Report of the Independent Audit Panel

for

Implementation of Recommendations in the Final Report of the Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project

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Introduction

1. A 17-kilometre long railway, the Shatin to Central Link ("SCL") is an integral part of the Government's railway development strategy. The entire SCL project is funded by the Government under the concession approach, under which the MTR Corporation Limited ("MTRCL") is entrusted with the design, construction and commissioning of the project by the Government, whereas the Highways Department ("HyD"), with the assistance of its Monitoring and Verification ("M&V") consultant, is responsible for verifying whether MTRCL has fulfilled its obligations as the project manager as stipulated in the Entrustment Agreement for Construction and Commissioning of the SCL signed between the Government and MTRCL on 29 May 2012 ("EA").

2. In May 2018, media reports revealed the substandard steel works found at a platform slab of Hung Hom Station Extension under MTRCL's Contract no. 1112 of the SCL project. There were also concerns that the main contractor had adopted revised slab to diaphragm wall connection details which were different from the design drawings accepted by the Building Authority. This gave rise to public concerns on the structural integrity of the station box structure, as well as the insufficiency of existing oversight and inspection regimes.

3. In response, the Chief Executive in Council appointed the Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project[1] ("the Commission") under the Commissions of Inquiry Ordinance (Cap. 86) on 10 July 2018 to look into the facts and circumstances surrounding the steel reinforcement fixing works and any other works which raised concerns about public safety in respect of the diaphragm wall and platform slab construction works at the Hung Hom Station Extension.

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[1] The Commission was named "The Commission of Inquiry into the Diaphragm Wall and Platform Slab Construction Works at the Hung Hom Station Extension under the Shatin to Central Link Project", and was given the present name when its terms of reference were extended in February 2019.

4. It has subsequently come to light that in respect of the North Approach Tunnels ("NAT"), South Approach Tunnels ("SAT") and Hung Hom Stabling Sidings ("HHS") (also under Contract 1112 of the SCL project), some of the required works-related documentation were missing, and some parts of the said works might have not been constructed according to the plans accepted by the HyD or Building Authority. As a result, the Chief Executive in Council approved on 19 February 2019 the extension of the terms of reference of the Commission to investigate the works at these three locations.

5. The Commission submitted its Interim Report, covering its inquiry under the original terms of reference, to the Chief Executive on 25 February 2019. The Commission put forward in the Interim Report a series of recommendations to enhance MTRCL's project management system and the Government's monitoring mechanism. In its Interim Report, the Commission also recommended that a follow-up audit independent from the Government be conducted so as to provide assurance to the Chief Executive that the recommended measures have been properly implemented and/or satisfactory progress towards their implementation is being made. With the agreement of the Chief Executive, this "Independent Audit Panel for Recommendations in the Interim Report of the Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project" ("the Panel") was appointed in October 2019 to conduct the independent follow-up audit ("the First Audit").

6. Mr Wong Kwai Huen, BBS, JP was appointed Chairman of the Panel, with Ir Professor Lo Hong Kam, JP and Ir Chan Chi Chiu, SBS appointed as members. The Panel was supported by the Secretariat to the Panel established by the Transport and Housing Bureau ("THB"). On 26 May 2020, the Panel submitted its report ("the First Audit Report") to the Chief Executive. Among the 58 recommendations[2] made by the Commission in its Interim Report to promote public safety and assurance on quality of works, 14 have

[2] Among the 58 recommendations made by the Commission in its Interim Report to promote public safety and assurance on quality of works, 13 and 33 are to be followed up solely by the Government and MTRCL respectively, while 12 require actions jointly by both parties.

been fully implemented, and satisfactory progress towards full implementation of 42 recommendations is being made, whereas progress has been made towards the implementation of the remaining two recommendations.

7. On 27 March 2020, the Commission submitted to the Chief Executive its Final Report, which covered its inquiry under both the original and extended terms of reference. The Final Report was made public after redacting several parts therein to avoid any prejudice (actual or perceived) to any ongoing criminal investigations and any potential prosecutions of any criminal offences in the future (if so decided to be justified after the relevant investigations). In its Final Report, the Commission has revised and supplemented on some of its recommendations in the Interim Report, as well as put forward several further recommendations arising from its inquiry under the extended terms of reference.

8. Similar to the Interim Report, the Commission recommended that an independent follow-up audit be conducted 12 months following the date of the Final Report (i.e. 26 March 2021). With the agreement of the Chief Executive, the Panel was reappointed on 3 June 2020 to conduct the further follow-up audit on the actions taken by the Government and MTRCL to implement the recommended measures in the Final Report ("the Second Audit"). The Panel has been retitled "Independent Audit Panel for Implementation of Recommendations in the Final Report of the Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project".

9. The updated terms of reference of the Panel in respect of the Second Audit are as follows:

(i) to consider progress reports from the Government and the MTRCL on the implementation of the recommended measures;

(ii) to review whether the recommended measures have been fully implemented and, if not, whether satisfactory progress towards full implementation is being made; and

(iii) to prepare a report to the Chief Executive on (i) and (ii) above, together with any relevant observations or recommendations on or before 26 March 2021.

For the avoidance of doubt, recommended measures in the Commission's Interim Report, including those that have yet to be fully implemented, are featured in the Commission's Final Report, hence forming part and parcel of the above terms.

10. This Audit Report of the Panel ("the Second Audit Report") was prepared to set out the outcome of the Second Audit, taking into account the progress reports, other written submissions and oral presentations from the Government and MTRCL to the Panel. In the course of the Second Audit, the Panel convened inquiry sessions on 11 September 2020 and 15 January 2021, during which officials from the Development Bureau, HyD and Buildings Department ("BD"), as well as core members of MTRCL's Projects, Engineering[3] and Legal Divisions were present to set out the follow-up actions taken by the Government and MTRCL respectively, and to respond to questions from the Panel. In addition, the Government and MTRCL submitted progress reports, as well as additional data and information as requested by the Panel, for its perusal prior to each inquiry session. The Panel also visited the site office of the Tung Chung Line Extension project in Fo Tan on 18 November 2020, during which Members were briefed on MTRCL's Competency Management Procedure, the new Second Line of Defence and dashboard reporting. During the visit, the Panel was also given a demonstration by MTRCL on the current adoption of Building Information Modelling ("BIM") in the Tung Chung Line Extension and Tuen Mun South Extension projects. The Panel also attended MTRCL's briefing on 4 January 2021, during which Members were given a demonstration of the partly

[3] The Projects Division was subsequently changed into the Capital Works Business Unit with effect from 22 February 2021 and the Engineering Division ceased to exist after 21 February 2021.

revamped Project Integrated Management Systems ("PIMS") and briefed on MTRCL's revised contractual procedures.

11. As in the case of the First Audit, the mandate of the Panel is to conduct an audit in the form of an administrative, rather than judicial or legalistic, inquiry into the follow-up actions taken by the Government and MTRCL. The purpose of the aforementioned site visits was not to verify on-site the manner and to what extent the follow-up measures as set out in the Government and MTRCL's written submissions were implemented, rather, it was to allow the Panel to familiarise with MTRCL's work flow first-hand. The Panel took submissions from the Government and MTRCL on face value given the nature of the audit being administrative. Representations of the follow-up measures taken by the Government and MTRCL in the main text of the Second Audit Report reflect this Panel's understanding of those measures and the relevant information provided by the Government and MTRCL to the Panel, on the assumption that this information is accurate and complete. The primary duty of the Panel is to evaluate the adequacy of these measures in the implementation of the recommendations. It is beyond the remit of this Panel to assess, critique or vary the recommendations as put forth by the Commission.

Structure of the Second Audit Report

12. The Interim Report put forward 58 recommendations to promote public safety and promote assurance on quality of works and the Final Report put forward 20 further recommendations. These recommendations are mainly contained in Chapters 9 – 11 of the Interim Report, Chapters 9, 13 and 14 of the Final Report, as well as Annexure H of the Final Report. An extract of the paragraphs in the Interim Report and the Final Report relevant to the recommendations is at **Annex A**. The Panel has categorised the recommendations into six categories. A table setting out the summary of each recommendation, their respective category and relevant action party is at **Annex B**. This Second Audit Report will set out the follow-up work taken by the Government and

MTRCL in respect of each of the recommendations, as well as the Panel's assessment, accordingly in the ensuing six chapters:

Chapter 1 Promoting public safety;

Chapter 2 Enhancement of leadership, competence, governance and culture;

Chapter 3 Promoting collaborative culture;

Chapter 4 Revised arrangements for contractual and commercial issues;

Chapter 5 Rationalisation and clarification of rules and requirements; and

Chapter 6 Review of monitoring and verification arrangements.

13. As mentioned in paragraph 6 above, 14 of the 58 recommendations put forward in the Interim Report (i.e. Recommendations 2.1.1, 2.1.2, 2.1.3, 2.2.2, 2.4.1, 2.4.2, 2.4.3, 3.1.2, 3.2, 3.3, 5.3.1, 5.3.6, 5.9 and 6.2.2) were considered as fully implemented in the First Audit Report. These recommendations would not be included in this Second Audit Report, except for Recommendations 3.3 and 6.2.2, on which the Commission has made revisions and/or supplements. In this Second Audit Report, new recommendations in the Commission's Final Report as well as revisions and/or supplements to the recommendations in the Commission's Interim Report are marked in blue font and shown in blackline format.

14. This Second Audit Report was written in English with a Chinese translation subsequently prepared. In case of any discrepancies, the English version prevails.

Chapter 1 Promoting public safety

On-going monitoring of station structure

Recommendation 1.1

~~*Instrumentation, by means of fibre optics or other approved measures, at the east and west diaphragm walls and the East West Line and North South Line platform slabs to detect movement during operational phase of the station, and movements should be monitored and reported to the Government.*~~ *On-going monitoring of the station structure during operation in the form of "Planned Preventive Inspection" regime for a period of up to five years.*

15. The Commission recommended in the Interim Report ongoing instrumented monitoring of the station box structure during operation by means such as fibre optics or other approved measures so as to provide assurance to the public. In light of further evidence received from the independent engineering experts, the Commission has been persuaded that the highly sensitive nature of such instrumentation may set off false alarms. The Commission therefore recommended the ongoing monitoring of the station structure to take the form of an enhanced "Planned Preventive Inspection" ("PPI") regime, perhaps for a period of up to five years. The Commission also noted that according to the expert advice it had received, any movement of the structure would be extremely low and such low level of movement would have no impact on the safe operation of the railway.

16. As mentioned in the Final Report of the Holistic Assessment Strategy for the Hung Hom Station Extension[4], MTRCL would

[4] Since MTRCL had failed to submit comprehensive as-constructed records, the Government requested MTRCL to formulate a holistic strategy to verify the condition of the platform slab structure of the Hung Hom Station Extension. Upon completion of the three-stage exercise, the Government scrutinised and accepted MTRCL's final report on the holistic assessment strategy on 18 July 2019. According to the final report, MTRCL proposed "suitable measures" to address poor workmanship issues and to attain the requirements of the Code of Practice for Structural Use of Concrete under the Buildings Ordinance as well as established good practice of engineering design. The "suitable measures" including drilled-in dowel bars, local thickening of slabs, reinstatement of shear links, addition of columns, grouting, etc., are proposed to address the workmanship issues of coupler connections, shear links, horizontal

devise a long-term structural monitoring scheme to monitor the structural integrity of the station structure. The proposed long-term structural monitoring scheme includes PPI covering manual survey of track movement at bi-monthly to quarterly intervals, groundwater level monitoring at monthly intervals, infrared thermographic survey of groundwater seepage of structural elements at North South Corridor level at quarterly to half-yearly intervals, visual inspection of structures by MTRCL as routine maintenance inspection and by independent Registered Structural Engineer ("RSE") at half-yearly to annually intervals. The Panel notes that contract for the long-term monitoring scheme commenced in March 2021.

17. The Panel reminded the Government and MTRCL that the long-term structural monitoring scheme should cover the entire station structure and the importance of establishing a reporting mechanism. MTRCL confirmed that the monitoring regime would cover the Hung Hom Station Extension works areas and the existing Hung Hom Station structures which were not impacted by the extension works would be subject to MTRCL's ongoing inspection routines. MTRCL reassured that any movement detected within the extension structures during the monitoring would be fully investigated for any impact on existing structures. The Government advised that MTRCL would submit reports on the monitoring/inspection results within one month from the date of each of such monitoring/inspection. MTRCL would also conduct a review after the 5-year PPI to ascertain whether the PPI should be extended.

18. In the meantime, the Panel notes that the East West Corridor platform slab has been monitored by the following means since October 2018, with no significant movement being detected:

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construction joints, seepage, etc. MTRCL completed the design in September 2019, and commenced the relevant works of the approved design progressively in November 2019. Long-term structural monitoring works will also be considered for implementation after the completion of the structural modifications.

(i) between October 2018 and June 2020, the M&V Consultant appointed by HyD conducted 153 site inspections to identify signs of distress;

(ii) between July 2020 and February 2021, HyD's in-house staff conducted 27 site inspections to identify signs of distress;

(iii) between October 2018 and September 2019, any sign of movement was monitored by an automatic deformation monitoring system; and

(iv) since September 2019, MTRCL's surveyors continued measurements for any excessive or abnormal movement or settlement on site manually at 22 survey stations located along the East West Corridor tracks to allow structural modifications (i.e. the "suitable measures" proposed in the Final Report of the Holistic Assessment Strategy for the Hung Hom Station Extension alluded to in footnote 4) pursuant to the above-mentioned Holistic Assessment Strategy to be implemented on site.

19. The Panel considers that the Commission's recommendation has been fully implemented in view that the contract for long-term monitoring scheme has commenced. The Panel also acknowledges that the Government would keep in view MTRCL's long-term monitoring inspection and take timely and appropriate action in case there is any failure on the part of MTRCL to fulfil its monitoring obligations.

Chapter 2 Enhancement of leadership, competence, governance and culture

Leadership

Recommendation 2.1.4
Review and reflect on MTRCL's leadership priorities and their implementation, particularly in relation to culture and the application of corporate procedures (e.g. as set out in PIMS/MAN/003/A6).
Develop an improvement action plan to maintain progress in the implementation of leadership priorities.
Establish a method for monitoring and measuring company culture on an ongoing basis.
Senior leaders to develop a coordinated programme of office and site visits to support the communication of corporate values, behaviours and priorities directly to MTRCL staff throughout the organisation.

20. The Commission's project management expert, Mr Steve Rowsell, reviewed MTRCL's requirements on MTRCL's top management in demonstrating leadership and commitment to the organisation. Mr Rowsell could not identify evidence as to how the leadership had ensured that the required culture, behaviours and desired way of working was embedded throughout the organisation. He further pointed out that some members of the inspection teams had not fully grasped the importance of effective quality management and of conforming to the PIMS requirements. As a result, Mr Rowsell recommended MTRCL to reflect on its leadership priorities and review how these priorities could be achieved.

21. The Panel understands from MTRCL that a leadership team was established in Q3 2019 to ensure direction, strategy and policies are in line with the MTRCL's corporate expectations. The team now meets on a monthly basis to review all matters relating to the management, strategy, policy and communication within railway projects.

22. MTRCL has also developed a Leadership Priorities Programme Plan detailing proposed initiatives, action owner, target completion

date and progress status of different leadership priorities. The monitoring and report mechanism will be included under the new Project Management Procedure document. As at end-January 2021, the drafting of the document is over 50% complete and on target to be signed off by MTRCL's senior management for use by the end of Q2 2021. MTRCL further reported that a quality culture assessment is being planned for Q3 2021.

23. In addition, the Panel notes that a series of site walks by MTRCL's Capital Works Director and senior managers to communicate directly with frontline staff are being conducted on a regular basis. Three site walks were conducted in the second half of 2020, and subject to the situation of the epidemic, site walks are intended to be held on a monthly basis in 2021. To nurture young talents and provide a different perspective on issues relating to railway projects, MTRCL has also put in place a Shadow Leadership Group programme. The Shadow Leadership Group comprises members across all disciplines nominated by the top management of Capital Works Business Unit. Members are invited to attend management level communication, technical, strategy and planning meetings to develop a greater understanding of how Capital Works Business Unit functions, and to provide a fresh perspective and new thinking to Capital Works Business Unit on how to meet new challenges in this digital age.

24. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the Leadership Priorities Programme Plan being developed as well as new measures introduced, and that the recommendation would be fully implemented when the new Project Management Procedure document is launched by the end of Q2 2021.

Competence

Recommendation 2.2.1
Review the "Competence" requirements for personnel engaged in project management/sponsorship roles and review checks and procedures to ensure ongoing competence of project-related staff.

25. When making Recommendation 2.2.1, the Commission remarked that "competence" could be defined as the combination of training, skills, experience and knowledge that a person has and the ability to apply them in performing a task effectively. Factors such as attitude and physical ability could also affect someone's competence. As stated in the First Audit Report, the Panel considered that the Commission's recommendation had been fully implemented by the Government.

26. As for MTRCL, the Panel notes that it has been verifying and recording the competence of project-related staff for identifying skill shortage and hence training needs. MTRCL's Project Competency Working Group has developed a Competency Management Procedure and is in the process of developing a matrix of competencies for the key staff who manage projects. Meanwhile, MTRCL has also created a new management position within the Capital Works Business Unit (i.e. Manager – Projects Resource and Competence) responsible for all aspects of training and competence management across the division.

27. During the Panel's visit to the site office of Tung Chung Line Extension project on 18 November 2020, MTRCL's representatives outlined the new competence management regime being implemented by MTRCL in all future projects and provided details on how the system is now being adopted in the Tung Chung Line Extension project, which is the first project to commence since the publication of the Commission's Final Report on 12 May 2020.

28. The Tung Chung Line Extension project team has been subject to the evaluation of their individual and collective competencies with respect to their roles in managing the preliminary design phase of

the project. Gaps were identified in the fields of BIM and New Engineering Contract ("NEC") management, and the relevant staff would be given specific training to fill these gaps. On the other hand, all staff in the project team attended briefings on the Design Management PIMS to be used in the preliminary design phase of the project. Elements of PIMS of relevance to each individual's roles were identified and the relevant staff were required to understand their roles and responsibilities within PIMS. Training modules on the use of PIMS are being developed and will be rolled out together with the launch of the new PIMS.

29. In the external recruitment or internal deployment process for the future railway projects, the competence of the applicants will be verified and checked against the framework of requirements.

30. The Panel considers that the Commission's recommendation has been fully implemented by MTRCL in view of the new competence management regime being implemented in the Tung Chung Line Extension project and all future projects.

Recommendation 2.2.3
Review induction training for project staff and mandate induction training and find opportunities to refresh the messages at regular intervals.
MTRCL to maintain individual training and development plans and a readily accessible system which records training undertaken and qualifications achieved by individuals to ensure that individuals have completed necessary training schemes and developed the skills and competences for the tasks they are performing.

31. Evidence given to the inquiry under the extended terms indicated a potential lack of training in the PIMS procedures and in relation to technical on-the-job training, particularly for less senior engineers. Due to the overall scale of the PIMS system in covering a very wide range of topics and procedures, training should focus on specific PIMS procedures of key relevance and individual training records and qualifications should be easily accessible to managers responsible for resources management and task planning, so as to

ensure that individuals have the appropriate competences for their assigned tasks.

32. This Panel notes that an external consultant has been appointed to carry out a full review and update of PIMS (see Recommendations 5.7.1 and 5.7.2 below) and developing a Training Plan for project staff is one of its deliverables. MTRCL's Project PIMS Working Group, which is managing the consultancy, has actively collaborated with Projects Competency Management Working Group to develop the requirements for inclusion within the deliverable document.

33. A recording system is to be included within the framework of the Competency Management Procedure (see Recommendation 2.2.1 above) as a live database of the skills and competences of project staff. Induction training and refresher training will form part of the basic requirement for project staff within the document. The Competency Management Procedure will be included under the Resource Management Section of the Project Management Procedure document to be signed off for use by the end of Q2 2021 (see Recommendation 2.1.4 above).

34. As pointed out under Recommendation 2.2.1 above, for new railway projects which have commenced ahead of the new PIMS being issued (e.g. the Tung Chung Line Extension project), a review was conducted to identify the PIMS procedures to be used by individuals, and a tracking record was developed to ensure that they are aware of the relevant PIMS requirements.

35. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of measures implemented in the Tung Chung Line Extension project, and that the recommendation would be fully implemented when the Training Plan is delivered as part of the new PIMS and the new Project Management Procedure document is launched by the end of Q2 2021.

Recommendation 2.2.4

Line managers to implement mentoring arrangements for team members to identify any weaknesses in their technical or procedural knowledge and to identify requirements for training and development.

36. Apart from strengthening induction training (see Recommendation 2.2.3 above), Mr Rowsell also recommended the implementation of mentoring arrangements. This would include team members being accompanied on occasions by experienced staff whilst they become familiar with their roles and the tasks they are performing.

37. The practice of mentoring, training and development need identification are being included in the Competency Management Procedure discussed in Recommendations 2.2.1 and 2.2.3 above.

38. Apart from identifying competence gaps for individuals, the overall team competence is also evaluated and there must be adequate number of staff in each team to cover all the required competences. In addition to training, mentoring arrangement is also in place in the Tung Chung Line Extension and Tuen Mun South Extension projects. Under the arrangement, there would be at least one fully competent member in each team, who would act as the mentor to assist team members whose competence level requires improvement. In each team, staff competence for roles and tasks is graded from level 1 (basic knowledge) up to level 3 (fully competent). Staff having attained level 3 competency (i.e. fully competent) would be responsible for mentoring the level 1 and 2 team members to bring their competency level up. For each team, there will be at least one person who has attained level 3 competency and will act as mentor. The detailed process for implementation in future projects is being developed and will be included in the Project Management Procedure document to be signed off for use by the end of Q2 2021 (see Recommendation 2.1.4 above).

39. The Panel considers that the Commission's recommendation has been fully implemented in view of the mentoring arrangement in

place for the Tung Chung Line Extension and Tuen Mun South Extension projects.

Recommendation 2.2.5
Assess the understanding throughout project organisations of non-contractual project partnering where it is applied to projects and, where necessary, provide further direction and training on the behaviours expected of staff working in a partnering environment.

40. During the inquiry, there was a suggestion that non-compliance with the inspection procedures was considered acceptable by members of MTRCL's inspection teams because it showed a partnering relationship to working with the Contractor. Mr Rowsell considered this a misunderstanding of partnering or collaborative working, which must ensure fulfilment of contractual responsibilities. Hence, Mr Rowsell considered that there was need to provide training in the application of partnering arrangements.

41. MTRCL advised that the knowledge and ability to work within a project partnering environment will be defined within the Competency Management Procedure (see Recommendation 2.2.1 above) and verified during the competence review to be carried out on all staff in the Capital Works Business Unit as they are nominated for roles in future projects.

42. MTRCL had a strong tradition in the use of partnering dating back to the Tseung Kwan O Line in the late 1990s. The Panel observes that MTRCL has engaged a consultant to update and re-boot its partnering approach. For the SCL project, the consultant carried out a series of workshops culminating in the round table partnering workshop in January 2020 among the Government, MTRCL and its contractors. Since the workshop, the consultant has tracked areas of improvement and regression through surveys. The latest of these was carried out in January 2021. In August 2020, a follow-up partnering workshop was held within MTRCL to identify what areas required further attention. The data from this workshop is currently under review by the consultant who will

provide recommendations on what the next step to enhanced partnering should be. Further partnering workshops with Government and the contractors are under planning to follow up on the findings of the regular surveys and recommendations for improvement proposed by the Partnering Task Force ("PTF") (see Recommendations 2.3.1 to 2.3.4 and Recommendation 3.1.3 below) and the consultant. These partnering activities will continue throughout 2021.

43. With respect to the future railway projects, a partnering consultancy would be awarded for each project to develop non-contractual partnering. For the Tung Chung Line Extension and Tuen Mun South Extension projects, an external consultant has already been appointed to specifically drive non-contractual partnering and develop the teams' ability to work collaboratively. All involved parties (such as the Government, MTRCL, consultants and contractors) will be engaged in the partnering activities arranged by the consultant.

44. The Panel considers that the Commission's recommendation has been fully implemented in view of the ongoing partnering activities as well as the competence reviews and appointment of partnering consultant for future railway projects.

Governance

Recommendation 2.3.1
Critically address the way in which the Government executes its multiple roles in relation to railway enhancement projects and actively consider creating an overall Government "sponsor" role for all individual projects to provide both authority and responsibility for the project.
Carry out a comprehensive review of the way in which it monitors and controls major projects, making fundamental changes where appropriate.

Recommendation 2.3.2
For future railway enhancement projects a Project Board should be established to provide strategic direction. The Project Board might comprise appropriate Government officials as board members, supported by external non-executive members from specialist backgrounds who could bring experience of best practice from the wider industry so as to provide strategic advice.

Recommendation 2.3.3
Review how the Government organises itself for the management of its interests in the railway project. Establish a single point of responsibility within the Government for administering its agreement with MTRCL, especially in overseeing and managing internal consultations. Consider whether rail projects should remain within the portfolio of Director of Highways or a new distinct Director of Rail Development should be established.

Recommendation 2.3.4
Consider whether the Government should continue to adopt the concession model or revert to ownership model, or the "Special Purpose Vehicle" approach with a dedicated Board and delivery organisation with reference to the experience of major rail infrastructure projects in the United Kingdom.

