



ASAE 3402

Assurance Report on Controls at a Service Organisation relating to the Derivatives Clearing System (DCS)

1 JULY 2019 – 30 JUNE 2020



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01 / Assertion by Management

The information provided by ASX management in this report has been prepared for participants who have used DCS (Participants) and their auditors who have a sufficient understanding to consider the description, along with other information (including information about controls operated by participants themselves), when assessing the risks of material misstatement of participant's financial reports / statements. ASX confirms:

- (a) The accompanying description in Sections 5, 6 and 8 fairly presents DCS for processing participant's transactions throughout the period 1 July 2019 to 30 June 2020.

The criteria used in making this statement were that the accompanying description:

- (i) presents how the system was designed and implemented, including:
- the types of services provided including, as appropriate, classes of transactions processed
 - the procedures, within both information technology and manual systems, by which those transactions were initiated, recorded, processed, corrected as necessary, and transferred to the reports prepared for participants
 - the related accounting records, supporting information and specific accounts that were used to initiate, record, process and report transactions; this includes the correction of incorrect information and how information was transferred to the reports prepared for participants
 - how the system dealt with significant events and conditions, other than transactions
 - the process used to prepare reports for participants
 - relevant control objectives and controls designed to achieve those objectives
 - controls that ASX assumed, in the design of the system, would be implemented by participants, and which, if necessary to achieve control objectives stated in the accompanying description, are identified in the description along with the specific control objectives that cannot be achieved by ASX alone, and
 - other aspects of the ASX control environment, risk assessment process, information system (including the related business processes) and communication, control activities and monitoring controls that were relevant to processing and reporting participants' transactions.
- (ii) includes relevant details of changes to DCS during the period 1 July 2019 to 30 June 2020, and
- (iii) does not omit or distort information relevant to the scope of the system being described, while acknowledging that the description is prepared to meet the common needs of a broad range of participants and their auditors and may not, therefore, include every aspect of the system that each individual participant may consider important in its own particular environment.

- (b) The controls related to the control objectives stated in the accompanying description were suitably designed and operated effectively throughout the period 1 July 2019 to 30 June 2020. The criteria used in making this statement were that:

- (i) the risks that threatened achievement of the control objectives stated in the description were identified
- (ii) the identified controls would, if operated as described, provide reasonable assurance that those risks did not prevent the stated control objectives from being achieved and



- (iii) the controls were consistently applied as designed, including that manual controls were applied by individuals who have the appropriate competence and authority, throughout the period 1 July 2019 to 30 June 2020. In response to the COVID-19 pandemic and in accordance with Government and other expert advice, in March 2020 ASX transitioned to a remote working operating model for the majority of personnel, including some responsible for transaction processing and operational support of the DCS system. There has been no material change to the control environment, including the design and operating effectiveness of the controls listed in section 8 of this report, as a result of this change.

Signed on behalf of management

DocuSigned by:

A handwritten signature in black ink that reads 'Tim Hogben'. The signature is enclosed in a blue DocuSign signature box.
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Tim Hogben

Chief Operating Officer

28 July 2020



02 / Independent Service Auditor's assurance report on the description of controls, their design and operating effectiveness

To: Directors of ASX Limited (ASX)

Scope

In accordance with the terms of the engagement letter dated 16 April 2020, we were engaged to report on the ASX Limited's description in Section 5 and 6 at pages 10-13 of its DCS System for processing Participant's transactions throughout the period 1 July 2019 to 30 June 2020 (the description), and on the design and operation of controls related to the control objectives stated in Section 8 at pages 16-34 of this report.

The description indicates that certain control objectives specified in the description can be achieved only if complementary Participant controls contemplated in the design of ASX's controls are suitably designed and operating effectively, along with related controls at the service organisation. We have not evaluated the suitability of the design or operating effectiveness of such complementary Participant controls.

ASX's Responsibilities

ASX is responsible for preparing the description and accompanying statement in Section 1 at pages 3-4, including the completeness, accuracy and method of presentation of the description and statement; providing the services covered by the description; stating the control objectives; and designing, implementing and effectively operating controls to achieve the stated control objectives.

Our Independence and Quality Control

We have complied with relevant ethical requirements related to assurance engagements, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

The firm applies Auditing Standard ASQC 1 *Quality Control for Firms that Perform Audits and Reviews of Financial Reports and Other Financial Information*, Other Assurance Engagements and Related Services Engagements and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

Service Auditor's Responsibilities

Our responsibility is to express an opinion on ASX's description and on the design and operation of controls related to the control objectives stated in that description, based on our procedures.

5/34

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We conducted our engagement in accordance with Standard on Assurance Engagements ASAE 3402 *Assurance Reports on Controls at a Service Organisation (ASAE 3402)*, issued by the Auditing and Assurance Standards Board. That standard requires that we plan and perform our procedures to obtain reasonable assurance about whether, in all material respects, the description is fairly presented and the controls are suitably designed and operating effectively.

