Crossrail Asset Information Fundamentals

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1 Purpose

The purpose of this document is to explain and describe key concepts utilised in Crossrail's Asset Information Management System (AIMS), a part of the overall eB system.

2 Scope

This document only covers AIMS related concepts and terms. Other eB concepts will be described in other documents.

3 Definitions, Acronyms and Abbreviations

For an explanation of the Definitions, Acronyms and Abbreviations used in this document and by CRL when describing asset information related activities, please refer to the Asset Information Glossary (CRL1-XRL-Z3-GUI-CR001-50012).

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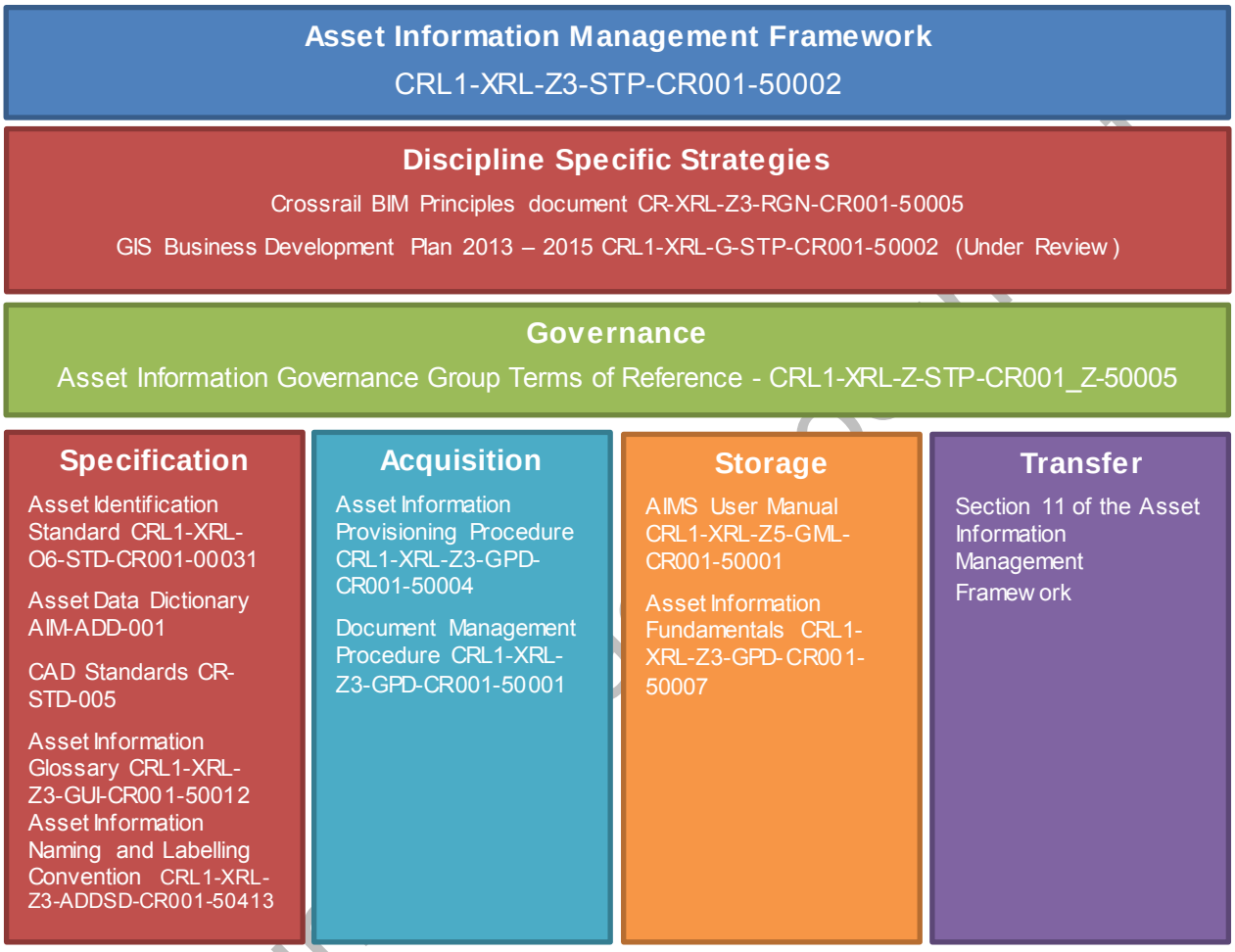
4 Relationship to other Crossrail documents

