



# National Roads Conference 2015

Are you ready for Level 2 BIM?

Killarney 23<sup>rd</sup> September

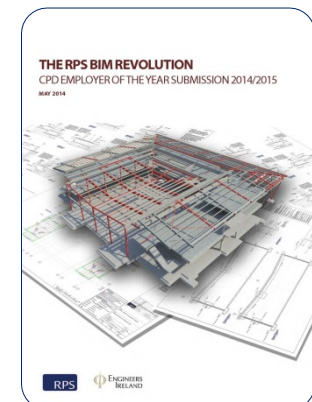
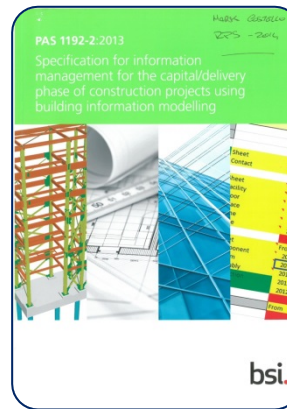
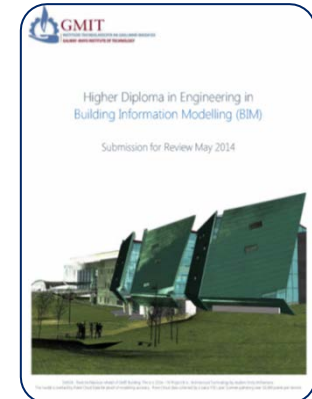
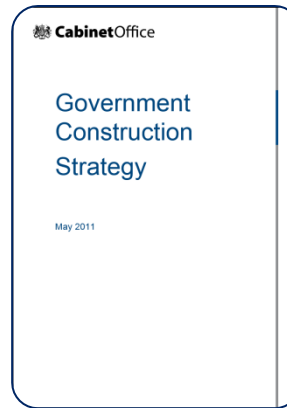
**Mark Costello** – Director BIM RPS  
Chairperson CITA Western BIM Hub  
BIM Development Planning (Organisation & Project)

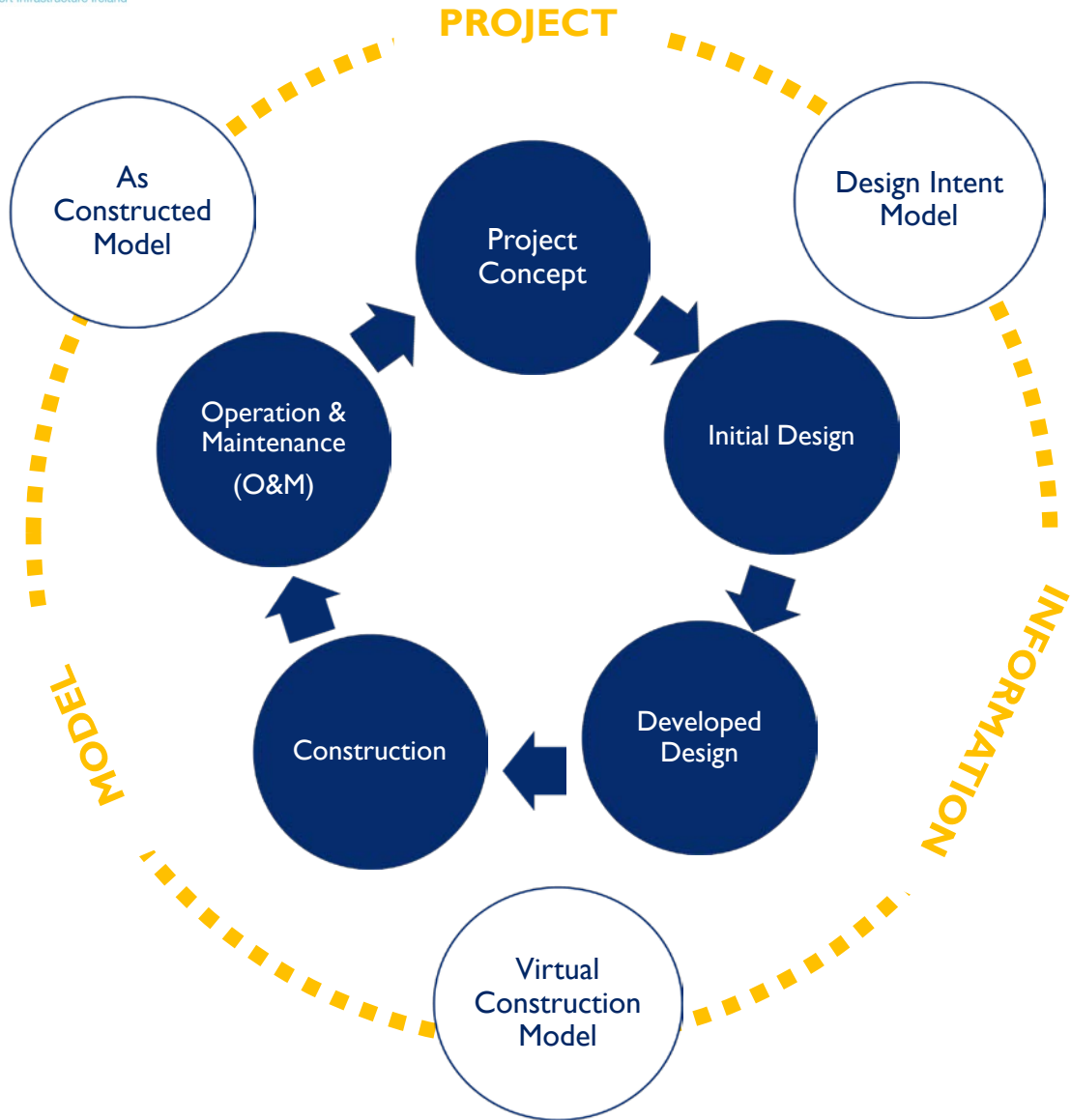
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# BIM Processes for the Organisation & Projects

