

Canford Energy from Waste
Combined Heat and Power Facility

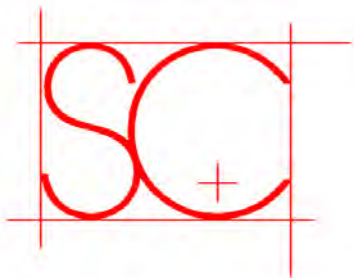


Document Reference: [MVVCANDED]
Revision 1.6
January 2023

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Design Evolution Document



**We inspire
with energy.**

Site Layout Masterplan



Technical concept - preliminary site layout

The proposed EfW CHP Facility is located within the existing Canford Resource Park (CRP) on land occupied by a part-built 110ktpa pyrolysis facility. Immediately adjacent to this facility, additional land is allocated for an extension to the CRP. Together, and based on MVV's experience, these areas provide sufficient space to accommodate a c.260ktpa EfW CHP Facility.

After the initial preliminary assessment, MVV's technical, construction and development teams' began to review the 'best fit' for an EfW CHP Facility. This review considered:

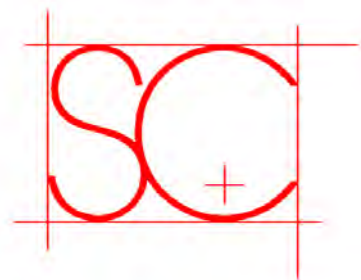
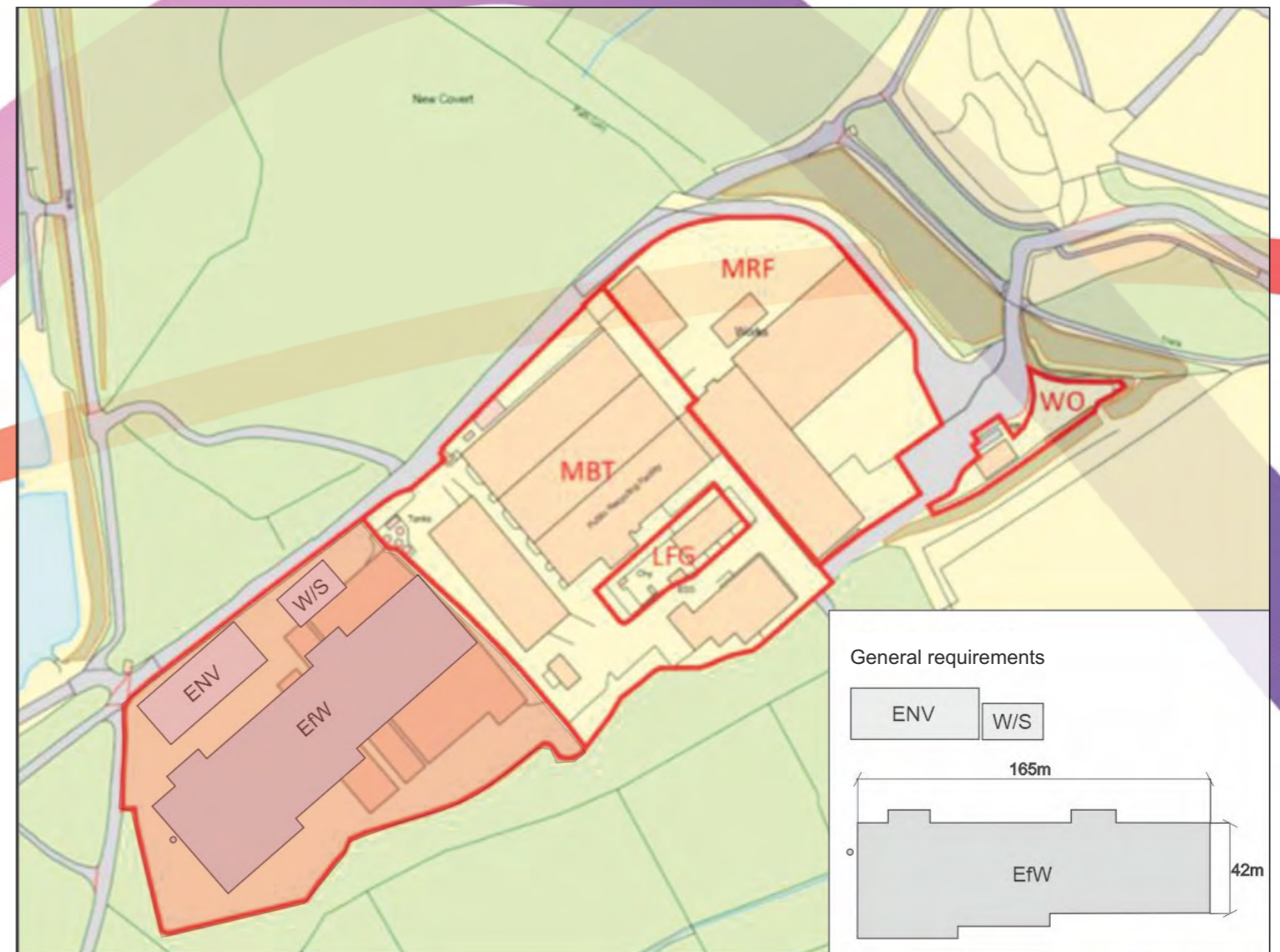
- technical and process requirements;
- constructability;
- vehicle access and circulation;
- adjacent ecologically designated sites;
- existing land uses within CRP; and
- further environmental improvements.

Four alternative examples that were considered in the preparation of the selected site layout are presented on page 2.

The selected site layout was considered to suitably address the considerations outlined above and is displayed on page 3.

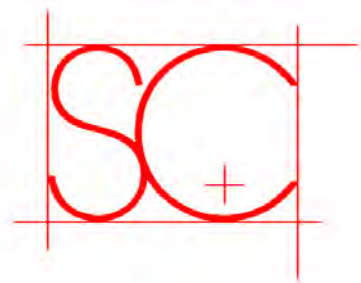
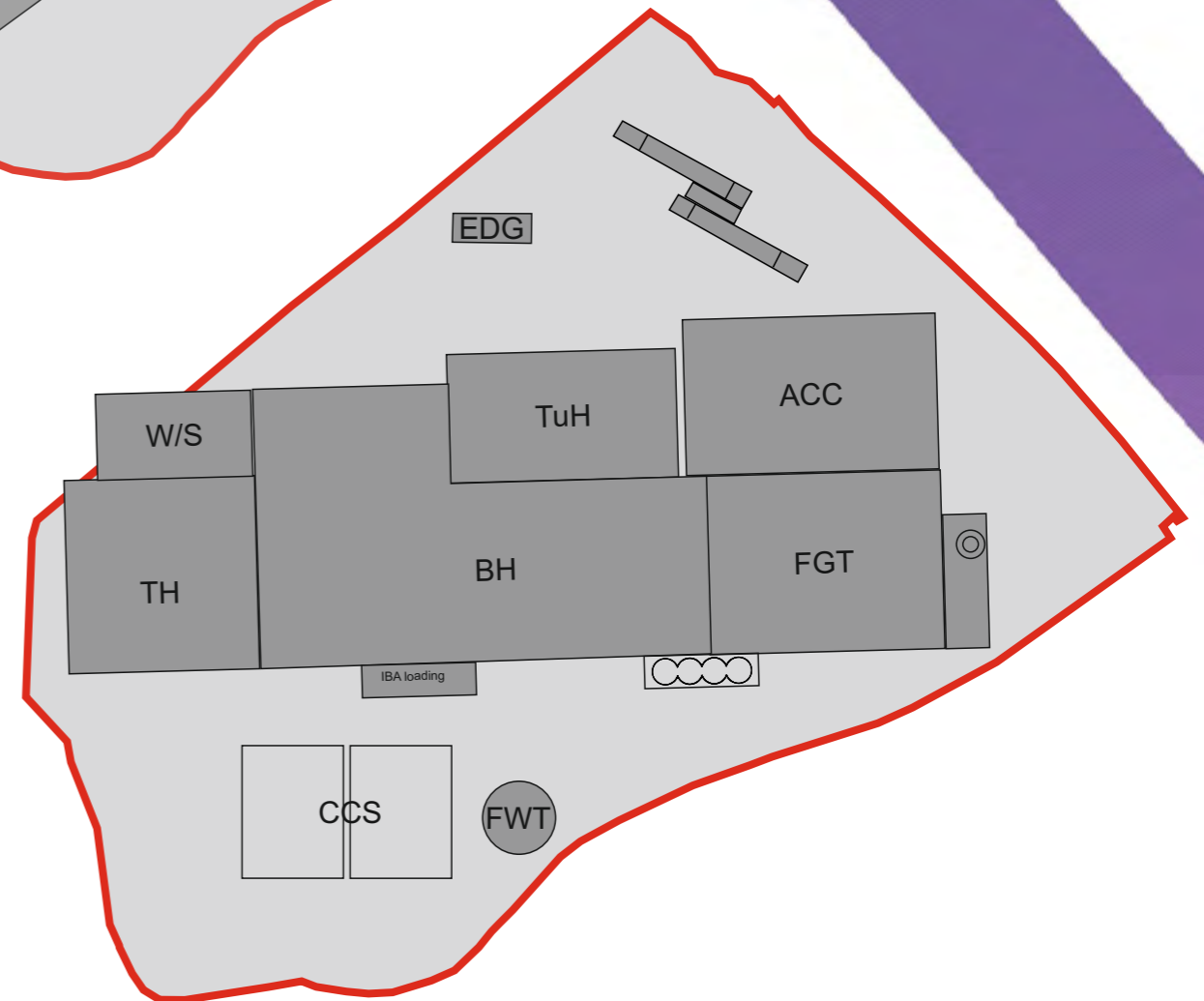
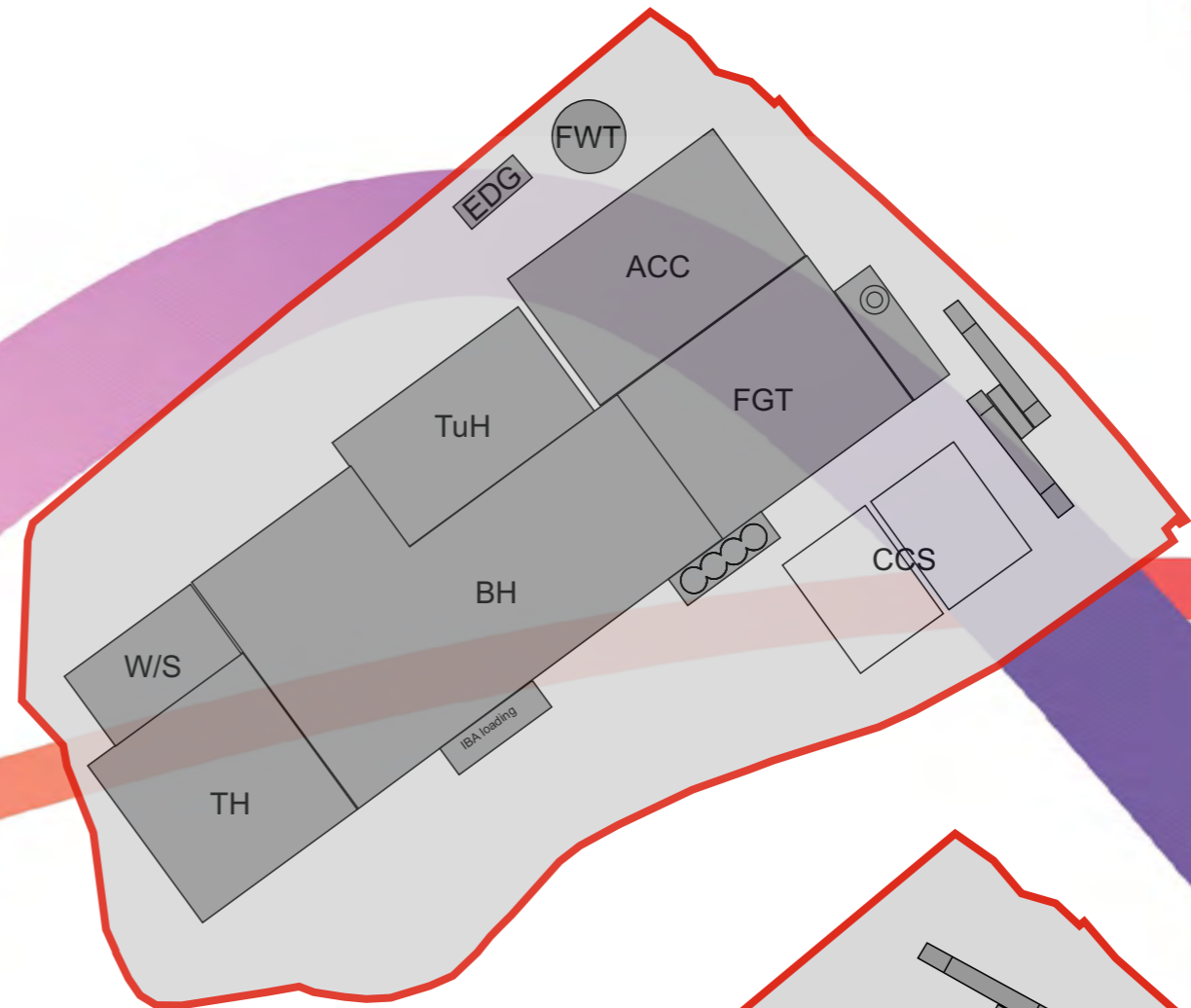
Having established the preliminary site layout, MVV instructed Savage and Chadwick (S+C) to undertake a site context analysis and develop the architectural concept design. This review is presented from page 4.

