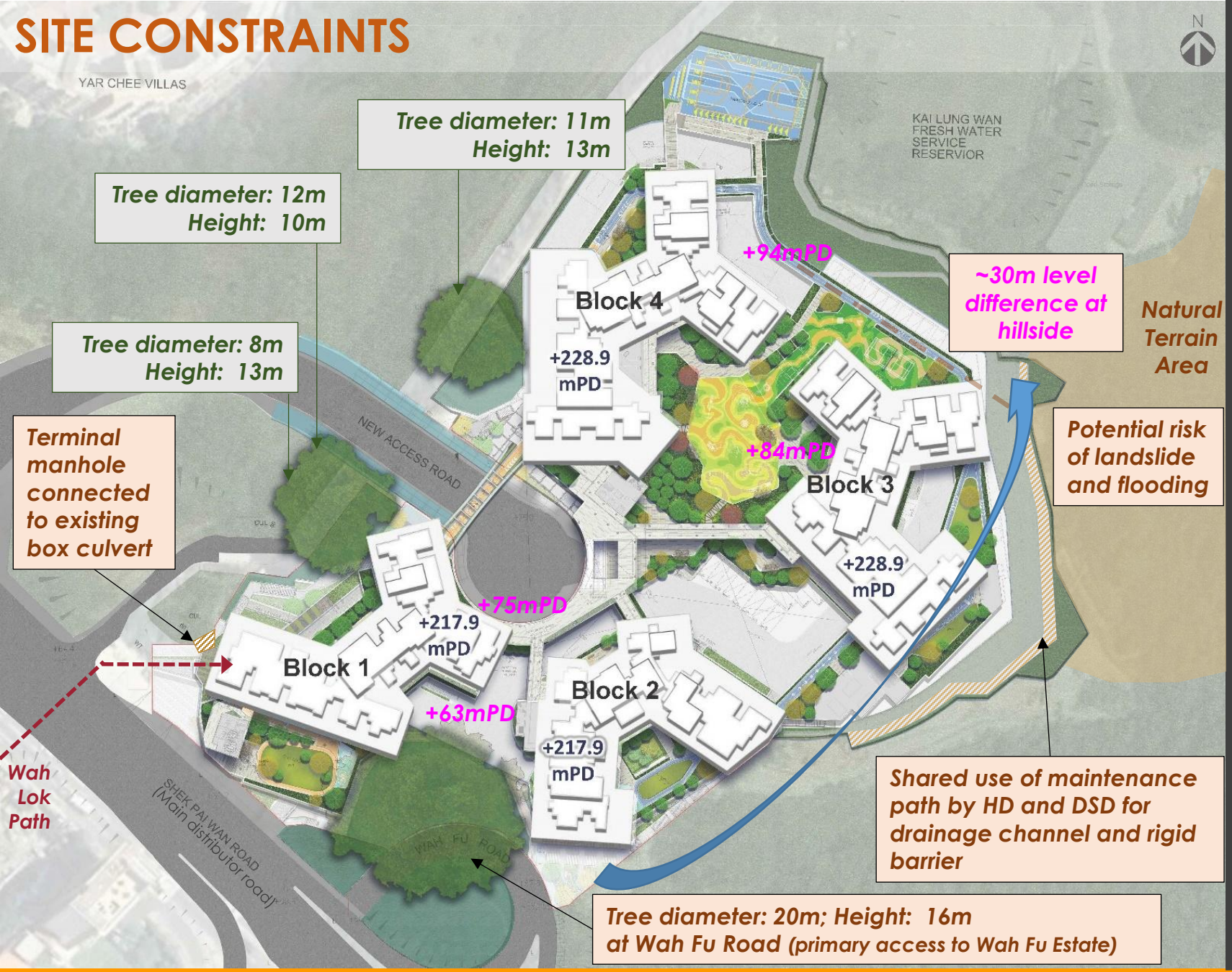

KAI LUNG WAN NORTH
RECEPTION ESTATE (PHASE 2) for
WAH FU ESTATE REDEVELOPMENT
2031/32

SITE CONSTRAINTS





KAI LUNG WAN NORTH

RECEPTION ESTATE (PHASE 2) for WAH FU ESTATE REDEVELOPMENT

2031/32

The project team analyzes the project and provides input during design development, addressing potential risks of the construction and maintenance stages.