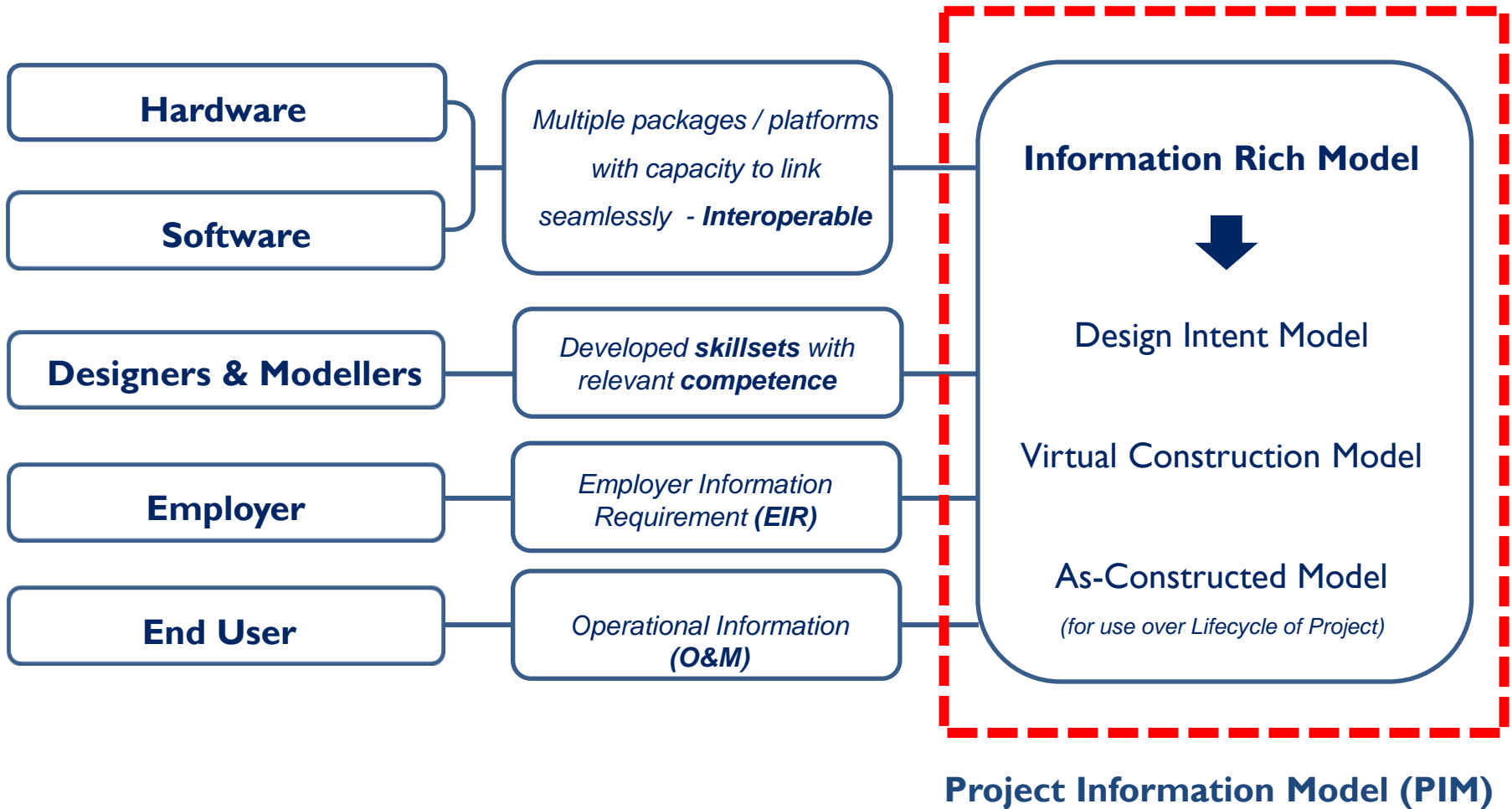
- Project Lifecycle
- Collaborative Working
- What is BIM?
- Why BIM?
- BIM Requirements in Ireland
- Benefits to Transportation Projects
- RPS BIM Projects







# Collaborative Working





# What is BIM?

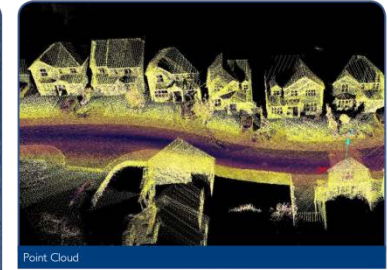
## Building Information Modelling Three separate but linked processes

- Building Information **Modelling** – A business process that allows all stakeholders to have access to the same information
- Building Information **Model** – Is the output of the business process, a virtual computer model
- Building Information **Management** – using the model for a project lifecycle process

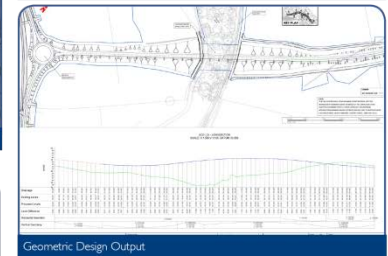
BIM alters the entire way in which a project is **procured, delivered, constructed and operated**  
It is both a process and a deliverable



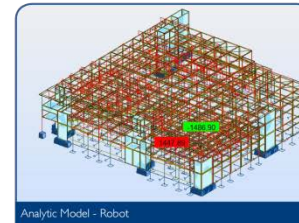
Data Collecting



Point Cloud



Geometric Design Output



Analytic Model - Robot

Volume Summary						
Item	Type	Cm Factor	BIM Factor	3D Area (sqm)	4D (cu m)	5D (cu m)
Subtotal	Box	1.000	1.000	1342.739	1.000.000	1427.000.000
Cost				14. Area (sqm)	4D (cu m)	5D (cu m)
Total				1342.739	1.000.000	1427.000.000

\* Values adjusted for net or 4D factor other than 1

Mass Haul Output



3D Coordinated BIM Model



# Put Simply - This is BIM!



*“It’s the economy stupid”*



# The BIM Process

## Client Requirements

*(Activity)*

### How?

*(New Collaborative BIM Process)*

### What?

*(Data Rich Model – D/B/O/M)*

### Why?

*(Avanti Research Project )  
20% savings on wasteful activities*

*Avanti findings incorporated into  
British Standard*

**BS 1192:2007**

*“for the production of information to  
be **truly lean** we must begin with  
the **end in mind**”*