An assurance engagement to report on the description, design and operating effectiveness of controls at a service organisation involves performing procedures to obtain evidence about the disclosures in the service organisation's description of its System, and the design and operating effectiveness of controls. The procedures selected depend on our judgement, including the assessment of the risks that the description is not fairly presented, and that controls are not suitably designed or operating effectively. Our procedures included testing the operating effectiveness of those controls that we consider necessary to provide reasonable assurance that the control objectives stated in the description were achieved. An assurance engagement of this type also includes evaluating the overall presentation of the description, the suitability of the objectives stated therein, and the suitability of the criteria specified by the service organisation and described in Section 1 at pages 3-4.

We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

Limitations of Controls at a Service Organisation

ASX's description is prepared to meet the common needs of a broad range of Participants and their auditors and may not, therefore, include every aspect of the System that each individual Participant may consider important in its own particular environment. In addition to this, because of their nature, controls at a service organisation may not prevent or detect all errors or omissions in processing or reporting transactions. Further, the projection of any evaluation of effectiveness to future periods is subject to the risk that controls at a service organisation may become inadequate or fail.

Opinion

Our opinion has been formed on the basis of the matters outlined in this report. The criteria we used in forming our opinion are those described in ASX's statement in Section 1. In our opinion, provided Participants have applied the complementary Participant controls contemplated in the design of ASX's System and those controls were operating effectively, in all material respects:

- (a) The description fairly presents the System as designed and implemented throughout the period from 1 July 2019 to 30 June 2020.
- (b) The controls related to the control objectives stated in the description were suitably designed throughout the period from 1 July 2019 to 30 June 2020.
- (c) The controls tested, which were those necessary to provide reasonable assurance that the control objectives stated in the description were achieved, operated effectively throughout the period from 1 July 2019 to 30 June 2020.



Description of Tests of Controls

The specific controls tested and the nature, timing and results of those tests are listed in Section 8 at pages 16-34.

Intended Users and Purpose of the report

This report and the description of tests of controls in Section 5, 6 and 8 are intended only for Participants who have used ASX's System and their auditors, who have sufficient understanding to consider it, along with other information including information about controls operated by Participants themselves, when assessing the risks of material misstatements of Participant's financial reports / statements.

This report is prepared only for the purpose set out above and we disclaim any liability in relation to our report or any assumption of responsibility for any reliance on our report to any person other than ASX, Participants and their auditors who have used ASX's System or for any purpose other than that for which it was prepared.

PricewaterhouseCoopers

DocuSigned by:

Corinne Best

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Corinne Best

Partner

Sydney

28 July 2020



03 / Introduction

ASX management is responsible for the design, implementation and maintenance of the internal control procedures and for the declarations and assertions in this report. In carrying out this responsibility, management has regard to the interests of participants, the general effectiveness of the operation of DCS and the overall stability of the Australian financial system.

This report has been prepared to provide:

- an overview of the ASX Group
- an overview of DCS and its role in the clearing and settlement process
- a summary of ASX's corporate governance arrangements relating to the DCS operating environment
- the control objectives and control procedures that underpin the DCS control environment, and
- the independent auditor's report on the control objectives and procedures.

The report has been prepared in compliance with *ASAE 3402 Assurance Reports on Controls at a Service Organisation*.



04 / Overview of the ASX Group

ASX is an integrated exchange offering listings, trading, clearing, settlement, technical and information services, and other post-trade services. It operates markets for a wide range of asset classes including equities, fixed income, commodities and energy and is a top 10 global securities exchange by value and the largest interest rate derivatives market in Asia.

