

Standard Procedure

S-324

Issue: 011

Characterisation Management

Notes Document templated updated. Addition of RACI matrix, procedure diagram and monitoring and measurement section and minor changes as highlighted.	
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1. PURPOSE

The purpose of this Standard Procedure is to provide the generic principles for conducting all types of characterisation to enable consistent characterisation practices across Nuclear Restoration Services (NRS) sites.

Characterisation is the process of finding out the body of information that is needed to be known about a given entity. Missing key bits of information about that given entity, may lead to misinformed decisions when managing it, resulting in, at best extra work needed to rectify the poor decisions or worst, risk to people, environment or plant. Characterisation (i.e. collecting quality data and information to support assessments and decision making) is therefore an enabling activity that can provide effective risk mitigation for project activities.

Completing necessary characterisation requires a managed and controlled process to ensure output is of a sufficient standard to support compliant management of wastes, materials or land. Characterisation activities should be planned to support compliant, cost effective, quality decision making in a whole life-cycle process, appropriate to the waste or materials, the proposed disposition route and/or required deliverables.

When new data or information is needed for the purposes of waste management, the approach taken to complete the required characterisation forms a key part of demonstrating compliance with both the site Environmental Permit / Radioactive Substances Authorisation and the Permits / Authorisations of receiving facilities. All evidence that supports key decision making within any process/activity needs to be robust, defensible and fully documented.

In order to ensure that decisions based upon the outputs of the characterisation process are compliant with regulation, robust, defensible and fully documented, the implementation of this Standard Procedure is supported by the following:

1. Characterisation Overview – WD/WAN/0225/17
2. Structured Planning/Data Quality Objectives for Characterisation – WD/WAN/0226/17
3. Characterisation Campaign Design (to include Data Acquisition Techniques) – WD/WAN/0227/17
4. Management of Waste Stream Fingerprints WD/WAN/0022/18
5. Characterisation Fragnet WD/WAN/0023/18
6. Writing an Analytical Scope of Work (ASOW) for the Procurement of Waste Analysis Services WD/WAN/0167/18
7. Commonly Used Acronyms and Terms Within characterisation WD/WAN/0169/18
8. Nuclear Material Measurement and Estimation WD/WAN/0209/18
9. Additional Sampling and Analysis Information for Waste Characterisation WD/WAN/0191/18

2. SCOPE

This document applies to NRS Centre and NRS Sites excluding NRS Dounreay who follow alternative arrangements.

The principles outlined within this Standard Procedure, in terms of the logic, apply to all situations where characterisation is required.

Waste characterisation applies to all wastes that will be generated and managed by NRS sites in operations, care and maintenance, decommissioning and interim end state of facilities / sites.

Typical drivers for characterisation include:

- Identification of hazards, radiological and non-radiological (e.g. presence of residual asbestos, carcinogens, toxins as well as radioactivity etc.) that may affect project delivery or waste management activities.
- Defining properties of waste that will affect any part of the waste management lifecycle i.e. retrieval/ movement/ processing/ packaging/ storage/ treatment/ transport/ consignment or disposal activities.
- Waste/material scopes/inventory definitions to inform management planning, decommissioning and delicensing strategies including reuse of materials.
- Demonstration that waste is compliant within stated requirements e.g. Waste Acceptance Criteria of any onward receiving facilities; Waste Characterisation Form (WCH) at the Low Level Waste Repository (LLWR); Letter of Compliance (LoC) process and Radioactive Waste Management (RWM) acceptance for Intermediate Level Waste (ILW) packaging and storage on site.
- To inform fingerprint reviews including those for legacy operational fingerprints, assurance, emergent issues due to an event and creation of a new fingerprint (PD-026)
- Options assessment such as Best Available Techniques (BAT)/Best Practicable Means (BPM) (S-391)
- Addressing requirement R8 (Site Characterisation and Monitoring) of the 'Management of radioactive waste from decommissioning of nuclear sites: Guidance on Requirements for Release from Radioactive Substances Regulation'(GRR), especially when considering the potential for on-site disposal.
- Management of land and ground water (S-154 – Arrangements for the Management of Land Quality)
- Care & Maintenance / Operational Facilities
- A range of activities including but not limited to Nuclear Materials Management (i.e. Materials containing Plutonium, Thorium or Uranium) (S-164) and Dangerous Goods (including Radioactive Materials) Transport (S-142) require the timely quantification of nuclear material mass. Where relevant, the requirements for accurate recording of nuclear material mass are required at the earliest opportunity (e.g. the recording of nuclear material present within legacy wastes that require to be retrieved).

