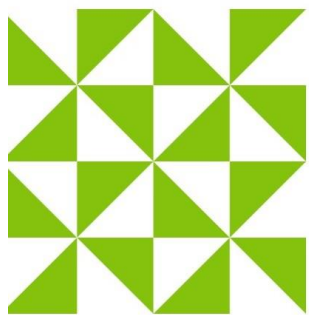
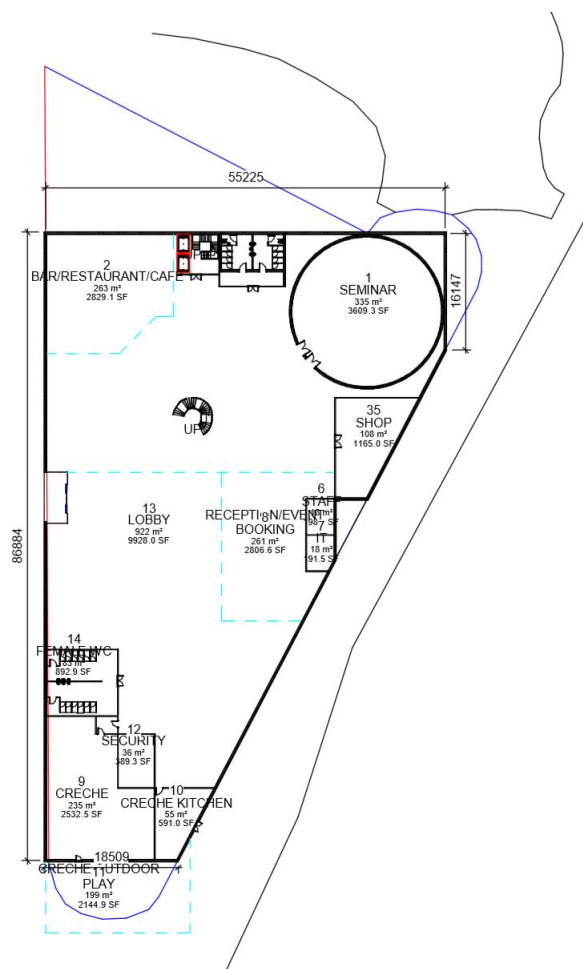




CABAT Consultancy LTD

Constructing Excellence Everyday



UWTSD Glyndŵr Development

Client: University of Wales Trinity Saint David

Wednesday 26th February 2020

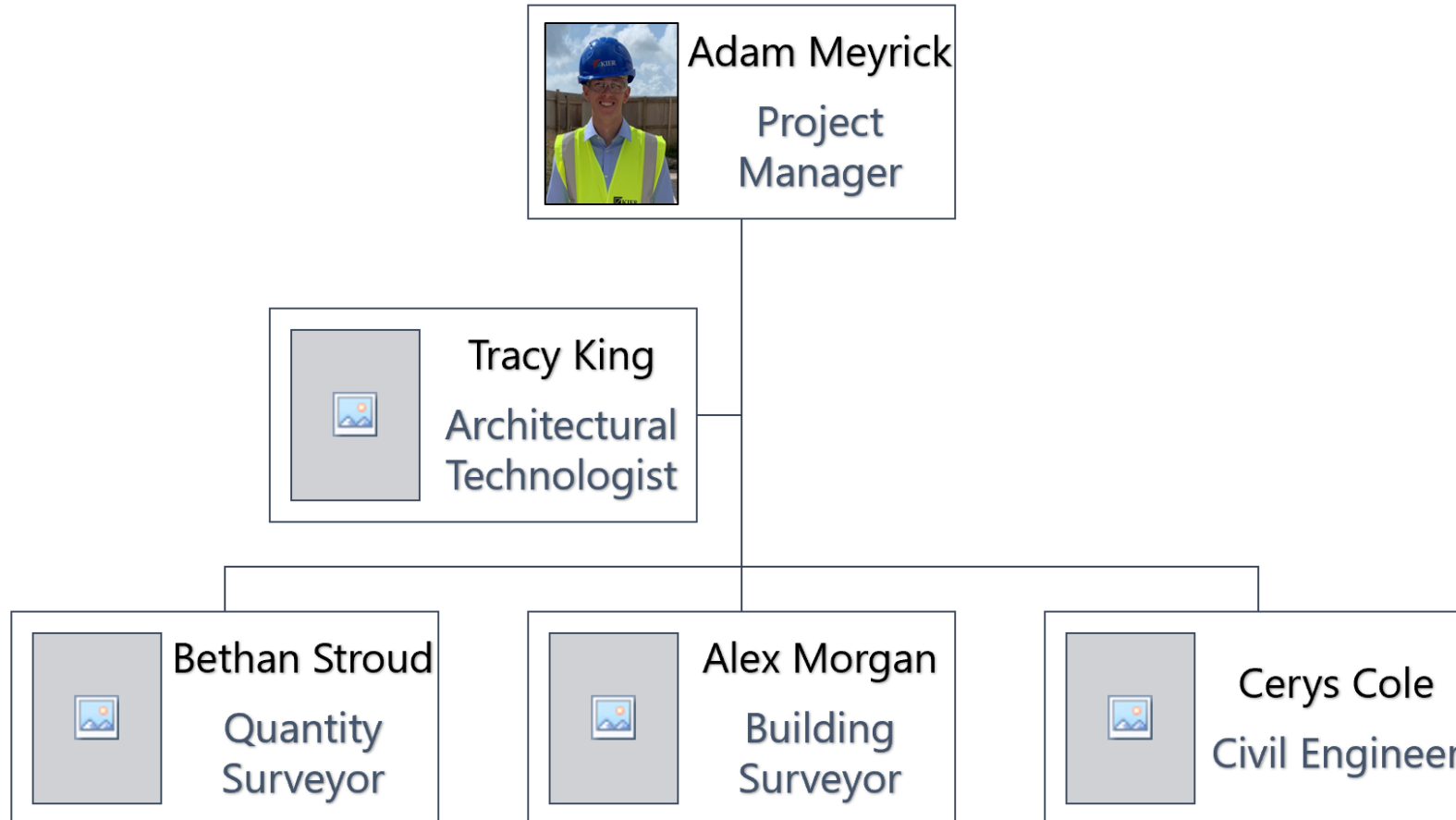
Contextual

The University of Wales Trinity Saint David is submitting a planning application to City and County of Swansea Council to develop a private educational facility at Plot 15 & 16 at the SA1 Waterfront. The proposed development is for a high quality three storey building which would provide a flagship 300 capacity main lecture theatre as well as 10 x 30 capacity classrooms and 4 x 80 capacity lecture theatres. Student union facilities, café, crèche, games room and a restaurant will complete this state-of-the-art facility.

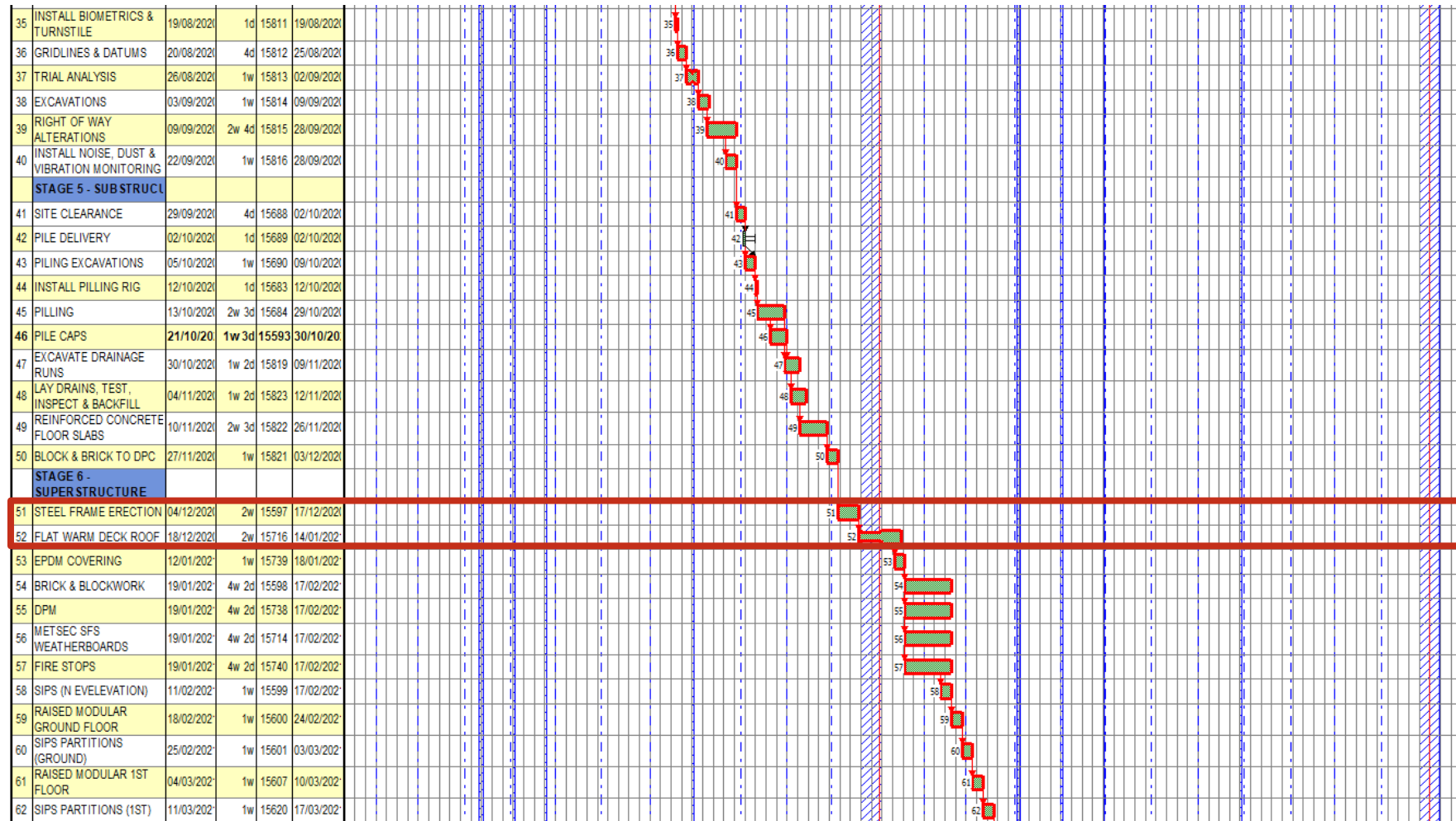
Client Critical Success Factors for the Project:

- ▶ Commencement of construction in May 2020,
- ▶ Completion of the new Hospital by end of August 2021,
- ▶ Adherence to a strict client budget,
- ▶ A minimum BREEAM rating of "Excellent",
- ▶ Develop a robust programme to deliver high quality standards expected of a modern educational institution,
- ▶ Soft landings principal for commissioning and handover,
- ▶ TR&T targets achieved through local engagement, 50% of SEWSCAP targets,
- ▶ Early involvement with Client Facilities Manager.

Your CABAT Project Team



Construction Programme 1



Please refer to Construction Programme 1 (Steel Frame) document.

Core Characteristics

Low cost, quick
with slight decrease
in quality



Steel Frame Construction:

- Versatility;
- Lightweight;
- Reduced construction time;
- Long lead time;
- Improved life cycle and change of use adaptability;
- Oxidization (Intumescent galvanising);
- 6 week frame assembly.

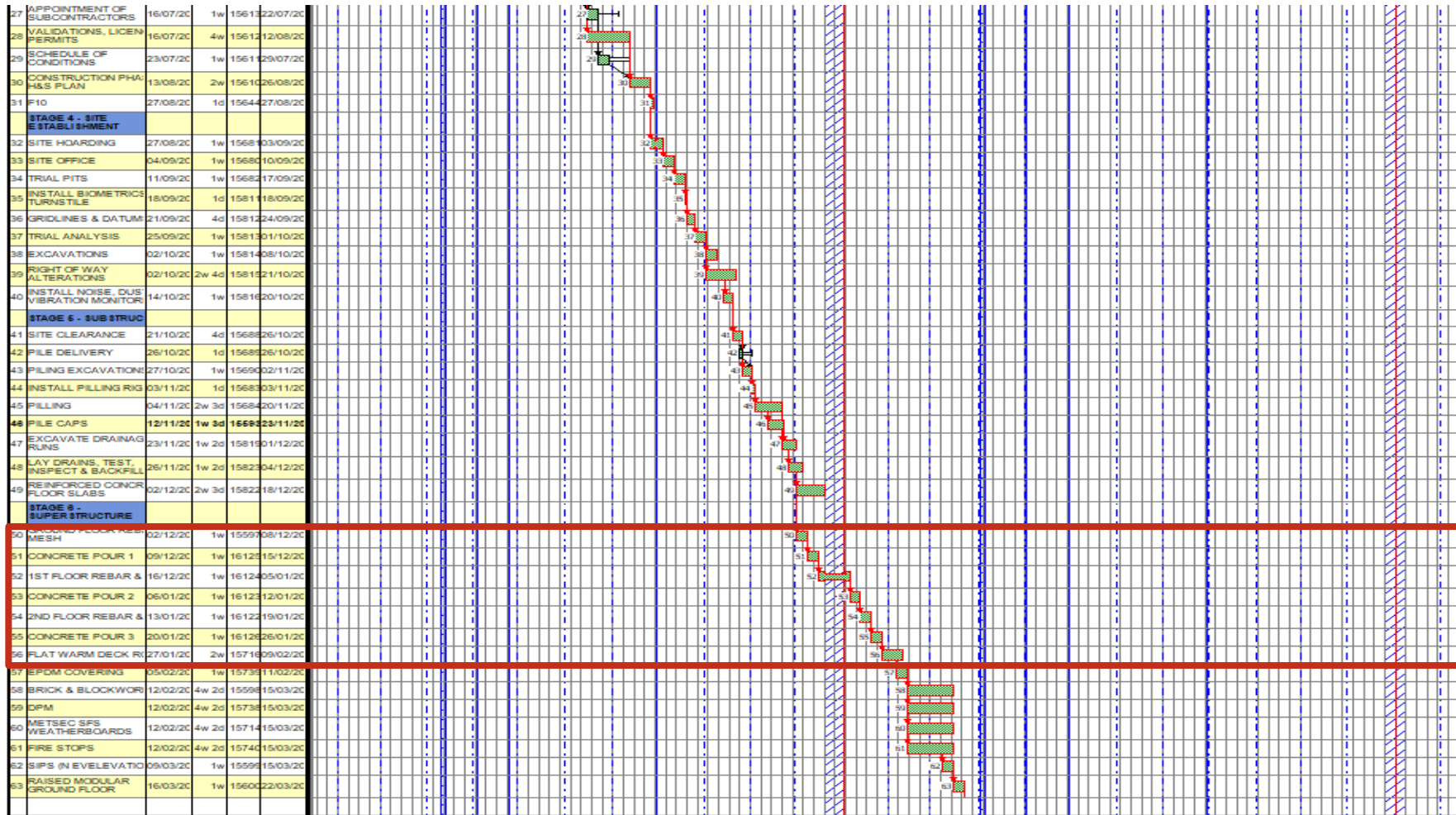
Programme 1 Programme 1 Summary

Element	Programme 1
Construction Begins	04/05/2020
Programme End	27/08/2021
Cost	£TBC* by QS (Cheaper)
Cladding	TBC
Foundations	Piles (Cheaper & Smaller)
Sustainable Technology	▪ Modular Living Wall System (MLWS) ▪ Rainwater harvesting ▪ Solar Photovoltaic (PV)



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Construction Programme 2



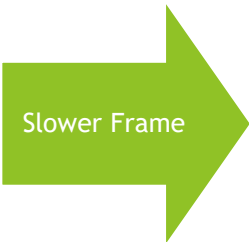
Planned by Powerproject

Please refer to Construction Programme 2 (Reinforced Concrete Frame) document.

Core Characteristics

Reinforced Concrete Frame Construction:

- Less sustainable materials;
- Higher quality;
- Fire resistance;
- Sacrificial galvanic anode protection;
- Greater thermal insulation;
- 8 week frame assembly.



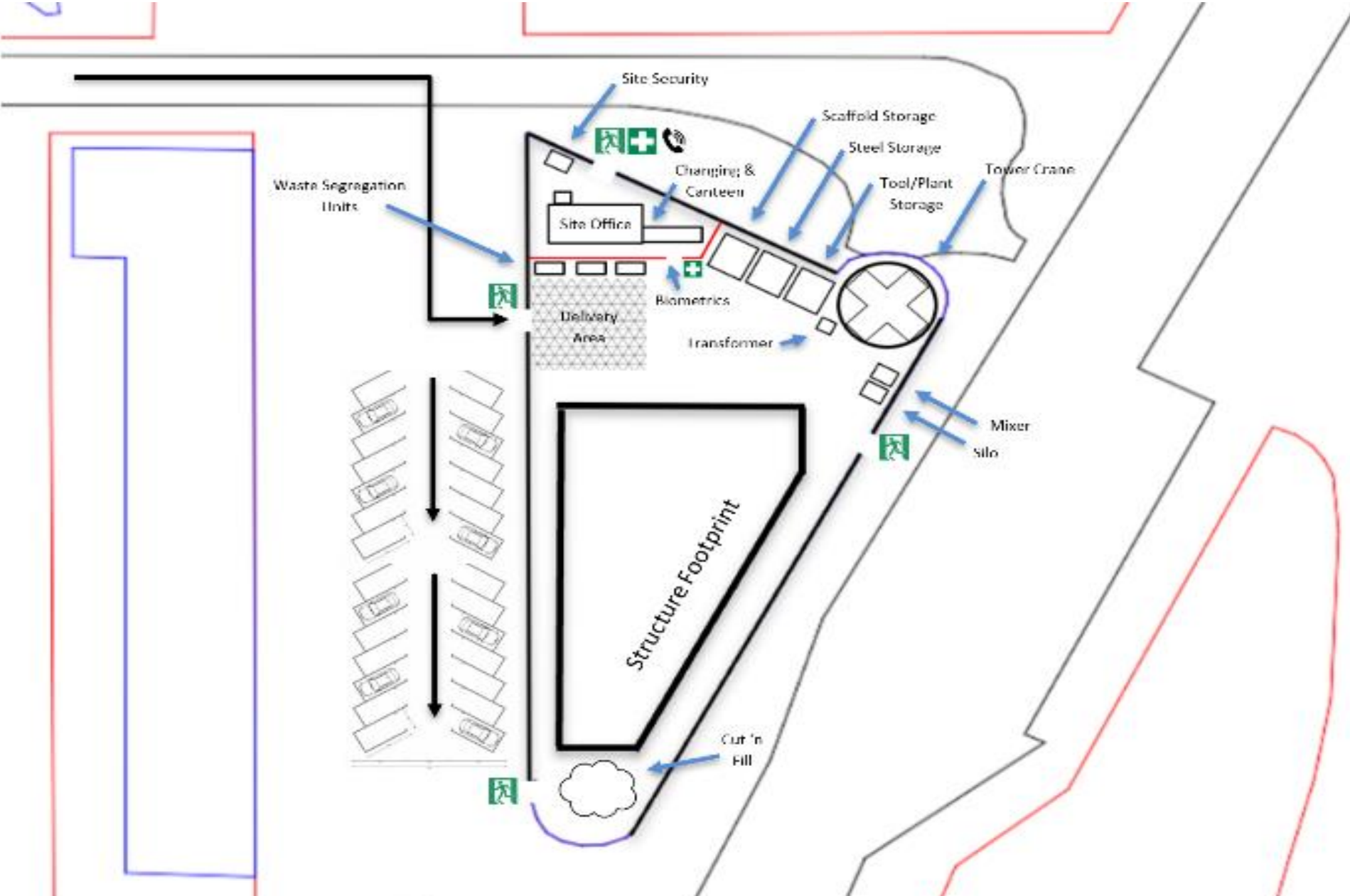
High cost, Slower with slight increase in quality