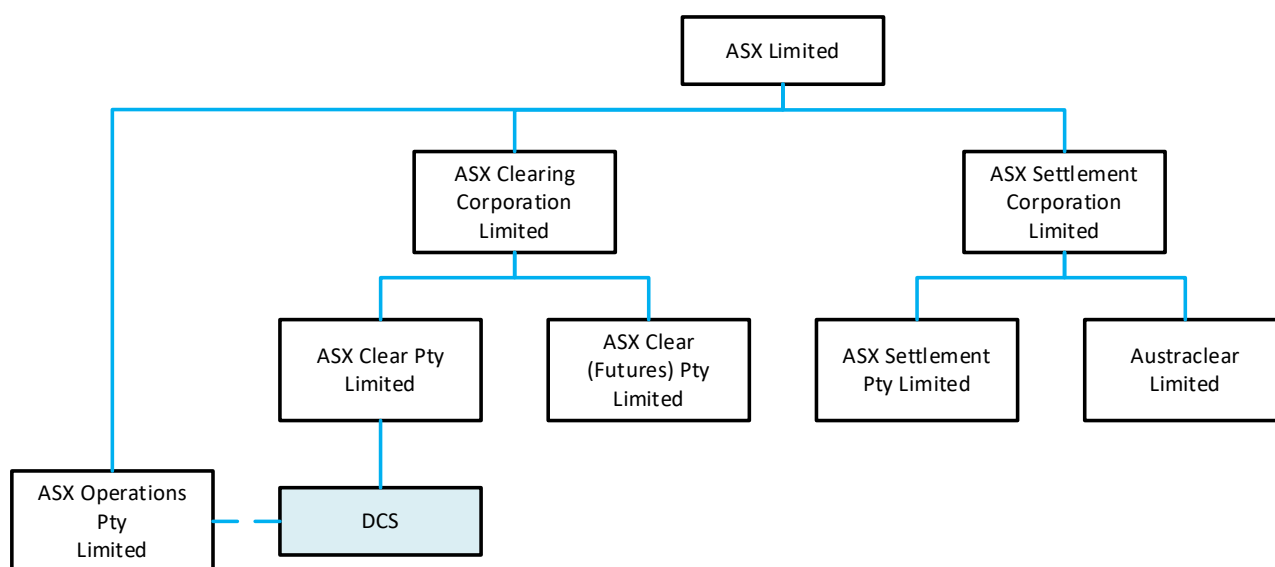
Companies, corporates and issuers of capital from Australia and around the world engage with ASX to manage risk and to raise capital to grow. ASX operates liquid, transparent and reliable markets of integrity. The certainty of its clearing and settlement activities underpins the systemic stability of the Australian economy.

ASX also provides data and technology services to intermediaries, banks, information vendors and software developers to help them make informed decisions, offer services to their clients and connect with one another.

More information about ASX can be found at: www.asx.com.au.

Structure

Relevant parts of the ASX Group structure, including the responsibility for the DCS system, are depicted below:





05 / Overall Control Environment

Corporate Governance

The control environment within which ASX operates DCS is not restricted to the control objectives and procedures outlined in this report.

The ASX Group maintains a high standard of corporate governance and has implemented governance arrangements which are consistent with the ASX Corporate Governance Council's Corporate Governance Principles and Recommendations (4th Edition). An overview of those components of ASX's corporate governance framework which are relevant to the operation of DCS is set out below. More information on ASX's corporate governance framework is available on ASX's website and in its Annual Report.

DCS is operated by ASX Operations Pty Limited, a wholly-owned ASX Group subsidiary, to fulfil the clearing functions of ASX Clear Pty Limited. ASX Clear is a clearing and settlement facility licensee and a wholly-owned subsidiary of ASX. It is one of the four clearing and settlement facility licensees in the ASX Group.

The ASX Board relies on the Clearing and Settlement Boards to provide oversight of the clearing and settlement operations of the clearing and settlement subsidiaries including, the management of clearing and settlement risk, and compliance with the Financial Stability Standards determined by the Reserve Bank of Australia (RBA). The Clearing and Settlement Boards' Charter sets out further details regarding their functions and governance.

ASX Limited has established an Audit and Risk Committee (ARC) (comprising independent, non-executive directors of ASX Limited). The ARC also serves as the audit and risk committee of ASX's Clearing and Settlement Boards (including ASX Clear).

The following Committees (comprised of Senior Management) also form an integral part of the overall control environment in which DCS operates:

- Risk Committee
- Regulatory Committee, and
- Technology, Operations and Security Committee.

The system of internal control and risk management is reviewed by Internal Audit. The General Manager of Internal Audit reports to the ARC, the Managing Director and Chief Executive Officer for functional audit purposes, and the Chief Risk Officer for administrative purposes. The General Manager Internal Audit presents an Internal Audit Plan and quarterly audit findings to the ARC and Clearing and Settlement Boards.

In addition, ASX's Enterprise Compliance function conducts oversight of the ASX Group by mapping the compliance framework for key obligations (including clearing and settlement facility obligations), undertaking compliance reviews, and reporting to regulators. This function is headed by a General Manager who has a direct reporting line to the ARC and Clearing and Settlement Boards for key licence obligations, and reports to the Chief Risk Officer for other purposes.

Charters of the ASX Board, Clearing and Settlement Boards, ARC and Internal Audit are available on ASX's website: www.asx.com.au.



Regulatory Governance

Licensed entities in the ASX Group are subject to review by ASIC and the RBA.

Operational Governance

The primary divisions that have direct control over the operational governance of DCS are Operations and Technology.

Operations is responsible for the day to day processing of trading, clearing and settlement transactions. The DCS operational environment includes processes and controls in the following areas:

- transaction processing
- error resolution and escalation, and
- security and operational resilience.

Technology is responsible for the IT support and development of DCS. The control environment in operation within Technology includes the following processes and controls areas:

- system operations
- change management
- security, and
- system resilience.