A process for delivering compliant characterisation activities inclusive of radioactive waste fingerprint management is outlined in a process flow 'road map' diagram in Appendix A. All characterisation activities inclusive of fingerprinting shall be considered in accordance with a structured planning approach such as Data Quality Objectives (DQO), outlined in Appendix B. To provide additional clarification, Appendix C outlines how the requirements of this standard are applied to the process of Fingerprint Management, including key roles, actions, and sources of information specific to the management of fingerprints.

This Standard Procedure applies to all solid or liquid materials / wastes, to include; Intermediate Level Waste (ILW), Low Level Waste (LLW) (all sub categories), Out of Scope (OoS) – including Hazardous, Non-Hazardous and Inert waste properties within each of these categories.

The scope of this standard excludes gaseous wastes and permitted/authorised discharges.

2.1. COMPLIANCE TABLE

Compliance Type	Specific Requirement	Compliance Delivered
Environmental Permits / Authorities and Consents	The Environmental Permitting (England and Wales) Regulations 2016 (EPR16) and Environmental Authorisations (Scotland) Regulations 2018 (EA(S)R18	Implementation of this Standard Procedure supports site compliance with all clauses under their EPR16 or EA(S)R18 permits. Specifically, this procedure meets the requirements under these permits for the general management, operations, disposal and monitoring and information requirements in relation to the management of radioactive waste.

3. RESPONSIBILITIES / RACI MATRIX

RACI (Responsible, Accountable, Consulted, and Inform)

R – Role responsible for the activity (may deliver under responsible person's delegation)

A – Role accountable for the activity

C – Consulted

I – Kept informed

Roles	Process Section/Step								
	4.2.1	4.2.2	4.2.3	4.2.4	4.2.5	4.2.6	4.2.7	4.2.8	4.2.9
DV Owner	A	-	-	R	-	-	-	A	R
Project Manager	R	A	A	A	A	A	A	-	-
Characterisation Manager	R	-	-	-	-	-	-	R	R
Technical Section Head, Rad & Characterisation	R	-	-	-	-	-	-	-	-
Characterisation / SQEP SME	-	C	R	R	R	R	-	-	-
Characterisation IC	-	-	-	C	-	R	-	-	-
Head of Waste / Waste Manager Or Project Engineer /PM	-	-	-	-	-	-	R	-	-

4. PROCEDURE

Activities to identify, underpin or improve data for physical, chemical and radiological properties where required are to be designed and executed as early as practicable. Characterisation data is needed to support strategic assessments such as Best Available Technique (BAT)/ Best

Practicable Means (BPM)/ as well as underpinning for project, commercial or compliance documentation such as Project Waste Management Plan (PWMP)/ Letter of Compliance (LoC) / Invitation to Tender. Furthermore data on physical, chemical or radiological properties of material may be required during project execution to de-risk processing strategies, and overcome waste retrieval, processing and packaging challenges etc.

The generic process for undertaking characterisation is provided in Appendix A. This needs to be tailored and scaled based on the requirements of the information that needs to be obtained. Ideally characterisation should be planned up front of a project starting and the most appropriate points at which to gather required information/data within the project lifecycle identified.

However, there will be instances where unforeseen wastes, changes in strategy or assurance/confirmation measurements, prompt the need for emergent characterisation efforts during a project or process e.g., a scheduled or emergent need for a fingerprint review.

Regardless of when characterisation occurs, the logic applied should be consistent i.e. documented structured planning with a resultant plan and the results of any campaign formalised appropriately.