**PAS 1192 – 2:2013**

*Now integral part of UK  
Government Project Requirements*

**Level 2 BIM**

**Value for Money - The Bottom Line!**



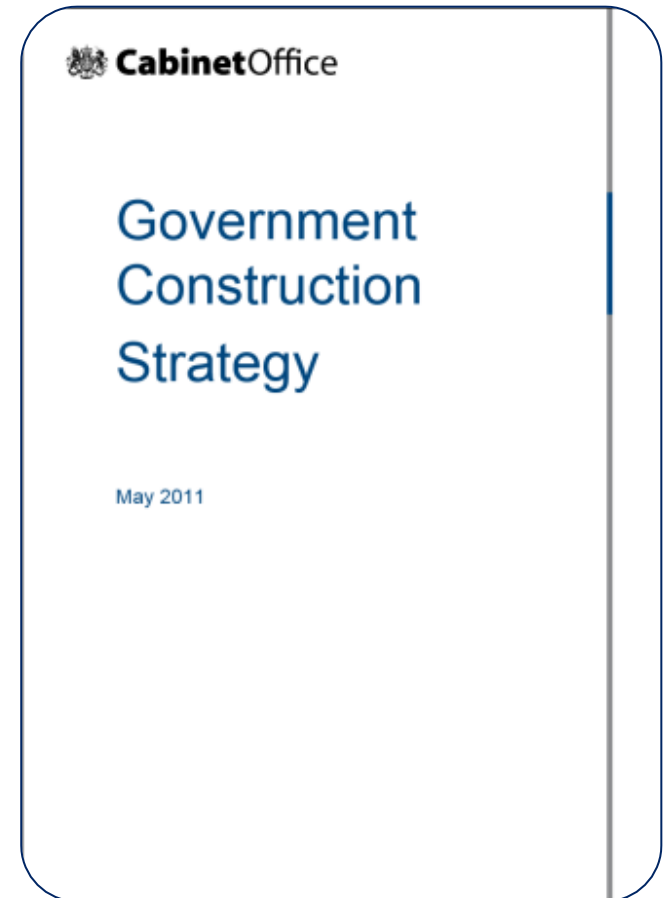
# Why BIM?

## UK Government Construction Strategy 2011

- Development of **standards** enabling all members of the supply chain to work collaboratively through BIM
- Requirement for fully collaborative 3D BIM by 2016

Other European and the US Government are stipulating similar requirements

Provides **opportunities** to work on major projects in the UK and Europe







# BIM Requirements in Ireland

Current Tenders are looking for the following in advance of 2016

## 1.23 Building Information Modelling (BIM)

### **BIM Requirement.**

The use of a full level 2 collaborative BIM process is a requirement of this competition for Design Team Services. It is expected that the use of a BIM system will offer qualitative advantage to project development and delivery by facilitating more efficient design option studies and development and co-ordination of design information, maximising co-ordination between design team members identifying conflicts in design drawings and maximising accuracy in the scheduling and measuring of building elements. It is expected that the project will derive significant improvements in cost, value and carbon performance, through the use of open sharable asset information (BIM).

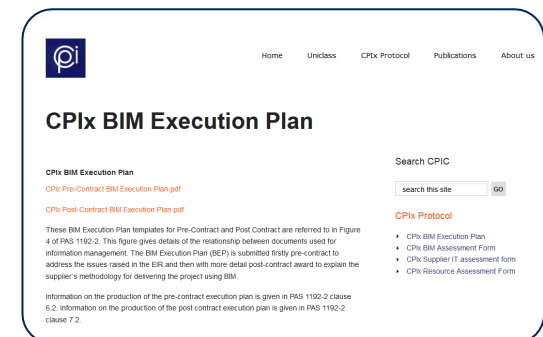
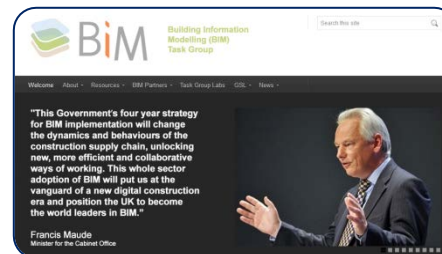
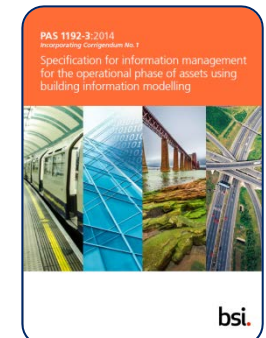
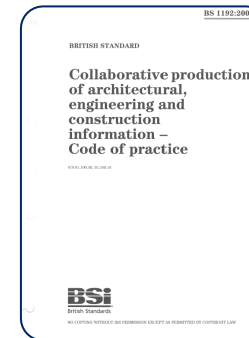
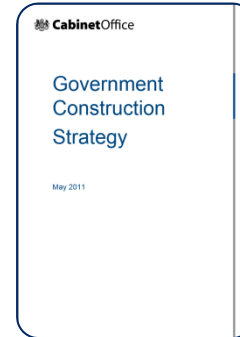
Please find attached the following documentation to assist you in formulating your prices;

- A. A booklet of the current design drawings for each development,
- B. Area schedules,
- C. A BIM capability questionnaire,
- D. A scope of works document,

.... Level 2 BIM Certification is next !

