

MANAGING DRAINAGE ASSETS USING BIM TO CREATE A PLATFORM FOR THE INTERNET OF THINGS

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WHAT IS THE INTERNET OF THINGS?

•The Internet of Things (IoT) represents a future where Internet traffic will no longer be dominated by human interaction; instead communication between semi-autonomous smart objects or devices will take prominence.

•Smart objects have been defined as having the capability to sense, store, communicate and make decisions about measurements made by sensors associated with them.

•IoT encapsulates a drainage network asset information models with integrated distributed smart sensing objects, which would facilitate real-time reporting of asset condition, precipitation events, flow rates and water level.

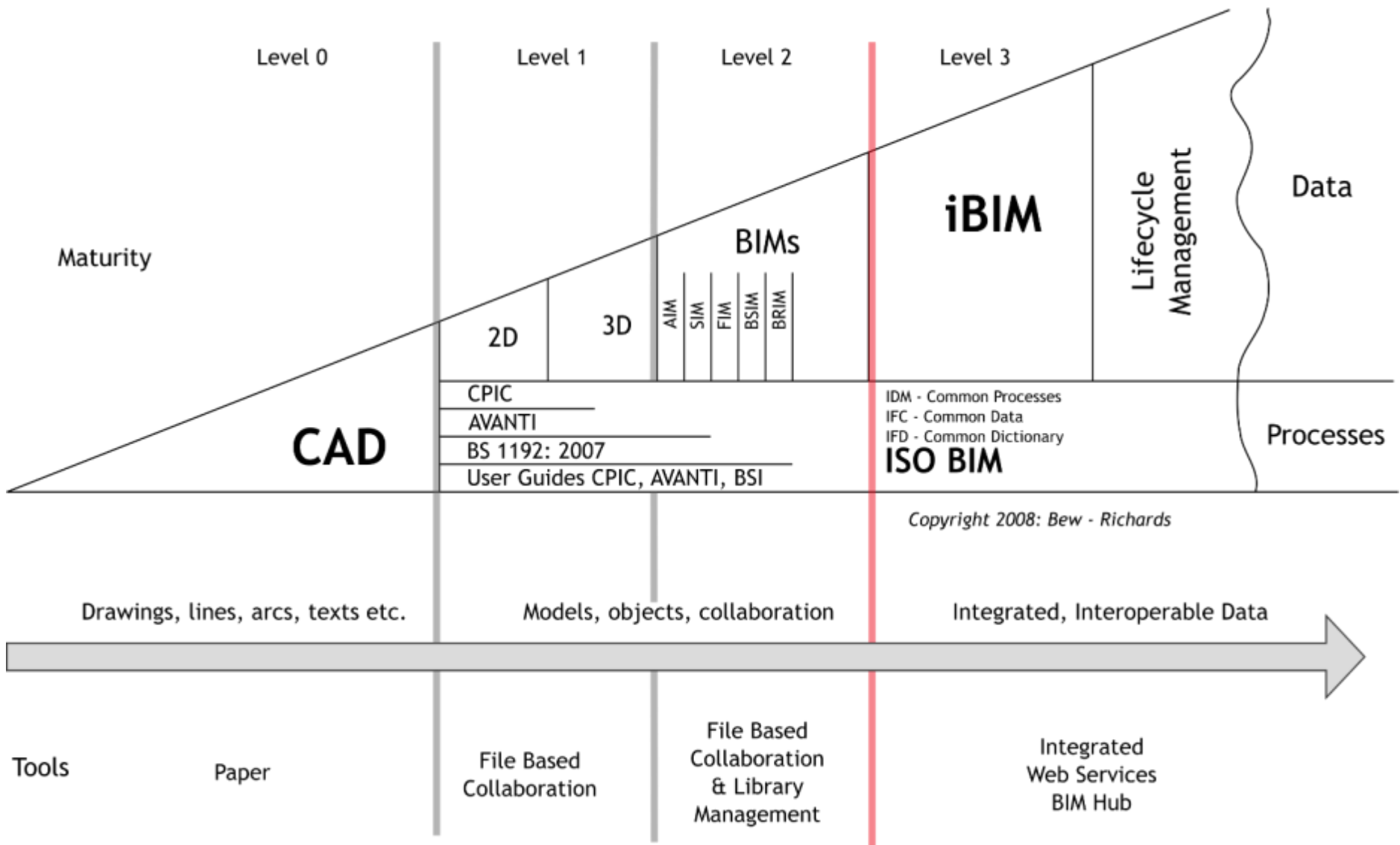
WHY BIM FOR THE ASSET MANAGEMENT

•Data based on standards

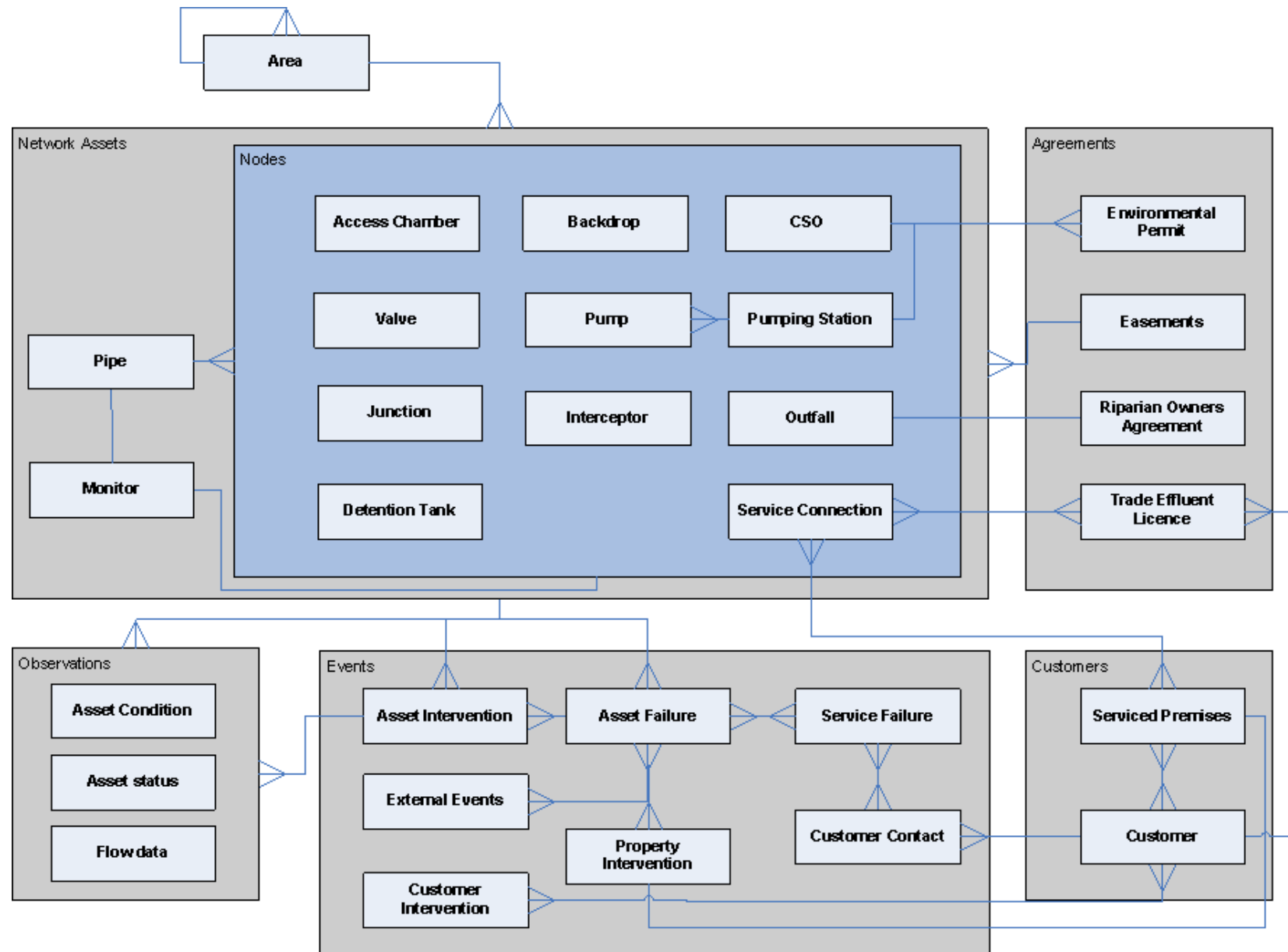
- IFC for description of assets, their relations and conditions
(BS ISO 16739:2013)
- Defined processes for asset operation (BS1192-3)
- COBie for data handover at all phases (BS1192-4)