This document is part of the overall suite of Crossrail documents explaining the approach to Asset Information Management:



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5 Asset Information Management System

Crossrail uses a number of software systems supplied by Bentley and other suppliers to specify, acquire and manage Asset Information:

- Bentley eB – Document management, asset inventory (AIMS Asset Information Management System), Configuration management
- Bentley MicroStation and ProjectWise – Design creation and management
- Bentley Maps – Geospatial data

AIMS utilises a number of concepts which enable it to provide effective support for the provision and hosting of asset information:

- The use of Asset Tags, Equipment and Serialised & Batched Items;
- Defining Asset Tags as part of three different hierarchies based on Location, Function and Classification;
- The ability to explicitly link groups of assets to form a single system, known as a Primary Functional Unit, or to a single sub-system, known as a Functional Unit;
- A capability to host an Asset Data Dictionary to define classification and functional hierarchies;
- The ability to explicitly define other relationships; and
- Workflow functionality to facilitate data provision.

These concepts are explained more fully in the following Sections.

5.1 Accessing AIMS data

There are three main ways that users can view and access AIMS data:

Version	Description	Access
eB Web	Browser based eB interface available to majority of Crossrail users	Through normal eB access
Engineering Designer	Specific application utilised by the Asset Information and Configuration Management team to administer AIMS data	Available to Asset Information Team only
eB Director	Specific application to administer the AIMS system (and eB system)	Available to eB System Administrators only

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6 Asset Tags, Equipment and Serialised Items

AIMS uses different types of entity to provide effective asset information management, as illustrated in Figure 1, below:

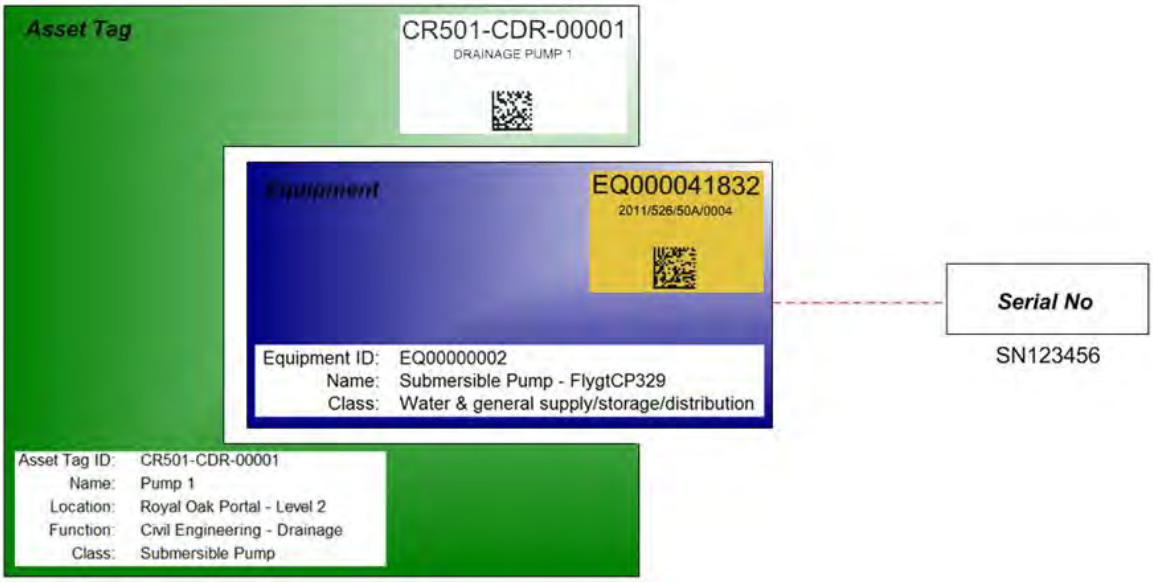

Figure 1 - Relationship between Asset Tags, Equipment and Serialised Items

An Asset Tag represents the design duty of an asset. Equipment represents the actual physical item that is to fulfil the duty of the Asset Tag and the Serialised Item represents the individual Serial or Batch number of the Equipment utilised.