Alongside the architectural concept design review, MVV and S+C refined the site layout to ensure the emerging proposals met the considerations highlighted above. The proposed site layout is presented on page 5.



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Site Layout Review



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Site Layout: Draft



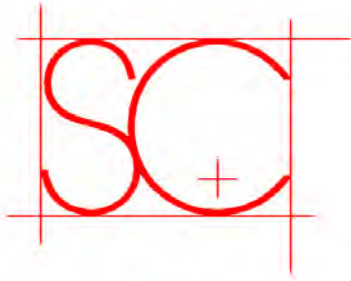
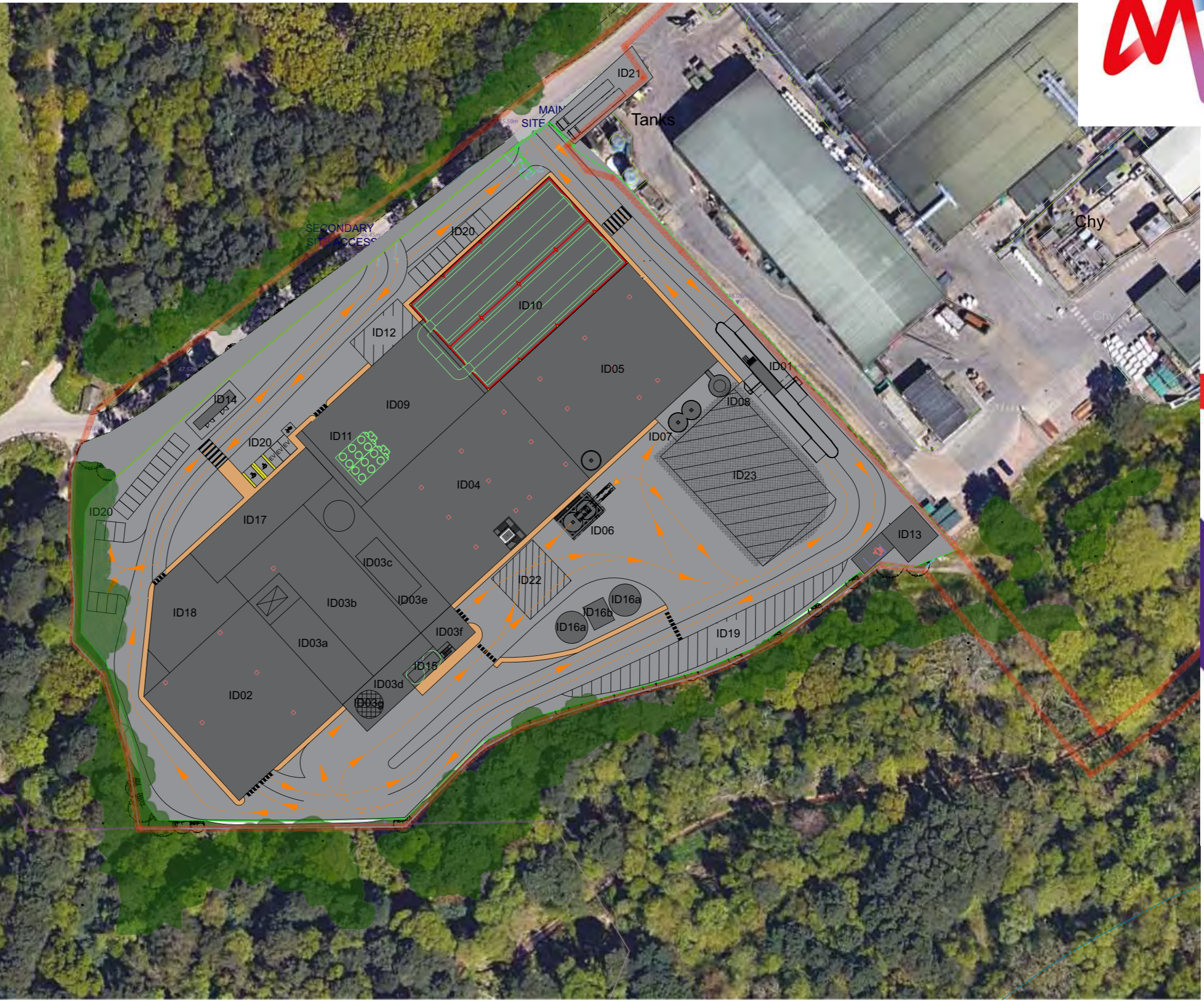
KEY

- PLANNING RED LINE BOUNDARY
- PROPOSED 2.4m HIGH PALADIN TYPE PERIMETER FENCE
- CANFORD HEATH NATURE RESERVE BOUNDARY
- PROPOSED/RETAINED TREES & SHRUBS

0 10m 20m 30m 40m 50m

LEGEND

- ID01: Gatehouse / weighbridges
- ID02: Tipping hall
- ID03: Waste bunker building
 - (ID03a): Tipping bunker
 - (ID03b): Main waste bunker
 - (ID03c): Waste chute platform
 - (ID03d): Crane maintenance area
 - (ID03e): IBA Bunker
 - (ID03f): IBA loading enclosure
 - (ID03g): Back loading hatch
- ID04: Boiler house
- ID05: Air pollution control building
 - (ID05a): APC plant and reactor
 - (ID05b): Bag filter house
 - (ID05c): Induced draft (ID) fan
 - (ID05d): Compressed air station
 - (ID05e): Water treatment plant
 - (ID05f): Urea tank
- ID06: APCr silos
- ID07: Lime & activated carbon silos
- ID08: Chimney & CEMS platform
- ID09: Turbine hall
- ID10: Air cooled condenser (ACC)
- ID11: Water re-cooling system
- ID12: Future district heating equipment area
- ID13: Main transformer & switchgear
- ID14: Emergency diesel generator
- ID15: Diesel tanks
- ID16: Fire water tank & pump enclosure
 - (ID16a): Fire water tanks
 - (ID16b): Fire pump enclosure
- ID17: Switchgear building, administration building and control room
- ID18: Workshop & stores
- ID19: Lay-by area
- ID20: Parking areas
- ID21: HGV out of hours parking area
- ID22: Mobile crane slab
- ID23: Laydown / maintenance & future environmental requirements area