45. The Commission made a number of recommendations in relation to restructuring the Government's project sponsorship arrangements to provide both authority and responsibility for the railway projects: thus enhancing project governance and high-level

supervision. The Government itself also sees the need to reinforce its ability to monitor and control the delivery of railway projects.

46. To this end, this Panel learnt that the Government is committed to establishing a new department (viz. the Railways Department) in the 2022/23 financial year, ahead of the commencement of construction stage of the new railway projects under the Railway Development Strategy 2014 ("RDS-2014") in 2023, to strengthen its supervision of railway planning and project delivery as well as regulation of railway safety. By amalgamating the Railway Development Office of the HyD and the Railways Branch of the Electrical and Mechanical Services Department ("EMSD"), the Railways Department will serve as the single point of responsibility in the Government in respect of the whole life cycle of railways in the planning, construction, operation, and asset replacement stages.

47. In addition, the Panel also noted that HyD commissioned a consultancy study in early 2020 to review the existing monitoring and control mechanisms for railway projects and to recommend improvement measures, with a view to enhancing the safety, quality, as well as programme and cost control performance during the delivery of the new railway projects. After reviewing experience and practice of major overseas railway projects and previous railway projects in Hong Kong, the Monitoring and Control Strategy ("MCS") Consultant has recommended a series of enhanced monitoring and control strategies for adoption in new railway projects during the design, construction, and testing and commissioning stages, including (i) an addition of a Project Board on top of the existing three-tier supervision structure and establishment of an Independent Railway Expert Advisory Committee; (ii) strengthened monitoring and checking in design, construction, testing and commissioning stages; (iii) proactive reporting and early warning mechanisms with respect to safety, quality, cost and programme control; (iv) monitoring mechanism on project delivery performance; and (v) building-up a collaborative culture between the Government and the project delivery entity. Separately, the Railways Branch of EMSD also

proposed to implement a new Project Safety Review process. Such Review would exercise tight control over the whole railway project life cycle to safeguard the long-term operational safety of critical civil infrastructure as well as electrical and mechanical ("E&M") installations. This has been taken on board to form part of the enhanced monitoring and control strategies for new railway projects. The Government briefed the Subcommittee on Matters Relating to Railways under the Panel on Transport of the Legislative Council at its meeting on 5 February 2021, and Members generally supported the enhanced monitoring and control strategies as well as the establishment of the Railways Department.

48. In addition to HyD and EMSD, a number of Government bureaux and departments (such as BD, Transport Department, Environmental Protection Department, Fire Services Department, etc.) are involved in the approval processes of railway projects. The MCS Consultant had reviewed the roles of these departments and indicated that since some departments (such as BD, Fire Services Department, etc.) are also responsible for enforcing the relevant ordinances for private developments in Hong Kong, it would not be advisable to amalgamate the functions of these departments under the proposed Railways Department as it might lead to risk of inconsistency in enforcing such ordinances in railway projects and other private developments. On the other hand, the MCS Consultant recommended the setting up of a Project Coordination Subcommittee to act as a single platform for overseeing and managing the Government's internal communications and consultations for new railway projects, and to take up a proactive facilitator role in embarking on early discussions and streamlining the communications among different bureaux and departments with the project delivery entity.

49. As regards the establishment of a Project Board to provide strategic direction having regard to industry best practices, the Government's MCS Consultant had reviewed the experience of overseas major railway projects and concluded that the establishment of Project Board in the railway projects in the United Kingdom and Germany had enhanced the overall governance

framework for monitoring of project performance, in particular with a clear channel for reporting and escalation of critical issues to the high level for steering. The MCS Consultant considered that for new railway projects, the Project Board may provide steer on strategic directions and critical issues (such as public safety or quality incidents, programme delay, cost overrun), challenge the project delivery entity on its project delivery performance, establish task forces to carry out investigations on areas of concern, etc. The Project Board may include external non-executive members. In fact, pending the recommendation of the MCS Consultant, the Government had already taken the initiative to establish a high level meeting chaired by the Permanent Secretary for Transport and Housing (Transport) and attended by the Chief Executive Officer as well as other senior staff of MTRCL to discuss policy issues relating to the new railway projects under RDS-2014. This high level meeting, first convened in July 2020, meets on a quarterly basis, and can be transformed into the said Project Board upon establishment of the Railways Department to implement the enhanced monitoring and control strategies to provide strategic oversight of the portfolio of railway projects undertaken by MTRCL.

50. On the delivery model of future railway projects, the Panel noted that the Government's MCS Consultant had studied the implementation of the "Special Purpose Vehicle" ("SPV") [5] approach in the United Kingdom to deliver large-scale infrastructure projects (e.g. Crossrail Project). Having reviewed its applicability, the Government's MCS Consultant did not recommend the adoption of the SPV approach for projects recommended in the RDS-2014 taking into account the following considerations:

(i) a SPV may deliver more benefits if tasked to deliver a large-scale, standalone project involving multiple stakeholders and funding sources. Given the nature and scale of the RDS-2014 projects (i.e. mainly natural

[5] An SPV is a separate legal entity designed to deal with focused, specific and/or temporary objectives that are difficult for the parent body to achieve itself.

extensions of existing railway network operated by MTRCL, and with the Government as the only source for bridging the funding gap), it may not yield substantial benefits to justify the substantial time, costs and efforts required to set up the SPV, including the associated legislative and/or funding approval procedures;

(ii) considerable overhead cost may be incurred from the setup of a SPV and maintaining its operation;

(iii) complex interfacing issues may arise as MTRCL exercises control over all the operational arrangements of the Kowloon-Canton Railway Corporation network in addition to its own network, and is responsible for the performance of the entire railway system since the Rail Merger in December 2007; and

(iv) strengthening the current monitoring and control strategies, for example by setting up a Project Board to provide strategic direction for new railway projects, establishing the PTF to foster collaboration (see Recommendation 2.2.5 above and Recommendation 3.1.3 below), and extending the role of the existing M&V Consultant (see Recommendation 6.1 below), can adequately address the issues associated with the roles, authorities and responsibilities of the Government and the project delivery entity.

51. The Government indicated that it would consider whether ownership approach, concession approach or SPV approach would be more appropriate for each new railway project on a case-by-case basis. For Tung Chung Line Extension project, Tuen Mun South Extension project and Northern Link project under RDS-2014, ownership approach would be adopted for project delivery. That said, the Panel was informed by the Government that consideration to adopt SPV approach might be given to projects with a stand-alone system from existing railway systems in Hong Kong (e.g. not an extension of existing railway network operated by

MTRCL), and of sufficiently large scale and funding requirement in order to justify the setting-up and operation of an SPV.

52. The Panel considers that the Commission's recommendations have been fully implemented in view of the Government's commitment to establish the new Railways Department and implement the enhanced monitoring and control strategies recommended by the MCS Consultancy.

Reviewing resource monitoring processes

Recommendation 2.5
Review MTRCL's processes for monitoring resource levels throughout the organisation and identifying potential pressure points.

53. During the inquiry, there were suggestions that non-compliance with the Request for Inspection and Survey Checks ("RISC") procedures were caused by pressure of work and insufficient available resources. In response, Mr Rowsell recommended that MTRCL should review its processes for monitoring resources levels throughout the organisation and identifying potential pressure points. Such review should ensure that: (i) line managers at all levels are applying systems to measure the performance of individuals in relation to the application of required quality procedures and are reporting the findings to top management; (ii) individuals are encouraged to report resource pressures which may put the implementation of quality procedures at risk; and (iii) line managers should consult with senior managers about priorities in the event that resource pressures are identified.

54. The Panel notes that MTRCL has introduced a digital dashboard and monitoring system to evaluate the resourcing needs for future projects to ensure that they are addressed in advance. The digital system identifies both existing and future projects to be undertaken by MTRCL with timelines for delivery from feasibility studies through to handover to Operations Department. For each individual project, a detailed resources requirement chart is

developed, with resourcing requirements broken down by discipline and grade throughout the full project life cycle. Available staff within MTRCL's Capital Works Business Unit are also categorised by discipline and grade, and overlaid onto the resources requirement charts of individual projects to help identify in advance any areas where potential resourcing issues may occur and can be addressed. The project managers can use this tool throughout the life cycle to manage in real time their resourcing requirements.

55. The Panel considers that the Commission's recommendation has been fully implemented in view of the introduction of the digital dashboard and monitoring system.

Reviewing investigation procedures

Recommendation 2.6
Review MTRCL's procedures for reviewing problems that have occurred and for learning lessons to avoid them being repeated, and automatically requiring for an investigation to the causes of the problems in case major remedial works are needed.

56. On investigations into perfunctory inspections, erosion of RISC form system and cause of defective works, Mr Rowsell considered it important for MTRCL, in liaison with the Contractor, to carry out rigorous investigations to learn lessons and to inform the development of enhanced procedures to prevent future recurrence.

57. The Panel learns that MTRCL currently operates a live Lessons Learned database accessible to all Project staff to identify any issues within live projects. All staff are encouraged to add lessons learned to the database, which would be reviewed regularly. In addition, MTRCL conducted a series of workshops to identify lessons learned across all five recent Projects (i.e. West Island Line, South Island Line (East), Kwun Tong Line Extension, Guangzhou-Shenzhen-Hong Kong Express Rail Link and SCL). The workshops were attended by MTRCL's staff across all

disciplines involved in project delivery and its design consultants, and cover (i) Contract Procurement Management; (ii) Design Co-ordination Management; (iii) Construction Management; (iv) Handover Management; and (v) Design Consultant Concerns and Lessons Learned. The findings of these workshops were compiled and a comprehensive PowerPoint presentation was prepared to summarise the lessons learned and suggest ways to improve on project delivery. The presentation was delivered to the design teams for new railway projects (e.g. Tung Chung Line Extension and Tuen Mun South Extension projects) before project commencement and is intended to be delivered to relevant staff before the start of all future railway projects. The presentation slides and the full report from the workshops have also been uploaded onto the Capital Works Business Unit website which is accessible by all staff in the division.

58. The existing PIMS Practice Note on "Lessons Learned Procedure" (i.e. PIMS/PN/02-6) is also being reviewed under the revamp of PIMS (see Recommendations 5.7.1 and 5.7.2 below). The revised PIMS will require the Lessons Learned database be reviewed by each project management team at key points during project delivery. The project management team will also be required to brief staff on lessons learned pertinent to the upcoming phases of work. In addition, the new Governance PIMS will also contain a section on 'Issues Escalation' which will be linked to relevant "stop work" regimes and the requirement for instigating investigation when major events occur.

59. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the workshops conducted as well as presentation delivered to design teams for new railway projects, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Chapter 3 Promoting collaborative culture

Fostering integrated working arrangement

Recommendation 3.1.1
Consider options for working arrangement in which Government staff could be integrated within MTRCL teams on a regular basis to help ensure a common understanding of requirements, improve communications, undertake joint forward planning and to resolve issues more efficiently.
Review options for more integrated and co-located working between the parties to achieve greater transparency of issues, better forward planning and joint risk management.

61. The Commission was of the view that there was considerable scope for creating a more collaborative culture between the Government, MTRCL and contractors with the objective to achieving more successful project outcomes. It took note of the progress being made across the world in changing the internal culture of the construction industry. It also recognised that the change was progressively resulting in the reduction of project delay and budget overruns.

62. For the SCL project, in-house inspectorate staff of HyD have been stationed at MTRCL's site offices since July 2019 (see Recommendations 3.1.3 and 6.1 below). Since December 2019, the arrangement has also been extended to HyD's engineers for initially half a day at monthly interval and BD has participated in the co-location working arrangement to facilitate direct communication with MTRCL and its design consultants and contractors. The aforesaid arrangement is considered effective in enhancing the communication at site level between the Government and MTRCL. The Panel understands that agreement has been reached in September 2020 between the Government and MTRCL to integrate Government staff into MTRCL's project teams for future projects. Similar arrangements where site offices are designated for co-locating staff of HyD/BD and/or its consultant(s), MTRCL and its contractors or sub-contractors will

be adopted in future railway projects under concession and ownership approaches.

63. The high level meeting between the top management of THB/HyD and MTRCL mentioned in paragraph 49 above are also one of the measures intended to build up a collaborative culture between the Government and MTRCL. In addition, the Government's MCS Consultant had reviewed the monitoring and control strategies, including the measures to enhance collaborative culture and build up a spirit of mutual trust and cooperation between the Government and MTRCL for new railway projects. Enhanced measures include:

(i) developing a shared vision for each project;

(ii) co-organising partnering workshops to build up a collaborative culture and establish common objectives;

(iii) adopting collaborative form of contracts (e.g. NEC form) and digital platforms (e.g. BIM) where appropriate;

(iv) taking forward co-location arrangement for Government's relevant staff/consultant at MTRCL's office if appropriate for facilitating direct communications and discussions; and

(v) establishing issues-based working groups that cut across organisations and disciplines to solve critical problems and issues.

64. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Recommendation 3.1.3
Review the way that liaison and communications have worked between HyD Railway Development Office ("RDO"), BD and MTRCL, e.g. BD to act more as a proactive project participant, offering its advice and expertise. Explore ways of improving communications and working relationships, such as more frequent site visits at a working level by members of RDO and BD.

65. The Commission recommended the Government to review and explore ways of improving communications and working relationships among RDO, BD and MTRCL. While recognising BD's role as the "ultimate gatekeeper" of acceptability of building standards, the Commission recommended that consideration be given as to whether it might be more beneficial for BD to act more as a proactive project participant. The Commission believed that such shift could be achieved without BD diluting its "ultimate gatekeeper" role.

66. To this end, the Panel notes that HyD and MTRCL established in May 2019 a high-level Steering Group on Communications ("SGC") for the SCL project, aiming to provide directions on enhancing the communication between the Government and MTRCL, including promotion of collaborative working relationships and culture in project delivery to achieve a quality outcome. Under the steering of SGC, the arrangements of Project Supervision Committee ("PSC") meeting, Project Coordination Meeting, and Project Progress Meeting have been streamlined, a clearer set of guidelines on reporting mechanism of sensitive incidents has been promulgated, and the new fast track consultation mechanism for processing minor changes on design and construction details has been endorsed.

67. Further, the Panel was informed that a Senior Leadership Round-Table was held in January 2020 to discuss the challenges in delivering the SCL project and exchange views on incentivisation measures and measures to promote trust and cross-party collaboration. It was attended by senior representatives from the Government, MTRCL, contractors and key subcontractors of

active contracts. Similar arrangement for engaging senior leaders to promote collaborative culture will continue to be made for major railway projects in future as appropriate. With the endorsement by SGC, a PTF was established to formulate actionable measures for fostering collaboration among the three parties. Under the direction of PTF, a tripartite dialogue forum among Government, MTRCL and contractors for coordination of civil and E&M construction works of Exhibition Centre Station was formed with first meeting held on 6 August 2020, and sharing sessions for enhancing mutual understanding of individual roles of Government, MTRCL and Contractors are underway.

68. The Government's MCS Consultant had reviewed the outcomes of SGC for the SCL project and the Panel notes that for new railway projects under concession approach, platform(s) similar to the SGC would be established for the Government and MTRCL to regularly review the existing communication protocols with supply chain stakeholders with a view to optimising the protocols for fostering effective communications and collaborative culture.

69. In addition, HyD and MTRCL have introduced co-location working arrangement for the SCL project since July 2019, and BD has also participated in the arrangement to facilitate direct communication with MTRCL and its design consultants and contractors (see Recommendation 3.1.1 above and Recommendation 6.1 below). Similar arrangements where site offices are designated for co-locating staff of HyD/BD and/or its consultant(s), MTRCL and its contractors or sub-contractors will also be adopted in future railway projects under the concession and ownership approaches. Furthermore, additional weekly review meetings involving BD, HyD, the M&V Consultant, MTRCL and its design consultants/contractors have been put in place since March 2020 for processing minor changes of design and construction details within seven days in accordance with a set of collaborative fast track consultation procedures. The Panel considered that BD had been acting more as a proactive project participant offering its advice and expertise to the project team at both design and construction stages.

70. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Adopting BIM as a collaboration tool

Recommendation 3.3
Develop, implement and promote the use of BIM ~~as a collaboration tool~~, first at a basic, "collaborative" level so as to gain experience before building up to more sophisticated, multi-dimensional versions.

71. The Commission noted that the introduction of BIM had made a significant contribution to improving trust and performance on project delivery. The Commission also noted that with effect from 1 January 2018, BIM technology is required to be used in all Government capital works projects with estimated costs greater than $30 million. In the First Audit Report, this Panel considered that Recommendation 3.3 had been fully implemented by the Government and MTRCL.

72. Since then, the recommendation was further supplemented in the Commission's Final Report. In its inquiry under the extended terms of reference, the Commission heard expert evidence from Mr Rowsell that it may be preferable to first introduce BIM at a basic, "collaborative" level so as to gain experience before building up to more sophisticated, multi-dimensional versions. In view of this, the Government and MTRCL were invited by the Panel to make further submissions in the Second Audit.

73. Insofar as public works projects are concerned, as of 28 February 2021, 339 consultancy agreements/works tenders with BIM adoption have been invited and 295 consultancy agreements /works tenders have been awarded. The Government further reported that it has been regularly updating its Technical Circular to extend the application of BIM to multi-dimensional uses in public works

contracts and exploring sophisticated BIM applications by pilot projects, e.g. using BIM for generation of digital bar bending schedule for off-site reinforcement steel bar ("rebar") prefabrication, integrating BIM with Geographic Information System data for smart city planning, etc. The latest version of Technical Circular, issued on 23 December 2020, has (i) extended BIM uses to engineering analyses, 3D control and planning, surveying of underground utilities and asset management; and (ii) delineated the Government's road map of BIM adoption in capital works projects and the ultimate goal of using BIM models for electronic tendering.

74. The Panel also took note of the Government's efforts in promoting wider adoption of BIM in the construction industry. For instance, the Development Bureau has been collaborating with the Construction Industry Council to develop various BIM standards and BIM training courses for the industry. Through the Construction Innovation and Technology Fund, financial subsidy is provided to the industry on procuring BIM software/hardware and undertaking BIM training.

75. The above-mentioned requirement of using BIM was promulgated after the EA was signed in 2012. For future railway projects (whether taken forward under the concession approach or ownership approach), HyD will impose the use of BIM as a standard requirement, and MTRCL has also decided that all future projects will be fully designed and managed using BIM. As a start, MTRCL has stipulated the use of 4-dimensional BIM (i.e. an extra dimension of time or schedule related information beyond the basic 3D level BIM) in the design consultancy of the detailed design of the Ma Chai Hang Recreation Ground reprovisioning works under the SCL project and the design consultancies of the Tung Chung Line Extension and Tuen Mun South Extension projects.

76. This Panel observes that HyD has organised an experience sharing session with MTRCL on the implementation of BIM in projects

under HyD's management in December 2019. There were about 40 participants from both HyD and MTRCL.

77. During the visit to the site office of Tung Chung Line Extension project on 18 November 2020, the Panel was given a demonstration on MTRCL's adoption of BIM in new railway projects. MTRCL has established a BIM Steering Group to plan and implement its BIM strategy across all future projects. A dedicated BIM Department has been established and a Senior BIM Manager has been appointed to oversee the development on BIM within MTRCL. The Panel was also informed of MTRCL's plan to develop a strategy to move into 5D BIM and beyond in coming projects.

78. MTRCL has also set up a common data environment ("CDE") to facilitate the future design and data management on site and throughout the full life cycle of projects using BIM. All staff working on live projects have been given training on the use of the BIM software and the CDE, and they need to review and manage design submissions made by its consultants using BIM. Training on how to use this CDE has commenced for all Capital Works Business Unit staff with a programme being put in place to train all staff who will be involved in future projects.

79. The Panel considers that the Commission's recommendation has been fully implemented in view of efforts and commitments from the Government and MTRCL in adopting multi-dimensional BIM in future projects.

MTRCL's internal organisation

Recommendation 3.4.1
Consider ways of inducing closer working between different groups within the project organisation to avoid the risk of silo-working in which information and knowledge is not shared. Consider the effectiveness of existing communication arrangements between the teams and throughout the organisation. Review information databases and systems to ensure a single accessible source of true position accessible as appropriate to all people.
Provide clarification and guidance to project team members in relation to reporting and communication requirements within the MTRCL.

80. The inquiry revealed that there was a lack of liaison and communication between the MTRCL construction management and design management teams. Certain essential information was not fed through as a matter of routine.

81. This Panel notes that MTRCL introduced a series of changes to its procedures with a view to improving communication arrangements:

(i) iShare was introduced in 2019 to all major SCL contracts; iShare is a web-based knowledge and information management portal for manging documents, information and other functions for internal knowledge sharing and collaboration purposes. It is accessible to all MTRCL project staff (including both construction and design teams) across contracts and to contractors. RISC forms, Request for Inspection and Test forms, non-conformance reports ("NCRs"), site diaries and quality observations are now digitalised for ease of access by relevant parties;

(ii) dashboard reporting has been introduced to keep the relevant parties better informed on developing issues; and

(iii) RISC form has been revamped to require and enable all relevant parties to review and sign off digitally; design

management team can now verify the status of data and drawings to ensure that the latest design details are being adopted by construction teams on site.

82. In addition, this Panel understands that MTRCL has introduced new digital platforms to provide a common, transparent platform for information sharing. For future projects, the further updates of PIMS (see Recommendations 5.7.1 to 5.7.2 below) will include integrated process maps for each project stage to promote collaborative project delivery and further improve project record keeping. The PIMS on site supervision and inspection process were revised and implemented in August 2019.

83. MTRCL's Capital Works Business Unit is also re-booting and introducing a set of high-level vision, mission and behavioural initiatives, which will promote communication and collaboration. These will be set out within the overview section of the Project Management Procedure document to be signed off for use by the end of Q2 2021 (see Recommendation 2.1.4 above). There will be a programme of briefings, workshops, presentations and other communication events put in place for the launch of the new PIMS (see Recommendations 5.7.1 to 5.7.2 below) to promote the new ways of working. It will involve all levels of staff from Executive Managers[6] through to front line staff.

84. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the improvement measures for communication arrangements, and that the recommendation would be fully implemented when the new Project Management Procedure document is launched and the new PIMS is substantially completed by the end of Q2 2021.

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[6] Executive Manager is a defined grade within MTRCL consisting of Heads of Departments, General Managers and Project Managers, reporting to the Chief Executive Officer and Executive Directors.

Recommendation 3.4.2

Review and clarify MTRCL roles and responsibilities in relation to ~~the provisions and requirements of the Conditions of Contract. In particular, ensure that the position of Engineer to the Contract is understood and that roles and responsibilities respect the need for the Engineer to act impartially in the administration of the contract. The role of the Engineer needs to be integrated and compatible with the roles of others in MTRCL who have responsibilities for delivering obligations under the Entrustment Agreements ("EAs")~~ construction contracts, perhaps by allocating and distinguishing its roles as the "Engineer" (and his representatives) from its separate roles as the "Project Manager" in delivering Entrustment Activities.

85. The Commission considered MTRCL's obligations as Employer and Engineer under the terms of the contract with Leighton Contractors Asia Limited ("Leighton") who was the contractor of the construction works in the Hung Hom Station Extension. The Commission remarked that it was not always clear which of these two roles MTRCL personnel were fulfilling at any given time. The Commission also pointed out that clarity should be provided, perhaps by allocating the distinct and separate roles to different designated individuals or teams.

86. This Panel notes that MTRCL's Projects Commercial and Contracts Working Group has reviewed current conditions of contract and concluded that the responsibilities of staff, including the Engineer, under the contract are clearly defined. The working group has been configured with five separate work streams charged with specific tasks in relation to reviewing and improving specific aspects of MTRCL's suite of documents for management of project contracts. As MTRCL is now using NEC in some of the future construction projects, the review also covers NEC. While the review is targeted to be completed progressively during the course of 2021, the specific recommendation to ensure clarity on roles and responsibilities with respect to the Engineer has been implemented in existing contracts.

87. The first of the new suite of documents has already been produced for use on the Tung Chung Line Extension and Tuen Mun South Extension preliminary design consultancies where the NEC4 contract conditions have been adopted. Within these documents the key roles and responsibilities for delivery have been clearly defined.

88. While the detailed terms of contracts for several of the forms of contract contained within MTRCL's suite of contract document are still being developed, the Panel notes that as a general principle, to provide a greater degree of independence and impartiality, the role of the Engineer in future railway projects will be transferred from MTRCL's Capital Works Business Unit to another independent division, which does not participate in the management or supervision of railway projects. The Engineer will carry out defined checks on the quality of project delivery, and will report directly to the Legal and Governance Director, rather than the Capital Works Director.

89. The Panel considers that the Commission's recommendation has been fully implemented in view of the new contract documents adopted in the Tung Chung Line Extension and Tuen Mun South Extension preliminary design consultancies, as well as MTRCL's commitment to transfer the role of the Engineer to another independent division.

Recommendation 3.4.3
Review arrangements for managing relationships with stakeholders to ensure that there is clarity on responsibilities and clear lines of communications particularly with Government Departments, and set out such arrangement in a Stakeholder Management Plan which is accessible by all involved in the project delivery.

90. The Commission noted the very large number of Government bureaux, departments, offices, committees and other sundry bodies involved in rail enhancement projects. On the one hand, the Government was recommended to critically address the way in which it executes its multiple roles (see Recommendation 2.3.1

above). On the other hand, MTRCL was recommended to review and set out its arrangements for stakeholder management.

