Science and Technology Facilities Council

Chilbolton Observatory
Framework Development Plan

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1.0 Introduction

Overview of Development Plan

1.1 This document, and its accompanying Implementation Plan, set out a Development Plan for Chilbolton Observatory, in Hampshire. It is owned and run by the Science and Technology Facilities Council (STFC), part of UK Research and Innovation (UKRI), and administered as part of RAL Space within STFC.

1.2 Chilbolton Observatory is an important location for atmospheric and space science research but also needs to maintain an estate with numerous challenges, consider future security and access arrangements, and ensure it plays its part in STFC's Net Zero ambitions while securing and enhancing biodiversity on the site. The Development Plan aims to chart a course so that the estate can support the scientific pipeline and future strategy of the site.

1.3 This document sets out:

- The baseline situation as of late 2023
- Key issues and opportunities
- Future development scenarios for the site
- Suggested next steps and projects

Site and Context

1.4 Chilbolton Observatory is located to the southeast of the village of Chilbolton, in the Test Valley District of Hampshire. It is located on a valley top plateau of farmland, to the east of the Test Valley, a protected rare chalk stream.

Figure 1: Site boundary on aerial plan

1.5 The site, covering 75 hectares, is mostly agricultural farmland which is leased to a local farmer. At the southwestern edge of the site is a small compound of buildings, the largest of which is a steerable radar dish, some 25m tall. This instrument is used for atmospheric research as well as low-earth orbit observations.

1.6 The site is accessed from Drove Road, which is surfaced from the public highway junction with Little Drove Road to the site access gate. An additional access for the farm is located further south on Drove Road, which is unsurfaced at this point.

1.7 A single-storey building housing offices, a radar dish control room, a workshop, a laboratory and services, covering 1760m^2 (NIA) is located to the south of the dish. The total estate with outbuildings is some 2,500m^2 in total.

1.8 Elsewhere in the site are numerous small-scale or temporary experiments, including an array of low-frequency radio antennae, part of the European LOFAR observatory. These are extremely sensitive to electromagnetic interference and are located some distance from the other buildings.

1.9 The site was formerly an RAF airfield, and its scientific research started as the radio and space field station of the Science Research Council, with the radar antenna installed to enable radio propagation studies, due to its relative isolation from major centres (and their electromagnetic noise) and its excellent visibility of the horizon, allowing long-range observations of storms over 50 miles away.

1.10 Currently there is a small staff contingent of 8 people based on site, and is operated as part of RAL Space. The site also hosts temporary experiments from other public sector bodies, including the Environment Agency and UK Space Agency.

UKRI and STFC's Strategy

1.11 STFC's mission is to deliver world-leading national and international research and innovation capabilities and, through those, discover the secrets of the Universe. Our major research and innovation campuses including at Chilbolton Observatory and our research facilities across the UK support fundamental research in astronomy, physics and space science.

1.12 Our goal is to deliver economic, societal, scientific and international benefits to the UK and its people – and more broadly to the world. Our strength comes from our distinct but interrelated functions.

1.13 Our scientific facilities provide access to world-leading, large-scale facilities across a range of physical and life sciences, enabling research, innovation and skills training in these areas.

1.14 On our national campuses we work with partners to build National Science and Innovation Campuses based around our National Laboratories to promote academic and industrial collaboration and translation of our research to market through direct interaction with industry.

1.15 We support university-based research, innovation and skills development in astronomy, particle physics, nuclear physics, and space science.

1.16 Our large-scale scientific facilities in the UK and Europe are used by more than 3,500 users each year, carrying out more than 2,000 experiments and generating around 900 publications. Our facilities provide a range of research techniques using neutrons, muons, lasers and X-rays, and high performance computing and complex analysis of large data sets.

1.17 They are used by scientists across a huge variety of science disciplines ranging from the physical and heritage sciences to medicine, biosciences, the environment, energy, and more. These facilities provide a massive productivity boost for UK science, as well as unique capabilities for UK industry.

1.18 We help to inspire and involve a future pipeline of skilled and enthusiastic young people by using the excitement of our sciences to encourage wider take-up of STEM subjects in school and future life (science, technology, engineering and mathematics).