Outputs (deliverables) required from characterisation are agreed within the structured planning process/DQO and where appropriate each output is to be subsequently verified/reviewed in line with the applicable quality management processes and approved by appropriate SQEP (Suitably Qualified Experienced Person) personnel. Where work is delivered externally, the outputs must be accepted into NRS by the relevant Intelligent Customer (IC) (or SQEP Subject Matter Expert (SME)) in line with S-084 Intelligent Customer (See also WD/WAN/0225/17). Examples of outputs are given in Appendix A. The outputs are used within the accountability process to provide evidence of progress (WD/WAN/0023/18 Characterisation Fragnet)

Characterisation activities may include existing data review and / or refinement, in-situ surveys/sampling, activity modelling, in-process measurement, activity assessments and fingerprinting, to support whole life-cycle process requirements including process design, package inventories, decommissioning, waste management, remediation strategies and disposal/clearance et.al.

It is imperative that projects retain all characterisation outputs and raw data as evidence to underpin the decisions made. (I.e. Evidence to underpin defensible data is to be retained). It is also incumbent on the project to ensure that data that is used to underpin a change to the radioactive waste inventory (RWI) is recorded on F-289, approved by the site Head of Waste/ Waste Manager and sent via the appropriate change control process (S-284 Radioactive Waste Inventory) to NRS.inventory.change.control@nrsservices.uk

In addition, final copies of all characterisation outputs (including both RWI and non-RWI related outputs) shall be copied to NRS.characterisation@nrsservices.uk

4.1. Procedure Diagram

For Process diagram see Appendix A.

4.2. Procedure Steps and Responsibilities

4.2.1. Initiation of Characterisation

Action	Responsibility
<p>The main items of characterisation work comprise of forecast work already entered into the lifetime plan (LTP) with an initial estimate of scope, cost and schedule assigned. This will include such routine work as annual LAW fingerprint reviews (See S-078). The items of work should be reviewed and will need to be properly scoped (see Step 4.2.2), costed and scheduled (see also WD/WAN/0023/18 Characterisation Fragnet).</p>	<p>DV Owner</p>
<p>Notify the scheduled characterisation to NRS.characterisation@nrsservices.uk</p> <p>Note: This is to enable the Lower Activity Waste Disposability and Characterisation team (LAWD&C) to maintain an overview of all characterisation related work within NRS Sites (for strategic reasons).</p>	<p>DV Owner</p>
<p>Emergent, non-forecast work arising as a result of unforeseen needs, changes required as a result of assurance activities, anomalies in data, changes in strategy, or support of opportunities to change strategy etc. will not have an initial scope, cost or schedule entered in the LTP. If undertaken, this work is to be change controlled into the LTP (or local equivalent) and a scope, funding and schedule assigned (S-302 Trending and Change Control and also WD/WAN/0023/18 Characterisation Fragnet).</p>	<p>DV Owner</p>
<p>Any changes to LTP scope (emergent work), related to or impacting characterisation activities, should be notified in writing to NRS.characterisation@nrsservices.uk</p>	<p>DV Owner / Project Manager (PM)</p>
<p>Maintain oversight of characterisation activities throughout NRS Sites for the purposes of reporting progress and facilitating resolutions of progress or priority challenges.</p>	<p>Characterisation Manager</p>
<p>At regular intervals, conduct a 6-12 month look ahead to ensure awareness of characterisation activities needing to be scoped and initiated.</p>	<p>Characterisation Manager</p>
<p>Support discussion / clarification regarding any aspect of the characterisation process e.g. Identification of potential SME resource; estimating characterisation costs; scheduling</p>	<p>Characterisation Manager</p>

Action	Responsibility
<p>requirements; aiding framework access; scoping characterisation content; etc.</p> <p>Contact via: NRS.characterisation@nrsservices.uk</p>	
<p>Assign an IC/ SQEP SME as requested by DV Owner, for externally delivered work, to ensure the characterisation scope of work is appropriate to deliver the project requirements.</p>	<p>Technical Section Head, Rad & Characterisation</p>

