## SCHEDULE 4

### Testing Regime

1. **Introduction**

1.1    This Schedule 4 sets out the procedures to be followed by the Service Provider in respect of testing the Services and the Service System(s).

1.2    The Service Provider shall Test all elements of the Services and the Service System(s) in accordance with the relevant Test Strategy, Test Plans and Test Specifications in order to demonstrate that the Services and Service Systems meet the Requirements and comply with the Design Documents.

2. **Testing Documents**

2.1    **Implementation Phase Testing**

(A)    The Service Provider shall in accordance with the Implementation Plan and paragraph 5 of Annex 1 (Testing Methodology) develop a draft test strategy for testing the Services and the Service System(s) during the Implementation Phase which:

(1)    is consistent with the Testing Approach; and

(2)    meets the relevant requirements set out in Annex 1 (Testing Methodology),

and shall submit such draft test strategy to TfL for Approval (such Approved test strategy being the "**Implementation Test Strategy**").

(B)    The Service Provider shall, in accordance with the Implementation Plan and as documented in the Implementation Test Strategy, group Tests and elements of the Service System(s) to be tested by each Test for organisational, management and reporting purposes.

(C)    For each Test (or group of Tests) required pursuant to the Implementation Test Strategy, the Service Provider shall in accordance with the Implementation Plan and paragraph 2.1(B) develop a Test Plan for testing the relevant Services and relevant parts of the Service System(s) which:

(1)    is consistent with the Testing Approach;

(2)    is consistent with the Implementation Test Strategy; and

(3)    meets the relevant requirements set out in Annex 1 (Testing Methodology) of this Schedule,

and shall submit such Test Plan to TfL for Assurance.

(D)    For each Test Plan, the Service Provider shall in accordance with the Implementation Plan and paragraph 5 develop a Test Specification or Test Specifications for all Tests in such Test Plan which:

(1)    is consistent with the Testing Approach;

(2)    is consistent with the Implementation Test Strategy;

     (3)     is consistent with the relevant Test Plan; and

     (4)     meets the relevant requirements set out in Annex 1 (Testing Methodology) of this Schedule,

and shall submit such Test Specification(s) to TfL for Assurance.

2.2    **Operational Phase Testing**

(A)    The Service Provider shall in accordance with the Implementation Plan and paragraph 5 of Annex 1 (Testing Methodology) develop a draft operational test strategy that:

     (1)     is consistent with the Testing Approach; and

     (2)     meets the relevant requirements set out in Annex 1 (Testing Methodology),

and shall submit such draft test strategy to TfL for Approval (such Approved operational test strategy being the "**Operational Test Strategy**").

(B)    During the Operational Phase, the Service Provider shall:

     (1)     in relation to each Change, Incident or Defect that occurs in the Operational Phase prepare and submit to TfL for Assurance a Test Plan covering all testing required to demonstrate:

          (a)     in the case of a Change, that it has been properly implemented;

          (b)     in the case of an Incident or Defect, that it has been resolved,

     in each case in accordance with the requirements for such implementation or resolution under this Agreement;

     (2)     prepare and submit to TfL for Assurance one or more Test Specification(s) for each such Test Plan; and

     (3)     prepare and, if requested by TfL, submit to TfL for Assurance detailed Test Specifications in respect of all other Operational Phase Testing as TfL may require.

3.    **Deviations from Testing Documents**

3.1    Subject to TfL's Assurance rights, the Service Provider's Testing shall not deviate from previously Approved or Assured Testing Documents unless:

(A)    for deviations from the Test Strategy:

     (1)     an updated Test Strategy reflecting such deviation has first been Approved by TfL; or

     (2)     if agreed in advance by TfL in writing, the Service Provider submits to TfL for Assurance:

          (a)     an updated Test Strategy reflecting such deviation (together with a written explanation detailing the reason for such deviation); and

          (b)     associated Test Plans reflecting such updated Test Strategy.

(B)     for deviations from the Test Plan:

    (1)     the Service Provider submits in advance to TfL for Assurance an updated Test Plan reflecting such deviation; or

    (2)     if agreed in advance by TfL in writing, the Service Provider submits to TfL for Assurance:

        (a)     an updated Test Plan reflecting such deviation (together with a written explanation detailing the reason for such deviation); and

        (b)     associated Test Specifications reflecting such updated Test Plan; and

(C)     for deviations from the Test Specification:

    (1)     the Service Provider submits in advance to TfL for Assurance an updated Test Specification reflecting such deviation; or

    (2)     if agreed in advance by TfL in writing, the Service Provider submits a Test Report documenting and justifying such deviation to TfL:

        (a)     (in relation to Implementation Testing) Acceptance of the relevant Milestone Acceptance Criteria; or

        (b)     (in relation to Operational Testing), Assurance in relation to:

            (a)     the resolution of the relevant Incident or Defect; or

            (b)     the implementation of the relevant Change.

## 4.     **Test Reporting**

4.1     For each Test, the Service Provider shall in accordance with the Test Strategy:

(A)     during periods of Test execution, submit to TfL for Assurance Test Progress Reports in accordance with the timetable set out in the relevant Test Plan; and

(B)     following completion of the Test, submit a full Final Test Report to TfL for:

    (1)     (in relation to Implementation Testing) Acceptance of the relevant Milestone Acceptance Criteria; or

    (2)     (in relation to Operational Testing), Assurance in relation to:

        (a)     the resolution of the relevant Incident or Defect; or

        (b)     the implementation of the relevant Change.

