For discussion **PWSC(2023-24)15**
on 7 June 2023

ITEM FOR PUBLIC WORKS SUBCOMMITTEE OF FINANCE COMMITTEE

HEAD 708 – CAPITAL SUBVENTIONS AND MAJOR SYSTEMS AND EQUIPMENT
Universities
The Hong Kong University of Science and Technology
18EL – New Research Building 2

Members are invited to recommend to the Finance Committee the upgrading of **18EL** to Category A at an estimated cost of $835.1 million in money-of-the-day prices for the construction of a research building on the main campus of The Hong Kong University of Science and Technology in Clear Water Bay.

PROBLEM

The Hong Kong University of Science and Technology (HKUST) requires additional space and up-to-date facilities to meet its academic needs.

PROPOSAL

2. The Secretary-General, University Grants Committee (UGC), on the advice of the Director of Architectural Services (D Arch S) as UGC's technical adviser and with the support of the Secretary for Education, proposes to upgrade **18EL** to Category A at an estimated cost of $835.1 million in money-of-the-day (MOD) prices for the construction of the New Research Building 2 on the HKUST main campus in Clear Water Bay.

/PROJECT …..

PROJECT SCOPE AND NATURE

3. The scope of works involves the construction of an eight-storey research laboratory building which will provide approximately 6 060 square metres (m^2) in net operational floor area (NOFA)[1]. Upon completion of the proposed project, the building will provide the following facilities –

(a) laboratories and research facilities of about 4 780 m^2 in NOFA;

(b) offices of about 1 050 m^2 in NOFA; and

(c) support space of about 230 m^2 in NOFA, including storage area.

4. The proposed project will also provide a pedestrian linkage to the adjacent Lee Shau Kee Business School Building for convenient access to the northern side of the HKUST campus. There will be about 60 car parking spaces. Electric vehicle charging facilities will also be provided.

5. A location and site plan, an artist's impression, floor plans and sectional drawings of the project are at **Enclosures 1 to 4** respectively. HKUST plans to commence the proposed construction works upon obtaining funding approval from the Finance Committee (FC) for completion in around three years. HKUST invited tenders in parallel for the proposed works in February 2023 and the returned tender price has been reflected in the estimated cost of the project. The contract will only be awarded after obtaining FC's funding approval.

JUSTIFICATION

6. In support of the initiative to develop Hong Kong into an International Innovation and Technology Hub under the National 14th Five-year Plan, HKUST has been pursuing its long-term strategy to develop the southern side of its campus to make available additional space and state-of-the-art facilities for cutting-edge research in strategic interdisciplinary areas. In particular, HKUST has proposed to develop the New Research Building 2 under **18EL** for research and development activities in the field of synthetic biology.

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[1] NOFA is the floor area allocated to the users of a building for carrying out the intended activities. Unlike the construction floor area (CFA) which takes into account all areas within the building structure envelope, NOFA does not include areas for basic facilities (if any) such as toilets, lift lobbies, stair halls, public or shared corridors, stairwells, escalators and lift shafts, pipe or services ducts, barrier-free access facilities, gender mainstreaming facilities, refuse rooms, flat roofs, car parking spaces, loading and unloading areas and mechanical plant rooms, etc.

7. Synthetic biology is an interdisciplinary field of advanced research that brings together expertise from molecular biology, biotechnology, physics, engineering, and computer science to design and create new biological systems or modify existing ones for specific purposes. It deploys genetic engineering techniques to create synthetic DNA sequences for further research in life sciences as well as practical uses. Through calculating, designing, coding and modifying microbial genomes, these genomes can be turned into smooth-operating tools with strong potential for improving health and sustainability.

8. The proposed new research building will support the development of technologies in synthetic biology to improve human conditions and harness innovation, as well as their thematic application for fundamental scientific investigation or innovative solutions in biomedicine, health technology, sustainable living and food to create a more sustainable economy. For example, researchers of HKUST are exploring the application of synthetic biology for treating diabetes, synthetic bio-circuitry for environmental sensing of phthalates and antibiotics to address water and food safety concerns.

9. The majority of the academic space to be provided by the new research building will be open laboratories, research facilities and write-up space for use by around 300 faculty members, research staff and postgraduate students at HKUST. In particular, the new research building will feature a DNA foundry, a state-of-the-art facility that specialises in using automated and robotic systems to synthesise and assemble large numbers of DNA fragments into longer, functional sequences. The DNA foundry will be an important facility for advancing synthetic biological research as they enable researchers to rapidly develop prototypes and test emerging applications.

10. The proposed new research building will also feature an exhibition gallery on the ground floor for organising public education and knowledge sharing activities from time to time to promote community understanding of the achievements and significance of scientific research. Where appropriate, the research facilities may also provide learning and collaborative opportunities for other interested researchers and postgraduate students at HKUST.

FINANCIAL IMPLICATIONS

11. We estimate the capital cost of the project to be $835.1 million in MOD prices, broken down as follows –

/(a) …..