4.2.2. Scope the Requirements for Characterisation

Action	Responsibility
<p>Identify the detail of the scope i.e. the types of material or potential waste to be produced (including secondary wastes) and the associated whole life-cycle management routes (see WD/WAN/0225/17) that are intended for them.</p>	<p>PM</p>
<p>Identify all potential owners of the elements that make up the whole lifecycle of the management route(s).</p>	<p>PM</p>
<p>Contact all owners e.g. Programme Managers / DV Owners to ensure their awareness of the proposed work and to facilitate agreement of handover points, schedule reconciliation, process requirements and funding.</p>	<p>PM</p>
<p>Identify the list of potential stakeholders (decision makers) within the complete lifecycle of the proposed management route, and determine data requirements.</p> <p>Note: A list of potential stakeholders is detailed in WD/WAN/0225/17 Appendix B</p>	<p>PM</p>

4.2.3. Review Existing Information

Action	Responsibility
Collate all relevant existing information against the requirements of the management lifecycles identified in step 4.2.2.	PM via SQEP SME
Ask stakeholders to evaluate the validity of the provenance in relation to the scope of the material / waste management route(s) / strategy(s) under consideration.	PM / SQEP SME
Appropriate action (in line with the structured planning process set out in Appendix B) should be taken dependent upon the validity or appropriateness of the existing data. Should additional data be required a characterisation activity will be actioned to provide the necessary data. Follow step 4.2.4 onwards.	PM via SQEP SME
If the provenance is sufficient to proceed with whole life cycle of material / waste strategy follow step 4.2.6.	PM

4.2.4. Develop the Characterisation Plan

Action	Responsibility
Use the gaps identified in sections 4.2.2 and 4.2.3 to develop the key deliverables required from the characterisation, including deciding the documentation outputs. See step below onwards.	PM
Use structured planning methodology such as DQO prior to any characterisation work being carried out, to identify the most appropriate methods and quality control/quality assurance requirements for obtaining, assessing and processing data and documenting the outcomes. This should be scaled ¹ as appropriate to the nature of the work required. See Appendix B and WD/WAN/0226/17. The appropriate SQEP SME/IC/stakeholder for buy-in/verification/review/approval of the methods and outputs also need to be identified and recorded. This includes such personnel that	PM

¹ Scaled DQO – From a formal, documented meeting of all relevant SQEP stakeholders, through to written consolidation of the requirements, with buy-in/review/ approval of the document, also by the relevant SQEP stakeholders. See WD/WAN/0226/17, Structured Planning/Data Quality Objectives for Characterisation.

Action	Responsibility
<p>Advise on appropriate data gathering methods & technique(s) to obtain data required.</p> <p>Note: An appropriate IC/SQEP SME must be engaged for all work to be supplied by a 3rd party (defined via a technical specification) (See step 4.2.1) and an SME should advise for work to be performed internally.</p>	<p>Characterisation IC / SQEP SME</p>
<p>Ensure the structured planning/DQO is recorded, either as a stand-alone report or as an integral part of the characterisation plan (see step below). See WD/WAN/0225/17 Appendix D1 for a guide that can be used to help construct a DQO report. Ensure stakeholder buy in and SQEP verification, review & approval of document is undertaken before acceptance and issue.</p>	<p>PM / Characterisation SME</p>
<p>Develop a characterisation plan using the DQO outcomes to provide the detail of how data will be obtained. A guide to aid the creation of a characterisation plan is shown in WD/WAN/0225/17, Appendix D2. Ensure stakeholder buy in and SQEP verification, review & approval of document is undertaken before acceptance and issue for use.</p>	<p>Characterisation SME</p>
<p>Ensure funding is in place (including Validation and Sanction) for any tasks identified in the characterisation plan prior to commencement of characterisation activities.</p>	<p>DV Owner</p>

4.2.5. Deliver the Characterisation Campaign

Action	Responsibility
<p>Implement the characterisation plan activities as appropriate: Appendix A provides information on some of the likely characterisation activities that will be required to deliver the requirements e.g.</p> <p>Non-intrusive - Surveys, Assay (see S-470), Modelling.</p> <p>Intrusive – Sampling</p> <p>(If external capability is being sourced for sample analysis, the scope of work needs to be defined via an Analytic Scheme of Work (ASOW), approved by characterisation IC/SQEP SME - see WD/WAN/0167/18).</p> <p>See WD/WAN/0227/17 for campaign advice.</p>	<p>PM / Characterisation SME</p>

