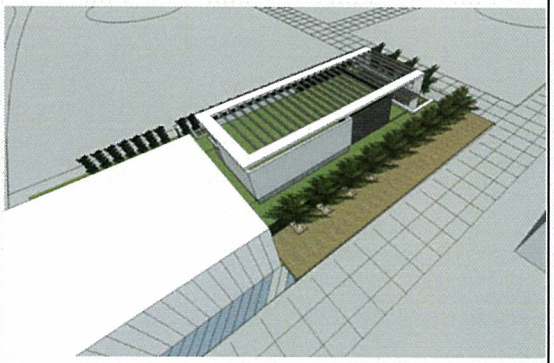
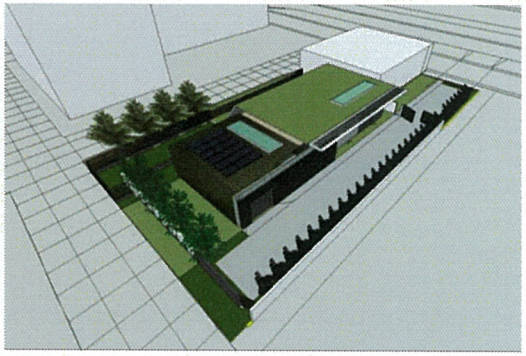
Scheme 3: Green Screening

- To treat the building as part of the landscape and in harmony with the environment