1.19 UKRI's strategy, and by extension STFC's strategy sets out long-term, high-level priorities for how we will deliver our vision for an outstanding research and innovation system in the UK that provides everyone with the opportunity to contribute and to benefit, enriching lives locally, nationally and globally. It is underpinned by four principles for change:

- Diversity;
- Connectivity;
- Resilience; and
- Engagement.

1.20 These principles are fundamental to how we work as an organisation and will help to create the conditions for the UK's research and innovation system to flourish.

1.21 In addition, the strategy outlines six objectives for how UKRI will deliver on its ambitions. Working with government and partners across the sector, to foster world-class people and careers, places, ideas, innovation and impacts, supported by STFC as a world-class organisation.

1.22 Through STFC's investments we ensure that UK-funded researchers remain at the forefront of global pioneering discoveries. We continue to provide strategic leadership and identify the brightest ideas and highest-priority areas for investment in our frontier science and facilities, and will work across UKRI through a new interdisciplinary responsive mode.

A ‘World-Class Place’

1.23 STFC’s vision and ambition, as part of UK Research and Innovation is to take a key role in UKRI’s key role in delivering the government’s ambitions for the UK as a global leader in research and innovation, and priorities set out in the:

- plan for growth;
- research and development (R&D) roadmap;
- innovation strategy;
- the R&D people and culture strategy;
- integrated review; and
- levelling up white paper.

1.24 Innovation is the lifeblood of the UK’s future economic growth. It boosts productivity, helps businesses grow and scale and drives the creation of a wide range of high-quality jobs. The future development of RAL Space and Chilbolton Observatory as one of its facilities will be a key driver of that economic growth.

1.25 The “World-Class Places” objective of UKRI’s strategy recognises the vital importance of place within the research ecosystem, bringing together people and facilities within an environment that enables innovation to thrive. The Development Plan at Chilbolton Observatory supports this objective and enables delivery of this vision.

1.26 This plan supports and enables the overall quality of placemaking, common infrastructure provision, and comprehensive forward planning at Chilbolton Observatory, with a clear forward spatial framework within which development can come forward. It will ensure that as well as the research inside the buildings, the spaces between buildings and the infrastructure that serves them is not forgotten and is provided to the same standard.

Image credit: National Centre for Atmospheric Science

The Science and Pipeline at Chilbolton

1.27 Chilbolton Observatory was originally founded to provide a home for radio propagation studies with the distinctive steerable radar dish located at a former RAF airfield in Hampshire that offered excellent visibility of the horizon, critical to understanding longer distance effects.

1.28 Since then it has continued to host this research, and has added additional observation facilities for a variety of space and atmospheric physics related science, including LOFAR, the international low-frequency radio array for observing deep space. The 25m antenna provides an atmospheric weather capability and now provides satellite and low earth orbit object tracking as part of the UK Space Agency's work.

1.29 Chilbolton has proven to be an adaptable location for experiments that require observation of the sky, and is a well-used facility for a variety of research councils and other public sector bodies (for example the Environment Agency). Many temporary installations are hosted here, for both operation and testing prior to shipment to other more remote locations (e.g. the Arctic).

1.30 Chilbolton is operated as part of RAL Space, and the pipeline for experiments is handled as part of RAL Space's overall strategy. Creation of the Development Plan has been undertaken in parallel with a refresh of Chilbolton's science strategy and future vision within the STFC family of sites. As a result, the Development Plan sets out a range of potential scenarios and their implications, based on stakeholder feedback, that have been used as a part of the development of the future vision of the site.

Development Plan Objectives

1.31 The Chilbolton Observatory Development Plan follows the overall pattern of other STFC Development Plans, with overarching objectives in three themes.