•Mandated by government

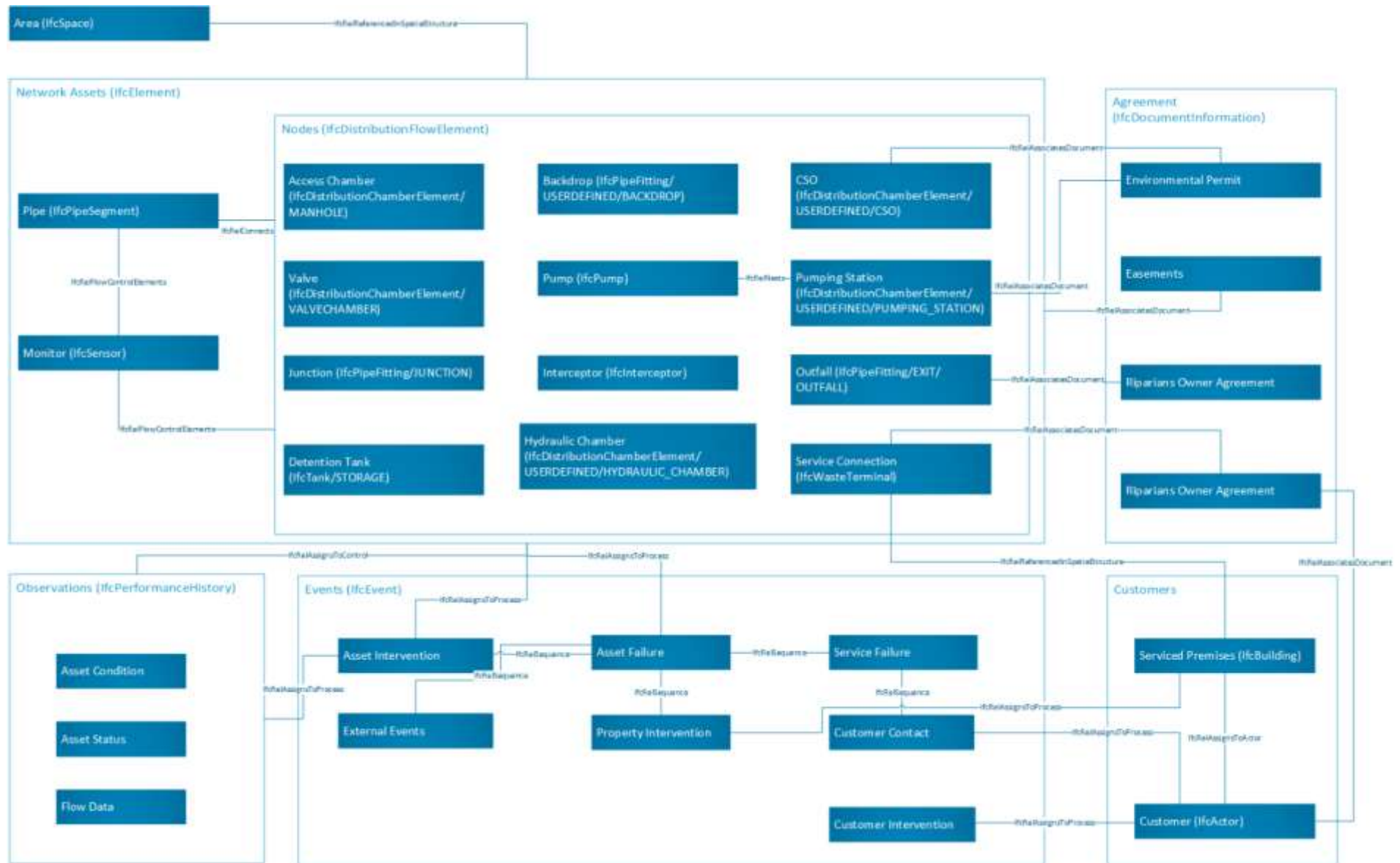
WHERE IS BIM TODAY



UKWIR CONCEPTUAL SCHEMA



BIM MODEL STRUCTURE



IFC PROPERTY MAPPING TOOL

BIM Specification

File About

IFC 4

- Flow Terminal
- Flow Controller
- Energy Conversion Device
- Flow Fitting
- Flow Segment
- Flow Moving Device
- Distribution Chamber Element
- Flow Treatment Device
- Flow Storage Device
 - Electric Flow Storage Device
 - Tank
- Element Assembly
- Feature Element
- Furnishing Element
- Geographic Element
- Transport Element
- Virtual Element
- Port

