

ASX Limited

Independent Expert Assessment of ASX's Actions to address the IBM Review Recommendations

10 February 2023

LIMITATION

The findings contained in this Independent Expert Report are based on the findings of the report prepared at the request of ASX Limited solely for the purpose of providing an Independent Assessment of ASX's Actions to address the IBM Recommendations, and is not appropriate for use for other purposes. This report is provided for information purposes only in order to provide details of the findings reported to the ASX Limited and should not be taken as providing specific advice on any issue, nor may this be relied upon by any party other than ASX Limited and ASX's regulators ASIC and the RBA. In carrying out our work and preparing this report Ernst & Young has worked solely on the instructions and information of ASX Limited, and has not taken into account the interests or individual circumstances of any party other than ASX Limited and ASX's regulators ASIC and the RBA. Ernst & Young does not accept any responsibility for use of the information contained in this report and makes no guarantee nor accept any legal liability whatsoever arising from or connected to the accuracy, reliability, currency or completeness of any material contained herein. Ernst & Young expressly disclaims all liability for any costs, loss, damage, injury, or other consequence which may arise directly or indirectly from the use of, or reliance on, this Report.

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1. Executive Summary

Reporting summary for quarter

Our assessment found that ASX has made significant and appropriate progress towards addressing and implementing the IBM Review Recommendations (“IBMRs” or “Recommendations”) with fifty-two (52) of the fifty-nine (59) total Recommendations complete after this submission. The ASX Delivery Excellence Program (“the Program”) is well run, staffed, and focused on meeting its deadlines. Highlights from this quarter’s submission from the Program include:

- 1) Closed five (5) IBMRs with a 100% pass rate for the first time,
- 2) Finalised and closed six (6) carryover Recommendations (items previously determined to be incomplete) out of six (6) re-submitted from prior quarterly reviews, and
- 3) Submitted one (1) update to satisfactorily address the final Design Adequacy observation.

While the ASX Delivery Excellence Program continues to have the appropriate governance and oversight, is staffed and supported by individuals well suited to deliver a quality outcome against the ASX Actions, and has made significant progress this quarter, we recognise that the remaining five (5) Recommendations that ASX still have to address over the two final quarters (Q6 and Q7) of the Program contain some of the more complicated Recommendations for the Program. Further, over the next two (2) quarterly submissions, ASX will need to address two (2) items previously submitted for review and marked as partially addressed.

Our previous quarterly report highlighted the risk that the Program may not fully close all fifty-nine (59) Recommendations at the end of the final quarter (Q7) in June 2023 for the following reasons:

- 1) The current and historic percentage completion rate of IBM Recommendations fully addressed on their first submission,

- 2) The current schedule the Program is working towards which assumes a final quarter that fully addresses 100% of the final quarter’s submitted Recommendations, and
- 3) The increase in complexity of the Recommendations.

While these risks are still present in the Program, this quarter ASX has mitigated some of these risks by bringing forward two (2) Recommendations that were originally planned to be submitted in the March 2023 quarterly review period (Q6, next quarter) earlier in this quarter (Q5), thus reducing the remaining Recommendations from seven (7) to five (5). We are also encouraged by the fact that ASX has achieved a 100% completion rate for the first time this quarter and on resubmissions to date. We believe this improves the chance of ASX fully closing all 59 Recommendations at the end of the final quarter (Q7).

We will continue to evaluate and offer commentary on the processes, governance, and resources as we evaluate the closure of ASX Actions addressed by the Program in the future.

Historic findings and recommendations

This is our fifth Independent Expert quarterly review report under the Licence Condition.

Below is a summary of the outcomes from our quarterly reports to date:

Period	Submissions		Fully Addressed				Partially Addressed	
	IBMR	Actions	IBMR	%	Actions	%	IBMR	Actions
Q1	22	49	18	82%	44	90%	4	5
Q2	9	23	6	67%	20	87%	3	3
Q3	12	37	5	42%	26	70%	7	11
Q4	6	27	4	67%	24	89%	2	3
Q5	5	20	5	100%	20	100%	0	0
Total	54	156	38*		134*			

Please note, '%' refers to '% fully completed'.

* Excludes partially addressed IBMRs and ASX Actions from previous quarters that were re-submitted by ASX in subsequent quarterly review periods for re-evaluation.

This summary shows that ASX has improved their percentage of fully addressed IBM Recommendations and ASX Actions as all Recommendations this quarter were fully closed. All partially addressed Recommendations from Q1, Q2 and Q3, total of fifteen (15), have now been resubmitted by ASX and assessed by EY as fully addressed. There are currently two (2) partially addressed Recommendations remaining from Q4 which will be resubmitted in subsequent quarterly review periods and assessed by EY.

During Q3, ASX resubmitted responses for all four (4) IE Recommendations made in the April 2022 Design Adequacy Report for assessment. Three (3) IE Recommendations were assessed as fully addressed as part of the Q3 re-evaluation. The remaining and final IE Recommendation relating to 'Program governance and management - Change Management Strategy' was assessed as partially addressed and ASX resubmitted the Recommendation during the current December 2022 quarterly reporting period for re-evaluation. This final Design Adequacy Recommendation has now been assessed as fully addressed

after re-evaluation in Q5. For full details and commentary, please refer to section 3.2 'Design Adequacy Report' of this report.

We are tracking the progress of the partially addressed Recommendations in this report (section 3.1), and ASX has provided an update as part of their December 2022 quarterly review submission.

For detailed progress of the fifty-nine (59) Recommendations please refer to Appendix E.

Background

In November 2020 an outage occurred following a major upgrade to ASX Operations Pty Ltd equity trading platform (ASX Trade), called the ASX Trade Refresh project. Consequently, the Australian Securities and Investments Commission (ASIC) and the Reserve Bank of Australia (RBA) required an Independent Expert review of the ASX Trade Refresh project to be completed. ASX appointed IBM Australia Limited (IBM) to undertake this review. IBM made fifty-nine (59) recommendations ("Recommendations" or "IBM Review Recommendations") in total across the following seven key domains in the review: risk, governance, delivery, requirements, vendor management, testing and incident management.

ASX subsequently developed a management response plan ("Response Plan" or "Plan") which consists of 182 deliverables ("ASX Action") to address the fifty-nine (59) IBM Recommendations.

In November 2021, the Minister imposed certain Licence Conditions on ASX. The Australian Market Licence (ASX Limited) Additional Conditions Notice 2021 (No. 1) dated 24 November 2021 requires ASX to:

- Address each of the IBM Review Recommendations to the satisfaction of ASIC, and
- Appoint an Independent Expert ("IE") to conduct an assessment of its implementation of the ASX Actions to address the IBM Review Recommendations.

Scope

In accordance with the relevant Licence Conditions, ASX, with ASIC's and RBA's consent, engaged Ernst & Young ("EY") to review each of the Quarterly Reports produced by ASX and assess whether the actions undertaken in the period covered by the report demonstrate appropriate implementation of, and progress towards addressing the IBM Review Recommendations. Refer to section 2.2 for detailed scope related to this report.

Approach

Our approach is to assess the quarterly reports produced by ASX. This includes an assessment of the closure packs and supporting evidence for the ASX Actions reported as closed during the period. As part of our assessment, we will consider:

- Whether the ASX Actions comprehensively address the relevant IBM Review Recommendations
- Whether the ASX Action is implemented in a sustainable manner
- The skills and experience of the people engaged by ASX to implement the ASX actions
- The closure of ASX actions is supported by demonstrable evidence, and has been subject to appropriate internal due diligence and governance processes
- The consistency of the attestations reported in ASX's quarterly report with our understanding of the status of the ASX actions.

Refer to section 2.3 for detailed approach related to this report.

2. Introduction

2.1 Background

Recommendations Review

To address the fifty-nine (59) IBM Recommendations, ASX subsequently developed a management response plan which consists of 182 deliverables. The Plan is structured around the following seven elements (which are different to the seven domains from the IBM review) that seek to improve ASX's project execution capability and to reduce the likelihood of similar project execution incidents in the future:

- Ensuring diverse thinking, avoidance of group think and challenge
- Increasing resources
- Upgrading policies, standards, and frameworks
- Educating staff so that they clearly understand the standards and practices expected of them
- Monitoring individual projects and the portfolio for compliance with ASX's policies, standards and frameworks
- Improving ASX's testing capability and capacity
- Improving ASX's project reporting and quality.

In November 2021, the Minister imposed certain Licence Conditions on ASX. The Australian Market Licence (ASX Limited) Additional Conditions Notice 2021 (No. 1) dated 24 November 2021 requires ASX to:

Address each of the recommendations to the satisfaction of ASIC, and

Appoint an Independent Expert (IE) to conduct an assessment of its implementation of the ASX actions to address the IBM review recommendations.

ASX has obtained the consent of ASIC to appoint Ernst & Young (EY) as the IE to conduct this assessment.

2.2 Scope

EY has been engaged to deliver the following scope of work:

In accordance with Licence Condition 4, ASX must by 31 January 2022 and thereafter within 14 days of each quarter end date occurring during the period from 31 March 2022 to 30 June 2023, give a report to ASIC and the IE containing an update on:

- The progress of the implementation of the ASX actions to address the review recommendations, and
- If there are any issues in implementing any remediation actions, the reasons for those issues and what action ASX will take to address them.

The quarterly report must be accompanied by an attestation from the relevant oversight body from ASX.

The scope of our engagement as the IE in accordance with the relevant licence condition is to:

- Review and assess each of the quarterly reports produced by ASX (as required under Licence Condition 3) and
- Within 30 days of receipt of each quarterly report, provide ASX and ASIC with a written report setting out whether the ASX Actions undertaken in the period covered by the report demonstrate appropriate implementation of, and progress towards addressing, the IBM review recommendations.

2.3 Approach










When conducting our assessment for the delivery of this report, the following activities were performed:

1. **Documentation review:** A detailed review and analysis of ASX's actions and provided artefacts, including closure packs, written responses, and additional supporting evidence. All documentation

was provided to EY by ASX based on a documentation request. A list of documentation reviewed can be found in Appendix D.

2. **Questionnaire submission to ASX:** Following review of the documentation, the EY team submitted a set of questions (if any) related to the recommendations and subsequent ASX actions 48 hours prior to the meeting where ASX prepared responses for the joint recommendation review workshops. A list of questionnaires submitted to ASX can be found in Appendix C.
3. **Recommendation review workshops:** Workshops were held to review and discuss the recommendations between key ASX stakeholders and EY SMRs (Subject Matter Resources) to go through the pre-submitted questions related to ASX's remedial actions approach. A list of all workshops conducted with ASX can be found in Appendix A and a list of interviewed ASX stakeholders can be found in Appendix B.

Following our review of the documentation, supporting evidence and knowledge gathered from recommendation review workshops with the relevant ASX stakeholders, the EY team have determined whether the ASX Actions are appropriate to close the IBM Recommendations by adopting the following approach for each of the ASX Actions:

1. **Has the recommendation been fully addressed by the ASX Action(s)?**
Yes  / No  / Partially done 
2. **Were ASX Action(s) in response to the IBM Recommendation reasonable and appropriate?**
Yes  / No  / Partially done 
3. **Is the ASX Action(s) sustainable? Has the ASX response to the recommendation considered measures to enforce / ensure that the ASX Actions remain closed in the future?**
Yes  / No  / Partially done 

The assessment criteria described above determines if the recommendation was fully, partially, or not appropriately addressed.

For detailed and comprehensive commentary around our decision, please refer to each recommendation's 'Findings' section.

2.4 Limitations

We draw your attention to the limitations inherent in this report:

- Our work was not performed in accordance with generally accepted auditing, review, or other assurance standards in Australia and accordingly does not express any form of assurance. This report does not constitute legal opinion or advice. We have not conducted a review to detect fraud or illegal acts.
- Our work does not assume any responsibility for any third-party products, programs or services, their performance or compliance with your specifications or otherwise.
- Our work did not intend to identify, address, or correct any errors or defects in your computer systems, other devices, or components thereof ("Systems"), whether or not due to imprecise or ambiguous entry, storage, interpretation, or processing or reporting of data. We are not to be responsible for any defect or problem arising out of or related to data processing in any Systems.
- Our Recommendations review was limited to the information available and provided by ASX at this stage, where for future reviews included in the plan only high-level planning has been conducted and a detailed analysis of scope and effort is pending.
- Our review was limited to documents provided by ASX as deemed relevant in line with the agreed scope and EY requests, with the expectation that ASX had those artefacts documented to satisfy its own reporting needs.
- Any projection of the outcome related to the recommendation's response and its sustainability for future periods, is subject to the risk that the actions may become inadequate due to changes

in conditions, or that the degree of compliance around remedial actions taken may deteriorate over time.