For example:

- Drainage Pump 1 – Asset Tag for the specific design duty
- Flygt CP3127 – Equipment fulfilling the duty of Drainage Pump 1
- Serial Number – 123456 – The serial number of the specific pump installed as Drainage Pump 1

If, for example, this pump were to fail and be replaced by one of the same type, then the Serial recorded against the Equipment would be changed, however, if a new type of pump were to be installed, then a new Equipment and associated Serial would be recorded against the Asset Tag.

Equipment is used to represent an item that can be purchased as a complete entity, in case of replacement, for example. Where an asset is a fabricated item, for example, HVAC ducting, then this will be recorded as an Asset Tag only.

If a particular type of Equipment does not have a serial (or Batch) number, then no serial number will be associated with that item of Equipment in AIMS.

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7 Asset Tag relationships

Each Asset Tag is related to three distinct hierarchy relationships:

- Location – The Facility where the Asset Tag is situated, for example, Royal Oak Portal
- Function – The overall purpose fulfilled by the Asset Tag, for example, drainage pumping – see Section 7.1 for more details of Functions being used by Crossrail
- Class – The type of Asset Tag, for example, a Submersible Pump. Crossrail has based its asset classification on the Uniclass L-Table of Classes and have added/amended as necessary to reflect the requirements of railways related systems.

See Figure 2, below, for an illustration of these relationships.

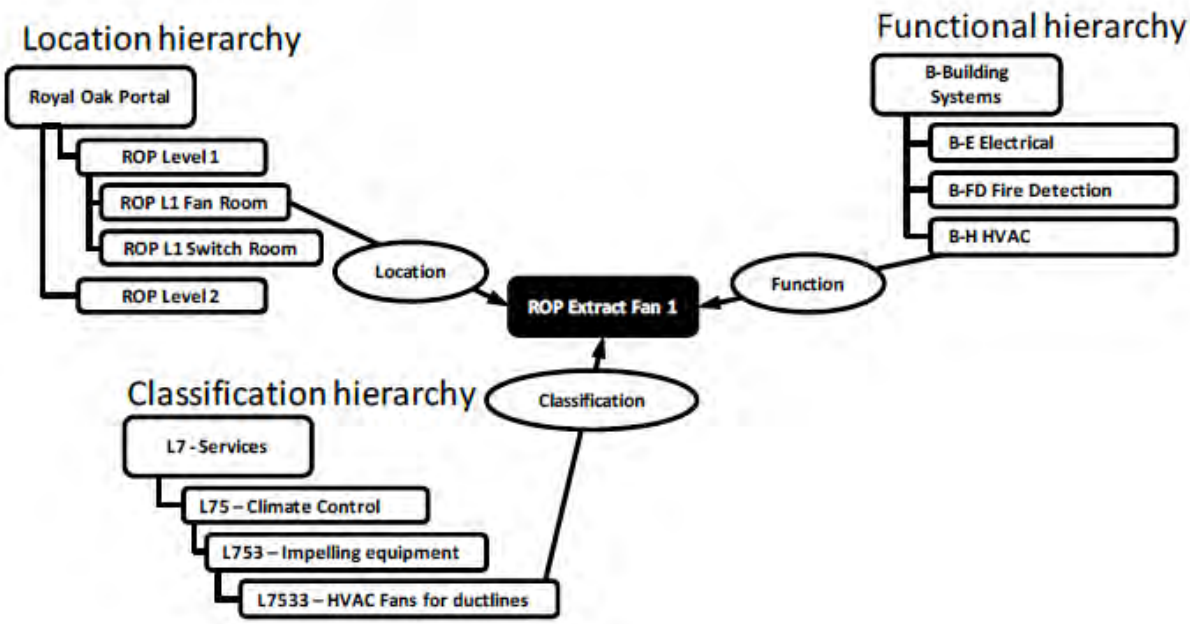

Figure 2 - Example of Asset Tag definition

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Figure 3, below, shows how this information appears in AIMS.