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Site Layout: Proposed



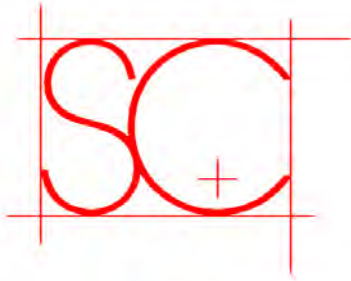
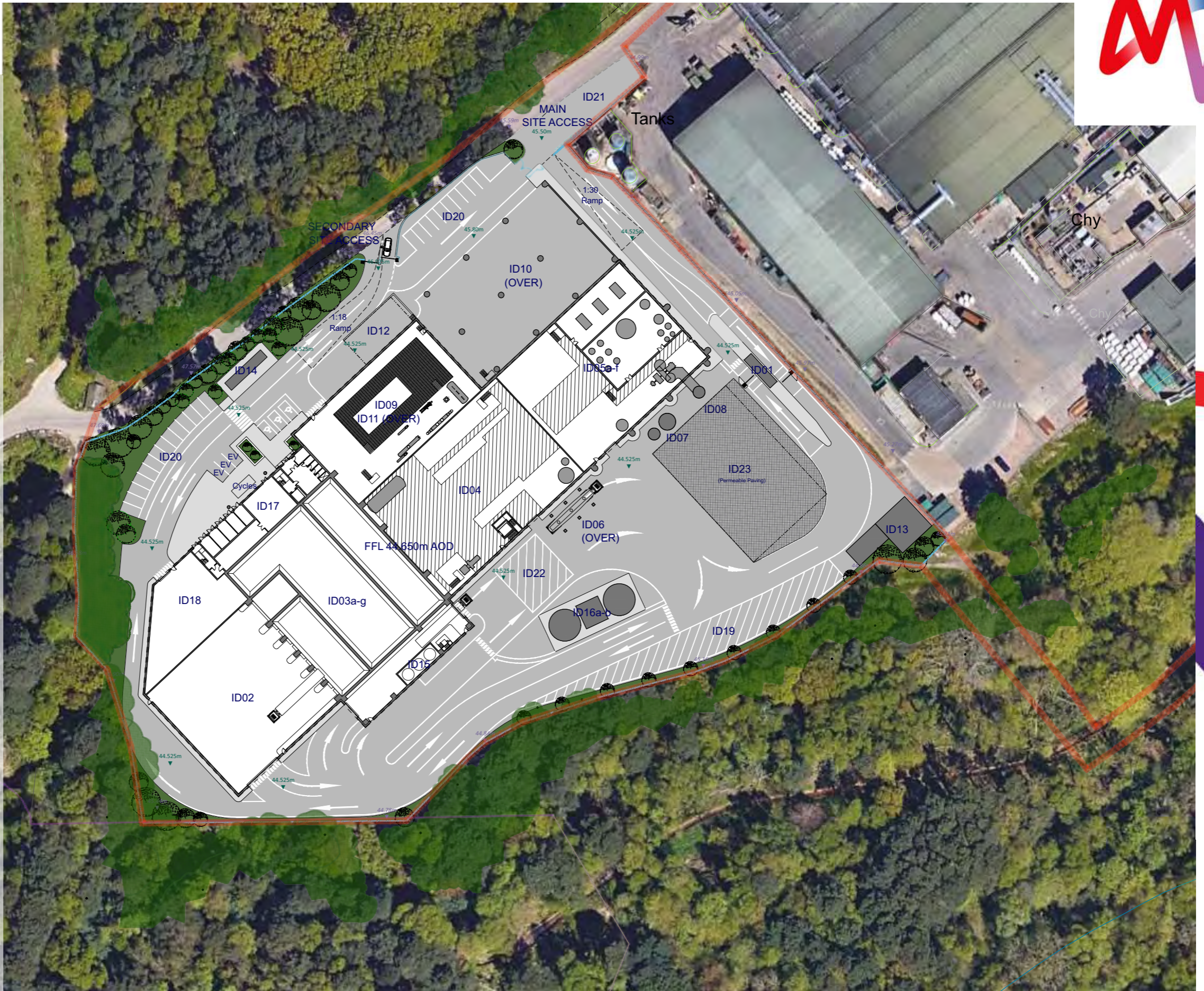
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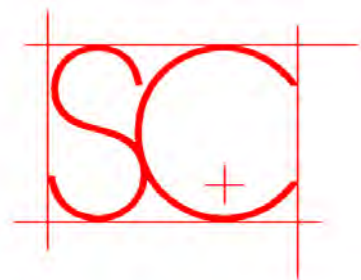
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Site Context



The CRP site is unusual in that it is an industrial enclave in a rural setting. Although it is to a large extent screened by existing mature trees the required size of the building and chimney mean that its higher profile will be visible from a distance. The surrounding topography and landscape is rural in context in that natural curves and contours define the surrounding skyline profile of the site. The photograph below illustrates the context – the 35m high chimney of the existing facility is just visible.

Canford Resource Park from distance (see VP)



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Concept designs



Options

There are many forms that an EfW can take however they are all driven by the internal process. This process is linear and the required height and mass builds from waste input (lowest) through the incineration process in the boiler (highest) and resultant air pollution control and bottom ash and energy recovery. The required height of the chimney to ensure no pollution risk is often considerable and the height will determine its architectural treatment. Using these principles, Savage and Chadwick (S+C) produced four options for consideration. Each of these options is explained as follows.

Option 1

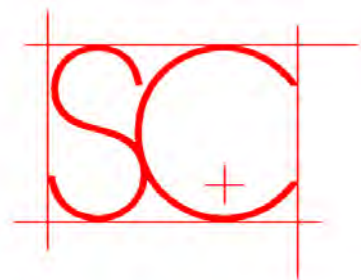
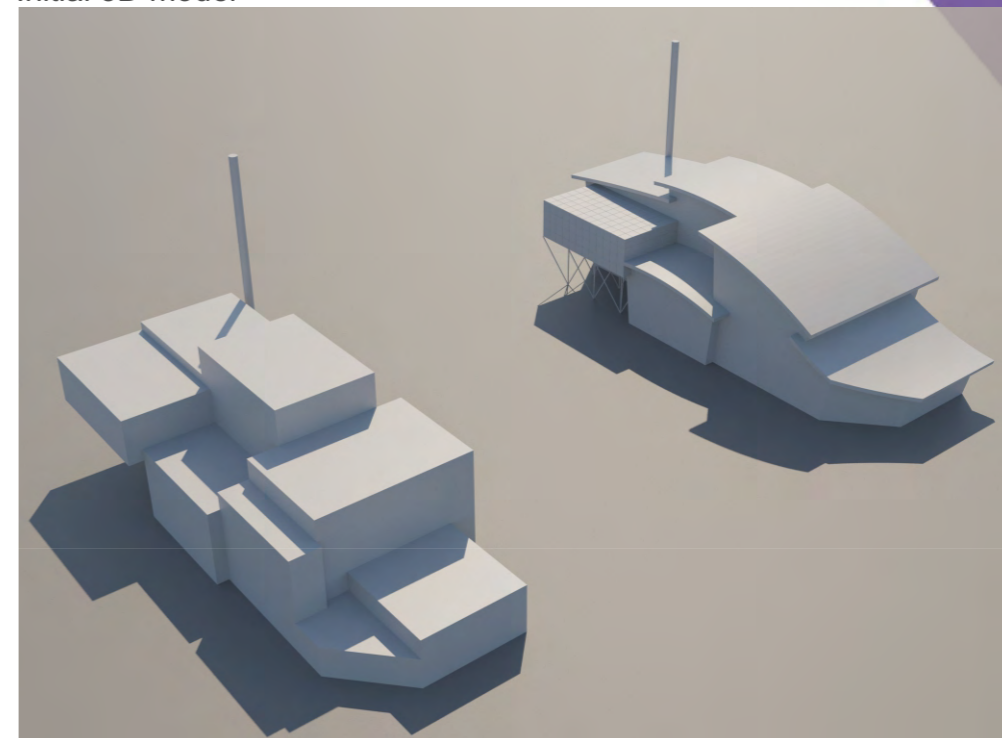
This option was a starting point for the design. S+C modelled the various mass requirements of the building 'boxes' using the selected site layout to offer a visual indication of how the building needed to function. From that model, S+C produced a series of basic curved profiles to enclose the mass. The reason for the curves was to reflect the site context as explained above. When viewing the site from a distance the curved profile of the roof reflects the natural environment the building is set in. To illustrate this, the attached photograph of S+C Isle of Man plant is included.

The initial 3D model provided a starting point for S+C design development. The chimney is illustrated as a single slim element due to its height. Whilst not fully fixed at the time of the concept design review, the required height of 90 – 115m dictates that any adornment or alternative form would be unwise as the resultant visual impact would be unacceptable. This is in direct contrast to the Isle of Man example where the chimney height of 60m set within the profile of surrounding hills could accommodate a more sculptural form. In all of the examples the chimney is the same slim profile.