			$ million (in MOD prices)
(a)	Site works		10.4
(b)	Foundation		83.8
(c)	Building[2]		183.5
(d)	Building services[3]		220.3
(e)	Drainage		6.5
(f)	External works		39.9
(g)	Energy conservation, green and recycled features		14.5
(h)	Furniture and equipment (F&E)[4]		177.4
(i)	Consultants' fee for		13.6
	(i) contract administration[5]	12.9	
	(ii) management of resident site staff (RSS)	0.7	
(j)	Remuneration of RSS		9.4
(k)	Contingencies		75.8
	Total		835.1

12. HKUST will engage consultants to undertake contract administration and site supervision of the construction of the project. A detailed breakdown of the estimates for consultants' fees and RSS costs by man-months is at **Enclosure 5**.

/13. …..

[2] Building works cover construction of substructure and superstructure of the building.

[3] Building services works cover electrical installations, ventilation and air-conditioning installations, fire services installations, lift installations and other miscellaneous installations.

[4] The estimated cost is based on an indicative list of F&E required and covers general and special F&E.

[5] The estimated fee covers quantity surveying services, site supervision and project management, etc.

13. To enhance cost effectiveness, HKUST has adopted the "fitness for purpose" principle in the design and construction of the project in order to reduce the construction cost. HKUST has also explored different design alternatives to achieve cost saving. The construction floor area (CFA) of this project is around 11 245 m^2. The estimated construction unit cost, represented by the building and building services costs, is $35,909 per m^2 of CFA in MOD prices. The D Arch S considers this unit cost comparable to that of similar projects for UGC-funded universities.

14. Subject to funding approval, HKUST plans to phase the expenditure as follows –

Year	$ million (in MOD prices)
2023 – 24	53.3
2024 – 25	192.2
2025 – 26	375.4
2026 – 27	119.3
2027 – 28	68.5
2028 – 29	26.4
	835.1

15. We have derived the MOD estimates on the basis of the Government's latest set of assumptions on the trend rate of change in the prices of public sector building and construction output for the period 2023 to 2029. HKUST intends to award the contract on a lump-sum basis as it can clearly define the scope of works in advance. The contract will provide for price adjustment.

16. The project is under the initiative announced in the 2019-20 Budget of setting aside $16-billion provision for UGC-funded universities to enhance or refurbish campus facilities.

17. The project has no impact on tuition fees. The additional recurrent costs associated with this project will be absorbed by HKUST. The proposal has no additional recurrent financial implication for the Government.

/**PUBLIC** …..

PUBLIC CONSULTATION

18. The project is located within the campus of HKUST. HKUST organised an exhibition on the proposed new research building in January 2023. No adverse comments were received.

19. HKUST also briefed the Chairman of the Hang Hau Rural Committee and other local community stakeholders on the proposed development in January 2023 and received no adverse comments.

20. We consulted the Panel on Education of the Legislative Council on 5 May 2023. Members supported submitting the funding proposal to the Public Works Subcommittee for consideration. We provided supplementary information to the Panel on Education on 15 May 2023 (LC Paper No. CB(4)452/2023(01)).

ENVIRONMENTAL IMPLICATIONS

21. This project is not a designated project under the Environmental Impact Assessment Ordinance (Cap. 499). It will not cause any long-term adverse environmental impacts. HKUST has included in the project estimates the cost to implement suitable mitigation measures to control short-term environmental impacts.

22. During construction, HKUST will control noise, dust and site run-off nuisances to within established standards and guidelines through the implementation of mitigation measures in the relevant contract. These include the use of silencers, mufflers, acoustic lining or shields for noisy construction activities; frequent cleaning and watering of the site and provision of wheel-washing facilities to minimise dust emission; and proper treatment of site run-off to avoid illegal effluent discharge.

23. At the planning and design stages, HKUST has considered measures to reduce the generation of construction waste where possible (e.g. adjusting the building layout and foundation system to cope with the topography). In addition, HKUST will require the contractor to reuse inert construction waste generated (e.g. use of excavated materials for filling within the site) on site or in other suitable construction sites as far as possible in order to minimise the disposal of inert construction waste at public fill reception facilities (PFRFs)[6]. HKUST will

/encourage …..

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[6] PFRFs are specified in Schedule 4 of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N). Disposal of inert construction waste in PFRFs requires a licence issued by the Director of Civil Engineering and Development.

encourage the contractor to maximise the use of recycled or recyclable inert construction waste, and the use of non-timber formwork to further reduce the generation of construction waste.

24. At the construction stage, HKUST will require the contractor to submit for approval a plan setting out the waste management measures, which will include appropriate mitigation measures to avoid, reduce, reuse and recycle inert construction waste. HKUST will ensure that the day-to-day operations on site comply with the approved plan and require the contractor to separate the inert portion from non-inert construction waste on site for disposal at appropriate facilities. HKUST will monitor the disposal of inert construction waste and non-inert construction waste at PFRFs and landfills respectively through a trip-ticket system.

25. HKUST estimates that the project will generate in total about 89 100 tonnes of construction waste. Of these, HKUST will reuse about 14 700 tonnes (17%) of inert construction waste on site and deliver 70 680 tonnes (79%) of inert construction waste to PFRFs for subsequent reuse. HKUST will dispose the remaining 3 720 tonnes (4%) of non-inert construction waste at landfills. The total cost for disposal of construction waste at PFRFs and landfills is estimated to be $5.8 million for this project (based on a unit charge rate of $71 per tonne for disposal at PFRFs and $200 per tonne at landfills as stipulated in the Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)).