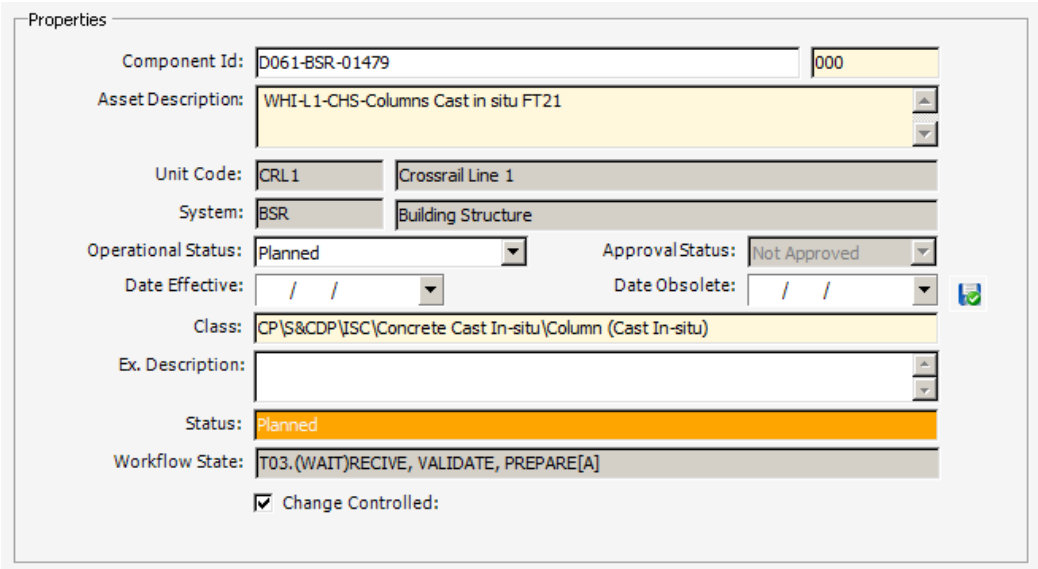

Figure 3 - Extract of Asset Tag information from AIMS

7.1 Other relationships

AIMS also allows other relationships to be explicitly defined to provide better information on how Asset Tags interact. These relationships could include:

- Powers/ Powered By
- Controls/ Controlled By

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8 Functions

The table below illustrates the mapping of Crossrail Functions to London Underground (LU) Disciplines.

CRL Function		LU Asset Classification/Discipline	Comments
BSR	Building Structure	Civils – Bridges & Structures	
CRS	Civil Retaining Systems		
CPD	Cross Passage Doors		
CTN	Tunnels Function	Civils – Deep Tube Tunnels	
DSW	Drainage Surface Water	Civils – Drainage	Crossrail currently have civil and mechanical assets together in the drainage functions, LU split these into two disciplines
DFW	Drainage Foul Water	Civils – Pumping Systems	
TPD	Tunnel Pumped Drainage		
CCC	Command and Control Communications	Communications	
CIN	Customer Information		
DAT	Data Communications		
CAB	Hardware Cabinets		
RAD	Radio		
SAS	Surveillance and Security		
TEL	Telephony		
SEC	Electronic Security		
NES	Electronic Signage (Non-signalling)	Control and Information	
BMS	Building Management Systems	Electrical Systems	
EML	Emergency Lighting		
LTG	Lighting (Un-secured)		
LGT	Tunnel Lighting		
LPS	Lightning Protection		
UPS	Uninterruptable Power Supply		
ENB	Earthing and Bonding		
Fencing is found in Building Structures			Fencing and Environment
FPC	Fire Compartmentation	Fire Systems	
FDA	Fire Detection and Alarm		
FPA	Fire Suppression/extinguish (Active Fire Protection)		