Programme 1 Programme 2 Summary	
Element	Programme 2
Construction Begins	20/04/2020 (2 Weeks Earlier)
Programme End	27/08/2021
Cost	£TBC* by QS (More expensive)
Cladding	TBC
Foundations	Piles (Expensive & Larger)
Sustainable Technology	▪ Modular Living Wall System (MLWS) ▪ Rainwater harvesting ▪ Solar Photovoltaic (PV)



Preliminary Site Setup



CABAT Consultancy LTD
Constructing Excellence Everyday

BIM Execution Plan (BEP)

The project team will utilise BIM on this project, regularly updating a BEP; a live document that helps the project team identify and execute the role BIM plays in the various phases of construction management.

- ▶ **Communication:** BIM execution plans encourage instant communication among teams at the very start of the construction project, helping to manage responsibilities and expectations.
- ▶ **Collaboration:** Because a BIM execution plan is a living, breathing document, the project team should collaborate in real time on various phases of the project, allowing for proper attention to be given to the project.
- ▶ **Saving time by sharing data:** Now, contractors to clients and everyone in between can have direct access to BIM implementation data (such as file formats, details and dimensions of the model) in a way that's easily shareable and can be updated frequently.
- ▶ **Stronger execution:** Composing a BEP focused on the project at hand means the team can communicate and collaborate better from the very start of the project, it ensures a strong finish and execution, pleasing project owners and investors.

Refer to BIM Execution Plan (BEP) document



Image 1: Waterfront Community Church (Meyrick, 2019).



Image 2: St Thomas Primary School (St Thomas Community, 2018).

CABAT Project Targets

Activity	SEWSCAP Requirement
Person Weeks	416
Previously Unemployed Weeks	200
Jobs Created (NEETS/Unemployed)	8
Training Weeks	16 Trainee Weeks
Apprentice Weeks	120 Weeks
Graduate Weeks	40 Weeks
Work Experience Weeks	32 Weeks
Community Initiatives	
Community Hours	250
Community Evenings	1
Conscience Constructors Scheme	40
Newsletters	Quarterly
Local Business'	30% of the workforce from Wales
	15% from Swansea area
Local Labour	30% of the workforce from Wales
	15% from Swansea area

Social Aspects

► Qualifying the Workforce

- ILM,
- IOSH
- NEBOSH
- SMSTS
- SSSTS.

Additionally, CABAT are obliged to set up annual training plans which incorporate free health and safety training, asbestos awareness, facelift training, SUSA and toolbox talks.

► Community Initiatives

CABAT will help deliver various social actions that will help positively impact deprivation and meet the socio-economic needs of the SA1 area.

BREEAM Target

- ▶ Target: BREEAM “Excellent” rating (70 - 85%)
- ▶ Potential: BREEAM “Outstanding” rating (85+)

Meeting Challenges in a Changing World

- Reduced whole life cycle cost
- Reduces resource use,
- Improved health & safety,
- Improved project certainty,
- Adaptation to climate,
- Resilient and durable asset,
- Increased asset value,



Refer to BREEAM checklist illustrating achievable credits

Alex Morgan

Cladding Options

- ▶ Timber composite cladding - **£105/m²**
- ▶ Fibre cement weatherboarding - **£65/m²**
- ▶ Softwood timber cladding (painted or treated) - **£50/m²**
- ▶ Hardwood timber cladding - **£90/m²**
- ▶ Heat-treated timber cladding - **£80/m²**
- ▶ Tiles (concrete) - **£40/m²**
- ▶ Tiles (slate) - **£100/m²**
- ▶ Natural stone - **100/m²**
- ▶ Artificial stone - **£70/m²**
- ▶ Metal - **£50/m²**
- ▶ PVCu cladding - **£50/m²**
- ▶ Brick - **£60/m²**
- ▶ Brick slips - **£50-60/m²**
- ▶ Rendering - **£60/m²**
- ▶ Masonry paint (three coats) - **£15/m²**

Recommendations

Timber cladding

- ▶ Life expectancy - 50 years
- ▶ Maintenance Low frequency due to increased dimensional stability as coatings do not stretch and shrink
- ▶ Certification - FSC, PEFC certified and cradle-to cradle gold standard
- ▶ Recyclability Can be reused or used as a biofuel to produce heat and power
- ▶ Costings - £75/m²
- ▶ Durable



Recommendations

Composite

- ▶ Made from a unique combination of recycled wood and plastic, our highly developed and unique composition combines the traditional appearance of wood with the durability of an engineered composite.
- ▶ Life expectancy - 25 year
- ▶ No need to paint, seal or treat the cladding
- ▶ Simple installation using standard tools
- ▶ Rot, splinter and warp resistance
- ▶ Contemporary and traditional design options
- ▶ Costings - £105/m²



The Internet of Things in Smart Commercial Buildings

Energy efficiency

- ▶ Electrical management
- ▶ Energy metering
- ▶ Energy management
- ▶ Energy storage
- ▶ Water management
- ▶ Smart parking

Fire Safety & Security

- ▶ Fire detection & extinguishing
- ▶ Emergency lighting
- ▶ Door entry/access control
- ▶ Intrusion detection
- ▶ CCTV

Building control

- ▶ Smart B.M.S
- ▶ Predictive maintenance
- ▶ Asset management
- ▶ Human-sensor networks
- ▶ MVHR
- ▶ Natural ventilation
- ▶ Lighting control

Smart Technology - IOT - Digital assistance

Wayfinding

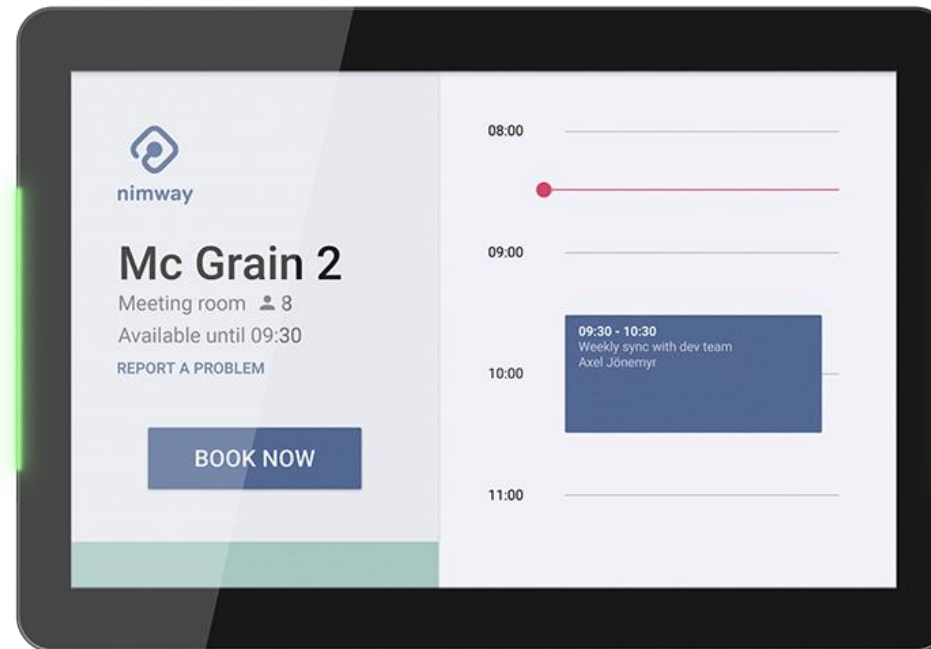
- ▶ Wayfinding navigates you around the office in a simple and intuitive way.
- ▶ In the [mobile app](#) and on any [digital floorplan](#) you can easily see where you are, and where you need to go for your next meeting.
- ▶ Walking up to a [digital floorplan](#), you will automatically get personalised navigation instructions for your next meeting, without needing to pick up the phone from your pocket.