4.2     **Test Progress Reports**

(A)     The Service Provider shall ensure that all Test Progress Reports are in the format set out in the relevant Test Plan and include, as a minimum, the following information:

    (1)     a detailed table which shall include an entry for each Test Script, with each such entry including:

        (a)     the name of the Test Script;

(b)     a unique identifier for the Test Script sufficient to allow cross-referencing against other Test Documents;

(c)     the current status of Test Script;

(d)     the identity of any and all Defects associated with the execution of that Test Script;

(e)     any observations associated with the execution of that Test Script; and

(f)     for a blocked Test Script, the dependencies and pre-requisites for future execution;

(2)     a detailed table setting out the status of any Defects identified which shall include an entry for each Defect revealed during the performance of the relevant Testing, including Defects which have been remedied by the Service Provider, with each such entry including as a minimum:

(a)     the name of the Defect;

(b)     a unique identifier for the Defect sufficient to allow cross-referencing against other Test Documents;

(c)     a concise description of the Defect;

(d)     the current status of the Defect;

(e)     the identity of the Test Script(s) associated with the Defect;

(f)     the Severity Level of the Defect;

(g)     dates relevant to the observation, investigation and resolution of the Defect; and

(h)     the name of person responsible for progressing the investigation of the Defect;

(3)     a table detailing any proposed changes to the Test Plan;

(4)     a detailed graphical and narrative analysis of the progress of the relevant Testing; and

(5)     a summary of the narrative given pursuant to section (4) including a short narrative of progress since the last Test Progress Report and a description of progress anticipated by the next Test Progress Report.

### 4.3     **Final Test Reports**

(A)     The Service Provider shall ensure that all Final Test Reports are in the format set out in the relevant Test Plan and, as a minimum, include:

(1)     any deviations from the Test Strategy or relevant Test Plan or Test Specification(s) (subject always to paragraph **3**);

(2)     the results of that Testing (to the extent that such results can be reported on);

(3)     the detail of any outstanding Incidents and Defects, including references to the Incident Log, Defect Log and the associated Severity Levels;

(4)     a description of any workarounds used during Testing, the relationship of such workarounds to specific Tests, Incidents observed or Defects raised, and their impact including their use to progress the testing or any proposal for their operational use;

(5)     summary metrics on Incidents and Defects raised during the Testing;

(6)     a Remedy Plan in respect of all outstanding Incidents and Defects and the removal of any associated workarounds; and

(7)     a description of any risks to the Implementation or operation of the Service raised during the testing.

4.4     The Service Provider agrees that, notwithstanding anything to the contrary in this Agreement, TfL may share Test Progress Reports and Final Test Reports in form or substance with any Third Party for any purpose in respect of this Agreement, the Services and/or the Scheme. Unless otherwise agreed in advance by TfL in writing, Test Progress Reports and Final Test Reports shall not include references to Test Data which includes Personal Data.

5.     **Timing Requirements**

5.1     Unless acting to resolve live Incidents or as otherwise agreed in writing with TfL, the Service Provider shall:

(A)     deliver all documents required for or relevant to Testing to TfL no less than ten (10) Working Days prior to the relevant Test;

(B)     deliver Test Specifications to TfL no less than ten (10) Working Days prior to the relevant Test;

(C)     give TfL at least ten (10) Working Days' written notice of any Testing to be undertaken by the Service Provider; and

(D)     complete and deliver each Final Test Report and Incident Log to TfL as agreed in writing between the Parties and in any event at least five (5) Working Days prior to the Milestone Date associated with successful completion of the relevant Test.

6.     **Test Witnessing**

6.1     TfL may, at its sole discretion, require its employees, agents or sub-contractors witness any of the:

(A)     Implementation Phase Testing; and/or

(B)     Operational Phase Testing in respect of any Change, Incident or Defect,

and the Service Provider shall comply with such request.

6.2     In relation to all Test Witnessing, the Service Provider shall:

(A)     provide such access, facilities, Information, Data, explanation, Documentation and assistance to TfL and any Third Party nominated by TfL

in order for TfL (and/or that Third Party) to prepare for and participate in such Test Witnessing as TfL may require, which shall include but shall not be limited to providing TfL with the facilities necessary to witness and evaluate the Testing, including, as a minimum:

(1)     desks;

(2)     telephones;

(3)     modems;

(4)     external network access (with appropriate security, such as via a virtual private network);

(5)     relevant Hardware; and

(6)     relevant Software.

(B)     follow TfL's reasonable instructions in relation to the form of Test Witnessing and the way in which Test Witnessing is to be carried out, including without limitation:

(1)     TfL witnessing the execution of the Testing being carried out by the Service Provider;

(2)     TfL witnessing a solution demonstration; and

(3)     TfL carrying out any Testing, including Testing by a TfL nominated Third Party, in conjunction with the Service Provider's Testing;

(C)     perform any specific sets of business process scenario Tests required by TfL;

(D)     demonstrate to TfL's reasonable satisfaction that adequate modifications and Testing have been performed leading to closure of any Incidents or Defects associated with the Test or the successful completion of the Test; and

(E)     ensure at all times that it provides a secure means of Test Witnessing by TfL (or the relevant Third Party) pursuant to section 6.2(A) which preserves the confidentiality and security of the Test Data and other information in connection with the Testing.