Both Operations and Technology are headed by the Chief Operating Officer of ASX.

Operational Resilience

ASX Group operates using a dual site model for all key functions, with one operational site outside of the CBD. In addition, a disaster recovery site is maintained for its technology systems and disaster recovery plans are tested periodically in accordance with a centrally managed testing schedule.

During the financial year ASX relocated its secondary data centre to a purpose-built, third-party facility approximately 30 km from the CBD (hereafter, the previous secondary data centre is referred to as the “ASX-managed secondary data centre” and the new secondary data centre is referred to as the “vendor-managed secondary data centre”). ASX controls access to the ASX-secured area and monitors the completion of maintenance activities for environmental controls. The DCS back up instance was moved to the new disaster recovery site on 1 February 2020 with no interruptions to services or significant changes to operational processes and controls.

Control Objectives and Control Procedures

Set out in the report are the control objectives implemented over the DCS system by ASX. The specific controls listed in Section 8 of the report have been designed to achieve each of the control objectives.



06 / Overview of DCS

ASX Clearing Corporation assists ASX participants to more effectively undertake their clearing activity by reducing systemic risk, minimising counterparty risk, and by increasing capital efficiency and operating efficiency. This is achieved through ASX Clearing Corporation's wholly owned subsidiaries, ASX Clear Pty Limited (ASX Clear) and ASX Clear (Futures) Pty Limited, which operate clearing facilities and provide central counterparty facilities.

ASX Clear Pty Limited (ASX Clear) operates a clearing facility and provides central counterparty (CCP) services for financial products traded on the ASX market, including equities, warrants, interest rate securities and equity related derivatives (exchange traded options), equities traded, warrants quoted and traded on the Chi-X market.

ASX Clear is authorised to clear transactions for certain customers located in a number of jurisdictions, including the EU and the United States.

ASX Clear is currently the sole provider of clearing services for Australia's equity markets.

ASX Clear operates the Derivatives Clearing System (DCS) to register and clear equity related derivative products and the Clearing House Electronic Subregister System (CHES) to register and clear cash equities, interest rate securities and warrants. A separate assurance report is available for the CHES system.

DCS consists of two primary components. The first component is used by ASX Clear and consists of a number of modules; the main module being the Central Clearing Controller (CCC). This component maintains clearing information such as open positions, financial details such as margin information for each participant's accounts, details of trades, allocations, give-ups, take-ups, parameters and all other required information.

Other modules within this component include the Derivatives Pricing System (DPS), Stock Lodgement System (SLS) and Product Factory.

DPS captures real-time price related data from the trading platform. This data is analysed throughout the day to maintain a record of 'deemed' market prices. These prices are used to establish end-of-day settlement prices and for intra-day risk assessment. DPS also includes a client application that allows parameter maintenance functions to be performed and results to be reviewed.

SLS provides functionality to manage physical non cash collateral. Collateral may be lodged to cover a specific account (omnibus or individual customer) or shared amongst multiple accounts. SLS interfaces to the securities depository system (CHES).

Product Factory provides the listing function for exchange traded options and also provides a mechanism by which corporate actions can be processed. The processing of corporate actions adjusts the exchange traded options series and also affects the existing open interest.

Margins for equity related derivative products are calculated in CME Span® 4.0, using position information contained within DCS. The margin calculation is sent back to DCS and reported as part of the participant's settlement obligation.

The second component is the Member Clearing Module (MCM) and is provided to participants. This component records information relating only to the relevant participant; it does not store any sensitive information relating to any other participants. MCM serves as the participant's interface to the clearing system and provides functionality to maintain account information and to perform position maintenance inclusive of allocations, transfers, give-ups, take-ups, match-outs and exercises.



Transaction Processing

DCS captures reported trades from the ASX Trade platform and disseminates them to the relevant participants in near real-time. If a trade did not have allocation details specified at the time of order entry in ASX Trade, the participants can send an allocation transaction in DCS to allocate the trade to one or more accounts. Alternatively, the participant can “give-up” the trade to another participant. In this event, the corresponding participant would then “take-up” the trade. Any unallocated trades at the end of the day are allocated to the default house account of the participant.

The system is closed at 7:00 pm each day so that end of day processing can commence. The key purpose of end of day processing is to determine each participant's settlement obligation. This comprises of premium due, fees and commissions and calculated margin less existing cash balance and collateral valuation. Additional processing takes place to exercise relevant positions and randomly assign them to counterparties. Any equities trades resulting from the expiry process are automatically reported to ASX Trade.

Processing errors are either flagged by the DCS system or identified by ASX via operational monitoring of the system and transaction reports. Once identified, errors follow a defined escalation path.