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CRL Function		LU Asset Classification/Discipline	Comments
TFM	Tunnel Fire Main		
LEC	Lifts and Escalators	Lifts and Escalators	
HVA	HVAC	Mechanical Systems	
DWS	Domestic Water Supply		
TVS	Tunnel Ventilation		
LVD	LV Power Distribution	Power	
HVP	HV Power (Non-Traction)		
OLE	OHLE		Conductor rails sit under track but LU have no OHLE
TPS	Traction Power		
BAF	Architectural Finishes	Premises	
TRK	Track - Plain Line	Track	
SNC	Track - S & C		
TWS	Walkways		
ATC	Signalling - Automatic Train Control	Signalling	
TSP	Signalling - Train Supervision		
SCC	Signalling Communications		
PSD	Platform Screen Doors		LUL S1042 states PED maintained by Signals
	These disciplines do not currently match with Crossrail Functions	Civils – Earth Structures Automatic Fare Collection Depot Plant and Equipment Rolling Stock	
CMS	Cable Management System		

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9 Primary Functional Units

A collection of Asset Tags that are all operating as part of the same system can be grouped together under a single Primary Functional Unit which enables complex systems to be explicitly defined. Definitions of where Functional Units should be recorded are detailed in the relevant Function AD4 documents. Figure 4, below, provides an example of how assets could be grouped under a single Primary Functional Unit.

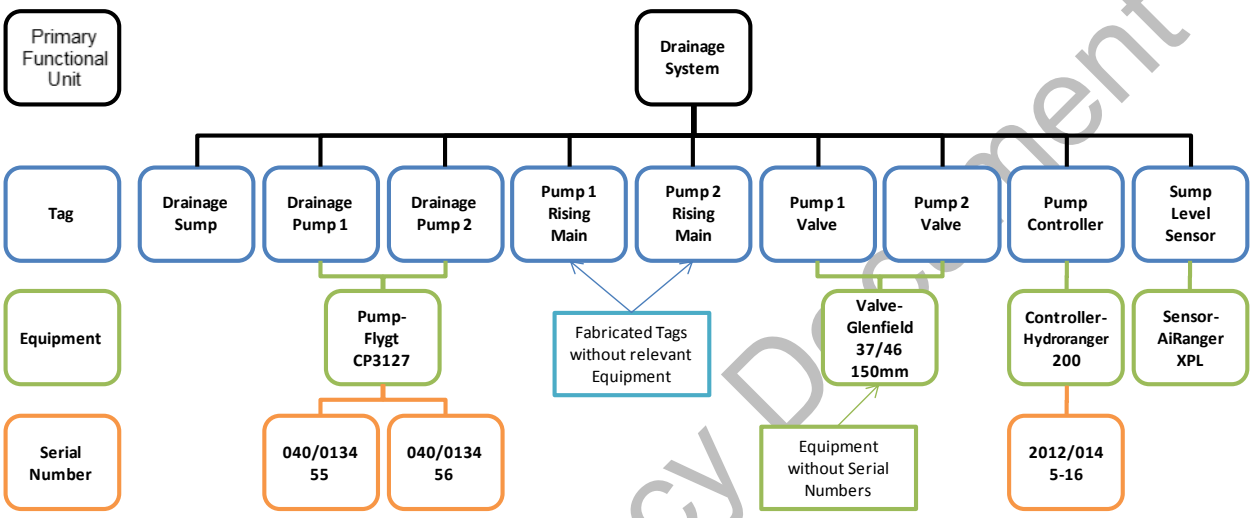

Figure 4 - Assets grouped under an example Primary Functional Unit

This diagram illustrates the Primary Functional Unit representing a Drainage System along with a selection of its associated Asset Tags, Equipment and Serial/Batch Numbers. The Asset Tags are a range of civil, mechanical and instrumentation assets which all work together to operate as a complete Unit. The fabricated items, such as the Rising Mains and Sump do not have associated Equipment. Some Equipment, such as the Valves and Level Sensor do not have associated Serial/Batch Numbers as these are not serialised items.

Functional Units are children of Primary Functional Units.

