水務署
Water Supplies Department

香港灣仔告士打道7號入境事務大樓
Immigration Tower, 7 Gloucester Road, Wan Chai, Hong Kong

本署檔號 *Our ref.* : (24) in WSD/ST 4991/R/22 Pt.1
來函檔號 *Your ref.* : CB4/PAC/R81

電話 *Tel.* : 2829 4365
傳真 *Fax.* : 2824 0578

16 January 2024

Ms Shirley CHAN
Clerk to the Public Accounts Committee
Legislative Council Complex,
1 Legislative Road
Central, Hong Kong

Dear Ms CHAN,

Public Accounts Committee
Consideration of Chapter 1 of the Director of Audit's Report No. 81
Expansion of Tai Po Water Treatment Works

Thank you for your letter of 20 December 2023 with regard to Chapter 1 of the Director of Audit's Report No. 81.

I enclose the responses of this Department to the questions attached to your letter.

Yours sincerely,

(Stanley CY CHAN)
for Director of Water Supplies

Encl.

c.c. Secretary for Development
Secretary for Financial Services and the Treasury
Director of Audit

Chapter 1 in Report No. 81 of the Director of Audit
"Expansion of Tai Po Water Treatment Works"
Enquiry and Request for Information

Part 2: Construction Works of Tai Po Water Treatment Works

1) According to paragraph 2.5 of the Report No. 81 of the Director of Audit ("Audit Report"), during the construction stage of Contract B, Consultant M rejected the sizes of the two washwater storage tanks proposed by Contractor B in its design submissions in the Contractor's Proposals submitted at the tender stage in March 2012. The Water Supplies Department ("WSD") please advise-

(a) why Consultant M rejected the sizes of the two washwater storage tanks during the construction stage which were proposed by Contractor B more than one year ago during the tender stage, rather than earlier; and
(b) who approved the drawings for Contractor B to construct

2) According to paragraph 2.6(a) of the Audit Report, the size of washwater storage tanks proposed by Contractor B in Contractor's Proposals deviated from the Employer's Requirements as given on the Employer's Drawings. WSD please advise-

(a) whether Contractor B was aware of the Employer's Requirements as given on the Employer's Drawings before submission of the Contractor's Proposals; if aware of, why WSD accepted the Contractor's Proposals; and
(b) why Contractor B was awarded the Contract even the Contractor's Proposals submitted during the tender stage did not meet the requirements of WSD; how did WSD evaluate the tenderers' designs during tendering.

3) According to paragraph 2.8(a) of the Audit Report, the Employer's Drawings were merely an outline or reference design, which was not binding on the contractor. WSD please advise whether there was review on the binding capacity of the Employer's Drawings; if yes, what were the details; if no, what were the reasons.

Response (1), (2) and (3):

Contract B was a Design and Build contract. Its Employer's Requirements comprised documents which were contractually binding (contract requirements), such as the Schedules, General Specification, Particular Specification, Pricing Document etc., including design parameters; and non-binding documents which were for reference only, such as the Employer's Drawings. The contractor could make use of its expertise to provide cost-effective, practicably feasible and innovative design schemes to fulfill the contract requirements. Document parts constituting contract requirements cover different aspects and the level of importance varies across different aspects. In the

tender evaluation process, if a tenderer's submission did not meet an important part of the contract requirements, the tenderer's technical competence score could be deducted according to the importance of that part. If the concerned part was an essential requirement of the entire project, the tender submission could even not be accepted. Relevant provisions had been made in the tender documents.

Regarding the tendering mechanism, Contract B adopted the "two-envelope" tender evaluation method. This method comprised the assessment of the tenderers' tender prices and their technical competence and past performance. In respect of tenderers' technical competence, tenderer's design was one of the evaluation criteria[1]. Regarding the two washwater storage tanks, Consultant M considered that Contractor B should be aware of the "Employer's Requirements" listed in the Employer's Drawings, and expected that Contractor B should carry out the preliminary design according to the requirements in the Employer's Drawings. Nevertheless, there were inconsistencies between the Particular Specification and Employer's Drawings of the tender documents in respect of the design parameters for the washwater storage tanks. Contractor B submitted in its tender the preliminary design which was conducted according to the requirements in the binding Particular Specification. Although Contractor B's preliminary design did not fully meet the requirements in the Employer's Drawings, Consultant M considered that the concerned design was not an essential requirement in the contract documents, and that there was no reason to reject the tender submission at the stage of tender assessment just because the preliminary design did not fully meet the requirements in the Employer's Drawings. Upon the assessment of technical competence and past performance and tender prices, Contractor B attained the highest overall score and was awarded with the contract.