7.     **Test Management**

7.1     The Service Provider shall, in accordance with Schedule 11 (Employees and Key Personnel), appoint a Test Manager as soon as reasonably possible and in any event on or before the Milestone Date for the "Mobilisation of Project Team Complete" Milestone.

7.2     Where for circumstances beyond the reasonable control of the Service Provider it is necessary for the Service Provider to replace the person performing the role of Test Manager, the Service Provider shall ensure that the Test Manager role must be filled continuously and that there must be no period for which there is no Test Manager appointed for the purposes of this Agreement.

7.3     The Service Provider shall ensure that its Test Manager:

(A)     is responsible for managing the Service Provider's obligations under this Schedule; and

(B)     liaises with TfL's Test Manager regularly (and in any event on a daily basis) during each Test,

including:

(C)     coordinating the development and Approval or Assurance (as the case may be) of the:

(1)     Implementation Test Strategy;

(2)     Operational Test Strategy;

(3)     Test Plans;

(4)     Test Specifications; and

(5)     Test Reports;

(D)     planning the development of the required Tests:

(1)     in the Implementation Phase; and

(2)     in the Operational Phase;

(E)     coordinating the implementation of all tests and their execution; and

(F)     monitoring and reporting on progress of all Tests in accordance with this Schedule.

## 8.     <u>Other Service Providers</u>

8.1     The Service Provider shall, where required to do so in the fulfilment of its obligations pursuant to this Agreement or where reasonably instructed by TfL, co-operate and enter into dialogue with Other Service Providers in relation to Testing.

8.2     Unless otherwise directed by TfL, the Service Provider shall be responsible for the co-ordination of all relevant Interoperability Testing with Other Service Providers. The Service Provider shall, in consultation with TfL and Other Service Providers:

(A)     develop a detailed timetable for all relevant Interoperability Tests;

(B)     develop Test Plans and Test Specifications for Interoperability Testing, including all actions to be performed, jointly or individually with associated expected results, that will together constitute the agreed Interoperability Test;

(C)     seek to obtain agreement from TfL and Other Service Providers on all Test Results, Incidents and observations arising from Interoperability Testing and allocate responsibility between the Service Provider, Other Service Providers and TfL for progressing Incidents to resolution;

(D)     update all Incidents arising from Interoperability Testing in the Incident Log, including those currently assigned to TfL or Other Service Providers for resolution;

(E)     report on the progress of Interoperability Testing and the generation of Interoperability Test Reports which shall include obtaining data from the Other Service Providers as required; and

(F)     generate final Interoperability Test Reports, which shall include obtaining data from the Other Service Providers as required and detailing outstanding

Incidents (including Severity Levels and assigning responsibility for resolution to the relevant service provider).

8.3 The Service Provider shall comply with Clause 15 (Co-operation with TfL and Others) in relation to any dependencies, issues or disagreements between it and an Other Solution Provider in relation to Interoperability Testing.

9. **Use of Personal Data in Testing**

9.1 Subject always to any contrary written instructions from TfL (as may be given from time to time), the Service Provider shall ensure that:

(A) so far as practicable, all Test Data is manipulated, masked or scrambled so that it would no longer constitute Personal Data in a Third Party's hands; and

(B) the use of Test Data which is Personal Data only occurs when essential to verify testing integrity and then only in a secure test environment, in accordance with Good Industry Practice and guidance issued by the Information Commissioner from time to time.

9.2 Without prejudice to paragraph 9.1, all Test Data shall:

(A) be stored and held securely and otherwise in a manner that is compliant with any applicable Privacy Legislation, as shall all Data from which Test Data is derived;

(B) in all but exceptional cases, have been processed to permanently and completely preserve the anonymity of the persons whose Data is contained therein in accordance with Privacy Legislation, best practice guidance that may be issued from time to time by the Information Commissioner, and/or other Good Industry Practice, and Clause 49 (Information Governance) and using irreversible procedures and technology agreed by TfL in writing in advance of processing and use of such Data or testing; and

(C) be securely and promptly destroyed in accordance with relevant Privacy Legislation and Good Industry Practice following completion of the relevant Tests for which such Test Data is being used unless it is required to be retained for any purpose compatible with the Data Protection Act. The Service Provider shall provide written confirmation to TfL that such Personal Data has been destroyed, as appropriate.

9.3 In the exceptional circumstances where the Service Provider believes that specific testing requires the use of Test Data containing Personal Data such that the anonymity of the persons whose Data is contained therein is not completely established, then the Service Provider shall obtain the prior written approval of TfL for this use and in requesting such approval shall provide to TfL all information that TfL may require in relation thereto. The Service Provider acknowledges and agrees that TfL may at its absolute discretion decline such a request.

10. **Disputes**

Any issues or Disputes arising between the Parties in relation to Testing shall first be discussed by the Test Managers and, if not resolved within five (5) Working Days shall be discussed and resolved in accordance with the Dispute Resolution Procedure.

**ANNEX 1**

**TEST METHODOLOGY**

1.   **<u>Types of Testing</u>**

   **Testing during the Implementation Phase**

1.1   During the Implementation Phase the Service Provider shall carry out the following test and assurance activities:

   (A)   Functional Testing and Non-Functional Testing in a manner consistent with section **7** of this Annex 1 (Test Methodology);

   (B)   Data Migration Testing in a manner consistent with section **8** of this Annex 1 (Test Methodology);

   (C)   Interoperability Testing in a manner consistent with section **9** of this Annex 1 (Test Methodology);

   (D)   Implementation Acceptance Testing in a manner consistent with section 10 of this Annex 1 (Test Methodology); and

   (E)   Ready for Service Assurance in a manner consistent with section 11 of this Annex 1 (Test Methodology).