HERITAGE IMPLICATIONS

26. This project will not affect any heritage site, i.e. all declared monuments, proposed monuments, graded historic sites/buildings/structures, sites of archaeological interest, all sites/buildings/structures in the new list of proposed graded items; and government historic sites identified by the Antiquities and Monuments Office.

LAND ACQUISITION

27. The project does not require any land acquisition.

ENERGY CONSERVATION, GREEN AND RECYCLED FEATURES

28. This project will adopt various forms of energy efficient features and renewable energy technologies, in particular –

/(a) …..

(a) high efficiency chiller;

(b) heat pump;

(c) demand control of supply air;

(d) heat energy reclaim of exhaust air;

(e) energy efficient lift system;

(f) building energy management system; and

(g) photovoltaic system.

29. For greening features, vertical greenery and landscaping of the ground floor will be provided in this project to create improved building environmental conditions. Shade trees will also be planted along the main footpath connections to provide thermal comfort for the pedestrians. The planting proposal includes the use of native tree and shrub species in order to maximise the potential ecological diversity.

30. For recycled features, this project will adopt condensate water and rainwater recycling system for irrigation purpose with a view to conserving water.

31. The total estimated cost for adoption of the above features is around $14.5 million (including $4.7 million for energy efficient features) which has been included in the cost estimate of the project. The energy efficient features will achieve 10% energy savings in the annual energy consumption with a payback period of about seven years.

BACKGROUND INFORMATION

32. Under existing procedures, UGC-funded universities submit capital works proposals to UGC annually. UGC examines all these proposals carefully, with the professional advice provided by the D Arch S who acts as UGC's technical adviser. UGC submits supported proposals to the Government for consideration in accordance with the established mechanism.

33. HKUST engaged consultants in February 2021 to carry out topographical survey, site investigation, preliminary design, detailed design and preparation of tender documents at a total cost of about $18.3 million. The services

/and …..

and works provided by the consultants were funded under block allocation **Subhead 8100EX** "Alterations, additions, repairs and improvements to the campuses of the UGC-funded institutions". The above pre-construction works and services have facilitated in finalising the project scope and the cost estimate for seeking funding approval from FC.

34. Of 222 trees within the project boundary, one tree will be preserved. The proposed project will involve felling of 221 trees. All trees to be felled are common trees that are not trees of particular interest[7]. HKUST will incorporate planting proposals as part of the project, including the planting of 224 trees.

35. HKUST estimates that the proposed works will create about 260 jobs (240 for labourers and another 20 for professional/technical staff) providing a total employment of 3 810 man-months.

Education Bureau
May 2023

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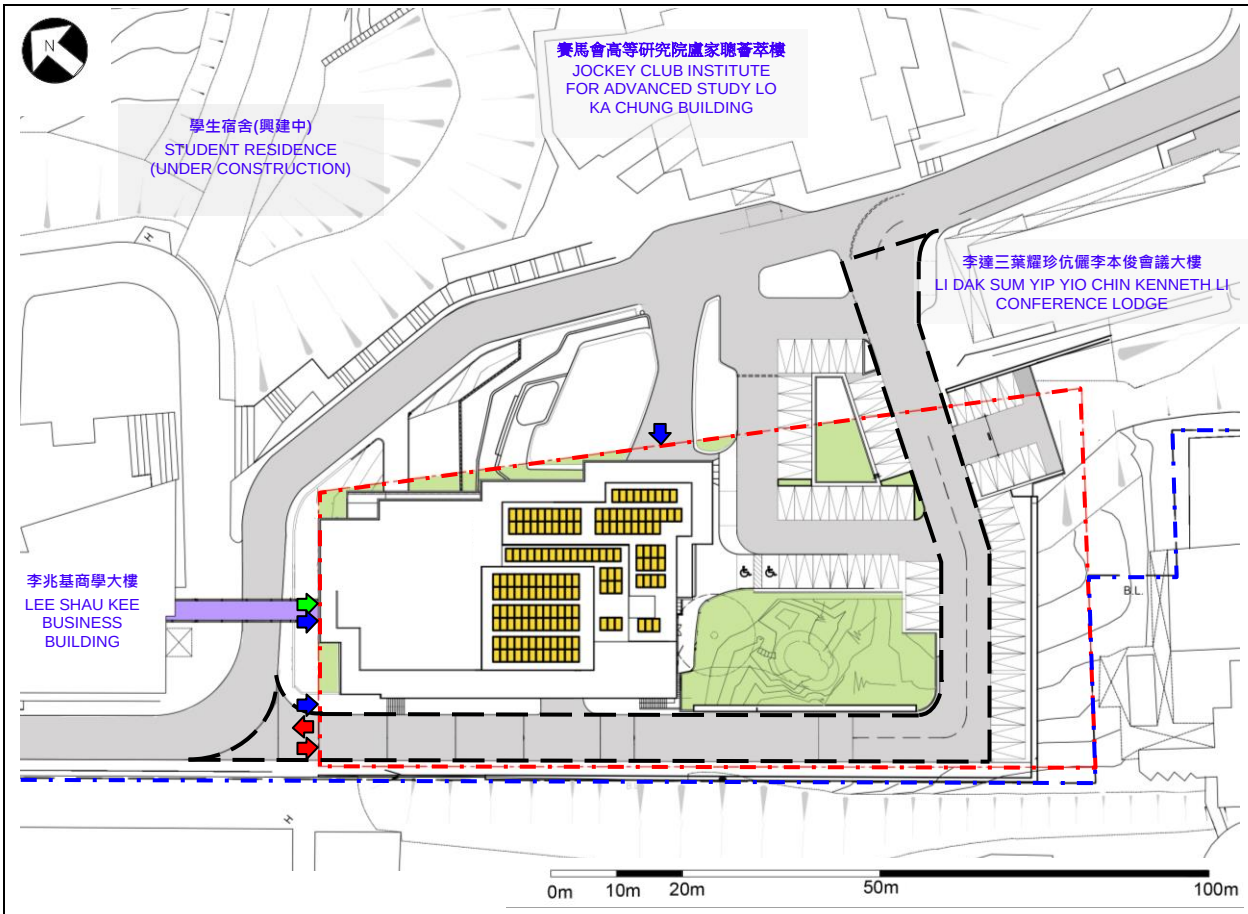
[7] "Trees of particular interest" are defined in Section 2.6.1 of the Guidelines for Tree Risk Assessment and Management Arrangement promulgated by the Development Bureau. Examples of trees of particular interest are listed as follows -