All property sets Only own sets

Copy Pset_EnvironmentalImpactIndicators

Name	Property Type	Value Type
Reference	Single Value	Identifier
Functional Unit Reference	Single Value	Label
Unit	Single Value	Unknown
Life Cycle Phase	Enumeration	Acquisition, Cradletosite, Deconstruction, Disposal, Disposaltransport, Growth, Installation, Maintenance, Manufacture, Occupancy, Operation, Procurement, Production, Productiontransport, Recovery, Refurbishment, Repair, Replacement, Transport, Usage, Waste, Wholelifecycle, UserDefined, NotDefined
Expected Service Life	Single Value	Time Measure
Total Primary Energy Consumption Per Unit	Single Value	Energy Measure
Water Consumption Per Unit	Single Value	Volume Measure
Hazardous Waste Per Unit	Single Value	Mass Measure
Non Hazardous Waste Per	Single Value	Mass Measure

Environmental Impact Indicators

Environmental impact indicators are related to a given "functional unit" (ISO 14040 concept). An example of functional unit is a "Double glazing window with PVC frame" and the unit to consider is "one square meter of opening elements filled by this product".

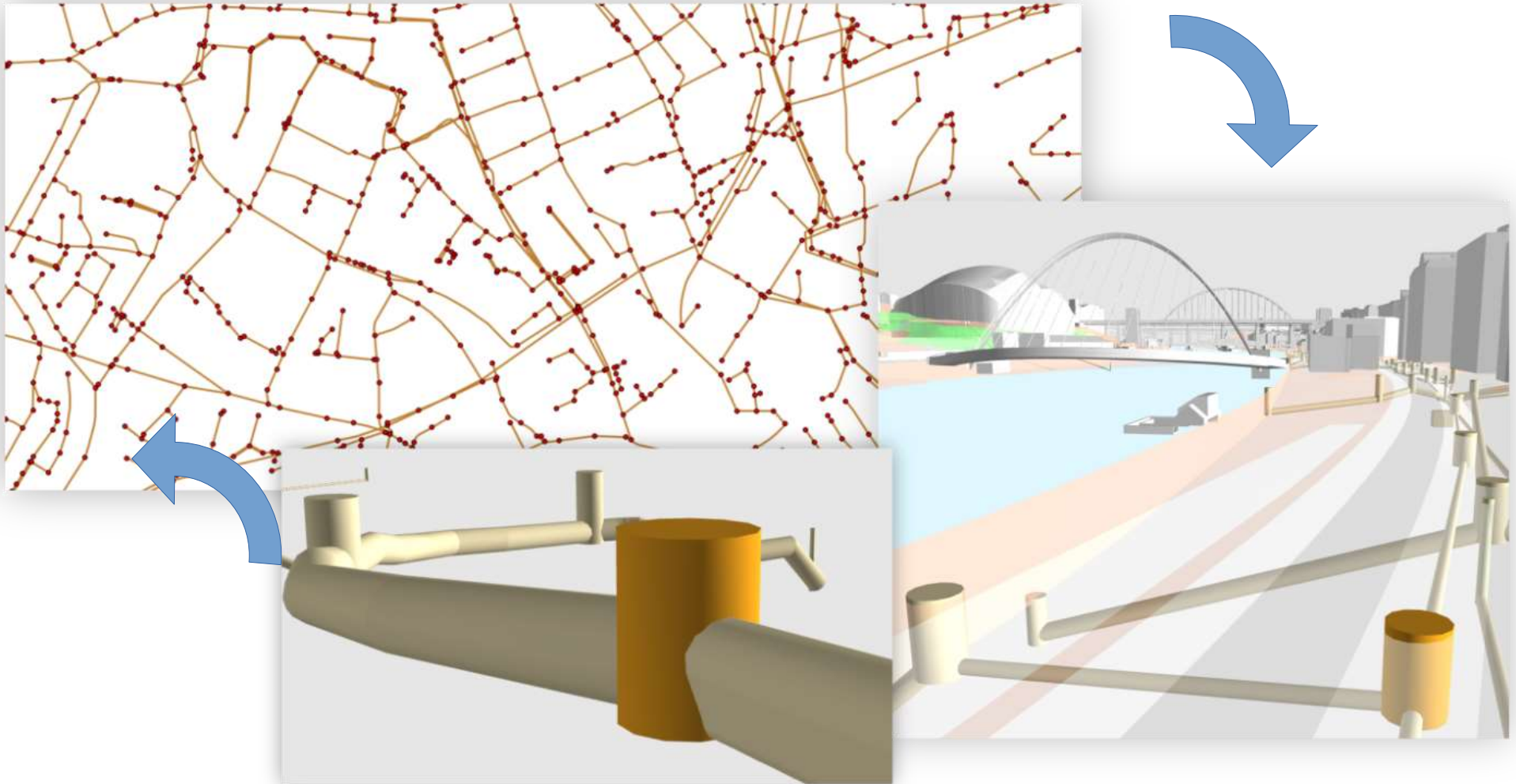
Indicators values are valid for the whole life cycle or only a specific phase (see LifeCyclePhase property). Values of all the indicators are expressed per year according to the expected service life. The first five properties capture the characteristics of the functional unit. The following properties are related to environmental indicators.