Smart Technology - IOT - Digital assistance

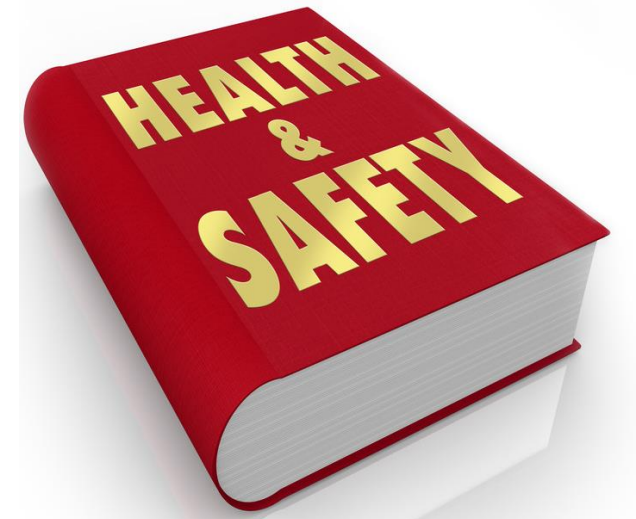
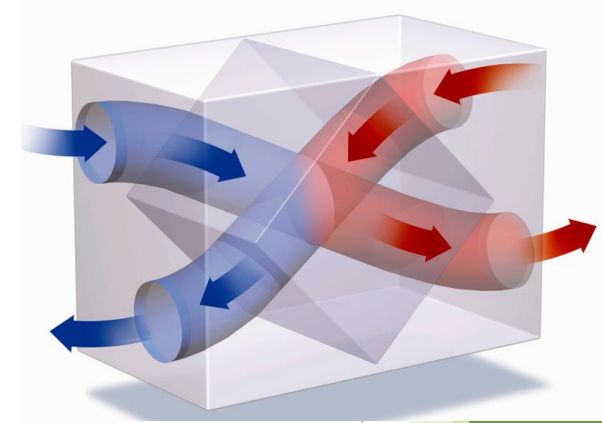
Room Booking

- ▶ Room panels fitted outside meeting rooms make it easy to book a room. Our quick and intuitive interface shows today's schedule, meeting room name and room type. You can also book a room in our mobile app.
- ▶ The room panels have LED lights that indicate occupancy and can be seen from a distance.



Specifications

- ▶ Health & Safety
- ▶ Fire Strategy Plan
- ▶ Ground Works
- ▶ SIP's
- ▶ MVHR





ARCHITECTURAL DESIGN

TRACY KING FdSc

AREA ANALYSIS

- ▶ BROWNFIELD SITE
- ▶ LARGE INVESTMENT BY UWTSO
- ▶ LARGE UNUSED AREAS
- ▶ POTENTIAL CONSTRUCTION ISSUES DUE TO SCAFFOLDING IN ADVERSE WEATHER.



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

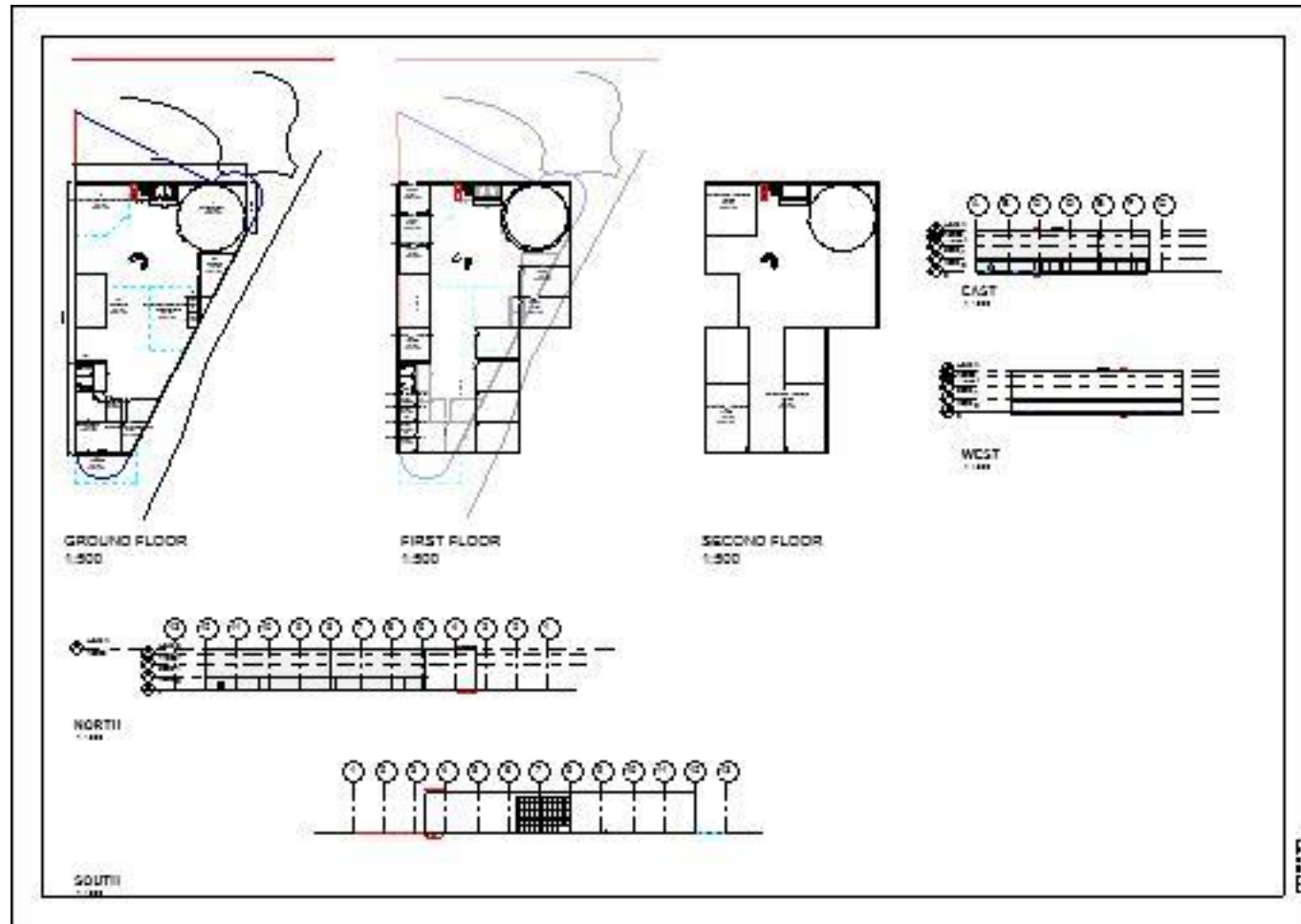


CONTINUING THEME

- ▶ SWANSEA WAREHOUSE RED BRICK BUILDINGS
- ▶ MODERN FEEL
- ▶ CONTRACT AGAINST THE NEWER STYLED BUILDINGS.
- ▶ STRONG SHAPE TO WITHSTAND WATERFRONT WEATHER.