- Old and Valuable Trees (OVTs) and trees that are potentially registerable in the Register of OVTs;
- Trees of 100 years old or above;
- Trees with trunk diameter equal to or exceeding 1.0 metre (measured at 1.3 metres above ground level), or with height/canopy spread equal to or exceeding 25 metres;
- Stonewall trees or trees of outstanding form (taking account of overall tree sizes, shape and any special features);
- Rare tree species listed in "Rare and Precious Plants of Hong Kong": (https://www.herbarium.gov.hk/en/publications/books/book2/index.html) published by Agriculture, Fisheries and Conservation Department;
- Endangered plant species protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586);
- Tree species listed in the Forestry Regulations (Cap. 96A) under the Forests and Countryside Ordinance (Cap. 96);
- Well-known Fung Shui trees;
- Landmark trees with evidential records to support the historical or cultural significance of the trees;
- Trees which may arouse widespread public concerns; and
- Trees which may be subject to strong local objections on removal.



圖例 LEGEND

- 工地界線 SITE BOUNDARY
- 校園界線 BOUNDARY OF SCHOOL CAMPUS
- 緊急車輛通道 EMERGENCY VEHICULAR ACCESS
- 無障礙出入口 BARRIER-FREE ENTRANCE / EXIT
- 車輛出入口 VEHICULAR INGRESS / EGRESS
- 行人出入口 PEDESTRIAN ENTRANCE / EXIT
- 太陽能光伏板 PHOTOVOLTAIC PANEL
- 地面綠化 AT-GRADE GREENING
- 行人天橋 (包括在 18EL 內) PEDESTRIAN FOOTBRIDGE (FORMING PART OF 18EL)