There is a consensus agreement international for the five one. Last ones are not yet fully and formally agreed at the international level.

DATA TRANSFORMATION

- .Using xBIM Toolkit to create IFC4 data
- .Continuous schema validation check
- .Incremental enrichment of the data
- .Using GIS asset data as parametric definitions
- .Using VNG City Model to add elevations
- .Modelling spatial relations as semantic data

FROM SYMBOLS TO REAL WORLD



PROTOTYPE WEB APPLICATION

- Modern web standards (HTML5 APIs)
- Based on xBIM Framework components
- Information generally available
- Standard data structures – extensible functionality
- No plugins
- No need for high-end computers
- No need for specialised SW installed locally

BRINGING DATA TOGETHER

The screenshot displays a web application interface for a pipe network. On the right, a 3D model shows a perspective view of a pipe system with yellow pipes and manholes. On the left, a data panel is highlighted with a red border, containing the following sections:

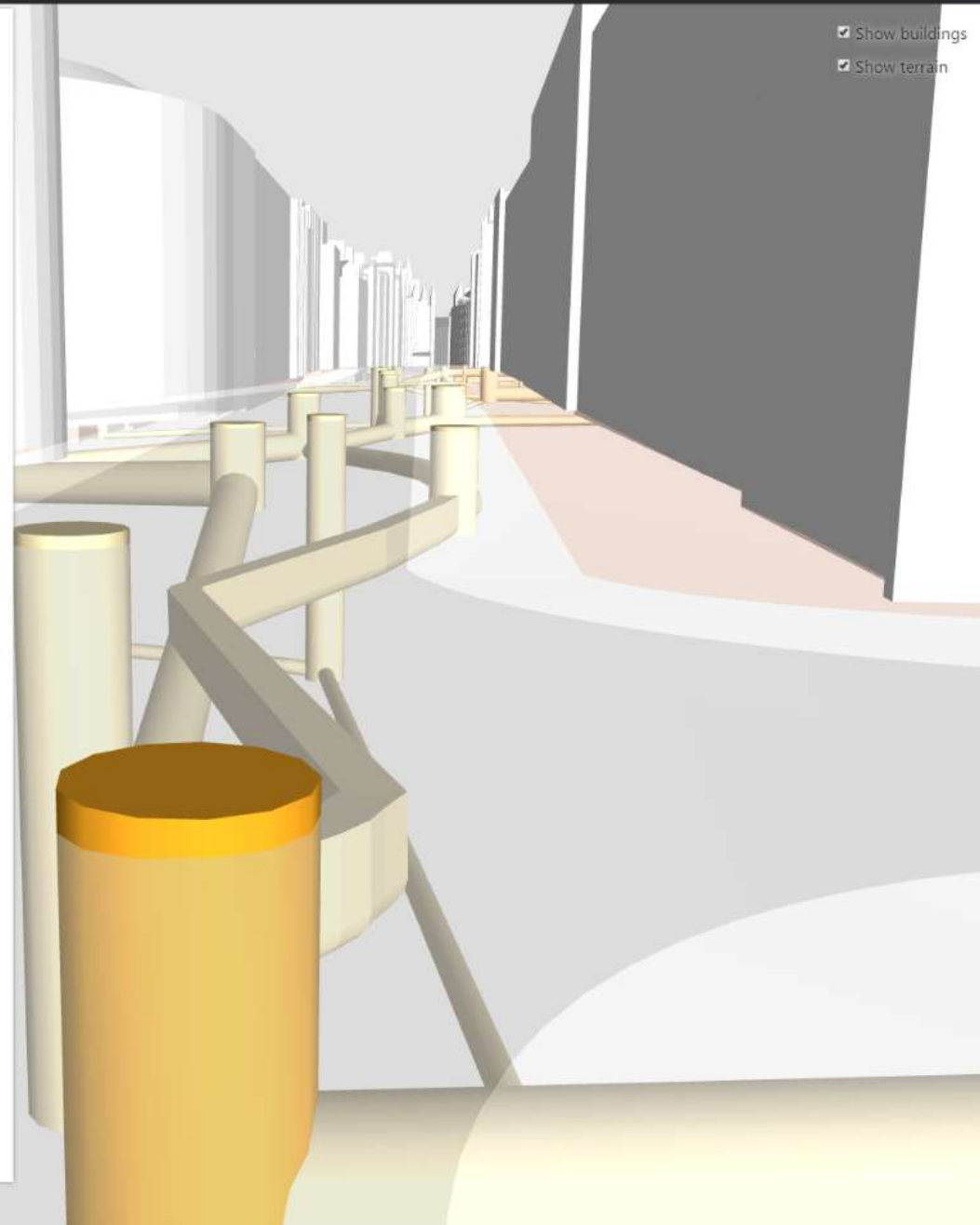
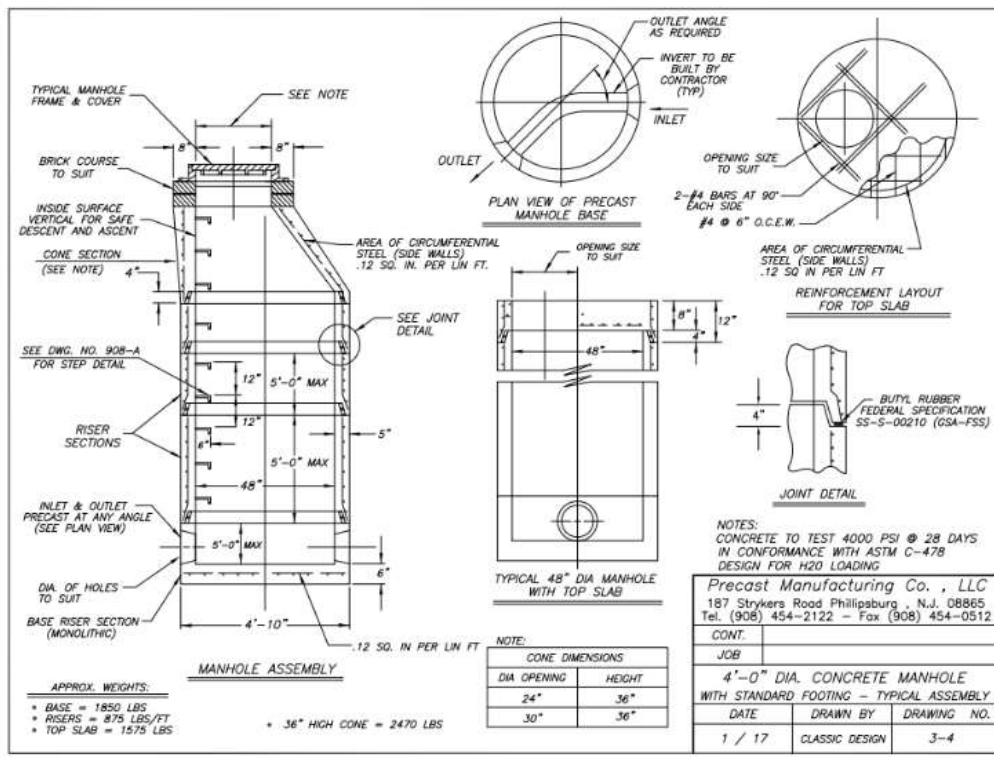
- Documents**
 - [Drawing.pdf](#) 08/11/2012
- CCTV**
 - [Survey PX1567](#) 12/08/2014
- Images**
 - [Image #01](#) 12/08/2014
 - [Image #02](#) 12/08/2014
 - [Image #03](#) 12/08/2014
- Connected pipes**
 - [STY-S018440](#)
 - [STY-S046558](#)
- Related events**
 - [Reported overflow](#) 16/10/2011
 - [Reported overflow](#) 08/04/2008