GROSS SIITE AREA:	about 3.3 ha.
HOUSING TYPE:	Public Rental Housing
PLOT RATIO:	Approx. 8.0
BUILDING HEIGHT:	+230 mPD (Max.)
4 DOMESTIC BLOCKS 9-STOREY PODIUM	>4200 units no. of flats for ancillary facilities

Project team incorporates safety reviews CONCURRENTLY with design development

RISK ASSESSMENT

Stage 1
Each discipline **identifies** **major hazards** during early design stage and registers hazards & initial solutions.

Stage 2
Project team discusses the registers and develops **integrated design solution** in the Design for Safety meetings.

Stage 3
Project team reviews the **registered detailed hazards mitigation strategies** and **validates** in the design development.

Stage 4
The Design for Safety meeting will be held with contractor for a **risk management report** during construction stage.

COLLABORATIVE MITIGATION STRATEGIES

Tools for hazard identification & initial solutions
- CIC Design for Safety protocols – Design Risk Register
- In-house design guidelines

Design for Safety meetings during design stage
- **multi-disciplinary** reviews
- design – construction – operation stage
- emphasis on **maintenance-focused design solution** to minimise operational risk in the future.

IDENTIFY SAFE DESIGN RISK							ANALYSE SAFE DESIGN RISK - CURRENT EXPOSURE			IMPLEMENT SAFE DESIGN RISK TREATMENT			
ID	Risk Title	Event / Cause / Consequence	Persons Affected	Applicable Phases	Applicable Disciplines	Inherent Risk Consequence	(Risk Treatment) Current Controls	Consequence	Likelihood	Risk Level	Risk Owner	Evaluation	(Risk Treatment) Action Summary	Comments
1	Incomplete Integration with Existing Systems	Insufficient review of interface with existing gas supply facilities may cause connection or operational issues	Designer, O&M Team	Design	Multi-Discipline	B - Major	Conduct preliminary interface workshop with stakeholders; Review of as-built documentation	B - Major	3 - Possible	Critical	Design Manager - Peter	Intolerable	Conduct regular interface coordination meetings; Develop a detailed interface matrix; Update design as new info is received;	24Nov2025 Peter - The risk has been mitigated
2	Space Constraints for New Facilities	Limited outdoor area may not allow for safe layout, access, or maintenance of gas supply skids	Contractor, O&M Team	Design	Multi-Discipline	B - Major	Review concept layout; Conduct comprehensive site walks with design and operations team	C - Moderate	3 - Possible	High	PM - Ken	Intolerable	Utilise 3D model to test various layouts; Coordinate with O&M for access and emergency egress during design	
3	Uncertainty in Utility Routing	Incomplete knowledge of underground/existing services may lead to clashes, design rework, or construction delays	Contractor, Project Team	Design	Civil	C - Moderate	Preliminary climate risk assessment; Review historical weather data	C - Moderate	2 - Unlikely	Medium	PM - Ken	Intolerable	Utilise GPR (Ground Penetrating Radar) for utilities detection; Integrate survey results into BIM model for clash analysis; Update design continuously as survey/verification data is obtained	
4	Inadequate Provisions for Future Expension	Design may not allow for future modification or expansion (e.g., additional gas trains or metering)	Owner	Design	Multi-Discipline	C - Moderate	Preliminary review of long-term masterplan; Discussions with asset owner	C - Moderate	3 - Possible	High	PM - Ken	Intolerable	Allow for space and connections for future facilities; Document provisions in design basis	
5	Working at Height	It is one of the major accident types which results in serious body injury or even fatality.	Contractor, Project Team	Design	Multi-Discipline	B - Major	Provide bridging chains of steel frame of the generator / air compressor / power pack to avoid rigging at height; Working platform is the first priority instead of the use of safety harness.	A - Catastrophic	4 - Likely	Critical	PM - Derek Poon	Intolerable	Review the design and working procedure to reduce the working at height opportunities	
		Any items or materials that fall from a height or elevated position, posing a risk of injury or damage to people or					Drilling Rigs with remote control to prevent plant operators expose in the lifting zone; Lifting zone / Excavation zone shall fenced off to prevent the accidental fall of any of	phic	/		Poon	e		