位置圖
LOCATION PLAN

0m 25m 50m 100m 200m

工地平面圖 **SITE PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

附件 2 **ENCLOSURE 2**

從北面望向大樓的構思透視圖

PERSPECTIVE VIEW OF THE BUILDING FROM NORTH DIRECTION

從西面望向大樓的構思透視圖

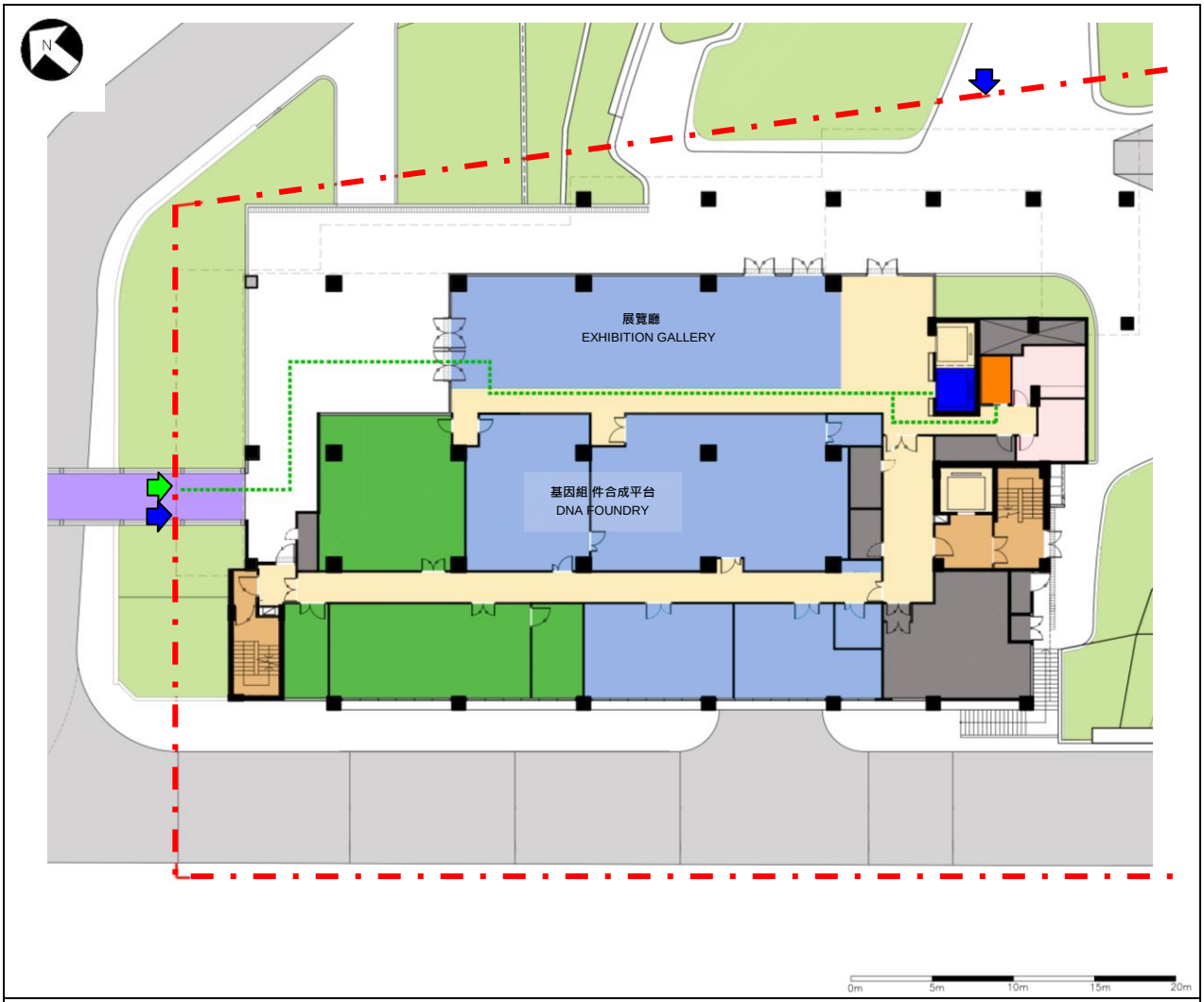
PERSPECTIVE VIEW OF THE BUILDING FROM WEST DIRECTION

構思圖 **ARTIST'S IMPRESSION**	**香港科技大學** **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

圖例 LEGEND

- 工地界線 SITE BOUNDARY
- 車輛出入口 VEHICULAR INGRESS / EGRESS
- 行人出入口 PEDESTRIAN ENTRANCE / EXIT
- 實驗室及研究設施 LABORATORY AND RESEARCH FACILITY
- 配套空間 SUPPORT SPACE
- 通道 CIRCULATION
- 逃生樓梯 MEANS OF ESCAPE STAIRCASE
- 機房 PLANT ROOM
- 地面綠化 AT-GRADE GREENING

底層地面平面圖 **LOWER GROUND FLOOR PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**



圖例 LEGEND

工地界線 SITE BOUNDARY	實驗室及研究設施 LABORATORY AND RESEARCH FACILITY	洗手間 TOILET
無障礙通道 BARRIER-FREE ACCESS	通道 CIRCULATION	地面綠化 AT-GRADE GREENING
無障礙出入口 BARRIER-FREE ENTRANCE / EXIT	逃生樓梯 MEANS OF ESCAPE STAIRCASE	
行人出入口 PEDESTRIAN ENTRANCE /EXIT	機房 PLANT ROOM	
行人天橋(包括在 18EL 內) PEDESTRIAN FOOTBRIDGE (FORMING PART OF 18EL)	暢通易達升降機 ACCESSIBLE LIFT	
辦公室 OFFICE	暢通易達洗手間 ACCESSIBLE TOILET	

地面平面圖 **GROUND FLOOR PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

圖例 LEGEND

工地界線 SITE BOUNDARY	逃生樓梯 MEANS OF ESCAPE STAIRCASE
無障礙通道 BARRIER-FREE ACCESS	機房 PLANT ROOM
辦公室 OFFICE	暢通易達升降機 ACCESSIBLE LIFT
實驗室及研究設施 LABORATORY AND RESEARCH FACILITY	暢通易達洗手間 ACCESSIBLE TOILET
通道 CIRCULATION	洗手間 TOILET

一樓平面圖 **FIRST FLOOR PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

圖例 LEGEND

工地界線 SITE BOUNDARY	逃生樓梯 MEANS OF ESCAPE STAIRCASE
無障礙通道 BARRIER-FREE ACCESS	機房 PLANT ROOM
辦公室 OFFICE	暢通易達升降機 ACCESSIBLE LIFT
實驗室及研究設施 LABORATORY AND RESEARCH FACILITY	暢通易達洗手間 ACCESSIBLE TOILET
通道 CIRCULATION	洗手間 TOILET