Proposed Architectural Design Schemes for Sewage Pumping Station PS1A

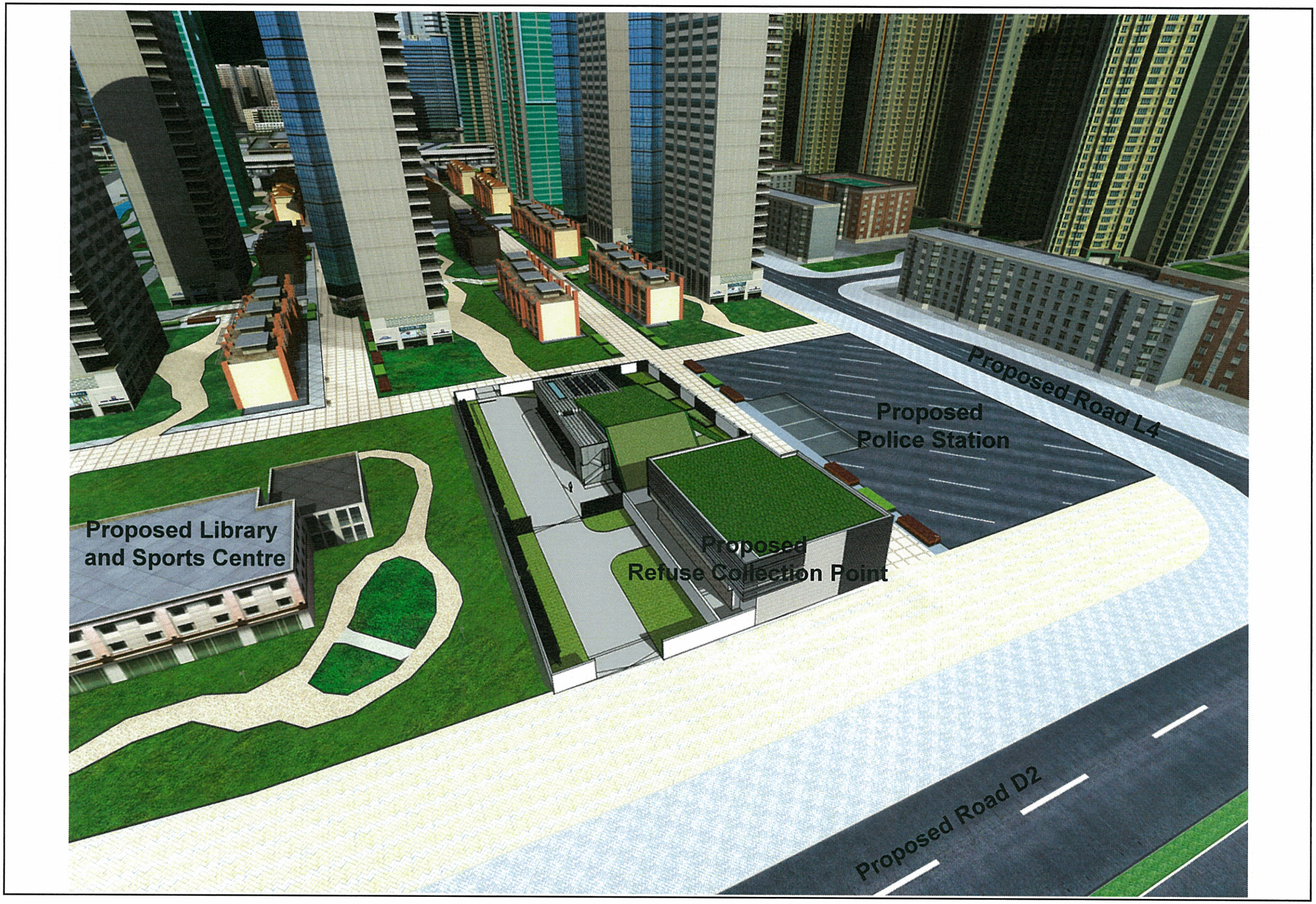
Figure 2

	Scheme 1 : Folding Green	Scheme 2 : Screening	Scheme 3 : Green Screening
			
PROS	• Interesting and elegant form. • The building as a folded landscape become itself a landscape to be seen. • The shape give a more light feeling that break the image of heavy and massive pumping stations. • The green ratio is maximized. • The building, the landscape treatment, shape, the fences, all elements can be understood as one whole. • A skylight on the roof top allows natural lighting to penetrate in the building.	• The layering of materials on the facades break down the massive scale of the building. • The open space for the public is wide and clear.	• The layering of materials on the facades break down the massive scale of the building. • The green ratio is maximized. • As an alternative of scheme 2, this option introduces more green visually, that helps to break down the scale successfully when seen from the top. • The green folding form the boundary to cover the top of the building give it a dynamic movement that avoid a monotonous effect. • A skylight on the roof top allows natural lighting to penetrate in the building.
CONS		• The screening of horizontal louvers on the roof is increasing the total building height. • The idea of screening is overprotective and might reveal an even stronger impact of the building than if it was not there. • The building scale is still massive.	• Unlike scheme1, here the green is folding from another direction which gives the building an important width at the place where the green covers the building. That makes the building look bulky from the pedestrian path. • It is hard to see the logic and the reason why the green is folding from the fence and does not seem to have a connection with the green at grade level unlike scheme 1.

Our preferred option is the scheme 1 ''Folding Green". Its unusual shape give it its originality and a lightness that the two other schemes don't have. The treatment of folding the green allows the building to become the landscape as a kind of natural sculpture. Thus it gives the most pleasing look when seen by pedestrians or from the buildings in the surroundings. Even if it might be the design option that stands out more compared to the others in terms of concept, it is still the option that blend in and fit the context the best. It has this contemporary, untraditional shape and still manage to be the most natural of the three. The issue of the security management in the public pockets areas can be solved in further developing the design.