# Useful Documents

- **UK Government Construction Strategy 2011**
- **BS 1192:2007** - Collaborative production of architectural, engineering and construction information
- **PAS 1192-2:2013** - Specification for information management for the capital/delivery phase of construction projects using building information modelling
- **PAS 1192-3:2014** - Specification for information management for the operational phase of assets using building information modelling
- **CIC Protocol**
- **CPIx Online Templates** (Pre-BEP, Post-BEP and BIM Capability Assessment Forms)
- **BIM Task Group**





# Do you want BIM?

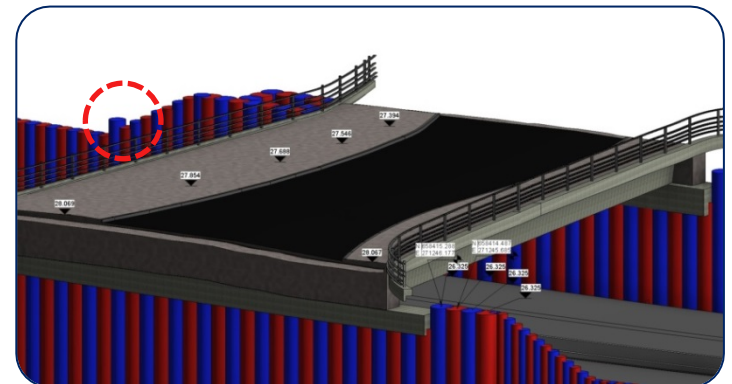
## Do you want the following?

- Improved Communications & Stakeholder Engagement
- Better Analysis (structure / energy / cost / programme)
- Improved Information Workflows
- Improved Design Coordination
- Improved Project Delivery
- Reduced Risk
- Value for Money & Cost Certainty
- **Lower Capital & Operational Costs**

....so you do want BIM!



Public Consultation



Design Validation

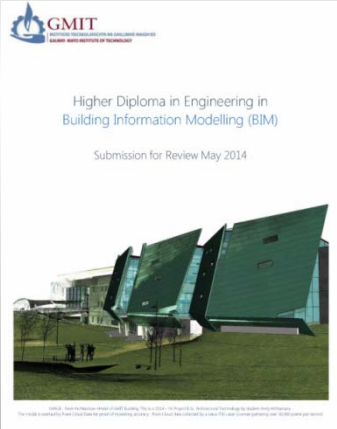


# Benefits to Transportation Projects

- **Collaborative Working** Reduces risks, lowers costs, less variations
- **Clash Avoidance** Reduces rework, conflicts, waste & delays
- **Information Planning** Coordinated, timely & accessible information
- **Project Programming** Efficient construction sequencing
- **Stakeholder Consultation** Increases project appreciation & acceptance
- **3D Simulations** Improved information workflows
- **Value** Reduced capital & operational costs



# Benefits of RPS/GMIT Collaboration



## BIM Virtual Modelling

Fundamentals of Structural/Architectural Models using Autodesk Revit Suite

## BIM Infrastructure

Fundamentals of Engineering Networks and Road Design using Autodesk Civil 3D

## BIM Collaboration

Fundamentals of Collaboration and Coordination within BIM using Autodesk Navisworks Manage

## BIM Research Project

Analyse and evaluate in detail issues associated within actual RPS projects using primary and secondary research techniques

### Electives

- BIM Architecture
- BIM Structure
- BIM Infrastructure
- BIM Mep
- BIM Collaboration

Higher Diploma in Engineering In BIM (Level 8)

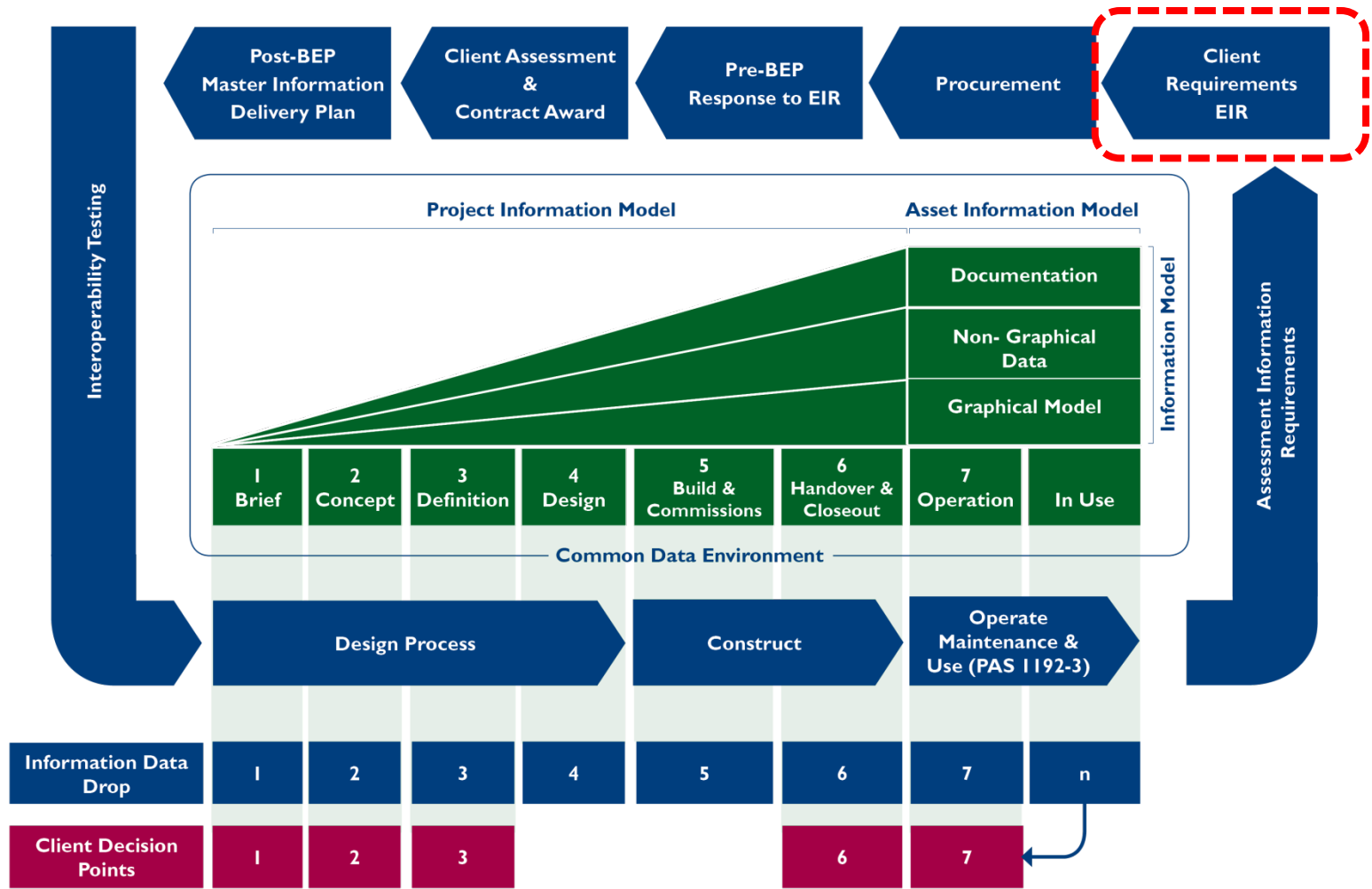
Year 1 Semester 1 (12 Weeks)