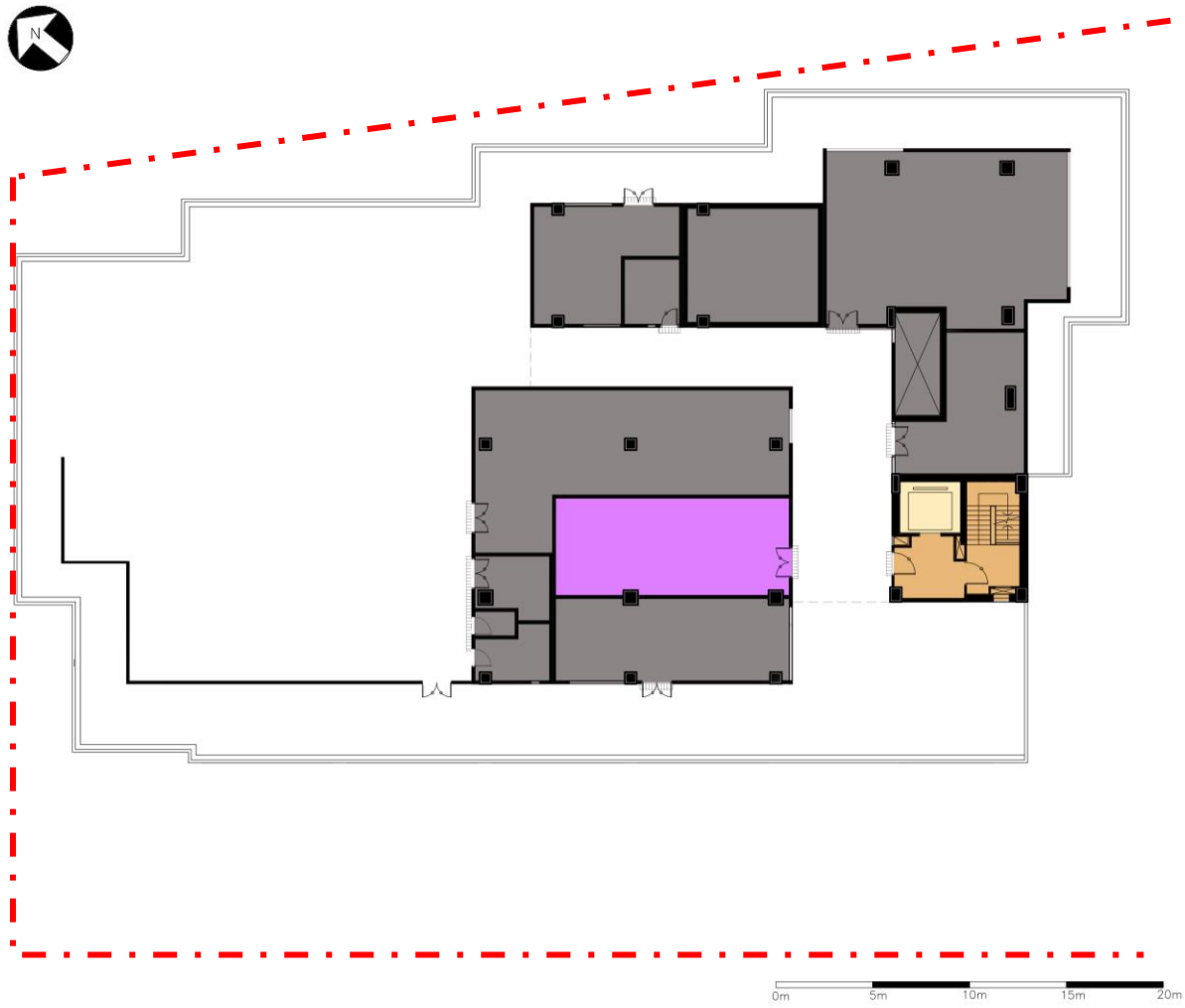
二樓及四樓平面圖 **SECOND AND FOURTH FLOOR PLANS**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

圖例 LEGEND

- 工地界線 SITE BOUNDARY
- 無障礙通道 BARRIER-FREE ACCESS
- 辦公室 OFFICE
- 實驗室及研究設施 LABORATORY AND RESEARCH FACILITY
- 通道 CIRCULATION
- 逃生樓梯 MEANS OF ESCAPE STAIRCASE
- 機房 PLANT ROOM
- 暢通易達升降機 ACCESSIBLE LIFT
- 暢通易達洗手間 ACCESSIBLE TOILET
- 洗手間 TOILET