Science

- Ensure Chilbolton Observatory can retain its status as a world-class research facility
- Enables and prepares for a wide range of future scientific use scenarios for the site
- Addresses the issues that are limiting the site's potential, including site access, building condition and suitability
- Future-proofed, flexible and modern accommodation for scientific research and potential facilities to support wider STFC business incubation

People

- Improve the quality and utility of outdoor spaces through improved landscape and public realm
- Consider how best to manage the estate to facilitate collaboration and integration of the site within the wider RAL Space

Environment

- Prepares the site for a Net Zero future as an exemplar site for decarbonisation and environmental sustainability
- Maximises biodiversity and nature recovery, with potential strategic nature recovery for wider STFC use within this countryside site
- Minimise environmental and visual impacts on neighbours

Environmental Sustainability at Chilbolton

1.32 UKRI's aspiration is to be Net Zero carbon emitter by 2040, and the UK Government has committed to being Net Zero by 2050. To support this, STFC wish to ensure that their estate can move to being Net Zero by 2040. The Development Plan will contribute towards this goal by setting out essential changes, and wider strategic areas of opportunity at Chilbolton Observatory.

1.33 Chilbolton Observatory, due to its comparatively small estate and large landholding, and the nature of the scientific research it is undertaking, has an exemplary opportunity to demonstrate leadership on environmental sustainability within STFC and wider UKRI.

1.34 By using a combination of photovoltaic panels, on-site battery energy storage and electrification of heat sources within buildings, the site could be the first in STFC to be Net Zero Carbon or largely decarbonised. The site is currently fueled by kerosene.

1.35 By employing different land management approaches, the site could provide new ecological habitats and provide a strategic biodiversity net gain 'bank' for the wider STFC estate as it undergoes renewal and further development.

1.36 The Development Plan supports the site ambition and vision by identifying the key estate and infrastructure changes that will need to be undertaken to realise it.

Methodology

1.37 Due to the smaller scale of site and limited anticipated pipeline, this Development Plan has been undertaken using a more 'light-touch' approach than Development Plans at STFC's larger sites at RAL and Daresbury.

1.38 The key stages of work have been:

1. A baseline assessment (including planning policy) and site visit (October 2023) which established a deeper understanding of the site and a discussion of scientific needs and future strategy. This site visit was collaborative between STFC's Estates team, research and operational staff at Chilbolton, and the Development Plan consultant team from David Lock Associates (DLA).
2. Supporting studies on PV energy generation and storage, development potential and nature recovery.
3. A review of findings and an opportunities plan, followed by feedback from STFC on additional projects or emphasis. This led to the development of three potential development scenarios.
4. A series of stakeholder meetings to discuss the draft Development Plan, and choose a preferred development scenario to support the emerging science strategy.
5. Development of the preferred scenario as the basis of the Development Plan.
6. A final report on findings and the Development Plan (this document).

1.39 This Development Plan has been a collaborative effort between STFC's Estates team and the consultant team at David Lock Associates, with supporting studies on planning context from Carter Jonas, and PV energy supply from Hoare Lea.

How to use the Development Plan

1.40 This document should be consulted to help guide future projects at Chilbolton Observatory, in particular those with spatial implications. It sets out a list of key projects which should form the basis of plans for capital investments in future years at the site.

1.41 Appendix 1 of the Development Plan sets out three future scenarios for the site that were explored during the process of creating the Development Plan, based on discussions with stakeholders. The path chosen will depend on the future science strategy for RAL Space and Chilbolton Observatory. This scenario approach ensures future flexibility for implementation, and has helped to explore the future of the site holistically.

1.42 A preferred development scenario is set out as the basis of the adopted Development Plan, which identifies required infrastructure, key projects and areas for future work to be funded and taken forward as part of STFC's Estates delivery plan.

2.0 Chilbolton Today

2.1 This chapter sets out a baseline understanding of the site's physical attributes, key issues and opportunities, growth considerations, and the wider planning context that might affect development. It forms a picture of the site during the period the Development Plan was being created, during late 2023.