During the construction stage, Contractor B carried out the detailed design according to the requirements of the Particular Specification and should submit the detailed design to Consultant M for approval before it could commence the construction works. In the approval process, Consultant M considered that Contractor B should carry out the detailed design according to the requirements in the Employer's Drawings and therefore required Contractor B to make modifications before commencing the construction works.

4) According to paragraphs 2.8(b) and 2.9 of the Audit Report, the Employer's Requirements of Contract B did not clearly spell out the important parameters for calculating the necessary capacity of the washwater tanks and other operation requirements. Eventually, Consultant M issued a variation order valued at a cost of $78.7 million to increase the volume of the washwater storage tanks. WSD please advise-

[1] The evaluation criteria for the tenderers' technical competence and past performance included: the tenderer's design, construction arrangements, construction management and technical resources, quality, safety, environmental protection, risk management and contingency plans, as well as past performance.

(a) why the Employer's Requirements did not clearly spell out the important parameters for calculating the necessary capacity of the washwater tanks;
(b) whether it was not necessary for the Employer's Requirements of previous projects to spell out the calculation parameters;
(c) whether the above incident was an issue of negligence or mechanism; what measures have been taken by WSD to prevent the recurrence; and
(d) whether Consultant M was disciplined or held accountable; if yes, what were the details; if no, what were the reasons.

Response (4):
Response (4)(a), (4)(b), (4)(c) and (4)(d)

For similar projects adopting Design and Build contract, design parameters are stated in the contract requirements in general for the contractors to carry out their design. In this case, Consultant M had stated the relevant design parameters in (i) the non-binding Employer's Drawings, and (ii) the binding Particular Specification, and failed to spot out the inconsistency between these two documents when cross-checking the above tender documents, resulting in this incident, which was an individual incident rather than a mechanism issue.

Regarding the above insufficiency of Consultant M, WSD has met with the Managing Director of Consultant M and issued a warning letter to express the dissatisfaction and urge Consultant M to learn from the experience of the incident to avoid recurrence of similar situation. Consultant M's management has also made internal admonishment in this respect.

Besides, making reference from the experience gained from this incident, WSD has issued a memo to relevant project management team members to remind them and consultants to observe the relevant guidelines and stipulate the design parameters in the binding contract requirements in preparing the tender documents for Design and Build contracts. On the other hand, WSD would continue to hold regular internal meetings with relevant project management team members to share experience in strengthening the management of engineering consultants.

5) According to paragraph 2.12(a) of the Audit Report, the condition survey report submitted by Consultant M in March 2010 did not include the condition survey results of the waterstops installed at the existing compartment of the Butterfly Valley Fresh Water Primary Service Reservoir (FWPSR). WSD please advise-

(a) whether Consultant M carried out condition survey for the waterstops installed at the existing compartment of the Butterfly Valley FWPSR; and
(b) why after commencement of works under Contract C, in February 2014, Consultant M instructed Contractor C to conduct additional physical tests on six samples of existing waterstops installed at the existing compartment of the

Butterfly Valley FWPSR (paragraph 2.12 (b) of the Audit Report), rather than earlier.

Response (5):
Response (5)(a) and (5)(b)

Waterstops at service reservoirs are mainly for preventing water leakage. The waterstops installed in the existing compartment of the Butterfly Valley FWPSR were reserved for future extension of the service reservoir, and were protected by brickworks with sand infill to avoid damage. The waterstops were only a minor component of the structures of the service reservoir. Should leakage result from aging of the waterstops, the time required for the replacement work in Contract C would not be too long and the expenditure would not be substantial, meaning that the progress of works and the overall budget would not be affected. Had the condition survey for the existing waterstops been carried out during the design stage of the project, the relevant brickworks protection would have to be removed which might cause damage to the waterstops and hence affect their leakage prevention function. Based on the above considerations, Consultant M chose to conduct the physical test for those waterstops during the construction stage to assess the need of any replacement work.