4.2.6. Evaluate the results (accept or reject)

Action	Responsibility
<p>Review the results of the campaign against the requirements of the DQO/Structured Planning. Where data has been generated by an external organisation, the characterisation IC/SQEP SME must accept the work.</p>	<p>Characterisation SME</p>
<p>If results are acceptable, the output of the sampling activity, modelling or measurement etc. should be formalised as required.</p> <p>For a guide to help create a characterisation report, see WD/WAN/0225/17, Appendix D3. It is important that the output is documented in line with the project requirements and the applicable QMS. For fingerprints this would typically validate the data is suitable for fingerprint derivation, whilst the F-143 template is provided to record how the fingerprint has been calculated and should be managed.</p>	<p>Characterisation SME</p>
<p>If results are NOT acceptable, consider reanalysis, revisiting sampling / surveys or the DQO.</p>	<p>PM / Characterisation IC or Characterisation SME</p>

4.2.7. Publication of Final Report to all interested parties

Action	Responsibility
<p>As a minimum, in addition to the interested parties (including the Head of Waste/Waste Manager where appropriate) identified in the DQO, all characterisation outputs (including the final report) should be sent to NRS.inventory.change.control@nrsservices.uk for inclusion in NRS Sites Inventory (to ensure underpinning of Company data is maintained for NRS Sites), and to NRS.characterisation@nrsservices.uk. (See section 4) (To ensure all efforts are captured for LFE purposes). This is a requirement unrelated to whether the information will change the RWI.</p>	PM
<p>Characterisation outputs that do inform a RWI update should be sent with the accompanying F-289 to NRS.inventory.change.control@nrsservices.uk</p>	<p>Head of Waste/ Waste Manager (for LAW) Project Waste Engineer/PM (for HAW)</p>

4.2.8. Implement the findings into the process

Action	Responsibility
<p>Implement the findings of the characterisation for use in the relevant processes. It is important to update site processes additional to project related processes that may be impacted by the results of the characterisation e.g. update PWMP etc.</p>	DV Owner
<p>Ensure the RWI is updated and the underpinning documentation filed electronically.</p>	Characterisation Manager
<p>Ensure salient data is uploaded onto the characterisation SharePoint page so it may be accessed by characterisation practitioners.</p>	Characterisation Manager

4.2.9. Records and Review

Action	Responsibility
It is imperative that projects retain all characterisation outputs and raw data as evidence to underpin the decisions made. (Evidence to underpin defensible data is to be retained).	DV Owner/PM
Co-ordination and review of all standards and documents associated with this Standard will be undertaken to ensure consistent advice is available to the company.	Characterisation Manager