- Our scope under the licence conditions requires us to oversee the ASX Actions taken related to ASX's Plan and our Independent Expert review which are relevant to the recommendations and its remedial actions. For the purpose of our engagement, we define oversee as to observe and inspect ASX has acted accordingly. ASX is accountable and responsible for the implementation activities and EY will not act as management or direct the implementation.

2.5 Use and disclosure of our reports

We are providing specific advice only for this engagement and for no other purpose and we disclaim any responsibility for the use of our advice for a different purpose or in a different context. If you plan to use this advice on another transaction or in another context, please let us know and provide us with all material information that we can provide advice tailored to the appropriate circumstances.

Our Reports may be relied upon by ASX and ASX's regulators, ASIC and the RBA, for the purpose outlined in this SOW only. We understand that ASIC and the RBA may issue a media release and/or a public report referring to or publishing the content of our Reports and may publish our Reports and/or the EY Summary Reports or make or issue its own summary from the content of our Reports.

For the avoidance of doubt, no other party other than ASX, ASIC and the RBA may rely on the Reports. We disclaim all responsibility to any such other party for any loss or liability that the other party may suffer or incur arising from or relating to or in any way connected with the contents of our Reports, the provision of our Reports to the other party or the reliance upon our report by the other party.

3. Monitoring of Partially Addressed Recommendations and ASX Actions

3.1 Previous quarterly review periods

The objective of this section is to monitor the status of IBM Recommendations that were submitted in previous quarterly review periods and deemed “partially addressed” or “not addressed”, and determine if it is fully executed and/or appropriate and/or sustainable following a re-submission by ASX and re-evaluation by the IE.

Q1 January 2022

In the first quarterly report submitted by ASX on 28 January 2022, we identified four (4) out of the twenty-two (22) submitted Recommendations as needing further evidence in future quarters for re-evaluation: 1.2.1, 5.1.1, 5.1.2 and 6.6.1.

ASX submitted all four (4) Partially Addressed Recommendations for re-evaluation in Q3 and these Recommendations have now all been assessed by EY as fully addressed. Please refer to our third IE quarterly report dated 12 August 2022 for outcome details and commentary.

Q2 March 2022

In the second quarterly report submitted by ASX on 13 April 2022, we identified three (3) out of the nine (9) submitted Recommendations as needing further evidence in future quarters for re-evaluation: 1.2.6, 1.3.6 and 6.4.8.

ASX submitted two (2) of the three (3) Partially Addressed Recommendations (1.2.6 and 1.3.6) in Q3 and one (1) Recommendation (6.4.8) in Q4 for re-evaluation, and these Recommendations have now all been assessed by EY as fully addressed. Please refer to our third IE quarterly report dated 12 August 2022 and fourth IE quarterly report dated 11 November 2022 for outcome details and commentary.

Q3 June 2022

In the third quarterly report submitted by ASX on 14 July 2022, we identified seven (7) out of the twelve (12) submitted Recommendations as needing further evidence in future quarters for re-evaluation: 1.4.1, 3.1.1, 3.2.2, 3.2.3, 3.2.5, 6.3.2 and 6.5.1.

ASX has submitted one (1) of the seven (7) Partially Addressed Recommendations (6.3.2) for re-evaluation in Q4 and the Recommendation is now assessed by EY as fully addressed. Please refer to our fourth IE quarterly report dated 11 November 2022 for outcome details and commentary.

This quarter, ASX has submitted six (6) Partially Addressed Recommendations for re-evaluation in Q5 and below are the re-evaluation outcomes:

1.4.1 - Ensure Technical Account Managers document risks and issues raised by customers

1. Technical Account Managers will be provided education on this requirement
2. ASX Delivery Framework will be updated to include this as a requirement
3. Project Risk Specialist, Project Assurance Specialist and the Line 2 ERM manager will monitor and challenge on this topic

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
Recommendation Addressed?	Partially		
Comment	<p>This recommendation has been largely closed with the actions conducted to date.</p> <p>While ASX has stated that the Project Risk Specialist, Project Assurance Specialist and the Line 2 ERM Manager will monitor and challenge</p>		

	<p>on this topic, ASX has only been able to provide evidence of how the Project Risk Specialist and Line 2 ERM Manager roles have done so. They have not yet been able to provide evidence of how the Project Assurance Specialist monitors and challenges on this topic as this is done as part of the project assurance review process which has only recently been rolled out as part of Recommendation 3.1.1 and is currently going through its first iteration, due to be completed in mid-late September 2022.</p> <p>As a result, we are marking the sustainability of ASX Action 3 as 'Partially Addressed' until such time we can confirm that ASX has completed the first iteration of the project assurance activities and the Project Assurance Specialist has reported on the results to the relevant forums, including monitoring and challenging on this topic.</p> <p>EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.</p>
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed.</p> <p>As stated in the updated commentary for Recommendation 3.1.1, since the initial launch of the Project Assurance Delivery Framework (PDAf) in July 2022, ASX has now completed several Project Assurance Reviews as part of the first iteration of the project assurance activities and reported recommendations and insights from the project assurance reviews to the relevant governance forum, the Portfolio Governance Group. We have reviewed the</p>

	<p>evidence provided by ASX to validate this. ASX also released an updated PDAf in December 2022 to address the findings in the Q3 IE quarterly report.</p> <p>Furthermore, the Project Assurance Specialist (PAS) attends the Weekly TAM (Technical Account Managers) Meeting as a required attendee on an ongoing quarterly basis to verify that the TAMs are being appropriately engaged by the projects. This was documented in the meeting minutes for the Weekly TAMs Meeting held on 21 September 2022 which announced the update to the TAMs team.</p> <p>We have seen evidence of the PAS communicating with TAMs via email to confirm issues have been raised appropriately on projects.</p>
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3.1.1 - At initiation, determine metrics for monitoring progress and adherence with requirements

1. Project Assurance Specialist (New Hire) to be recruited
2. Define and build (ready for rollout) a Project Assurance Framework that defines project performance metrics and measures (quality)

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
Recommendation Addressed?	Partially		
Comment	<p>This recommendation has been largely closed with the actions conducted to date.</p> <p>While ASX has built a Project Delivery Assurance Framework (PDAf) that defines project</p>		

	<p>performance metrics and measures at the beginning of project initiation, this has been rolled out recently and is their first iteration of the assurance process, due to finish by mid-late September 2022.</p> <p>As a result, we are marking the sustainability of ASX Action 2 as 'Partially Addressed' until such time we can confirm that ASX has completed the first iteration of the project assurance activities and reported on the results to the relevant forums.</p> <p>EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.</p>
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed. Since the initial launch of the Project Assurance Delivery Framework (PDAf) in July 2022, ASX has now completed several Project Assurance Reviews as part of the first iteration of the project assurance activities. ASX also released an updated PDAf in December 2022 to address the findings in the Q3 IE quarterly report.</p> <p>We have reviewed the evidence provided by ASX in the example Project Assurance Review focused on 'Risk Management'. In undertaking the Project Assurance Review, ASX undertook the following processes, in line with the 10 step process outlined in the updated PDAf:</p> <ol style="list-style-type: none"> 1. Preparation & Engagement 2. Review & Interview 3. Report, Action & Closure

	<p>Recommendations resulting from the Project Assurance Review were tracked in Jira, which included action owner, due dates, action activity and evidence all being stored in Jira.</p> <p>At the November 2022 Portfolio Governance Group (PGG) meeting, the topic 'Portfolio Status: Project Delivery Assurance' was included as part of the meeting agenda to provide an update on project assurance activities, including insights and recommendations. We have reviewed the November 2022 PGG meeting pack and seen evidence of the dashboards and reporting on project assurance activities.</p>
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3.2.2 - Investigate whether to formalise quality management into delivery process

1. Project Assurance Specialist (New Headcount) to be recruited
2. Define and Build (ready for rollout) a Project Assurance Framework

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
Recommendation Addressed?	Partially		
Comment	<p>This recommendation has been largely closed with the actions conducted to date.</p> <p>While ASX has built a Project Delivery Assurance Framework (PDAf) that defines project performance metrics and measures at the beginning of project initiation, this has been rolled out recently and is their first iteration of the assurance process, due to finish by mid-late September 2022.</p>		

	<p>Additionally, while the PDAf is appropriate for project and risk activities, the referenced 'Independent Testing Quality Assurance Framework' under the 'Technology Delivery and Management' Assessment Criteria is currently under development as part of future Recommendations (6.1.2 and 6.5.2) due in later quarters. ASX should update their PDAf to include their existing process on how to review any testing assurance that may arise in the interim, noting that the Independent Testing Quality Assurance Framework is not yet launched.</p> <p>As a result, we are marking the appropriateness and sustainability of ASX Action 2 as 'Partially Addressed' until such time we can confirm that ASX has completed the first iteration of the project assurance activities and reported on the results to the relevant forums, as well as updated their PDAf to include their existing process for testing quality assurance in the interim.</p> <p>EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.</p>
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed.</p> <p>As stated in the updated commentary for Recommendation 3.1.1, since the initial launch of the Project Assurance Delivery Framework (PDAf) in July 2022, ASX has now completed several Project Assurance Reviews as part of the first iteration of the project assurance activities</p>

	<p>and we have reviewed the evidence provided by ASX to validate this.</p> <p>Furthermore, we have reviewed the updated PDAf from December 2022 and have seen under the 'Technology Delivery and Management' Assessment Criteria that ASX has included the link to the 'Independent Testing Quality Assurance' framework, launched as part of Recommendations 6.4.8 (from Q2) and 6.1.2 (current quarter, Q5) to ensure there is an independent testing quality assurance service for all projects. Recommendation 6.5.2 from Q4 saw the launch of the new QE Authority, the Quality Engineering & Testing Forum (QETF), which is the formal governance forum of Independent Testing Quality Assurance activities.</p> <p>For more details on the 'Independent Testing Quality Assurance' framework, please refer to Findings for Recommendation 6.1.2 in Section 4 'Our Findings' of this report.</p>
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3.2.3 - Update policy so that EPMO is on PSG for P1 projects

1. Project Assurance Specialist to be recruited within the EPMO to ensure quality and compliance
2. Metrics and measures will be introduced as part of the Project Assurance Framework (refer 3.2.2) to monitor compliance

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
Recommendation Addressed?	Partially		
Comment	This recommendation has been largely closed with the actions conducted to date.		