   **Testing during the Operational Phase**

1.2   The Service Provider shall carry out the following Testing as required in relation to each Change or corrected Incident or Defect:

   (A)   Functional, Non-Functional and Interoperability Testing in respect of each Change or corrected Incident or Defect. Testing will include all constituent parts of the Service System(s) (including but not limited to all Interfaces) down to the lowest level of testable components in accordance with the Design Documents, the Requirements and the relevant Test Specification;

   (B)   Regression Testing in relation to each Change or corrected Incident or Defect on the basis of analysis of the impact of the changes made to the Service System(s) to demonstrate that the Change or corrected Incident or Defect has not affected the Service System(s) not subject to such Change or corrected Incident or Defect, including but not limited to end-to-end evidential and financial integrity, in accordance with the Design Documents and the relevant Test Specification;

   (C)   Acceptance Testing in relation to each Change or corrected Incident or Defect, to demonstrate to TfL that the Change, Incident or Defect:

      (1)   is in accordance with the Design Documents and the relevant Test Specification;

      (2)   is consistent with the agreed Change Request pursuant to Schedule 9 (Change Control Request Procedure);

(3)     is in accordance with the Security Plan;

(4)     complies with Privacy Legislation, the Data Retention Policy, and all other policies and procedures of TfL which may be amended, replaced, or introduced during the Term;

(5)     complies with and does not prejudice the Business Continuity Plan, Business Continuity Infrastructure, Business Continuity Services and other Business Continuity (in each case including as required in accordance with Schedule 25 (Business Continuity))and back-up continuity procedures, recovery work areas and overflow resources and Premises, including without limitation Testing these aspects against the Security Plan in respect of that Change or corrected Incident or Defect (unless otherwise agreed in writing between the Parties);

(6)     is consistent with the Service Levels; and

(7)     is implemented in accordance with Good Industry Practice,

such Acceptance Testing to involve (*inter alia*) Tests which demonstrate the operation of all Services which are or may be affected by:

(1)     the resolution of the relevant Incident or Defect, or

(2)     the implementation of the relevant Change,

which must include the demonstration of business process scenarios (including any business process scenarios reasonably specified by TfL); and

(D)     where relevant prepare and provide to TfL release notes describing any new or amended functionality in functional user terms, any outstanding Incidents or Defects and any operational workarounds required due to those Incidents or Defects.

2.    **Implementation Test Strategy**

2.1    The Implementation Test Strategy shall include, but shall not be limited, the following:

(A)    the requirements, objectives and scope of all Testing during the Implementation Phase;

(B)    a description of the approach to Testing, including:

(1)    a description of all testing methodologies to be employed;

(2)    a rationale for the use of these testing methodologies in the context of the overall development methodologies and lifecycles to be employed;

(3)    a description of how the scope and depth of the testing of the constituent parts of the Services and Service System(s) will be

matched to the design and development complexity of those constituent parts; and

(4)     a description of how consistency of testing will be achieved across the use of the testing methodologies employed to ensure adequate testing across all constituent parts of the Services and Service System(s), including but not limited to, demonstrating end-to-end financial and evidential integrity;

(C)     a description of how Testing will be grouped for organisational, management and reporting purposes into a more granular format (including, for example, test levels, phases, increments and test cycles) including, but not limited to:

(1)     a high level plan for the Testing of the Services and Service System(s), including the scheduling of all Tests to be completed during the Implementation Phase, consistent with the Implementation Plans and Schedule 3 (Milestones and Deliverables);

(2)     a description of dependencies between different elements of the high level plan, including dependencies between proposed test levels, phases, increments and cycles; and

(3)     the identification of which of those elements will be associated for planning and reporting purposes with the generation of Test Plans as envisaged under section **5**of this Annex 1 (Test Methodology) prior to their commencement and will conclude with the generation of Final Test Reports as envisaged under paragraph 4.3 of this Schedule 4 (Testing Regime), so as to ensure the resulting set of Test Plans and Test Reports cover all of the Services and Service System(s);

(D)     a description of how the approach and structuring of the Testing will ensure that:

(1)     all required aspects of the test coverage outlined in sections 7 (Functional and Non-Functional Testing) to 12 (Regression Testing) inclusive of this Annex 1 (Test Methodology) will be addressed; and

(2)     any aspects of the test coverage outlined in sections 7 (Functional and Non-Functional Testing) to12 (Regression Testing) inclusive of this Annex 1 (Test Methodology)that the Service Provider believes are not required are identified;

(E)     for each Milestone descriptions of the anticipated processes relating to Testing for achieving Acceptance of that Milestone including the performance of the Service Provider's obligations in respect of Test Witnessing, Test Reports, Incident management and the business process scenarios to be used in determining whether the Test Criteria have been met;

(F)     any dependencies affecting the Testing, including reliance on Third Parties;

(G)     any assumptions made by the Service Provider that may have an impact upon Testing;

(H)     any perceived risks to Testing together with the impact of such risks and proposed methods of mitigation;

(I)     an outline of the resource requirements, including Personnel, Personnel training, Test Environments and Testing tools and how they will be used at each stage of the Testing in accordance with the high level plan as set out in section 2.1 (C)(1) of Annex 1;

(J)     the roles and responsibilities of all those involved with the Testing programme, including Personnel of TfL or the Service Provider and/or Third Parties where applicable;

(K)     the full address of the location where all Testing is to be performed;

(L)     the sources and mechanisms for specification, creation management and secure destruction of Test Data, in compliance with Privacy Legislation where applicable; and

(M)     the quality management tools and processes to be used in Testing including:

(1)     the standards to be applied to Testing;

(2)     test design techniques to be employed during the testing;

(3)     requirement traceability mechanisms;

(4)     Defect management processes;

(5)     configuration management;

(6)     release management;

(7)     Test results capture, logging, and tracking;

(8)     Test Progress Reports; and

(9)     Final Test Reports.