Primary Functional Units can also be utilised for defining an assembly of Functional Units/Asset Tags that operate together, such as an Escalator which comprises Asset Tags for steps, chains, motor, gearbox etc. Similarly, a Primary Functional Unit can be used to group a number of individual structural Asset Tags that can be treated as a single entity, for example, a number of walls, beams, columns and floors that are one Girdering of a station.

9.1 Locational Functional Unit

The Locational Functional Unit (LFU) is defined by all the Functional Units and assets that make up and support the Primary Functional Unit at a defined LCS1 area. The Locational Functional Unit is a subset of a PFU where systems span across two or more locations such as Geographic Facilities. The systems that typically span multiple Geographic Facilities include: -

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- Radio
- Cable Management
- CCTV
- Data Networks
- Earthing
- Tunnel Ventilation
- Track
- Overhead Line
- HV Power
- Fibre Optic Networks
- Train Control
- Track drainage
- Etc., etc.

A Locational Functional Unit represents a part of the railway that is not typically operated as a single sub-system. For example, the assets making up the Track system would be grouped together as a Locational Functional Unit within an LCS1 location but are not part of a single operated system as they would form part of a wider system at Primary Functional Unit level.

9.2 Functional Unit

A Functional Unit represents a part of the railway that would typically be operated as a single sub-system. For example, the steps of an escalatorwould be grouped together as a Functional Unit which may be moved by the driving motor, which may be a separate Functional Unit. Both these Functional units would be part of the Escalator Primary Functional Unit.

10 Asset Data Dictionary

Asset intensive organisations need to have a clear specification of how assets are classified, i.e. grouped into similar types, what these classes do/don't represent and the attributes that should be collected for each class of asset. Typically, this group of specifications is described as an Asset Data Dictionary (ADD).

The Crossrail Asset Data Dictionary defines:

- Functions – assets grouped by what they are primarily designed to perform
- Classes – representing the different types of asset. The Crossrail approach to asset classification is based on Uniclass with changes, where required, to ensure rail assets are adequately represented
- The valid Classes that are part of a Function
- Class specific requirements for asset naming and identification

The Crossrail Asset Data Dictionary hosted within eB publishes these explicit definitions of the relevant Classes, Functions and Attributes, see Figure 5, below. This facility includes accompanying documents, Asset Data Definition Documents, known as AD4s for simplicity, to

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be provided to ensure that, for example, a length dimension for a class of assets is interpreted consistently.

The structure and content of AD4s is discussed and agreed with the relevant discipline experts before publishing in eB. The granularity and structure of the AD4s is also discussed with Infrastructure Managers in order to gain acceptance that the structure is compatible with current practice in IMs and may in fact be more detailed/rigorous than the approach they currently utilise.

Although the definition of individual Classes and Functions will not tend change often, the overall Asset Data Dictionary will evolve over time, for example, as definitions of Classes or Functions are refined to prevent ambiguity, new Classes are specified for new types of asset included in Crossrail, where additional attributes are required and where a single Class may need to be split into two Classes to support Maintenance or Operational activities.

If there are changes to existing AD4s, then careful consideration will be given to the nature and magnitude of the change and the approach to be taken with Contractors, outcomes will be:

- Change to definitions improve understanding is approved with no change to data collection activities;
- Change approved, asset data issued subsequently to this approval will reflect the agreed changes, but existing Asset Data Collection Spreadsheets will not be changed;
- Change not approved, no changes to asset data collection activities; and
- Change approved, asset data issued subsequently to this approval will reflect the agreed changes and any Contracts that had already provided data will be required to bring their data up to the level required by the new AD4

Note that, it is anticipated that the majority of changes will be of the first type and that the fourth option above will only be utilised in very rare circumstances.

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The ADD can be viewed by any user who has access to the eB web interface.