三樓及五樓平面圖
THIRD AND FIFTH FLOOR PLANS

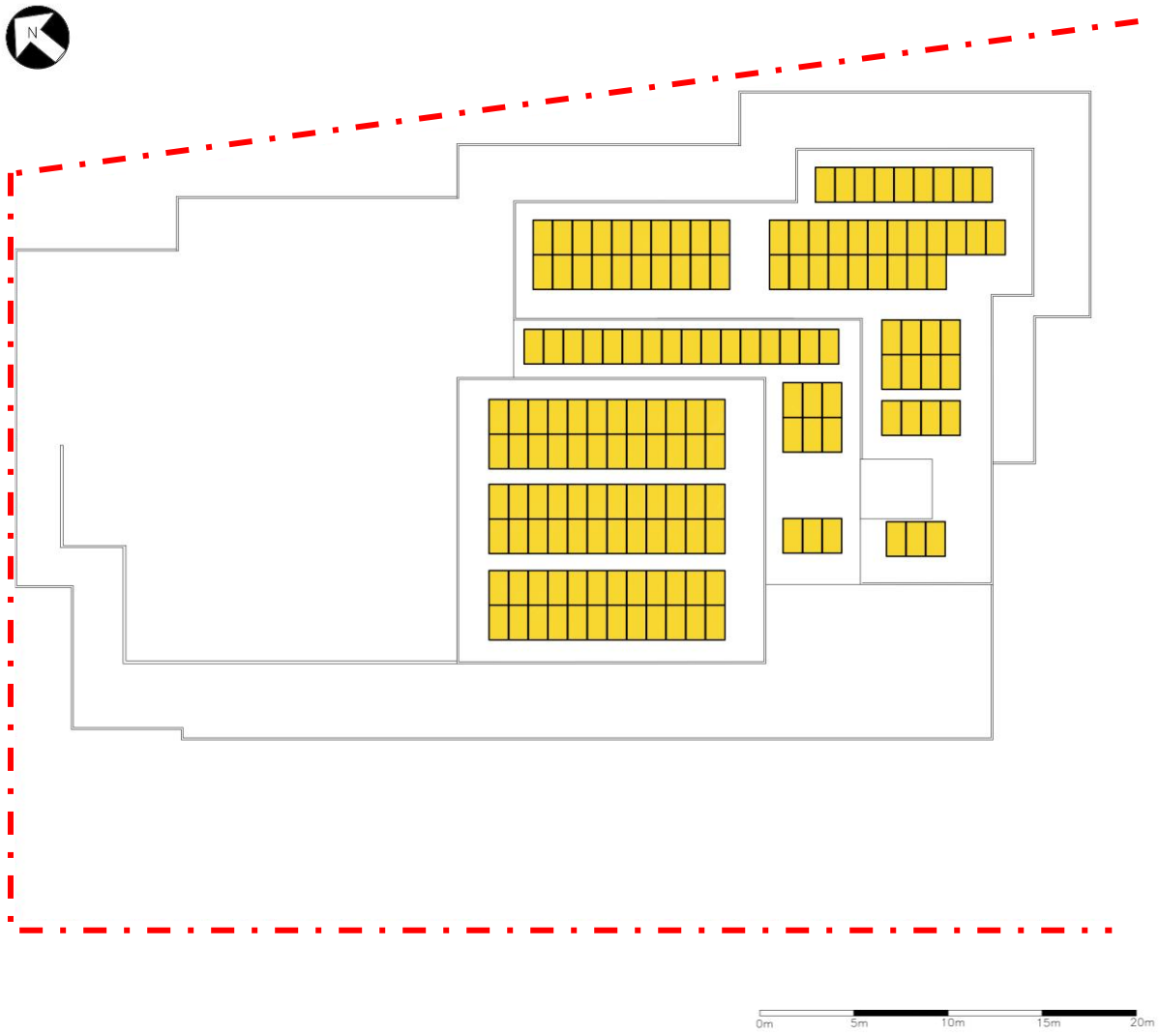
香港科技大學
18EL – 新科研樓 2
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY
18EL - NEW RESEARCH BUILDING 2