3.      **Operational Test Strategy**

3.1     The Operational Test Strategy shall include, but shall not be limited to the following:

(A)     a description of approach to Testing during the Operational Phase, including a description of all testing methodologies to be employed;

(B)     an outline of the resources available for Testing during the Operational Phase, including Personnel, Personnel training, Test Environments and Testing tools;

(C)    the roles and responsibilities of all Service Provider Personnel involved with Testing during Operational Phase;

(D)    the full address of the location where Operational Phase Testing is to be performed;

(E)    the sources and the mechanisms for specification, creation management and secure destruction of Test Data during the Operational Phase, in compliance with Privacy Legislation where applicable; and

(F)    the quality management tools and processes to be used in Testing during the Operational Phase including:

    (1)    the standards to be applied to Testing;

    (2)    test design techniques to be employed during the Testing;

    (3)    requirement traceability mechanisms;

    (4)    Defect and Incident management processes;

    (5)    Configuration Management;

    (6)    Release management;

    (7)    Test results capture, logging and tracking;

    (8)    Test Progress Reports; and

    (9)    Final Test Reports.

## 4. Implementation Phase Testing Documents

4.1    The Service Provider shall be responsible for ensuring that all Testing is adequately documented.

4.2    The Service Provider shall structure the documentation required to meet the requirements of sections 5 (Test Plans) and 6 (Test Specifications) of this Annex1 and paragraph 4 (Test Reporting) of Schedule 4 (Testing Regime).

## 5. Test Plans

5.1    Each Test Plan shall include, but shall not be limited to:

(A)    an overview of the specific Testing approach for the release and applicable Testing covered by the Test Plan;

(B)    the scope of the Testing for the version or release covered, including without limitation a description of the Software, Systems, constituent parts or functional areas of the Service System(s) under test;

(C)    any specific Testing requirements or objectives for the release and applicable Testing covered by the Test Plan, including any Change Requests addressed;

(D)    a detailed process for Testing of Software versions and releases covered by the Test Plan, including but not limited to all required Regression Testing;

(E)     the identification and details of the Environment(s) to be used in carrying out the Testing covered by the Test Plan;

(F)     the detailed entry and exit criteria applicable to the Testing covered by the Test Plan;

(G)     any specific dependencies, pre-requisites, assumptions and risks related to Testing any Software or System version or release;

(H)     identification of the Test Scripts to be executed;

(I)     a detailed schedule for the Testing;

(J)     named roles and responsibilities for all those involved with Testing; and

(K)     a description of the Test Data to be used for Testing,

(together, the "**Test Activities**"); and

(L)     a description of where the Test Activities described in the Test Plan represent a deviation from the earlier Test Strategy (subject always to the requirement that such deviation must be permitted in accordance with paragraph 3 (Deviations from Testing Documents) of this Schedule 4 (Testing Regime), together with the reasons and rationale for the deviation.

6.     **Test Specifications**

6.1     Each Test Specification shall include, but shall not be limited to:

(A)     the Test Criteria with traceability back to the relevant Requirements, through the Design Documents and any other documents relevant to the Testing;

(B)     a set of Test scenarios (including without limitation business process scenarios (where applicable)) and Test Cases designed to exercise all the Test Criteria identified within the Test Specification, each with a reference to the Test Criteria covered by the Test scenario;

(C)     a set of Test Scripts corresponding to the Test scenarios and Test Cases describing the purpose of the Test, the Data requirements for the Test, any pre-requisites for the Test, the actions to be taken during the Test, and the expected results for each step or action of the Test against which success or failure of the Test shall be judged; and

(D)     a description of where the Test Specification represents a deviation from the earlier Test Plan (subject always to the requirement that such deviation must be permitted in accordance with paragraph 3 Deviations from Testing Documents of Schedule 4 (Testing Regime)), together with the reasons and rationale for the deviation.

7.     **Functional And Non-Functional Testing**

7.1     Testing of the Service System(s) shall include Functional Testing and Non-Functional Testing to demonstrate that, when employing the Infrastructure

to be used operationally in its final location, the features, functions and facilities associated with the Hardware, Software, System or constituent parts of the Service System(s) (including but not limited to all Interfaces):

(A)     meet the relevant Requirements;

(B)     are in accordance with the Design Documents; and

(C)     comply with the relevant Test Specifications.

**Functional Testing**

7.2     The Service Provider shall ensure that any and all constituent parts of the Service System(s) (including but not limited to all Interfaces) have been subject to Functional Testing which shall be conducted using a Test Environment representative of the Infrastructure to be used operationally, to a degree appropriate to the method and complexity of the relevant Service System(s)'s development and configuration, as set out in the Test Strategy.