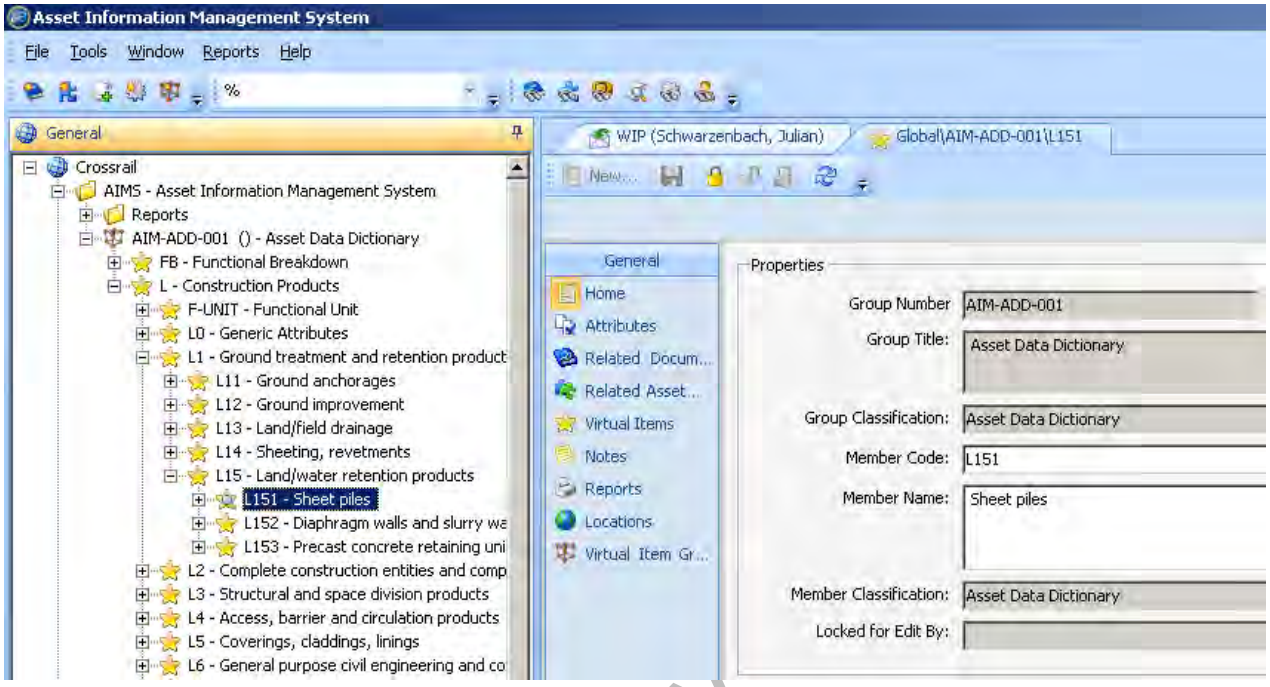

Figure 5 - Asset Data Dictionary screenshot

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11 Asset identification

Crossrail have developed an Asset Identification Standard CRL1-XRL-O6-STD-CR001-00031 to define:

- How assets will be identified;
- Generic approach to asset naming; and
- Requirements for asset identification labels.

More specific examples of the approaches to asset naming and labelling are contained within the Asset Naming and Labelling Convention document (CRL1-XRL-Z3-ADDSD-CR001-50413) for each Asset Class. Additionally, the Asset Information & Configuration Management Team will liaise with the relevant bodies in London Underground to ensure that Crossrail assets and rooms cannot be confused with existing assets and rooms, for example both the existing and Crossrail parts of a station having an Escalator 1.

Stations, levels and rooms will utilise Location Coding System (LCS) codes in order to provide clear identification across a complete station complex:

- LCS Level 1 codes align with those defined by London Underground, except at Portals, Shafts and similar major complexes which use specific codes agreed with London Underground, e.g. CR501
- LCS3 codes for individual rooms, also known as S
- ID codes, will be issued by the London Underground Fire Compliance Team only. It is intended that they will be utilised across all Crossrail below ground facilities. **Crossrail Location codes**

The Crossrail Location codes are listed in the table below:

LCS1 Code	Location
CR149	Abbey Wood Station
CR073	Acton Main Line Station
CR074	Acton Main Line to Kensal Town
C125	Bond Street Station
CR084	Bond Street to TCR Section
CR127	Brentwood Station
CR128	Brentwood to Shenfield
CR035	Burnham Station
CR036	Burnham to Slough
CR143	Canary Wharf Station
CR144	Canary Wharf Station to Custom House Station