Design Risk Register

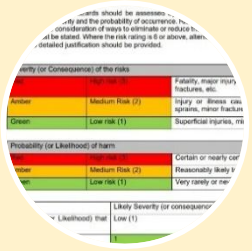
Project team integrates DIFFERENT TECHNOLOGIES into project design to ENHANCE SAFETY

PLANNING



DfS meetings

+



RAG Analysis

+



HD's Design Guidelines

DESIGN

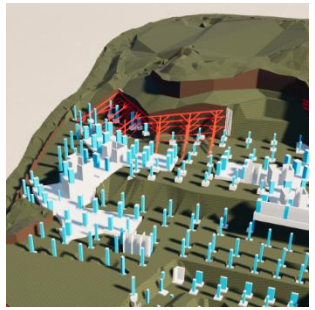
Parallel design development of hazard identification and resolution in design stage of project



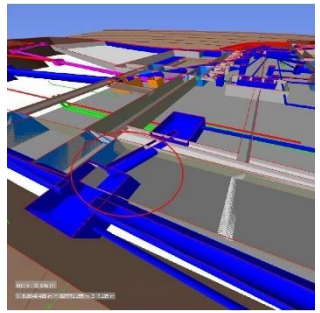
GIS



LiDAR – 3D Point Cloud



BIM-SAFD optimised foundation design



BIM coordination

CONSTRUCTION

Off-site fabrication
off-site and on-site robotic works
off-site and on-site monitoring management in work sequence



HA-PIMAP with real time data





4S



MiC



MiMEP



Robotics

OPERATION

Building inspection and maintenance by mechanical means



Indoor cleaning Robots



Drones



Mobile Electric Scissor Lift

Potential Risk

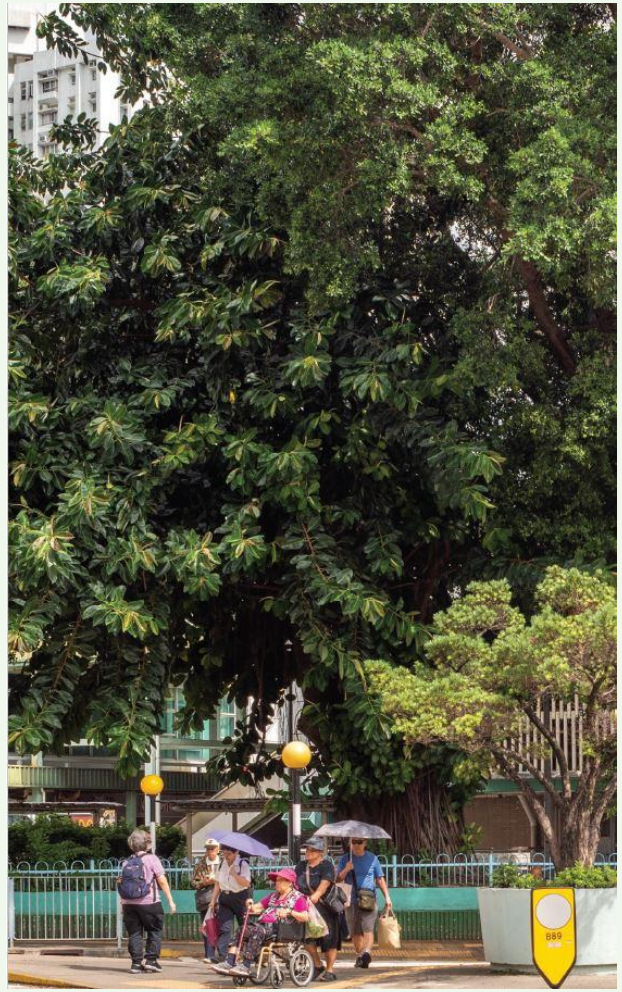
TREE COLLAPSE at **Wah Fu Road**
- primary access road to Wah Fu Estate



The Banyan Tree
(Tree of Particular Interest)
Diameter: 20m;
Height: 16m



- **Big tree** is a key element at Wah Fu providing significant amenity **value to its community**.
- In order to inherit the living culture, the project team **commit to deliver the holistic design with a multi-disciplined solution** to keep the tree at its spot.
- With aid of technologies, Maintenance cost is minimized and the design brings positive effect to the community. The Risk and value of the tree is offset.