Regulation

ASX Clear is a licensed CS facility under the Corporations Act and must comply with the Financial Stability Standards (FSS) published by the RBA. In addition, as a CS facility licensee, it must:

- to the extent that it is reasonably practicable to do so, do all other things necessary to reduce systemic risk
- to the extent that it is reasonably practicable to do so, do all things necessary to ensure that the facility's services are provided in a fair and effective way, and
- have an adequate arrangement for supervising the facility.

Reporting

DCS automatically provides a number of reports to Participants, including:

- financial reports (current account statements, interest statements, fee statements, daily margin summary, daily financial statement, commissions, margin prices, theoretical prices, price averaging, price warning)
- collateral reports (activity statements, holding statement)
- position reports (open positions, daily position activity, exercise activity, allocation listing, give-ups, transfers)
- exercise and expiring contracts reports, and
- reconciliation reports.

System Change

During the period, there were changes made to the DCS environment as part of usual management and support.



07 / Use and Scope of the Report

Requirement for the Report

The requirement for and scope of the independent audit is mandated in ASX Clear Operating Rules. The following table provides the requirements under section 1.22 of the ASX Clear Operating Rules.

Rule Ref	Title	Content
1.22.1	ASX Clear to conduct annual review	ASX Clear must require an independent auditor to conduct an annual review of the Clearing System and that review must comprise the matters specified in the Procedures.
1.22.2	Copy of audit certificate to be provided to Participant	<p>If a Participant requests that ASX Clear provide a copy of any audit certificate arising from an annual review under Rule 1.22.1, ASX Clear must, without charge, provide a copy of the audit certificate to the Participant within 1 calendar month of:</p> <ul style="list-style-type: none"> (a) ASX Clear receiving the audit certificate or (b) the request <p>whichever is the later.</p>
1.22.3	Participant may request other review of the Clearing System	<p>If a Participant gives notice to ASX Clear requesting an audit certificate in relation to any review of the Clearing System other than an annual review under Rule 1.22.1:</p> <ul style="list-style-type: none"> (i) the Participant must in the notice undertake to pay any fee for that service which ASX Clear may notify to Participants from time to time and (ii) ASX Clear must request an independent auditor to conduct the requested review and supply an audit certificate in relation to the review to the Participant as soon as reasonable practicable.
1.22.4	No other right to inspect ASX Clear records	Except as expressly provided in these Rules, no Participant has any right of access to, or right to inspect, ASX Clear's Records.
1.22.5	Participant to accept review by auditor	Each Participant must accept and treat a review conducted by ASX Clear's auditor under this section as if that review were conducted by the Participant's own auditor.



The following provides the requirements under section 1.22.1 of the ASX Clear Operating Rules – Procedures:

The review will comprise:

- (a) reviewing ASX Clear's information processing facilities and the integrity of the Clearing System including:
 - (i) maintenance of security and confidentiality over the data of Participants
 - (ii) security over the physical operation of the Clearing System
 - (iii) backup and disaster recovery procedures and
 - (iv) Clearing System access controls.
- (b) assessing the integrity and accuracy of information generated by the Clearing System including:
 - (i) internal controls over data input by ASX Clear and
 - (ii) processing and reporting of transaction data.

Use of the Report

The report has been prepared for ASX Clear to comply with the ASX Clear Operating Rules. While ASX understands participants may provide the report to external parties (e.g. their own auditors), ASX has no knowledge or understanding of the individual circumstances of any participant.

Participant Controls

Achievement of each of the control objectives set out in Section 8 is also dependent on participants maintaining an effective control environment and implementing controls such as:

- documented policies and procedures (including transaction processing procedures, risk management policies such as conditions and restrictions for system use, good password practices and virus protection)
- restricted access to operating systems, applications, databases and underlying records (including role based security mechanisms)
- user administration management
- a documented security strategy that includes appropriate tools and techniques to prevent, detect, respond to and recover from security incidents
- transaction processing, monitoring and reporting mechanisms
- segregation of duties in transaction processing
- reconciliation of transactions and holdings and follow up of any variances
- physical security of system infrastructure
- provision of data backup and restoration and other computer operations, and
- business continuity and disaster recovery planning.



08 / Control Objectives and Related Control Procedures

The scope in relation to this control report has been defined in the control objectives and associated control procedures for DCS that have been included below. Any references made to the network, application, operating system and database are specific to DCS.

Logical Access

Control Objective 1: *Controls provide reasonable assurance logical access is restricted to prevent inappropriate or unauthorised access to the network, application software, operating systems and underlying data.*

Description of controls	Test performed by PwC	Results
1.1 The ASX Identity and Access Management Policy (the Policy) outlines the principles for restricting access to the network, application software, operating systems and underlying data. The Policy is available to all staff.	Inspection Verified through inspection that the ASX Identity and Access Management Policy outlines the principles for restricting access to the network, application software, operating systems and underlying data and is available to all staff.	No exception noted.
1.2 Processes are in place for administering access to the network, application software, operating systems and the underlying data. This includes approval of access granted and the timely termination of accounts no longer required.	Inspection For a sample of new users, verified through inspection that access to the network, application, operating system and database was approved prior to access being granted. Inspection For a sample of user revocations, verified through inspection that access to the network, application, operating system and database was revoked in a timely manner.	No exception noted.