Isle of Man EfW facility



Initial 3D model



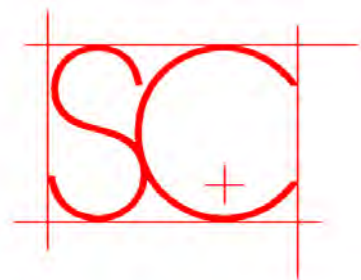
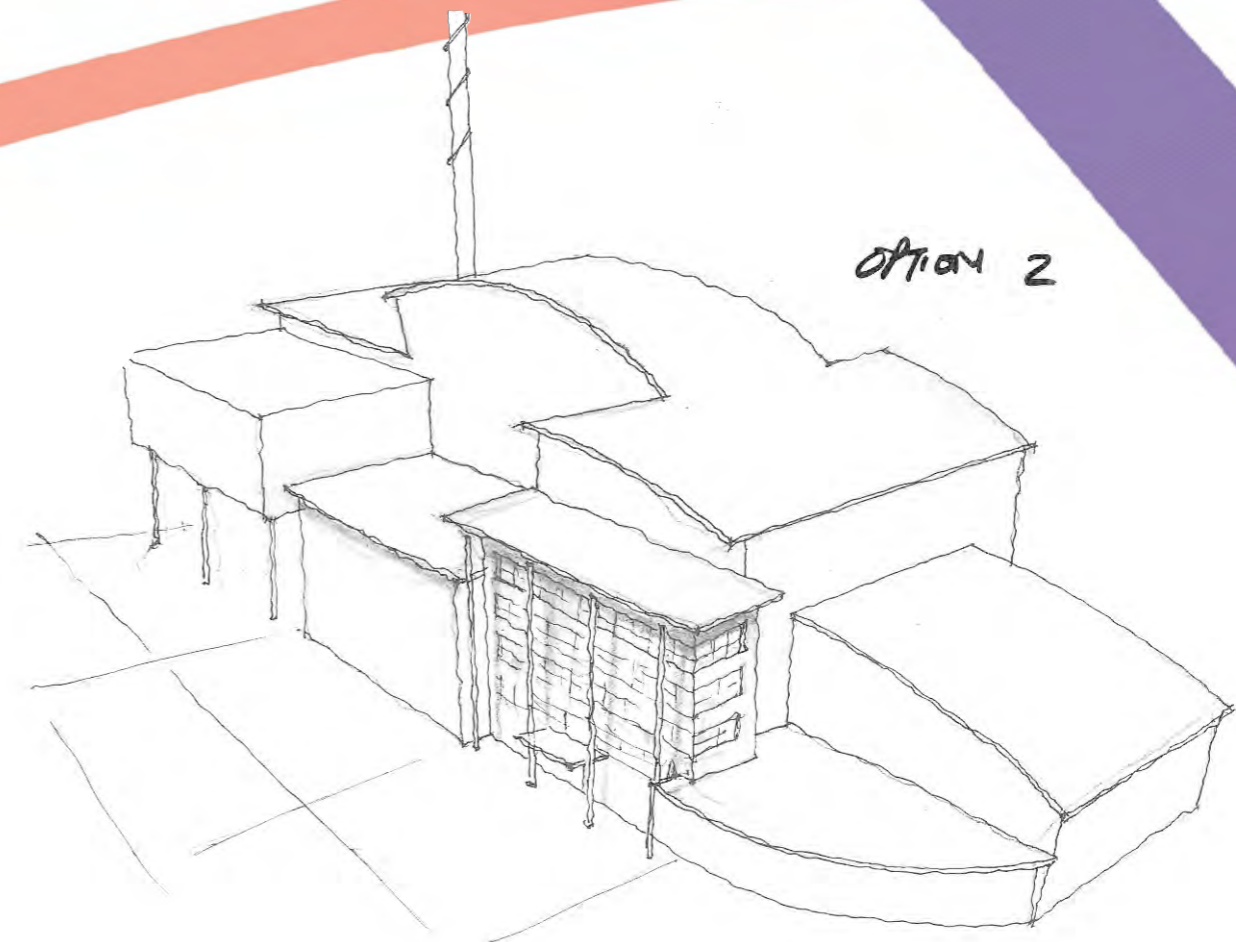
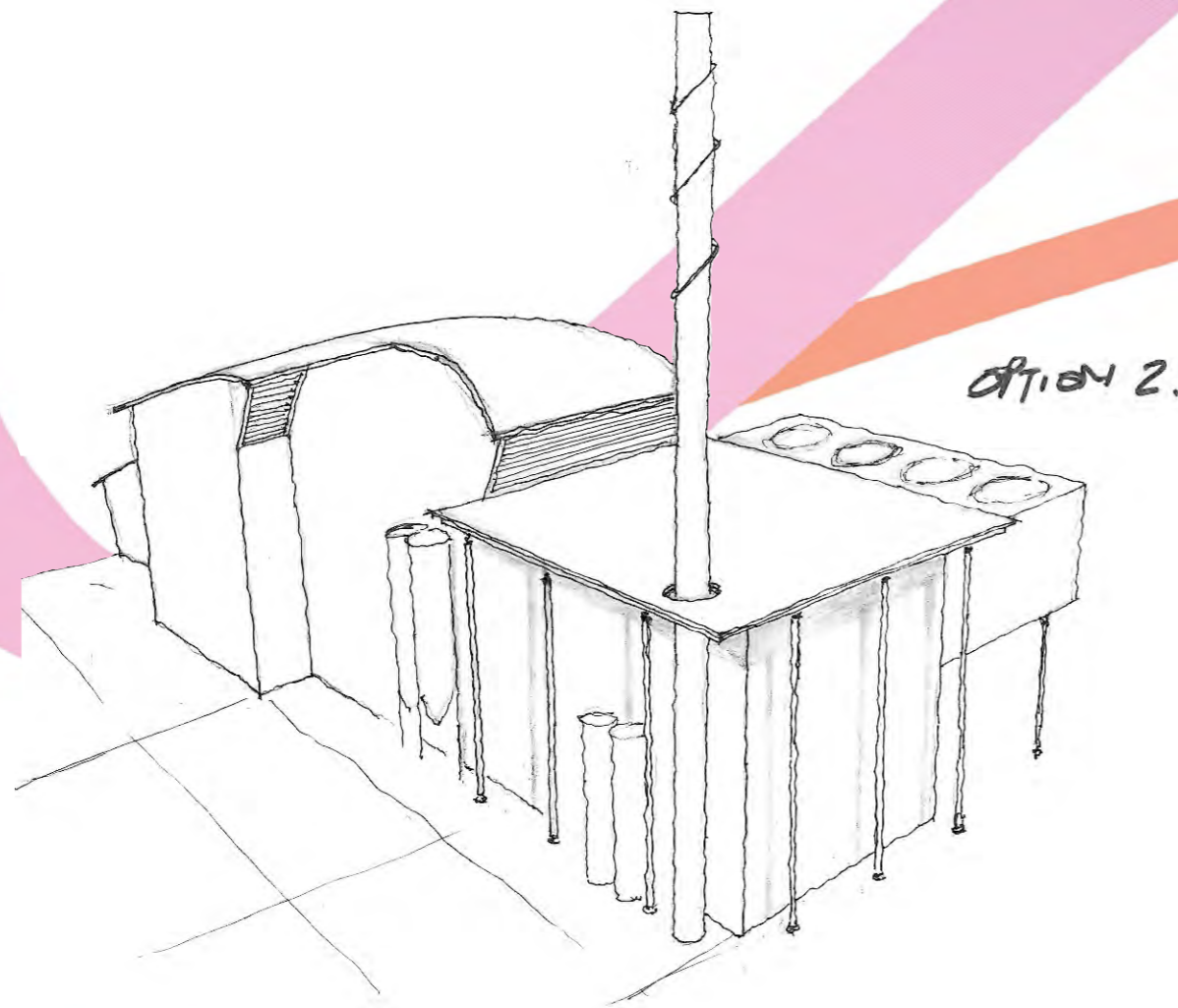
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Concept designs



Option 2 (preferred)

The sketch for Option 2 breaks the curved form down a little to more efficiently enclose the required volumes. From a distance however the main roof profile is still consistent with the visual impact of Option 1. This option however explores the possibility of the Air Pollution Control (APC) building and administration block as flat roofed profiles with significant eaves overhangs supported by circular feature columns. The main APC roof overhang is directional in that no overhang is permissible over the Air Cooled Condensers (ACC) however on the chimney side of that building, the overhang is significant and supported by canted columns to allow the functional requirements of access to the APCr silos. This chimney then 'pierces' the roof at its junction. This achieves two things – a lessening of the visual impact of the chimney at closer distances to the building and shelter for the various functional activities below – such as the Continuous Emission Monitoring (CEMs) platform below. The APC building is planned to be a green roof. The ACC block is clad with a decorative cladding panels on the vertical sides, but has to remain open at top and bottom for airflow requirements. The administration building adopts the same architectural theme as the APC building. In the more developed modelling of this preferred option, S+C have also accurately profiled the chimney.



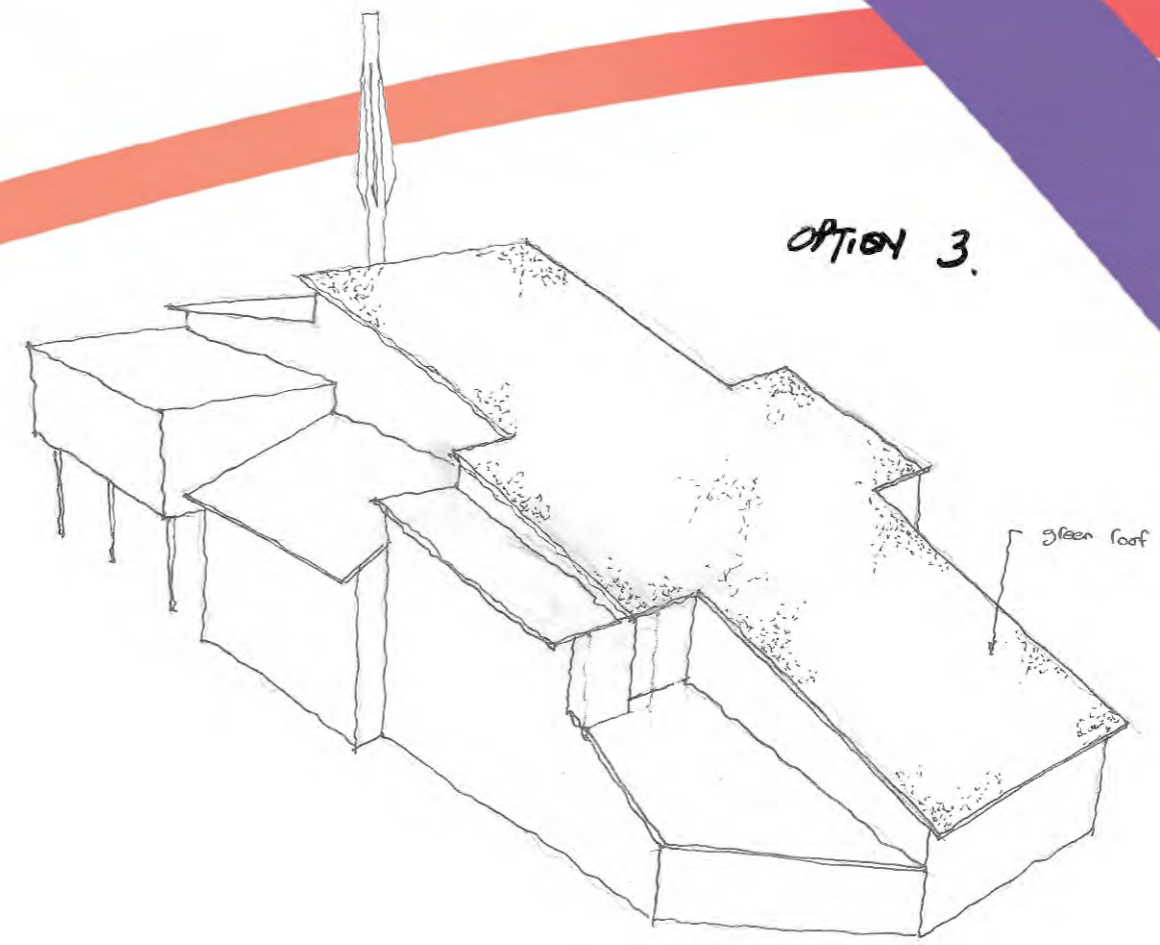
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Concept designs