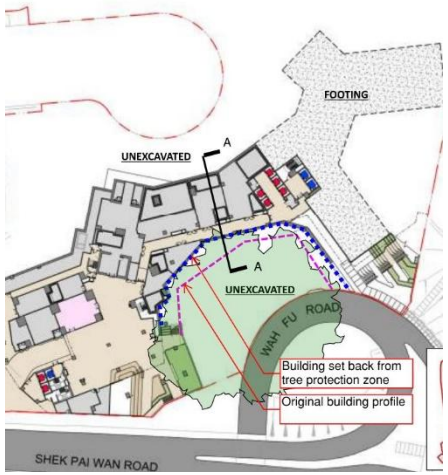
The 'Big Tree'
at Wah Fu Estate (I)

Solution — Prioritization of prevention methods in design **during site works**

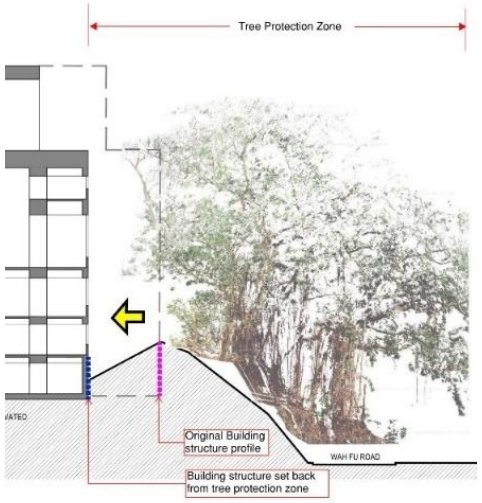
A. Use **LiDAR** to obtain **3D point cloud** to **precisely** define the **tree crown** and therefore the **tree protection zone (TPZ)** together with BIM and GIS for

1. **ELSW**
2. **Building design**

with the advice from **tree expert**,
the podium structure, pipe pile walls and ELSW are **precisely set back** from the TPZ **to minimize potential adverse impact** to the trees.



LG3/F +62.5 Plan



Section A – A

Solution — Prioritization of prevention methods in design **during site works and operation**

B. Employ **Independent Tree Expert** to provide advice on TPZ and construction sequence to minimize impact to the trees and qualified arborist to upkeep the tree condition during construction stage.

C. **Tree Monitoring** by installing **extensive monitoring checkpoints** at main trunk and branches of the tree with regular measure to keep track the movement and tilting during construction.

Prompt actions can be taken from abnormal tilting to prevent collapse of the tree.