91. This Panel notes that MTRCL has reviewed its PIMS procedure and practice notes for stakeholder engagement to enhance accessibility and usability for implementation in future railway projects, covering all stakeholders within a project (see Recommendations 5.7.1 to 5.7.2 below). The drafting and peer review of the suite of new PIMS documents for the stakeholder engagement discipline containing procedure, instructions, guidelines, as well as relevant forms and templates has been completed and will be formally launched in due course.

92. The Panel considers that the Commission's recommendation has been fully implemented in view that the drafting and peer review of the relevant PIMS documents have been completed for formal launch in due course.

Recommendation 3.4.4
Review MTRCL's systems and procedures for escalating problems and disputes up through the organisation to senior management, who should encourage the reporting of issues in case of doubt.

93. Evidence presented to the inquiry under the extended terms of reference suggested that MTRCL's frontline staff were left to their own devices to do what they thought was best without being given clear direction by line managers. Mr Rowsell considered that the breakdown in RISC procedures should have been escalated to MTRCL senior management to address with Leighton senior management. As a result, he recommended MTRCL to review its procedures for escalating problems, and encourage reporting of issues in case of doubt, so that senior management can consider the significance of the problem and decide whether to get involved.

94. The Panel notes that protocols for escalating problems and disputes are included in the new PIMS procedures, instructions and guidelines, which are being prepared by the PIMS Consultant. A section titled "Issues requiring attention from Senior Management"

has been added to the relevant template within PIMS/PN/11-01 "Site Meetings and Reports". The new PIMS on Governance will be issued by the end of Q2 2021 which will cover the procedure for escalating problems and disputes to the senior management. In advance of formal issue of the new PIMS, MTRCL advises that the existing PIMS had been amended to introduce guidelines for escalation of issues and disputes to the senior management. In particular, non-conformance issues and status are now reported upwards on a weekly basis, by a defined mechanism to the senior management of both MTRCL and the Government.

95. The Panel considers that the Commission's recommendation has been fully implemented in view of the introduction of guidelines for escalating problems and disputes in the existing PIMS, which will also be included in the new PIMS.

Chapter 4 Revised arrangements for contractual and commercial issues

Devising and developing a conflict of interest policy

Recommendation 4.1
Developing a conflict of interest policy appropriate and applicable to projects of this nature, the administration of which may be assigned to the Project Coordination Meeting or other committees as appropriate.

96. The Commission noted that the same design firm was engaged by MTRCL as the detailed design consultant while at the same time also engaged by Leighton as a technical advisor. While the firm had set up two teams to work for MTRCL and Leighton separately, both the project director and design team leader were the same persons for both teams. The Commission remarked that while no actual conflict of interest was identified, the potential for such conflict was real, hence this recommendation.

97. On the part of the Government, there is an established policy on conflict of interest for civil servants. In addition, this Panel notes that the Handbook on Selection, Appointment and Administration of Engineering and Associated Consultants has set out requirements and procedures in respect of avoidance of conflict of interest in the procurement and management of the related consultancy services for public works projects. There are standard requirements on "Special Conditions of Employment: Conflict of Interest and Debarring" for incorporation in consultancy agreements.

98. The Panel notes that HyD had shared the Government's policy on conflict of interest for consultants directly employed by the Government and debarring (as mentioned in paragraph 97) for MTRCL's review and development of its internal conflict of interest policy. HyD has also asked MTRCL to ensure that future consultancy agreements entered into under the SCL project and future railway projects of similar nature should follow similar conflict of interest policy in general. The policy related to conflict

of interest will be stipulated in the project agreements/entrustment agreements for new railway projects and the Government will monitor the implementation of the policy at a committee to be established under the project agreements/entrustment agreements. For new railway projects, if there is any case of actual, apparent, potential or perceived conflict of interest in the employment of consultants by MTRCL or its contractors, the default position of MTRCL is not allowing the appointment to proceed. However, in exceptional cases where MTRCL considers that the appointment would have a significant benefit for the project and would not develop any actual conflict of interest within the roles of the consultant or contractor involved, appointment may be allowed subject to control and mitigation measures being in place. The Government considers that MTRCL should provide the details of such exceptional cases to the Government, including but not limited to (i) full justifications; (ii) evaluation of other alternatives; (iii) proposed measures to mitigate or prevent any such conflict; and (iv) proposed monitoring measures to ensure the effectiveness of mitigation measures. MTRCL has agreed that such exceptional circumstances would be discussed with the Government as part of the policy related to conflict of interest as mentioned above.

99. MTRCL reported that it had corporate-level documentation in place to guard against conflict of interest. In general, the same design consultant would not be employed by MTRCL and its contractor to work on the same contract. In exceptional circumstances where there is an advantage to the safe and efficient production of designs (as in Contract 1123 where the same consultant has, since January 2015, been designing both permanent and temporary works for MTRCL and its contractor respectively), MTRCL has introduced a procedure which clearly defines and separates the workflows of the respective consultant teams. By so doing, all communications must route through the teams of MTRCL and the contractor on site to provide a meaningful and effective firewall. Team membership must be subject to approval to ensure that the same staff are not working for both teams. These measures were taken in response to the Commission's recommendation. No breach of protocol has been found in the internal audits conducted in August 2019.

100. As noted in Recommendation 3.4.2 above, MTRCL's Projects Commercial and Contracts Working Group is reviewing the suite of contract documents used for managing future railway projects. This Panel notes that the review also covered provisions to guard against conflict of interest. All MTRCL standard conditions of contracts and conditions of employment have been updated on 24 September 2020 to provide consistency across all the standard forms in relation to (i) offering, soliciting or accepting gratuities; and (ii) conflicts of interest. A new clause has also been inserted into the conditions of employment/appointment to the effect that consultants shall not undertake engagements in subsequent contracts which arise from the subject contract, except with the prior written approval of the Employer. Approval by the Employer of a waiver to allow the same designer to work for both MTRCL and the contractor would only be given where, after a risk-based review, the Executive Managers responsible were satisfied that the safety and quality of the project were best served by allowing the waiver, and with the written consent of the Capital Works Director and formal approval of the Project Control Group[7]. The Government would be consulted in this regard.

101. This Panel has expressed concern over how the conflict of interest policy will be ensured to be continuously overseen and administered. In response, MTRCL advised that it had established a separate and dedicated team for dealing with matters concerning potential conflict of interest.

102. Apart from engagement of the same consultant by both the client and the contractor, other undesirable scenarios may include MTRCL's employment of staff from the contractor to work on the same contract/project or vice versa, personal relationship with working counterparts, etc. There are already requirements for contractors of Government's contracts to complete a declaration

[7] Project Control Group is chaired by the Capital Works Director and responsible for making key decisions related to management of projects. Following the retirement of the Engineering Director, Deputy Director – Legal, Procurement and Supply Chain and Chief Engineer – E&M and Civil Engineering, both of whom report directly to the Legal and Governance Director, have been appointed to the Project Control Group to provide independent views from outside of the Capital Works Business Unit.

form on compliance with ethical requirements including conflict of interest. Failure to do so will result in withholding of payment by the Government. This Panel notes that HyD has reminded MTRCL to make reference to these Government requirements in future contracts, and follow up on all potential scenarios.

103. The Panel considers that the Commission's recommendation has been fully implemented by the Government in view of the inclusion of conflict of interest policy in the future project agreements/entrustment agreements. The Panel also considers that the Commission's recommendation has been fully implemented by MTRCL in view of its updated conditions of contracts.

Commercial settlements

Recommendation 4.2
Including subcontracts within the provisions for commercial settlements set out in the EA to provide the Government with greater transparency of commercial settlements which have a significant impact on the settlement of the final contract value and greater control on the settlement of the contract final account.

104. It was revealed during the inquiry that there had been commercial disputes between Leighton and one of its sub-contractors since late 2016, alongside assertions from the sub-contractor about systematic and extensive cutting of the thread end of rebars on site. Eventually, Leighton and the sub-contractor reached a commercial settlement in September 2017.

105. Under the SCL project, commercial settlements with main contractors would require consultation with the PSC as set out in clause 4.6(B) of the EA, while settlements with sub-contractors were not included in this obligation. Nevertheless, Mr Rowsell pointed out that sub-contracts represented typically around 70% of the value of the main contract, and it was therefore important to have transparency and effective accounting and governance

procedures to ensure that sub-contract settlements are in accordance with the approved terms and conditions.

106. This Panel understands that there is a limited scope for implementation of this recommendation under the SCL project as it would involve the amendment of the EA. Nevertheless, HyD is liaising with MTRCL with a view to devising a mechanism under which MTRCL would report major commercial settlements with sub-contractors at an appropriate forum so as to provide the Government with more information to enable closer monitoring of the contract final account. MTRCL has also agreed to consider introducing the requirement of consulting the Government for any commercial settlement between the contractor and its subcontractors in future contracts.

107. This Panel notes MTRCL's view that this recommendation is primarily directed towards target cost contracts where payments under the contract are based on the costs incurred by the contractor, including the costs of sub-contracts (as distinct to the majority of contracts which are lump sum where contract price is a function of valuation provisions stipulated in the contract). MTRCL's latest target cost contracts included strengthened provisions in relation to the verification and settlement of sub-contracts.

108. The Government's MCS Consultant had reviewed the implications of the proposed extension of the requirement for consultation with the PSC to any commercial settlement between MTRCL's main contractors and the subcontractors. The proposed consultation could provide the Government with greater transparency of the details (such as the issues in question, legitimacy and quantum of the claims involved) of such commercial settlements. However, such direct micro-management of financial matters down to the sub-contractor level, if applied to all contracts, would require substantial resources. To take forward this initiative in a more cost-effective manner, the reporting and consultation requirements may be targeted to those commercial settlement at sub-contractor level which would have significant impact to the final account of the main contract. For target cost contracts, MTRCL would be

requested to prepare the monthly reports of potential commercial settlements (with contractors and tier 1 subcontractors) and the Government would consider cases to be selected for consultation process, taking into account project-specific selection criteria if appropriate. Relevant requirements will be specified in the entrustment agreements for new railway projects under concession approach.

109. The Panel considers that the Commission's recommendation has been fully implemented by the Government in view of the inclusion of relevant requirements in the entrustment agreements for new railway projects under the concession approach. The Panel also considers that the Commission's recommendation has been fully implemented by MTRCL in view of the strengthened provisions in relation to the verification and settlement of sub-contracts.

Subcontracting arrangements and commercial settlements

Recommendation 4.3.1
Review the procedures for the approval of sub-contracts and any subsequent revisions which change the conditions and/or prices.

Recommendation 4.3.2
Review the arrangements for the commercial settlements of sub-contracts to include a stage for MTRCL to verify and accept that proposed settlements are in line with the approved sub-contract terms and conditions.

Recommendation 4.3.3
Review and rationalise the provisions for disallowable costs and consider incorporating works not undertaken in accordance with approved plans and procedures as a disallowable costs.

110. The Panel understands that it will not be possible to implement changes to live contracts under the SCL project due to limitations in amending their terms and conditions. This Panel also notes that MTRCL is reviewing its procedures for approval of sub-contracts,

the definition of disallowable costs and commercial management procedures as part of its review on conditions of contracts targeted to be completed during the course of 2021 (see Recommendation 3.4.2 above). The clauses on disallowed costs are being reviewed to simplify the instances where disallowed costs are applicable and to allow more transparency in their implementation. The NEC being adopted in the Tung Chung Line Extension and Tuen Mun South Extension projects have clear guidance on what does and does not constitute disallowed costs. The issue of commercial settlements of sub-contracts and MTRCL's view are also discussed under Recommendation 4.2 above.

111. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the ongoing review of the procedures for approval of sub-contracts, definition of disallowable costs and commercial management procedures, and that the recommendation would be fully implemented when the review of the suite of contract documents is completed during the course of 2021.

Chapter 5 Rationalisation and clarification of rules and requirements

Rationalising and clarifying rules and requirements

Recommendation 5.1.1
In relation to the Buildings Ordinance ("BO") and consultation, pull together the provisions into a clearer and more precise description of the requirements and responsibilities.
Review consultation procedures in relation to design revisions and clarify arrangements for fast-tracking the consultation process for minor design changes.

112. In his expert reports, Mr Rowsell expressed his opinion that the provisions for the applicability of the BO and the associated requirements for consultation appeared to be quite complex. It was not straightforward to follow how the documents (e.g. the BO, the EA, the Instrument of Exemption ("IoE"), etc.) had worked together. He added that some imprecise wordings were used in the requirements and that it would be beneficial to clarify arrangements for consultation in relation to minor design changes.

113. The Panel notes that, on the one hand, the Government is of the view that the relevant professionals appointed by MTRCL[8] should have the pre-requisite knowledge and competence in understanding and handling the requirements under the BO and the IoE. It is because these professionals are persons registered under the BO while the Competent Person's qualifications and experience have to be vetted by the Government.

114. On the other hand, with a view to providing a concise document on the requirements and responsibilities under the BO to the relevant

[8] Under the IoE for the SCL project, MTRCL is required to appoint a Competent Person to take up the responsibilities and duties of both Authorized Person and RSE. The Competent Person is required to co-ordinate and supervise the works in accordance with the agreed proposals. In addition, a Registered Geotechnical Engineer is required to be appointed for building works with significant geotechnical content. MTRCL is also required to appoint Registered Contractors to supervise and carry out the works in accordance with the agreed proposals.

professionals as well as their respective site supervisory personnel engaged in private development projects, BD drafted a new practice note which consolidates the various requirements relating to specific tasks and testing of materials (e.g. quality supervision plan for installation of ductility coupler splicing assemblies, on-site sampling for testing, etc.) imposed under the BO when approving plan submissions so as to provide clearer and more precise description of the requirements and responsibilities. After consulting the building industry via the established consultation platforms, the new Practice Notes for Authorized Persons ("APs"), RSEs and Registered Geotechnical Engineers ("RGEs") (PNAP APP-162) and Registered Contractors ("RCs") (PNRC 80) were promulgated on 23 September 2020.

115. Regarding the consultation process for plan submissions, as reported under Recommendation 3.1.3 above, a set of fast track consultation procedures for processing minor changes within seven days through an enhanced communication system and working arrangement with MTRCL and its design consultants/contractors has been implemented since March 2020. Detailed working arrangement of the fast track consultation procedures and definitions of minor changes have been incorporated into the revised Project Management Plan ("PMP"). Review meetings for discussing minor changes proposals are held at weekly interval. As of 28 February 2021, 115 minor changes proposals have been accepted.

116. The Panel considers that the Commission's recommendation has been fully implemented in view of the promulgation of the new practice notes and the fast track consultation procedures.

Recommendation 5.1.2
Review the 2009 Code of Practice for Site Supervision ("CoP") to give clarity on the definition of supervision, record keeping requirements and non-conformance reporting. Set out in CoP requirements of the communication of the supervision plan and associated obligations, which should provide an adequate role for the designer to ensure delivery of design intent in the construction.

117. Throughout the inquiry, it was alleged that involved parties have different interpretations of the requirements in relation to supervision, record keeping and non-conformance reporting. The inquiry also revealed construction team's misunderstanding of certain design intent.

118. In response to this recommendation, BD had completed a review on the CoP and proposed amendments with a view to further enhancing its clarity on the definition of supervision, record keeping requirements and non-conformance reporting, strengthening the requirements on obligations of the site supervisory personnel and the communication among the site supervisory personnel in order to ensure delivery of design intent in the construction. The proposed amendments include highlighting the manner of continuous supervision by full time Technically Competent Persons ("TCPs"), completing and keeping inspection records and site supervision reports contemporaneously, keeping these records and reports by responsible functional streams, enhancing non-conformance reporting procedures, maintaining communication among TCPs of different function streams, and clarifying the responsibility of the head of each functional stream to ensure that their representatives and TCPs are fully aware of supervision requirements. After consulting the building industry via the established consultation platforms, the amendments to the CoP were promulgated on 29 September 2020.

119. The Panel considers that the Commission's recommendation has been fully implemented in view of the promulgation of the amendments to the CoP.

Recommendation 5.1.3

Review and confirm requirements for as-built records particularly in relation to the need for hard copies of RISC forms, taking into account the development of the increasing use of technology to create drawings and records and should ensure that requirements can be met as efficiently as possible.

120. Mr Rowsell recognised that there was uncertainty as to whether RISC forms were required as part of the as-built records covered by the EA. He opined that MTRCL should have recognised the potential importance of RISC forms in forming part of the as-built records required by the EA and confirmed the position with the Government if in doubt. That said, he also recommended the Government to review and confirm its requirements for as-built records, particularly in relation to the need for hard copies of RISC forms.

121. The Government advised the Panel that the use of hard copy RISC forms was a requirement stipulated by MTRCL for the SCL project, and that it welcomes MTRCL's recent efforts in adopting digital RISC form through iSuper (see Recommendation 5.3.5 below). At the meeting of Handover Committee on SCL held on 14 March 2018, the arrangement on delivery of as-built drawings and documents for the SCL project was discussed and further streamlined.

122. Requirements for other construction records to be submitted are set out in the respective IoE/Instrument of Compliance as well as in the acceptance letters for specific types of works and tasks. BD attaches great importance to the Competent Persons/RGEs/RCs appointed by MTRCL in fulfilling their respective responsibilities and duties for ensuring compliance with the statutory requirements under the BO and its subsidiary regulations. The Panel notes that the same control regime applies to the APs/RSEs/RGEs/RCs for private building developments, and the Government's position that the extant requirements for as-built records are effective and should remain in force.

123. Notwithstanding the above, the Government indicates that the recommendation is being followed up by MTRCL by way of reviewing and updating the measures/arrangements of as-built documentation. When processing the PMPs for future new railway projects, the Government will take into consideration any enhanced measures/arrangements in respect of as-built documentation for meeting the contractual and statutory requirements. The Government is also exploring the receipt of such site records and enhancement of their traceability through digitisation.

124. Taking into consideration the latest technological applications and tools (including BIM, digital construction management and supervision system), the Government's MCS Consultant had reviewed the key project information (such as BIM, construction management and supervision records, as-built records, etc.) to be shared from the project delivery entity for new railway projects. It recommended the adoption of BIM and common data environments as a common practice or requirement for future railway projects to improve communication and collaboration in complex inter-organisational projects. The Panel notes that (i) access right with authentic digital signature to be granted to the Government for the common data platform(s); and (ii) provision of softcopy of the aforesaid key project information, will be stipulated in the project agreements/entrustment agreements for new railway projects being developed with reference to the findings of the MCS Consultancy. Hardcopy of the key project information would not be required unless the relevant softcopy could not be provided.

125. The Panel considers that the Commission's recommendation has been fully implemented in view of the enhanced measures proposed for new railway projects.

Clarifying design submission and consultation procedures

Recommendation 5.2.1
Review the wording of the Particular Specification in relation to alternative works design proposals to ensure that the process and terminology is aligned with the contract conditions.

126. As set out in the contract between MTRCL and Leighton, the Contractor might propose alternative works design by submitting to the Engineer full particulars and details of adjustments in cost and programme. If the Engineer considered it desirable, he would issue an order recording the change. Nevertheless, Mr Rowsell expressed concern that the terminology and procedures in the contract and its Particular Specification did not appear to be fully aligned. In addition, in relation to the change associated with the modification to the top of the diaphragm wall, he had not seen an order from the MTRCL Engineer implementing the change.

127. This Panel notes that the guidance for drafting MTRCL's Particular Specifications is being reviewed as part of the review on contracts targeted to be completed during the course of 2021 as mentioned under Recommendation 3.4.2 above. The wording of future Particular Specifications will clearly set out the process to be followed for approval of any alternative works design proposals. In the three sets of contract documents that have been prepared and signed for the preliminary design of Tung Chung Line Extension and Tuen Mun South Extension projects as well as the detailed design of Ma Cha Hang Sports Ground, contracts allow the designer to make proposals for alternative or modified design in the subsequent stages. MTRCL has checked the wording used within the Particular Specifications relating to the process to be followed to ensure that it is compatible with those used in the other relevant contract documents.

128. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the measures implemented in the three sets of contract documents issued, and that the recommendation would be

fully implemented when the ongoing review of the guidance for drafting Particular Specifications as part of the review of the suite of contract documents is completed during the course of 2021.

Recommendation 5.2.2
Ensure that the construction method statements are in place based on the latest approved designs before construction commences.

Recommendation 5.2.3
Review the liaison arrangements between the Contractor's design team, the Building Authority and MTRCL's design and construction management teams to ensure common understanding of submission requirements and awareness of design issues and the forward programme of potential submissions.

129. It was found during the inquiry that the drawings used for inspection purposes did not illustrate the modification to the top of the diaphragm wall. In his expert report, Mr Rowsell remarked that it would have meant that there was no approved method statement in place and that the design change had not been ordered by the Engineer. Without complying with those two requirements, the construction work should not have taken place.

130. Furthermore, proposals for permanent modifications to the top of the diaphragm wall were included in a submission which focused mainly on temporary works issues. The proposal was submitted by Leighton to MTRCL for review, and subsequently sent by MTRCL to BD. Nevertheless, the parties did not appear to have agreed on whether the permanent modifications were properly submitted in accordance with the consultation procedures. It also did not appear that the different teams within MTRCL had agreed on the application of the appropriate procedures.

131. This Panel notes that new PIMS requirements are being developed for future projects, which capture enhanced measures for stakeholder engagement and statutory submission processes. Pending issue of MTRCL's new PIMS (see Recommendations

5.7.1 to 5.7.2 below), this Panel notes that MTRCL implemented the following measures:

(i) during the period from January 2018 to November 2020, 64 existing PIMS documents including procedures, practice notes and plans have been updated, which included in particular, the PIMS Practice Note on "Monitoring of Site Works", which covers the use and review of methods of construction, was updated in August 2019 to reflect the Responsible, Accountable, Consulted and Informed ("RACI") matrices of MTRCL in areas including review and monitoring of method statement implementation;

(ii) the new digital platform iSuper (see Recommendation 5.3.5 below) has been further developed and includes a workflow for the joint involvement of design and construction teams to ensure that the latest approved designs are referenced in RISC form checks;

(iii) all inspection and test plans within current contracts have been reviewed since the SCL issues came to light to verify their correctness and adequacy; and

(iv) at site level, regular meetings are now being held with BD to identify submission requirements and the status of submissions made, together with the prioritisation of submissions against the programmed works on site.

132. With respect to the review and liaison arrangements across all parties, these are now addressed within the new PIMS for design management and construction management procedures which will be completed by the end of Q2 2021 (see Recommendations 5.7.1 and 5.7.2 below). The new PIMS on design management addresses management of design deliverables, including those which require review and consultation with BD. The new PIMS on construction management covers construction methods and the requirement for them to be approved in advance of commencement of works on site. Each individual PIMS includes its own RACI

chart to make clear the level of responsibility and accountability of individuals who manage the processes defined in the PIMS.

133. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the interim enhancement measures for stakeholder engagement and statutory submission processes, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Rationalising and clarifying supervision requirements

Recommendation 5.3.2
Review documents which set out supervision requirements and guidance to rationalise the documents to a more manageable and readable number, ideally with a view to producing an all-inclusive and bilingual "Supervision Manual" accessible to all involved in supervision and inspection procedures.

134. One of the matters that caused the Commission's concern was that the obligations of the various parties operating on site appeared to be contained in a variety of disparate documents. In the result, engineers and others working on site were not always fully aware of the obligations that they must meet.

135. This Panel notes that an external consultant has been appointed by MTRCL to carry out a full review and update of PIMS by the end of Q2 2021 (see Recommendations 5.7.1 to 5.7.2 below). The new PIMS include the adoption of clearer definitions (which state clearly mandatory instructions and good practice guidelines) and use of flowcharts. MTRCL further supplemented that the revised PIMS Practice Note on "Monitoring of Site Works" will act as a *de facto* "Supervision Manual" for new projects. The site supervision teams will be given training on the use of this Practice Note and their roles within it.

136. Further, MTRCL also issued a new Quality Management Plan ("QMP") in May 2019 to all project staff to provide a quick reference guide on PIMS documentation. The QMP is readily accessible on the iShare platform discussed under Recommendation 3.4.1 above. A Chinese version of the relevant sections of PIMS procedures/practice notes related to communication and site supervision have also been developed and included in training materials for project staff.

137. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the issuance of new QMP and development of Chinese PIMS materials, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.3.3
Develop a clear definition of supervision for the purpose of contractual obligations and adopt a consistent approach to terminology throughout the documentation, with requirements being specific about the information that needs to be recorded and certified.

138. In his expert report, Mr Rowsell noted that while most people involved in the construction industry had a reasonable understanding of what was meant by supervision, there was no precise and agreed definition explaining the formal roles and duties. The terms used to describe supervision related activities also varied from document to document. Mr Rowsell was also of the opinion that the specific requirements for the information that needed to be recorded and retained by the MTRCL's and Leighton's site supervision and inspection teams were not clearly set out.

139. MTRCL's follow-up actions in regards of contractual documents review have been set out under Recommendations 3.4.2, 4.2, 4.3.1, 4.3.2 and 4.3.3 above. In addition, the review and update of PIMS (see Recommendations 5.7.1 to 5.7.2 below) will also capture the details of the roles and responsibilities of staff involved in a contract. Appropriate cross-referencing exercise will be carried

out by MTRCL to ensure that the new suite of contract documents contain consistent terminology and requirements as the revised PIMS and BD's CoP.

140. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the ongoing review of the suite of contract documents, and that the recommendation would be fully implemented when the review is completed during the course of 2021, subject to the fulfilment of clear and consistent definition of supervision requirements.