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CR117	Chadwell Heath Station
CR118	Chadwell Heath to Romford
CR146	Connaught Tunnel
CR145	Custom House Station
CR146	Custom House Station to Woolwich Station
C175	Ealing Broadway Station
CR072	Ealing Broadway to Acton Main Line
CR514	Eleanor Street Shaft
M123	Farringdon Station
CR088	Farringdon to Liverpool Street
CR511	Fisher Street Shaft
CR105	Forest Gate Station
CR106	Forest Gate to Manor Park
CR123	Gidea Park Station
CR124	Gidea Park to Harold Wood
CR115	Goodmayes Station
CR116	Goodmayes to Chadwell Heath
CR065	Hanwell Station
CR066	Hanwell to West Ealing
CR125	Harold Wood Station
CR126	Harold Wood to Brentwood
CR061	Hayes and Harlington Station
CR062	Hayes and Harlington to Southall
D233	Heathrow Central
CR056	Heathrow Central to Hayes and Harlington Station
D235	Heathrow Terminal 4
CR054	Heathrow Terminal 4 to Heathrow Central
D237	Heathrow Terminal 5
CR052	Heathrow Terminal 5 to Heathrow Central
CR527	Ilford Depot Back Up Control Facility
CR109	Ilford Station
CR112	Ilford to Seven Kings
CR043	Iver Station
CR044	Iver to West Drayton
CR075	Kensal Town Station
CR522	Kensall Green Bulk Supply
CR076	Kensall Town to Paddington Section

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CR039	Langley Station
CR042	Langley to Iver
CR515	Limmo Peninsular Shaft
C101	Liverpool Street Station
CR092	Liverpool Street to Whitechapel
CR031	Maidenhead Station
CR032	Maidenhead to Taplow
CR107	Manor Park Station
CR108	Manor Park to Ilford
CR103	Maryland Station
CR104	Maryland to Forest Gate
CR513	Mile End Park Shaft
M135	Moorgate Station
CR504	North Woolwich Portal
CR523	Old Oak Common Depot
B071	Paddington Station
CR081	Paddington Station (Crossrail)
CR082	Paddington to Bond Street Section
CR505	Plumstead Portal
CR516	Plumstead Shaft
CR526	Plumsted Depot & Sidings
CR524	Pudding Mill Lane Bulk Supply
CR502	Pudding Mill Lane Portal
CR021	Reading Station
CR022	Reading to Twyford
CR119	Romford Station
CR122	Romford to Gidea Park
CR521	Route Control Centre
CR501	Royal Oak Portal
CR113	Seven Kings Station
CR114	Seven Kings to Goodmayes
CR129	Shenfield Station
CR037	Slough Station
CR038	Slough to Langley
CR063	Southall Station
CR064	Southall to Hanwell
CR512	Stepney Green Shaft
CR142	Stepney Green Shaft to Canary Wharf Station

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CR094	Stepney Green Shaft to Stratford Station
CR102	Stratford to Maryland
CR033	Taplow Station
CR034	Taplow to Burnham
CR086	TCR to Farringdon Section
N105	Tottenham Court Road Station
CR023	Twyford Station
CR024	Twyford to Maidenhead
CR503	Victoria Dock Portal
CR045	West Drayton Station
CR046	West Drayton to Hayes and Harlington
CR067	West Ealing Station
CR068	West Ealing to Ealing Broadway
CR525	Westbourne Park Turnback Facility
D061	Whitechapel Station
CR094	Whitechapel Station to Stepney Green Shaft
CR147	Woolwich Station
CR148	Woolwich Station to Abbey Wood Station

Fleet assets will use their five digit fleet/vehicle number as their location code.

Note: Liverpool Street Crossrail station stretches from Moorgate LU Station to Liverpool Street LU Station. The LCS boundary is a set of fire doors at the interface between AP8 and the existing LU Ticket Hall B. Assets to the left/west of this boundary should be assigned M135 (LCS Code for Moorgate Station). Assets to the right/east of this boundary should be assigned C101 (LCS Code for Liverpool Street Station).

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