LiDAR – 3D Point Cloud



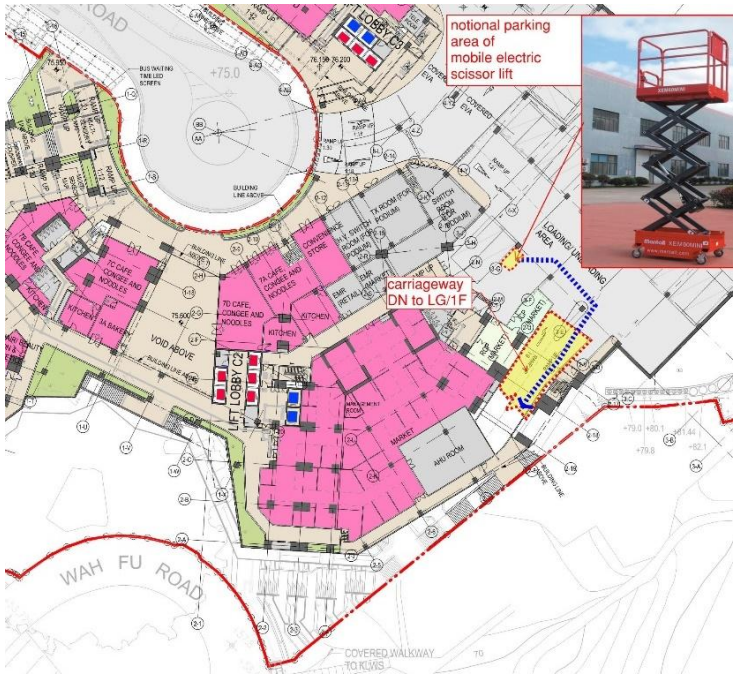
Monitoring points on the trees

Solution

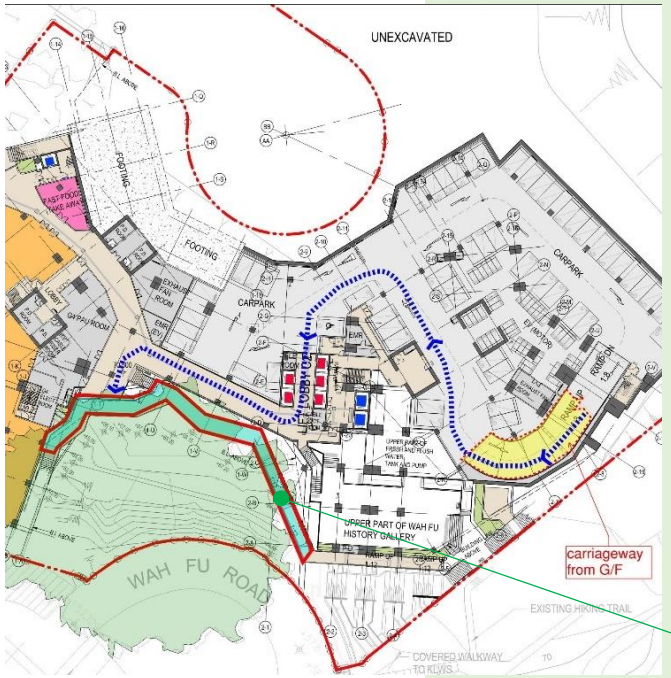
Prioritization of prevention methods in **design to balance between the Risk and Value of the tree**

D. Propose a **well-planned Maintenance Route** with dedicated parking space and route for storage and maneuvering of **Mobile Electric Scissor Lift** to the tree for carrying out routine **inspection** and **tree pruning**.

E. **Material Selection** of lightweight steelworks for tree walk to avoid extensive foundation and ELS works, while providing adequate loading capacity for the Mobile Electric Scissor Lift.



LG1/F PLAN



G/F PLAN





Entry of the mobile electric scissor lift

Tree Walk for education and leisure, and maintenance

Potential Risk

SERIOUS FLOODING/ LANDSLIDE

Substantial surface run-off from the large upslope catchment area of the extensive hilly terrain





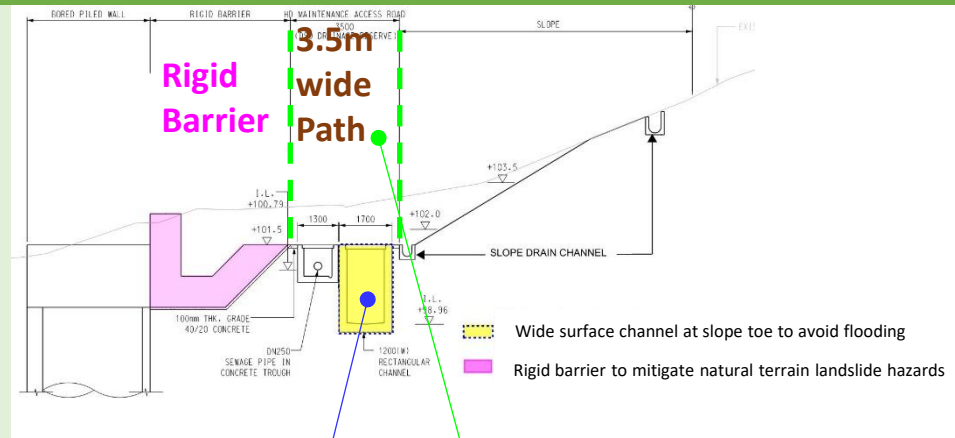
Solution

Inter-departmental collaboration among HD, CEDD and DSD to build a rigid barrier with drainage and machinery maintenance path

The structure consists of

- **Rigid Barrier** to cater natural terrain hazard (HD's asset)
- **1.2m deep drainage channel** to collect run-off and prevent flooding (DSD's asset)
- **3.5m wide maintenance path** allows machinery use and **shared** by HD and DSD.