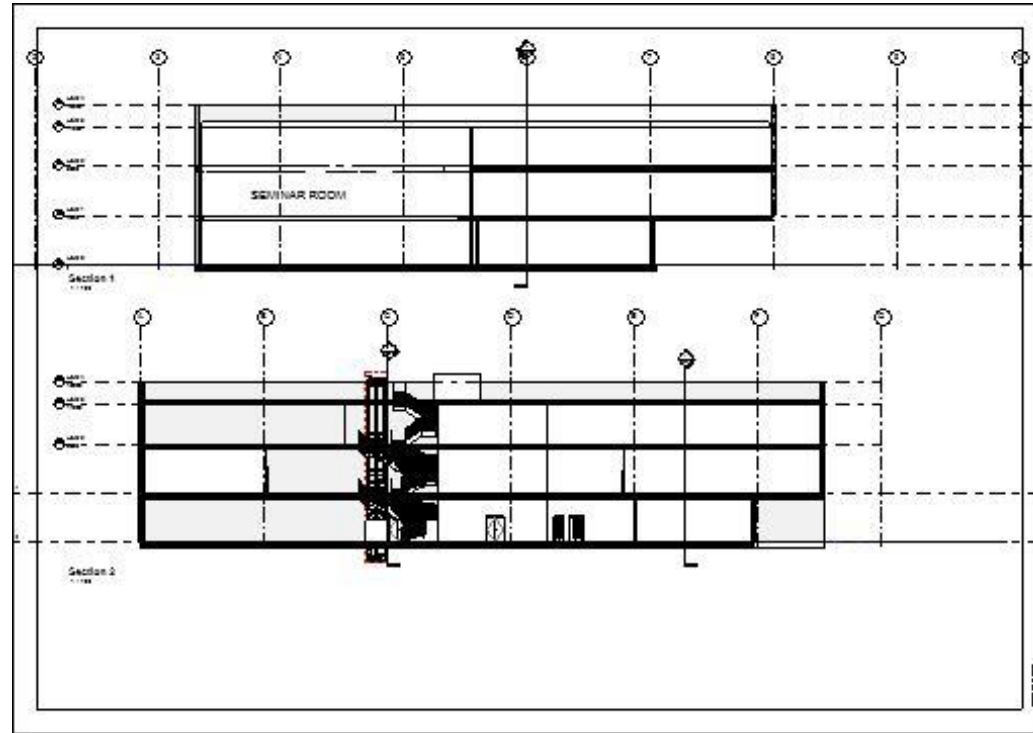
DESIGN



- STRONG SHAPE
- OVERHANG WALK WAY
- 3 STOREY SEMINAR ROOM
- LIGHT AIRY CIRCULATION SPACE

SECTIONS

- 3 STOREY SEMINAR ROOM
- EMERGENCY STAIR/ LIFT SHAFT
- WINDOWLESS NORTH ELEVATION





SUSTAINABILITY

- ▶ WHOLISTOCALLY SUSTAINABLE IN USE
- ▶ CONSIDERATELY SUSTAINABLE IN BUILD
- ▶ RECYCLED MATERIALS
- ▶ GREENER MATERIALS



UNIVERSITY/LIFE BALANCE

- ▶ CRECHE
- ▶ FIRST AID ROOM
- ▶ COMFORTABLE STUDY SPACE
- ▶ STUDENT KITCHEN
- ▶ SHOWERS
- ▶ GAMES ROOM



The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic visual effect.

Site Investigation Cerys Cole

Proposed Development

The proposed development is a universal learning/lecture hall building comprising of 10 classrooms for 30 students, 4 lecture theatres for 80 students and one lecture theatre for 300 people. Considerations for acoustics and possibility for renting out spaces for conferences and seminars outside term times are essential.

Criteria also includes:-

- Entrance hall

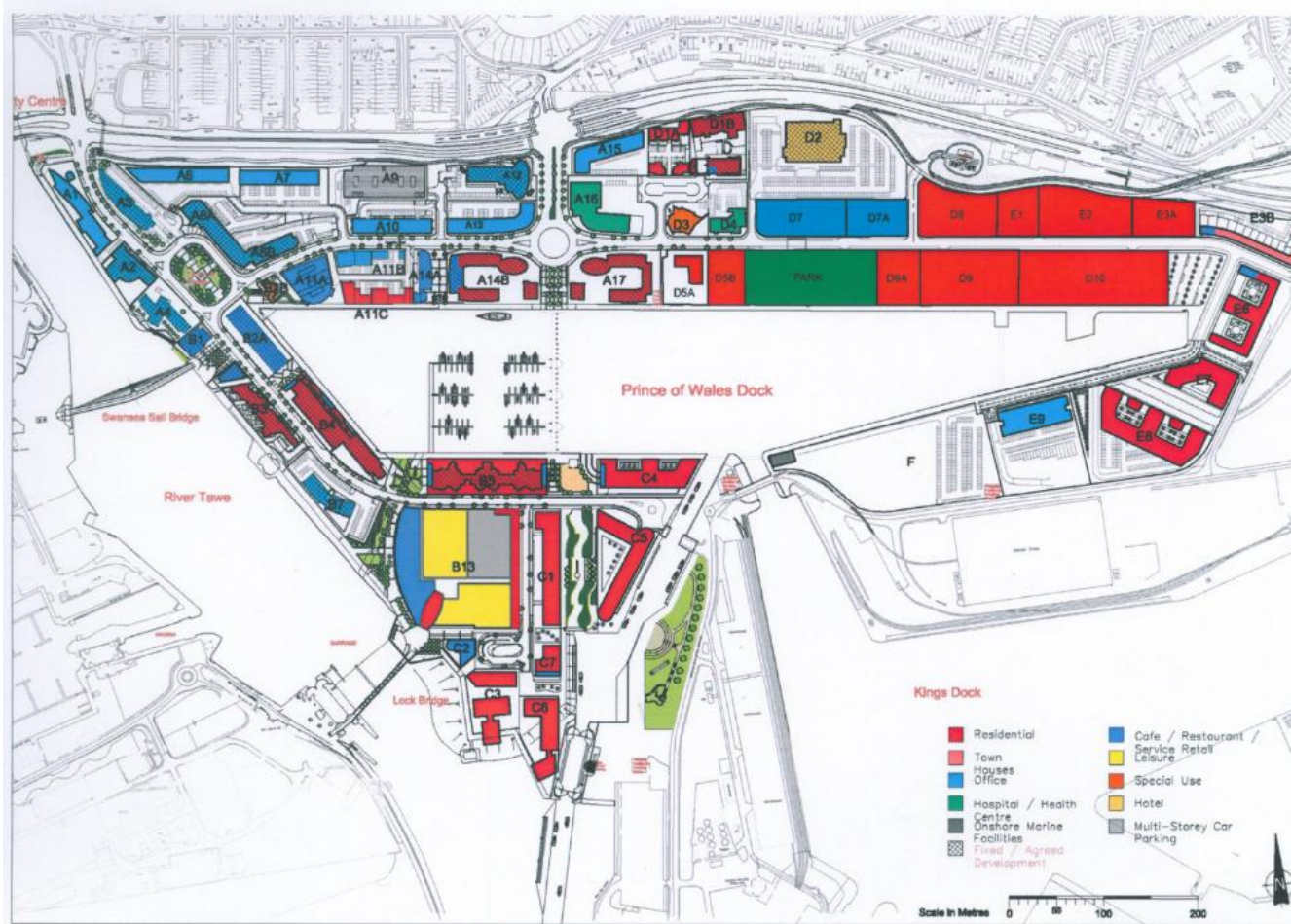
- Reception

- Toilets

- Storage space

- Faculty

- Central open meeting areas.



A map of SA1 defining all developments and the proposed site for development is illustrated as C5.

Site Description

The site for development is a brownfield site but has been prepared for redevelopment and is currently an unsurfaced gravel area.

The total area of the proposed site is still 12,025m²

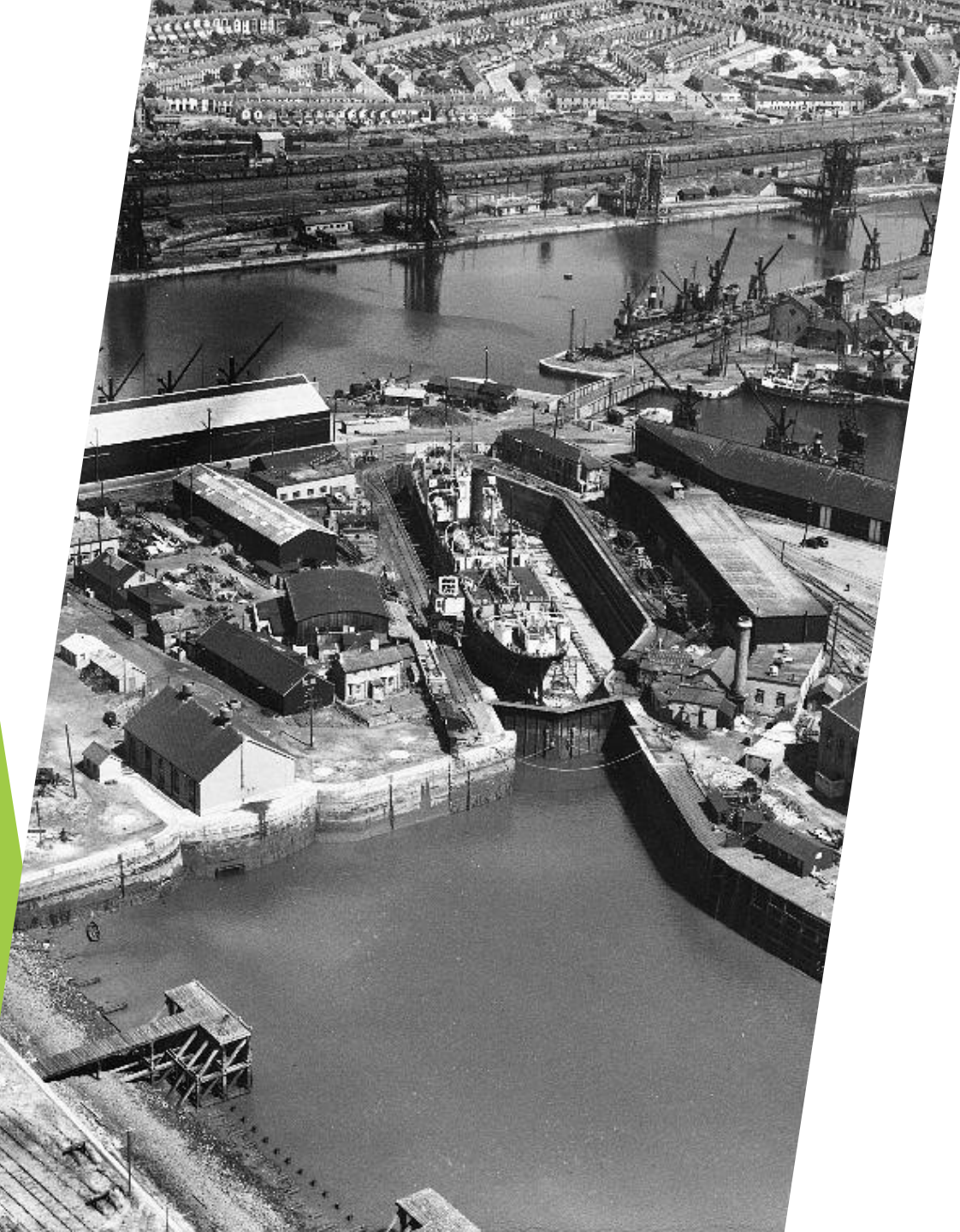
Site co-ordinates from osmaps.ordnancesurvey.co.uk

OS Grid Ref: SS 66881 92613

Latitude: 51° 36' 59" N

Longitude: 3° 55' 26" W

The surrounding land is designated for redevelopment, comprising residential apartments and commercial units including a university campus, hotels and restaurants.