Recommendation 5.3.4
Make the frequency of supervision and inspections flexible and reactive to the compliance and performance of work with requirements, with less frequent supervision supported by self-certification and audits upon demonstration of consistently high-quality work.

141. Mr Rowsell remarked that high levels of supervision might not produce good value for money when the contractor had a skilled workforce working to robust procedures and was producing good quality with little input from supervisors. Instead, he suggested commencing a project with a high level of supervision but with a phased reduction when the contractor had demonstrated good performance and created a good level of confidence. Ongoing performance could be monitored by a combination of more limited supervision supported by audit, with the cost of additional audit arising from poor performance being borne by the contractor.

142. MTRCL reported that the review of PIMS has been carried out which identified all supervision and inspection compliance points as the First Line of Defence. The findings were shared with the consultant responsible for revamping PIMS, who has adequately captured them within the new PIMS.

143. This Panel also notes that MTRCL has set up a new quality assurance team to monitor performance of project teams on site as a Second Line of Defence. To bolster reliability of self-

certification and audits, a new, enhanced training programme has been introduced for site supervision teams including those who have statutory responsibilities. A register is now in place to record training attended by project personnel and to match training programmes with actual duties performed on site, and retraining programmes are also offered. An Assurance Manual for the Second Line of Defence has been developed for risk-based inspections to be carried out on site in support of the First Line of Defence activities. These Second Line of Defence surveillances have been in place since early 2020 and are flexible and reactive to the quality of supervision that has been demonstrated.

144. For future projects, MTRCL has completed a review of auditing and checks, including self-certification audits to be implemented as mechanisms for monitoring contractor's compliance with works requirements, expected level of supervision and encouragement of earlier notification of defects of works. MTRCL's Project Quality Team has drafted revised procedures and templates for auditing all stages of project delivery and these audits are now being progressively rolled out for live contracts. The audit programme requirement developed will be included in the contract documents for all future projects to improve the quality of works on site.

145. The Panel considers that the Commission's recommendation has been fully implemented in view of the Second Line of Defence in place and the revised audit programme requirement.

Recommendation 5.3.5
Review the requirements for formally defined hold points in relation to the contract provisions for not covering-up work without inspection and clarify whether inspection certificates apply to both hold points and pre-covering up inspections.

146. As pointed out by Mr Rowsell, PIMS and the PMP set out the need for hold points in relation to higher risk activities where the contractor might not proceed. However, the contract set out a wider requirement that no work might be covered up or made unavailable for testing or examining without the consent of the

Engineer. The lack of integration between the different documents carried risks that the contractual requirement duty might be overlooked or procedures might not be applied consistently.

147. Submission of inspection and test plans and carrying out works according to these plans are contract requirements that help prevent works being covered up prior to inspection and certification. MTRCL has reviewed its inspection and test plans to ensure that critical hold points are covered. This Panel notes that MTRCL has introduced a new digital platform known as iSuper, which was reportedly more efficient in managing hold points as it allowed for easier detection of irregularities, and, because it was fully archivable and allows tracking of certification documents, it enhances accountability. RISC forms recorded in iSuper will highlight the delegation of respective inspectors and record those parties that sign off the inspection and certify the works can proceed to the next stage. Through iSuper, MTRCL can identify if inspection and test plans have been breached, and if so, defect correction can be instigated.

148. Since the introduction of iSuper in 2019, there has been a constant process of review and enhancement to ensure that it is responsive to the needs of the site supervision teams. Dashboards have been developed by MTRCL to allow better tracking of RISC forms and identification of any concerns. The site team's feedback and suggestions are being incorporated for the development of iSuper 2.0, which is planned for the next phase of construction projects. In the meantime, there is also an ongoing process of updating the existing iSuper with respect to the feedback from the frontline teams utilising the system.

149. This Panel further notes that an external consultant has been appointed by MTRCL to carry out a full review and update of PIMS by the end of Q2 2021 (see Recommendations 5.7.1 to 5.7.2 below). As part of the review, guidance on key hold points for key construction activities has been updated under the revamped PIMS Practice Note on "Monitoring of Site Works" issued in August 2019 in parallel with the progressive implementation of the digital site

supervision and inspection tool iSuper. The enhanced emphasis on traceability of hold point sign offs, with automatic archiving of RISC forms and traceability of sign off in dashboards, ensures that hold points could not go undetected due to works being covered up.

150. The Panel considers that the Commission's recommendation has been fully implemented in view of the introduction of iSuper and revamped PIMS Practice Note on "Monitoring of Site Works".

Recommendation 5.3.7
Ensure there are procedures in place to record who are undertaking supervision duties on a daily basis and that supervisors have the required level of competence.

151. In relation to the requirements for approved resources for site supervision and their technical competence as set out in the Site Supervision Plan, Mr Rowsell doubted if the requirements were being delivered.

152. This Panel notes that MTRCL's review and update of PIMS (see Recommendations 5.7.1 to 5.7.2 below) will capture the details of the roles and responsibilities of staff involved in a contract. This will support identification of particular procedures relating to particular roles. The new PIMS is based on RACI matrices, which more clearly define the responsibilities for staff in the supervision of works.

153. As regards competency, as mentioned under Recommendation 2.2.1 above, MTRCL has developed a Competency Management Procedure so as to build a framework of requirements for all key roles across supervisory staff for all disciplines. MTRCL has also delivered training courses on its code of practice on site supervision for relevant staff in appropriate contracts. This training course now forms part of the training requirements for new staff joining future railway projects.

154. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being

made in view of the development of the Competency Management Procedure and training courses delivered, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.3.8
Ensure that records are kept to support the possible application of the contractual disallowable cost provisions.

155. The administration of the provisions for disallowable costs relies on robust and reliable record keeping. While the contractor shall keep accounts and records which allow payment to be justified, the Engineer also needs to have reliable records in order to verify work and to certify payment.

156. This Panel notes that the iSuper system discussed in Recommendations 5.3.5 provides archived records of approvals for work to proceed, disapprovals for works to proceed and records of where works have proceeded without approval, which can subsequently be used to evaluate potential disallowed cost activities. MTRCL advises that the iSuper system would ensure supporting records for disallowed costs are properly archived. The digital dashboard reporting on quality, cost, programme and safety developed since the incidents in the SCL project allow for tracking and archiving progress of work on site and can be used to establish cost entitlement of the contractors.

157. For future projects, MTRCL is reviewing the definition of disallowable costs as part of its review on contracts (see Recommendations 4.3.1 to 4.3.3 above). MTRCL is constantly reviewing the emerging digital technologies which could be used in future railway projects to further enhance supervision, including the monitoring of activities that generate disallowable costs. The Panel takes note of MTRCL's target is to ensure that any digital enhancement to detect and record disallowable costs would be in place prior to the commencement of the next phase of construction contracts in 2022/2023.

158. The Panel considers that the Commission's recommendation has been fully implemented in view of the introduction of iSuper for proper archiving of records. The Panel also acknowledges that this will be further complemented by the review of the suite of contract documents targeted for completion during the course of 2021 and the ongoing review of emerging digital technologies.

Reviewing site entry/exit systems and records

Recommendation 5.4

Review the existing entry/exit site staff recording system in relation to:

- *knowing who is on site;*
- *supporting the payment of people under the commercial model;*
- *knowing who undertook work inspections and who certified work; and*
- *helping to confirm that the required level of supervision and the ratio of supervisors to workers.*

159. The reliability of entry/exit records was called into question during the inquiry. People, including casual visitors, came and went without the system making any record.

160. For the remainder of the SCL project, MTRCL has pointed out that while digital hand key systems continue to be used at all site entry points to record who is present on site, a new digital site diary system, which specifically records where on site workers, trade foremen and specialist foremen are deployed and what their trades are, is being deployed under iSuper (see Recommendation 5.3.5 above). Under iSuper, digitised RISC forms record those parties that sign off the inspection and certify that the works can proceed to the next stage. By recording the location of workers and supervisory staff on site, as well as the supervisory staff responsible for managing the hold points, iSuper in conjunction with the digital hand key system can help verify the level of supervision and where appropriate the ratio of supervisors to workers. Verification that supervision levels comply with the CoP requirements is carried out by MTRCL's project management team as part of their quality control/quality assurance checking process, and regularly checked

by the respective Government departments. Meanwhile, steps have been taken in SCL sites to reinforce with the contractors the need to better manage the digital hand key system.

161. This Panel notes that MTRCL is reviewing options for recording and monitoring of works on site, and will consider whether there are alternative systems that improve the monitoring of entry/exit to sites for implementation in future railway projects. For instance, smart helmets, which could track the location of workers within the work site, are being trialled in the construction works at the Exhibition Centre Station. MTRCL further reported that it is also exploring the interaction between several systems.

162. The Panel considers that the Commission's recommendation has been fully implemented in view of the steps taken to enhance the management of the digital hand key system and the introduction of iSuper. The Panel also acknowledges that this will be further complemented by MTRCL's ongoing effort in reviewing options for monitoring workers on site digitally.

Reviewing non-conformance reporting

Recommendation 5.5.1
Review current guidance on NCRs (e.g. requirements in PIMS procedural document PIMS/PN/11-4/A6) to ensure clarity and consistency on when NCRs should be issued and with BD's CoP.

Recommendation 5.5.2
Encourage "near-miss" non-conformance reporting to drive continuous improvement.

Recommendation 5.5.3
Maintain a single NCR database across all parties which is accessible to all supervisors and inspectors to allow recurrent issues to be readily identified.

Recommendation 5.5.4
Review and enhance the NCR close-out procedures including effective monitoring arrangements. Make sure that responsibility for ensuring non-compliances with procedures being promptly addressed is clearly seen to lie with the Engineer and that appropriate action is taken in accordance with the provisions of the contract.

163. The Commission found that NCRs provide valuable learning points and facilitate continuous improvement through proper investigation and implementation of corrective measures, and suggested that MTRCL's system of non-conformance reporting require a full review. Specifically, Mr Rowsell gave the following opinions:

(i) The process for dealing with non-conformities was not fully robust as it did not clearly describe the types of non-conformance that should have been recorded and reported. BD's CoP indicated that any non-conformance should get reported but this was not clarified in the project plans and it did not occur in practice;

(ii) While it would seem reasonable and pragmatic to apply a degree of significance to the non-conformance reporting requirements, the definition of significance would need to be set quite low as it was important to learn from non-conformances to support continuous improvement;

(iii) It was important for non-conformances to be shared across the team so that different inspectors were aware of any emerging problems; and

(iv) It would be desirable to review the guidance for issuing NCRs and ensure that there are sanctions which can be used by the Engineer to help ensure that failures are rectified promptly.

164. In the view of the Commission, the review of MTRCL's system of non-conformance reporting would not be full without reviewing the procedures for "closing out".

165. This Panel notes that MTRCL's non-conformance reporting process has been substantially revised in July 2018:

(i) to capture quality issues found prior to hold point inspections, MTRCL has introduced a new reporting system known as "quality observation" under iSuper since September 2019 under two live SCL contracts. Under the system, quality issues and "near miss" cases are logged and communicated to relevant contractors for actions and due closure of these issues are closely monitored by MTRCL. Issues identified thereunder are communicated to relevant teams to alert them of potential non-conformance and allows early follow-up actions. The system has now been introduced to all SCL contracts, and will be introduced to future railway projects;

(ii) to improve tracking of follow-up on NCRs, MTRCL digitised NCR and introduced dashboard reporting. These allow easier identification and follow-up of issues on site by MTRCL's site teams. The status of NCRs is updated on a

weekly basis under a consolidated register for better monitoring of remedial actions. This register is circulated to HyD for discussion;

(iii) to enhance communication on issues with stakeholders, a database on iShare capturing NCRs issued by MTRCL is now being maintained. NCR registers provided by contractors are also being maintained and can be accessed by MTRCL project teams. MTRCL will adopt one digital system in future railway projects; and

(iv) to increase visibility of close out status, NCRs are graded by severity, and a procedure, based on the grading of the NCR, for the phased escalation to MTRCL's senior management of NCRs which are slow to be closed out was put in place in late 2018 to effectively monitor and manage the closure of NCRs. There are also regular meetings where NCRs to be closed out are reported to both the Government and MTRCL's senior management. The duration required to close out any specific NCR is dependent on its nature and scope of remedial action required. Figures provided by MTRCL indicate that the average number of open NCR per week reduced from above 70 in Q3 to Q4 2018, to around 40 in Q1 2020.

166. The Panel notes that the existing PIMS have been updated in August 2019 to reflect the new procedures and staff have been trained accordingly. The review and revamp of PIMS (see Recommendations 5.7.1 to 5.7.2 below) includes the updated procedure from August 2019. It makes reference to the use of digital systems for checking and tracking as well as a revamped layout of the NCR forms to ensure that the NCR type and severity are clearly indicated.

167. The Panel considers that the Commission's recommendations have been fully implemented in view of the updates to the existing PIMS, which will also be included in the new PIMS.

Recommendation 5.5.5
Distinguish reporting procedures for non-conforming works from that for non-conforming processes in contract specifications.

168. NCRs may be used for two distinct purposes – to record non-conforming works and, quite separately, to record non-conforming processes. The Commission took the view that it would be helpful to distinguish between these two types of NCR and their respective reporting procedures.

169. The enhancements to MTRCL's NCR management since the SCL event have been set out in Recommendations 5.5.1 to 5.5.4 above. The Panel is further advised by MTRCL that selection boxes delineating whether NCRs relate to works or processes have been added to the standard NCR reporting form templates in the revised PIMS Practice Note on "Monitoring of Site Works". This change has also been implemented across the civil contracts using the iSuper system with any new NCRs to be classified as works- or process-related. This has also been incorporated in the new Construction Management PIMS to be issued by the end of Q2 2021, which also includes a RACI matrix for clarity on roles and responsibilities.

170. The Panel considers that the Commission's recommendation has been fully implemented in view of the updates to the existing PIMS, which will also be included in the new PIMS.

Reviewing PMPs

Recommendation 5.6.1
Make PMPs more comprehensive and relevant to the project by translating generic guidance into project specific requirements while minimising cross-reference to other documents.

Recommendation 5.6.2
Consider including an introductory section in PMPs setting out MTRCL's corporate policies and the project strategic objectives to help steer the development of the project.

171. Under the IoE for the SCL project, MTRCL is required to prepare a PMP for the Building Authority's agreement. It sets out how MTRCL's proposed management process will meet the exemption requirements.

172. In his expert report, Mr Rowsell pointed out that for many procedures, the PMP cross-referred to other procedural documents which were largely generic type documents. He suggested that the PMP should contain more specific detail on how the generic procedures would be applied to individual contracts.

173. This Panel notes that MTRCL has amended the current PMP for the SCL project to update information therein which has been superseded. Given the SCL project being in its final stages of construction, this Panel accepts MTRCL's submission that it is not an opportune moment to overhaul the PMP.

174. As a long term objective, MTRCL will be revisiting the format and contents of the PMP for future railway projects in consultation with the Government so as to address the Commission's recommendations for implementation. The new PMP is expected to include sections on liaison between the Government and MTRCL, quality assurance on design and construction management, with a focus on communication, adherence to processes and maintaining project records.

175. The use of PMPs in MTRCL's projects has generally been confined to Government Entrusted Works. The consultant engaged by MTRCL for the PIMS review recommended extending the use of PMPs to all works projects by MTRCL and has introduced a PIMS procedure to give guidance on the format and contents of PMPs. This is included in the Project Management PIMS to be issued by the end of Q2 2021. The first construction contracts that will adopt the proposed PMPs will not be let until 2022/2023. The PMP for these projects will be submitted to Government before commencement of construction for its agreement.

176. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the Project Management PIMS being developed, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.6.3
Include specific details about which PIMS manuals are applicable to a project and job roles.

177. On making the PMPs more contract specific, Mr Rowsell remarked that the PMP, which stated that a list of 153 PIMS documents would be applied to the SCL project "where appropriate", did not identify who would make the call of appropriateness. He considered that the applicability of documents and requirements should be made clearer to ensure a consistent and comprehensive approach to the application of the PIMS manuals and procedures on the contract.

178. This Panel notes that MTRCL has been offering training on specific PIMS relevant to the work of existing project staff. Relevant training on PIMS will also be provided to staff involved in future railway projects. As noted under Recommendation 5.3.2 above, MTRCL issued a new, readily available QMP in May 2019 to all project staff to provide a quick reference guide on PIMS documentation. In the long term, the review and update of PIMS (see Recommendations 5.7.1 to 5.7.2 below) will address this recommendation, and will also suggest relevant training

requirements for project staff. The PMP will include a section detailing which PIMS are relevant on a project-specific basis to ensure that staff competence training can be aligned with the PIMS procedures in use.

179. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the QMP issued, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.6.4

Review requirements in relation to the content and use of PMPs and consider including/ensure that they cover:

(a) proposals for partnering arrangements and initiatives;
(b) checklists for sub-contract approval procedures;
(c) commercial management procedures;
(d) resources planning;
(e) training and development plans for project purposes;
(f) project communication strategies;
(g) interface risk management; and
(h) leadership roles in establishing appropriate culture and behaviours.

180. Mr Rowsell also opined that MTRCL, together with the Government, should review the content and use of the PMPs to contain all the key aspects that need to be in place to achieve successful project outcomes.

181. The issue of PMP review has been discussed under Recommendations 5.6.1 and 5.6.2 above. While the existing PMP of SCL project would not be revised to incorporate the Commission's recommendations, MTRCL advised that they have taken into account the requirements (a) to (h) under the reviews of its corporate procedures such as PIMS, Procurement and Commercial Department Procedures, Particular Specifications and Division Training Programme.

182. As for the Government, its MCS Consultant had reviewed the key project management information to be shared from the project delivery entity for new railway projects. The Panel is advised that the requirements (a) to (h) as recommended by the Commission will be stipulated in the project agreements/entrustment agreements for new railway projects.

183. The Panel considers that the Commission's recommendation has been fully implemented by the Government in view of the inclusion of relevant requirements in the project agreements/entrustment agreements for new railway projects. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made by MTRCL in view of the ongoing reviews of its corporate procedures, and that the recommendation would be fully implemented by MTRCL when the new PIMS is substantially completed by the end of Q2 2021.

Reviewing PIMS

Recommendation 5.7.1

Review and update PIMS procedures and manuals, including:

(a) requirements for site record keeping, supported by technology solutions and devices;

(b) arrangements for communicating updates and revisions to staff;

(c) use of photographs as a record of works inspections; and

(d) development of new manual on project communication strategies setting out roles, responsibilities, systems and reporting requirements.

Ensure alignment of project management guidance and procedures with contractual procedures.

Recommendation 5.7.2

Highlight in the manuals the aspects of the guidance which need to be assessed for the specific circumstances of a project and translated into project-specific guidance in the PMP, and the aspects of PIMS manuals which need to be converted from generic advice into project specific proposals.

184. The SCL project was entrusted to MTRCL on, among others, the condition that MTRCL would follow its own project management system, i.e. PIMS. PIMS includes a number of manuals, procedures and practice notes. The Commission suggested that substantial changes to PIMS is warranted.

185. In particular, Mr Rowsell pointed out that it would be desirable to review and refresh the older PIMS documents, and align PIMS procedures with the conditions of contract (e.g. rationalising hold points under PIMS and pre-covering up inspections under the contract, as mentioned under Recommendation 5.3.5 above). There might also be opportunities to rationalise or combine some PIMS documents to reduce the overall numbers to which practitioners have to refer.

186. In relation to Recommendations 5.6.1 and 5.6.3 above on translation of the generic requirements in PIMS into project

specific plans, Mr Rowsell considered it helpful if PIMS manuals could more easily identify aspects which need to be developed into project specific requirements for inclusion in PMPs.

187. This Panel notes that an external consultant has been appointed to carry out a full review and update of PIMS. The PIMS review is being carried out as part of the MTRCL business transformation process to proactively advance the project delivery capability of MTRCL in going forward.

188. As an interim measure pending the launch of the updated PIMS, MTRCL continues to progressively update the existing PIMS in their current format. During the period from January 2018 to November 2020, 64 existing PIMS documents including procedures, practice notes and plans have been updated to enhance project management of the works.

189. MTRCL has confirmed that quality culture is being cultivated through the updated PIMS by incorporating RACI matrices, competence management and capture of quality measurements and performance levels. The updated PIMS includes the definition and implementation of cross-discipline and integrated process maps for each project stage to support a holistic view of how disciplines and function groups will work collaboratively for project delivery. The updated PIMS also includes processes that ensure all information is captured, generated and maintained as project record, as well as revamped stakeholder management plans.

190. The updated PIMS is made accessible on digital platform to facilitate the dissemination of updated practices and requirements. MTRCL arranged a practical demonstration of this platform for the Panel on 4 January 2021. This introduces a simplified route for readers to comprehend the processes and requirements. The documents are digitised, grouped together online into relevant disciplines, and searchable by job title. MTRCL will also consider introduction of a supervision manual once the updated PIMS is launched.

191. The revamped PIMS will be substantially completed by the end of Q2 2021 and will be formally launched thereafter for use on all new projects, addressing the following:

(i) digital record keeping of site monitoring;

(ii) use of site photographs, RISC forms and site diaries as project records;

(iii) use of flow charts to promote clarity in the roles and responsibilities of parties on site together with encouraging collaboration;

(iv) communication strategies to enhance the MTRCL core values, mission and behavioural traits; and

(v) use of the PMP to inform staff on which PIMS procedures are relevant to project works to be undertaken.

192. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the ongoing PIMS review, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.7.3
Review training (with the contractor where appropriate) on PIMS and contract procedures, including ongoing refresher training and the coverage of any updates to the procedures. Training should cover the procedures to be followed and provide an understanding of the importance of applying quality procedure.
Develop training modules on PIMS procedures in alignment with the requirements of individual roles by focusing training for different roles on the specific PIMS procedures which are of particular relevance to the role.

193. In his expert report, Mr Rowsell advised that initial induction training needed to be supported by ongoing and focused training on

key aspects of PIMS as well as contract procedures and associated roles. Where possible, this should be joint training between the Engineer's and Contractor's teams so that there is a common understanding of roles and how contract procedures will work.

194. This Panel notes that MTRCL has provided more structured training on PIMS and contract procedures for its frontline project staff and contractor's staff since Q3 2018 to improve the site team's understanding of their supervision role. Classroom-based PIMS training has also been introduced, and an online training module to be completed by all project staff on a compulsory basis is being developed for the new PIMS. These will be supplemented by discipline specific training to be undertaken by staff in advance of using specific PIMS for new projects. An annual training plan is in place, which is subject to review and updating on a regular basis. As part of the PIMS review, MTRCL has developed training guidance on PIMS specific to the roles of different staff in the future.

195. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the more structured, formalised and traceable approach to PIMS training, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

As-built drawings requirements and production

Recommendation 5.8.1
Review the current documents setting out requirements for as-built drawings to ensure consistency and clarity on roles, responsibilities and procedures, and pull them together in the PMP.

Recommendation 5.8.2
Clarify and maintain site records to support the delivery of the contractual requirements for the prompt recording of dimensions and details of as-built structures.

196. While requirements for as-built drawings were contained in a number of documents, the management of the production of as-built drawings did not appear to be specifically covered in the PMP. Mr Rowsell also flagged up a discrepancy in the main contract and its general specifications regarding the extent of as-built drawings the contractor was required to produce.

197. Production of as-built drawings required the contemporaneous recording of what had been built. While there was some contention during the inquiry that site photographs could serve this purpose, Mr Rowsell stated that they alone could not deliver the contractual requirements of keeping dimensions during the course of the execution of the works and the provision of as-built surveys and records.

198. This Panel notes that MTRCL has reviewed and updated all aspect of as-built documentation in PIMS as part of the PIMS review (see Recommendations 5.7.1 to 5.7.2 above). The process for managing as-built drawing production is covered in the Project Information Management PIMS which is on target to be issued by the end of Q2 2021. The updated PIMS enhances the procedures for producing, managing, tracking and submitting of drawings, and put measures in place to ensure that all stakeholders have access to the same drawings.

199. Separately, the Panel observes that the adoption of BIM by MTRCL (see Recommendation 3.3 above) in future railway projects will improve the accuracy of as-built data by developing it in 'real time' as the works progress on site. During the Panel's visit to the site office of Tung Chung Line Extension project on 18 November 2020, the Panel was given a demonstration by MTRCL on how design is now carried out in BIM models, which are immediately updated as changes occur and stored in the CDE as a single source of truth throughout design development. These models will continue to be updated throughout the construction period to ensure that as-built data and drawings are in place when the project is completed.

200. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the adoption of BIM in future railway projects, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.8.3
Introduce rigorous monitoring of as-built drawing production.

201. Some MTRCL witnesses testified at the inquiry that as-built drawings were still not prepared for the East West Corridor slab. However, the contractor was actually required by the contract to produce and submit to MTRCL updated as-built records and drawings during the course of the work, and MTRCL's procedures should have ensured that this was happening.

202. This Panel notes that the status of submissions including as-built records has been reported to PSC since Q4 2018. Monthly coordination meetings between the Government and MTRCL have been enhanced to deal with submission matters, including as-built records.

203. MTRCL's review on as-built documentation in PIMS has been discussed under Recommendations 5.8.1 and 5.8.2 above. The Project Information Management PIMS, target to be issued by the

end of Q2 2021, will require regular update of models with as-built data. While the current contract requires as-built drawings to be submitted after completion of the works, MTRCL will consider the introduction of specific clauses to future contracts for the phased submission of as-built drawings based on the phased completion of works packages. In addition, MTRCL is now discussing with BD on submission requirements prior to implementation of future railway projects, including whether multiple phased as-built drawing submissions are preferable. The use of BIM and NEC in future projects will also greatly assist in ensuring that design data is consistent with as-built data and in managing design data.

204. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the reporting of submission status to PSC as well as enhancement to monthly coordination meetings, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

RISC Form and Inspection Procedures

Recommendation 5.10.1
Introduce a further hold point for the contractor and MTRCL to jointly confirm readiness to commence reinforcement installation so as to ensure that all couplers are present and properly exposed and that coupler threads are not damaged.

Recommendation 5.10.2
Provide clarity in contract specifications as to the status of RISC forms (in paper and/or digital form), and as to their retention and storage requirements.
Ensure that roles and responsibilities in relation to the RISC procedures and the recording of results are clear and communicated to all those involved in the procedures on a project specific basis.
Consider pulling the requirements relating to RISC form procedures and inspections into a single source covering requirements on individual projects.
Review and clarify procedures in relation to inspections which are not formal hold points, ideally using the same technology and systems as formal procedures.

Recommendation 5.10.3
Introduce new technology-based RISC form procedures and ensure that site staff have access to the latest working drawings to support more reliable surveillance and inspections of the works.

Recommendation 5.10.4
Consider ways of improving the forward planning of formal inspections and inform forward programmes by the notice periods provided by the submission of Inspection and Test Plans to support resource planning and ensure that inspections are being requested and completed as expected.

205. Missing RISC forms was one of the key issues being investigated in the Commission's inquiry under the extended terms of reference. The Commission found that a high percentage of RISC forms, being a contractual requirement under Contract 1112 and proof of quality of construction, had either not been made out in the

first place or had been lost. The Commission considered that RISC forms, constituting the primary source of certification of work correctly done, should have been the subject of full and contemporaneous compliance. The Commission was satisfied that the reason such a high percentage of RISC forms were never completed was that a form of contempt for the process was allowed to develop due to poor management. In response, the Commission, with the assistance from Mr Rowsell, made a number of recommendations to MTRCL's RISC form and inspection procedures.

206. MTRCL reports that further hold point for couplers prior to reinforcement installation has been included in the revised PIMS Practice Note on "Monitoring of Site Works" being used in the SCL project. All RISC forms are to be linked to the CDE and BIM models in future projects to ensure all inspections are based on current designs. These requirements are indicated in the new Project Management and Construction Management PIMS which will be issued by the end of Q2 2021.

207. The Panel also notes that MTRCL is incorporating RACI matrices covering the roles and responsibilities of staff in the RISC procedures, and a comprehensive audit plan for future project including audits of RISC records into the revamped PIMS. The RISC procedures have also been completely revamped to address the Commission's recommendations, with the following characteristics:

- fully digitised;
- clearer definition and allocation of roles and responsibility;
- enhanced hold point guidance;
- automatic storage and archive;
- linkage to dashboard reporting to alert users to developing issues; and
- linkage to forward planning schedules for new works.

208. On forward planning of formal inspections, the Panel is advised that MTRCL's current arrangements have been enhanced such that

up-coming inspections are covered in the regular Construction Manager's Meetings with contractors. The new digital system is used in progress meetings with the contractors to plan and manage works on site in advance, allowing improved planning of the works.

209. The iSuper system (see Recommendation 5.3.5 above) that manages RISC forms also digitally manages new systems for generating and filing of site diaries, site photographs, tracking records, NCRs, quality observations and Requests for Inspection. This new system has already been fully adopted in the SCL project. All templates for reporting and monitoring purposes have been revamped for ease of use by site teams, and all systems can be used on mobile devices.

210. The contractual status of RISC forms and their retention requirements as project records are being addressed in the review of contract documents (see Recommendation 3.4.2 above) and PIMS (see Recommendations 5.7.1 and 5.7.2 above) respectively and will be clarified in the revised suite of contract documents and PIMS documents. Further guidance on the RISC form procedures and hold points in general will be included in QMPs for future projects.

211. The Panel learns that MTRCL is developing a new digital inspection tool (iSuper 2.0) to support site inspection activities that can interface with BIM/CDE, in particular the linkage of RISC forms to BIM models to ensure that the latest drawing and design information relating to RISC forms can be accessed on hand held digital device on site. iSuper 2.0 will be tendered in the first half of 2021 and developed over 2021 for use when future construction projects commence in 2022/2023.

212. The Panel considers that the Commission's Recommendations 5.10.1, 5.10.3 and 5.10.4 have been fully implemented in view of the revised PIMS Practice Note on "Monitoring of Site Works" and digital system in place. The Panel also considers that satisfactory progress towards the implementation of Recommendation 5.10.2 is being made in view of the incorporation of RACI matrices in the

RISC procedures, and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021 and the review of suite of contract documents is completed during the course of 2021.

BOSA mechanical couplers

Recommendation 5.11
Devise and prescribe a clearer and more foolproof means of positively indicating that the coupler assembly has been correctly installed in a manner that will achieve its specified structural properties, which should not be dependent on merely counting the number of exposed threads.

213. BOSA Technology (Hong Kong) Limited ("BOSA") entered into a contract with Leighton to supply its own proprietary products, namely threaded rebars and couplers. During the inquiry, there had been much disputed evidence regarding the necessity of achieving "butt-to-butt" connection between respective threaded rebars inserted into each end of a coupler. On this issue, some of the independent structural engineering experts assisting the Commission opined that there is an incompatibility with BOSA's inspection protocols and their intent to achieve butt-to-butt connection. To this end, the Commission made one specific recommendation regarding the use of BOSA mechanical couplers to facilitate the proper and safe use of this type of coupler in future construction projects.

214. BD wrote to BOSA on 9 July 2020 requesting them to conduct a review of its coupler products in light of the Commission's recommendation and to advise BD of the outcome of their review and any enhancement proposal. After several rounds of discussion between BD and BOSA, BOSA submitted the revised technical and quality assurance manuals to BD on 16 February 2021. BD considered that the revised manuals have addressed the Commission's recommendation for clearer and more foolproof indication of correct coupler installation, and issued an acknowledgment letter to BOSA on 19 February 2021.

215. The Panel considers that the Commission's recommendation has been fully implemented in view of the revised technical and quality assurance manuals submitted by BOSA to BD.

Interface Management

Recommendation 5.12.1
Review interface management requirements, ensure that interface risks are generally treated as potential key risks and consider defining a joint interface inspection as a hold point.
Ensure that method statements are required from contractors for the execution of works at interfaces.

Recommendation 5.12.2
Ensure that actions are clearly allocated and communicated to the responsible individuals in interface management meetings.
Consider holding interface workshops attended by relevant site team members to ensure that works are adequately planned and risks are identified and mitigated.
Consider the appointment of a project interface manager in the Engineer's team who has responsibility for ensuring that interface planning and communications are delivered as required.

216. Another key issue being investigated in the Commission's inquiry under the extended terms of reference was the mismatch between taper-threaded couplers and parallel-threaded rebars on the two sides of the interface between Contracts 1111 and 1112, leading to the failure in coupler connections at the interface stitch joints and the shunt neck joint at NAT. The Commission noted that frontline staff of MTRCL and Leighton, who are responsible for the supervision and inspections of the stitch joints and shunt neck joint, were not familiar with the details of couplers to be used at the interface.

217. On this, Mr Rowsell further pointed out that interface risks are widely considered in the construction industry to represent one of

the biggest risks that could impact on the successful delivery of projects. To this end, the Commission and Mr Rowsell has made a number of recommendations in relation to MTRCL's interface management.

218. The Panel notes that the existing PIMS Practice Note on "Interface and Co-ordination" used in the SCL project has been amended to enhance management of hold points and risks across interfaces. MTRCL further advised that the enhanced interface management procedures will be covered in the new PIMS Construction Management Procedure, which will include (i) requirement for a hold point inspection for interfacing works; (ii) requirements for contractor to submit method statement for interfacing works; (iii) roles and responsibilities of attendees of interface management meetings; (iv) arrangement for interface workshop; and (v) development of RACI matrices relating to interface management to ensure that allocation of responsibility across interfaces is clear. The new PIMS Construction Management Procedure will be issued by the end of Q2 2021.

219. On appointment of a project interface manager, the Panel takes note of MTRCL's advice that the role will be taken up by the MTRCL Construction Manager and that guidance on responsibility is given within the new PIMS. The Construction Managers will manage interfacing contracts to ensure that the interface planning and communication are delivered as required between all parties, including both design consultants and contractors. The interface planning and communication have been enhanced with updates to the PIMS Practice Note on "Monitoring of Site Works", which is now being used in the SCL project with the introduction of RACI charts. The Senior Construction Engineers are responsible for ensuring works are inspected based on the RISC form procedures and are responsible for liaising with the contractors to capture and follow up on interface requirements.

220. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendations is being made in view of the updates to PIMS Practice Notes on "Interface

and Co-ordination" and "Monitoring of Site Works", and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Steel testing

Recommendation 5.13.1
Develop procedures for ensuring that the Engineer's team is notified by the Contractor that a delivery requiring testing has arrived on site and ensure requirements are included in contracts to achieve effective segregation on site of tested and untested steel.

221. During the Commission's inquiry under the extended terms of reference, it was revealed that approximately seven percent of the rebars delivered to site was not sampled and tested by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (in addition to the certification provided by the steel manufacturers) pursuant to the Government's requirement. The root cause appeared to have been an admitted failure of communication between MTRCL and Leighton. If there was no efficient liaison with Leighton regarding deliveries of rebars, it would be difficult for MTRCL's inspectorate team to know that certain batches of rebars required testing. Hence, Mr Rowsell recommended that relevant procedures be developed to ensure compliance with testing requirements.

222. MTRCL reported to the Panel that new PIMS Instruction/Guidelines are being developed for testing of materials including concrete, steel reinforcement and couplers under new PIMS Construction Management Procedure. In addition, the sections relevant to sampling of steel reinforcement in MTRCL's current PIMS Practice Note on "Material Testing and Review" is being updated to incorporate the notification and segregation requirements, which include arranging for material storage prior to delivery, agreeing on a colour-coding system for material testing indicating status (under inspection/pass/reject), as well as giving advance notice to MTRCL on material delivery. The revised

PIMS Practice Note is now in the final phase of internal consultation, and will be issued by the end of Q2 2021 under the existing PIMS and incorporated into the new PIMS.

223. The Panel considers that satisfactory progress towards the implementation of the Commission's recommendation is being made in view of the ongoing amendment to the PIMS Practice Note on "Material Testing and Review", and that the recommendation would be fully implemented when the new PIMS is substantially completed by the end of Q2 2021.

Recommendation 5.13.2
Review its requirements for the testing of steel that has been delivered to sites from quality accredited sources in line with the long-term objectives set out in Construction Standard CS2:1995.

224. On the Government's requirements for testing of rebars (see Recommendation 5.13.1 above), Mr Rowsell took note of the long-term objective set out in the Construction Standard CS2: 1995 to rely on the third-party certification so that further testing by the purchaser would not be needed. He considered there to be clear benefits in achieving the stated objective, such as enhancing efficiency in the processing and use of rebars. This would allow maximisation of steel utilisation, leading to reduced wastage as well as reduced material and administration costs, whilst maintaining product integrity.

225. The Panel notes that the Government's long term objective is to implement product certification scheme ("PCS") on rebars to cover the whole supply chain from manufacturers, stockists and prefabrication yards for public works projects.

226. DEVB has been discussing with key parties including the Construction Industry Council, the Standing Committee on Concrete Technology, etc. on the feasibility of implementing the PCS on rebars in Hong Kong such as identifying suitable scheme owner and sufficient certification bodies to implement the scheme. The scheme will be implemented on trial basis in public works

projects for about two to three years upon its establishment for verification of its effectiveness. The requirements for on-site sampling tests would be reviewed upon completion of the trial period, during which industry stakeholders' views would also be sought. DEVB and Civil Engineering and Development Department ("CEDD") are working to appoint a suitable party to develop the scheme. A working group comprising representatives from DEVB, CEDD and Hong Kong Accreditation Service was established in December 2020 to monitor the development of the scheme. The working group targeted to invite tender and appoint the suitable party by the end of Q2 2021. It is anticipated that the PCS on rebars will be put on trial in public works contracts in late 2022.

227. The Panel considers that satisfactory progress has been made towards implementation of the Commission's recommendation in view of the ongoing discussion regarding the PCS.

Chapter 6 Review of monitoring and verification arrangements

Extending the role of the M&V Consultant

Recommendation 6.1
Consider extending the role of the M&V Consultant to provide a wider "eyes and ears" role to help protect the Government's interests in the delivery of the project and to provide high-level monitoring of the project quality assurance systems. Develop the M&V Consultant into the Government's Project Representative that works more closely within the MTRCL organisation to monitor performance and to identify emerging issues.
Consider including construction quality and checks on construction records in the M&V role as failures in these areas can impact adversely on cost, programme and safety.

228. The Commission pointed out the potential to expand the M&V Consultant's role to help ensure that Government had access to more reliable project performance data which would put it in a stronger position to plan its involvement at key stages and to respond to any issues that emerge during the delivery of the project. The Commission also took on board Mr Rowsell's recommendation that the M&V Consultant's role could be extended to a Project Representative role, the responsibilities of which would include high-level monitoring and auditing of quality assurance procedures.

229. For the SCL project, the current "check the checker" approach was heavily reliant on MTRCL's compliance with its internal project management procedures and/or contractual requirements under the EA.

230. That said, this Panel notes that HyD has provided in-house inspectorate staff stationing full-time on site to serve as Government's "eyes and ears" since July 2019. A total of 9 inspection officers at different ranks and 4 works supervisors, all with experience in site supervision of infrastructure projects, have been progressively deployed on various MTRCL site offices of the

SCL project. They would conduct surprise checks at works fronts critical to structural quality and safety or to the overall progress of the project, spot-check the compliance of works against the working drawings and review whether MTRCL fulfils its supervision requirements. They also check associated site records such as RISC forms and test records.

231. With in-house inspectorate staff on site, HyD could monitor the site works more closely and independently, and could assess the effectiveness of MTRCL's supervision regime. For example, HyD's inspectorate staff have identified missing and irregular RISC forms during their inspections and flagged these incidents up for MTRCL's immediate follow-up.

232. Owing to existing contractual arrangements, there will be limitations to extend the role of the M&V Consultant. This notwithstanding, HyD has requested the M&V Consultant to be more proactively involved in the responsibilities of its existing role under the SCL project. Since mid-2018, the M&V Consultant has joined all of the three-tier project supervision meetings to enable its prompt follow-up of and instant feedback to issues raised by MTRCL thereat. Since August 2018, the M&V Consultant has been conducting site walks and audits more frequently. The frequency of site walks has been increased from quarterly to monthly for civil engineering contracts, and from half-yearly to quarterly for E&M contracts. From August 2018 to February 2021, a total of 261 site walks have been conducted by the M&V Consultant. As for audits, the average number of audits per year for active civil engineering contracts has been increased from 4-5 audits before the enhancement in August 2018 to 7-8 audits at present. These enhancements have enabled the M&V Consultant to monitor the works more closely. In addition, the Panel notes that the M&V Consultant was also requested to perform other duties specifically covering the quality issue, such as the "health check" for site supervision and construction control, and the technical and procedural review of NCRs issued by MTRCL, etc. such that the M&V Consultant could strengthen its role in

monitoring and verifying MTRCL's performance in ensuring the quality of works.

233. For future railway projects, the Government's MCS Consultant had considered the roles and responsibilities of the Project Supervision, Monitoring and Checking ("PSMC") Consultant by extending the existing duties of M&V Consultant to a wider "eyes and ears" role (covering construction quality and associated records as well), so as to help protect the Government's interests in new railway projects. The PSMC Consultant will co-locate at MTRCL's site office to facilitate the monitoring and checking of the site works using a risk-based approach. On top of the checking of MTRCL's compliance to the relevant requirements, the PSMC consultant will be required to work in a proactive way to check the performance of MTRCL in the project management, construction supervision and quality assurance aspects.

234. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Reviewing the engagement arrangements of the M&V Consultant

Recommendation 6.2.1
Review the lump sum contractual arrangement used to employ the M&V Consultant to ensure that they do not act as a disincentive to the delivery of comprehensive services and consider options which may provide a more effective incentive to be proactive in the execution of its duties (e.g. provide a fair return for a good service).
Consider options of recovering M&V Consultant's costs from the defaulting party for additional audits as a result of poor performance by the contracting parties.

235. Mr Rowsell was of the view that the form of contract involving payment to the M&V Consultant on a lump sum basis did not

support the proactive approach that the Government was seeking. Alternative contractual arrangements should be considered.

236. For the SCL project, upon HyD's invitation for new initiatives, the M&V Consultant has made some proposals to uplift the M&V services. HyD has agreed to the proposed increase in the frequency of site walk (see Recommendation 6.1 above) and arrangement of "surprise audit" after regular site walk. So far, 20 additional services have been ordered from the M&V Consultant to extend and strengthen M&V works for the SCL project. These include provision of additional manpower and additional quality checking and verification duties.

237. For future railway projects, the Panel notes that the Government's MCS Consultant had considered the remuneration arrangement of the PSMC Consultant. The proposed remuneration arrangement for the PSMC Consultant will be allowed with more flexibility to adjust and align its manpower resource deployment to match with the manpower demand arising from the latest development and any special issues identified in the project, subject to a pre-determined ceiling value (with reference to similar mechanism for resident site staff for public works projects). The Government advised that the remuneration arrangement will allow it to review and adjust the manpower requirements as proposed by the PSMC Consultant on a regular basis.

238. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Recommendation 6.2.2

Review the procedures for satisfying itself that the M&V consultant has sufficient resource capacity and flexibility of resource to deliver required services.

Ensure that the M&V Consultant is given access to the necessary level of resources if the level of monitoring has to be increased due to concerns about poor performance.

Consider whether there could be benefit in appointing more than one M&V consultant on major complex contracts to provide more flexibility and resilience of resource in delivering requirements.

239. The level of resources reasonably expected and required from the M&V Consultant was a topic of investigation during the inquiry. In the First Audit Report, this Panel considered that Recommendation 6.2.2 had been fully implemented by the Government.

240. Since then, the recommendation was further supplemented in the Commission's Final Report. In the inquiry under the extended terms of reference, Mr Rowsell raised concerns over the level of service being in part constrained by the M&V Consultant's resource capacity. He also suggested consideration be given to appointing an additional M&V Consultant to provide greater flexibility of resource. In view of this, the Government was invited by the Panel to make further submissions in the Second Audit.

241. The Panel notes that HyD would continue to monitor the level of resources of the M&V Consultant to ensure that it has sufficient resources to deliver its tasks. In fact, a standing item for reviewing the level of resources of M&V Consultant has been included in the monthly progress meeting since October 2019. Further, this Panel notes that HyD would order additional services from the M&V Consultant if such services are necessary and justified under the M&V agreement (see Recommendation 6.2.1 above). According to HyD, thus far manpower resources deployed by the M&V Consultant are considered sufficient to meet service requirements.

242. For future railway projects, the Government's MCS Consultant had reviewed the remuneration arrangement of the PSMC Consultant. The proposed arrangement will be allowed with more flexibility to align with its manpower resource deployment for the project. Regarding the procurement of PSMC Consultants, the Panel is advised by the Government that it will consider the project specific attributes in determining the contract packaging and strategies. These include, but are not limited to, factors such as the nature and scale of projects, risk of interfacing issues, market conditions and funding sources, etc.

243. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Clarifying requirements for the M&V Consultant

Recommendation 6.3
Clarify in M&V Consultants' briefs requirements in relation to site audits and surprise checks.
Ensure that M&V consultants treat interface risks as potential key risks as part of their risk-based approach to the identification of review priorities.

244. The nature of surprise checks and audits by the M&V Consultant and how they could be implemented under the terms of the EA were looked into during the inquiry. In particular, the Commission was not entirely convinced that the "surprise check" needed to be scheduled in advance with MTRCL and Leighton, despite site security and access constraints.

245. Contract interface was a topic of investigation in the Commission's inquiry under the extended terms of reference (see Recommendations 5.12.1 and 5.12.2 above). On this, Mr Rowsell considered that contract interfaces should have been identified as a key risk by the M&V Consultant and opined that resources and

measures should be in place to manage them. Noting that the M&V Consultant would not have been able to monitor all contract interfaces, he suggested that the M&V Consultant could have prioritised those where interface risks were the most complex.

246. Under the EA, MTRCL shall be informed of the date and site of the M&V Consultant's inspections and audits. Nevertheless, to maintain an element of surprise, specific site locations and scope of the inspections and audits will not be disclosed in advance. In addition, HyD will regularly review with the M&V Consultant on the requirements and details of site inspections and audits, including their frequency, location and scope.

247. On the other hand, as mentioned under Recommendation 6.1, HyD's in-house inspectorate staff are stationed full-time on site to carry out ad-hoc and unscheduled site inspections and audits. Upon the Panel's inquiry, the Government supplemented that to maintain the element of surprise, MTRCL would not be notified the scope of these ad-hoc and unscheduled site inspections and audits. The results of these inspections and audits would then be recorded in a report with information of inspection dates, locations, types of works inspected and observations. Upon HyD's request, MTRCL has started providing a 3-week rolling programme of site activities for advance information, facilitating checks by HyD's inspectorate staff on site and the M&V Consultant.

248. As mentioned under Recommendation 2.3.1 to 2.3.4 for future railway projects, taking into account the findings in relation to the role of the M&V Consultant under the MCS Consultancy, HyD will specify the requirements related to site inspections, audits and/or surprise checks in the briefs for future PSMC consultancies.

249. The Panel takes note that the M&V Consultant for the SCL project has been regularly reviewing and updating the risk registers which have already covered contractual interface risks. In view of the Commission's recommendation, HyD had reminded the M&V Consultant to review the latest risk registers to ensure that relevant interface risks could be assigned with appropriate weighting.

Since then, contract interface risks have been included in the risk registers for monitoring. HyD will specify the requirements related to interface risks in the briefs for future PSMC consultancies.

250. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Ensuring prompt notification to M&V consultants

Recommendation 6.4
Consider ways of ensuring that M&V consultants are advised promptly of construction problems and defective work which may require remedial works and could have significant cost and programme implications

251. In relation to the issues at the stitch joints of NAT (see Recommendations 5.12.1 and 5.12.2 above), Mr Rowsell considered that lines of communication should have been in place to ensure that the M&V Consultant was informed that a major problem had arisen requiring replacement works. He would have expected the M&V Consultant to make inquiries about cause and liability as it was possible that all or some of the costs would fall to the Government and that the remedial works could have impacted on the completion programme. Hence, Mr Rowsell recommended the Government to consider ways of ensuring prompt notification to the M&V Consultant.

252. As mentioned in Recommendations 6.1 above, since mid-2018, the M&V Consultant has been invited to join all of the three-tier project supervision meetings (instead of just some of them in the past) so that the M&V Consultant has the first hand information from the senior management down to contract management of MTRCL. The number of site walks/audits by the M&V Consultant has also been expanded since August 2018. From August 2018 to February 2021, a total of 261 site walks have been conducted. As

for audits, the average number of audit per year for active civil engineering contracts has been increased from 4-5 audits before the enhancement in August 2018 to 7-8 audits at present. These enhancements enable the M&V Consultant to monitor the works more closely.

253. The Panel learns that the Government's MCS Consultant has reviewed the management of M&V Consultant to come up with enhanced measures to facilitate the effective performance of the PSMC Consultant which will be extended from the existing duties of M&V Consultant to a wider "eyes and ears" role, including:

(i) co-location arrangement for the consultant at MTRCL's site office;

(ii) attendance at MTRCL's relevant meetings; and

(iii) proactive reporting and early warning mechanisms (covering non-compliance reports on works and processes, safety and quality incidents, etc.).

254. The Panel considers that the Commission's recommendation has been fully implemented in view of the measures implemented in the SCL project and the enhanced measures proposed for new railway projects.

Conclusion

255. Railway projects, like many other mega infrastructure projects, are often of an immense scale and complexity. The successful delivery of such projects requires close-knit coordination among multiple stakeholders and compliance with a myriad of regulatory and supervisory requirements, involving voluminous documents, guidelines and specifications. The Commission has put forward insightful recommendations in its Interim and Final Reports regarding aspects of construction and management of infrastructure projects.

256. In the First Audit Report, the Panel considered that 14 of the 58 recommendations put forward in the Interim Report as fully implemented. In the Second Audit, this Panel set to review the implementation progress of 66 recommendations, consisting of 44 outstanding recommendations in the First Audit Report, 20 new recommendations put forward in the Commission's Final Report, as well as two of the fully implemented recommendations in the Interim Report on which the Commission has made revisions and/or supplements.

257. In the Second Audit Report, having reviewed in detail verbal and written submissions from the Government and MTRCL, this Panel is of the view that 38 of the 66 recommendations reviewed have been fully implemented and satisfactory progress towards full implementation of 28 recommendations is being made. This Panel notes that upon the completion of MTRCL's review of PIMS and suite of contract documents during the course of 2021, most of these remaining recommendations would also be adequately addressed.

258. Taking the findings of both the First and the Second Audits into account, out of the total of 78 recommendations put forward by the Commission, this Panel considers that 50 recommendations have been fully implemented. A table setting out the summary of implementation progress of the 78 recommendations is at **Annex C**. To ensure the full implementation of the remaining 28

recommendations, the Panel suggests that THB should continue to keep track of the implementation progress of these recommendations.