Site photos

Figure 2: Main access road

Figure 3: Looking back from compound to main access

Figure 4: Main entrance to building C1

Figure 5: 25m radar dish

Figure 6: Building C1 from above

Figure 7: Front of building C1

Figure 8: Rear of building C1

Figure 9: Garage C2 at rear of main C1 building

Figure 10: Planting on southeast side of building C1

Figure 11: C7 Transmit Cabin

Figure 12: 500m test range, looking towards C6 Receive Cabin

Figure 13: Main compound hardstanding, storage and C10 vehicle store

Figure 14: Experimental compound near main entrance point

Access and Security

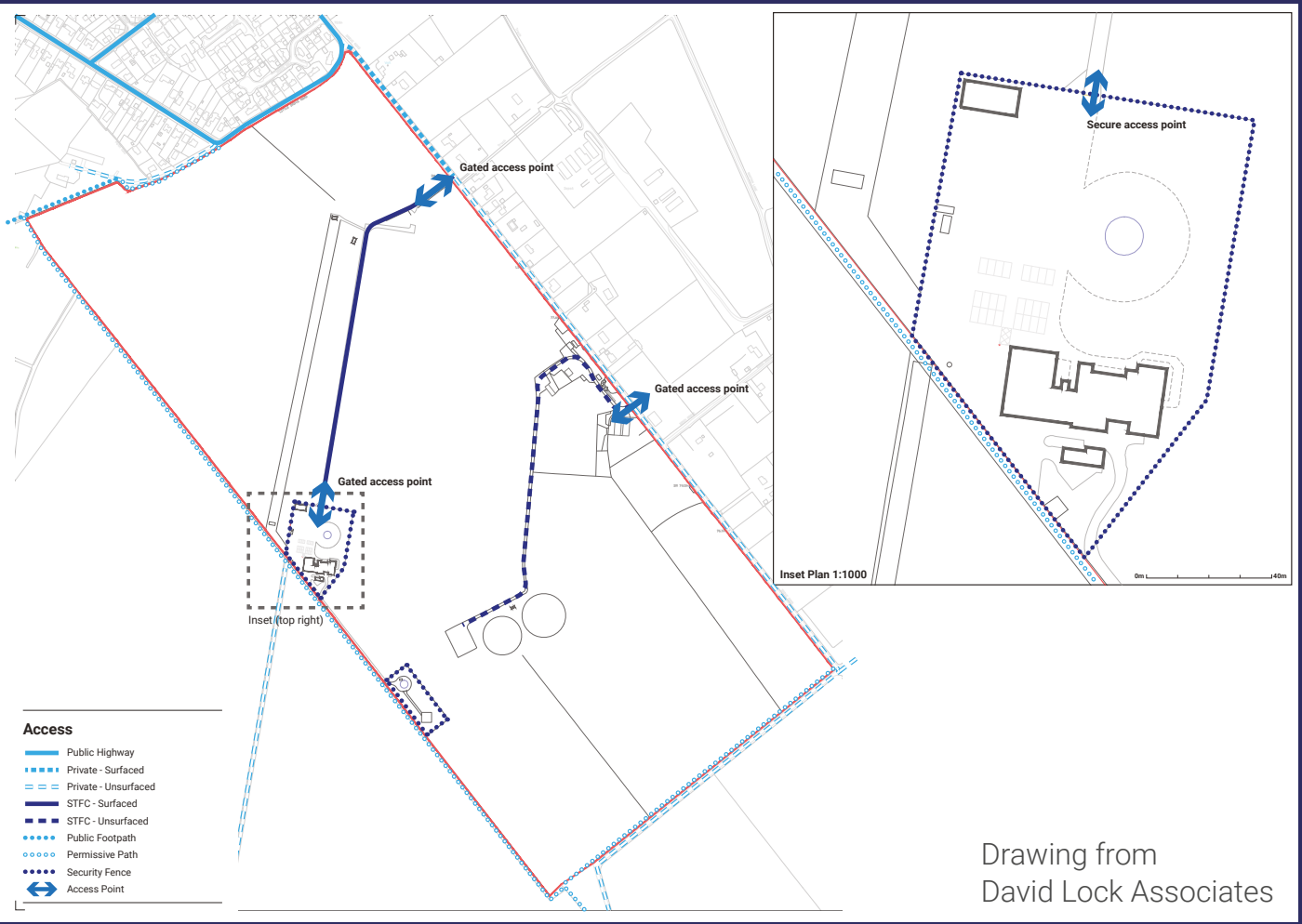


Figure 15: Site analysis plan - Access and Security

2.2 The site has a gated access onto Drove Road, which can be manually closed and opened. This leads onto a concrete track that runs south to the main secure compound area, which is accessed by a larger gate, which is electrically operated, and pass activated, but due to problems with the intercom system it only gets closed at night or when the site is unoccupied.