	<p>While ASX has built a Project Delivery Assurance Framework (PDAf) that defines project performance metrics and measures at the beginning of project initiation, this has been rolled out recently and is their first iteration of the assurance process, due to finish by mid-late September 2022.</p> <p>Additionally, while the PDAf contains the 9-step process of what is involved in a project assurance review, and notes in Step 9 (and the Roles and Responsibilities table) that the Project/Program Sponsor is accountable for ensuring that the assurance review recommendations/actions are completed by the agreed timeframe, it is unclear the extent of reviews and approvals needed to consider a recommendation/action closed. It also does not specify what the escalation process is for any recommendations/actions that have not been closed by its due date.</p> <p>Furthermore, the PDAf does not specify how agreed recommendations/actions will be assigned a priority/risk rating.</p> <p>As a result, we are marking the appropriateness and sustainability of ASX Action 2 as 'Partially Addressed' until such time we can confirm that ASX has included in their PDAf the details around reviews and approvals needed to consider a recommendation/action closed; the escalation process for any recommendations/actions that have not been closed by the due date; and the relevant ASX Risk Rating matrices that will be applied to the agreed recommendations/actions.</p>
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	EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed.</p> <p>ASX has now specified in the updated PDAf the process on how a recommendation/action is closed and what the escalation process is for any recommendations/actions that have not been closed by its due date.</p> <p>As stated in the updated commentary for Recommendation 3.1.1, since the initial launch of the Project Assurance Delivery Framework (PDAf) in July 2022, ASX has now completed several Project Assurance Reviews as part of the first iteration of the project assurance activities and we have reviewed the evidence provided by ASX to validate this. ASX also released an updated PDAf in December 2022 to address the findings in the Q3 IE quarterly report.</p> <p>In the December 2022 version of the PDAf, ASX has added an extra step to the original 9 step process (i.e., now 10 step process) of what is involved in a project assurance review. The newly added Step 10 (Recommendations, Monitoring and Closure) notes that the <i>"agreed recommendations are monitored by the assurance reviewer through to closure to ensure that the actions have been addressed in a sustainable manner."</i> This includes applying the following:</p> <ul style="list-style-type: none"> entering recommendations into the Risk management system (JIRA) for visibility and tracking

- the provision of evidence of appropriate and sustainable action/s
- monthly monitoring of due actions, escalating as required
- recommendation status reports (including metric such as volume and overdue items) reported through to governance forums (at least quarterly)

ASX has also updated the 'Roles and Responsibilities Matrix' in Appendix B of the PDAf to include a new activity line 'Assurance function reporting and escalation' and identified that the 'Internal or External Assurance Reviewer' will be Accountable and Responsible for the activity. Assurance activities including recommendations and escalations will be reported on a quarterly basis to the Portfolio Governance Group (PGG), as stated in the PDAf under section titled 'Project Delivery Assurance Roles and Responsibilities'.

In the updated February 2023 version of the PDAf, under the section titled 'Recommendation Action Plans (RAP)', ASX has defined the three Priority Ratings which are applied to recommendations/actions and the Target Closure Timeframe:

- **High:** [Redacted]
- **Medium:** [Redacted]

- **Low:** [Redacted]

The RAP further states that "All Project Assurance recommendations, no matter what priority rating, are required to be closed by the standard Target Closure Timeframe, to the satisfaction of the Project Assurance Specialist. By exception a Project Sponsor needs to agree with the Project Assurance Specialist any extension to the standard Target Closure Timeframe."

ASX has provided evidence that assurance recommendations and insights (including tracking of actions and their priority ratings) from the project assurance reviews have been reported to the relevant governance forum, the PGG. We have reviewed the evidence provided by ASX to validate this.

For more details, please refer to the updated commentary for Recommendation 3.1.1.

3.2.5 - Delivery gaps challenged by PSG, project team and EPMO

1. Project Assurance Framework and metrics / measures will identify any compliance gaps (Refer 3.2.2)
2. Project Risk Specialist, Project Assurance Specialist and ERM Line 2 resource will be tasked with challenge

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓

Recommendation Addressed?	Partially
Comment	<p>This recommendation has been partially closed with the actions conducted to date.</p> <p>For ASX Action 1, while ASX has built a Project Delivery Assurance Framework (PDAf) that defines project performance metrics and measures at the beginning of project initiation, this has been rolled out recently and is their first iteration of the assurance process, due to finish by mid-late September 2022.</p> <p>Additionally, while the PDAf is appropriate for project and risk activities, the referenced 'Independent Testing Quality Assurance Framework' under the 'Technology Delivery and Management' Assessment Criteria is currently under development as part of future Recommendations (6.1.2 and 6.5.2) due in later quarters. ASX should update their PDAf to include their existing process on how to review any testing assurance that may arise in the interim, noting that the Independent Testing Quality Assurance Framework is not yet launched.</p> <p>As a result, we are marking the appropriateness and sustainability of ASX Action 1 as 'Partially Addressed' until such time we can confirm that ASX has completed the first iteration of the project assurance activities and reported on the results to the relevant forums, as well as updated their PDAf to include their existing process for testing quality assurance in the interim.</p> <p>For ASX Action 2, while ASX has stated that the Project Risk Specialist, Project Assurance Specialist (PAS) and ERM Line 2 resource will be</p>

	<p>tasked with challenging delivery gaps prior to Line 3 internal or external audit, the assurance process is currently undergoing its first iteration.</p> <p>As a result, and similarly for ASX Action 1, we are marking the sustainability of ASX Action 2 as 'Partially Addressed' until such time we can confirm that ASX has completed the first iteration of the project assurance activities and reported on the results to the relevant forums. EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.</p>
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed.</p> <p>As stated in the updated commentary for Recommendation 3.1.1, since the initial launch of the Project Assurance Delivery Framework (PDAf) in July 2022, ASX has now completed several Project Assurance Reviews as part of the first iteration of the project assurance activities and reported recommendations and insights from the project assurance reviews to the relevant governance forum, the Portfolio Governance Group. We have reviewed the evidence provided by ASX to validate this.</p> <p>For more details, please refer to the updated commentary for Recommendation 3.1.1.</p>

6.5.1 - Implement defect analysis techniques including linkage to releases, tests, & functions

1. Enhance ongoing defect analysis techniques, including defect leakage, defect modelling and prediction aligned to industry and internal standards and thresholds
2. Link defect, incident and problem management processes to accurately measure defect leakage
3. Mandate root cause analysis recording for higher severity defects and derive metrics and commentary
4. Integrate enhanced defect management processes into QE processes and procedures
5. Integrate all metrics into QE authority and project reporting

Outcome from Q3	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
ASX Action 4	✓	✓	✓
ASX Action 5	✓	✓	✓
Recommendation Addressed?	Partially		
Comment	<p>This recommendation has been largely closed with the actions conducted to date.</p> <p>For ASX Action 1, while ASX has documented the approach for enhanced defect analysis techniques, ASX has only recently implemented this in practice.</p> <p>As a result, we are marking the sustainability of ASX Action 1 as 'Partially Addressed' until such time we can confirm that ASX has been able to capture significant insight from performing these enhanced defect analysis techniques in practice.</p>		

	<p>For ASX Action 2, while ASX has provided evidence of how they link their defect, incident and problem management processes, they have not showed how this linkage has been used to accurately measure defect leakage i.e., determined/tracked % of defects leaked into UAT/production.</p> <p>As a result, we are marking the sustainability of ASX Action 2 as 'Partially Addressed' until such time we can confirm that ASX has been able to accurately measure defect leakage.</p> <p>For ASX Action 3, while ASX has mandated root cause analysis (RCA) to be performed on higher severity defects and is currently performing RCA, ASX is still in early stages of capturing consistent and centralised data from performing RCA, and the data gathered to date is not sufficient to derive significant insight or commentary.</p> <p>As a result, we are marking the sustainability of ASX Action 3 as 'Partially Addressed' until such time we can confirm that ASX has been able to gather sufficient data to analyse and derive commentary from performing RCA, as well as put in measures to act on the insights gathered.</p> <p>For ASX Action 5, while ASX has stated they will integrate all metrics into QE authority and project reporting, ASX has not provided evidence that they have established the QE authority and reported to the forum. ASX has provided evidence of metrics incorporated into project reporting for a specific project, however they have not provided a portfolio view.</p> <p>As a result, we are marking the execution, appropriateness, and sustainability of ASX Action 5 as 'Partially Addressed' until such time</p>
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	<p>we can confirm that ASX has defined the terms of reference for the QE authority, established the forum, and reported metrics to the forum, as well as included a portfolio view of the metrics into project reporting.</p> <p>EY will include the completion of this 'Partially Addressed' item in its scope for subsequent reviews.</p>
Outcome from Q5 Re-evaluation	Fully Addressed
Comment	<p>This Recommendation is now fully addressed. Please see below for updated commentary on each ASX Action that was previously assessed as 'partially addressed' in the June 2022 (Q3) reporting period.</p> <p>ASX Action 1: Since the initial launch of the enhanced defect analysis techniques in June 2022 as part of the updated Defect Management Strategy, ASX has performed the defect analysis techniques for an ongoing period and has now been able to capture defect management metrics data and derive insights from the data.</p> <p>As part of its regular monthly reporting to the new QE Authority - the Quality Engineering & Testing Forum (QETF), ASX has been reporting on the following metrics:</p> <ul style="list-style-type: none"> • Complete Defect Data Percentage • Line of Business (LoB) Complete Defect Data Percentage • Customer-Facing Defect Leakage • SDLC Defect Leakage Index • Defect Risk Removal Percentage • Defect Management Process Sentiment

	<p>Note: this captures an NPS-like value that reflects ASX participant feedback on how likely they are to recommend continued use of the ASX Defect Management Process</p> <p>The insights gathered are assigned recommendations, and this is discussed during the QETF.</p> <p>We have reviewed the metrics recorded in the 'QETF Monthly Metrics Reporting' templates for November 2022 and December 2022, as well as the December 2022 meeting evidence provided by ASX. In the December 2022 QETF meeting pack, ASX has shown that defect management metrics, derived insights and recommendations have been included in the agenda of the QETF discussion.</p> <p>ASX Action 2: As stated in the updated commentary for ASX Action 1, ASX has now been able to capture defect management metrics data and derive insights from the data. This is then reported to the QETF monthly and discussed as part of the meeting's agenda.</p> <p>In addition to this, during the December 2022 QETF meeting, ASX included in the meeting agenda their plan to add QE&T Key Risk Indicators (KRIs) and a new metric, "Defect Risk Indicator RAG", to the Defect Management Measurement Plan and monthly QETF Reporting, as part of their Continuous Improvement Process.</p> <p>ASX states that the QE&T KRIs are defined and reported monthly via ERICA (ASX's risk management tool) to reflect the previous rolling 3 month period. The Defect Risk Indicator RAG</p>
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reported to the QETF will reflect the QE&T KRIs as defined in ERICA and ASX Risk Appetite Statement. If the QE&T KRIs or thresholds change, the Defect Risk Indicator RAG will change accordingly.

ASX Action 3:

Since the initial mandate that Root Cause Analysis (RCA) needed to be performed on higher severity defects in June 2022, ASX has now been able to gather sufficient data to derive significant insight.

RCA metrics have been captured by ASX through Jira at the point of defect realisation, and a dashboard is created using the data collected. RCA metrics are also reported in the 'QETF Monthly Metrics Reporting' templates and then discussed during the QETF.

In November 2022, ASX captured 3 months' worth of data for the first time and this was presented to the QETF November 2022, as well as the December 2022 QETF, for discussion.

ASX Action 5:

As part of Recommendation 6.5.2 submitted by ASX during the September 2022 quarterly review period (Q4), ASX established the Quality Engineering & Testing Forum (QETF) in August 2022, to act as the QE Authority. The QETF occurs monthly and is held on the last Wednesday of each month. In the QETF Terms of Reference (ToR), ASX states that the QETF is an enterprise-level governance group made up of executive and senior leadership roles involved in software delivery, with an exclusive focus on product quality and testing process quality.

We have reviewed the QETF meeting evidence for the QETFs held to date (August 2022 to December 2022), and have seen evidence of ASX reporting defect management metrics data and including the metrics as points of discussion in the November 2022 and December 2022 QETF meetings.

Q4 September 2022

In the fourth quarterly report submitted by ASX on 13 October 2022, we identified two (2) out of the six (6) submitted Recommendations as needing further evidence in future quarters for re-evaluation: 1.3.4 and 3.2.1.

ASX has stated in their December 2022 report that the Partially Addressed Recommendations (1.3.4 and 3.2.1) will be re-submitted during the March 2023 quarterly reporting period for re-evaluation.

For specific details relating to each Recommendation, please refer to the relevant IE quarterly review report for the period the Recommendation was originally submitted:

- First IE quarterly report dated 25 February 2022
- Second IE quarterly report dated 13 May 2022
- Third IE quarterly report dated 12 August 2022
- Fourth IE quarterly report dated 11 November 2022

For an overview of the status of each of the fifty-nine (59) Recommendations, please refer to Appendix E.

3.2 Design Adequacy Report

The objective of this section is to monitor the status of the recommendations we made as the IE in our Design Adequacy Report and determine if they have been addressed by ASX.