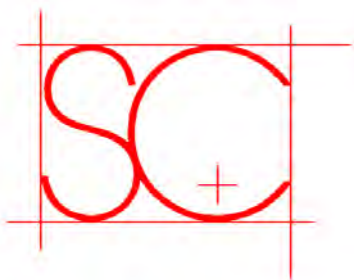


Option 3

Option 3 explores an alternative approach by enclosure of the required volumes with angular monopitch forms. The main roof is continuous from tipping hall to boiler apex and could maximise the green roof potential. This may be of benefit when viewed from a distance from a southerly direction. Although striking in appearance we concluded that this sort of building form would sit awkwardly in its context. The angular forms would visually jar against the natural landscape profiles and the architectural statement it would undoubtedly make would be at odds with its surroundings. The process was however useful as it quickly allowed S+C to view the effect of this architectural treatment on the surrounding environment.



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Concept designs



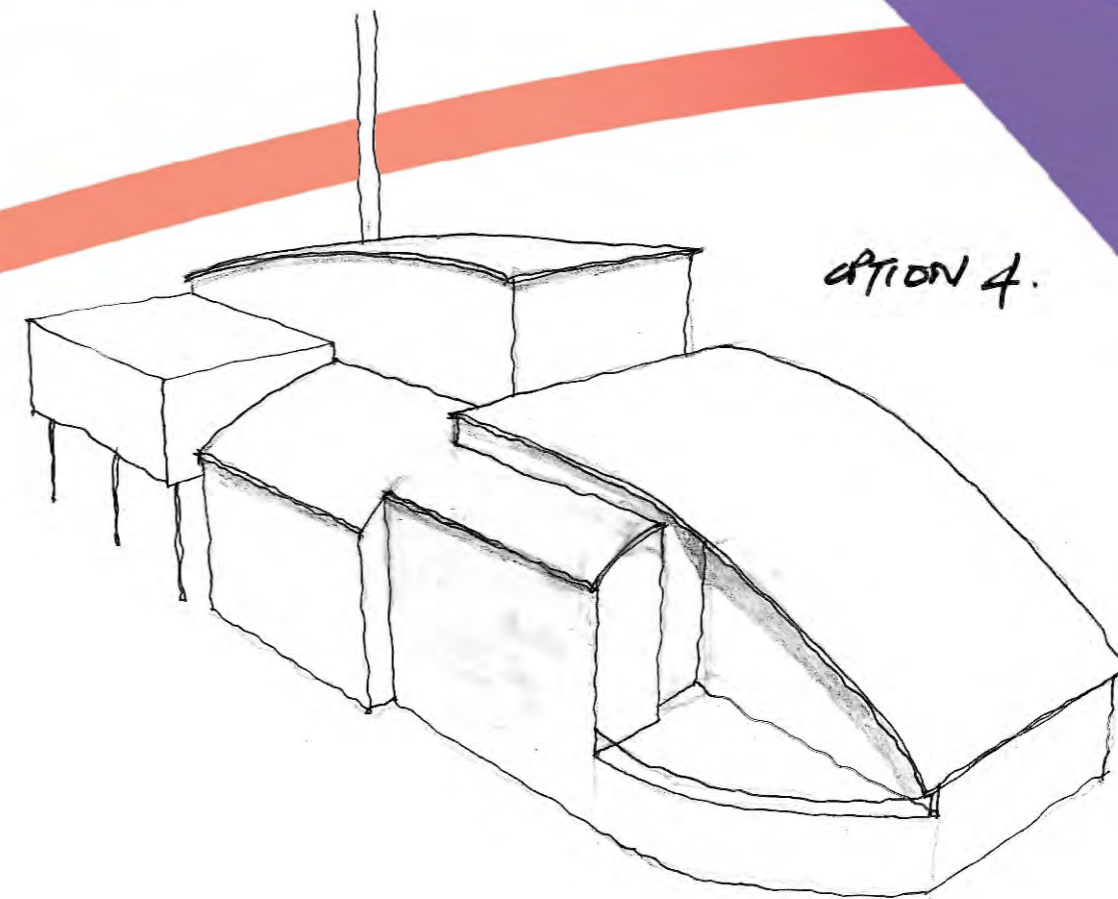
Option 4

Option 4 returned the curved forms again but explored the potential to change some of the curved enclosures to span in different directions. Whilst this enclosed the required volumes reasonably efficiently its resultant effect did not have the same visual 'flow' of both options 1 and 2. It consequently appears as a series of separate and visually unconnected curved volumes. The distant views would in S+C's opinion also be less successful than preferred option 2 and the higher profiles are not natural landscape flows, but shapes truncated by vertical elements alien to a natural landscape.

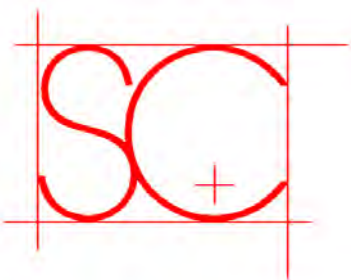
S+C's Devonport EfW CHP Facility design echoed this approach of splitting the building into a number of components however that site was in an entirely urban environment – see below.



Architectural concept: Devonport EfW CHP Facility



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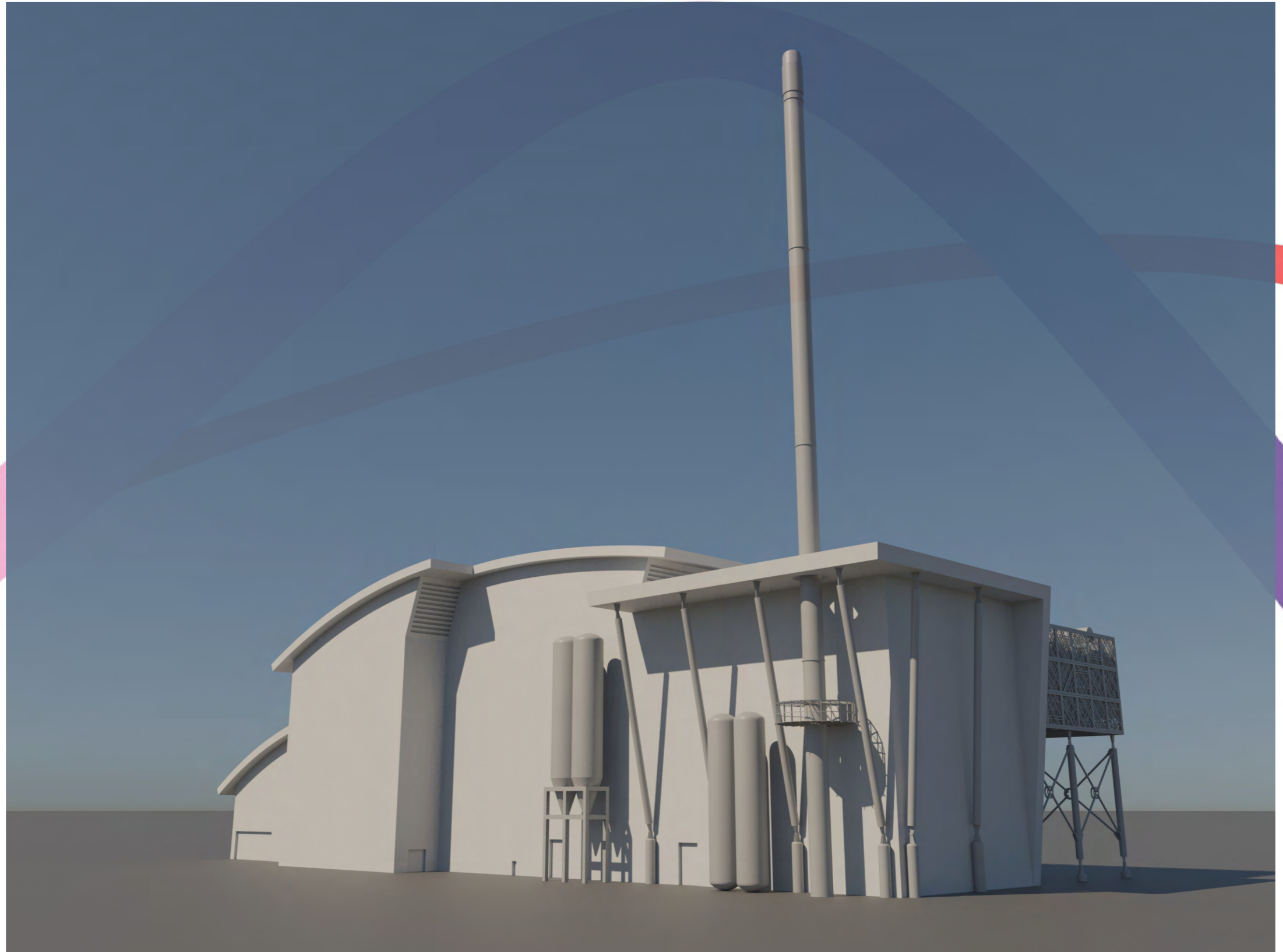
Preferred design



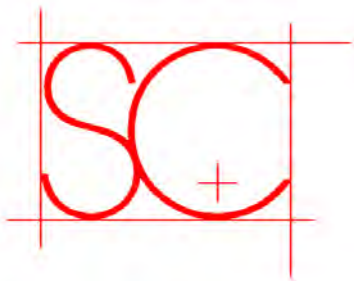
Conclusion

The preferred and developed option (Option 2) achieves distant context with its surrounding landscape and some visual mitigation of the chimney and closer views with a more dramatic architectural treatment. The curved and flat profiles are happily integrated together to provide a complete and pleasing architectural composition whilst allowing all the many functions of the EfW CHP Facility to be processed efficiently both internally and externally.