259. The Panel appreciates the Government and MTRCL's full commitment to put in undiluted effort to implement the Commission's recommendations with a view to tackling the long standing issues as identified in the inquiry. Such effort was duly reflected in the detailed progress reports submitted and presentations given to the Panel during the First and the Second Audits. Where the Panel found information submitted insufficient, the Government and MTRCL were effective and responsive in providing supplementary information and clarifications to aid the Panel's deliberation. Representatives of the Government and MTRCL attending the inquiry sessions and site visits showed their understanding of the necessity and gravity of taking on board the Commission's recommendations.

260. In the Panel's view, maintaining such commitment, as well as nurturing a culture that emphasises quality and collaboration, will be crucial to sustaining and following through all the measures fully implemented or to be fully implemented in the SCL project as well as all future railway projects. These measures, representing valuable outcomes of lessons learned from the SCL project, will bring about positive change to the construction industry as a whole if followed through.

Extract of Paragraphs Relevant to the Recommendations

Paragraph Number[9]	Extract	Recomm-endation Number
Interim Report of the Commission		
Chapter 9 Is the structure safe?		
(IR-391)	Pursuant to section (c) of its original Terms of Reference, the Commission is required to make recommendations on suitable measures with a view, firstly to promoting public safety, and secondly to promoting assurance on quality of works. With regard to the first part, namely promoting public safety, the Commission recommends as follows: The Commission recommends ongoing monitoring of the station structure during operation of the station, so as to provide reassurance to the public. However, the Commission notes the advice it has received that it is unlikely that any significant movement will occur.	1.1
Chapter 10	**Reviewing adequacy of MTRCL's & Government's management systems**	
(IR-408)	The project management systems of both MTRCL and Leighton prescribe a system for reporting substandard works requiring the use of 'Non-conformance' reports ('NCR's). The accepted practice is that it is unnecessary to issue an NCR if the defective work that has been identified is able to be corrected and signed off on the same day. Both project management experts agreed with this practice. However, they recommended that all site supervision and construction engineering teams should be made aware of the defective work so that they are put on notice to be watchful for repeat occurrences. In the event that similar defective work occurs again, an NCR should then be issued.	5.5.1 5.5.3
(IR-410)	In the view of the Commission, MTRCL's system of non-conformance reporting requires a full review which should include a review of the process of 'closing out' (in respect of which evidence was put before the Commission of unacceptable delay).	5.5.4

[9] IR-X denotes paragraph reference in the redacted Interim Report; FR-X denotes paragraph reference in redacted Final Report; HA-X and HB-X denote paragraph reference in Mr Steve Rowsell's first and second expert reports respectively, both provided in Annexure H of the Final Report. Paragraphs with their numbers in brackets do not carry recommendations per se, but suggestions from the Commission or its experts which supplement the recommendations.

(IR-416)	The Commission further notes that Atkins was not required to have a presence on site under either of its arrangements. One of the risks associated with this absence from site is that the designer is given little opportunity to ensure that its design intent is properly implemented in the works. The Commission agrees with the project management experts that it is desirable, if not essential, for a designer to have a presence on site. The Commission believes that this should be considered for all future rail infrastructure projects.	5.3.1
(IR-426)	The Commission is aware of the fact that digital, hand-held devices are used extensively on construction sites around the world to capture the results of quality inspections and for tracking defects. It was surprising therefore to discover during the course of the hearings that MTRCL, together with its contractors and subcontractors, did not appear to make use of technology for systematic data capture on site, especially for producing contemporaneous records of quality inspections. The Commission heard from a number of witnesses that records of inspection were not immediately recorded on site but were recorded later on paper in the site office: on occasions, only being recorded much later, if at all. In respect of the use of technology on site, MTRCL appears to have 'fallen behind the curve'.	5.3.6
(IR-428 – IR-434)	Building Information Modelling ('BIM') has not been used on the SCL project. Indeed, it appears that BIM has hardly been used on any MTRCL projects. However, Steve Rowsell, the Commission's independent expert, recommended that MTRCL should develop and implement the use of BIM as a collaboration tool. In addition, MTRCL's management consultant, Turner & Townsend, make reference to BIM in their review and the Commission has been informed that MTRCL is progressing the development of BIM for future projects. What therefore is BIM and, in the view of the Commission, what benefits will it provide in future Hong Kong infrastructure projects? BIM is a process. A software model of the asset is developed and shared within a common data environment thereby increasing transparency between the parties. BIM provides clarity regarding the asset requirements at each phase of the project life cycle. Data from all parties is linked. The project is thereby kept on schedule and on budget. It may even be said that BIM is becoming part of the DNA of future construction.[49] Experience in the use of BIM demonstrates that significant savings of time and cost can be achieved, predominantly by reducing wasted or duplicated effort. BIM has been widely adopted in the United Kingdom, Europe and North America. In 2012, the Government of the United Kingdom mandated	3.3

	that BIM be used on all publicly procured projects from April 2016. Many private sector clients in the United Kingdom have followed suit and BIM is progressively becoming the norm for designing, implementing and maintaining building and infrastructure assets across the United Kingdom and parts of Europe. The Commission notes that similar government mandates have been introduced in Finland (2007), Norway (2008), USA (2008), Singapore (2014) and France (2017). Germany will follow in 2020. The Hong Kong construction community is already aware of the benefits of BIM. In the Chief Executive's 2018 Policy Address it was stated that the Government has established a "HK$1 billion Construction Innovation and Technology Fund to encourage wider adoption of innovative technologies and stimulate the provision of cutting-edge solutions". [50] Further, the Government's *Budget Measures for 2018-2019* states that starting this year, the Government will adopt BIM technology in the design and construction of major government capital works projects.[51] The Commission also notes that the Secretary for Development issued Technical Circular (Works) number 7/2017 in December 2017 setting out the requirement to use BIM technology in all capital works projects with estimated costs greater than HK$30 million, this to take effect from 1 January 2018. The Commission is not therefore recommending a technological process that is unknown in Hong Kong or of no interest to the construction industry here. In the context of this report, however, and looking forward, it is a development to be encouraged. _____ [49] AIM Group, Hong Kong [50] See paragraph 145 of that address [51] See paragraph 113 of the Budget Measures statement	
(IR-437)	The Commission recognises that there can be breakdowns in communication in the best managed organisations. The independent expert witnesses have, however, suggested that one way of materially improving communications, including communications within a single organisation, is by the adoption and use of BIM.	3.3
IR-442	Steve Rowsell suggested that, in respect of a project which the Government is funding, it could ensure greater efficiency, greater cost effectiveness and savings in time if there was a single point of responsibility within the Government for administering the Government's agreement with MTRCL, more especially to oversee and	2.3.3

	manage internal Government consultations. The Commission believes there is much strength in Steve Rowsell's recommendation.	
(IR-443)	In the course of closing submissions, counsel for the Government said that it was the Railway Development Office ('RDO') within the Highways Department which served as the single point of contact for overall administrative coordination. However, counsel went on to say that, if considered necessary, the Government was prepared to instil further clarity into its lines of communication and reporting. The Commission believes this should be done.	2.3.3
(IR-444)	Indeed, the Commission goes further. It believes that the Government should critically address the way in which it executes its multiple roles in relation to railway enhancement projects and that active consideration should be given to creating an overall Government 'sponsor' role [52] for all individual projects. The sponsor must command authority and take responsibility for the project on behalf of the Government. Steve Rowsell, the project management expert appointed by the Commission, also recommended that the Government should address its project sponsorship arrangements.[53] _____ [52] Sponsorship of a project, programme or portfolio is an important senior management role. The project sponsor is the individual (often a manager, executive or senior officer) with overall accountability for the project. The sponsor is accountable for ensuring that the work is governed effectively and delivers the objectives that meet the identified needs. The project sponsor is primarily concerned with ensuring that the project delivers the agreed benefits. It is normal on a large, complex project for the project sponsor to be supported by a sponsorship team. [From: The Association for Project Management (APM), *Body of Knowledge*] [53] Also included in paragraph 6 of Annexure F	2.3.1
(IR-445)	In this regard, the Commission respectfully suggests that the Government might wish to look to the experience of its counterparts elsewhere in the world, for example, in the United Kingdom where a number of major rail infrastructure projects have been funded (wholly or partly) and sponsored by the central Government.	2.3.4
(IR-446)	Finally, it is to be emphasised that, in the view of the Commission, the skill sets required for effective sponsorship of projects are not the same as that required for effective project management.	2.3.1
IR-451 – IR-452	Finally, and more fundamentally, the Commission is of the view that there is in Hong Kong considerable scope for creating a more collaborative culture between the Government, MTRCL and contractors with the object of achieving more successful project outcomes. The Government should take a leading role if such a change is to take place.	3.1.2

	By way of example, the Commission believes that there would be great value in the Buildings Department working much more closely with MTRCL and its designers and contractors in order to facilitate dialogue on all engineering matters.	
(IR-454)	Key enablers of this change have been the introduction of new contract forms such as NEC3 and NEC4[54] and the introduction also of collaborative initiatives such as partnering and alliancing. The introduction of BIM has also made a significant contribution to improving trust and performance on project delivery. _____ [54] The New Engineering Contract (NEC) is a suite of contracts created by the Institution of Civil Engineers. NEC3 is a family of contracts unique in offering a complete end-to-end project management solution for the entire project life-cycle; from planning, defining legal relationships and procuring of works, all the way through to project completion, management and beyond. NEC4 builds on NEC3, providing improved flexibility, clarity and ease of use, thereby enabling the delivery of projects on time, on budget and to the highest standards.	3.2 3.3
(IR-455)	Steve Rowsell, the Commission's expert, advocated the establishment of a Senior Leadership Forum, comprising the Government, MTRCL and its contractors in order to "monitor working relationships and cultural aspects of service delivery and to agree ways of developing collaborative working". He went on to suggest that it should include leaders of the major sub-contractors. The Commission supports this suggestion.	2.1.3
Chapter 11 Recommendations in respect of promoting public safety and promoting assurance on quality of works		
IR-460	The Commission accepts the advice provided to it by independent structural engineering experts that the east and west diaphragm walls and EWL and NSL platform slabs should be instrumented to detect movement during the operational phase of the station. Instrumentation should be by means of fibre optics or other approved measures. Movements should be monitored and reported to the Government.	1.1
(IR-467)	The Commission observes that MTRCL places a high reliance on its PIMS, which MTRCL notes has served it well over more than two decades. However, a record of past success cannot be a guarantee of future performance. The Commission is of the opinion that substantial change to PIMS is warranted.	5.7.1
IR-469	The Commission recommends that MTRCL expedites its adoption of BIM technology for new capital projects within its portfolio.	3.3

IR-470	The Commission recommends that for future rail infrastructure projects the designer should have a site presence so as to assist in ensuring that the design intent is implemented in the works.	5.3.1
IR-471	The Commission recommends the closer involvement of senior leaders of all parties – Government, MTRCL and contractors – working collaboratively to achieve a quality outcome. This would involve senior leaders being more visible to the workforce and taking a lead role in communicating key messages throughout their respective organisations.	2.1.1
IR-473	The Commission recommends that both MTRCL and the Government should review the 'Competence' [55] requirements for personnel engaged in project management and project sponsorship roles in their respective organisations. _____ [55] 'Competence' can be defined as the combination of training, skills, experience and knowledge that a person has and their ability to apply them in performing a task effectively. Factors such as attitude and physical ability can also affect someone's competence. [*In plain sight: assuring the whole-life safety of infrastructure,* The Institution of Civil Engineers, 2018]	2.2.1
IR-474	The Commission recognises, that even when employing competent people, human nature means that errors may still occur. Effective measures must therefore be in place to reduce the risk of failure, be it by mistake, incompetence or malicious act. The Commission recommends that MTRCL and the Government respectively should review their checks and procedures to ensure the ongoing competence of their project-related staff.	2.2.1 2.2.2
IR-475	The Commission recommends that the Government should critically address the way in which it executes its multiple roles in relation to railway enhancement projects. Of particular concern is Government's role as 'client' or 'sponsor' of railway projects. The sponsor organisation must provide both authority and responsibility for the project.	2.3.1
IR-476	The Commission recommends that for future railway enhancement projects a Project Board should be established to provide strategic direction. The Project Board might comprise appropriate Government officials as board members, supported by external non-executive members from specialist backgrounds who could bring experience of best practice from the wider industry so as to provide strategic advice.	2.3.2
IR-477	The Commission recommends that consideration be given as to whether it is appropriate for rail projects to remain within the portfolio of Director of Highways, or whether a new distinct Director of Rail Development role should be established.	2.3.3

IR-478	The Commission further recommends that consideration should be given as to the appropriateness of the 'Concession' model for future projects entrusted by the Government to be project managed by MTRCL, or whether the Government should revert to the previously used 'Ownership' model. Alternatively, consideration might be given to the creation of a Special Purpose Vehicle ('SPV') approach, with a dedicated Board and delivery organisation, as has been employed on major rail infrastructure projects in the United Kingdom[56]. _____ [56] Crossrail Limited and HS2 Limited	2.3.4
Final Report of the Commission		
Chapter 9	**A Monitoring programme to ensure ongoing structural integrity**	
(FR-420)	The Commission therefore recommends that regular visual inspections should take place in order to monitor those areas in the station with the highest assessed stress levels. The monitoring should take the form of a planned preventative inspection regime, a regime that should be in existence for an extended period, perhaps five years.	1.1
Chapter 13	**Reviewing of MTRCL's and Government's management systems**	
(FR-614)	In respect of the fundamentally important process of conducting hold point inspections, in the opinion of the Commission, it might be sensible in future contracts to introduce an earlier hold point inspection for the contractor and MTRCL to jointly confirm readiness to commence reinforcement installation. This would provide assurance that, among other matters, all couplers are in place and are properly exposed and that coupler threads are not damaged. Such an inspection, properly conducted, would ensure that there was no existing impediment to full and secure engagement of rebars into the couplers.	5.10.1
(FR-629)	MTRCL had two distinct roles on the SCL Project: one as the Engineer with defined powers under the contracts, and a separate role as the Project Manager. The Commission finds that it was not always clear which of these two roles MTRCL personnel were fulfilling at any given time. It is for senior leadership to provide that clarity, perhaps by allocating the distinct and separate roles to different designated individuals or teams.	3.4.2
(FR-630)	The project management systems of both MTRCL and Leighton prescribe a system for reporting sub-standard works requiring the use of NCRs. The accepted practice is that it is unnecessary to issue an NCR if the defective work that has been identified can be corrected and signed off on the same day. The project management experts agreed with this practice. However, they recommended that all site supervision and	5.5.1 5.5.3

	construction engineering teams should be made aware of the defective work so that they are put on notice to be watchful for repeat occurrences. In the event that similar defective work occurs again, an NCR should then be issued.	
(FR-632)	NCRs may be used for two distinct purposes – to record non-conforming works and, quite separately, to record non-conforming processes. The Commission is of the view that it would be helpful to distinguish between these two types of NCR, perhaps labelling them differently.	5.5.5
(FR-633)	In the view of the Commission, MTRCL's system of non-conformance reporting requires a full review which should include a review of the process of 'closing out'.	5.5.4
(FR-639)	The Commission further notes that Atkins was not required to have a presence on site under either of its arrangements. One of the risks associated with this absence from site is that the designer is given little opportunity to ensure that its design intent is properly implemented in the works. The Commission agrees with the project management experts that it is desirable, if not essential, for a designer to have a presence on site. The Commission believes that this should be considered for all future rail infrastructure projects.	5.3.1
(FR-644)	The Commission is further of the view that quality records should be created and signed by the relevant parties at the time of the quality inspection or, if not possible, within a short period thereafter.	5.10.2
(FR-647)	The Commission uncovered an ambiguity as to whether or not a completed RISC form constitutes a certificate, and as such whether it needs to be retained by MTRCL as a quality record and for what period it needs to be retained. The Commission considers that this matter should be clarified for future contracts.	5.10.2
(FR-650)	The Commission is aware of the fact that digital, hand-held devices are used extensively on construction sites around the world to capture the results of quality inspections and for tracking defects. It was surprising therefore to discover during the course of the hearings that MTRCL, together with its contractors and sub-contractors, did not appear to have made use of technology for systematic data capture on site, especially for producing contemporaneous records of quality inspections. The Commission heard from a number of witnesses that records of inspection were not immediately recorded on site but were recorded later on paper in the site office: on occasions, only being recorded much later, if at all. In respect of the use of technology on site, MTRCL appears to have 'fallen behind the curve'.	5.3.6

(FR-652 – FR-658)	Building Information Modelling ('BIM') has not been used on the SCL Project. Indeed, it appears that BIM has hardly been used on any MTRCL projects. However, Mr Rowsell, the Commission's independent expert, recommended that MTRCL should develop and implement the use of BIM as a collaboration tool. In addition, MTRCL's management consultant, T&T, has made reference to BIM in their review and the Commission has been informed that MTRCL is progressing the development of BIM for future projects. What therefore is BIM and, in the view of the Commission, what benefits will it provide in future for Hong Kong infrastructure projects? BIM is a process. A software model of the asset is developed and shared within a common data environment thereby increasing transparency between the parties. BIM provides clarity regarding the asset requirements at each phase of the project life cycle. Data from all parties are linked. The project is thereby kept on schedule and on budget. It may even be said that BIM is becoming part of the DNA of future construction.[62] Experience in the use of BIM demonstrates that significant savings of time and cost can be achieved, predominantly by reducing wasted or duplicated effort. BIM has been widely adopted in the UK, Europe and North America. In 2012, the Government of the UK mandated that BIM be used on all publicly procured projects from April 2016. Many private sector clients in the UK have followed suit and BIM is progressively becoming the norm for designing, implementing and maintaining building and infrastructure assets across the UK and parts of Europe. The Commission notes that similar government mandates have been introduced in Finland (2007), Norway (2008), USA (2008), Singapore (2014) and France (2017). Germany will follow in 2020. The Hong Kong construction community is already aware of the benefits of BIM. In the Chief Executive's 2018 Policy Address it was stated that the Government has established a "HK$1 billion Construction Innovation and Technology Fund to encourage wider adoption of innovative technologies and stimulate the provision of cutting-edge solutions". [63] Further, the Government's 2018-19 Budget stated that starting from 2018, the Government will adopt BIM technology in the design and construction of major government capital works projects.[64] The Commission also notes that the Secretary for Development issued Technical Circular (Works) number 7/2017 in December 2017 setting out the requirement to use BIM technology in all capital works projects with estimated costs greater than HK$30 million, effective 1 January 2018.	3.3

	The Commission is not therefore recommending a technological process that is unknown in Hong Kong or of no interest to the construction industry here. In the context of this report, however, and looking forward, it is a development to be encouraged. [62] AIM Group, Hong Kong [63] See paragraph 145 of the 2018 Policy Address [64] See paragraph 113 of the 2018-19 Budget	
FR-659	The Commission heard expert evidence that it may be preferable to first introduce BIM at a basic, 'collaborative' level so as to gain experience before building up to more sophisticated, multi-dimensional versions.	3.3
(FR-668 – FR-669)	Mr Rowsell suggested that, in respect of a project which the Government is funding, it could ensure greater efficiency, greater cost effectiveness and savings in time if there was a single point of responsibility within the Government for administering the Government's agreement with MTRCL, more especially to oversee and manage internal Government consultations. The Commission believes there is much strength in Mr Rowsell's recommendation. In the course of final submissions, counsel for the Government said that it was RDO within HyD that served as the single point of contact for overall administrative co-ordination. However, counsel went on to say that, if considered necessary, the Government was prepared to instil further clarity into its lines of communication and reporting. The Commission believes this should be done.	2.3.3
FR-671	Indeed, the Commission goes further. It believes that the Government should critically address the way in which it executes its multiple roles in relation to railway enhancement projects and that active consideration should be given to creating an overall 'sponsor' role[66] for all individual projects. The sponsor must command authority and take responsibility for the project on behalf of the Government. Mr Rowsell also recommended that the Government should address its project sponsorship arrangements. In the view of the Commission, this is not a small change requiring minor adjustments to the Government's current arrangements for monitoring and controlling projects. Rather, the Commission is of the view that the Government should carry out a comprehensive review of the way in which it monitors and controls major projects, making fundamental changes where appropriate. [66] Sponsorship of a project, programme or portfolio is an important senior management role. The project sponsor is the individual (often a manager, executive or senior officer) with overall accountability for the project. The project sponsor is accountable for ensuring that the work is governed effectively	2.3.1

	and delivers the objectives that meet the identified needs. The project sponsor is primarily concerned with ensuring that the project delivers the agreed benefits. It is normal on a large, complex project for the project sponsor to be supported by a sponsorship team. See *Body of Knowledge* by the Association for Project Management	
(FR-672)	In this regard, the Commission respectfully suggests that the Government might wish to look to the experience of its counterparts elsewhere in the world, for example, in the UK where a number of major rail infrastructure projects have been funded (wholly or partly) and sponsored by the central Government.	2.3.4
(FR-673)	Finally, it is to be emphasised that, in the view of the Commission, the skill sets required for effective sponsorship of projects are not the same as that required for effective project management.	2.3.1
FR-681-FR-682	Finally, and more fundamentally, the Commission is of the view that there is in Hong Kong considerable scope for creating a more collaborative culture between the Government, MTRCL and contractors with the object of achieving more successful project outcomes. The Government should take a leading role if such a change is to take place. By way of example, the Commission believes that there would be great value in BD working much more closely and more collaboratively with MTRCL and its designers and contractors in order to facilitate dialogue on all engineering matters.	3.1.2
(FR-683)	In the view of the Commission, BD is considered currently to be a relatively remote authority whose approval is required to be sought and obtained. BD is, quite properly, the ultimate 'gatekeeper' of acceptability of building standards. Consideration should be given as to whether it might be more beneficial for BD to act more as a proactive project participant, offering its advice and expertise. The Commission believes that this shift can be achieved without BD diluting its ultimate gatekeeper role.	3.1.3
(FR-685)	Key enablers of this change have been the introduction of new contract forms such as NEC3 and NEC4[67] and the introduction also of collaborative initiatives such as partnering and alliancing. The introduction of BIM has also made a significant contribution to improving trust and performance on project delivery.	3.2 3.3

[67] The New Engineering Contract ('NEC') is a suite of contracts created by the Institution of Civil Engineers. NEC3 is a family of contracts unique in offering a complete end-to-end project management solution for the entire project life-cycle; from planning, defining legal relationships and procuring of works, all the way through to project completion, management and beyond. NEC4 builds on

	NEC3, providing improved flexibility, clarity and ease of use, thereby enabling the delivery of projects on time, on budget and to the highest standards.	
(FR-686)	Mr Rowsell advocated the establishment of a Senior Leadership Forum, comprising the Government, MTRCL and its contractors in order to "monitor working relationships and cultural aspects of service delivery and to agree ways of developing collaborative working". He went on to suggest that it should include leaders of the major sub-contractors. The Commission supports this suggestion.	2.1.3
Chapter 14	**Recommendations**	
FR-690	With regard to the first part, namely promoting public safety, the Commission recommends ongoing monitoring of the station structure during operation of the station, so as to provide reassurance to the public. Such monitoring should take the form of an enhanced 'Planned Preventative Inspection' regime, perhaps for a period of up to five years. However, the Commission notes the expert advice it has received that any movement of the station structure will be extremely low, if indeed any movement occurs at all.	1.1
FR-698	The Commission recommends the closer involvement of senior leaders of all parties – the Government, MTRCL and contractors – working collaboratively to achieve a quality outcome. This would involve senior leaders being more visible to the workforce and taking a lead role in communicating key messages throughout their respective organisations.	2.1.1
FR-700	The Commission recommends that MTRCL reviews and clarifies its roles and responsibilities in relation to its construction contracts, perhaps by allocating and distinguishing its roles as the 'Engineer' (and his representatives) from its separate roles as the Project Manager.	3.4.2
FR-701	The Commission observes that MTRCL places a high reliance on its PIMS, which MTRCL claims has served it well over more than two decades. However, a record of past success cannot be a guarantee of future performance. The Commission is of the opinion that substantial change to PIMS is warranted. In particular, the Commission recommends that MTRCL reviews its requirements for site record keeping, supported where appropriate by technology solutions. The Commission welcomes MTRCL's commitment to adopt in full the recommendations of its consultant, T&T, and observes that notable progress is being made in implementing those recommendations.	5.7.1
FR-702	The Commission recommends that MTRCL reviews the provision of 'hold points' in its contract specifications. In addition to the current hold points, the Commission observes that it may be sensible to introduce a further hold point for the contractor and MTRCL to jointly confirm	5.10.1

	readiness to commence reinforcement installation. This would provide assurance that, *inter alia*, all couplers are present and properly exposed and that coupler threads are not damaged.	
FR-703	The Commission recommends that MTRCL provides clarity in its contract specifications as to the status of RISC forms (in paper and / or digital form), and as to their retention and storage requirements.	5.10.2
FR-704	The Commission makes one specific recommendation regarding the use of BOSA mechanical couplers. To facilitate the proper and safe use of this type of coupler on future construction projects, the Commission recommends that the manufacturer devises and prescribes a clearer and more foolproof means of positively indicating that the coupler assembly has been correctly installed in a manner that will achieve its specified structural properties. In the view of the Commission, this should not be dependent on merely counting the number of exposed threads.	5.11
FR-705	The Commission recommends that MTRCL reviews its interface management requirements, considering defining a joint interface inspection as a hold point.	5.12.1
FR-706	The Commission recommends that MTRCL distinguishes in its contract specifications the procedures to be used for reporting non-conforming works, separately from those to be used for reporting non-conforming processes.	5.5.5
FR-707	The Commission recommends that both MTRCL and the Government should review the 'Competence' [69] requirements for personnel engaged in project management and project sponsorship roles in their respective organisations. The Commission recognises that even when competent people are employed, errors may still occur. Effective measures must therefore be in place to reduce the risk of failure, be it by mistake, incompetence or malicious act. The Commission recommends that MTRCL and the Government respectively should review their checks and procedures to ensure the ongoing competence of their project-related staff.	2.2.1 2.2.2
FR-708	The Commission recommends that MTRCL reviews its induction training for project staff, considering culture and values, together with training in PIMS and in appropriate behaviours for working in a project partnering environment.	2.2.3