Year 1 Semester 2 (Electives) (12 Weeks)

Year 2 Semester 3 (12 Weeks)

Year 2 Semester 4 (12 Weeks)

# Project Level - BIM Process



# BIM Maturity Levels

## Structured learning progression over a period of time

- **Level 0** – Unmanaged 2D CAD
- **Level 1** – Managed 2D & 3D CAD
- **Level 2** – Managed 3D environment where collaboration and information exchange (using individual models) takes place through a common data environment (to create a Federated BIM Model) – **UK Target 2016**
- **Level 3** - Full collaboration between all disciplines by means of using a single, shared project model which is held in a centralised repository – **Open - BIM UK Target 2019**

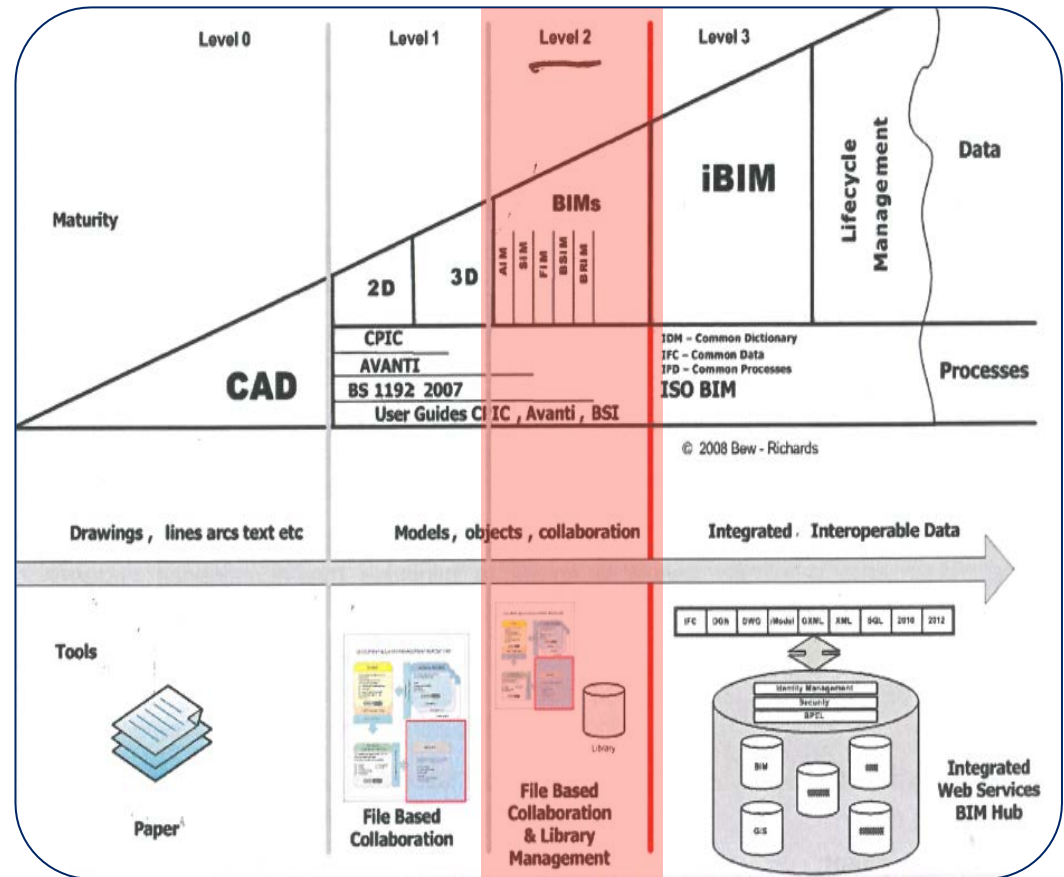


Figure 1 - PAS 1192-2:2013

# BIM at Contract Level

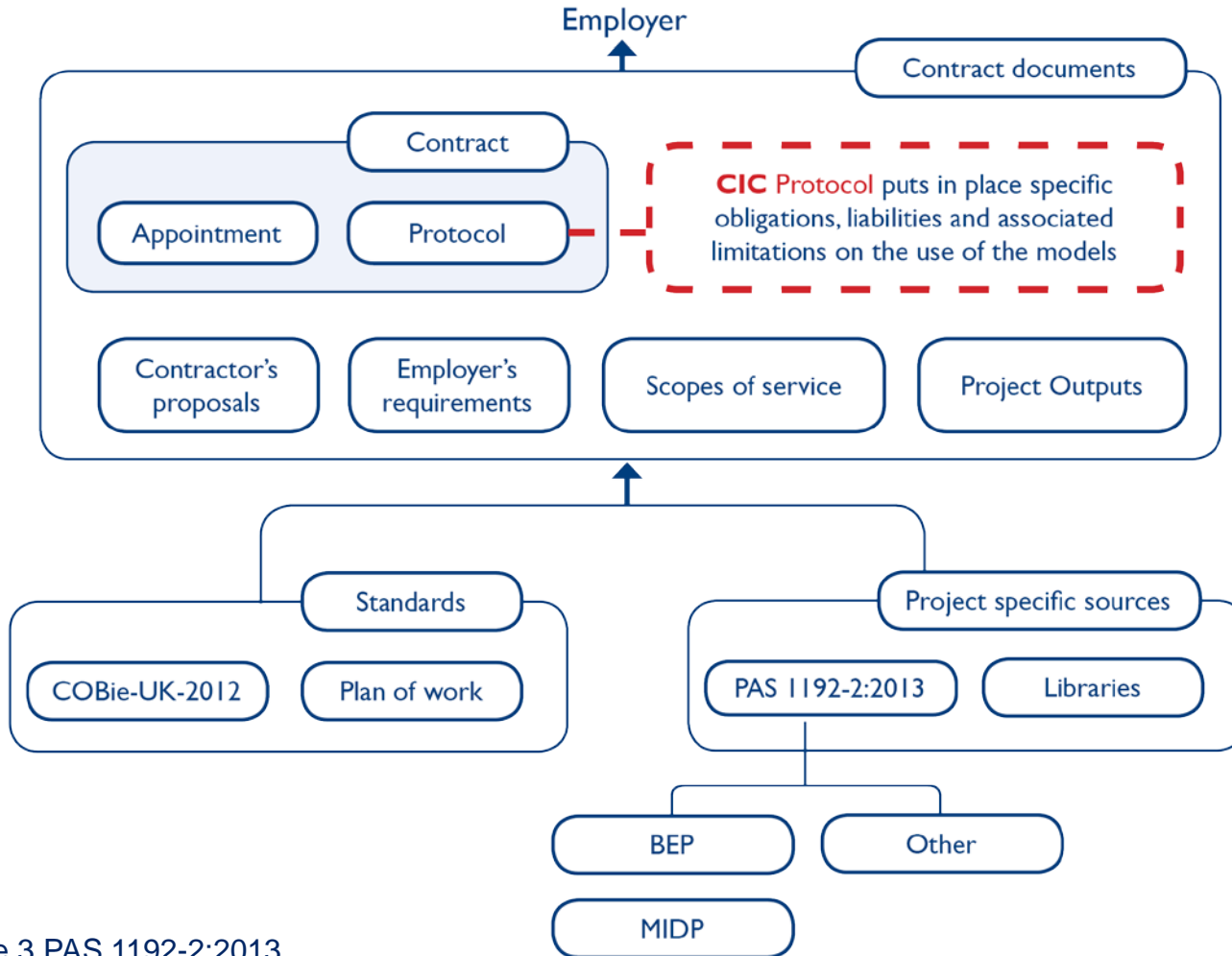


Figure 3 PAS 1192-2:2013





# Employers Information Requirements

Irish Employers are now requesting the following in line with PAS 1192-2:2013 – “Collaborative Working”

## Employers Information Requirements (EIR)

- **Information Management** - Level of Detail, Training Requirements, Planning of Work and Data Segregation, Co-ordination & Clash Detection, Collaboration Process, Health & Safety Requirements, Security & Integrity, Information included or not, IT Constraints, Compliance Plan, Coordinate System, Software Requirements
- **Commercial Management** - Information Exchange, Client BIM Model Requirements, Software, Responsibility Matrix, BIM Standards and Protocols, BIM Roles
- **Competency Assessment** - BIM Capability Assessment Forms