6) According to paragraph 2.13 and Note 16 of the Audit Report, in the meeting between WSD and Consultant M held in June 2009, the proposed scope of works for inclusion in Contract A had been discussed. However, after the award of Contract A in February 2010, additional issues on the operation and maintenance of TPWTW were further identified by Consultant M necessitating the issue of 14 variation orders valued at $5.5 million for enhancement works. WSD please advise-

(a) why Consultant M identified the additional issues only after award of contract;
(b) WSD informed Audit that the additional issues on the operation and maintenance of TPWTW identified after the award of Contract A had not been anticipated by stakeholders during the design stage; who were the stakeholders involved; what were the additional issues that had not been anticipated during the design stage.
(c) what measures have been taken by WSD to prevent the recurrence.

Response (6)(a) and (6)(b):
Response (6)(a) and (6)(b)

The scope of works under Contract A included the installation of new mechanical and electrical facilities in the existing buildings of Tai Po Water Treatment Works involving a large number of interfaces between the existing and new mechanical and electrical facilities. During installation of the new mechanical and electrical facilities, the operation and maintenance staff of the Tai Po Water Treatment Works (including WSD

operation staff, maintenance staff for mechanical and electrical facilities and instruments, etc.) had to review the need for upgrading or modification of the existing mechanical and electrical facilities and their components so as to integrate the new and existing mechanical and electrical facilities to achieve the system design performance. For example, to enhance drinking water safety after increasing the water treatment capacity, new water level monitoring devices were installed in some existing water tanks to facilitate WSD operation staff to monitor the system effectively. In addition, during installation of the new mechanical and electrical facilities, modifications to the existing environment or facilities were required to accommodate the operational needs, including installation of new lighting system to enhance the safety of the working environment.

The above upgrading or modification works could not be anticipated wholly during the design stage and Consultant M had to issue variation orders for such works. Consultant M had allowed sufficient contingency in Contract A to cater for the above unforeseen circumstances.

Response (6)(c)
Making reference from the experience gained in this incident, WSD has issued a memo to remind the relevant project team members and consultants to maintain close liaison with relevant stakeholders during design stage, including the operation and maintenance staff of relevant facilities etc., to minimize upgrading or modification works as far as possible after construction. Sufficient project contingencies should also be allowed to cater for situations similar to the above. Moreover, WSD would continue to hold regular internal meetings with relevant project management team members to share experience in strengthening the management of engineering consultants.

7) According to paragraph 2.23(a) of the Audit Report, as far as could be ascertained, Consultant M did not identify any parts of the water mains that must be constructed by trenchless techniques to avoid unacceptable traffic conditions in the final traffic impact assessment report submitted in February 2010. WSD please advise whether Consultant M was disciplined or held accountable; if yes, what were the details; if no, what were the reasons.

Response (7):
Considering the cost-effectiveness, the comparatively lower-cost "open trench" method should be considered first for the replacement of watermains. Only for locations with significant traffic or environmental impacts, pipe laying by the "trenchless method" will be considered. During the design stage of water mains replacement projects, traffic impact assessment for road sections affected by the proposed works should be carried out first to ensure that the proposed pipe laying method would not cause unacceptable traffic impact. The traffic impact assessment report will be circulated to the relevant departments for approval.

During the design stage, Consultant M first considered adopting the comparatively lower-cost "open trench" method, and submitted the traffic impact assessment report to

the relevant departments, including the Transport Department and the relevant Traffic Offices of the Hong Kong Police Force, and received no objection. Nevertheless, during the construction stage, the actual traffic flows on some road sections were heavier than originally anticipated. Consultant M had to change the "open trench" method as originally proposed to the "trenchless method" to complete the works. The proposals of adopting trenchless method were accepted by the relevant departments. The above practices are considered acceptable.