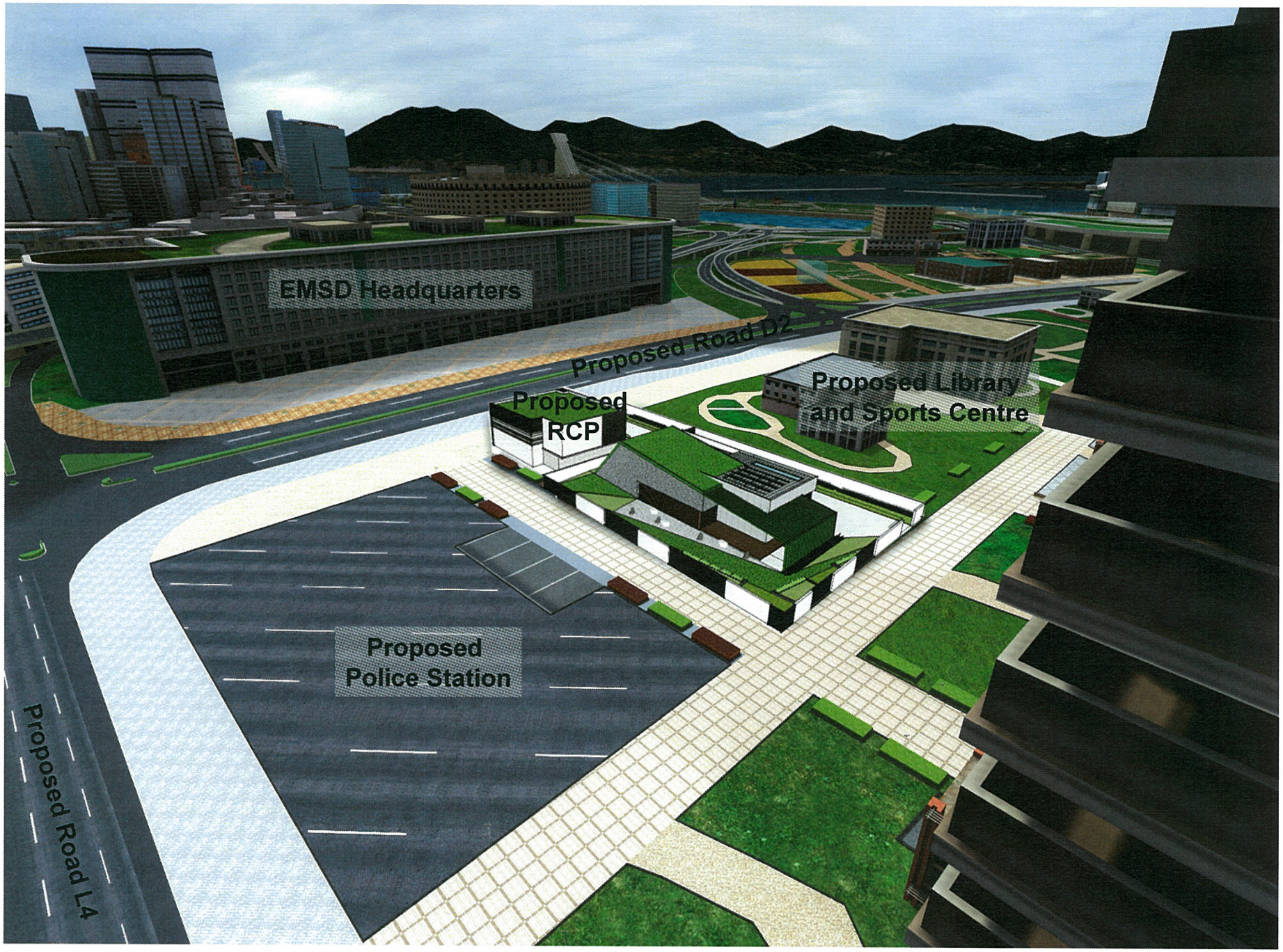
Comparison of Proposed Schemes for Architectural Design of Sewage Pumping Station PS1A