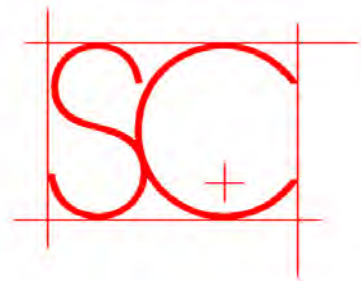
S+C are confident that the visual impact of this design will be sympathetic in profile and form.



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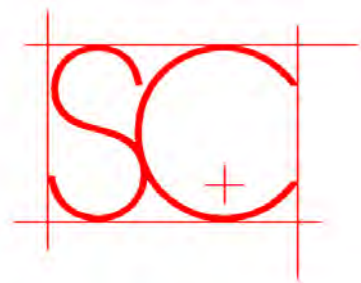


Preferred design



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Preferred design



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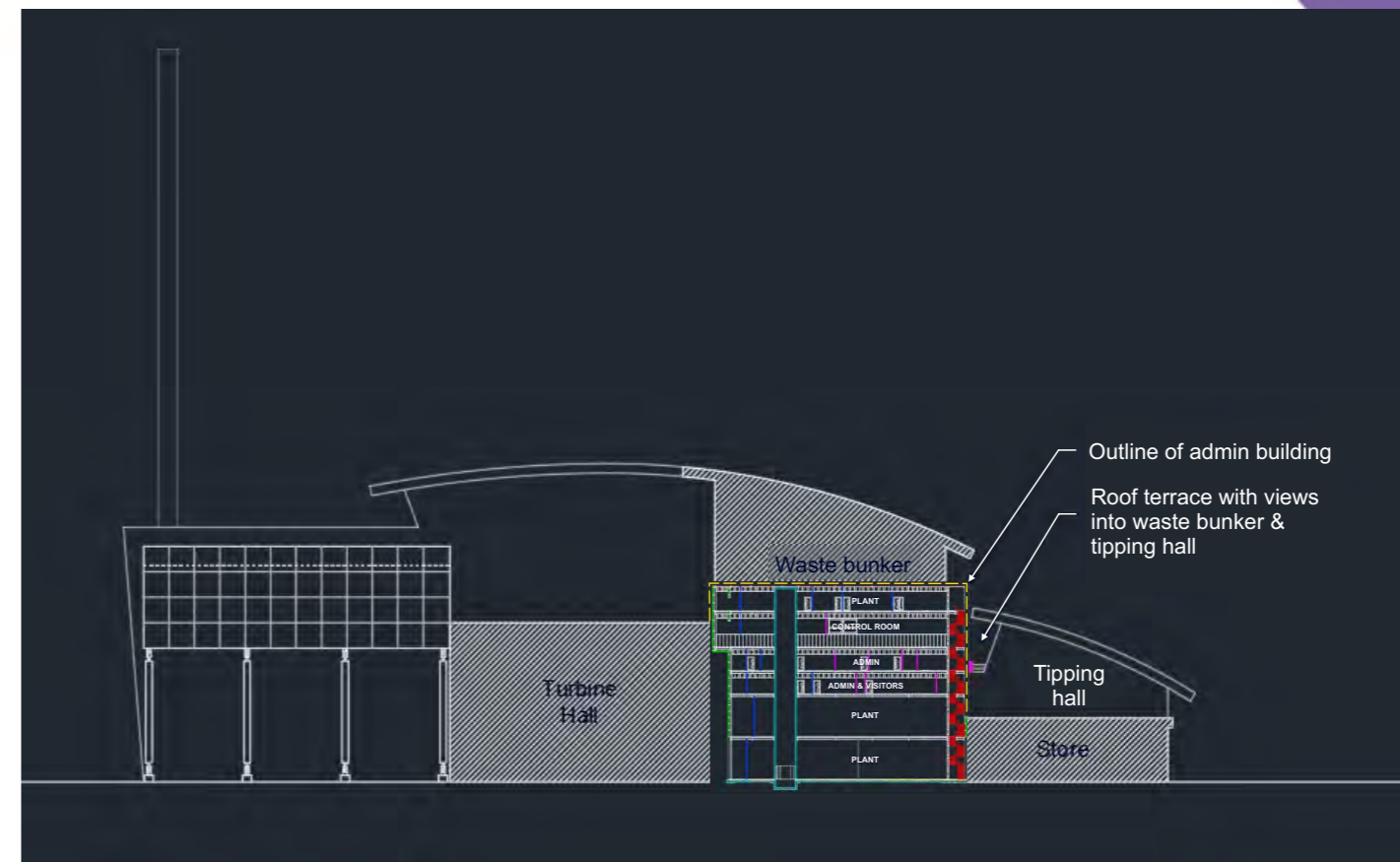
Refining the preferred design



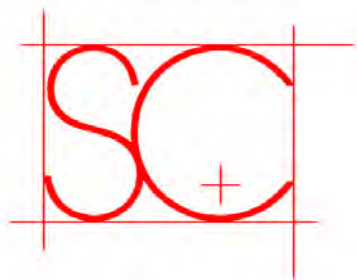
The design then considered the provision of green roofs and roof access for both ecological and visual benefit. Green roofs are possible on curved roof sections but in practice they have proven very difficult to maintain due to the rapid water run off and the required safety measures to enable such maintenance are considerable. Consequently the green roof provision was proposed for flat roof sections of the building – specifically the Air Pollution Control building, the Administration building and the Workshop and Stores. It is not possible to introduce green roofs to the Turbine Hall (rooftop plant requirements) or Air Cooled Condensers (free air requirement) so the provision was limited to the three aforementioned areas.



Access from the Administration building to the adjacent flat roof was considered for the purposes of visitors to the facility being able to view the tipping hall process below. First thoughts were to introduce a curved roof break to enable a roof terrace between tipping hall and waste bunker – however the required means of escape and technical issues restricting the viewing possibilities made this proposal unviable.



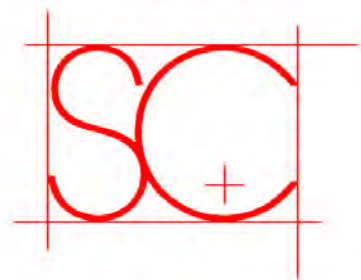
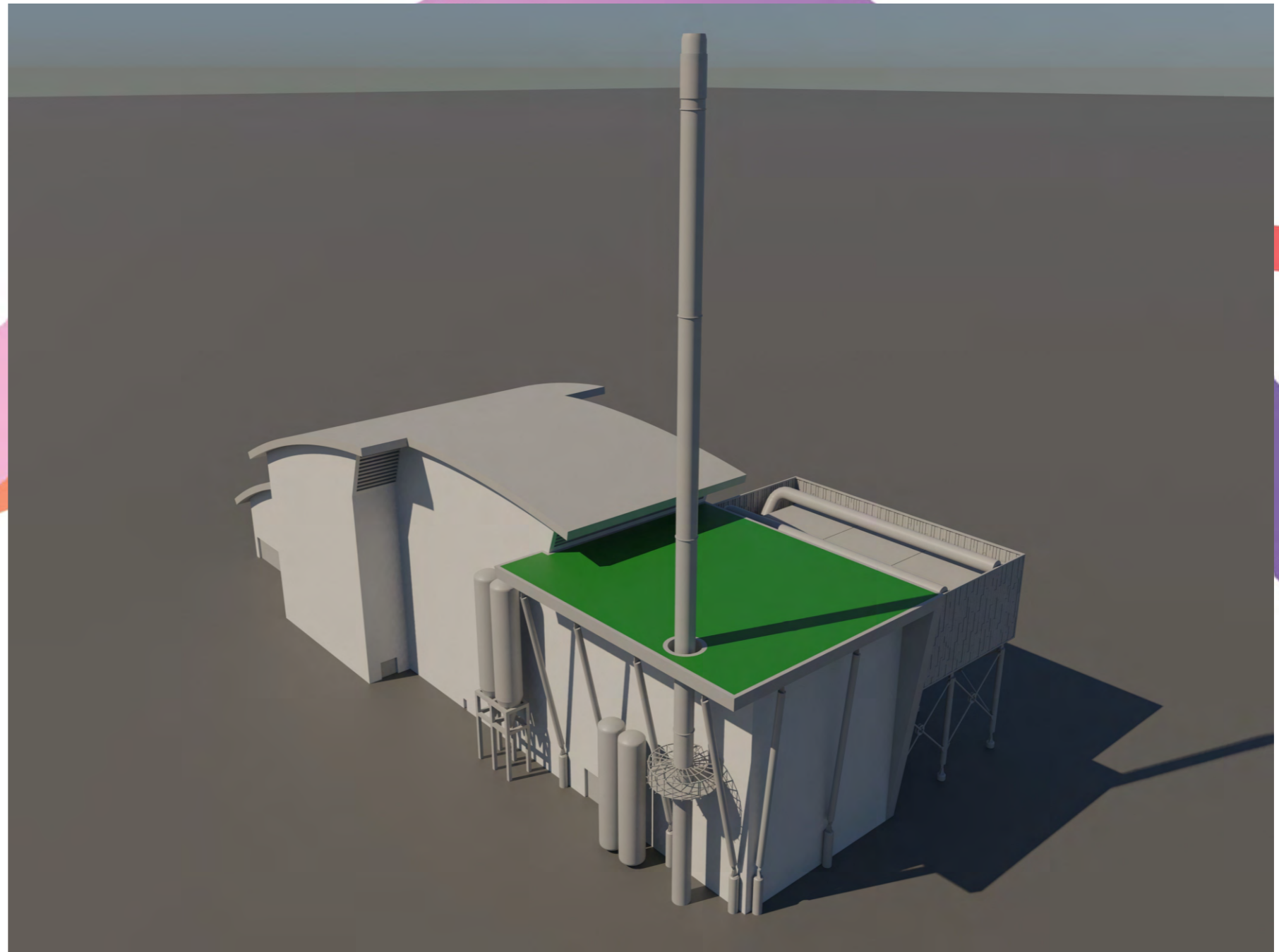
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Refining the preferred design