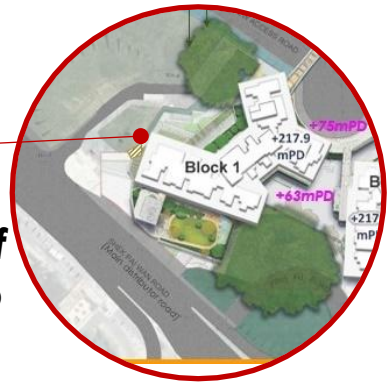
The holistic design is **incorporated at early stage of site planning** and helps minimised the required **site formation works** by CEDD. It achieves cost saving and also reduces impact to the natural environment.





Potential Risk

Deep ELSW and working in confined space in future maintenance work



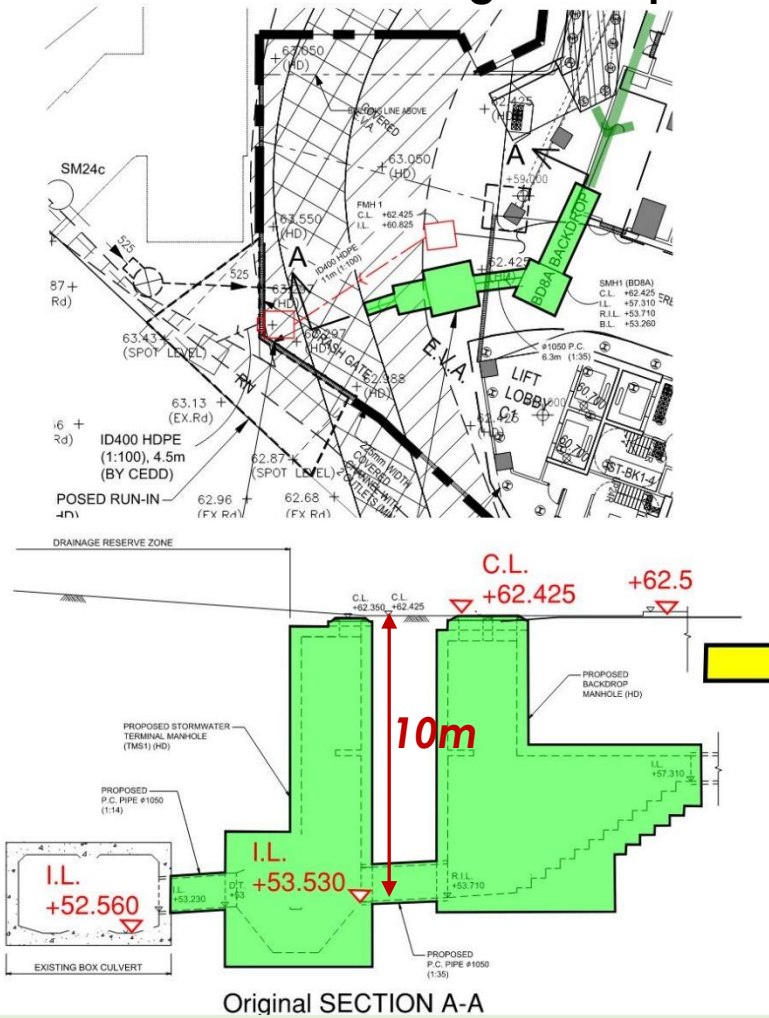
Original proposed terminal manhole was designed with a depth of about 10m to connect to an existing box culvert.

- The terminal manhole is then relocated to a lower elevation, bringing it closer to the box culvert by natural terrain's level. **The overall depth of the terminal manhole is reduced to about 6m**.
- The relocation results in **extension of site boundary area** for **HD's maintenance** work.