In our Design Adequacy Report, we provided four (4) recommendations (“IE Recommendations”), with two (2) relating to the overall ‘Program governance and management’ by ASX of its Delivery Excellence Program, one (1) relating to the ‘Timing of ASX Actions’ and one (1) relating to ‘Adequacy of ASX Actions’.

ASX submitted responses for all four (4) IE Recommendations in June 2022 (Q3) for assessment and three (3) IE Recommendations were assessed as fully addressed. Please refer to the third IE quarterly review report dated 12 August 2022 for outcome details and commentary.

The remaining IE Recommendation relating to ‘Program governance and management - Change Management Strategy’ was deemed partially addressed in Q3. This quarter, ASX has re-submitted the IE Recommendation for re-evaluation and below is the re-evaluation outcome:

#	IE Recommendation	Status	Date Due
1	<p>Program governance and management</p> <p>Articulate Change Management strategy for assessing each Recommendation from an organisational change management perspective including people impact assessments, organisational change impacts, and training on implemented ASX Actions (including resourcing traceability to best ensure training completion is achieved) and communications approach</p>	In Progress	<p>30 June 2022 (in readiness for next quarter)</p> <p>Revised Date Due: 31 December 2022</p>

Outcome from Q3	Partially addressed
Comment from Q3	While we can see evidence of Change in the Delivery Excellence Program, the Change Management strategy should have an additional long-term plan with a target audience approach for communication and training in the long term. The shared strategy is very high level, and feasible for the duration of the Delivery Excellence Program, in order for the IE to deem this recommendation fully addressed, a long-term strategy is required to assess, plan, and implement Change and ensure the culture of ASX has changed following the closure of the 59 IBM Recommendations. This requires recorded engagement from teams, such as HR and Change Management within ASX, going beyond Project and Risk approach, to change the culture and behavior of Projects in the future.
Outcome from Q5 Re-evaluation	Fully Addressed
Comment from Q5 Re-evaluation	<p>This IE Recommendation is now fully addressed.</p> <p>Following our initial review of the IE Recommendation in Q3, ASX has demonstrated over the past quarterly review periods that they have been applying appropriate and robust change management disciplines (e.g., communications, updated frameworks/policies, ongoing training) in their Delivery Excellence Program as they have implemented the IBM Recommendations each quarter.</p> <p>As part of their re-submission for this IE Recommendation, ASX submitted additional documentation that provides insight on the role of ASX’s Centres of Excellence, Capability Practices and Community of Practices in the longer-term embedment of the changes implemented as</p>

part of the Delivery Excellence Program, as well as how ASX has considered and managed change fatigue.

While the Delivery Excellence Program is not relying on an Organisational Change Management Strategy Framework to implement the changes on the Program, it would be beneficial for ASX to embed the change disciplines we observed them adopting as part of the Program into BAU Change Management processes for a more robust BAU process in the future.

Please refer to the Design Adequacy Report dated 27 April 2022 to read our detailed findings and commentary.

4. Our Findings

Detailed below are our Independent Expert findings following our assessment of the actions taken by ASX as part of their Response Plan to address the IBM Recommendations, on whether ASX have taken the adequate steps to close the recommendations.

The following pages provide detailed findings for each of the five (5) Recommendations submitted by ASX to ASIC and RBA on 13 January 2023 as part of the fifth quarterly review period.

The 'Executed, Appropriate and Sustainable' summary table contains the final outcome of our review of the ASX Actions including the supporting materials, and whether they have been completed appropriately by ASX to close the IBM Recommendation. The 'Findings' section offers the rationale for an Action's successful completion or, in the event of an Action's failure to be successfully passed, the 'Comment' section of the summary table provides clarification of the shortcomings that should be addressed.

Summary of Review Recommendations Assessment

All five (5) Recommendations and the twenty (20) related ASX Actions were fully addressed and completed.

Below is a summarised view of the outcome of each Recommendation and its related ASX Action(s) submitted this quarter (December 2022). For detailed commentary around findings please refer to the following pages.

#	Recommendation / ASX Actions		Executed	Appropriate	Sustainable
6.1.2	Establish independent testing quality assurance		Recommendation has been fully addressed		
	Action 1	Document independent assurance model and processes aligned to risk appetite	✓	✓	✓
	Action 2	Select panel of independent assurance providers	✓	✓	✓
	Action 3	Update estimation guides to include budget for independent assurance in project planning	✓	✓	✓
	Action 4	Roll out with appropriate training and education	✓	✓	✓
	Action 5	Ongoing measurement and reporting	✓	✓	✓
6.3.1	Describe role-based test training program		Recommendation has been fully addressed		
	Action 1	Current state assessment of test training and knowledge using industry-aligned framework (e.g. SFIA)	✓	✓	✓
	Action 2	Determine certification & training needs and minimum requirements linked to delivery and operational risk	✓	✓	✓
	Action 3	Develop and roll out training and on boarding plan and processes, prioritising higher risk groups	✓	✓	✓
6.3.3	Adopt ASX overarching test strategy consistent with ISO29119		Recommendation has been fully addressed		
	Action 1	Create and document a detailed ASX test methodology, aligned to ISO29119 guidelines	✓	✓	✓
	Action 2	Prescribe acceptable testing standards (ATS) required for all technology-enabled change aligned to risk appetite and risk-based pathways	✓	✓	✓
	Action 3	Update sourcing processes to provide acceptable testing standards to partners and vendors providing engineering, quality engineering or testing services	✓	✓	✓
	Action 4	Enhance job roles and responsibilities linked to ASX Testing Career Pathways	✓	✓	✓

#	Recommendation / ASX Actions		Executed	Appropriate	Sustainable
	Action 5	Publish and roll out the ASX test methodology with appropriate education and communication, linked to training programs	✓	✓	✓
6.4.5	Create detailed interface and integration log. Require all high risk interfaces be tested		Recommendation has been fully addressed		
	Action 1	Design and implement a knowledge base for system interfaces and integrations across architecture, engineering and testing	✓	✓	✓
	Action 2	Align integration knowledge base to BA framework and deliverables for maintainability	✓	✓	✓
	Action 3	Develop acceptable testing standards for system integration and end-to-end testing with regards to use of stubs vs real interfaces, based on risk	✓	✓	✓
	Action 4	Integrate testing with external feeds into project planning and estimation processes	✓	✓	✓
	Action 5	Include system integration and end-to-end testing standards into QE procedures, processes and methodology and govern through QE Authority	✓	✓	✓
6.4.7	Document a test planning guide that prompts wide range of test scenarios		Recommendation has been fully addressed		
	Action 1	Create an ASX Test Planning guide to provide specific guidance and criteria to plan for wider test coverage to include for example dynamic functional scenarios, schedule-based scenarios (e.g. SOD/EOD), cumulative scenarios, different profiles of market activity and edge cases	✓	✓	✓
	Action 2	Integrate ASX Test Planning guide with QE processes, procedures and methodology, Test environments and test data management capability, Continuous improvement program and Risk-based pathways	✓	✓	✓

Recommendation 6.1.2: Establish independent testing quality assurance

	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
ASX Action 4	✓	✓	✓
ASX Action 5	✓	✓	✓
Recommendation Addressed?	Yes		
Comment	Recommendation has been addressed, as evidenced by the findings outlined below. ASX Actions are deemed appropriate and sustainable at the present time.		

Background/Tasks

Establish an independent testing quality assurance service for internal projects.

ASX Action(s)

1. Document independent assurance model and processes aligned to risk appetite
2. Select panel of independent assurance providers
3. Update estimation guides to include budget for independent assurance in project planning
4. Roll out with appropriate training and education
5. Ongoing measurement and reporting

Findings

ASX Action 1:

This activity has been fully addressed as part of Recommendation 6.4.8 submitted by ASX during the March 2022 quarterly review period (Q2). As part of Recommendation 6.4.8, ASX created the 'Independent Testing Quality Assurance' page which can be accessed via the 'Quality Engineering & Testing (QE&T) Home' page on the Confluence site.

The Independent Testing Quality Assurance page includes the 'Independent Testing Quality Assurance Framework' document which describes the model and process for independent testing quality assurance at ASX for all projects (including internal projects), and sets out the following:

- What are the goals and the scope of independent test assessments and assurance
- What are the criteria for independent assessments of test strategies and testing processes (e.g., mandatory versus optional, internal versus external), and when an independent assessment should be conducted
- Who conducts the independent assessment and provides assurance and what are the roles and responsibilities in this process
- How will findings and recommendations from the independent assessment process be dealt with

The framework explicitly states the risk level of the project/change, as determined by the Project Risk Assessment (PRA), will determine whether the Independent Testing Quality Assurance Assessment needs to be conducted by the ASX QE&T Capability Practice within ASX's Technology Centre of Excellence (CoE) or an external provider.

Please refer to the Q2 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_May 2022 Final Report_13052022' and Q4 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_November 2022 Final Report_11112022' for full details and findings for Recommendation 6.4.8.

ASX Action 2:

This activity has been fully addressed as part of Recommendation 6.4.8 submitted by ASX during the March 2022 quarterly review period (Q2). As part of Recommendation 6.4.8, ASX created the 'Independent Testing Quality Assurance' page which can be accessed via the 'Quality Engineering & Testing (QE&T) Home' page on the Confluence site. The 'Independent Testing Quality Assurance Framework' document is located on this page, and describes the model and process for independent testing quality assurance at ASX for all projects.

[REDACTED]

- [REDACTED]
- [REDACTED]

ASX has provided evidence that since the establishment of the 'Independent Quality Assurance Framework' and [REDACTED] the new requirements for independent specialist review have been used on projects.

Please refer to the Q2 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_May 2022 Final Report_13052022' and Q4 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_November 2022 Final Report_11112022' for full details and findings for Recommendation 6.4.8.

ASX Action 3:

As part of Recommendation 6.4.8 submitted by ASX during the March 2022 quarterly review period (Q2), ASX created a page titled 'Test Estimation Process' on their QE&T Home Confluence site. This page provides users with a 'Test Estimation Checklist' section to guide them on which estimation template should be used depending on the category of the initiative. The templates are:

- Estimation Template for New Implementation
- Estimation Template for System Upgrade

As part of the submission for the current Recommendation, 6.1.2, ASX made updates to the wording in the above templates and the 'Test Estimation Checklist'. ASX explicitly states that:

- ***"Independent Quality Assurance and Project Risk Assessment - High risk projects requiring independent testing quality assurance need to consider effort and cost from external providers for activity related to test capability, test processes and test strategy."*** This update demonstrates that project teams need to ensure that costs for independent assurance is taken into consideration as part of their project planning if the outcome of the PRA requires it
- ***"Projects undergo 6 monthly risk assessments. If the risk level changes from Low or Medium to High, or from Medium to High, this has implications for independent testing quality assurance."*** This update covers the circumstances where 6 monthly project risk assessments are made and the implications if the risk profile increases

The 'Test Estimates Checklist' page also includes an 'Indicative Guidance on independent testing quality assurance assessments and specialist test strategy reviews' table, which provides guidance on type of assurance assessment, indicative effort and indicative budget for external provider, depending on the project size.

ASX Action 4:

As part of Recommendation 6.4.8 submitted by ASX during the March 2022 quarterly review period (Q2), ASX's Head of Testing conducted training and provided communications to roll out the new Independent Testing Quality Assurance Framework and processes. Training and communications completed included:

- Independent Test Quality Assurance training session (virtual meeting) for test managers and test leads on 13 January 2022

- Email distribution of Independent Testing Assurance training material on 20 January 2022 following training session
- Blogpost on Confluence site on 24 January 2022 announcing changes to Independent Testing Assessment
- Email communication from Head of Testing on 25 January 2022 to impacted business stakeholders of upcoming projects titled 'Awareness for new projects - two new processes to independent testing assurance'
- Email communication from Head of Testing on 27 January 2022 to Enterprise Risk Management (ERM) titled 'Awareness - new independent testing assurance process which will also cover customer testing'

ASX has since included the 'Independent Test Quality Assurance' training as a mandatory training for certain roles (i.e., Test Leads, Test Managers, Project Test Manager) as part of on-boarding to the QE&T Community of Practice.