The Air Pollution Control Building roof (illustrated green) is a substantial green roof area and can be accessed for maintenance from the upper levels of the boiler house

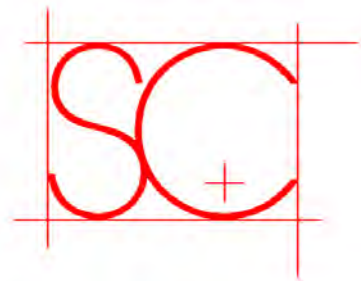
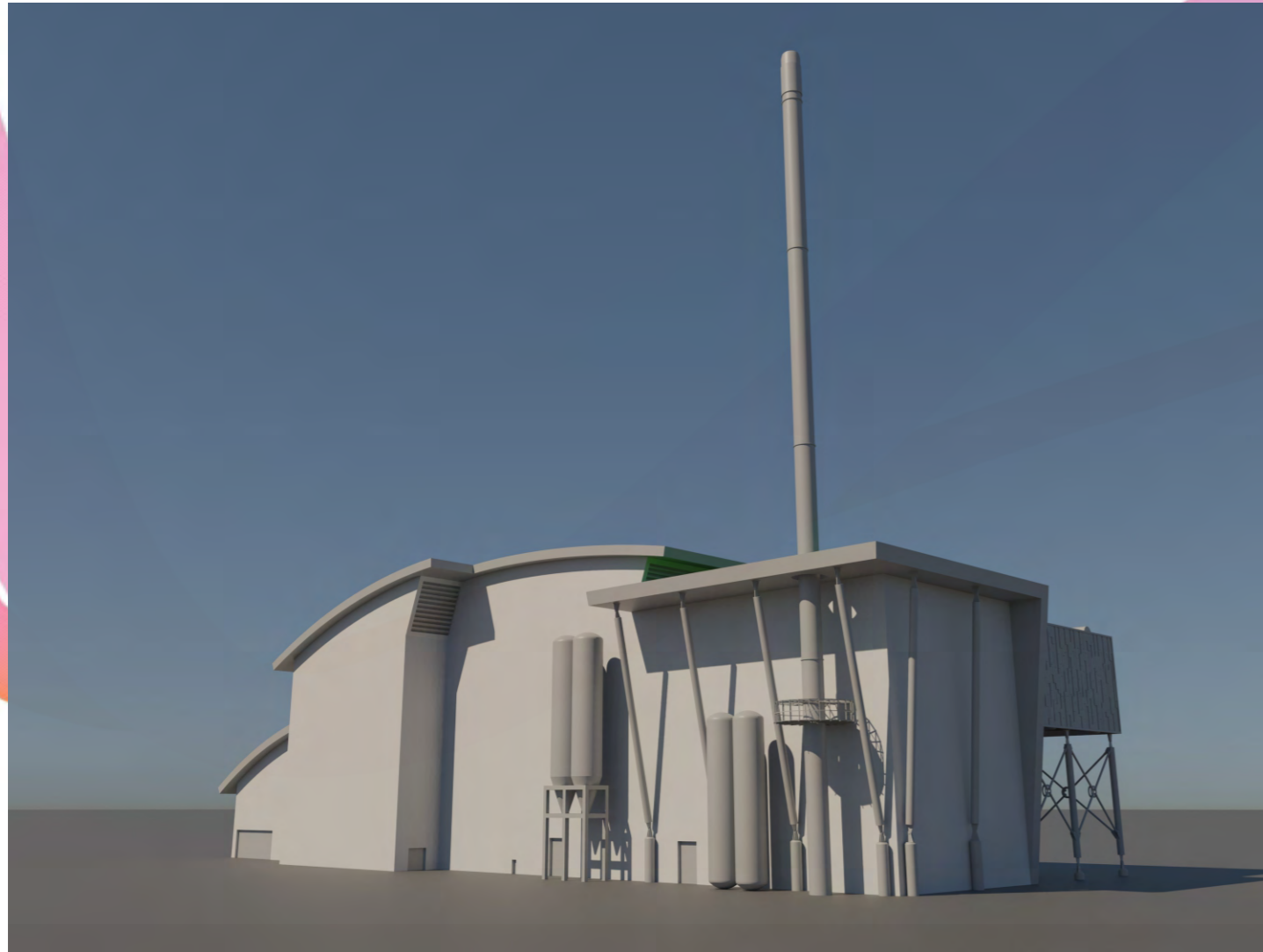


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Refining the preferred design



The Air Cooled Condensers require free air flow top and bottom but their sides are preferred solid. This offers an opportunity for a raised/textured cladding panel system and this has been incorporated.

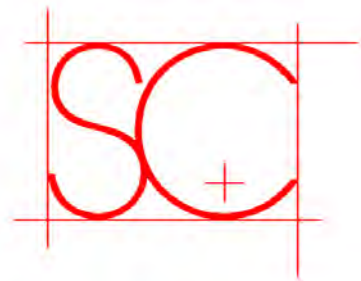


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Refining the preferred design



As an alternative solution to the roof access from the Administration building, a small enclosure has been created on the side of the Tipping hall mounted on the Workshop roof. This enables level access for visitors to the building and a good view of the tipping hall process below. The roof of this structure is also able to be a green roof.



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Refining the preferred design



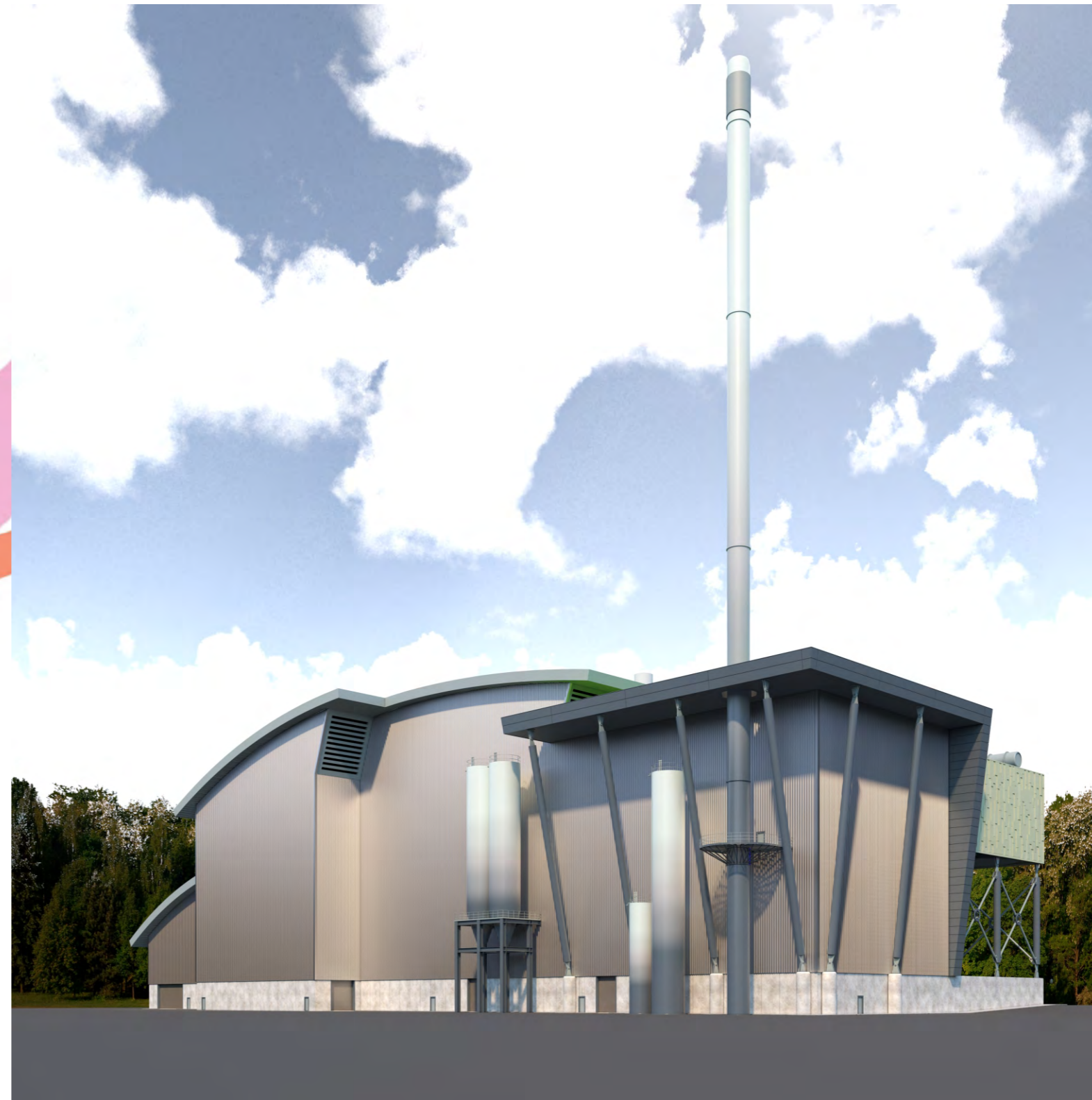
Having established a form for the proposed development consideration must be given to materials, colours and finishes.

A muted palette of clean, practical materials is used to lift the building beyond the industrial.

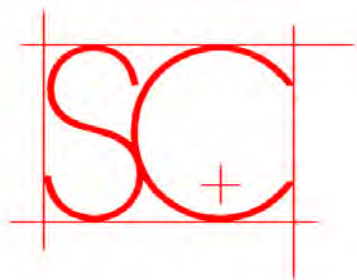
The use of precast concrete panels at the building's base provides both an aesthetic "plinth" as well a hard wearing finish to areas more vulnerable to accidental damage.