Figure 3



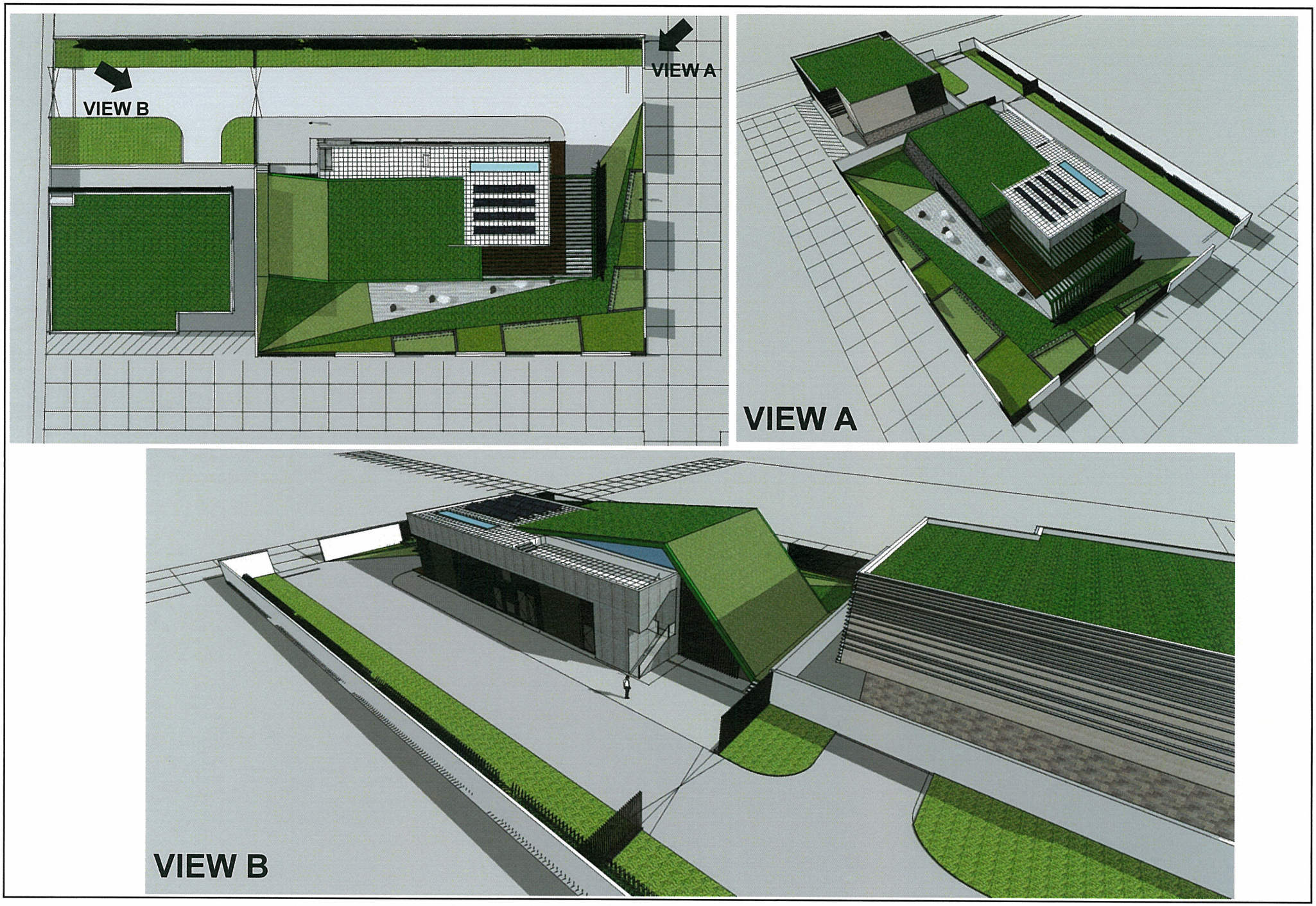
Site Layout Plan for Proposed Sewage Pumping Station PS1A (Sheet 1 of 2)

Figure 4



Site Layout Plan for Proposed Sewage Pumping Station PS1A (Sheet 1 of 2)