7.3     The Service Provider shall ensure that Functional Testing of the Service System(s):

(A)     uses Data representative of operational conditions for the Testing;

(B)     demonstrates end-to-end Data and process flows across each the Service System(s) meet the Specification;

(C)     demonstrates Data and process integrity across the Service System(s), including across any and all interfaces between constituent parts of the Service System(s), works in accordance with the Specification;

(D)     verifies that Data and input validation works in accordance with the Design Documents;

(E)     demonstrates that Data display formatting works in accordance with the Design Documents;

(F)     demonstrates that screen/report layout are in accordance with the Design Documents;

(G)     demonstrates that process and screen navigation and the management of context Data meets the Specification and works in accordance with the Design Documents;

(H)     demonstrates continuity of processing across the Service System(s) in accordance with the Design Documents;

(I)     includes negative and positive Tests for all functionality implemented within the Service System(s);

(J)     verifies through defined Tests that potentially damaging transactions cannot be performed;

(K)     demonstrates that Incidents are handled and reported correctly;

(L)     demonstrates that maximum, minimum, null and zero (0) Data values across the Service System(s) and its Interfaces are correctly handled;

(M)     demonstrates that Data contention and Data locking are correctly handled;

(N)     demonstrates that transactional integrity and Data integrity and Data replication work correctly;

(O)     verifies that all Management Information is correctly recorded, stored and reported on;

(P)     verifies that all systems, security, access and audit trail logs are appropriately and correctly updated; and

(Q)     verifies that all Service Systems correctly process Legacy Data;

7.4     The Service Provider shall perform Testing of the filtering processes to be applied to the records emanating from the Detection and Enforcement Infrastructure to verify that they work correctly.

**Non-Functional Testing**

7.5     The Service Provider shall perform Non-Functional Testing of the Service System(s) employing the Infrastructure to be used operationally in its final location.  The Non-Functional Testing shall be designed to demonstrate that:

(A)     the Service System(s) have been built correctly in terms of installation, configuration and connectivity and demonstrating that all Software and Infrastructure comprising the Service System(s) has been correctly installed, built and configured in accordance with the Design Documents and System Build Documentation, including:

(1)     the performance of audits to ensure that all infrastructure specified by the System Build Documentation is present and functional;

(2)     the performance of Tests to ensure that all Software specified by the System Build Documentation is present and functional;

(3)     the performance of configuration Tests in relation to all Software and Infrastructure comprised in the Service System(s) to ensure that it is configured in accordance with the System Build Documentation;

(4)     the demonstration of complete network connectivity between the Service System(s), the Other Service Provider Systems and the Systems of TfL; and

(5)     that any Functional Testing performed on a Test Environment distinct from the Infrastructure to be used operationally remains valid through the use of appropriate Regression Tests.

(B)     the resilience of the Service System(s), including through:

   (1)     the performance of fail-over Tests of all relevant Infrastructure;

   (2)     the performance of load balancing Tests (where relevant); and

   (3)     Testing of the Business Continuity Plan, Business Continuity Infrastructure, Business Continuity Services and other Business Continuity and back-up continuity procedures (in each case including as required in accordance with Schedule 25 (Business Continuity)), recovery work areas and overflow resources and Premises is complete, including without limitation the Testing of these aspects to confirm that they comply with the Security Policy as confirmed by an external independent BS7799 audit, and in each case has been Approved by TfL;

(C)     the Service System(s) conform to the Security Policy;

(D)     the Service System(s) are safe from external penetration and the Non-Functional Testing shall include independent external penetration Tests to demonstrate the security of the Service System(s) from intrusion via networks external to those of the Service Provider, to be arranged by Service Provider:

   (1)     at the cost of the Service Provider;

   (2)     with the full participation of the Service Provider;

   (3)     to occur:

      (a)     in advance the Operational Commencement Date or any processing of non-anonomised personal data by the Service Systems (whichever is the sooner); and

      (b)     additionally, promptly upon written request from TfL from time to time (up to four (4) times in each Operational Year) or as required to retest the fix for any previously failed external penetration test;

(E)     the Service Elements comprising the Service System(s) integrate correctly with each other and that the Service Systems Interfaces comply with the relevant Interface Specifications and any Third Party Specifications prior to the commencement of Interoperability Testing. Such integration Testing shall include:

   (1)     demonstrating full end-to-end integration of the Service Provider's Service System(s);

   (2)     technical integration Tests across the Interfaces between the Service System(s) and the Systems of TfL, the Other Service Provider Systems and the Systems of all relevant Third Parties, using Test harnesses where necessary, to:

      (a)     demonstrate compliance with the Interface Specification; and

(b)     ensure all Interface failure conditions, exception conditions and recovery mechanisms are working effectively;

(F)     the Service System(s) have capacity to run without Incident for an extended period, and such Non-Functional Testing shall include:

(1)     demonstrating periods of extended and continuous operation to provide assurance to TfL of the reliability and maintainability of the Service System(s), including a period of continuous operation:

(a)     exercising all Software and Infrastructure to comprise the operational Service System(s) at the Operational Commencement Date, and

(b)     ensuring that the period of continuous running is of sufficient length to cover all material business activities (and, in any event, at least fourteen (14) days unless agreed otherwise in writing by TfL prior to the commencement of Non-Functional Testing);

(G)     the Service System(s) can run reliably at the required load and to the required PIs, including demonstrating that the Service Levels can be reliably achieved for all key business processes through the use of sufficient business input volumes on the Infrastructure to be used operationally in its final location, ensuring that:

(1)     Data volumes, including without limitation, Legacy Data, can be processed to the required level  as set out in Appendix 3 (Volumetrics) of Schedule 2 (Statements of Requirements (Business Operations)) and the Design Documents; and

(2)     proving that the Service System(s) will function at 150% of the required level  as set out in Appendix 3 (Volumetrics) of Schedule 2 (Statements of Requirements (Business Operations)) and take into account the effect of bow-wave volumes;

(H)     Data is correctly stored by the Service System(s);

(I)     the Service System(s) comply with all applicable Laws, including the Congestion Charging Scheme Order, the LEZ Scheme Order, the legislation stated in Appendix 5 – Legislation Guidance of Schedule 2 (Statement of Requirements), all Privacy Legislation, FOI Legislation, monitoring and interception of communication laws from time to time and to the extent applicable; and

(J)     the Service System(s) as built provide accurate Management Information, and such Non-Functional Testing shall include that MIS and Interfaces in relation to TfL's Infrastructure, Software, Systems perform to the reasonable satisfaction of TfL.

8. **Data Migration Testing**

8.1 The Service Provider shall carry out Data Migration Testing to demonstrate that Legacy Data is correctly transferred to and stored by the Service System(s) in accordance with the Data Migration Strategy and the relevant Test Plan and Test Specification without limitation ensuring that:

(A) Testing of any required Data cleansing scripts is performed on manufactured Data to validate that such scripts operate correctly prior to being used in connection with Legacy Data;

(B) the integrity of the Legacy Data is tested to ensure the correct format, structure and content;

(C) Testing of the Data transformation and transfer scripts is performed on manufactured Data to validate the scripts operate correctly prior to being used in connection with cleansed Legacy Data;

(D) reconciliation of the migrated Legacy Data is performed to verify that the source and target Data is reconciled;

(E) migrated Data is used during Functional Testing, Non-Functional Testing and Interoperability Testing to demonstrate that the Systems comprising the Service System(s) function in accordance with the Specification and the Design Documents when processing migrated Legacy Data; and

(F) the Service Provider has complied with Clauses 7.3 and 7.4 (Implementation and Migration) in relation to such data migration.

9. **Interoperability Testing**

9.1 The Service Provider shall ensure that Interoperability Testing shall take place to demonstrate that the Service Systems fully integrate and fully inter-operate with all Systems to which the Service Systems interface, directly or indirectly, including:

(A) any of TfL's Systems (including the Interface with the TfL Website);

(B) all Other Service Provider Systems (including the EOps Service Systems);

(C) any Third Party Systems with an Interface to the Service Systems; and

(D) any other Systems with an Interface to the Service Systems specified in the Interface Catalogue;

9.2 Such Interoperability Testing shall employ end-to-end Tests across the Service Systems, all other Systems to which the Service Systems interface, and the Interfaces between them, designed to demonstrate that they behave in accordance with the relevant:

(A) Requirements;

(B) Design Documents; and

(C) Test Specifications,

and shall be designed to identify where conflicts exist between the specification, design and implementation of Service Systems and other Systems to which they interface with regard to delivering the Services.

9.3     The Service Provider shall ensure that Interoperability Testing of the Service is conducted employing Test Environments representative of the Service Provider's Infrastructure to be used operationally and at a location to be determined by TfL.

9.4     The Service Provider shall ensure that Interoperability Testing includes, without limitation:

(A)     Data constructed to cover normal and exception conditions, including but not limited to boundary values, null values and maximum length values, passed between the Service Systems and all other Systems to which they interface;

(B)     Test of all Interface failure conditions and recovery from failure for all Interfaces between the Service Systems and all other Systems to which they interface;

(C)     the demonstration the full end-to-end integration of the Service Systems with all other Systems to which they interface by executing Tests based on end-to-end business processes and Data flows across all of those Systems against the business process definitions set out in the Design Documents and the Specification, so as to demonstrate compliance with the Specification;

(D)     load and stress Testing performed with and across the Service Systems and all other Systems to which they interface, including without limitation the MIS, to demonstrate that the Service Systems interoperating with such other Systems can reliably process the normal and maximum expected volumes of events or transactions to meet the relevant Service Levels and to ensure that the Capacity and scalability of the Service Systems are met including:

(1)     testing using stored Data volumes, including without limitation, Legacy Data, comparable with the required levels as set out in Appendix 3 (Volumetrics) of Schedule 2 (Statements of Requirements (Business Operations)), the Design Documents and with representative volumes of Data passing via those Systems; and

(2)     proving that the Service Systems interoperating with the other Systems will function at 150% of the required levels as set out in Appendix 3 (Volumetrics) of Schedule 2 (Statements of Requirements (Business Operations)) and take into account the effect of bow-wave volumes;

(E)     Tests to demonstrate compliance with the Security Policy and other obligations set out in this Agreement; and

(F)     Tests to demonstrate that all Management Information is correctly accumulated from each Service Element, stored and reported.

10. **Implementation Acceptance Testing**

10.1 The Service Provider shall carry out Implementation Acceptance Testing that shall comprise:

(A)     Usability Testing;

(B)     System Proving; and

(C)     Simulated Operation Testing.