5. MONITORING AND MEASUREMENT

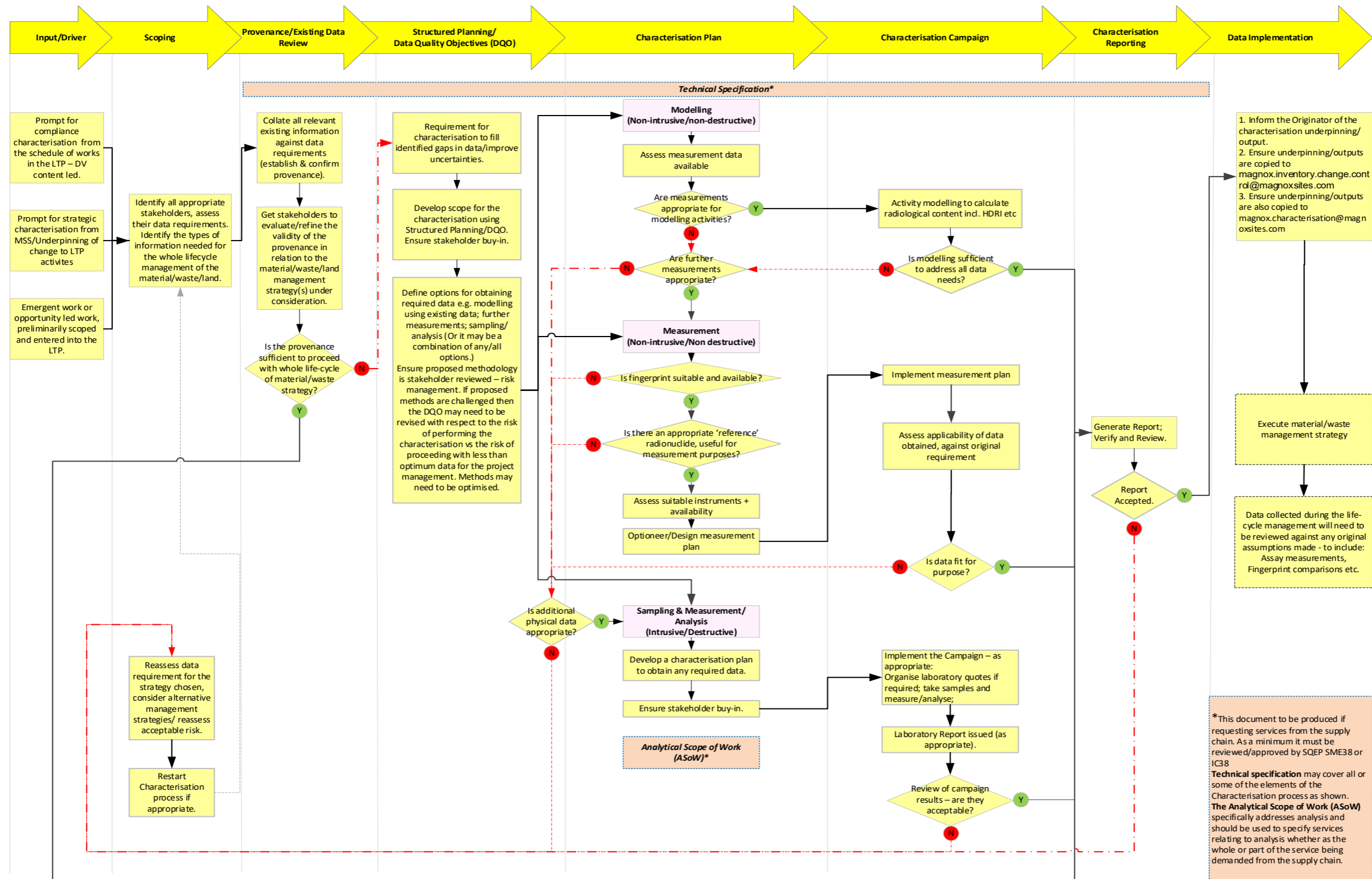
All NRS Company Standards under PD-026 will be monitored and measured via Risk based assurance activities led by the Waste Operations Programme Standards and Assurance Team.

6. DEFINITIONS

Term used	Explanation
ASOW	Analytical Scope of Work
BAT	Best Available Techniques
BPM	Best Practicable Means
DQO	Data Quality Objectives
FIR	Fingerprint Implementation Report
FP	Fingerprint
HAW	Higher Activity Waste
IC	Intelligent Customer
ILW	Intermediate Level Waste
LAW	Lower Activity Waste
LAWD&C	Lower Activity Waste Disposability and Characterisation
LLW	Low Level Waste