Description of controls	Test performed by PwC	Results
	<p>Observation</p> <p>Verified through onscreen observation that an automated deactivation process is in place to disable terminated staff network access on the last day of service.</p>	
<p>1.3 Access to the application is authenticated and restricted through the use of password controls at the application and network layer. Per the Policy, controls include:</p> <ul style="list-style-type: none"> - authentication by a unique user ID and password - system enforced a minimum password length - the requirement to change passwords at predefined intervals, and - the lockout of user accounts after a pre-defined number of invalid sign-in attempts. 	<p>Observation</p> <p>Verified through onscreen observation that access to the application, operating system and database required the use of a user ID and password.</p> <p>Inspection</p> <p>Verified through inspection that password parameters at the application, operating system and database layer are in line with the ASX Identity and Access Management Policy requirements which include:</p> <ul style="list-style-type: none"> - system enforced a minimum password length - users changing passwords at pre-defined intervals, and - lockout of user accounts after a pre-defined number of invalid sign-in attempts. <p>Inspection</p> <p>Where the password parameters are not in compliance with the ASX Identity and Access Management Policy requirements, validate through inspection that a current exemption for the deviation exists.</p>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
1.4 Regular user access reviews are performed to confirm currency and appropriateness of access.	Inspection For a sample of application, operating system and database user access reviews, verified through inspection that the reviews were performed to confirm currency and appropriateness of access.	No exception noted.
1.5 Documented procedures are in place outlining the principles for safeguarding against the threat of malicious attack.	Inspection Verified through inspection of the Security Patching Policy, Malicious Code Management Standard and Cyber Security Escalation Procedure that principles for safeguarding against the threat of malicious attack are outlined.	No exception noted.
1.6 Network security measures including firewalls, intrusion detection software, anti-virus software and incident response processes are in place.	Inspection and Observation Verified through inspection of network documentation and onscreen observation that a number of measures including firewalls, intrusion detection software and anti-virus software are in place. Inspection Verified through inspection of the Cyber Security Escalation Procedure and playbooks document that incident response processes are in place.	No exception noted.



Description of controls	Test performed by PwC	Results
1.7 Remote access to the network, application software, operating system and underlying data is restricted and includes security measures such as digital certificates and/or RSA tokens.	<p>Observation</p> <p>Verified through onscreen observation that User IDs and passwords, as well as digital certificates or RSA tokens, are required to access the ASX network remotely.</p> <p>Inspection</p> <p>Verified through inspection of the ASX Mobility and Remote Access Standard that remote access using RSA token is required to be authorised.</p> <p>Inspection</p> <p>For a sample of new remote access using RSA tokens, verified through inspection that remote access to the ASX network, application software, operating system and database was authorised in accordance with the standard.</p> <p>Inspection</p> <p>For a sample of user departures with remote access accounts, verified through inspection that remote access was removed in a timely manner.</p>	No exception noted.



Change Management

Control Objective 2: Controls provide reasonable assurance all changes relating to the application software, operating system software and underlying data within the DCS production environment are authorised and tested in accordance with the ASX change management policy.

Description of controls	Test performed by PwC	Results
2.1 Documented change management procedures are in place. All changes and upgrades follow the procedures.	Inspection Verified through inspection that documented change management procedures are in place covering the change lifecycle.	No exception noted.
2.2 All changes are logged and monitored throughout the life cycle of the change.	Inspection For a sample of changes, verified through inspection that changes were logged and monitored throughout the life cycle of the change.	No exception noted.
2.3 Testing results are recorded, tracked and signed off.	Inspection For a sample of changes, verified through inspection that testing results were recorded and signed off.	No exception noted.
2.4 Test documentation exists, including test plans / strategies, test cases / criteria, test logs and issue reporting.	Inspection For a sample of changes, verified through inspection that test documentation existed, including test plans / strategies, test cases / criteria, test logs and issue reporting.	No exception noted.