ASX Action 5:

As part of Recommendation 6.5.2 submitted by ASX during the September 2022 quarterly review period (Q4), ASX established the Quality Engineering & Testing Forum (QETF) in August 2022 and held the first QETF on Wednesday 31 August 2022. The QETF is held on the last Wednesday of each month. In the QETF Terms of Reference (ToR), ASX states that the QETF is an enterprise-level governance group made up of executive and senior leadership roles involved in software delivery, with an exclusive focus on product quality and testing process quality. Additionally, it is stated that one of the main tasks the QETF is responsible and accountable for is to "review enterprise metrics against established targets to identify risks and improvement opportunities".

In the September 2022 QETF meeting pack, ASX has shown that the Independent Testing Assessments (ITA), which is done by the external independent expert (i.e., independent testing quality assurance provider), and metrics have been included in the agenda of the QETF and discussed as part of 'Quality Metrics Reporting' section. In the most recent QETF meeting (offline session) on 16 December 2022, ASX noted

in the meeting pack that ITA were excluded as there were no changes since previous reporting period, demonstrating ongoing monitoring.

ASX Action(s) update Communication Log:

Please note, the below Communication Log also contains a consolidation of the past communications completed by ASX when the related Recommendation concept was first introduced.

Channel	Description	Date
Training Session Meeting	Q2 Recommendation 6.4.8 - Communication on important updates to the Project Management Framework (Independent Testing Assurance Training Material)	13/01/2022
Outlook Email	Q2 Recommendation 6.4.8 - Distribution of Independent Testing Assurance Training Material following training session	20/01/2022
Blog Post on Confluence	Q2 Recommendation 6.4.8 - Messaging and announcement to raise awareness and change of Independent Testing Assessment	24/01/2022
Outlook Email	Q2 Recommendation 6.4.8 - Communication from Head of Testing (Awareness for new projects - two new processes to independent testing assurance)	25/01/2022
Outlook Email	Q2 Recommendation 6.4.8 - Communication between Head of Testing and ERM (Awareness - new independent testing assurance process which will also cover customer testing)	27/01/2022
Outlook Email	Quality Engineering and Testing - September Delivery Excellence Update. Launch of Quality Metrics Framework.	6/10/2022
QETF Meeting (Offline)	Offline (email distribution) December 2022 QETF Meeting	16/12/2022

Recommendation 6.3.1: Describe role-based test training program

	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
Recommendation Addressed?	Yes		
Comment	Recommendation has been addressed, as evidenced by the findings outlined below. ASX Actions are deemed appropriate and sustainable at the present time.		

Background/Tasks

Describe role-based ASX test training program within the ASX test policy that supports the ASX test policy and guidelines, the ASX test methodology, and their concepts.

ASX Action(s)

1. Current state assessment of test training and knowledge using industry-aligned framework (e.g. SFIA)
2. Determine certification & training needs and minimum requirements linked to delivery and operational risk
3. Develop and roll out training and on boarding plan and processes, prioritising higher risk groups

Findings

ASX Action 1:

ASX has created a 'Quality Engineering & Testing (QE&T) Training and Knowledge' page on their QE&T Confluence site, which provides an overview of the test training and knowledge collateral available to ASX's Project Testing community. ASX recognises the following roles within its Project Testing community:

- Test Engineer
- Senior Test Engineer
- Test Lead
- Test Manager
- Program Test Manager
- Senior Test Automation Manager
- Test Automation Lead
- Principal Test Automation Engineer

Under the section titled 'ASX Approach to Professional Development', ASX states that their approach for effective professional development involves 3Es:

- **Education (10%)** - formal learning, education or reading
- **Experience (70%)** - performance of actual role or task
- **Exposure (20%)** - relationships, networking and feedback

ASX (with a People Partner) utilised the 'Skills Framework for the Information Age (SFIA)' framework to develop a new SFIA Testing Skills Capability Framework and the 'Skill Based Test Training & Knowledge' table, after conducting a skills assessment of its QE&T staff. The 'Skill Based Test Training & Knowledge' table details the key ASX training collateral (e.g., in person/virtual training sessions and e-modules) and key knowledge collateral (e.g., reading material from training sessions (training packs), frameworks, policies, repositories) that support knowledge acquisition and retention.

ASX has covered each of the following SFIA aligned skills:

- Testing
- Programming & Software Development
- Methods & Tools
- Resourcing
- Requirements Definition & Management
- Systems Development Management
- Performance Management
- Relationship Management

ASX has explicitly stated that its training approach is designed to support ASX ways of working and ASX's application of industry standards i.e., not design to train the industry standard but the application of the industry standard at ASX, as well as how ASX wants its QE&T resources to deliver.

Furthermore, all new starters (i.e., permanent, contractor, consultant and FTE) at ASX are sent a welcome email and directed to the 'QE&T Onboarding Page' on the Confluence site which provides the new starter with a summary of the onboarding process (e.g., mandatory training and reading required) and useful links to frameworks and repositories.

ASX Action 2:

During the June 2022 quarterly review period (Q3), ASX submitted Recommendation 6.3.2 and Recommendation 6.5.1. These Recommendations covered the topics of Risk Based Testing (RBT) Strategy and Defect Management Strategy, respectively, and as part of the launch of these new QE&T strategies, ASX produced targeted training materials and communications.

At the time of rolling out these new strategies as part of their respective Recommendations in June/July 2022, ASX conducted Fundamentals Training sessions and Brown Bag sessions to educate the QE&T community on these topics. However, these training sessions were not mandatory for everyone to attend, although in their written response from 4 August 2022, ASX confirmed that all the Test Managers had attended the training and the training would become mandatory for all

new Test Managers in the future as part of the implementation of this current Recommendation, 6.3.1.

For Recommendation 6.3.1, ASX stated that through the training and knowledge mapping exercise, they identified the areas of Defect Management and Risk Based Testing as key areas that support projects and operations, and therefore necessary for all QE&T staff to have a clear understanding of the QE&T policy and standards.

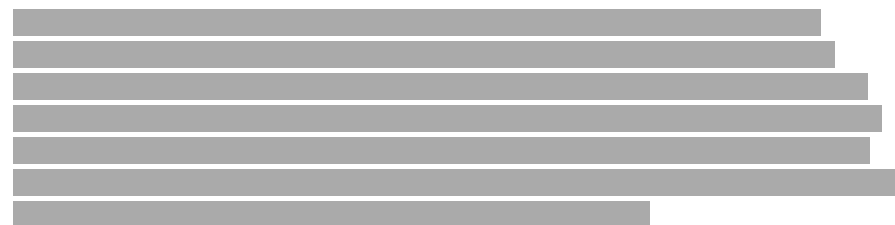
As a result, ASX created two mandatory training courses in their Learning Management System (LMS - online learning tool) for new starters as part of onboarding:

- Defect Management Certification
- Risk Based Training (RBT) Certification

These courses are required to be completed within 30 days from when the new starter commenced the role at ASX (accessed via onboarding page and welcome email), and a digital certificate (Certificate of Completion) is issued upon completing the course content.

The Defect Management Certification training is mandatory for all members of the QE&T team and the RBT Certification training is mandatory for the following QE&T roles (i.e., role based training):

- Test Lead
- Test Manager
- Program Test Manager



ASX Action 3:

As stated in Action 1, ASX has created a 'QE&T Onboarding Page' on the Confluence site which provides the new starter with a summary of the

onboarding process (e.g., mandatory training and reading required) and useful links to frameworks and repositories. This page acts as a guide for the new starter and provides a timeline of the tasks required of them within the first 3 months of becoming a QE&T Capability team member. New starters are directed to this site via the welcome email sent to them, which provides information on the following:

- Your New Starter Onboarding Toolkit
- Important Reading
- QE&T Mandatory Onboarding and Learning Sessions

In the first month, new starters are enrolled in the mandatory QE&T Onboarding training session, which is an instructor lead (senior managers within QE&T Capability), classroom based training that introduces the QE&T Capability. The training content is accessible at any time in the QE&T Repository. The LMS will record and track the attendance of new starters for these sessions.

In the written response provided by ASX on 23 January 2023, ASX stated that as part of onboarding, all new starters will receive an ASX email with a career contact person from HR to support their onboarding journey.

Furthermore, ASX explained in their written response that ASX classifies 'higher risk groups' as roles that need to produce a test plan for projects or change (i.e., anyone managing end-to-end testing changes), which currently include the roles of Test Lead, Test Manager and Program Test Manager identified in ASX Action 2 that are required to complete the RBT Certification training. The accountabilities of the roles are as per below:

- **Test Lead:** small change
- **Test Manager or Program Test Manager:** Tier 1 and Tier 2 projects

ASX also stated in their written response that following a review of the CHES Replacement Project towards the end of 2022, they had identified a new role, Test Director, as being required in major projects,

which they intend to incorporate into their Project Testing community in the future.

ASX Action(s) update Communication Log:

Please note, the below Communication Log also contains a consolidation of the past communications completed by ASX when the related Recommendation concept was first introduced.

Channel	Description	Date
MS Teams Meeting	Q3 Recommendation 6.3.2 - 'Risk Based Testing Strategy -Fundamentals v1.0' training session	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.3.2 - Brown Bag Sessions - Delivery Excellence IBMR Information Session	27/06/2022-1/07/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - 'Defect Management Strategy -Fundamentals v1.0' training session	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - Brown Bag Sessions - Delivery Excellence IBMR Information Session	27/06/2022-1/07/2022
Meeting	QETF Community of Practice November 2022 Meeting	November 2022
Outlook Email	Delivery Excellence- November Update Part 1	18/11/2022

Recommendation 6.3.3: Adopt ASX overarching test strategy consistent with ISO29119

	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
ASX Action 4	✓	✓	✓
ASX Action 5	✓	✓	✓
Recommendation Addressed?	Yes		
Comment	Recommendation has been addressed, as evidenced by the findings outlined below. ASX Actions are deemed appropriate and sustainable at the present time.		

Background/Tasks

Adopt an overarching and detailed ASX Test Methodology which includes templates, methods and processes, job role and guidelines to ensure any compliance to ISO29119 guidelines.

ASX Action(s)

1. Create and document a detailed ASX test methodology, aligned to ISO29119 guidelines
2. Prescribe acceptable testing standards (ATS) required for all technology-enabled change aligned to risk appetite and risk-based pathways
3. Update sourcing processes to provide acceptable testing standards to partners and vendors providing engineering, quality engineering or testing services
4. Enhance job roles and responsibilities linked to ASX Testing Career Pathways

5. Publish and roll out the ASX test methodology with appropriate education and communication, linked to training programs

Findings

ASX Action 1:

ASX has created a 'Test Methodology' page as part of their Quality Engineering & Testing (QE&T) Confluence site. The 'Test Methodology' page describes the end-to-end process for delivering testing in a project at ASX, designed to be a constituent part of an overall Software Development Methodology. The 3 test methodologies used by ASX are:

- Waterfall
- Agile
- Hybrid

Specifically, ASX's 'Test Methodology' page describes in detail the below, for each of the 3 test methodologies:

Waterfall

- Processes and Governance (Model)
 - Test Phase Summary
 - Detailed Process Description
 - Functional System Testing
 - System Integration Testing
 - End to End Testing
 - Regression Testing
 - User Acceptance Testing
 - Specialised Testing
 - Non-Functional Testing
 - Data Migration Testing
 - Customer Testing
 - Customer Testing Types
 - Customer Testing in Risk Based Testing
 - Benefits of Customer Testing
- Metrics (Method)
- Workforce (Mindset)

- RACI

Hybrid (Agile and Waterfall)

- Tools and Practices (Machinery)
- Processes and Governance (Model)
- Metrics (Method)
- Workforce (Mindset)
 - RACI

Agile

- Tools and Practices (Machinery)
- Process and Governance (Model)
 - Test Phase Mapping with Sprint Event
 - Guidance on the Process for Non-Functional Testing
- Metrics (Method)
- Workforce (Mindset)

For each test methodology, ASX describes an overall delivery lifecycle, including the following factors where relevant:

- Key phases, stages or cycles
- Processes and activities that must be enacted
- Procedural rulesets, entry/exit criteria, checkpoints and gates
- Testing artefacts including their relationship internal to testing and to development touchpoints
- Required delivery unit composition (e.g., team structures)
- Roles and responsibilities
- The means by which governance is performed

ASX states that adoption of a suitable test methodology on a project is done in the 'Define & Plan' phase, where the Delivery Approach is agreed, which includes how the team will work from a delivery methodology perspective i.e., waterfall, agile or hybrid.