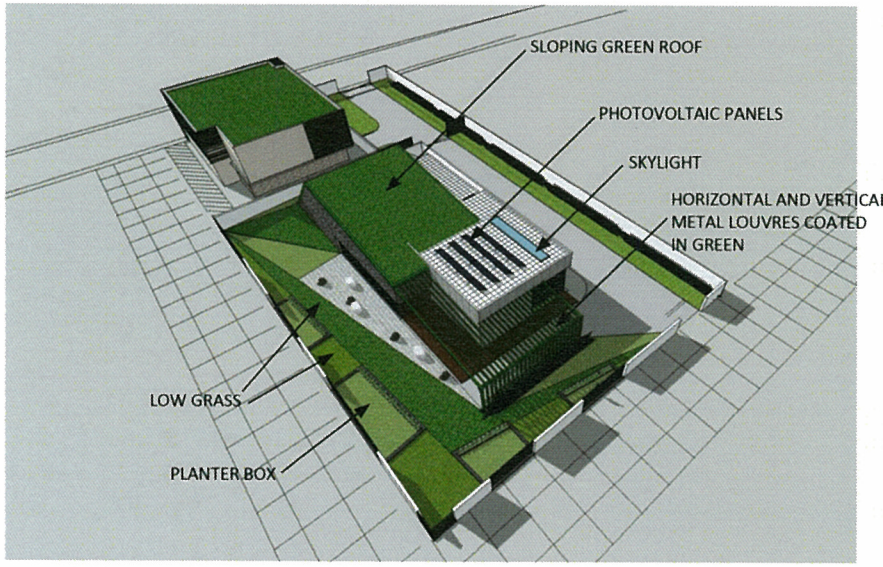
Figure 5

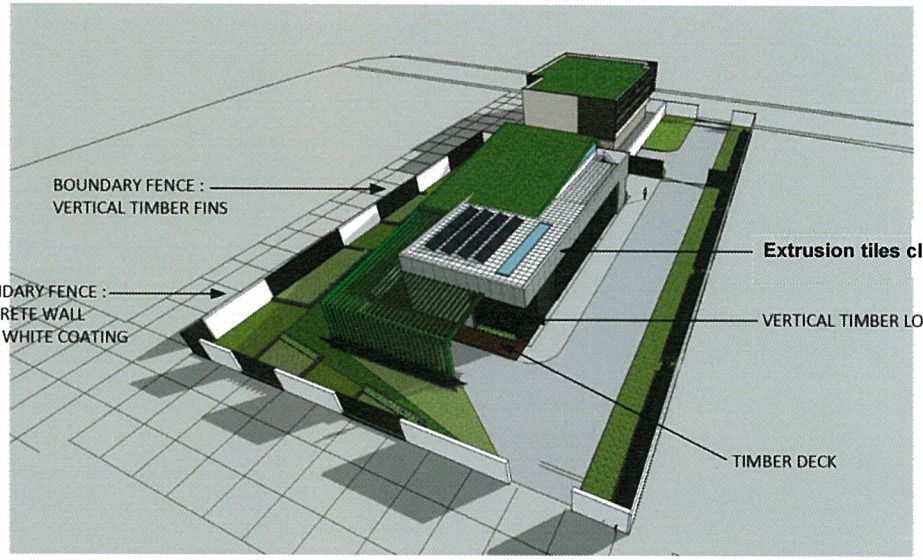


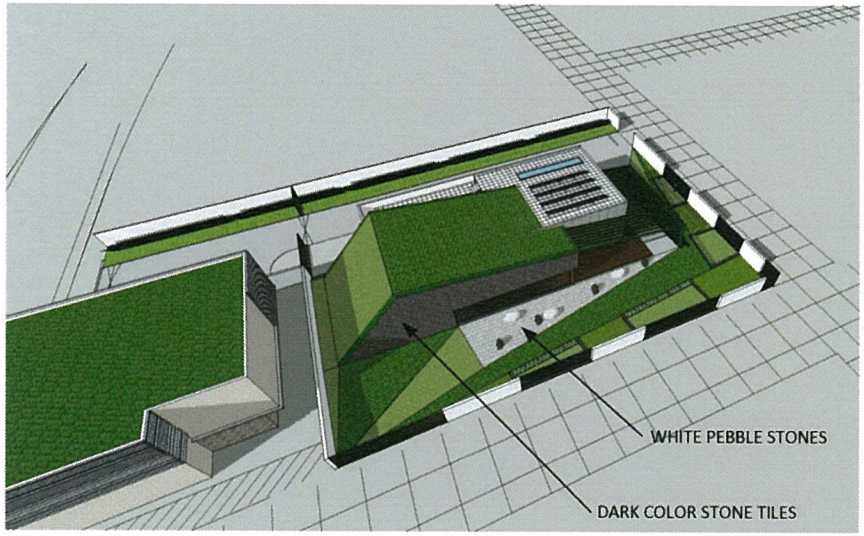
Layout and Perspective Views for Proposed Sewage Pumping Station PS1A