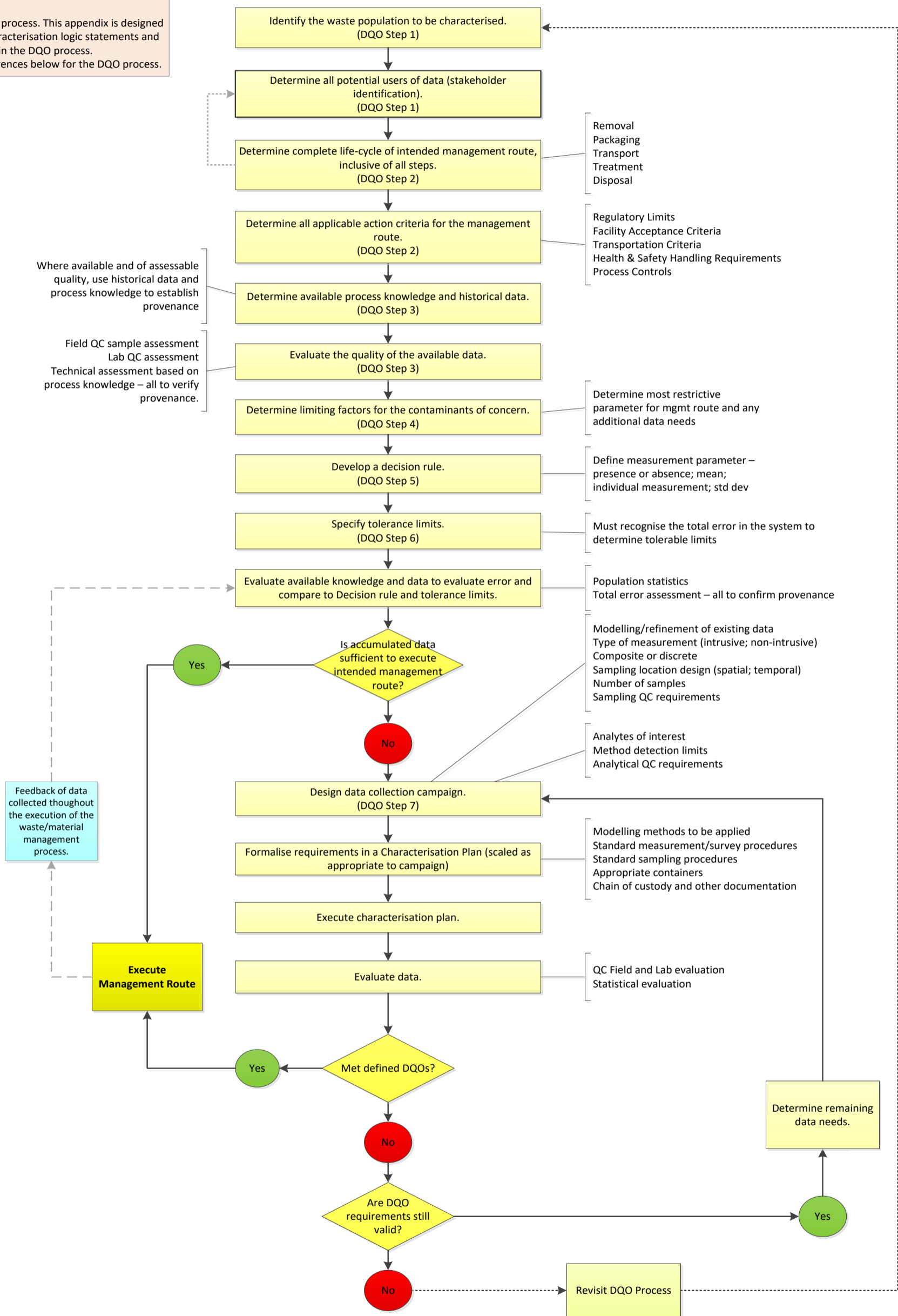
Term used	Explanation
LLWR	Low Level Waste Repository Limited
LTP	Life Time Plan
OoS	Out of Scope
PWMP	Project Waste Management Plan
QP	Quality Plan
RWI	Radioactive Waste Inventory
RWM	Radioactive Waste Management
SME	Subject Matter Expert
SQEP	Suitably Qualified Experienced Person
WCH	Waste Characterisation Form