Site History

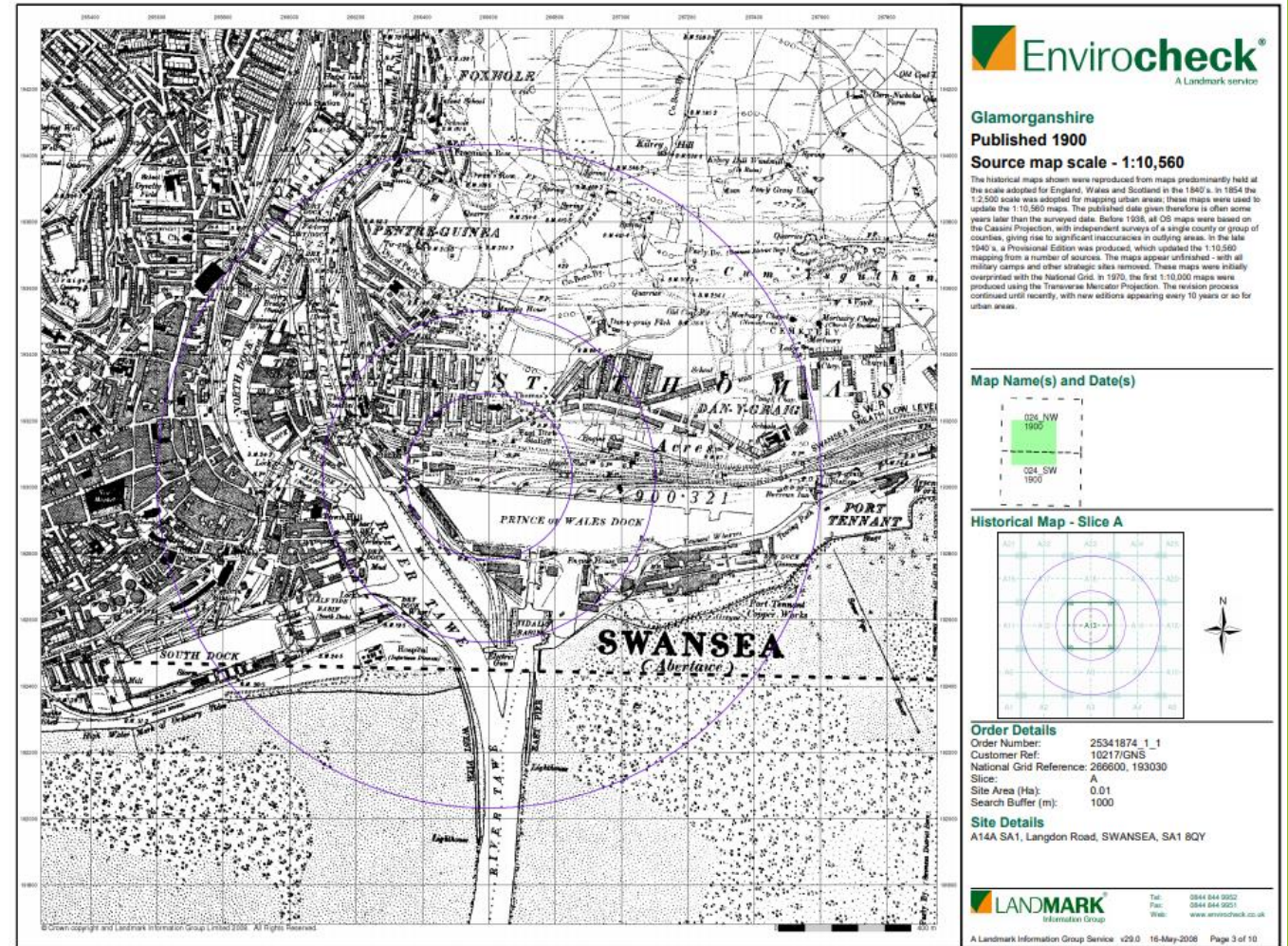
- ▶ The site previously had a high industrial output of copper, zinc, iron and tinplate combined with developments in shipping and Swansea's harbour needed to be expanded.
- ▶ The Swansea Harbour Trust (SHT) commissioned the construction of the **Prince of Wales Dock**. Opened in 1881 by the Prince and Princess of Wales it was completed in 1882 and expanded in 1898. The North Quay frontage was let to the Great Western Railway, Neath and Brecon Railway and the Rhondda and Swansea Bay Railway, which linked the Dulais Valley and Rhondda Valley coalfields directly with the docks.

Site History - 1900

Earliest recorded map dated 1884 - southern half of the site numerous railway lines and engine sheds, the northern half and the land further to the north occupied by rough pasture.

South of the site is a channel feeding into Fabian Bay. By 1900 the site and surrounding area had significantly been redeveloped as part of the Prince of Wales Dock which was built within the area of Fabian Bay, to the south of the site.

The 1900 map shows the site to be covered entirely by railway sidings servicing the Prince of Wales Dock.

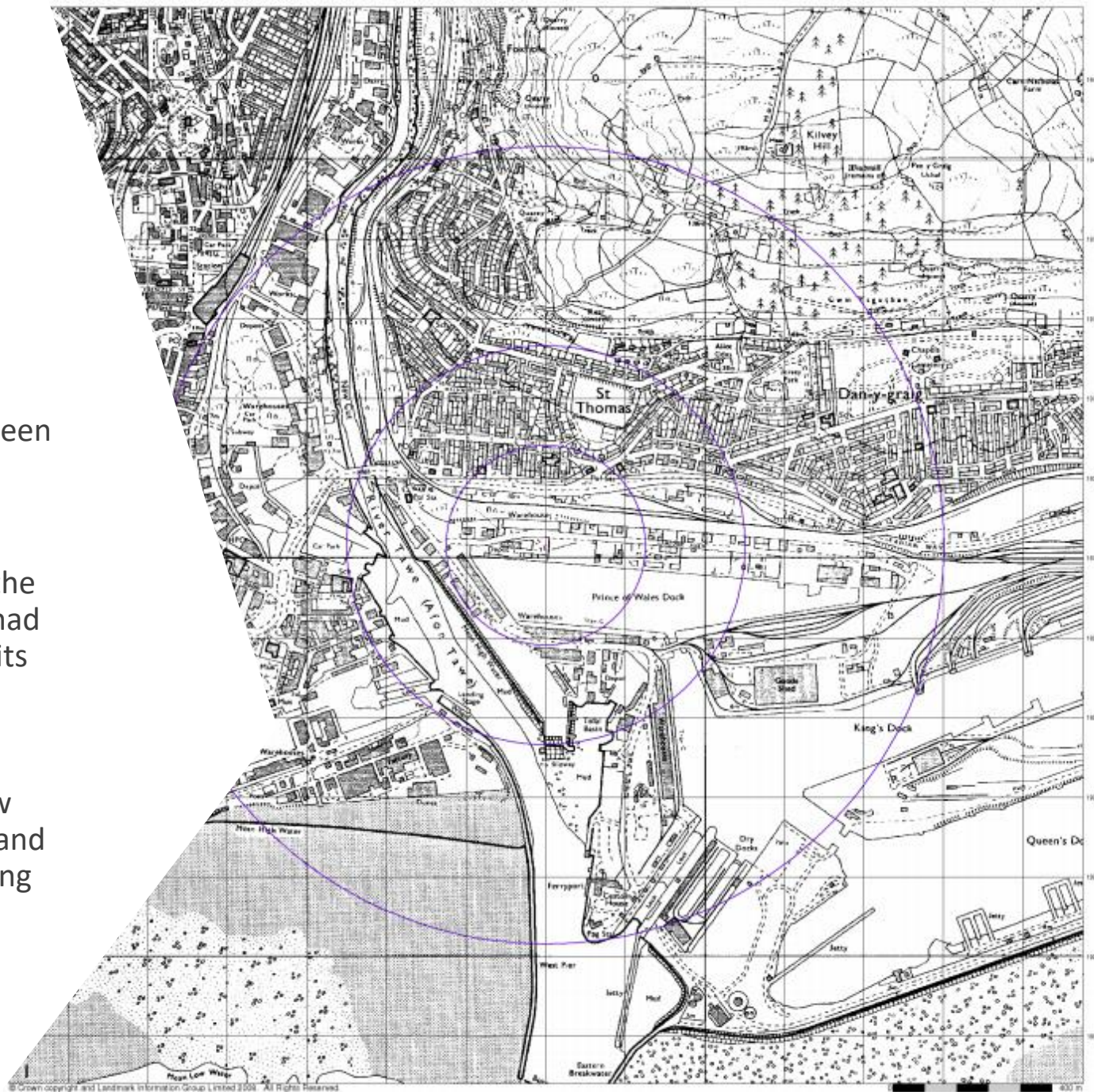


Site History - 1921 to 1979

► The 1921 map shows no significant changes just numerous other railway sidings, storage depots and a hoist had been constructed to the south of the site.