Under the 'References' section, ASX has listed the industry standards that were considered and aligned to:

- ISO-IEC-IEEE-29119-2 Part 1 (Concepts and Definitions)

- ISO-IEC-IEEE-29119-2 Part 2 (Test Processes)
- TMMi Level 3 - Defined - PA 3.3 (Test Life Cycle and Integration)

ASX has provided evidence of a project applying the test methodology through the deliverables created during the test lifecycle:

- Test Strategy
- RBT Assessment
- Test Plans
 - Functional Test Plan
 - Non-Functional Test Plan
 - Test Automation Plan
 - IWT Test Plan
 - Test Summary Report

ASX Action 2:

As part of Recommendation 6.2.2 submitted by ASX during the March 2022 quarterly review period (Q2), ASX created a centralised 'Quality Engineering Repository', an entry point for all management system related artefacts that support the 'what, why and how' of the QE&T methodology, which can be accessed via the 'Quality Engineering & Testing (QE&T) Home' page on the Confluence site. For the launch of the centralised repository during Q2, ASX had also revised and launched their new ASX Quality Engineering Vision, Roadmap and Policy.

ASX's 'QE&T Policy' page under the QE&T Confluence site describes the principles, approach and major objectives of the ASX's QE&T regarding testing. ASX states that this policy, when combined with the ASX quality engineering and testing processes and templates, provides a focus on standardising test processes and associated deliverables, with the following objectives:

- Ensuring a new or updated service meets the quality standards required for production implementation and use
- Improved customer experience and business/user satisfaction through an increase in the quality of services delivered into production

- Improvements in testing effectiveness and efficiency. This objective includes a decrease in the cost of testing, decreased time to implementation, early detection of defects, and mitigation of risks
- A reduction in the production implementation of changes which cause significant production incidents to business functionality
- Aligning testing objectives with ASX business objectives
- A working philosophy that aims to test smarter. This objective is realised in part through the documented service validation and testing processes, training, testing thought leadership, and a commitment to continuous improvement

One of the main QE&T policies defined by ASX is that:

“It is the Quality Engineering and Testing function's responsibility to identify the required resources and methods to appropriately identify system quality and allow project change to be conducted within the ASX risk appetite.”

This is measured through the use of:

- Risk Based Testing Framework
- Measurement Plan - Risk Based Testing
- Measurement Plan - Test Coverage

As part of Recommendation 6.3.2 submitted by ASX during the June 2022 quarterly review period (Q3), ASX introduced the concept of Risk Based Testing (RBT) and implemented this new QE strategy. Under the RBT approach, the recommended method for performing an RBT assessment is through a collaborative workshop, hosted by the Test Manager and involving various SMEs relevant to the change. The purpose of the workshop is to complete the RBT assessment collaboratively and leveraging the experience and knowledge of SMEs and, thereby, determine a proposed testing scope and identify any residual risks.

Under the 'Quality Engineering & Testing Standards' section of the QE&T Policy page, ASX has defined the standard groups:

- **Minimum Testing Standards:** Standards that apply to all testing at ASX
- **Testing Assessments:** Assessments applied to a project or change that supplement test planning and test scoping activities to mitigate the risk of testing gaps and ensure appropriate and comprehensive testing. Use the results of these assessments to select the minimum standards and related details that apply for a given project or change
- **Risk Based Testing Standards:** For change or project level testing activities (operational level), the set of standards that apply is based on the risk represented by all inputs and assessments to testing activities. Test Coverage tracking per the 'Measurement Plan - Test Coverage'. The appropriateness of testing, coverage percentage, and scope depends on the criticality of the platform from an ASX perspective, the software's historical quality profile, testing standards, and any test assessments conducted, including RBT Assessments, change assessments, risk assessments, independent assessments, etc.
- **Quality Maturity Standards:** Apply at the organisation level

In this section, ASX goes into comprehensive detail defining the minimum standards and evidence required for each testing category/activity expected from ASX and its vendors.

ASX states that through the measurement plans the application of RBT is visible to the QETF governance forum, which identifies compliance to minimum standard and identifies opportunities for RBT improvement. The measurement plans support consistent and, common across the project and change portfolio, reporting of test coverage, effectiveness and completeness of RBT.

ASX Action 3:

ASX has stated in their 'QE&T Policy' page that *“the policy is applicable to quality engineering and testing for all ASX services, including services provided by vendors, whether packaged or purpose built. It applies to all ASX quality engineering and test process participants and all project,*

initiatives, changes, and maintenance releases that require any implementation into production.”

As stated in Action 2, ASX has defined the minimum standards and evidence required for each testing category/activating expect from both ASX and the vendor side.

During the January 2022 quarterly review period (Q1), ASX submitted Recommendation 5.1.2 required them to create guidelines for supplier contract acceptance testing. As part of addressing Recommendation 5.1.2, ASX updated their ‘Vendor Management Framework’ and created the supplementary document titled ‘ASX Vendor Quality Guideline Standards and Controls’ in December 2021. Both these documents are accessed via the ASX Vendor Relationship Management SharePoint site.

In particular, the ‘ASX Vendor Quality Guideline Standards and Controls’ documents sets out the quality guidelines, standards and controls for vendors providing software and product releases to ASX. [REDACTED]

ASX Action 4:

Initially, ASX had created a ‘QE&T Roles and Responsibilities’ page under their QE&T Home page on the Confluence site in April 2022. This page provided a comprehensive view of the roles and their responsibilities within the QE&T capability practice and the ASX’s lines of business.

As part of Recommendation 6.3.1, also submitted during this quarterly review period (Q5), ASX developed a role-based training program to support the ASX test policy and guidelines, test methodology and concepts. In addressing 6.3.1, ASX conducted a skills assessment of its QE&T staff to create the ‘ASX Skills Capability Framework’, aligned to the global skills and competency framework as defined by the ‘Skills Framework of the Information Age’ (SFIA) framework. Subsequently,

ASX updated the QE&T Roles and Responsibilities page in October 2022 based on the skills assessment report. The following changes were made:

- **Updated responsibilities of the following Roles**
 - Principal Test Automation Engineer
 - Test Manager
 - Test Leads
 - Senior Test Engineer
 - Test Engineer
- **Newly Added Roles with Responsibilities**
 - NFT Engineer
 - Test Automation Lead
 - Senior Test Automation Engineer
 - Automation Engineer

During the Recommendation Review Workshop held on 25 January 2023 (Q5 ASX Remedial Actions - Q&A Review for Recommendation 6.3.3), ASX stated that they are currently focused on automation and maturing their DevOps journey. As the technology landscape continues to evolve, ASX will be reviewing their workforce strategy and the roles required to ensure they are keeping up with the changing technology landscape.

ASX Action 5:

This activity has been fully addressed as part of Recommendation 6.3.1, also submitted during this quarterly review period (Q5). As part of Recommendation 6.3.1, ASX developed a role-based training program to support the ASX test policy and guidelines, test methodology and concepts.

Please refer to Findings for 6.3.1 for details on the onboarding/training programs.

ASX Action(s) update Communication Log:

Please note, the below Communication Log also contains a consolidation of the past communications completed by ASX when the related Recommendation concept was first introduced.

Channel	Description	Date
Outlook Email	Q1 Recommendation 5.1.2 - ASX shared the final version of the document to the Team #2 ASX Vendor Quality Guidelines Standards and Controls.pdf	17/12/2021
Design Authority Meeting	Q2 Recommendation 6.2.2 - Presentation of changes (new Design Authority template) for information and awareness	14/03/2022
Test Management Meeting	Q2 Recommendation 6.2.2 - Changes to the Design Authority template and PRA tabled for discussion and awareness	29/03/2022
Outlook Email	Q2 Recommendation 6.2.2 - Communication of new QE transformation items from test management meeting	30/03/2022
MS Teams Meeting	Q3 Recommendation 6.3.2 - 'Risk Based Testing Strategy -Fundamentals v1.0' training session	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.3.2 - Brown Bag Sessions - Delivery Excellence IBMR Information Session	27/06/2022-1/07/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - 'Defect Management Strategy -Fundamentals v1.0' training session. As part of submission for 6.3.1	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - Brown Bag Sessions - Delivery Excellence IBMR Information Session. As part of submission for 6.3.1	27/06/2022-1/07/2022
Meeting (Virtual)	Q4 Recommendation 6.1.1 - Quality Engineering Vision Update 2022 (multiple sessions held in March 2022)	March 2022
Outlook Email	Q4 Recommendation 6.1.1 - Launch email to introduce new Quality Engineering & Testing repository in Confluence	31/03/2022

Meeting	Q4 Recommendation 6.1.1 - QE&T Introduction and Roadmap Securities & Payments LoB Meeting	30/06/2022
Outlook Email	Q4 Recommendation 6.1.1 - QE&T August Delivery Excellence Update	1/09/2022
Blog Post on Confluence	Q4 Recommendation 6.1.1 - Blog post on launch IWT Guide and QE&T Roadmap	6/09/2022
Outlook Email	Q4 Recommendation 6.1.1 - QE&T September Delivery Excellence Update	6/10/2022
Meeting (Virtual)	Q4 Recommendation 6.1.1 - CoP Event September 2022	12/09/2022
Meeting (In-Person)	Q4 Recommendation 6.1.1 - ASX CoE Community Launch Event	13/10/2022
Meeting	Q5 Recommendation 6.3.1 - QETF Community of Practice November 2022 Meeting	November 2022
Outlook Email	Q5 Recommendation 6.3.1 - Delivery Excellence- November Update Part 1	18/11/2022
QETF Meeting (Offline)	Offline (email distribution) December 2022 QETF Meeting	16/12/2022

Recommendation 6.4.5: Create detailed interface and integration log. Require all high risk interfaces be tested

	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
ASX Action 3	✓	✓	✓
ASX Action 4	✓	✓	✓
ASX Action 5	✓	✓	✓
Recommendation Addressed?	Yes		
Comment	Recommendation has been addressed, as evidenced by the findings outlined below. ASX Actions are deemed appropriate and sustainable at the present time.		

Background/Tasks

Create a detailed interface and integration log, and for high importance interfaces ensure that end-to-end test coverage is completed. Where interfaces are not tested, then a clear rationale should be identified, the risk should be logged in the risk register and added to the implementation readiness document. Require that all high-risk feeds and interfaces, internal and external must be included in integration and end-to-end tests using test or live feeds rather than a virtualised or simulated stub.

ASX Action(s)

1. Design and implement a knowledge base for system interfaces and integrations across architecture, engineering and testing
2. Align integration knowledge base to BA framework and deliverables for maintainability

3. Develop acceptable testing standards for system integration and end-to-end testing with regards to use of stubs vs real interfaces, based on risk
4. Integrate testing with external feeds into project planning and estimation processes
5. Include system integration and end-to-end testing standards into QE procedures, processes and methodology and govern through QE Authority

Findings

ASX Action 1:

ASX has created a 'Knowledge Base - System Interfaces & Integration' page under the 'Quality Engineering and Testing (QE&T) Home' page on the Confluence site. The 'Purpose' section of the page states that the purpose of the 'System Interface Knowledgebase' is to provide a central repository of links to ASX system interfaces and integration. It is for used by the QE&T team when performing test analysis and design to ensure coverage, and is used in addition to the interface/integration requirements captured on the project specific Confluence pages.

As described under the 'Method' section, QE&T teams needs to review enterprise interfaces to identify high risk/high importance interfaces that need to be considered as part of scope for System Integration/End to End Testing.