Above the plinth the building is extensively clad in a silver metallic panel. The finish of which picks up the ever-changing tones of the surrounding countryside whilst the undulating form softens and blends the effect.

The verticality of elements such as the silos and chimney is picked out by a graduated paint finish. When seen against the building this provides emphasis, when seen against the sky this significantly reduces the chimney's impact.



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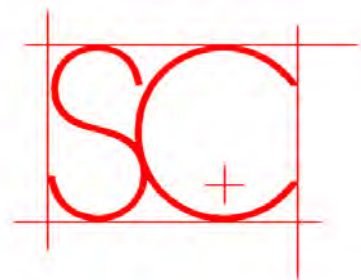
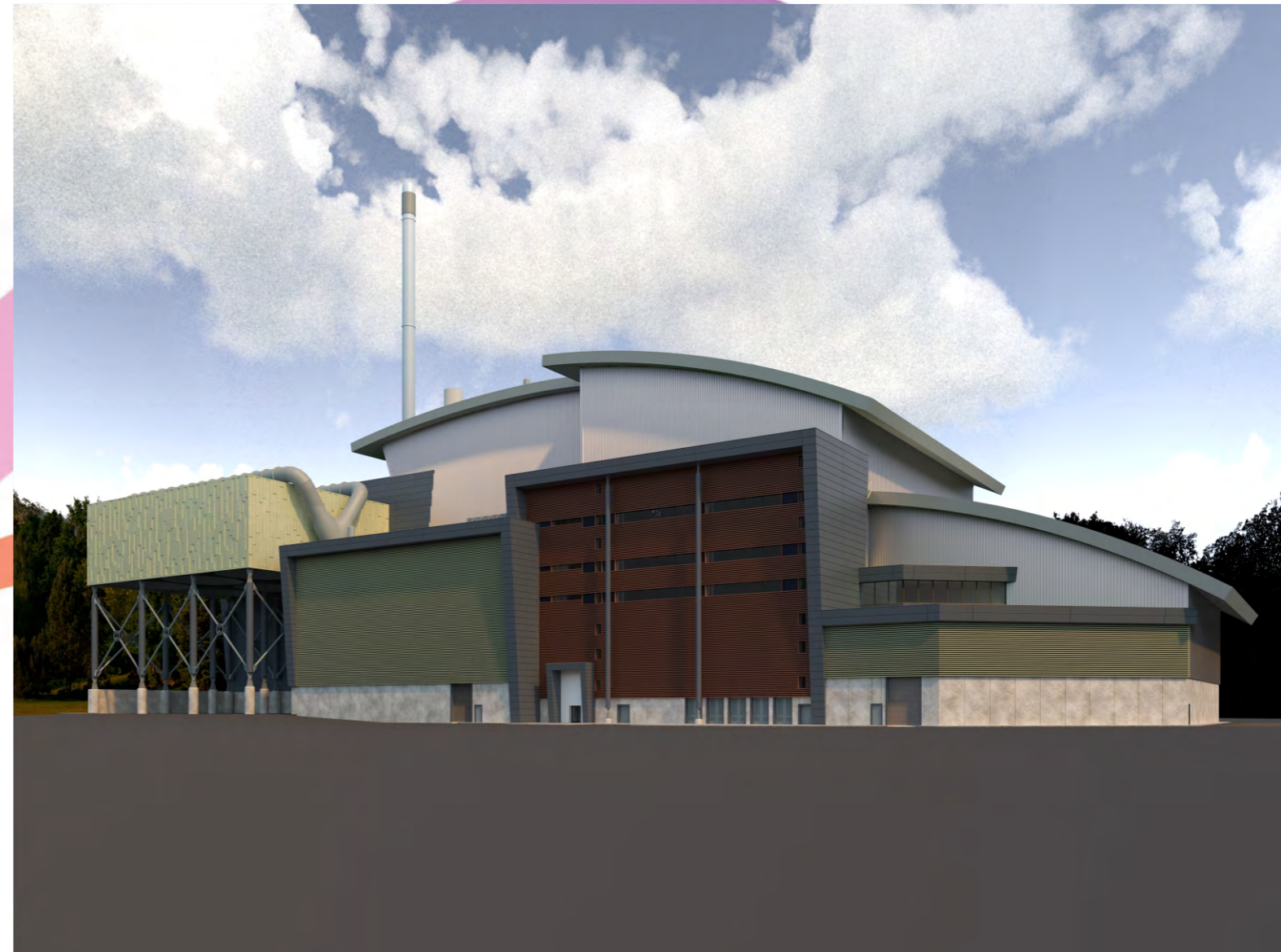
Refining the preferred design



Emphasis is given to the more “public”, north western side of the building where the more natural tones of Willow Green and Autumn offer a warmer welcome.

The framed elements, in Merlin Grey, help the larger volumes of the building step down to the more human scale of the administration building.

The feature fin profile cladding of these facades also helps to soften the elevations by providing texture.

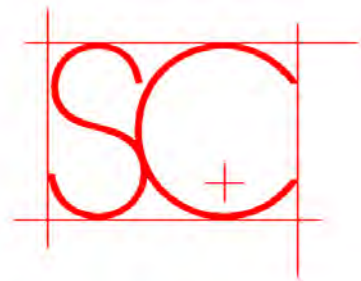


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Refining the preferred design



At this stage it has also become necessary to look at some of the smaller (yet still not inconsiderable) practical requirements of the building at roof level: - heat and smoke vents, duct work and roof access etc.



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Refining the preferred design



Chosen material palette.

A - RAL Colour finishes.

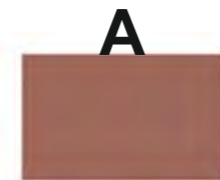
B - RAL metallic finish.

C - Precast concrete panels.

D - Kingspan Dri-Design rainscreen cladding or equivalent (colour not indicative)

E - Kingspan Quadcore Curved wall panel or equivalent (colour not indicative)

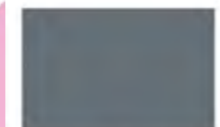
F - Feature fin profile cladding in Autumn & Willow Green



A
Autumn
RAL 040 50 20



Willow Green
RAL 100 80 20
BS 12B17



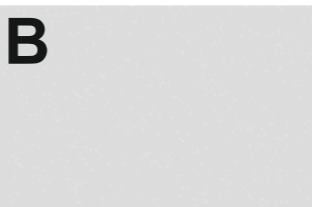
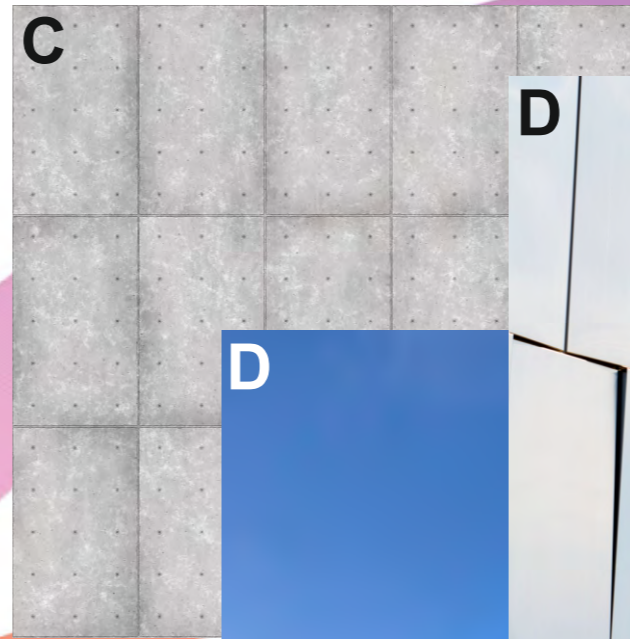
Merlin Grey
RAL 180 40 05
BS 18B25



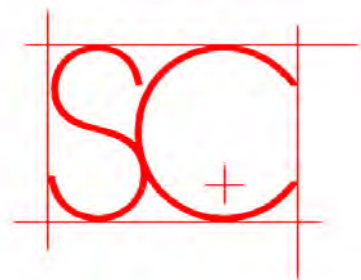
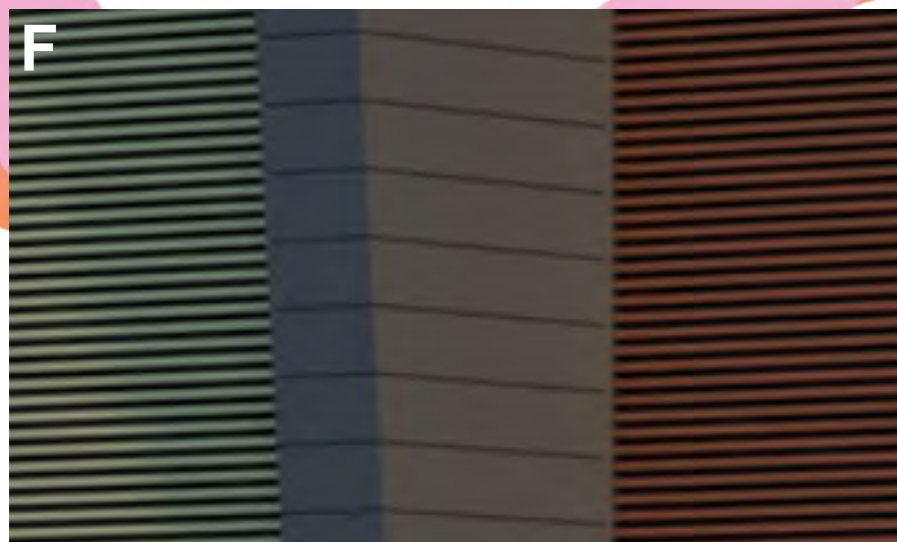
Pure Grey
RAL 000 55 00



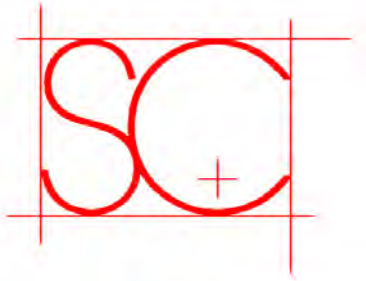
Goosewing Grey
RAL 080 70 05
BS 10A05



B
Silver
RAL 9006



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