8) According to paragraph 2.33 of the Audit Report, WSD took about 7 months to implement the alternative measures to address the problems of manufacturing and storage of dangerous goods (DG) at TPWTW. Consultant M contended that the requirements imposed by the Fire Services Department (FSD) and Environmental Protection Department (EPD) were unforeseen ones and inevitably caused serious impacts to progress of the works. Audit however noted that the general siting requirements was included in "A Guide to Application for Dangerous Goods Licence" issued by FSD in June 2009. WSD please advise whether Consultant M was disciplined or held accountable; if yes, what were the details; if no, what were the reasons.

Response (8):

Chlorine is used for disinfection of drinking water produced in water treatment works in Hong Kong. As there was no local chlorine manufacturer, Hong Kong had all along imported chlorine in liquid form (i.e. liquid chlorine) from the Mainland to different water treatment works for storage and use. The transportation and storage of liquid chlorine were subject to a stringent risk assessment and adequate safety measures were adopted to ensure safety and reliability. With advancement of technology, on-site chlorine generation (OSCG) technology has become mature and reliable. In April 2016, WSD, after study, concluded that the OSCG technology was ready for adoption in the water treatment works in Hong Kong, and decided in the same year to install the OSCG facilities for all major water treatment works in Hong Kong to phase out the importation of liquid chlorine, thus eliminating the risks associated with the transportation and storage of liquid chlorine. In addition, the OSCG facilities enable a more stable supply of chlorine, enhancing the reliability of the water supply system.

Contract B commenced in February 2013. Based on the above decision, WSD gave approval in January 2017 for Consultant M to issue a variation order for the additional works of supply and installation of new OSCG facilities at the Tai Po Water Treatment Works. Consultant M immediately started the design work of the OSCG facilities. In view of the limited space at the Tai Po Water Treatment Works, Consultant M considered that it was necessary to install the new OSCG facilities on the lower level of the existing chlorine building, whilst the existing liquid chlorine system on the upper level of the same building would continue to operate during the installation of the new OSCG facilities and would be demolished after the new OSCG facilities commission to operate.

During the early design stage, Consultant M considered the relevant requirements for fire services and environmental protection, including "A Guide to Application for Dangerous Goods Licence" issued by FSD in June 2009. One of the requirements in the above Guide was that a proposed dangerous goods store within a building should not be located directly under or above another dangerous goods store. For the case of the Tai Po Water Treatment Works, the new OSCG facilities should not be located directly under the existing liquid chlorine system. Consultant M at that time considered that such requirement was only applicable to the operation stage of the proposed OSCG facilities at the Tai Po Water Treatment Works, not including the testing stage. Consultant M submitted an application to FSD in March 2017 regarding the manufacturing and storage of dangerous goods at the OSCG facilities at the Tai Po Water Treatment Works.

Regarding the application concerned, FSD pointed out that the relevant requirement in the above Guide also applied to the testing stage of the proposed OSCG facilities at the Tai Po Water Treatment Works. So the existing liquid chlorine system located on the upper floor of the same building should cease operation during the testing of the new OSCG facilities. As a consequence, operation of the Tai Po Water Treatment Works would be hampered as it could not produce drinking water during the testing stage, and a solution has to be worked out. In view of limited space in the Tai Po Water Treatment Works, Consultant M had to identify another suitable location to install an additional OSCG facility to maintain the disinfection of drinking water produced in the Tai Po Water Treatment Works. Therefore, it took 7 months for Consultant M to identify the suitable location at the Ngau Tam Mei Water Treatment Works for the additional set of OSCG facility and subsequently submitted an application to FSD in October 2017 regarding the manufacturing and storage of dangerous goods, which was eventually approved by FSD.

As mentioned in the Response (4)(d), regarding Consultant M's being unable to fully understand the requirements of the above-mentioned Guide, WSD has met with the Managing Director of Consultant M and issued a warning letter to express the dissatisfaction and urge Consultant M to learn from the experience gained from the incident, particularly early clarification with the authority the relevant requirements, to avoid recurrence of similar situation. Consultant M's management has also made internal admonishment in this respect.