**Usability Testing**

10.2 The Service Provider shall perform (or, with respect to the TfL Website, ensure that (where relevant) TfL performs) Usability Testing for all Graphical User Interfaces, including Customer Interfaces, SMS layouts, IVR menu designs and recordings:

(A)     to ensure that they are easily comprehensible and usable by their target user base; and

(B)     to generate associated training material, or guidance for use, where required.

**System Proving**

10.3 The Service Provider shall carry out System Proving to demonstrate to TfL that the Services fulfil the Requirements, the Design Documents and all other requirements set out in this Agreement, including the Performance Indicators in Schedule 5 (Service Level Agreement), and are ready for the Operational Commencement Date.

10.4 System Proving shall demonstrate the operation of all aspects of the Services, including without limitation:

(A)     daily customer queries through all contact channels;

(B)     batch processing;

(C)     settlement processes;

(D)     financial and MIS processes;

(E)     management of exceptions;

(F)     third party interactions; and

(G)     Sub-Contractor management.

10.5 System Proving shall run in parallel with the development and Testing Activities and shall demonstrate the operation of the Services by means of employing:

(A)     the Service System Software, or parts of the Service System Software, as those parts becomes stable enough for simulating live operations;

(B)　operational processes and procedures to be employed in delivering services, or subsets of those processes and procedures, as those subsets becomes stable enough for simulating live operations, and where stable software, process and procedures are not available, the Service Provider shall substitute precursor material (which may include but is not limited to relevant Design Documents, prototypes and wire-frames) as they become available; and

(C)　Personnel who are:

　　(1)　versed in the use of the available infrastructure, software and operational processes and procedures or other material; or

　　(2)　trained in the use of those aspects of the material subject to System Proving for which training is available from the Service Provider.

**Simulated Operation Testing**

10.6　The Service Provider shall carry out a period of Simulated Operation Testing using:

(A)　the Infrastructure to be used operationally in its final location;

(B)　the Service System Software to be used operationally;

(C)　relevant Personnel who make use of the Service Systems in order to provide services to Customers who have been appropriately trained in the operational processes and procedures to be employed in delivering those Service Systems; and

(D)　the Service Management framework to be used operationally including the people, processes and technology that will be used to manage the Services to meet the Requirements.

10.7　Simulated Operational Testing shall be performed in order to simulate and prove all the Operational Services to be provided during the Operational Phase:

(A)　are in accordance Requirements; and

(B)　will deliver an effective service that meets the Service Levels,

and such Simulated Operational Testing shall include, without limitation, the simulation of:

　　(1)　daily customer queries through all contact channels;

　　(2)　batch processing;

　　(3)　settlement processes;

　　(4)　financial and MIS processes;

　　(5)　management of exceptions;

　　(6)　third party interactions; and

　　(7)　Sub-Contractor management.

10.8   The period of Simulated Operation Testing shall include Tests of business process scenarios (including without limitation as reasonably specified by TfL) using the Service System(s) Test to demonstrate compliance with the Requirements, and relevant Test Plan and Test Specification and including without limitation ensuring:

   (A)   relevant Personnel who make use of the Service Systems in order to provide services to Customers are appropriately trained, used and involved by the Service Provider in order to provide the Services;

   (B)   relevant Personnel who manage the Service System(s) operations (including service management, performance management and security management) are appropriately trained, used and involved by the Service Provider in order to support the Services;

   (C)   all Management Information is provided; and

   (D)   the operational procedures for the Service Provider to perform its obligations under this Agreement are used and complied with and are sufficient to support the Service System(s) to meet the required Service Levels, including those related to the Business Continuity Plan, Business Continuity Infrastructure, Business Continuity Services and other Business Continuity and back-up continuity procedures, in each case including as required in accordance with Schedule 25 (Business Continuity).

11.   **Ready For Service Assurance**

11.1   The Service Provider shall carry out carry out Ready for Service Assurance to ensure that all Test related activities required prior to the transition to Operational Service have been completed, including without limitation ensuring:

   (A)   full completion of all Testing, including confirmation that:

      (1)   Testing of the Security Policy has been undertaken and is complete;

      (2)   independent external penetration has been undertaken by a company approved in writing by TfL in advance and is complete;

      (3)   Testing of all MIS reporting has been undertaken and is complete; and

      (4)   Testing of the Business Continuity Plan, Business Continuity Infrastructure, Business Continuity Services and other Business Continuity and back-up continuity procedures has been undertaken and is complete, in each case including as required in accordance with Schedule 25 (Business Continuity);

   (B)   the Operational Test Strategy has been Approved;

(C)     that it has been demonstrated to TfL's reasonable satisfaction that the Evidential Integrity requirements for the Services have been met;

(D)     that it has been demonstrated to TfL's reasonable satisfaction that all audit mechanisms and trails are operational and adequate including without limitation by way of an external independent BS7799 audit (to be carried out by the National Computing Centre or such other suitably qualified Third Party as the parties may agree in writing, the cost of which shall be borne by the Service Provider) and that the Service Provider shall at its own cost and expense promptly rectify any failing areas identified during the course of any such audit; and

(E)     that it has been demonstrated to TfL's reasonable satisfaction that the Service Provider's data retention mechanisms comply and continue to comply with Privacy Legislation, the Data Retention Policy, and all TfL Policies.

12.     **Regression Testing**

The Service Provider shall perform Regression Testing as necessary to demonstrate that changes to the Software have no adverse impact on the Service System(s), Interfaces, the Other Service Provider Systems or any Hardware, Software or Systems of TfL.