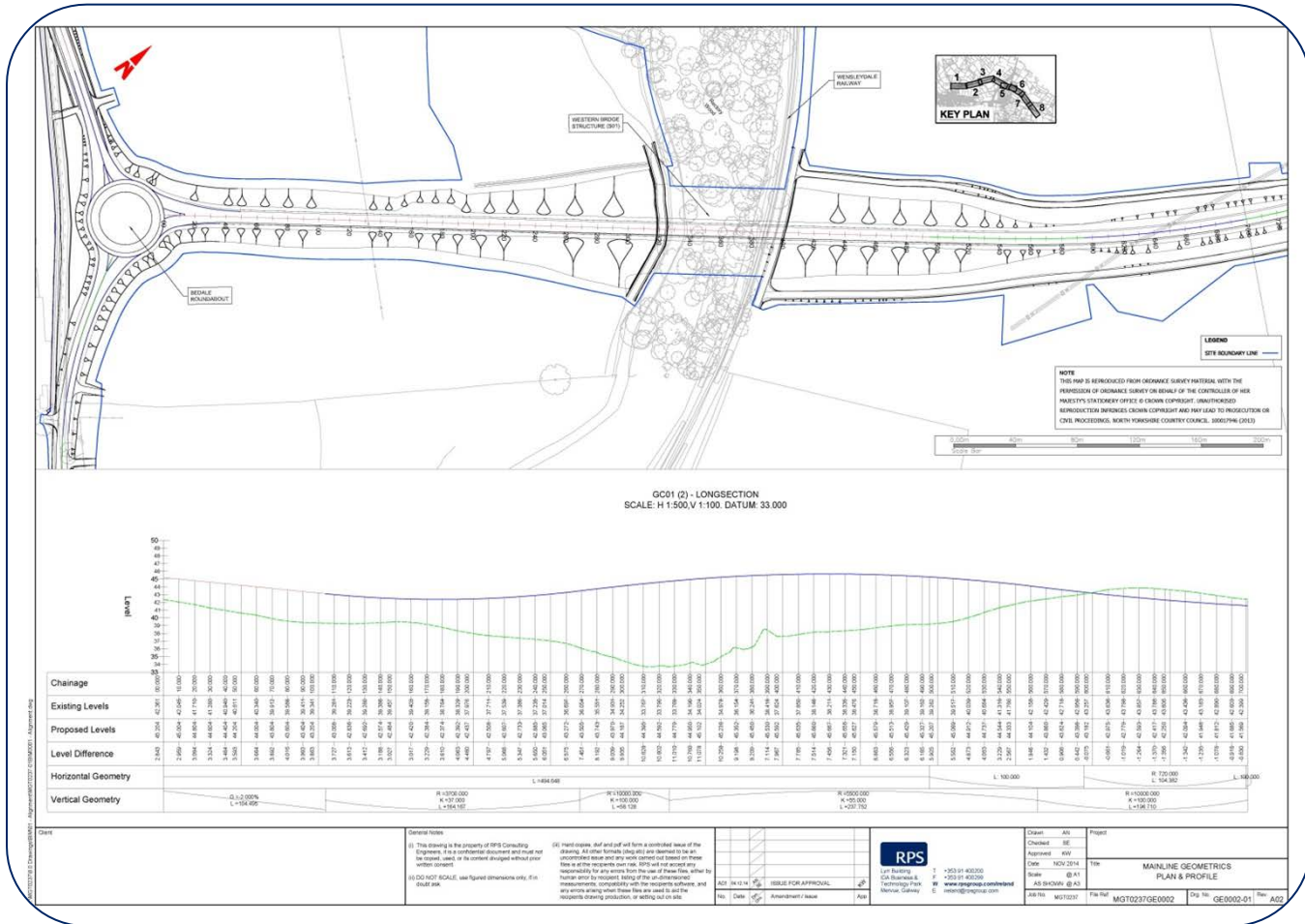


# Post BIM Execution Plan

- **Project Management** - Roles and Responsibilities, Project Milestones, Project Information Model Delivery Strategy, Survey Strategy, Existing Data, Approval of Information and Project Information Model Process
- **Planning and Documentation** – Capability of Supply Chain, Project Process for Collaboration, Responsibility Matrix, Task Information Delivery Plan and Master Information Delivery Plan
- **Standards and Procedures** – Volume Strategy, Project Information Model Origin and Orientation, File Naming, Layer Naming, Construction Tolerances, Drawing Template and Attribute Data
- **IT Solutions** – Software Versions, Exchange formats and data management systems



# Design Outputs from BIM

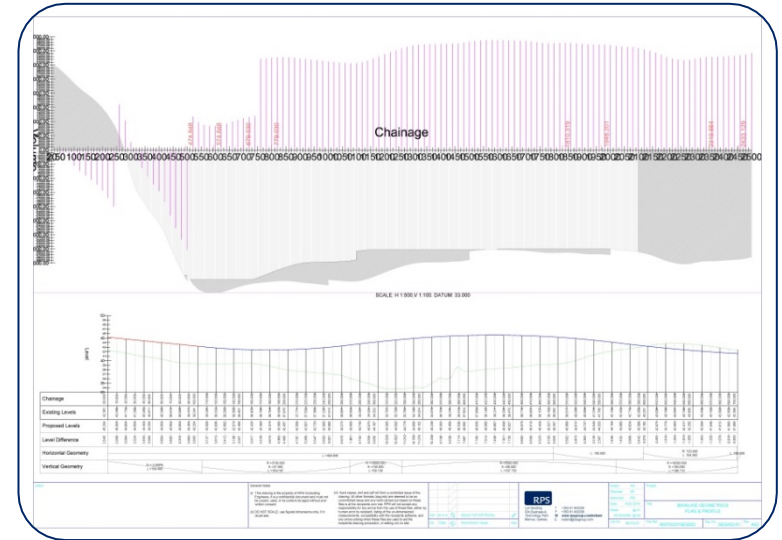


Geometric Design Output

# Design Outputs from BIM

## Mass Haul Output

- Contractors site requirements
- Cut and Fill volumes & site movements
- Graphic representation of accumulated volumes
- Cut and fill volumes updated in real time



Volume Summary							
Name	Type	Cut Factor	Fill Factor	2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Surface2	full	1.000	1.000	57417.079	15909.190	92781.237	76872.047<Fill>
Totals				2d Area (sq.m)	Cut (Cu. M.)	Fill (Cu. M.)	Net (Cu. M.)
Total				57417.079	15909.190	92781.237	76872.047<Fill>

\* Value adjusted by cut or fill factor other than 1.0

Geometric Design Output




# Typical BIM Capability Assessment

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G1.1	Are you prepared to issue your native CAD / BIM format files?	Yes, if required we issue native CAD/ BIM formats to clients in line with specific project requirements?
G2.7	Do you understand the ‘Level of Information’ required at each of the project delivery stages?	Yes, before the project starts we produce a Levels of Model Definition for Building and Infrastructure Projects (LOMD). This document outlines the graphical (geometry) and non-graphical (COBie data drop information and client requirements) information required
G5.1	Are all your CAD / BIM Tools covered by a yearly maintenance agreement?	Yes, RPS pays annual fees for all our software maintenance and support requirements

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# M8/M73/M74 Motorway Scotland



3D Coordinated BIM Model – Alignment/Structures/Drainage/Utilities/Temporary Works/Signage/Road Markings/Lighting – **Common Data Environment 4 Projects**



# Federated BIM Model



3D Coordinated BIM Model – Alignment/Structures/Drainage/Utilities/Temporary Works/Signage/Road Markings/Lighting – **Common Data Environment 4 Projects**