[69] 'Competence' can be defined as the combination of training, skills, experience and knowledge that a person has and their ability to apply them in performing a task effectively. Factors such as attitude and physical ability can also affect someone's competence. See 'In Plain Sight: Assuring the Whole-life Safety of Infrastructure' by the Institution of Civil Engineers, published in 2018

FR-709	The Commission recommends that MTRCL expedites its adoption of BIM for new capital projects within its portfolio.	3.3
FR-710	The Commission recommends that for future rail infrastructure projects, the designer should have a site presence so as to assist in ensuring that the design intent is implemented in the works.	5.3.1
FR-711	The Commission recommends that the Government considers extending the role of the M&V consultant to provide a wider 'eyes and ears' role to help protect the Government's interests in the delivery of projects. This role might include monitoring of the operation of the project quality assurance systems on top of the current role of monitoring cost, programme and public safety issues. The M&V consultant's role could be developed into a Government's 'Project Representative' role that works more closely with MTRCL to monitor performance and to identify emerging issues.	6.1
FR-712	The Commission recommends that the Government should critically address the way in which it executes its multiple roles in relation to the delivery of railway projects. Of particular concern is the Government's role as 'client' or 'sponsor' of railway projects. The sponsor organisation must both command authority and take responsibility for the project	2.3.1
FR-713	The Commission recommends that for future railway projects, a Project Board should be established to provide strategic direction. The Project Board might comprise appropriate Government officials as board members, supported by external non-executive members from specialist backgrounds who could bring experience of best practice from the wider industry so as to provide strategic advice. The Sponsor should attend the Project Board meetings and report to the Project Board.	2.3.2
FR-714	The Commission recommends that consideration be given as to whether it is appropriate for railway projects to remain within the portfolio of the Director of Highways, or whether a new distinct Director of Rail Development role should be established to handle and supervise railway planning and delivery matters. In this regard, the Commission is pleased to note that the Chief Executive has announced in her 2019 Policy Address Supplement that the Government will examine the feasibility of establishing a new department specifically tasked to handle and supervise railway planning and delivery matters.	2.3.3
FR-715	The Commission recommends that consideration should be given as to the appropriateness of the 'Concession' model for future projects entrusted by the Government to be project managed by MTRCL, or whether the Government should revert to the previously used 'Ownership' model. Alternatively, consideration might be given to the	2.3.4

	creation of a Special Purpose Vehicle ('SPV') approach, with a dedicated Board and delivery organisation, as has been employed on major rail infrastructure projects in the UK.[70] [70] Crossrail Limited and HS2 Limited	
FR-716	The Commission recommends that the Government reviews the way that liaison and communications is carried out between HyD / RDO, MTRCL and BD. The Commission suggests that it might be more beneficial for BD to act more as a proactive project participant, offering its advice and expertise.	3.1.3
Annexure H of the Final Report - Recommendations of Mr Steve Rowsell on strengthening systems for supervision, monitoring, control and management (Original Terms)		
HA-151	Strengthen the involvement of senior leaders in all parties in establishing appropriate behaviours across the organisations to support a collaborative approach in the delivery of the project. Leadership roles should be developed in line with the principles set out in ISO9001:2015 and would involve senior leaders being more visible to the workforce and in them taking a lead role in communicating key messages throughout the organisations.	2.1.1 2.1.2
HA-152	To support collaborative working on projects, establish a cross-party Senior Leadership Forum to monitor working relationships and cultural aspects of service delivery and to agree ways of developing collaborative working.	2.1.3
HA-153	Consider ways of improving closer working between different groups within the project organisation to avoid the risk of silo-working in which information and knowledge is not shared. Consider the effectiveness of existing communication arrangements between the teams and throughout the organisation. Review information databases and systems to ensure that there is a single source of the true position which is accessible as appropriate to all people.	3.4.1
HA-154	Review and clarify MTRCL roles and responsibilities in relation to the provisions and requirements of the Conditions of Contract. In particular ensure that the position of Engineer to the Contract is understood and that roles and responsibilities respect the need for the Engineer to act impartially in the administration of the contract. The role of the Engineer needs to be integrated and compatible with the roles of others in MTRCL who have responsibilities for delivering obligations under the EAs.	3.4.2
HA-155	Review arrangements for managing relationships with stakeholders to ensure that there is clarity on responsibilities and clear lines of communications particularly with Government Departments.	3.4.3

	Arrangements should be set out in a Stakeholder Management Plan which is accessible by all involved in the project delivery.	
HA-156	Review how Government organises itself for the management of its interests in the railway project. The structure needs to take account of the requirement for MTRCL to consult ten or more different Government Departments as part of its responsibilities for delivering the project. Whilst the Agreement with MTRCL is signed by the Secretary for Transport and Housing on behalf of the Hong Kong SAR Government, there would appear to be scope for improving the Government's project sponsorship arrangements to provide greater clarity in communication and reporting lines and more efficient project controls.	2.3.1 2.3.3
HA-157	In relation to BO and consultation, the current structure of documents setting out requirements is quite complex and not easy to follow. I consider that for a specific project it would be helpful for Government to pull together the provisions into a clearer and more precise description of the requirements and responsibilities.	5.1.1
HA-158	Consider extending the role of the MVC to provide a wider "eyes and ears" role to help protect Government's interests in the delivery of the project. The role should also provide high level monitoring of the operation of the project quality assurance systems as well as the current role in monitoring cost and programme issues. The MVC role could be developed into a Government's Project Representative role who works more closely within the MTRCL organisation to monitor performance and to identify emerging issues.	6.1
HA-159	Consider options for working arrangement in which Government staff would be integrated within MTRCL teams on a regular basis, say one day a fortnight, to help ensure a common understanding of requirements, improve communications, undertake joint forward planning and to resolve issues more efficiently.	3.1.1
HA-160	Review the attendance at the PSC to ensure that it is operating as intended, as a high-level committee focusing on strategic issues and performance. Ensure that the reporting arrangements to PSC are providing the Committee with reliable performance data which will allow substantive issues relating to time, cost and quality to be identified and acted upon.	2.4.1 2.4.2
HA-161	Review the BD's CoP to give clarity on the definition of supervision, record keeping requirements and non-conformance reporting. Terminology such as "continuous and full time supervision" requires further explanation. It would also be desirable for the BD's CoP to set out requirements of the communication of the supervision plan and	5.1.2

	associated obligations. The overall supervisory arrangements should provide an adequate role for the designer to give assurance that the intent of the design is delivered in the construction of the Works.	
HA-162	Develop a conflicts of interest policy appropriate and applicable to projects of this nature. Allocate responsibility for administering the policy to the PCM or other committee as appropriate.	4.1
HA-163	Review the lump sum contractual arrangement used to employ the MVC and consider options which may provide a more effective incentive to be proactive in the execution of its duties.	6.2.1
HA-164	Clarify in MVC briefs clearer requirements in relations to site audits and surprise checks.	6.3
HA-165	Ensure that companies appointed to MVC roles have access to the necessary levels of resource if the level of monitoring by the MVC has to be increased due to concerns about poor performance.	6.2.2
HA-166	Consider the option of recovering MVC audit costs if poor performance by the contracting parties results in additional audits being required above that normally required.	6.2.1
HA-167	Review the wording of the Particular Specification in relation alternative works design proposals to ensure that the process and terminology is aligned with the contract conditions.	5.2.1
HA-168	Ensure that construction method statements are in place based on the latest approved designs before construction commences.	5.2.2
HA-169	Review the liaison arrangements between the Contractor's design team, the BA and MTRCL's design and construction management teams to ensure that there is common understanding of submission requirements and that all parties are aware of design issues and the forward programme of potential submissions.	5.2.3
HA-170	Review the significant number of various documents which set out supervision requirements and guidance with the aim of rationalising the documents to a more manageable and readable number. Ideally, it would be better to have all supervision requirements and responsibilities pulled together into a single Supervision Manual made accessible to all involved in the supervision and inspection procedures and such Supervision Manual should be translated into the Chinese language which workers are familiar with. There is evidence before the Commission that there might not be any Chinese version of the SSP and the provisions of the SSP were not explained to site supervisors[54].	5.3.2

[54] Chan Chi Ip **[Day 19/pp.26:29:9; 66:17-68:8]**

HA-171	Develop a clear definition of supervision for the purposes of contractual obligations and adopt a consistent approach to terminology throughout the documentation. The requirements need to be specific about the information that needs to be recorded and certified.	5.3.3
HA-172	To deliver best value for money and to make best use of resources, the frequency of supervision and inspections should be flexible and reactive to the compliance and performance of work with requirements. Demonstration of consistently high-quality work should allow supervision requirements to be reduced with confidence being maintained by less frequent supervision supported by self-certification and audits.	5.3.4
HA-173	Review the requirements for formally defined hold-points in relation to the contract provisions for not covering-up work without inspection. Clarify whether inspection certificates apply to both hold-points and pre-covering up inspections. In the evidence given before the Commission, there seems to be confusion and misunderstanding over the requirements to keep contemporaneous inspection records and RISC forms. Mr Aidan Rooney, General Manager of MTRCL, took the view that RISC forms alone were more than enough evidence to show that the rebar and couplers were properly completed and connected[55]. Mr Louis Kwan, Construction Engineer of MTRCL responsible for the inspection of bar-fixing works, however, gave evidence which suggested that the RISC forms which he signed did not, in fact, signify that couplers had been inspected. As far as he was concerned, he was never even assigned to inspect the couplers, hence he did not inspect the couplers on formal inspection, and the RISC forms which he signed did not cover couplers[56]. Mr Kobe Wong as a Senior Inspector of Works of MTRCL, on the other hand, gave evidence that he was expressly told by his superior that inspection of couplers for the EWL slab was the responsibility of the Construction Engineer team (which included Mr Louis Kwan) and that he should refrain from inspecting the couplers. This is notwithstanding that he was assigned to inspect the couplers when the diaphragm walls were built[57]. [55] Aidan Rooney **[Day 28/p.53:16-24]** [56] Louis Kwan **[Day 29/pp.16:7-29:20]** [57] Kobe Wong **[Day 30/pp.4:17-12:25]**	5.3.5
HA-174	Review options for the use of the latest technological applications and tools, such as tablets or smartphones, to support the efficient effective recording of site records.	5.3.6

HA-175	Ensure that there are procedures in place to record who are undertaking supervision duties on a daily basis and that supervisors have the required level of competence.	5.3.7
HA-176	Ensure that records are kept to support the possible application of the contractual disallowable cost provisions.	5.3.8
HA-177	Review the adequacy of existing entry / exit site staff recording system in relation to: • knowing who is on site; • supporting the payment of people under the commercial model; • knowing who undertook work inspections and who certified work; • helping to confirm that the required level of supervision and the numbers supervisors to workers is provided.	5.4
HA-178	Review current guidance on NCRs to ensure that there is clarity and consistency on when non-conformance reports should be issued.	5.5.1
HA-179	Encourage a culture that treats non-conformance reporting in a similar way to "near-miss" reporting on health and safety so that lessons learnt drives continuous improvement.	5.5.2
HA-180	Maintain a single NCR database across all parties which is accessible to all supervisors and inspectors to allow recurrent issues to be readily identified.	5.5.3
HA-181	Review and enhance the NCR close-out procedures including effective monitoring arrangements.	5.5.4
HA-182	Review and improve the detailed content of Project Management Plans, as set out in paragraphs 22 and 23 of this report, to make them more comprehensive and relevant to the project by translating generic guidance into project specific requirements. The Plan should minimise the need to cross refer to other documents for details of project specific requirements.	5.6.1
HA-183	Consider including an introductory section in PMPs setting out MTRCL's corporate policies and the project strategic objectives to help steer the development of the project.	5.6.2
HA-184	It would be desirable to be more specific about which PIMS manuals are applicable to a project and job roles rather than just including a long list of all PIMS documents.	5.6.3
HA-185	Consider including in the PMP, proposals for: • partnering arrangements and initiatives;	5.6.4

	• checklists for sub-contract approval procedures, including revisions to subcontract terms and arrangements; and • commercial management procedures including the settlement of sub-contract final accounts.	
HA-186	Review PIMS procedures, and update as necessary, to ensure alignment of project management guidance and procedures with contractual procedures. As part of this, highlight in the manuals the aspects of the guidance which need to be assessed for the specific circumstances of a project and translated into project-specific guidance in the PMP.	5.7.1 5.7.2
HA-187	Review and refresh the older PIMS manuals which date back as far as 2008.	5.7.1
HA-188	Review training on PIMS and contract procedures, including ongoing refresher training and the coverage of any updates to the procedures. Where appropriate, consider integrated training sessions with the Contractor to ensure a common understanding of requirements.	5.7.3
HA-189	Highlight the aspects of PIMS manuals which need to be converted from generic advice into project specific proposals.	5.7.2
HA-190	Review the current documents setting out requirements for as-built drawings to ensure that there is consistency and clarity on roles, responsibilities and procedures. Pull together responsibilities and procedures associated with as-built drawings in the PMP.	5.8.1
HA-191	Clarify and maintain site records to support the delivery of the contractual requirements for the prompt recording of as-built dimensions and details.	5.8.2
HA-192	Rigorous monitoring of as-built drawing production to be introduced and progress reported as part of the monthly progress to PSC.	2.4.3 5.8.3
HA-193	Review and clarify the procedures for the submission and acceptance of working method statements.	5.9
HA-194	Introduce the standard use of an industry standard collaborative form of contract such as NEC4.	3.2
HA-195	Review options for more integrated and co-located working between the parties to achieve greater transparency of issues, better forward planning and joint risk management.	3.1.1
HA-196	Develop and implement the use of BIM as a collaboration tool.	3.3
HA-197	Review the procedures for the approval of sub-contracts and any subsequent revisions which change the conditions and/or prices.	4.3.1

HA-198	Review the arrangements for the commercial settlements of sub-contracts to include a stage for MTRCL to verify and accept that proposed settlements are in line with the approved sub-contract terms and conditions.	4.2 4.3.2
HA-199	Review and rationalise the provisions for disallowable cost and consider incorporating works not undertaken in accordance with approved plans and procedures as a disallowable cost. This would be achieved by the use of the NEC contract.	4.3.3
Annexure H of the Final Report - Recommendations of Mr Steve Rowsell on strengthening systems for supervision, monitoring, control and management (Extended Terms)		
HB-131 – HB-133	MTRCL should review and reflect on the priorities that it has identified for their top management particularly in relation to culture and the application of corporate procedures. MTRCL should review how effectively the leadership priorities set out in PIMS/MAN/003/A6 at paragraph 3.1 **[B3/1080-1081]** are being achieved. MTRCL should develop an improvement action plan to maintain progress in the implementation of the leadership priorities. MTRCL should consider how successful the leadership has been in embedding throughout the organisation, the culture and behaviours which flow from the leadership priorities set out in PIMS/MAN/003/A6. It would be desirable to establish a method for monitoring and measuring company culture on an ongoing basis. Senior leaders should develop a coordinated programme of office and site visits to support the communication of corporate values, behaviours and priorities directly to MTRCL staff throughout the organisation.	2.1.4
HB-134	MTRCL should review its processes for monitoring resource levels throughout the organisation and identifying potential pressure points. It should ensure that: a. line managers at all levels are applying systems to measure the performance of individuals in relation to the application of required quality procedures and are reporting the findings to top management; b. individuals are encouraged to report resource pressures which may put the implementation of quality procedures at risk; and c. line managers should consult with senior managers about priorities in the event that resource pressures are identified.	2.5
HB-135	MTRCL should investigate and introduce new technology-based RISC form procedures which can be implemented by site staff using portable devices such as tablets. MTRCL should ensure that roles and responsibilities in relation to the RISC procedures and the recording of	5.10.2 5.10.3

	results are clear and communicated to all those involved in the procedures on a project specific basis.	
HB-136 – HB-137	Requirements relating to RISC form procedures and inspections are set out in a number of different documents. MTRCL should consider whether it would be beneficial to pull the information together into a single source covering requirements on individual projects. MTRCL should review and clarify procedures in relation to inspections which are not formal hold-points. Ideally procedures for informal and formal procedures would be administered and recorded using the same technology and systems.	5.10.2
HB-138	MTRCL should review its arrangements for ensuring that its site staff have access to the latest working drawings to support more reliable surveillance and inspections of the works. It is likely that this would be best facilitated through the use of technology solutions and mobile devices.	5.10.3
HB-139	MTRCL should consider ways of improving the forward planning of formal inspections. Forward programmes should be informed by the notice periods provided by the submission of Inspection and Test Plans. The plans should be used to support MTRCL's resource planning and to monitor when inspections are expected and ensure that they are being requested and completed.	5.10.4
HB-140	MTRCL should review responsibilities and procedures for ensuring that non-compliances with procedures by the Contractor are addressed promptly and that action is taken to remedy non-compliances. MTRCL should ensure that responsibility is clearly seen to lie with the Engineer and that appropriate action is taken in accordance with the provisions of the contract.	5.5.4
HB-141	MTRCL should review its training strategies and plans to ensure that staff are being provided with the necessary training required to perform their roles effectively. Individual training and development plans should be maintained and regularly updated to ensure that they develop the necessary skills and competences for the tasks they are performing.	2.2.3
HB-142	Training modules on PIMS procedures should be developed which align with the requirements of individual roles. Training for different roles should focus on specific PIMS procedures which are of particular relevance to the role.	5.7.3
HB-143	MTRCL should maintain a readily accessible system which records training undertaken and qualifications achieved by individuals. A system that links required skills, competences and qualifications to individual roles and duties within project teams would be highly	2.2.3

	desirable. The system should be used to confirm that individuals allocated to key tasks have completed necessary training schemes including the use of technical components specific to the project.	
HB-144	Induction training for new staff should be reviewed to ensure that it is effectively covering corporate culture, values and behaviours. The importance of working within MTRCL's quality management system should also be covered. Induction training should be mandatory and opportunities found to refresh the messages at regular intervals.	2.2.3
HB-145	As part of the development of project staff, line managers should implement mentoring arrangements for team members which would include them being accompanied on occasions by experienced staff whilst they become familiar with their roles and the tasks they are performing. This should be used to identify any weaknesses in their technical or procedural knowledge and to identify requirements for training and development.	2.2.4
HB-146	MTRCL should assess the understanding throughout project organisations of the understanding of non-contractual project partnering where it is applied to projects. Where necessary, further direction and training should be provided on the behaviours expected of staff working in a partnering environment. It should be emphasised that partnering arrangements are not an excuse for failing to implement specified procedures.	2.2.5
HB-147	MTRCL should review its arrangements for training staff in the use of PIMS and seek to ensure that training modules are focused as closely as possible on the roles of individuals. Training should cover the procedures to be followed and also provide an understanding of the importance of applying quality procedures.	5.7.3
HB-148	MTRCL should review its arrangements for communicating updates and revisions to staff and should develop procedures for targeting relevant staff who are mainly responsible for implementing new guidance and procedures.	5.7.1
HB-149	PIMS procedural document PIMS/PN/11-4/A6 Monitoring of Site Works includes requirements for the issue of Non-conformance Reports. MTRCL should review this guidance to ensure that it is consistent with BD's Code of Practice for Site Supervision.	5.5.1
HB-150 - HB-152	MTRCL should review its requirements for site record keeping and develop clearer and more comprehensive guidance which is communicated effectively to site staff. This should be supported by technology solutions and devices which make the procedures as simple and as efficient as possible.	5.7.1

	MTRCL should review and update PIMS guidance on the use of photographs as a record of works inspections. This should ensure that photographic records are controlled and stored in a structured system. MTRCL should consider the development of a PIMS manual on the development of project communication strategies setting out roles, responsibilities, systems and reporting requirements.	
HB-153	MTRCL, in liaison with the Government, should review the content and use of Project Management Plans and ensure that they are effectively performing the role expected of them. Consideration should be given to including sections in PMPs on the following: a. resource planning; b. training and development plans for project purposes; c. project communication strategies; d. interface risk management; and e. leadership roles in establishing appropriate culture and behaviours.	5.6.4
HB-154	MTRCL should consider and clarify roles and responsibilities in relation to their obligations as Project Manager in delivering Entrustment Activities and also as Engineer to the Contract. In particular, clarification and guidance should be given to project team members in relation to reporting and communication requirements both internally within the MTRCL organisation and externally with the Contractor and stakeholders.	3.4.1 3.4.2
HB-155	MTRCL should review its systems and procedures for escalating problems and disputes up through the organisation to senior management. Senior management should encourage the reporting of issues where there may be doubt about whether to elevate them, so that senior management can consider their significance and decide whether to get involved.	3.4.4
HB-156	MTRCL should ensure that interface risks are generally treated as potential key risks in its procedural documents, risk management and reporting procedures.	5.12.1
HB-157 – HB-158	Interface management meetings should ensure that actions are clearly allocated and communicated to the responsible individuals. Meeting notes containing relevant information about interface issues should be communicated to all members of site teams who may be involved in the execution and supervision of the interface works. Consideration should be given, where appropriate, to holding interface workshops attended by relevant site team members, to ensure that the works are adequately planned and risks are identified and mitigated.	5.12.2

HB-159	MTRCL should ensure that method statements are required from contractors for the execution of works at interfaces.	5.12.1
HB-160	MTRCL should consider the appointment of a project interface manager in the Engineer's team who has responsibility for ensuring that interface planning and communications are delivered as required.	5.12.2
HB-161 – HB-162	MTRCL should develop procedures for ensuring that the Engineer's team is notified by the Contractor that a delivery requiring testing has arrived on site. MTRCL should ensure that requirements are included in contracts to achieve effective segregation on site of tested and untested steel to avoid the risk of untested steel being used in the works.	5.13.1
HB-163	MTRCL should review its procedures for reviewing problems that have occurred and learning lessons to avoid them being repeated. In the case of the need for major remedial works there should be an automatic requirement for an investigation to the causes of the problems.	2.6
HB-164	The Government should review and confirm its requirements for as-built records particularly in relation to the need for hard copies of RISC forms. The review should take account of the development of the increasing use of technology to create drawings and records and should ensure that requirements can be met as efficiently as possible.	5.1.3
HB-165	The Government should review its Consultation procedures in relation to design revisions and clarify arrangements for fast-tracking the Consultation process for minor design changes.	5.1.1
HB-166	The Government should review its requirements in relation to Project Management Plans and should ensure that they cover all of the key aspects that need to be in place to achieve successful outcomes. Consideration should be given to inclusion of the additional contents suggested in the section above on PMPs.	5.6.4
HB-167	The Government should review the way that liaison and communications have worked between RDO, BD and MTRCL. Consideration should be given as to whether the aim of a partnering approach to facilitate close communication on technical and project management issues as set out in the PMP has been achieved. Ways of improving communications and working relationships should be explored, such as more frequent site visits at a working level by members of RDO and BD.	3.1.3
HB-168	The Government should review its requirements for the testing of steel that has been delivered to sites from quality accredited sources in line with the long-term objectives set out in CS2:1995.	5.13.2

HB-169	In relation to the role of the Monitoring and Verification consultant, the Government should consider the following:	6.1 6.2.1 6.2.2 6.3 6.4
HB-169a	The M&V role should include construction quality and checks on construction records as failures in these areas can impact adversely on cost, programme and safety.	6.1
HB-169b	The Government should review its procedures for satisfying itself that the M&V consultant has sufficient resource capacity and flexibility of resource to deliver required services.	6.2.2
HB-169c	The Government should review its commercial arrangements for M&V contracts to ensure that they do not act as a disincentive to the delivery of comprehensive services. The Government should ensure that contracts provide a fair return for a good service.	6.2.1
HB-169d	The Government should consider on major complex contracts whether there could be benefit in appointing more than one M&V consultant to provide more flexibility and resilience of resource in delivering requirements.	6.2.2
HB-169e	The Government should ensure that M&V consultants treat interface risks as potential key risks as part of their risk-based approach to the identification of review priorities.	6.3
HB-169f	The Government should consider ways of ensuring that M&V consultants are advised promptly of construction problems and defective work which may require remedial works and could have significant cost and programme implications. This could include the possibility of the M&V consultant having an entitlement to sit in on Project progress meetings not normally attended by the Government.	6.4

Summary of Recommendations

	Recommendation[10]	Action Party[11]		Ref[12]
		Gov	MTR	
1. Promoting public safety				
1.1	**On-going monitoring of station structure** - ~~Instrumentation, by means of fibre optics or other approved measures, at the east and west diaphragm walls and the East West Line and North South Line platform slabs to detect movement during operational phase of the station, and movements should be monitored and reported to the Government.~~ On-going monitoring of the station structure during operation in the form of "Planned Preventive Inspection" regime for a period of up to five years.	✓		IR-460 (IR-391) FR-690 (FR-420)
2. Enhancement of leadership, competence, governance and culture				
2.1	**Leadership**			
2.1.1	- Closer involvement of senior leaders of all parties - Government, MTR Corporation Limited ("MTRCL") and contractors - working collaboratively to achieve a quality outcome, involving senior leaders being more visible to the workforce and taking a lead role in communicating key messages throughout their respective organisations.	✓		IR-471 FR-698 HA-151
2.1.2	- Leadership roles should be developed in line with the principles set out in ISO9001:2015.	✓	✓	HA-151
2.1.3	- Establish a cross-party Senior Leadership Forum comprising the Government, MTRCL, contractors and major sub-contractors to monitor working relationships and cultural aspects of service delivery and to agree ways of developing collaborative working.	✓		HA-152 (IR-455) (FR-686)

[10] Recommendations that were considered as fully implemented in the First Audit Report are shaded in grey.