2.3 Drove Road is surfaced (at STFC's expense, 2017) from the main access point to the adopted highway at the junction with Little Drove Road.

2.4 A gated farm access is located further south on Drove Road, which provides access to farm buildings, fields and the LOFAR experiment array.

2.5 The main compound, which contains parking, the main buildings and the radar dish, is fenced and secured.

2.6 Outside of the compound are a number of smaller dish or observatory installations, each of which have secure fencing around them. Some experiments are controlled by neighbouring temporary shipping container buildings, which are individually secured.

2.7 Running along the northern edge of the site (outside STFC ownership) is a public footpath, and along the north-western and south-eastern boundaries are permissive footpaths on STFC land. A permissive footpath runs along the south-western boundary outside STFC land. This provision was put in place to enable people to connect to Drove road from the footpath along the south-west boundary to prevent them from making gaps in the fence and walking across STFC land. Drove Road is a designated bridleway.

2.8 A full assessment of security risks and provision is planned by STFC's security team to provide further detail on key measures and changes required. This will be informed by the scenarios considered by the Development Plan and the preferred development path.

Environment

Figure 16: Site analysis plan - Environment

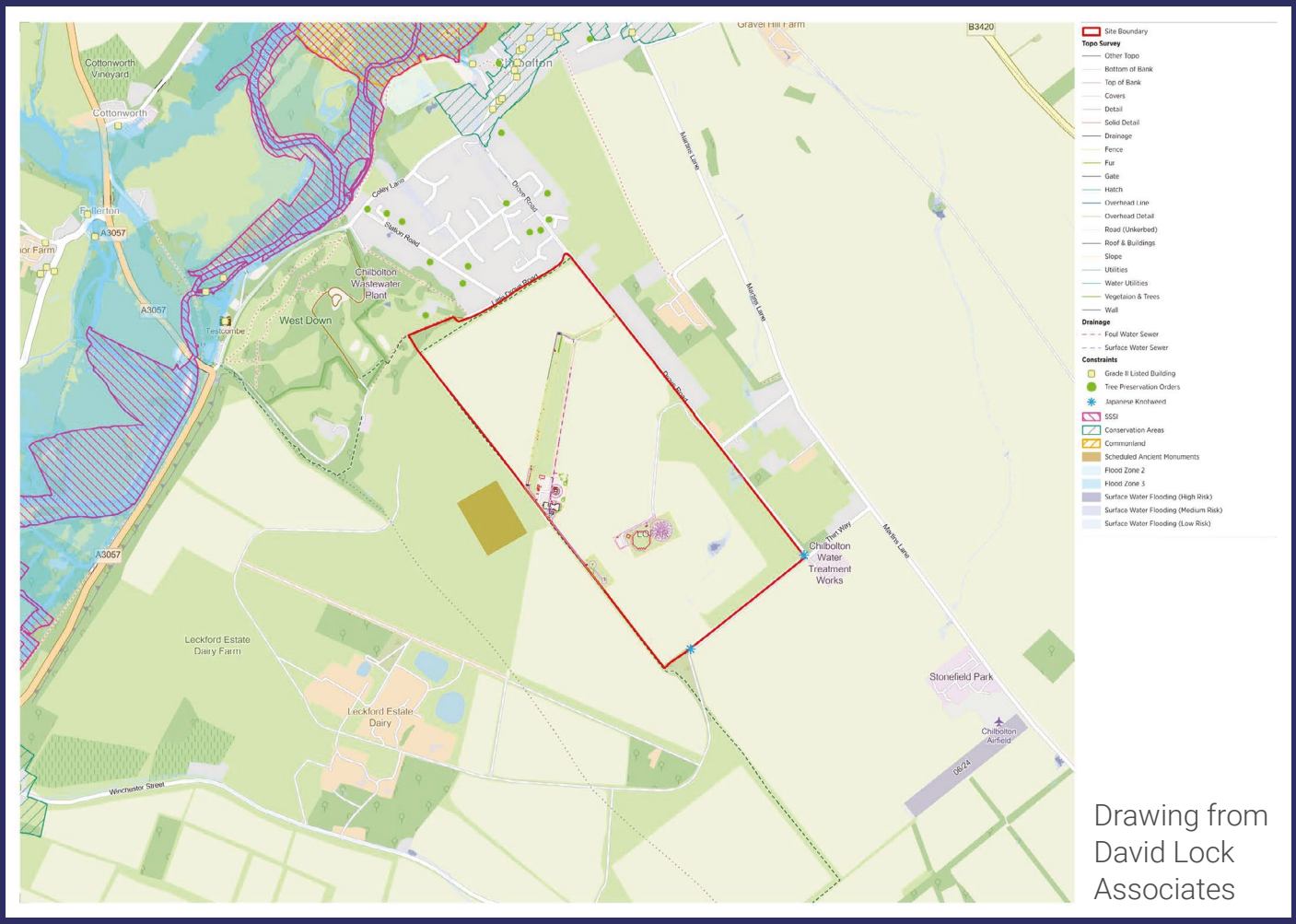
2.9 Most of the 75ha site is given over to agriculture, leased to a local farmer, and used as monoculture arable fields. Small areas of set-aside and some retained hedgerows provide some opportunities for biodiversity and natural habitat.