Description of controls	Test performed by PwC	Results
2.5 Changes are subject to levels of system (i.e. developer) and user testing prior to implementation.	Inspection For a sample of changes, verified through inspection of relevant documentation that each change was subject to levels of system and user testing prior to implementation.	No exception noted.
2.6 Changes are subject to authorisation by Technology and/or the Business prior to implementation.	Inspection For a sample of changes, verified through inspection that each change was subject to authorisation by Technology and/or the Business prior to implementation.	No exception noted.
2.7 There is segregation of the development, test and production environments.	Observation Verified through onscreen observation that segregated development, test and production environments exist.	No exception noted.
2.8 Documented procedures for emergency changes are in place. Emergency changes are subject to formal authorisation prior to or as soon as practical after implementation. Emergency changes are documented and tested as soon as practical upon implementation.	Inspection Verified through inspection that documented procedures for emergency changes are in place. Inspection For a sample of emergency changes, verified through inspection that each change was formally authorised, tested and documented according to emergency procedures.	No exception noted.



Description of controls	Test performed by PwC	Results
2.9 All system and user documentation is updated accordingly.	Inspection For a sample of changes, verified through inspection that release notes were published and user documentation was updated.	No exception noted.



Physical Security

Control Objective 3: *Controls provide reasonable assurance physical security is restricted to prevent unauthorised access to ASX Data Centres (including the primary and secondary data centres).*

Description of controls	Test performed by PwC	Results
3.1 Documented physical security policies and procedures are in place. This includes site visitation procedures for each category of access.	Inspection Verified through inspection that the documented physical security policies and procedures are in place.	No exception noted.
3.2 Access to the ASX Data Centres is restricted and monitored through the use of electronic security devices and other arrangements.	Observation Verified through observation of the primary and secondary data centre, using live feed streaming under our direction, that access to the ASX data centres is restricted and monitored through the use of electronic security devices and other arrangements, including: <ul style="list-style-type: none"> - exterior doors were locked - electronic access cards were required to enter the data centre, and - the data centres were monitored by CCTV. 	No exception noted.
3.3 Access requests to the ASX Data Centres are approved prior to access being granted.	a. Primary data centre Inspection For a sample of access requests to the primary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.	No exception noted.



Description of controls	Test performed by PwC	Results
	b. Secondary data centres	
	Inspection For a sample of access requests to the ASX-managed secondary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.	No exception noted.
	Inspection For a sample of access requests to the vendor-managed secondary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.	No exception noted.



Description of controls	Test performed by PwC	Results
	<p>Inspection</p> <p>Verified through inspection that all temporary access passes managed by the vendor were used only by approved personnel.</p>	<p>Exception noted.</p> <p>Our review of the user access controls in the vendor-managed secondary data centre noted that there were active temporary passes to the ASX secure area managed by both the ASX project team and the vendor. For the period between 1 February 2020 and 1 June 2020, ASX controls did not include the recording of who used the access pass on each occasion.</p> <p>We noted that for this period, there were instances where temporary passes were used without being recorded in the manual sign in sheet managed by the vendor. Further investigation by management noted that in all such instances, access was used by appropriate personnel (either by an active ASX employee or an approved contractor).</p> <p>Management Response</p> <p>ASX management has put in place additional controls from 1 June 2020. This includes the implementation of dual-factor authentication for access to the ASX secure area and the deactivation of all temporary passes for this data centre. These passes are only reactivated when required for an approved period of time by ASX Security.</p>



Description of controls	Test performed by PwC	Results
3.4 Staff, visitors, contractors and customers are required to wear identification badges / tags.	Observation Verified through observation using live feed streaming under our direction, that staff, visitors, contractors and customers were required to wear identification badges / tags.	No exception noted.
3.5 Access is removed in a timely manner for employees who no longer require access to the ASX Data Centres.	a. Primary data centre Inspection For a sample of terminated employees, verified through inspection that access to the primary data centre was removed in a timely manner. a. Secondary data centres Inspection For a sample of terminated employees to the ASX-managed secondary data centre, verified through inspection that access to the ASX data centres was removed in a timely manner. Inspection For a sample of terminated employees to the vendor-managed secondary data centre, verified through inspection that access to the ASX data centres was removed in a timely manner.	No exception noted.



Description of controls	Test performed by PwC	Results
	Inspection For the vendor-managed data centre, for the period between 1 February 2020 to 1 June 2020, verified through inspection of the sign in sheet that all visitors to the data centre had signed out and contractor passes were returned before leaving the data centre	
3.6 Regular access reviews are performed to confirm currency and appropriateness of access to the ASX Data Centres.	Inspection For a sample of data centre user access reviews, verified through inspection that regular access reviews were performed to confirm currency and appropriateness of access to the ASX Data Centres.	No exception noted.



Disaster Recovery Procedures

Control Objective 4: *Controls provide reasonable assurance in the event of a disaster, measures are in place to enable DCS to resume effective operations within agreed timeframes.*

Description of controls	Test performed by PwC	Results
4.1 A Documented Disaster Recovery Plan for the System is in place.	Inspection Verified through inspection that the Disaster Recovery Plan exists.	No exception noted.
4.2 The Disaster Recovery Plan for the System is tested on a regular basis.	Inspection Verified through inspection that the Disaster Recovery Plan was tested on a regular basis.	No exception noted.