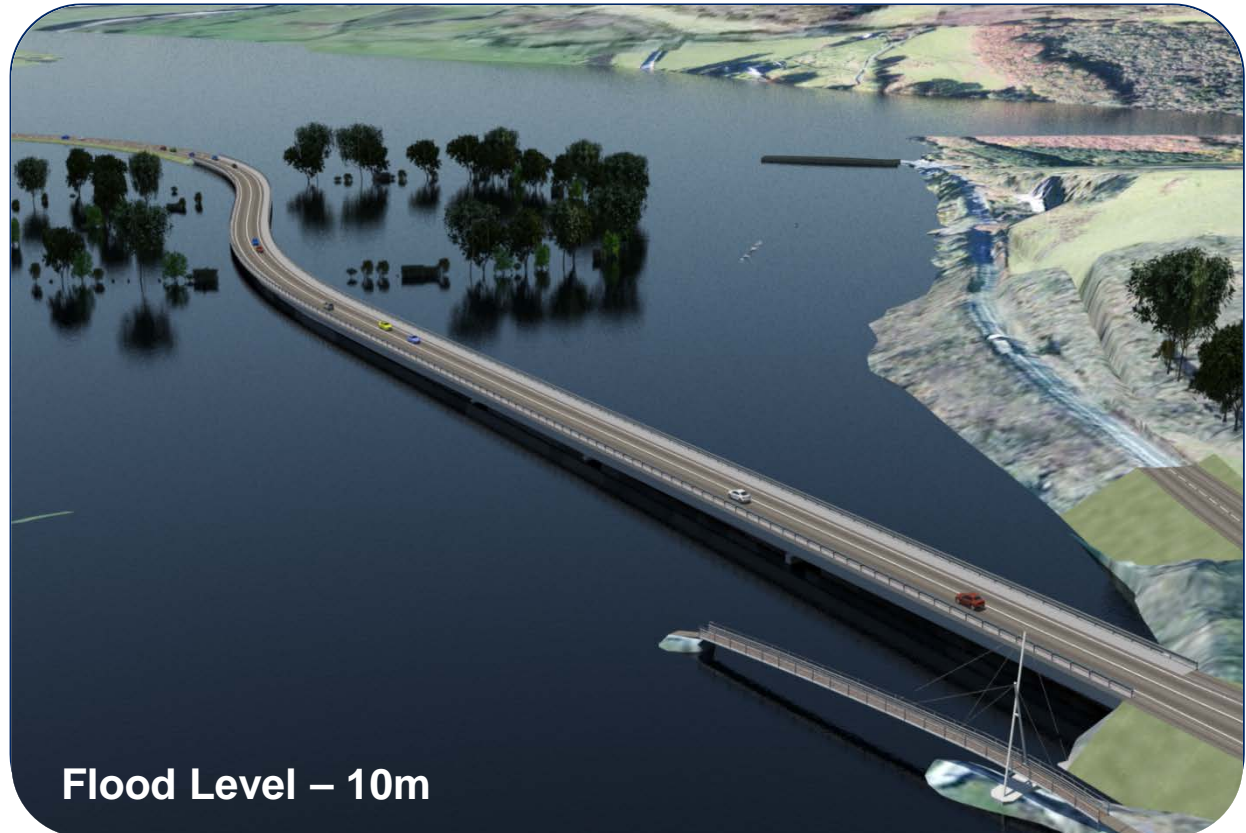


# BIM – Stakeholder Engagement

**RPS use GIS data within BIM to effectively design and communicate during conceptual and preliminary design stages.**

Flood Mapping & Constraints data can be draped across our Topographical model in 3D Max Design.

InfraWorks 360 can also be used in this process.



# BIM for Public Consultation



Traffic Calming Options – BIM and available mapping



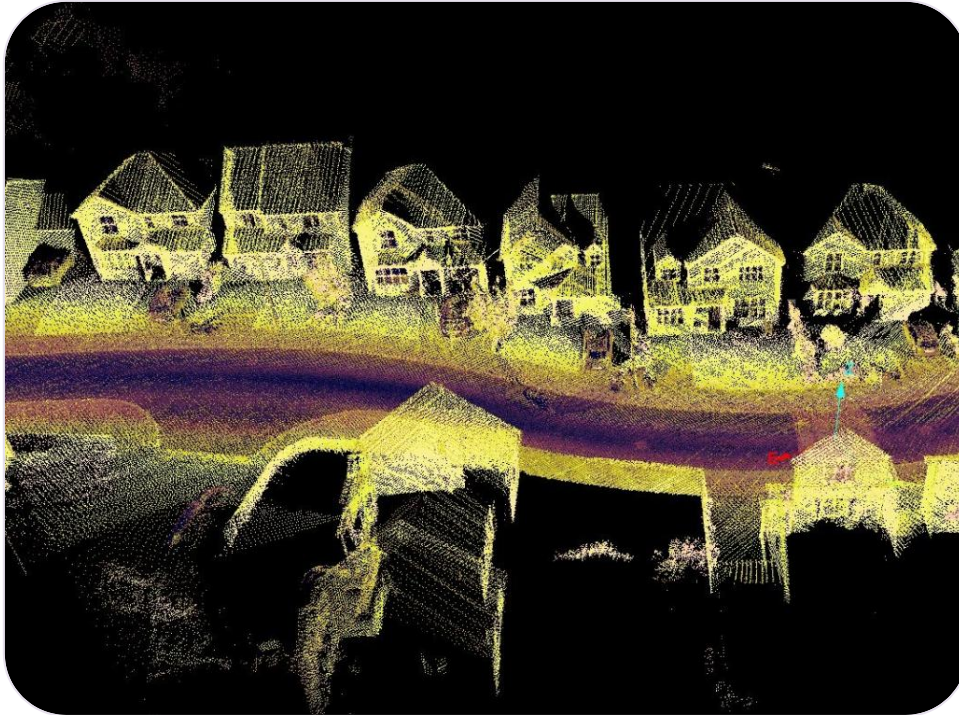
# BIM for Traffic Management



Scotia GAS – Traffic Modelling in Central London



# Data & Model Verification



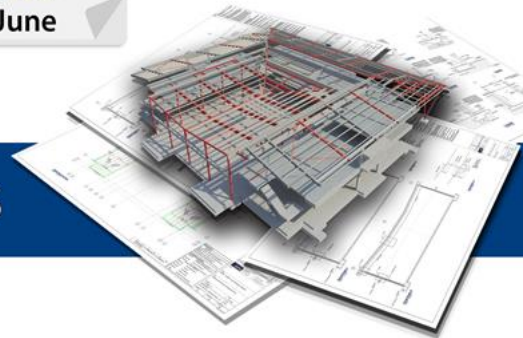
RPS has survey teams with the ability to capture and post process Point Cloud Data into a BIM Environment – *“appropriate surveys such as Point Cloud or LiDAR shall be provided to verify the completeness of the as-constructed model”*



# Thank You

**Mark Costello** – Director BIM RPS  
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# Breakfast Briefing Series

## Invitation

**RPS** is the largest integrated multi-disciplinary consultancy in Ireland.

We have integrated a BIM philosophy into our design ethos across core disciplines including civil, structural and mechanical engineering and architecture. In this series of breakfast briefings RPS will outline the benefits and challenges of working in a **collaborative environment**, the **protocols** and **processes** required and **competencies** necessary to meet the upcoming UK Government 2016 deadline along with current requirements set out in recent Irish Government tenders.

Mark Costello is Director for BIM in RPS. He has over twenty years' experience of large infrastructural projects. Mark is currently managing BIM delivery of major roads, water, pharmaceutical, healthcare and education projects. Mark has been awarded the BIM Accredited Professional badge of approval from the BRE Academy and is also a member of building SMART, CITA and Engineers Ireland. He is currently working with a multi-party BIM Committee in the UK which has been instrumental in **driving improved integration** and **collaboration** between clients, designers and contractors.