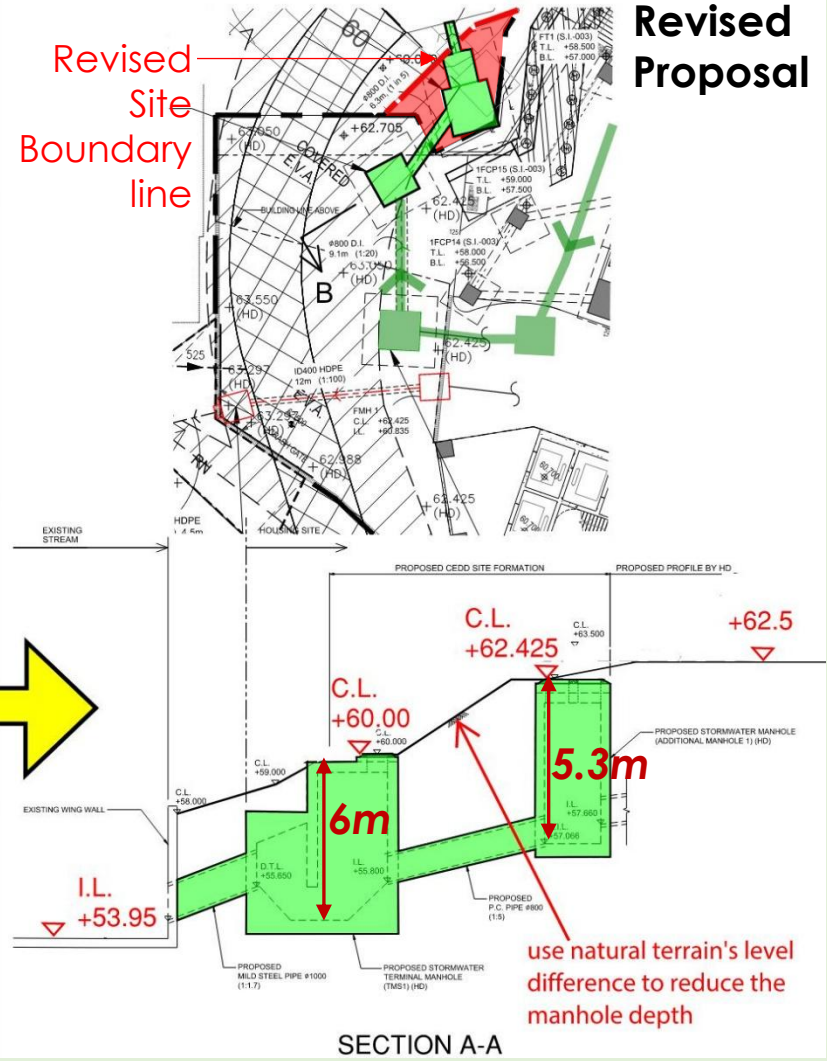
Solution

Terminal manhole is revised to lower elevation together with extended site boundary line

Original Proposal



Revised Proposal



INTEGRATION OF DIFFERENT TECHNOLOGIES IN FOUNDATION DESIGN

to enhance safety during construction works

from planning, design, construction to maintenance

PLANNING → DESIGN

Potential Risk

- Existing Topography (e.g. hilly)
- Complex geological condition
- Underground obstructions

Solution

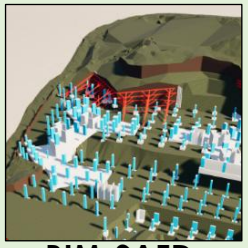
Revise design via technology application



BIM



BIM + GIS



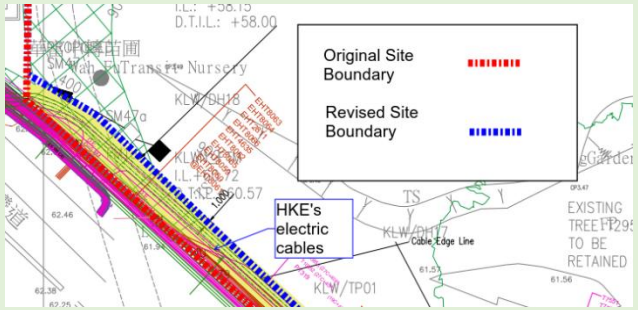
BIM-SAFD Optimised design option

Identified Hazards

- rock head level
- high voltage cables within site boundary



Reduced basement extent to minimise rock excavation



Revised site boundary and building line to avoid the risk of area-wide power out and electric hazards to construction workers

CONSTRUCTION →

Potential Risk

- Heat stroke under hot weather
- Fire, electric shock, burns, bright arcs, toxic fumes/ gases, etc during hot work of welding