2.10 Minimal tree planting exists, primarily to preserve the view of the horizon and prevent interference in experiments, and also as a characteristic of the local landscape. To the northwest a bank of trees marks the edge of West Down nature reserve, which runs down to the River Test.

2.11 Around the main drive are areas of managed grassland, which are identified as locations for biodiversity improvement in the site nature recovery plan (2023).

2.12 Within the main compound there are some trees in proximity to the dish, and areas of mown grass and ornamental planting.

2.13 The site sits within a wider context of environmental and policy constraints, including proximity to the River Test SSSI. These are shown on the wider constraints plan on the following page.



Drawing from David Lock Associates

Figure 17: Environmental and policy constraints context plan

Image credit: National Centre for Atmospheric Science

Utilities

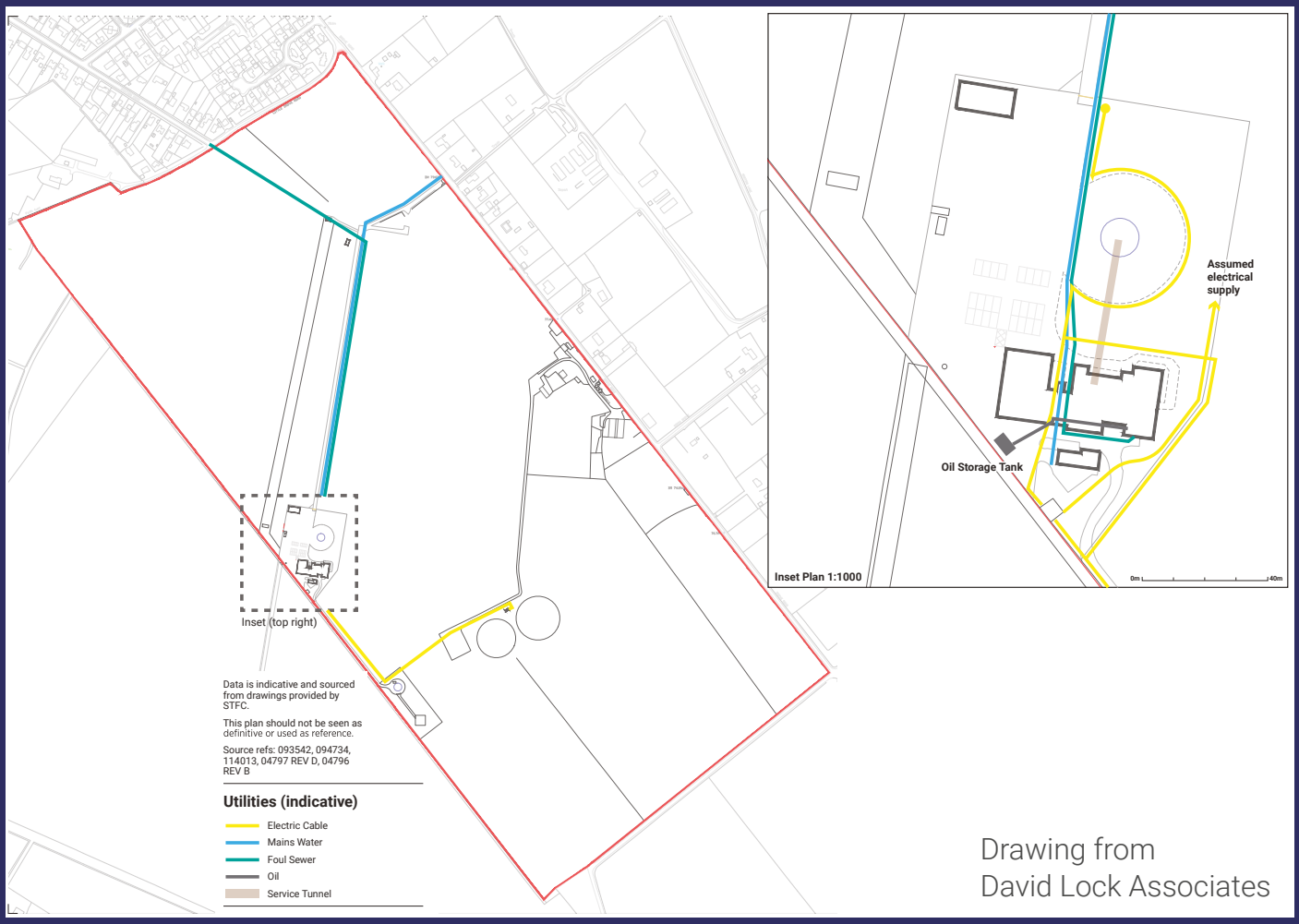


Figure 18: Site analysis plan - Utilities (indicative, awaiting full topographic survey)

2.14 External services on the site include:

- Mains fresh water
- Foul sewerage
- Electricity (single connection)
- Data and communications

2.15 The site is served by a single electrical grid connection. Diesel generators are located on site to provide essential electrical backup in the case of failure of the grid connection. A power cable runs across STFC land to the south of the main compound and to the western corner.

2.16 Heating of buildings is provided by fuel oil, fed from a tank on the south-western edge of the main compond. This is refilled by tanker when needed.

2.17 There is a tunnel connection between the main building and the radar dish, which contains various services including control wires.

2.18 Some records and plans of utilities on the site are patchy and/or out of date. A full topographic survey of the site's utilities will be completed soon by STFC. Until this is completed this section of the Development Plan should be considered indicative.