LINKING TO EXTERNAL DATA

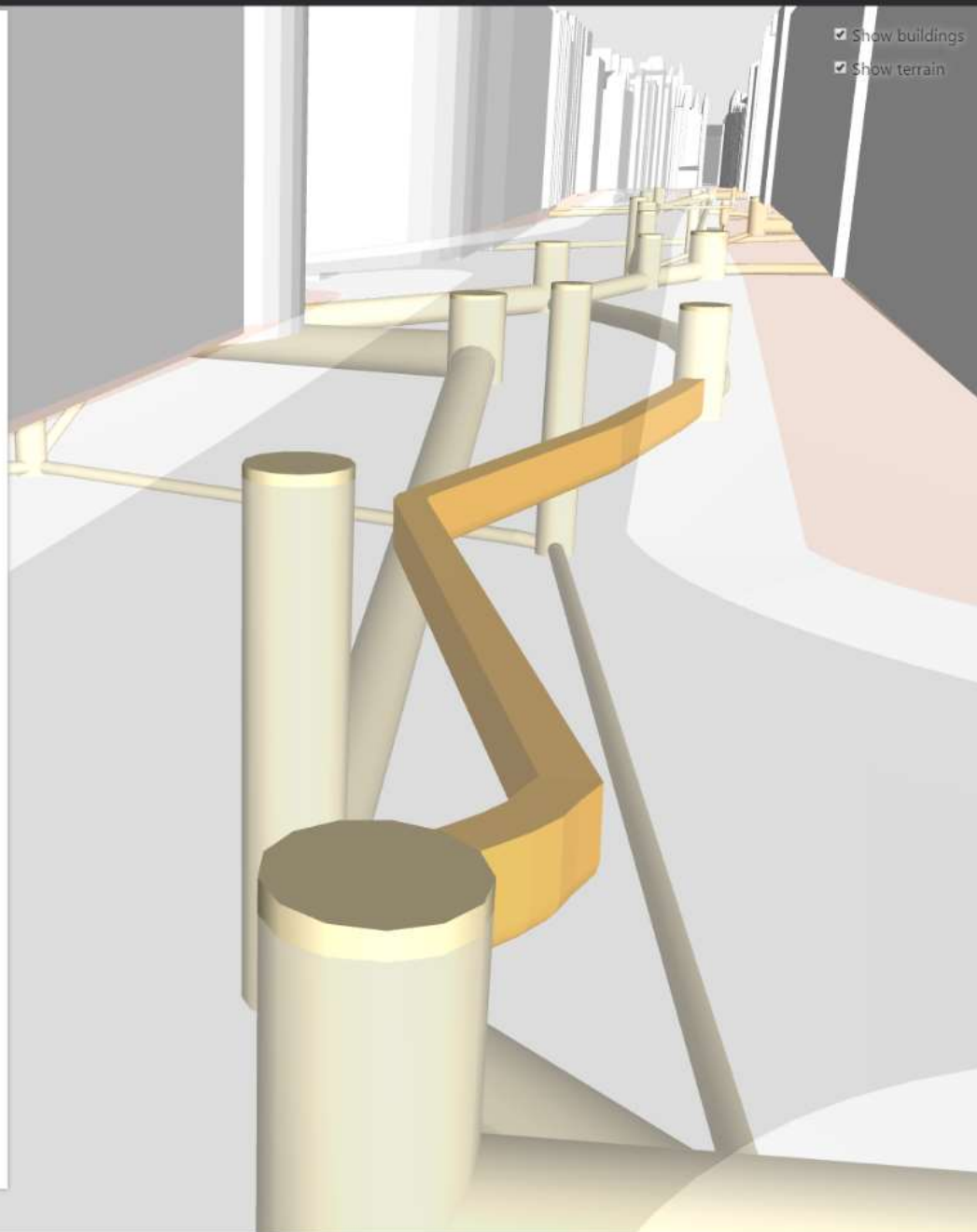
- .Documentation
- .CCTV surveys
- .Historical events
- .Customers affected by specific component
- .Sensor data (stored as IFC or linked externally)
- .Prediction data (extrapolation of current state)
- .Modelling and prediction tools

Manhole drawing [back]

- Show buildings
- Show terrain



Survey PX1567 [back]



...see you in the BIM future...

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