ASX considers an interface as high risk/high importance if it satisfies any one of the below criteria:

- It has any regulatory feeds
- Feeds in and out of Gold Systems (System Classification information found in SNAP)

System, integration and architecture information is captured in different levels at ASX as below:

- Architecture level
- Engineering level

ASX QE&T teams need to check if the project/CR changes meet any of the below criteria to determine the System Integration/End to End Testing scope & approach:

- feed data directly or indirectly to high risk/high importance interface(s) and related applications/systems
- consume data directly or indirectly from high risk/high importance interface(s) and related applications/systems
- form part of end to end flow containing high risk/high importance interface(s)

Once the high risk/high importance interfaces have been determined, teams will review the below list with Business Analysts and Architects from the project/LOB to classify them appropriately:

- Interfaces that are identified as not high risk/high importance to check if any of them need to be classified as high risk
- If a System/application does not have business criticality information in SNAP
- If Interface information is missing in the interface's information stored on Data Exchange page
- If System information is missing

Additionally, as part of the 'Knowledge Base - System Interfaces & Integration' page, ASX has included links to other useful QE&T pages to help QE&T teams with the analysis of system interfaces and integration:

- **ASX Wiki:** ASX Wiki is ASX's answer to Wikipedia. The site provides up-to-date information about ASX systems, products, services and has useful information
- **Systems:** List of ASX Systems. Click on the system to find out a brief introduction of what they are used for
- **System Owners and Classification:** Systems in ASX are classified as Gold / Silver / Bronze based on Business criticality. This classification information is captured in SNAP
- **System Integration flows:** High level integration flows between systems (owned by Enterprise Architecture)

- **Interfaces:** Interfaces information at a high level is stored on Data Exchange Page (owned by Enterprise Architecture)

ASX Action 2:

ASX has included the link to the 'Knowledge Base - System Interfaces & Integration' Confluence page in the Business Analysis (BA) Community of Practice's 'Business Analysis Home' Confluence page, the 'Detailed Business Requirements' Confluence page, and the 'User Stories and Acceptance Criteria' Confluence page.

In both the 'Detailed Business Requirements' and the 'User Stories and Acceptance Criteria' pages, the following information has been added:

*"Quality Engineering & Testing team **System Interface Knowledge Base** to provide a central repository of links to ASX system interfaces & integration. It is for use by the Quality Engineering & Testing team when performing test analysis and design to ensure coverage. Refer to the knowledge base to understand current state and determine existing pain points (note requirements are to be solution agnostic), potential risks, non-functional requirements and acceptance criteria (note: acceptance criteria on user stories will evolve and will require solution design to be completed)."*

To promote awareness of the System Interface Knowledge Base, ASX conducted a real-time walkthrough of the knowledge base during the BA Community of Practice Forum on 10 November 2022.

ASX Action 3:

As part of Recommendation 6.3.3, also submitted during this quarterly review period (Q5), ASX was required to 'create and document a detailed ASX test methodology, aligned to ISO29119 guidelines' for ASX Action 1, and 'prescribe acceptable testing standards (ATS) required for all technology-enabled change aligned to risk appetite and risk-based pathways' for ASX Action 2.

For ASX Action 1 of Recommendation 6.3.3, ASX created a 'Test Methodology' page as part of their Quality Engineering & Testing (QE&T) Confluence site. The 'Test Methodology' page describes the end-to-end

process for delivering testing in a project at ASX, designed to be a constituent part of an overall Software Development Methodology.

Both 'System Integration Testing' and 'End to End Testing' are covered on the Test Methodology page, and ASX provides explicit guidance on when stubs or real interfaces should be used, depending on the risk level of the interface/integration. [REDACTED]

- [REDACTED]
- [REDACTED]
- [REDACTED]

For ASX Action 2 of Recommendation 6.3.3, ASX updated the 'Quality Engineering & Testing Standards' section of the 'QE&T Policy' Confluence page, and defined the standard groups:

- **Minimum Testing Standards**
- **Testing Assessments**
- **Risk Based Testing (RBT) Standards**

- **Quality Maturity Standards**

In this section, ASX goes into comprehensive detail defining the minimum standards and evidence required for each testing category/activity expected from ASX and its vendors.

Please refer to Findings for 6.3.3 for full details on ASX's Testing Methodology and acceptable testing standards.

As part of Recommendation 6.3.2 submitted by ASX during the June 2022 quarterly review period (Q3), ASX introduced the concept of Risk Based Testing and implemented this new QE strategy. Please refer to the Q3 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_August 2022 Final Report_12082022' for full details and findings for Recommendation 6.3.2.

ASX Action 4:

ASX requires Project Owners, Project Managers and Project Teams to complete a Business Case form in order for a project to be formally considered by the relevant governing body. ASX states in their Business Case guidelines that the Business Case sets out the business justification and rationale for the project, focusing on the preferred solution being proposed for implementation, timeline, resourcing, costs and benefits of the opportunity, risk profile associated with delivery and the overall organisational change management aspects to be considered to ensure successful BAU transition.

Depending on the proposed Project Tier, there are two templates to choose from:

- **Full Business Case:** mandatory for all Tier 1 projects. For Tier 2 projects, certain sections noted within the template are optional or recommended
- **Short Form Business Case:** a significantly simplified version of the business case for Tier 3 projects

Prior to completing the relevant Business Case form, project teams need to firstly determine the costs and efforts of the project, by completing an 'Estimation Template' to gather work estimates in a consistent and standardised manner. In the written response provided by ASX on 25

January 2023, ASX stated that capturing of testing with new or existing external feeds form part of the assessment and are reflected in the costs and efforts estimates. The 'Estimation Template' also contains a sample 'Features List' with different sizing or estimation techniques applied that would be required for project teams to capture when completing the overall estimates and end-to-end delivery planning.

Project Managers/Scrum Masters are then required to use the 'Budget & Forecast Template' to compile and manage their project budgets at a granular level. This will feed into formal Financial Management tools such as the Financial Cash flow Model (completed as part of the Business Case) and FARSight.

Later on in the ASX project delivery cycle, as part of ASX's test planning process, projects need to complete the Test Plan template, which captures the testing to be executed. The Test Plan includes the following:

- Test Objectives
- Test Scope and Approach
- Planned Test Coverage
- Out of Scope
- Test Milestones
- Test Process
- Test Automation
- Test Data
- Test Metrics
- Test Environments
- Definition of Ready and Definition of Done
- Suspension and Resumption Criteria
- Deviations from the Organisational Test Strategy
- Roles and Responsibilities
- Assumptions, Risk, Dependencies and Decisions

Under the 'Test Scope and Approach' section, System Integration Testing and End to End Testing are captured, including the planned test coverage.

ASX Action 5:

As stated in the Findings for ASX Action 3, ASX has created a 'Testing Methodology' page under the Quality Engineering & Testing (QE&T) Confluence site, as well as updated the 'Quality Engineering & Testing Standards' section of the 'QE&T Policy' Confluence page to provide detail on acceptable testing standards at ASX. Both of these pages include explicit guidance on System Integration Testing and End to End Testing.

As part of Recommendation 6.5.2 submitted by ASX during the September 2022 quarterly review period (Q4), ASX established the Quality Engineering & Testing Forum (QETF) in August 2022 and the QETF is the QE Authority at ASX. In the QETF Terms of Reference (ToR), ASX states that the QETF is an enterprise-level governance group made up of executive and senior leadership roles involved in software delivery, with an exclusive focus on product quality and testing process quality. Additionally, it is stated that one of the main tasks the QETF is responsible and accountable for is to "review enterprise metrics against established targets to identify risks and improvement opportunities".

In the December 2022 meeting pack provided by ASX, test coverage reporting was included in the agenda.

ASX Action(s) update Communication Log:

Please note, the below Communication Log also contains a consolidation of the past communications completed by ASX when the related Recommendation concept was first introduced.

Channel	Description	Date
Meeting (In Person/Virtual)	Q4 Recommendation 6.5.2 - 'Quality Engineering & Testing Forum (QETF) Pre-Read Pack' session to introduce the new QETF	31/08/2022
Outlook Email	Q4 Recommendation 6.5.2 - Email from the Head of Testing - QE&T Capability Practice to ASX Testing	6/10/2022

	and Project Management staff to raise awareness about the 'Quality Engineering and Testing - September Delivery Excellence Update'. Quality Metrics Framework Information Pack attached to the email.	
MS Teams Meeting	Q3 Recommendation 6.3.2 - 'Risk Based Testing Strategy - Fundamentals v1.0' training session	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.3.2 - Brown Bag Sessions - Delivery Excellence IBMR Information Session	27/06/2022-1/07/2022
Meeting (In-Person)	BA CoP Meeting	10/11/2022
Outlook Email	Delivery Excellence - November Update Part 2 of 2. Email from Head of Testing announcing the new 'Knowledge Base - System Interfaces and Integration.	18/11/2022
QETF Meeting (Offline)	Offline (email distribution) December 2022 QETF Meeting	16/12/2022

Recommendation 6.4.7: Document a test planning guide that prompts wide range of test scenarios

	Executed	Appropriate	Sustainable
ASX Action 1	✓	✓	✓
ASX Action 2	✓	✓	✓
Recommendation Addressed?	Yes		
Comment	Recommendation has been addressed, as evidenced by the findings outlined below. ASX Actions are deemed appropriate and sustainable at the present time.		

Background/Tasks

Document a test planning guide that prompts delivery teams to consider a wider coverage of the requirements due to inherent risks and complexities involved. For example, consider dynamic functional scenarios e.g. at start of day, in a slow market, in a very fast market, with many cancels, in a top of book scenario, in a non-top of book scenarios, across partition.

ASX Action(s)

1. Create an ASX Test Planning guide to provide specific guidance and criteria to plan for wider test coverage to include for example dynamic functional scenarios, schedule-based scenarios (e.g. SOD/EOD), cumulative scenarios, different profiles of market activity and edge cases
2. Integrate ASX Test Planning guide with QE processes, procedures and methodology, Test environments and test data management capability, Continuous improvement program and Risk-based pathways

Findings

ASX Action 1:

ASX has created a 'Scenario Test Design Technique Guide' page as part of their Quality Engineering & Testing (QE&T) Confluence site. Under the 'Purpose' section of the page, ASX states that the purpose of the 'Scenario Test Design Technique Guide' is to provide guidance and criteria to plan for wider test coverage by utilising the Scenario Test Design Technique. This includes processes for planning and executing functional and non-functional (i.e., performance testing) scenario tests, and how to derive test coverage.

This guidance is provided to ensure test coverage achieves the level of coverage required based on the dimensions of the change to a system or systems. Under the 'Method' section of the guide, ASX states that a change/project may have inherent risks due to the project characteristics or due to the absence of controls. The test manager, in these circumstances, can use the scenario test design technique during the test planning, to help identify test cases to cover inherent risk and adhere to any mandatory requirements.

The types of Scenario Testing covered in the guide are those:

- Based on operational profiles (dynamic functional scenarios/different profiles)
- Based on use cases/stories (customer centricity)
- Based on schedules (schedule-based scenarios e.g., start of day (SOD)/end of day (EOD))

Cumulative scenarios can be derived by considering test cases that can be combined to form a complex business workflow to mimic complex behaviour within the application.

The guide also notes that the Scenario Test Design Technique is not suitable for all types of testing. For example, security testing uses specialised tools to execute tests and analyse results. However, there are instances where scenario tests may supplement a test type. For example, failover testing could be supplemented by applying load using scenario tests.

ASX has developed the 'Template - Test Plan' template, which is used to capture the Scenario Test Design. The test plan captures inputs that supports defining the extend of testing to be performed in a project, and is a consolidation point for how testing will be performed factoring in scope and approach, objectives coverages, process, test data, measurement and environments. Once a test plan has been produced, the General Manager of Engineering and Architecture, as well as the Head of Testing must review and sign off on the test plan. A list of the required approvals and recommended reviews of the Test Plans and Test Summary Reports has been created by ASX under the 'Signatories and Reviewers for Test Plans and Test Summary Reports' section on their QE&T Confluence site.

ASX uses [REDACTED] to capture the outcomes from test scenarios in the form of test cases, and has provided evidence of projects applying the Scenario Test Design Technique to create test scenarios. It is a mandatory requirement for all projects/changes to create a 'Requirements Traceability Matrix (RTM)' document, a document that maps and traces user requirements through design and completes with the relevant test cases, as part of their deliverables. The main purpose of the RTM is to track all the requirements and to confirm that the project implementation meets the requirements. The RTM is generally completed using Confluence and Jira. In the instance where Jira isn't used, a 'Traceability Matrix' spreadsheet document is used. ASX has stated in their Summary Consolidation Page for this Recommendation that no projects have been identified where Confluence and Jira has not been used for requirements traceability.