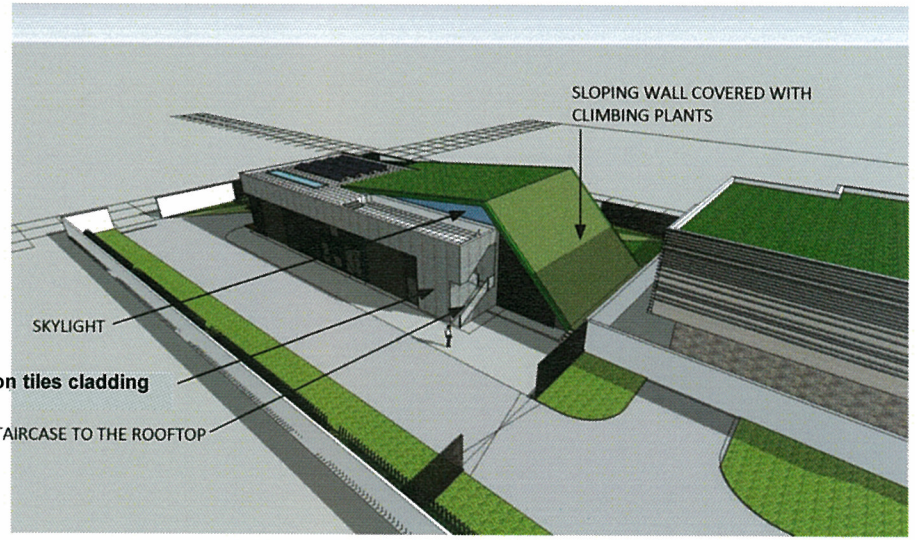
Figure 6

Scheme 1 : *Folding Green*





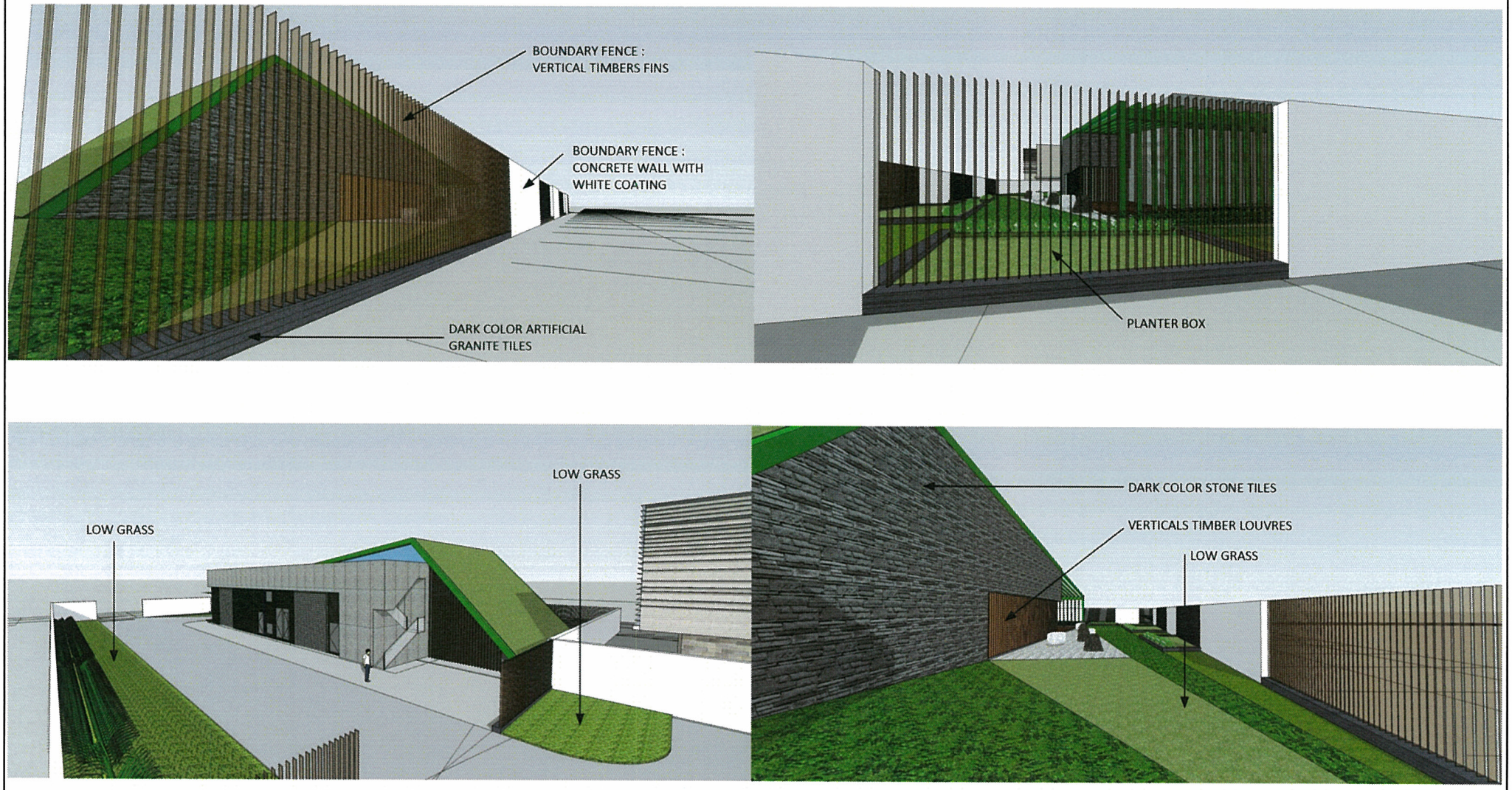




Proposed Scheme for Sewage Pumping Station PS1A (Sheet 1 of 3)