9) According to paragraph 2.35 of the Audit Report, variation order A's cost had increased significantly from the original total estimated cost of $220 million by $153.2 million (70%) to the final value of $373.2 million. WSD please advise what measures were taken to finalise the design of works before issuing the relevant variation order as far as practicable.

Response (9):

As mentioned in the Response (8), in April 2016, WSD, after study, concluded that the OSCG technology was ready for adoption in the water treatment works in Hong Kong,

and decided in the same year to install the OSCG facilities for all major water treatment works in Hong Kong to phase out the importation of liquid chlorine. At that time, the OSCG facilities were a new technology in Hong Kong, involving complex systems. The cost was estimated based on the best information available at the time, including conceptual design drawings, preliminary quotations from suppliers, etc., and after the consultation with the operation and maintenance staff of WSD. During the design stage, Consultant M had familiarized itself as much as practicable with the new technology for OSCG in Hong Kong. Nevertheless, Consultant M still had to deal with many unforeseen issues, such as how the dehumidification system of the OSCG facilities could effectively remove moisture from wet chlorine gas.

Making reference to the experience gained from this incident, WSD can make much better assessment in formulating the estimated cost for the OSCG facilities in the future. Moreover, WSD has issued a memo to remind the relevant project team members and consultants that when implementing works projects, they should take measures for more effective assessment of the estimated project cost and the values of the variation orders.

10) How WSD evaluated the performance of Consultant M; whether the performance of Consultant M was reflected in the consultant's performance report; if yes, what were the details; if no, what were the reasons.

Response (10):

Regarding the Expansion of Tai Po Water Treatment Works project, Consultant M did have insufficiencies in some aspects, including inconsistence of design parameters in preparation of tender documents, inability to fully understand individual fire services requirement during design, omissions during review of Bills of Quantities leading to omitted items and inability to properly reflect some accidents in the Contractor's quarterly performance reports. Regarding Consultant M's respective insufficiencies, WSD has met with Consultant M's Managing Director and issued warning letters to express the dissatisfaction and urge Consultant M to learn from the experience of the incidents to avoid recurrence of similar situation. Moreover, Consultant M's management has also made internal admonishment in those respects. On the other hand, WSD would continue to hold regular internal meetings with relevant project management team members to share experience in strengthening the management of engineering consultants.

11) Whether there are projects in the WSD currently supervised by Consultant M; if yes, what are the total values of the projects.

Response (11):

Consultant M is currently supervising 13 nos. of WSD projects, involving work values amounting to HK$16.4 billion approximately.

Part 3: Other Contract Management Issues

12) According to paragraph 3.3(d) of the Audit Report, the sum allowed for Contract B in the project cost estimate was $1,542.9 million more than the recommended tender sum of $3,252.1 million. According to Note 36(a) of the Audit Report, one of the main reasons for the difference was that upon the completion of the Project, the increased output capacity of TPWTW could take up the existing loading of STWTW for supplying fresh water to a significant part of Kowloon, and Central and Western District of Hong Kong Island, which could pave the way for the in-situ reprovisioning of STWTW, while enhancing the overall resilience, flexibility and reliability of the water supply system. WSD please advise the causal relationship between the two issues.

Response (12):

Tai Po Water Treatment Works and Sha Tin Water Treatment Works are two major water treatment works in Hong Kong. As of 2009, Sha Tin Water Treatment Works had been in operation for more than 40 years and had reached a stage requiring substantial reprovisioning as its plant and equipment were approaching the end of their service life. To allow Sha Tin Water Treatment Works to be partially shut down for the in-situ reprovisioning works, it was necessary to substantially increase the output capacity of the Tai Po Water Treatment Works for taking up part of the loading of Sha Tin Water Treatment Works to meet the water demands. Against the above background, the Expansion of Tai Po Water Treatment Works project needed to be completed as soon as possible to minimize any risk in water supply. At the same time, the project involved large-scale expansion works in the operating Tai Po Water Treatment Works, to ensure security and safety of water supply, the complexity and difficulty of the project were very high. Therefore, the project team had recommended a higher contingency in the cost estimate for Contract B to cater for potential risks of the project (including site constraints arising from maintaining operation of the existing Tai Po Water Treatment Works during the construction period, limited working space in the project site leading to additional design requirements, differences in geological data, uncertainty arising from fluctuation in costs of plant, equipment and materials etc.). The final contract sum of Contract B was $3,760.4 million and most of the contingencies were finally not required.