► No changes on site until 1979. Where the railway sidings, hoist and storage sheds had been removed, and several industrial units constructed on the southern half of the plots.

Maps in 1989, 1999 and 2008 maps show no significant change on site since 1979 and little change to the immediate surrounding area.



Ordnance Survey
Published 1979

Source map scale -

The historical maps shown were reproduced at the scale adopted for England, Wales and Northern Ireland. The 1:25,000 scale was adopted for mapping updates to the 1:10,560 maps. The publication years later than the surveyed date. Before the Cassini Projection, with independent countries, giving rise to significant inaccuracies. In 1940's, a Provisional Edition was produced from a number of sources. The military camps and other strategic sites overprinted with the National Grid. In 1950 produced using the Transverse Mercator continued until recently, with new editions in urban areas.

Map Name(s) and Date



Historical Map - Slice



Order Details

Order Number: 2534
Customer Ref: 1021
National Grid Reference: 2666
Slice: A
Site Area (Ha): 0.01
Search Buffer (m): 1000

Site Details

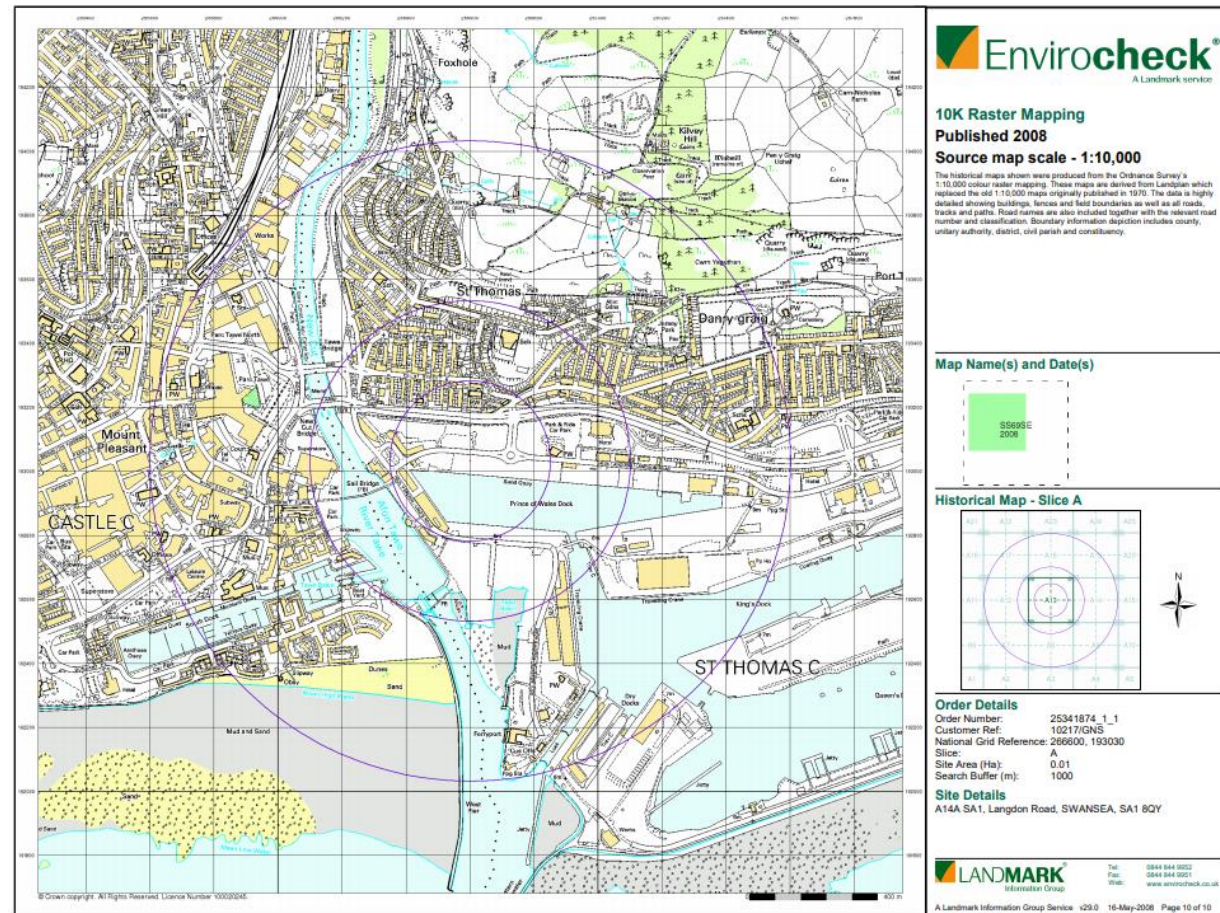
A14A SA1, Langdon Road, SW

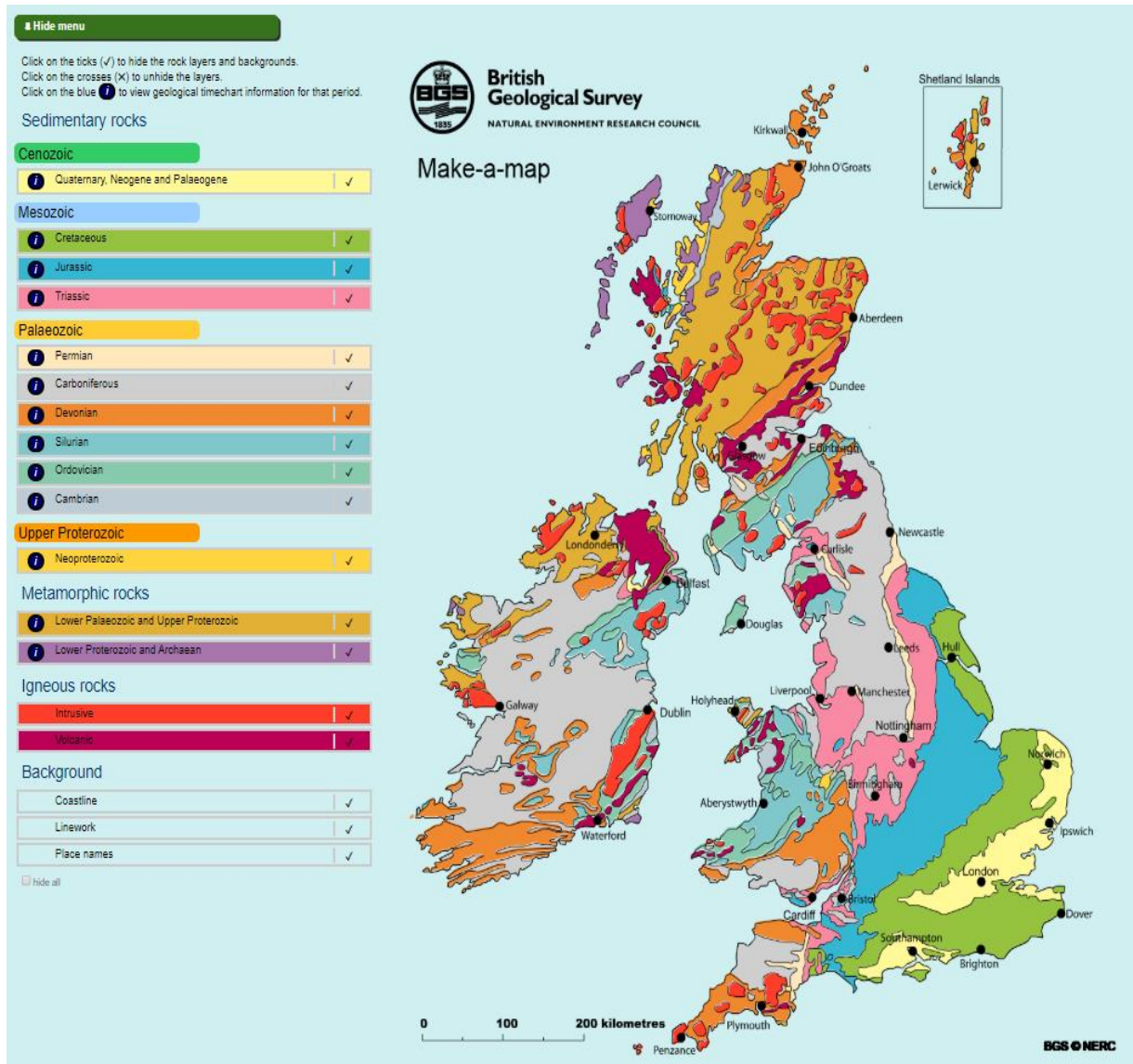


A Landmark Information Group Service

Site History - 2008 onwards

Since 2008 the site has been cleared of structures and prepared for redevelopment.