Furthermore, ASX has created a 'Term Definitions and Glossary' section as part of the 'QE&T Policy' page on the QE&T Confluence site, and has included an introductory definition of the Scenario Test Design Technique.

ASX Action 2:

In the Summary Consolidation Page for this Recommendation, ASX has summarised, at a high level, the 'Test Planning' and 'Test Execution' effort in their Testing Lifecycle as the below:

1. **Risk Based Testing** - help identify test scope, test types and test pattern

Note: Previously submitted by ASX in the June 2022 quarterly review period (Q3) as part of Recommendation 6.3.2

2. **Test Plan** - captures the testing to be executed

Includes:

- Test Objectives
- Test Scope and Approach
- Planned Test Coverage
- Out of Scope
- Test Milestones
- Test Process
- Test Automation
- Test Data
- Test Metrics
- Test Environments
- Definition of Ready and Definition of Done
- Suspension and Resumption Criteria
- Deviations from the Organisational Test Strategy
- Roles and Responsibilities
- Assumptions, Risk, Dependencies and Decisions

3. **Test Cases** - captures the specification of what is to be done (scenario test design contributes here as a technique to inform the design of test cases)

4. **Defect Management** - the process of rectifying defects

Note: Previously submitted by ASX in the June 2022 quarterly review period (Q3) as part of Recommendation 6.5.1

5. **Test Summary Report** - the culmination of a completed cycle, cycles or full scope of testing (type or all types)

Includes:

- Test Objectives
- Test Scope and Approach
- Out of Scope
- Test Coverage Details
- Test Execution Details
- Defects and Quality
- Test Environments and Release Details
- Recommendation
- Lessons Learned

During the June 2022 quarterly review period (Q3), ASX submitted Recommendation 6.3.2 and Recommendation 6.5.1. These Recommendations covered the topics of Risk Based Testing (RBT) Strategy and Defect Management Strategy, respectively, and ASX was able to demonstrate clearly how these new strategies integrated into their QE processes, procedures and methodology.

Please refer to the Q3 quarterly report 'ASX Independent Assessment of IBM Review Recommendations_August 2022 Final Report_12082022' for full details and findings for Recommendation 6.3.2 and Recommendation 6.5.1.

Once the RBT assessment has been completed to determine the test scope, test types and test pattern, the test plan and test cases are created via the processes described in the Findings for Action 1, with the use of the 'Scenario Test Design Technique'. The Defect Management Strategy (i.e., defect process, defect analysis and resolution) is then applied to rectify issues that arise from testing, and test coverage measurement reporting is made through the QE&T Forum (QETF). Finally, the Test Summary Report, a mandatory delivery, is created at the end of each completed testing cycle.

During the Recommendation Review Workshop held on 25 January 2023 (Q5 ASX Remedial Actions - Q&A Review for Recommendations 6.4.5 and 6.4.7), ASX stated that the Test Plan template is the key document that informs the Test Manager of all the services they need to engage,

such as the Test Environment and Test Data Management Capability, in order to complete all the categories of the test plan. At the time of the workshop, ASX explained that the 'Test Data' and Test Environments' sections of the test plan were completed by the Test Manager with the Test Environment and Test Data Management Capability teams. The Test Manager would engage those teams by emailing the central mailbox of the Test Environment team or Test Data Management team and obtain their input in completing the sections. However, ASX had not documented in the test plan template these instructions to engage Test Environment and Test Data Management teams.

Following the workshop, ASX provided a written response on 31 January 2023 and included an updated version of the Test Plan template which now includes the central mailboxes the Test Manager needs to email in order to engage the Test Environment and Test Data Management teams. In their written response, ASX states that authors and contributors (i.e., Test Manager and Test Environment and Test Data Management Capability teams) also make direct contact through channels other than email e.g., phone call, walk-up or Teams communication, as the authors and contributors generally know the representatives of data and environment that they need to connect with. Once all the sections of the test plan are completed, the Head of QE&T and QETF would review and approve the test plan.

In terms of continuous improvement of the Scenario Test Design Technique Guide, ASX seeks to improve the effectiveness and efficiency of the testing processes through the existing PIR (Project Implementation Review) process, or through the QE&T continuous improvement framework.

ASX Action(s) update Communication Log:

Please note, the below Communication Log also contains a consolidation of the past communications completed by ASX when the related Recommendation concept was first introduced.

Channel	Description	Date
MS Teams Meeting	Q3 Recommendation 6.3.2 - 'Risk Based Testing Strategy -Fundamentals v1.0' training session	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.3.2 - Brown Bag Sessions - Delivery Excellence IBMR Information Session	27/06/2022-1/07/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - 'Defect Management Strategy -Fundamentals v1.0' training session. As part of submission for 6.3.1	23/06/2022 and 24/06/2022
MS Teams Meeting	Q3 Recommendation 6.5.1 - Brown Bag Sessions - Delivery Excellence IBMR Information Session. As part of submission for 6.3.1	27/06/2022-1/07/2022
MS Teams Meeting	QET Lighthouse Review Forum - Scenario Based Testing Guideline walkthrough	14/10/2022
Outlook Email	Provides overview of updates made to Scenario Based Testing Guideline, post 'QET Lighthouse Review Forum - Scenario Based Testing Guideline walkthrough' meeting	19/10/2022
Outlook Email	Quality Engineering and Testing - October Delivery Excellence Update. Launch of Scenario Based Testing.	7/011/2022
QETF Meeting (Offline)	Offline (email distribution) December 2022 QETF Meeting	16/12/2022

Appendix A Recommendation review workshops list

#	Date	Meeting Title
1	23/01/2023 (<i>Workshop not held, written response provided</i>)	Q5 ASX Remedial Actions - Q&A Review for Recommendations 6.1.2
2	23/01/2023 (<i>Workshop not held, written response provided</i>)	Q5 ASX Remedial Actions - Q&A Review for Recommendations 6.3.1
3	25/01/2023	Q5 ASX Remedial Actions - Q&A Review for Recommendations 6.4.5 and 6.4.7
4	30/01/2023	Q5 ASX Remedial Actions - Q&A Review for Recommendations 6.3.3
5	8/02/2023	Q5 ASX IBM Recommendations: EY IE Draft Report Factual Accuracy Check Review

Appendix B Interviewed ASX stakeholders list



Appendix C Recommendations Questionnaire submitted to ASX post SMR documentation review





Appendix D Documents reviewed



















Appendix E Status summary of all 59 Recommendations

ASX has submitted fifty-four (54) Recommendations for closure to date. Out of the fifty-four (54) Recommendations, fifty-two (52) Recommendations have been deemed 'fully addressed' and closed, with two (2) Recommendations deemed as 'partially addressed' and requiring further evaluation in upcoming quarterly review periods.

The Design Adequacy ("DA") Report submitted on 27 April 2022 identified that 13 Recommendations out of the remaining 37 Recommendations which had yet to be submitted at that point in time, were partially addressed and did not have ASX Actions fit for purpose to address the IBM Recommendations. In order for ASX to fully address the Recommendations during the relevant quarterly submission period, ASX should take into consideration the Independent Expert Recommendations for those partially addressed Recommendations in the DA Report.

Below is an overview of each of the 59 Recommendations and their closure / submission status at the end of the fifth quarterly review period (10 February 2023):

Status	Description	Total (59)
✓ Closed	Recommendation reviewed by the IE and deemed fully addressed	52
✓ Partially Addressed	Recommendation submitted by ASX, reviewed by the IE but currently deemed partially addressed	2
Not Submitted	Recommendations not yet submitted by ASX (expected due date indicated)	5
✗ Original Submission Date	Indicates the original date Recommendation was submitted by ASX but deemed partially addressed by IE after review. <i>*Applicable for Recommendations deemed fully addressed in subsequent quarterly review periods.</i>	

#	IBMR	Design Adequacy - Fit for Purpose?	Status	Q1	Q2	Q3	Q4	Q5 (Current)	Q6	Q7
1. Risk Related Recommendations										
1	1.1.1	Partial	Closed			✓				
2	1.2.1	N/A	Closed	✗		✓				
3	1.2.2	Yes	Closed			✓				
4	1.2.3	Yes	Closed			✓				
5	1.2.4	N/A	Closed	✓						
6	1.2.5	Partial	Closed			✓				
7	1.2.6	Yes	Closed		✗	✓				
8	1.3.1	N/A	Closed	✓						

#	IBMR	Design Adequacy - Fit for Purpose?	Status	Q1	Q2	Q3	Q4	Q5 (Current)	Q6	Q7
9	1.3.2	N/A	Closed	✓						
10	1.3.3	N/A	Closed	✓						
11	1.3.4	Yes	Submitted				✓			
12	1.3.5	N/A	Closed	✓						
13	1.3.6	Partial	Closed		✗	✓				
14	1.3.7	Partial	Closed			✓				
15	1.3.9	N/A	Closed	✓						
16	1.3.10	N/A	Closed	✓						
17	1.4.1	Yes	Closed			✓		✓		
2. Governance Related Recommendations										
18	2.1.1	N/A	Closed	✓						
19	2.1.2	N/A	Closed	✓						
20	2.1.3	N/A	Closed	✓						
21	2.1.4	N/A	Closed	✓						
3. Delivery Related Recommendations										
22	3.1.1	Yes	Closed			✓		✓		
23	3.1.2	N/A	Closed	✓						
24	3.1.3	N/A	Closed	✓						
25	3.1.4	N/A	Closed	✓						
26	3.2.1	Yes	Submitted				✓			
27	3.2.2	Partial	Closed			✓		✓		
28	3.2.3	Yes	Closed			✓		✓		
29	3.2.4	N/A	Closed	✓						
30	3.2.5	Yes	Closed			✓		✓		
31	3.2.6	N/A	Closed	✓						
32	3.2.7	N/A	Closed	✓						
4. Requirements Related Recommendations										

#	IBMR	Design Adequacy - Fit for Purpose?	Status	Q1	Q2	Q3	Q4	Q5 (Current)	Q6	Q7
33	4.1.1	N/A	Closed	✓						
5. Vendor Management Related Recommendations										
34	5.1.1	N/A	Closed	✗		✓				
35	5.1.2	N/A	Closed	✗		✓				
36	5.1.3	Yes	Closed		✓					
6. Testing Related Recommendations										
37	6.1.1	Yes	Closed				✓			
38	6.1.2	Yes	Closed					✓		
39	6.1.3	Yes	Not Submitted							
40	6.2.1	Yes	Not Submitted							
41	6.2.2	Yes	Closed		✓					
42	6.3.1	Partial	Closed					✓		
43	6.3.2	Yes	Closed			✓	✓			
44	6.3.3	Yes	Closed					✓		
45	6.4.1	Partial	Closed		✓					
46	6.4.2	Yes	Not Submitted							
47	6.4.3	Partial	Closed				✓			
48	6.4.4	Yes	Closed		✓					
49	6.4.5	Partial	Closed					✓		
50	6.4.6	Yes	Not Submitted							
51	6.4.7	Yes	Closed					✓		
52	6.4.8	Yes	Closed		✓		✓			
53	6.5.1	Partial	Closed			✓		✓		
54	6.5.2	Yes	Closed				✓			
55	6.5.3	Partial	Not Submitted							
56	6.5.4	Yes	Closed				✓			
57	6.6.1	N/A	Closed	✗		✓				

#	IBMR	Design Adequacy - Fit for Purpose?	Status	Q1	Q2	Q3	Q4	Q5 (Current)	Q6	Q7
58	6.7.1	Partial	Closed		✓					
7. Incident Management Related Recommendations										
59	7.1.1	Partial	Closed		✓					

Appendix F Release Notice

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The results of EY's work, including the assumptions and qualifications made in preparing the report, are set out in EY's report dated 10 February 2023 ("Report"). ASX and ASX's regulators ASIC and the RBA, should read the Report in its entirety including any disclaimers and attachments. A reference to the Report includes any part of the Report. No further work has been undertaken by EY since the date of the Report to update it.

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