Figure 7

Scheme 1 : *Folding Green*



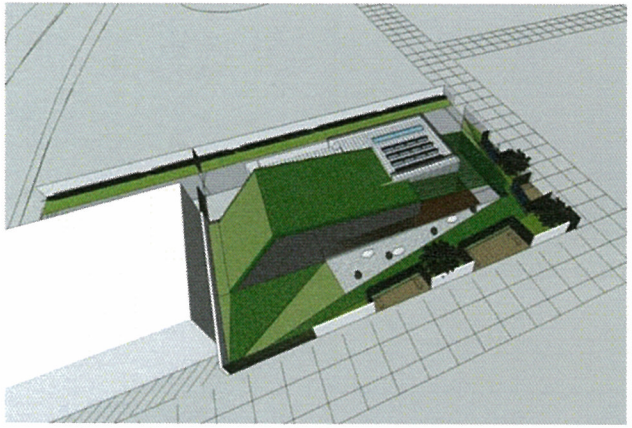
Proposed Scheme for Sewage Pumping Station PS1A (Sheet 2 of 3)

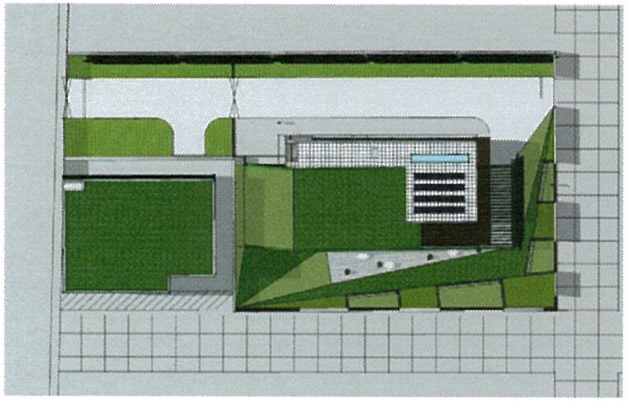
Figure 8

Design Concept and Materials Selection

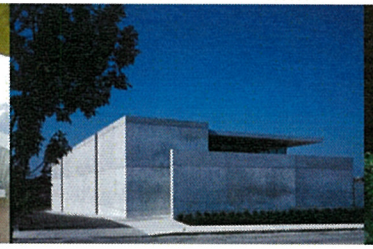
Scheme 1 : *Folding Green*

The green at grade level is folding up to form the building mass, the building in the continuity with the landscape is understood as a whole with its context



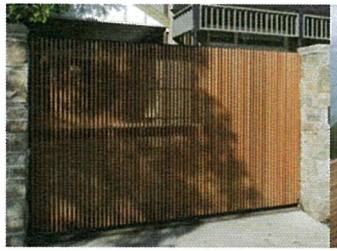


Vertical Timber Louvers



Fair-face Concrete

Dark Color Stone Tiles



Vertical Timber Louver Fence

Timber Deck

Green Roof and Green Wall

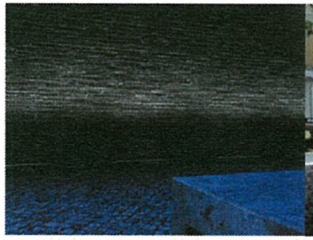
Photovoltaic Panels

Climbing Plants

Different type of Low Grass

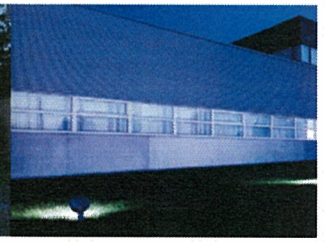
Japanese Like Stones

Round Pebble Stones



LED : Grazing Light on Façade

Recessed Floor Lighting to highlight the trees



Floor Light to highlight part of the landscape

Proposed Scheme for Sewage Pumping Station PS1A (Sheet 3 of 3)

Figure 9