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 entation.

Foundations

- ▶ The geology across the site typically comprise clayey sandy gravels and cobbles.
- ▶ With a basic development proposal, it is based on current knowledge that suitably reinforced concrete shallow strip type foundations on re-engineered ground would be a suitable approach to foundations for this development.
- ▶ The ground below the load bearing areas should be improved by excavation. Any soft silts, clays and peat within the made ground and superficial soils are to be removed and replaced with granular fill materials laid and compacted to a consistent level. The excavated materials will require screening to achieve the required grading and then re-compaction in controlled layers.
- ▶ Earthworks should be undertaken to a minimum depth of 1.0m below underside of foundation level in the area outside the footprint of the proposed building. Reduced formations should be subject to proof rolling. Any soft spots encountered during proof rolling should be excavated and replaced with compacted structural fill materials.

Foundations Continued

- ▶ If structure is regarded as heavily loaded or possibly sensitive to settlement then the use of piled foundations may be necessary. Driven pre-cast concrete or cast in-situ augured/driven piles are the most appropriate foundation solution for the ground conditions.
- ▶ The piles would be end bearing socketed into the medium dense to dense sand and gravel with frequent cobbles at depths of between 13-15m.
- ▶ Lengths will depend on pile capacity required and pile installation techniques adopted.
- ▶ The use of piles is subject to any vibration constraints needed to protect site infrastructure, adjacent buildings and any sewers.
- ▶ Piles need to be designed to ignore load contribution from any fill and weaker clay strata.. Pile diameters of 450mm to 750mm could be adopted with varying sockets into the sands, gravels and cobbles or underlying bedrock strata, depending on capacity required. Safe working loads in the range of 300-600kN should be achievable for piles of this length.

Excavation Works

- ▶ Most excavations should be possible with normal soil excavating machinery. Various pneumatic breaker attachments, or similar tools will be useful if needed for any buried obstructions or dense made ground materials could be encountered.
- ▶ Deep excavations will require sheet piled supports driven to such depth as to limit water pressure hazards on the stability of the excavations and structures. Shallow excavations within the made ground should not encounter significant groundwater inflows.
- ▶ However, if any groundwater seepages/inflows or rainfall infiltrations are encountered it should be possible to deal with them using conventional pumping techniques.

Foundations Continued

- ▶ Allowances should be made for monitoring and dealing with ground induced vibrations from the piling works.
- ▶ Augured piles should be used where unacceptable levels of ground vibration are anticipated. A specialist piling contractor should be consulted regarding the detailed pile design, safe working load and contamination transmission risk assessments may require additional boreholes to confirm deeper ground conditions.
- ▶ Allowances should be made for encountering natural (suspected boulders) or man-made obstructions at the proposed pile locations and for a suitable period of pile testing.
- ▶ Ground slabs should be of suspended construction.

Driven precast concrete pile

ADVANTAGES

- ▶ Quality of pile can be inspected before it is placed in the ground
- ▶ Construction is not affected by ground water
- ▶ Can be driven in longer lengths
- ▶ Most appropriate in soft and unobstructed soils
- ▶ No removed soil to dispose of

DISADVANTAGES

- ▶ Can be damaged during driving
- ▶ Pile can be displaced if it hits obstruction
- ▶ Actual length of pile is known only when proved on site
- ▶ Relatively large rig required
- ▶ Noise and vibration – although technology is constantly being improved
- ▶ Driving force may determine pile properties
- ▶ Displacement of soil may damage surrounding structures

Driven Cast In-situ

ADVANTAGES

- ▶ Length can be readily varied to suit actual ground conditions encountered
- ▶ Can be driven in very long lengths
- ▶ Driven with a closed end and therefore groundwater is excluded from hole

DISADVANTAGES

- ▶ Can be damaged during driving
- ▶ Relatively large rig
- ▶ Noise and vibration
- ▶ Driving force may determine pile properties
- ▶ Displacement of soil may damage surrounding structures
- ▶ Concrete cannot be inspected after casting
- ▶ Large diameters cannot be used

Augured

ADVANTAGES

- ▶ Soil removed can be inspected
- ▶ The ground is continuously supported by the auger
- ▶ Relatively quiet
- ▶ Low vibration
- ▶ Suitable for most soil types (excluding boulders)
- ▶ Can be installed with limited headroom
- ▶ The continuous helical displacement technique reduces volume of removed soil and increased soil strength adjacent to pile shaft

DISADVANTAGES

- ▶ Maximum 1200mm pile diameter
- ▶ Concrete cannot be inspected after pouring
- ▶ Maximum pile length around 30meters
- ▶ Limited length of reinforcement cage
- ▶ Removed soil required disposal
- ▶ Efficiency is dependant on regular supply of concrete
- ▶ Auger may be impeded by relatively stiff soils

Further investigations

RADON - Envirocheck report indicates that no radon protective measures are required on site

Mining - Coal Mining Report will be obtained from The Coal Authority

Hydrology, Hydrogeology and flooding - The River Tawe flows near the site. Envirocheck indicates that there is a groundwater abstraction for hydroelectric power at the River Tawe Barrage and another abstraction for the National Waterfront Museum near South Dock.

Landfill sites - Envirocheck suggests that there are no current landfill sites within 500m of the site and no historic landfill sites

Potential contamination – previous and future

Other environmental issues

Bethan Stroud



Cost Comparison Steel v Concrete

Case Study : Christ the King Secondary School

The building's key features are:

- Three storeys, with no basement levels
- Typical clear spans of 9m x 9m
- 591m² sports hall (with glulam frame)
- 770 m² activity area and atrium
- Plant at roof level

- School is not as big as the auditorium unit (economies of scale would benefit)

Method	Concrete Planks	Insitu concrete slab	Steel Frame
Frame & upper floors	292	252	265
Cost per m2	£3189/m2	£3158/m2	£3132/m2

Rainwater Harvesting

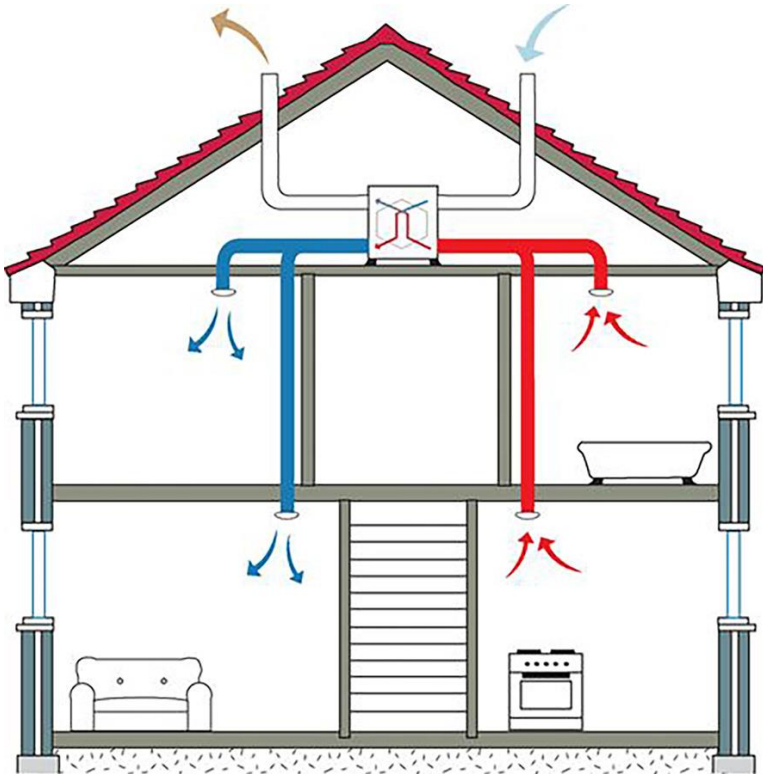
- ▶ What are the key issues effecting system?
- ▶ Average number of flushes per person per day is 4.42 with an average of 5 litres per flush.
- ▶ Inclusion of drought protection
- ▶ This will all determine tank size
- ▶ An approximate cost of a 19500L tank would be £6000 (no installation)



The Renewable Energy Hub

MVHR System

- ▶ Medium/Large unit £9000
- ▶ AHU commercial costs approx. £25000 depending on option
- ▶ We must have user and load information to calculate a more accurate cost



BPC Ventilation

Solar

- ▶ Most efficient collector is the solar
- ▶ Panelling could be used to save money
- ▶ Rule of thumb = 1kw / £1000
- ▶ Cost study at Ty Trevithick cost £24400 to install in 2016. - diagram available



Solar Panel Issues

- ▶ The size will also depend on location
- ▶ Over sizing will not benefit
- ▶ Damaging the Glycol fluid in the system
- ▶ Small system will also not create a payback worth spending the money

BoQ

- ▶ Completed design to create BoQ
- ▶ Take-offs required to complete measurements
- ▶ Materials required on the project
- ▶ Variations or additional works can change the initial budgeted cost
- ▶ There is no budget on this scheme