[11] Recommendations 1.1, 2.1.1, 2.1.3, 3.1.1, 3.1.2, 4.1, 4.2 and 5.6.4 are to be implemented jointly by the Government and MTRCL.
Recommendations 2.1.2, 2.2.1, 2.2.2, 3.2 and 3.3 are to be implemented independently by the Government and MTRCL.

[12] IR-X denotes paragraph reference in the redacted Interim Report; FR-X denotes paragraph reference in redacted Final Report; HA-X and HB-X denote paragraph reference in Mr Steve Rowsell's first and second expert reports respectively, both provided in Annexure H of the Final Report. Paragraphs with their numbers in brackets do not carry recommendations per se, but suggestions from the Commission or its experts which supplement the recommendations.

2.1.4	- Review and reflect on MTRCL's leadership priorities and their implementation, particularly in relation to culture and the application of corporate procedures (e.g. as set out in PIMS/MAN/003/A6). - Develop an improvement action plan to maintain progress in the implementation of leadership priorities. - Establish a method for monitoring and measuring company culture on an ongoing basis. - Senior leaders to develop a coordinated programme of office and site visits to support the communication of corporate values, behaviours and priorities directly to MTRCL staff throughout the organisation.		✓	HB-131 – HB-133
2.2	**Competence**			
2.2.1	- Review the "Competence" requirements for personnel engaged in project management/sponsorship roles and review checks and procedures to ensure ongoing competence of project-related staff.	✓	✓	IR-473 – IR-474 FR-707
2.2.2	- Put in place effective measures to reduce the risk of failure by mistake, incompetence or malicious act.	✓	✓	IR-474 FR-707
2.2.3	- Review induction training for project staff and mandate induction training and find opportunities to refresh the messages at regular intervals. - MTRCL to maintain individual training and development plans and a readily accessible system which records training undertaken and qualifications achieved by individuals to ensure that individuals have completed necessary training schemes and developed the skills and competences for the tasks they are performing.		✓	FR-708 HB-141 HB-143 HB-144
2.2.4	- Line managers to implement mentoring arrangements for team members to identify any weaknesses in their technical or procedural knowledge and to identify requirements for training and development.		✓	HB-145
2.2.5	- Assess the understanding throughout project organisations of non-contractual project partnering where it is applied to projects and, where necessary, provide further direction and training on the behaviours expected of staff working in a partnering environment.		✓	HB-146
2.3	**Governance**			
2.3.1	- Critically address the way in which the Government executes its multiple roles in relation to railway enhancement projects and actively consider creating an overall Government "sponsor" role for all individual	✓		IR-475 FR-671 FR-712

	projects to provide both authority and responsibility for the project. - Carry out a comprehensive review of the way in which it monitors and controls major projects, making fundamental changes where appropriate.			HA-156 (IR-444) (IR-446) (FR-673)
2.3.2	- For future railway enhancement projects a Project Board should be established to provide strategic direction. The Project Board might comprise appropriate Government officials as board members, supported by external non-executive members from specialist backgrounds who could bring experience of best practice from the wider industry so as to provide strategic advice.	✓		IR-476 FR-713
2.3.3	- Review how the Government organises itself for the management of its interests in the railway project. Establish a single point of responsibility within the Government for administering its agreement with MTRCL, especially in overseeing and managing internal consultations. Consider whether rail projects should remain within the portfolio of Director of Highways or a new distinct Director of Rail Development should be established.	✓		IR-477 FR-714 IR-442 HA-156 (IR-443) (FR-668 – FR-669)
2.3.4	- Consider whether the Government should continue to adopt the concession model or revert to ownership model, or the "Special Purpose Vehicle" approach with a dedicated Board and delivery organisation with reference to the experience of major rail infrastructure projects in the United Kingdom.	✓		IR-478 FR-715 (IR-445) (FR-672)
2.4	**Facilitating the work of the Project Supervision Committee ("PSC")**			
2.4.1	- Review the attendance at the PSC to ensure that it is operating as a high-level committee focusing on strategic and performance issues as intended.	✓		HA-160
2.4.2	- Ensure that the PSC is provided with reliable performance data which will allow substantive issues relating to time, cost and quality to be identified and acted upon.	✓		HA-160
2.4.3	- Report progress of as-built drawing production as part of the monthly progress to PSC.	✓		HA-192
2.5	**Reviewing resource monitoring processes** - Review MTRCL's processes for monitoring resource levels throughout the organisation and identifying potential pressure points.		✓	HB-134
2.6	**Reviewing investigation procedures**		✓	HB-163

	- Review MTRCL's procedures for reviewing problems that have occurred and for learning lessons to avoid them being repeated, and automatically requiring for an investigation to the causes of the problems in case major remedial works are needed.			
3. Promoting collaborative culture				
3.1	**Fostering integrated working arrangement**			
3.1.1	- Consider options for working arrangement in which Government staff could be integrated within MTRCL teams on a regular basis to help ensure a common understanding of requirements, improve communications, undertake joint forward planning and to resolve issues more efficiently. - Review options for more integrated and co-located working between the parties to achieve greater transparency of issues, better forward planning and joint risk management.	✓		HA-159 HA-195
3.1.2	- Create more collaborative culture between the Government, MTRCL and contractors with the objective of achieving more successful project outcomes, e.g. closer working relationship between the Buildings Department ("BD") and MTRCL and its designers and contractors to facilitate dialogue in all engineering matters.	✓		IR-451 – IR-452 FR-681 – FR-682
3.1.3	- Review the way that liaison and communications have worked between Highways Department Railway Development Office ("RDO"), BD and MTRCL, e.g. BD to act more as a proactive project participant, offering its advice and expertise. Explore ways of improving communications and working relationships, such as more frequent site visits at a working level by members of RDO and BD.	✓		FR-716 (FR-683) HB-167
3.2.	**Introducing New Engineering Contract ("NEC")** - Introduce standard use of an industry standard collaborative form of contract such as NEC4.	✓	✓	HA-194 (IR-454) (FR-685)
3.3	**Adopting Building Information Modelling ("BIM") as a collaboration tool** - Develop, implement and promote the use of BIM ~~as a collaboration tool~~, first at a basic, "collaborative" level so as to gain experience before building up to more sophisticated, multi-dimensional versions.	✓	✓	IR-469 FR-659 FR-709 HA-196 (IR-428 – IR-434) (IR-437)

				(IR-454) (FR-652 – FR-658) (IR-662) (FR-685)
3.4	**MTRCL's internal organisation**			
3.4.1	- Consider ways of inducing closer working between different groups within the project organisation to avoid the risk of silo-working in which information and knowledge is not shared. Consider the effectiveness of existing communication arrangements between the teams and throughout the organisation. Review information databases and systems to ensure a single accessible source of true position accessible as appropriate to all people. - Provide clarification and guidance to project team members in relation to reporting and communication requirements within the MTRCL.		✓	HA-153 HB-154
3.4.2	- Review and clarify MTRCL roles and responsibilities in relation to ~~the provisions and requirements of the Conditions of Contract. In particular, ensure that the position of Engineer to the Contract is understood and that roles and responsibilities respect the need for the Engineer to act impartially in the administration of the contract. The role of the Engineer needs to be integrated and compatible with the roles of others in MTRCL who have responsibilities for delivering obligations under the Entrustment Agreements ("EAs")~~ construction contracts, perhaps by allocating and distinguishing its roles as the "Engineer" (and his representatives) from its separate roles as the "Project Manager" in delivering Entrustment Activities.		✓	FR-700 HA-154 HB-154 (FR-629)
3.4.3	- Review arrangements for managing relationships with stakeholders to ensure that there is clarity on responsibilities and clear lines of communications particularly with Government Departments, and set out such arrangement in a Stakeholder Management Plan which is accessible by all involved in the project delivery.		✓	HA-155
3.4.4	- Review MTRCL's systems and procedures for escalating problems and disputes up through the		✓	HB-155

	organisation to senior management, who should encourage the reporting of issues in case of doubt.			
4. Revised arrangements for contractual and commercial issues				
4.1	**Devising and developing a conflict of interest policy** - Developing a conflict of interest policy appropriate and applicable to projects of this nature, the administration of which may be assigned to the Project Coordination Meeting or other committees as appropriate.	✓		HA-162
4.2	**Commercial settlements** - Including subcontracts within the provisions for commercial settlements set out in the Entrustment Agreement to provide the Government with greater transparency of commercial settlements which have a significant impact on the settlement of the final contract value and greater control on the settlement of the contract final account.	✓		HA-198 Para 143 of Rowsell's first Expert Report
4.3	**Subcontracting arrangements and commercial settlements**			
4.3.1	- Review the procedures for the approval of sub-contracts and any subsequent revisions which change the conditions and/or prices.		✓	HA-197
4.3.2	- Review the arrangements for the commercial settlements of sub-contracts to include a stage for MTRCL to verify and accept that proposed settlements are in line with the approved sub-contract terms and conditions.		✓	HA-198
4.3.3	- Review and rationalise the provisions for disallowable costs and consider incorporating works not undertaken in accordance with approved plans and procedures as a disallowable costs.		✓	HA-199
5. Rationalisation and clarification of rules and requirements				
5.1	**Rationalising and clarifying rules and requirements**			
5.1.1	- In relation to the Buildings Ordinance and consultation, pull together the provisions into a clearer and more precise description of the requirements and responsibilities. - Review consultation procedures in relation to design revisions and clarify arrangements for fast-tracking the consultation process for minor design changes.	✓		HA-157 HB-165
5.1.2	- Review the 2009 Code of Practice for Site Supervision ("CoP") to give clarity on the definition of supervision, record keeping requirements and non-conformance	✓		HA-161

	reporting. Set out in CoP requirements of the communication of the supervision plan and associated obligations, which should provide an adequate role for the designer to ensure delivery of design intent in the construction.			
5.1.3	- Review and confirm requirements for as-built records particularly in relation to the need for hard copies of Request for Inspection and Survey Checks ("RISC") forms, taking into account the development of the increasing use of technology to create drawings and records and should ensure that requirements can be met as efficiently as possible.	✓		HB-164
5.2	**Clarifying design submission and consultation procedures**			
5.2.1	- Review the wording of the Particular Specification in relation to alternative works design proposals to ensure that the process and terminology is aligned with the contract conditions.		✓	HA-167
5.2.2	- Ensure that the construction method statements are in place based on the latest approved designs before construction commences.		✓	HA-168
5.2.3	- Review the liaison arrangements between the Contractor's design team, the Building Authority and MTRCL's design and construction management teams to ensure common understanding of submission requirements and awareness of design issues and the forward programme of potential submissions.		✓	HA-169
5.3	**Rationalising and clarifying supervision requirements**			
5.3.1	- For future rail infrastructure projects, require site presence of the designer to assist in ensuring implementation of design intent in the works.		✓	IR-470 FR-710 (IR-416) (FR-639)
5.3.2	- Review documents which set out supervision requirements and guidance to rationalise the documents to a more manageable and readable number, ideally with a view to producing an all-inclusive and bilingual "Supervision Manual" accessible to all involved in supervision and inspection procedures.		✓	HA-170
5.3.3	- Develop a clear definition of supervision for the purpose of contractual obligations and adopt a consistent approach to terminology throughout the documentation, with requirements being specific about the information that needs to be recorded and certified.		✓	HA-171

5.3.4	- Make the frequency of supervision and inspections flexible and reactive to the compliance and performance of work with requirements, with less frequent supervision supported by self-certification and audits upon demonstration of consistently high-quality work.		✓	HA-172
5.3.5	- Review the requirements for formally defined hold points in relation to the contract provisions for not covering-up work without inspection and clarify whether inspection certificates apply to both hold points and pre-covering up inspections.		✓	HA-173
5.3.6	- Review options for the use of the latest technological applications and tools to support the efficient effective recording of site records.		✓	HA-174 (IR-426) (FR-650)
5.3.7	- Ensure there are procedures in place to record who are undertaking supervision duties on a daily basis and that supervisors have the required level of competence.		✓	HA-175
5.3.8	- Ensure that records are kept to support the possible application of the contractual disallowable cost provisions.		✓	HA-176
5.4	**Reviewing site entry/exit systems and records** - Review the existing entry/exit site staff recording system in relation to: • knowing who is on site; • supporting the payment of people under the commercial model; • knowing who undertook work inspections and who certified work; and • helping to confirm that the required level of supervision and the ratio of supervisors to workers.		✓	HA-177
5.5	**Reviewing non-conformance reporting**			
5.5.1	- Review current guidance on non-conformance reports ("NCRs") (e.g. requirements in Project Integrated Management System ("PIMS") procedural document PIMS/PN/11-4/A6) to ensure clarity and consistency on when NCRs should be issued and with BD's CoP.		✓	HA-178 HB-149 (IR-408) (FR-630)
5.5.2	- Encourage "near-miss" non-conformance reporting to drive continuous improvement.		✓	HA-179
5.5.3	- Maintain a single NCR database across all parties which is accessible to all supervisors and inspectors to allow recurrent issues to be readily identified.		✓	HA-180 (IR-408) (FR-630)

5.5.4	- Review and enhance the NCR close-out procedures including effective monitoring arrangements. Make sure that responsibility for ensuring non-compliances with procedures being promptly addressed is clearly seen to lie with the Engineer and that appropriate action is taken in accordance with the provisions of the contract.		✓	HA-181 HB-140 (IR-410) (FR-633)
5.5.5	- Distinguish reporting procedures for non-conforming works from that for non-conforming processes in contract specifications.		✓	FR-706 (FR-632)
5.6	**Reviewing Project Management Plans ("PMPs")**			
5.6.1	- Make PMPs more comprehensive and relevant to the project by translating generic guidance into project specific requirements while minimising cross-reference to other documents.		✓	HA-182
5.6.2	- Consider including an introductory section in PMPs setting out MTRCL's corporate policies and the project strategic objectives to help steer the development of the project.		✓	HA-183
5.6.3	- Include specific details about which PIMS manuals are applicable to a project and job roles.		✓	HA-184
5.6.4	- Review requirements in relation to the content and use of PMPs and consider including/ensure that they cover: (a) proposals for partnering arrangements and initiatives; (b) checklists for sub-contract approval procedures; (c) commercial management procedures; (d) resources planning; (e) training and development plans for project purposes; (f) project communication strategies; (g) interface risk management; and (h) leadership roles in establishing appropriate culture and behaviours.	✓		HA-185 HB-153 HB-166
5.7	**Reviewing PIMS**			
5.7.1	- Review and update PIMS procedures and manuals, including: (a) requirements for site record keeping, supported by technology solutions and devices; (b) arrangements for communicating updates and revisions to staff;		✓	HA-186 HA-187 FR-701 HB-148 HB-150 HB-152

	(c) use of photographs as a record of works inspections; and (d) development of new manual on project communication strategies setting out roles, responsibilities, systems and reporting requirements. - Ensure alignment of project management guidance and procedures with contractual procedures.			(IR-467)
5.7.2	- Highlight in the manuals the aspects of the guidance which need to be assessed for the specific circumstances of a project and translated into project-specific guidance in the PMP, and the aspects of PIMS manuals which need to be converted from generic advice into project specific proposals.		✓	HA-186 HA-189
5.7.3	- Review training (with the contractor where appropriate) on PIMS and contract procedures, including ongoing refresher training and the coverage of any updates to the procedures. Training should cover the procedures to be followed and provide an understanding of the importance of applying quality procedure. - Develop training modules on PIMS procedures in alignment with the requirements of individual roles by focusing training for different roles on the specific PIMS procedures which are of particular relevance to the role.		✓	HA-188 HB-142 HB-147
5.8	**As-built drawings requirements and production**			
5.8.1	- Review the current documents setting out requirements for as-built drawings to ensure consistency and clarity on roles, responsibilities and procedures, and pull them together in the PMP.		✓	HA-190
5.8.2	- Clarify and maintain site records to support the delivery of the contractual requirements for the prompt recording of dimensions and details of as-built structures.		✓	HA-191
5.8.3	- Introduce rigorous monitoring of as-built drawing production.		✓	HA-192
5.9	**Clarifying method statement procedures** - Review and clarify the procedures for the submission and acceptance of working method statements.		✓	HA-193
5.10	**RISC Form and Inspection Procedures**			
5.10.1	- Introduce a further hold point for the contractor and MTRCL to jointly confirm readiness to commence reinforcement installation so as to ensure that all		✓	FR-702 (FR-614)

	couplers are present and properly exposed and that coupler threads are not damaged.			
5.10.2	- Provide clarity in contract specifications as to the status of RISC forms (in paper and/or digital form), and as to their retention and storage requirements. - Ensure that roles and responsibilities in relation to the RISC procedures and the recording of results are clear and communicated to all those involved in the procedures on a project specific basis. - Consider pulling the requirements relating to RISC form procedures and inspections into a single source covering requirements on individual projects. - Review and clarify procedures in relation to inspections which are not formal hold points, ideally using the same technology and systems as formal procedures.		✓	FR-703 HB-135 HB-137 (FR-644) (FR-647)
5.10.3	- Introduce new technology-based RISC form procedures and ensure that site staff have access to the latest working drawings to support more reliable surveillance and inspections of the works.		✓	HB-135 HB-138
5.10.4	- Consider ways of improving the forward planning of formal inspections and inform forward programmes by the notice periods provided by the submission of Inspection and Test Plans to support resource planning and ensure that inspections are being requested and completed as expected.		✓	HB-139
5.11	**BOSA mechanical couplers** - Devise and prescribe a clearer and more foolproof means of positively indicating that the coupler assembly has been correctly installed in a manner that will achieve its specified structural properties, which should not be dependent on merely counting the number of exposed threads.	*BOSA Technology (Hong Kong) Limited*		FR-704
5.12	**Interface Management**			
5.12.1	- Review interface management requirements, ensure that interface risks are generally treated as potential key risks and consider defining a joint interface inspection as a hold point. - Ensure that method statements are required from contractors for the execution of works at interfaces.		✓	FR-705 HB-156 HB-159
5.12.2	- Ensure that actions are clearly allocated and communicated to the responsible individuals in interface management meetings. - Consider holding interface workshops attended by relevant site team members to ensure that works are		✓	HB-157 HB-158 HB-160

	adequately planned and risks are identified and mitigated. - Consider the appointment of a project interface manager in the Engineer's team who has responsibility for ensuring that interface planning and communications are delivered as required.			
5.13	**Steel testing**			
5.13.1	- Develop procedures for ensuring that the Engineer's team is notified by the Contractor that a delivery requiring testing has arrived on site and ensure requirements are included in contracts to achieve effective segregation on site of tested and untested steel.		✓	HB-161 HB-162
5.13.2	- Review its requirements for the testing of steel that has been delivered to sites from quality accredited sources in line with the long-term objectives set out in Construction Standard CS2:1995.	✓		HB-168
6. Review of monitoring and verification ("M&V") arrangements				
6.1	**Extending the role of the M&V Consultant** - Consider extending the role of the M&V Consultant to provide a wider "eyes and ears" role to help protect the Government's interests in the delivery of the project and to provide high-level monitoring of the project quality assurance systems. Develop the M&V Consultant into the Government's Project Representative that works more closely within the MTRCL organisation to monitor performance and to identify emerging issues. - Consider including construction quality and checks on construction records in the M&V role as failures in these areas can impact adversely on cost, programme and safety.	✓		FR-711 HA-158 HB-169a
6.2	**Reviewing the engagement arrangements of the M&V Consultant**			
6.2.1	- Review the lump sum contractual arrangement used to employ the M&V Consultant to ensure that they do not act as a disincentive to the delivery of comprehensive services and consider options which may provide a more effective incentive to be proactive in the execution of its duties (e.g. provide a fair return for a good service). - Consider options of recovering M&V Consultant's costs from the defaulting party for additional audits as a result of poor performance by the contracting parties.	✓		HA-163 HA-166 HB-169c

6.2.2	- Review the procedures for satisfying itself that the M&V consultant has sufficient resource capacity and flexibility of resource to deliver required services. - Ensure that the M&V Consultant is given access to the necessary level of resources if the level of monitoring has to be increased due to concerns about poor performance. - Consider whether there could be benefit in appointing more than one M&V consultant on major complex contracts to provide more flexibility and resilience of resource in delivering requirements.	✓		HA-165 HB-169b HB-169d
6.3	**Clarifying requirements for the M&V Consultant** - Clarify in M&V Consultants' briefs requirements in relation to site audits and surprise checks. - Ensure that M&V consultants treat interface risks as potential key risks as part of their risk-based approach to the identification of review priorities.	✓		HA-164 HB-169e
6.4	**Ensuring prompt notification to M&V consultants** - Consider ways of ensuring that M&V consultants are advised promptly of construction problems and defective work which may require remedial works and could have significant cost and programme implications.	✓		HB-169f

Summary of Implementation Progress

	Implementation Progress	Number of recommendations	Recommendation number
a.	Fully implemented	50	1.1, 2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.2, 2.2.4, 2.2.5, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.4.1, 2.4.2, 2.4.3, 2.5, 3.1.1, 3.1.2, 3.1.3, 3.2, 3.3, 3.4.2, 3.4.3, 3.4.4, 4.1, 4.2, 5.1.1, 5.1.2, 5.1.3, 5.3.1, 5.3.4, 5.3.5, 5.3.6, 5.3.8, 5.4, 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.9, 5.10.1, 5.10.3, 5.10.4, 5.11, 6.1, 6.2.1, 6.2.2, 6.3 and 6.4
b.	Satisfactory progress towards implementation (fully implemented when the new Project Management Procedure document is launched by the end of Q2 2021/the new PIMS is substantially completed by the end of Q2 2021)	21	2.1.4, 2.2.3, 2.6, 3.4.1, 5.2.2, 5.2.3, 5.3.2, 5.3.7, 5.6.1, 5.6.2, 5.6.3, 5.6.4, 5.7.1, 5.7.2, 5.7.3, 5.8.1, 5.8.2, 5.8.3, 5.12.1, 5.12.2 and 5.13.1
c.	Satisfactory progress towards implementation (fully implemented when the review of suite of contract documents is completed during the course of 2021)	6	4.3.1, 4.3.2, 4.3.3, 5.2.1, 5.3.3 and 5.10.2[13]
d.	Others	1	5.13.2

[13] The full implementation of Recommendation 5.10.2 is also subject to the new PIMS, which will be substantially completed by the end of Q2 2021.

List of Abbreviations

APs	-	Authorized Persons
BD	-	Buildings Department
BIM	-	Building Information Modelling
BO	-	Buildings Ordinance
BOSA	-	BOSA Technology (Hong Kong) Limited
CDE	-	Common data environment
CEDD	-	Civil Engineering and Development Department
Commission	-	Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project
CoP	-	Code of Practice for Site Supervision
EA	-	Entrustment Agreement for Construction and Commissioning of the SCL signed between the Government and MTRCL on 29 May 2012
E&M	-	electrical and mechanical
EMSD	-	Electrical and Mechanical Services Department
First Audit	-	Independent follow-up audit as recommended by the Commission in its Interim Report
First Audit Report	-	Report of the First Audit submitted to the Chief Executive on 26 May 2020
HHS	-	Hung Hom Stabling Sidings
HyD	-	Highways Department
IoE	-	Instrument of Exemption
Leighton	-	Leighton Contractors Asia Limited
M&V	-	Monitoring and Verification
MCS	-	Monitoring and Control Strategy
MTRCL	-	MTR Corporation Limited
NAT	-	North Approach Tunnels
NCR	-	Non-conformance report
NEC	-	New Engineering Contract

Panel	-	Independent Audit Panel for Implementation of Recommendations in the Final Report of the Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project
PCS	-	Product certification scheme
PIMS	-	Project Integrated Management System
PMP	-	Project Management Plan
PPI	-	Planned Preventive Inspection
PSC	-	Project Supervision Committee
PSMC	-	Project Supervision, Monitoring and Checking
PTF	-	Partnering Task Force
QMP	-	Quality Management Plan
RACI	-	Responsible, Accountable, Consulted and Informed
RCs	-	Registered Contractors
RDO	-	Railway Development Office
RDS-2014	-	Railway Development Strategy 2014
Rebar		Reinforcement steel bar
RGEs	-	Registered Geotechnical Engineers
RISC	-	Request for Inspection and Survey Checks
RSEs	-	Registered Structural Engineers
SAT	-	South Approach Tunnels
SCL	-	Shatin to Central Link
Second Audit	-	Further follow-up audit as recommended by the Commission in its Final Report
Second Audit Report	-	Report of the Second Audit
SGC	-	Steering Group on Communications
SPV	-	Special Purpose Vehicle
TCPs	-	Technically Competent Persons
THB	-	Transport and Housing Bureau