IT Processing

Control Objective 5: *Controls provide reasonable assurance the DCS system is backed up, and system processing and performance is monitored.*

Description of controls	Test performed by PwC	Results
5.1 Documented backup policies and procedures are in place.	Inspection Verified through inspection that backup policies and procedures have been documented.	No exception noted.
5.2 Application data is backed up on a regular basis.	Observation Verified through onscreen observation that the backup schedule for application data was setup in line with policy requirements. Observation and Inspection Verified through onscreen observation and inspection that an automated notification is generated upon failure of a backup job. Inspection For a sample of days, verified through inspection that backups were completed successfully. Inspection For a sample of incident tickets raised due to backup failures, verified through inspection that they were resolved in a timely manner.	No exception noted.



Description of controls	Test performed by PwC	Results
5.3 Backed up data is stored in an offsite secure location and restricted to authorised personnel.	<p>Inspection</p> <p>Verified through inspection of a copy of the agreement with the third-party service provider that backed up data is taken and stored in an offsite secure location.</p> <p>Inspection</p> <p>For a sample of days, verified through inspection that sign-off was obtained by an authorised representative indicating that backup tapes had been taken off-site for storage.</p> <p>Inquiry and Inspection</p> <p>Verified through inquiry with management and inspection of the listing of individuals with access to ASX data stored at offsite locations that they were authorised personnel.</p>	No exception noted.
5.4 Network capacity, performance incidents, operational incidents and system availability is monitored and reported.	<p>Inspection</p> <p>Verified through inspection of a sample of management status reports that network capacity, performance incidents, operational incidents and system availability are monitored and reported.</p>	No exception noted.
5.5 Automated system monitoring tools are used to monitor operational integrity. Exception reporting is used to alert staff of operational failures.	<p>Observation</p> <p>Verified through onscreen observation that system monitoring tools are utilised to monitor the operational integrity of the System.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
5.6 Job schedules are in place for batch processing. Each time a job schedule is run the results are documented and reviewed.	Inspection Verified through inspection that exception reporting functionality alerted staff of operational failures.	No exception noted.
	Inspection Verified through inspection that job schedules are in place for batch processing.	
	Inspection For a sample of days, verified through inspection that the job schedules results were documented and reviewed.	
5.7 Changes to job schedules are approved.	Inspection For a sample of changes to job schedules, verified through inspection that they were approved.	No exception noted.



Environmental Controls

Control Objective 6: Controls provide reasonable assurance environmentally controlled data centres exist to facilitate continuity of data processing operations.

Description of controls	Test performed by PwC	Results
<p>6.1 The data centres contain the following environmental mechanisms</p> <ul style="list-style-type: none"> - fire detection and suppression systems - air conditioning systems - uninterruptible power supplies, and - water detection systems. 	<p>Observation</p> <p>Verified through observation of the primary and secondary data centres, using live feed streaming under our direction, that they contain the following environmental mechanisms:</p> <ul style="list-style-type: none"> - fire detection and suppression systems - air conditioning systems - uninterruptible power supplies, and - water detection systems. <p>Inspection</p> <p>For the vendor-managed secondary data centre, for a sample of months, verified through inspection that management receives and reviews a report which includes information on these relevant environmental mechanisms.</p>	No exception noted.
<p>6.2 A schedule of maintenance is performed on a regular basis to assist in preventing operational failure of the above environmental mechanisms.</p>	<p>Inspection</p> <p>Verified through inspection of the primary and secondary data centres maintenance schedule that maintenance of the above environmental mechanisms is performed on a regular basis.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
	<p>Inspection</p> <p>For primary and ASX-managed secondary data centre, verified through inspection of a sample of maintenance reports that the preventative maintenance occurred in accordance with the schedule.</p> <p>Inspection</p> <p>For the vendor-managed secondary data centre, verified through inspection that management has performed a monitoring check to ensure maintenance for environmental mechanisms relevant to ASX have been completed in accordance with the pre-defined schedule.</p>	



DCS

Control Objective 7: *Controls provide reasonable assurance the process of daily settlement is complete and accurate.*

Description of controls	Test performed by PwC	Results
7.1 Checklists for key tasks in the daily settlement process are completed and reviewed on a timely basis. Any exceptions are actioned.	Inquiry and Inspection	No exception noted.
	Verified through inquiry with management and inspection that checklists for key DCS tasks in the daily settlement process exist.	
	Inspection For a sample of daily checklists, verified through inspection that they were completed and reviewed on a timely basis and any exceptions are actioned.	
	Inspection For a sample of participants who failed to settle margin calls prior to pre-defined cut-off time, verified through inspection that they were escalated to ASX Compliance in a timely manner.	There was no instance of participant failing to settle margin calls prior to pre-defined cut-off time during the testing period.