圖例 LEGEND

工地界線 SITE BOUNDARY	逃生樓梯 MEANS OF ESCAPE STAIRCASE
配套空間 SUPPORT SPACE	機房 PLANT ROOM
通道 CIRCULATION	

天台平面圖 **ROOF FLOOR PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**



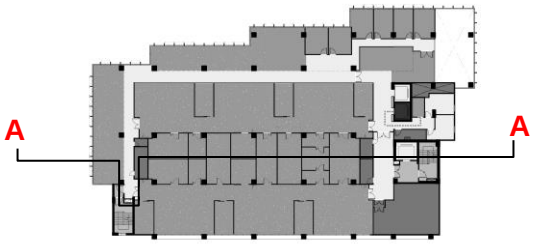
圖例 LEGEND

工地界線
SITE BOUNDARY
太陽能光伏板
PHOTOVOLTAIC PANEL

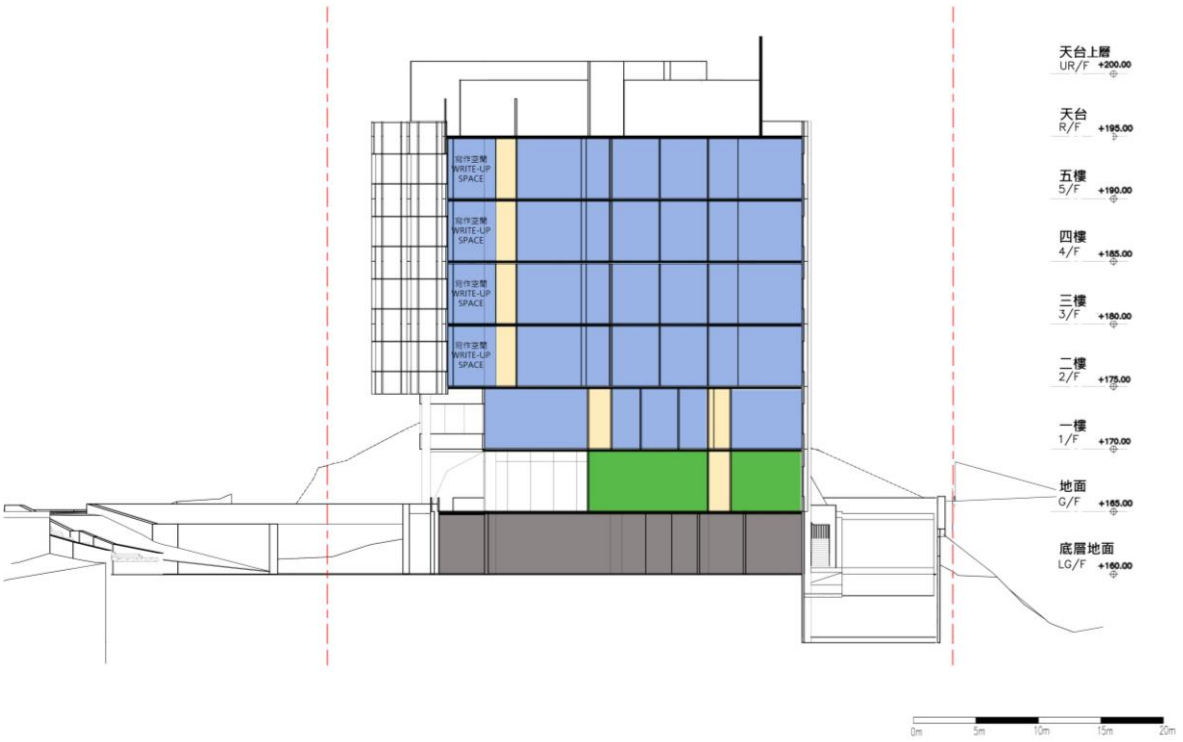
天台上層平面圖 **UPPER ROOF FLOOR PLAN**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

圖例 LEGEND

- 工地界線 SITE BOUNDARY
- 實驗室及研究設施 LABORATORY AND RESEARCH FACILITY
- 辦公室 OFFICE
- 通道 CIRCULATION
- 逃生樓梯 MEANS OF ESCAPE STAIRCASE
- 機房 PLANT ROOM
- 地面綠化 AT-GRADE GREENING
- 行人天橋 (包括在 18EL 內) PEDESTRIAN FOOTBRIDGE (FORMING PART OF 18EL)

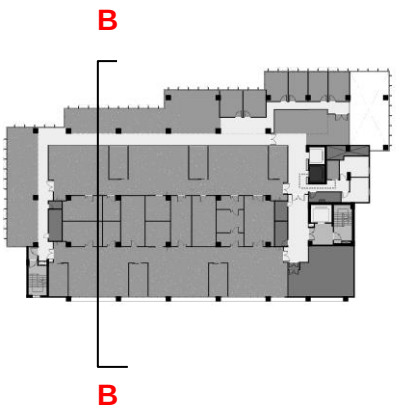


剖面圖 A-A SECTION A-A	香港科技大學 18EL – 新科研樓 2 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY 18EL - NEW RESEARCH BUILDING 2



圖例 LEGEND

- 工地界線 SITE BOUNDARY
- 實驗室及研究設施 LABORATORY AND RESEARCH FACILITY
- 辦公室 OFFICE
- 通道 CIRCULATION
- 機房 PLANT ROOM



剖面圖 B-B **SECTION B-B**	香港科技大學 **18EL – 新科研樓 2** **THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY** **18EL - NEW RESEARCH BUILDING 2**

The Hong Kong University of Science and Technology
18EL – New Research Building 2

Breakdown of the estimates for consultants' fee and resident site staff costs (in September 2022 prices)

		Estimated man-months	Average MPS* salary point	Multiplier (Note 1)	Estimated fee ($ million)
(a) Consultants' fees for contract administration (Note 2)	Professional	-	-	-	11.3
	Technical	-	-	-	-
				Sub-total	11.3#
(b) Resident site staff (RSS) cost (Note 3)	Professional	-	-	-	-
	Technical	177	14	1.6	8.8
				Sub-total	8.8
Comprising –					
(i) Consultants' fees for management of RSS				0.6#	
(ii) Remuneration of RSS				8.2#	
				Total	**20.1**

* MPS = Master Pay Scale

Notes

1. A multiplier of 1.6 is applied to the average MPS salary point to estimate the staff costs of RSS employed by the consultants (as at now, MPS salary point 14 = $30,990 per month).

2. The consultants' fees for the contract administration are calculated in accordance with the existing consultancy agreements relating to the project. The construction phase of the assignment will only be executed subject to the Finance Committee's approval to upgrade **18EL** to Category A.

3. The consultants' fees and staff costs for site supervision is based on the estimates prepared by HKUST. The actual man-months and actual cost will only be known after completion of the construction works.

Remarks

The cost figures in this Enclosure are shown in constant prices to correlate with the MPS salary point of the same year. The cost figures marked with # are shown in money-of-the-day prices in paragraph 11 of this paper.