Making reference from the experience from this incident, WSD has issued a memo to remind the relevant project team members and consultants that when implementing works projects, they should take measures to enhance the estimate for the project costs.

13) According to paragraph 3.5 and Note 40 of the Audit Report, there were 52 omitted items under Contract C. Of the 52 omitted items, 3 items (with value ranging from $2 million to $3.8 million) accounted for $8.7 million (78%) of the total value of $11.2 million. According to Consultant M, these 3 items were provided in the contract drawings but omitted from Bills of Quantities. WSD please advise whether Consultant M was disciplined or held accountable; if yes, what were the details; if no, what were the reasons.

Response (13):

Contract C was a Remeasurement contract. There were about 690 items in the Bills of Quantities. The 52 omitted items were about 8% of the total numbers of Bills of Quantities' items. The total value of these 52 omitted items was $11.2 million, which was about 3% of the final contract sum of Contract C of $375.4 million. In the preparation of tender documents for Contract C, Consultant M had insufficiency in reviewing the Bills of Quantities leading to omitted items.

As mentioned in the Response (4)(d), regarding the above insufficiency of Consultant M, WSD has met with the Managing Director of Consultant M and issued a warning letter to express the dissatisfaction and urge Consultant M to learn from the experience of the incident to avoid recurrence of similar situation. Consultant M's management has also made internal admonishment in this respect.

14) According to paragraph 3.14 of the Audit Report, Audit noted that Contractor B's performance reports of the relevant period had not reflected instances related to its late reporting of 7 reportable accidents and unauthorised access to the chlorine building by its worker in June 2018. WSD please advise why these accidents were not reflected in Contractor B's performance reports of the relevant period.

Response (14):

Whereas Consultant M issued warning letters to Contractor B concerning the above incidents, the incidents were not reflected in Contractor B's quarterly contractor's performance reports. As mentioned in the Response (4)(d), regarding the above insufficiency of Consultant M, WSD has met with the Managing Director of Consultant M and issued a warning letter to express the dissatisfaction and urge Consultant M to learn from the experience of the incident to avoid recurrence of similar situation. Consultant M's management has also made internal admonishment in this respect.

On the other hand, WSD has issued a memo to remind the relevant project management team members and consultants that when implementing works projects, they should take measures to ensure that the performance issues of contractors should be duly reflected in their performance reports, and to strengthen the controls on access to hazardous/restricted areas with a view to preventing unauthorised access to and use of facilities in these areas.

15) Some aspects in the quarterly performance reports of Contractor B were rated as "poor" and "very poor" (Note 44, Note 46 and Note 48 of the Audit Report). WSD please advise whether there was disciplinary action and whether Contractor B participated in other projects after completion of the Expansion of TPWTW project.

Response (15):

According to the Development Bureau's contractor management mechanism, works departments are required to conduct quarterly performance appraisals for the contractors in various aspects including workmanship, progress of works, site safety, environmental pollution control, organization, general obligations and resources. If the overall performance of a contractor is poor, the score in the contractor's performance report will be lower, which will affect its opportunity of being awarded with new works contracts in the future. In addition, if a contractor's performance continues to be poor, the Government can take regulatory action according to the mechanism, including temporary suspension from tendering or even removal of the contractor from the "List of Approved Contractors for Public Works".

As Contractor B got "very poor" and "poor" ratings in some aspects of the individual performance reports under Contract B, the associated performance reports obtained lower scores. On the other hand, Contractor B was a joint venture contractor composed of two individual contractors. After completion of the Expansion of Tai Po Water Treatment Works project, each of these two contractors has participated in tender submission for other waterworks projects and construction of some waterworks projects.