APPENDIX A: CHARACTERISATION ROADMAP



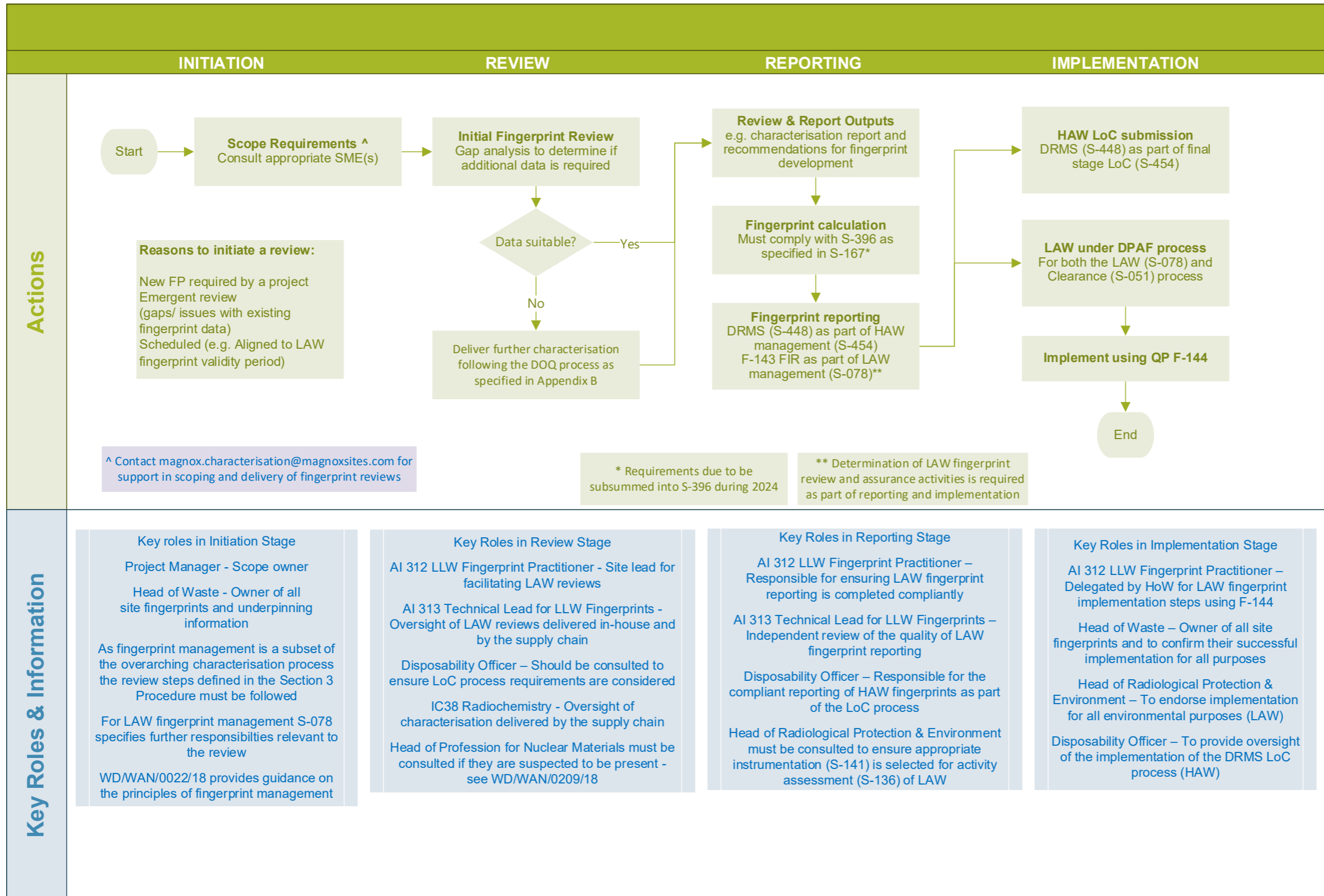
APPENDIX B: STRUCTURED PLANNING/DQO PRINCIPLES SUMMARY APPLIED TO CHARACTERISATION PROCESS

Please note:
This is not the DQO process. This appendix is designed to show typical characterisation logic statements and where they sit within the DQO process. Please see the references below for the DQO process.



References:
1) WD/WAN/0226/17 Structured planning/Data Quality Objectives for Characterisation
2) Guidance on Systematic Planning Using Data Quality Objectives Process; EPA QA/G-4.

APPENDIX C: FINGERPRINT MANAGEMENT PROCESS



APPROVAL SHEET

Approval		
Title: Characterisation Management		
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Author: D Marsland	Technical Author (EDF)	Date: 07/04/2025
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