Solution

Prefabrication / Robotic use



Standardised footing design and prefabrication of reinforcement cages



Robotic welding for capping plates for piling and ELSW

Potential Risk

Flooding to major public road during extreme weather





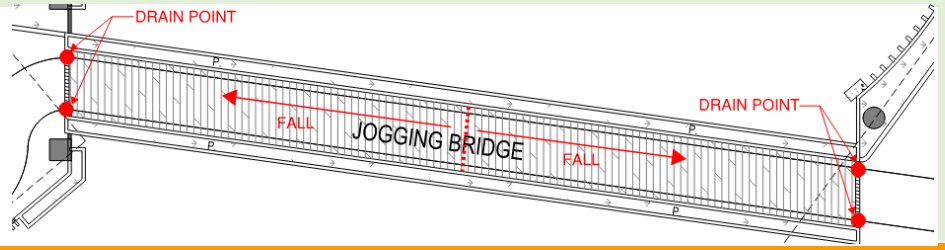
Solution

Designed temporary and permanent drainage system more than min. req., proven effective during extreme rainfall in 2025.

Jogging Bridge - 20m above ground level

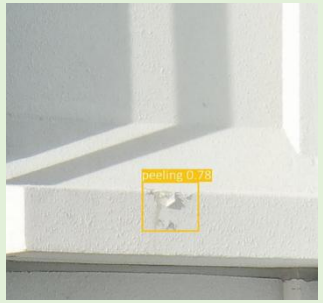
Potential Risk	Maintenance at high level
Solution	No building services running underneath the bridge to avoid maintenance at height



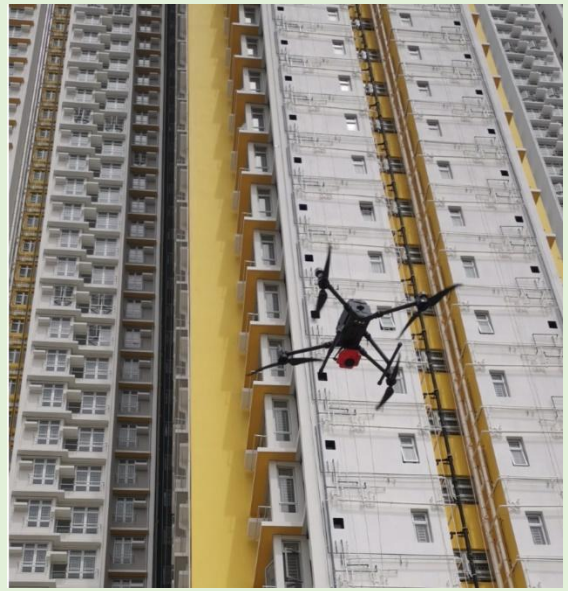


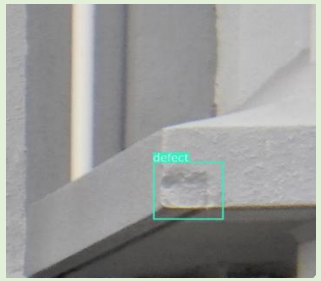
Super-high structure – highest 44 storeys atop of 3 – 9 storey podium

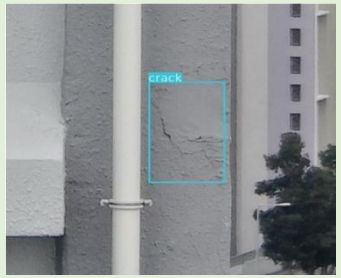
Potential Risk	Inspection at height
Solution	**Use of Drone** Real time detection of unsafe act / conditions and data transfer to the site managers or maintenance team in the future.











Close-out Partnering Workshop (Post completion review of the project)

Participants

- HD Project team members
- Project consultants
- Contractors
- Staff of Estate Management Office

Workshop

- **Review** the project from different perspectives together
  - **Design** - aspect
  - **Construction** - aspect
    - use of DfS-related technologies in construction stage such as MiC, robotics, drones, etc
    - buildability of DfS provision
  - **Management** - aspect
    - practicality, performance and maintainability of DfS provisions such as storm drain design, maintenance pathway, tree management, etc.

- **Propose enhancements** on design guidelines and contract specifications for future public housing developments







THANK YOU