Science

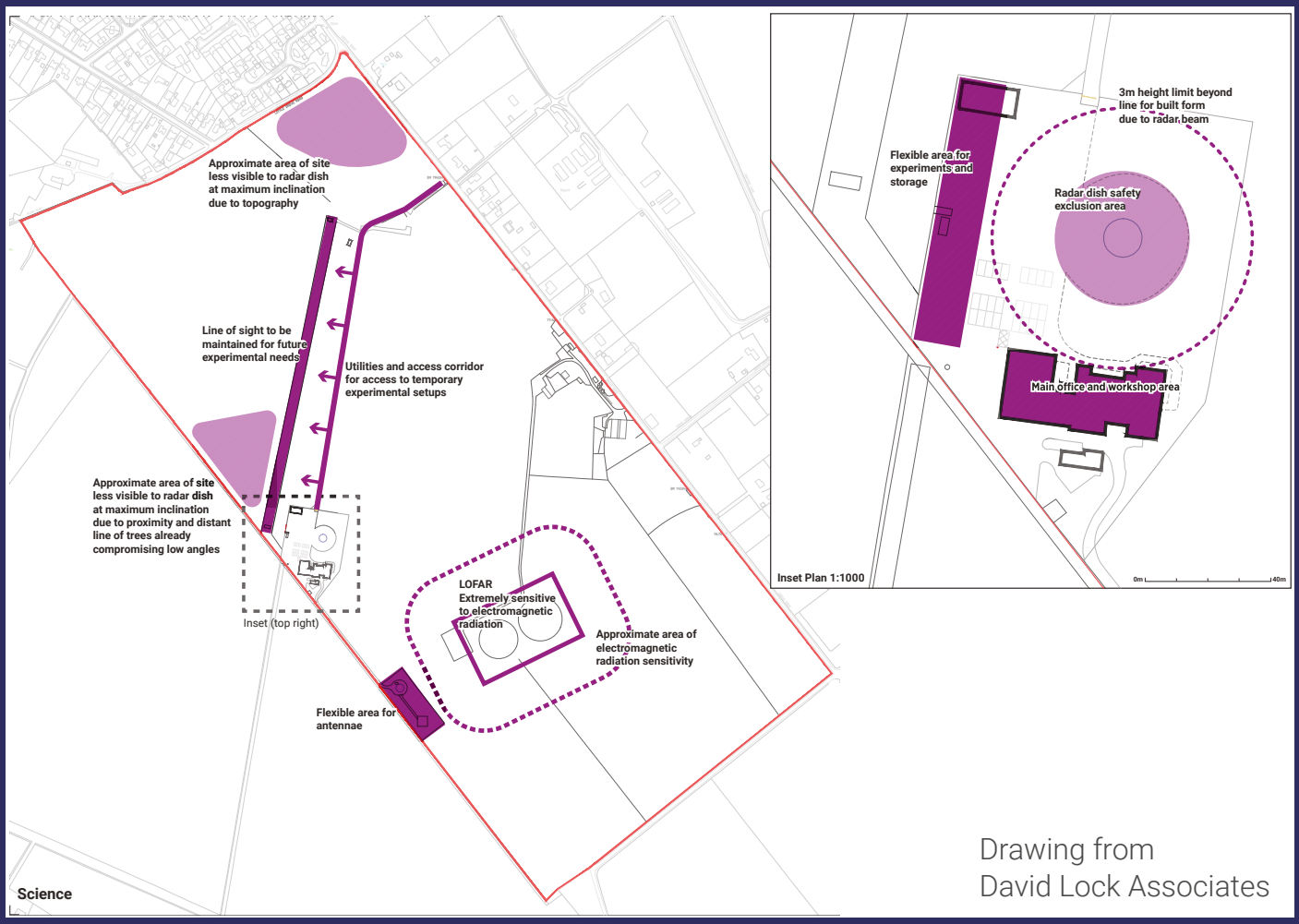


Figure 19: Site analysis plan - Science

2.19 As the primary instrument at the site, the radar dish imposes a number of potential constraints on what is and isn't possible on the site. The dish is steerable and can be inclined to 90 degrees, facing towards the horizon, and is used to observe the interior of distant storms. As such a clear line of sight to the horizon is a vital requirement for the site.

2.20 The radar dish is an emitter of powerful electromagnetic radiation. When in operation, and at full inclination, this beam is as low as 3-4m off the ground and poses a safety risk to those in its direct path. This presents a constraint to new development, as anything above a single storey is likely to block the dish's line of sight and be in the path of the beam.

2.21 The radar beam can also be subject to interference from items on the ground, particularly metal or reflective items that are likely to interact with electromagnetic radiation. This could include photovoltaic installations and their associated metal framework.

2.22 The long-range radar systems on the 25m antenna are also sensitive to wind turbines within their field of view, away from the site up to 50 miles. These installations block areas of view for observation. To remain operationally effective, STFC needs to be informed about potential future developments within this range.

2.23 Several areas exist within the site that are used flexibly for different types of observation station and antennae. These are adjacent to utilities to provide electrical and data connectivity, and where they can be accessed by vehicles.

2.24 The LOFAR antennae are very sensitive to electromagnetic interference. An existing zone around the antennae requires users to switch off devices such as mobile phones. High load electrical equipment such as photovoltaic panel inverters could potentially cause interference that LOFAR would pick up.

2.25 A former experiment on the site used two cabins with an open line of sight between them, along a former runway. Although this line of sight experiment is no longer operational, the cabins remain in place for other uses, and the line of sight is maintained, to ensure future experiments can be undertaken on this range.

Buildings

2.26 There are nine buildings on site, totalling some 2,500m2. The bulk of accommodation is in the main C1 observatory building, the adjacent garage and the radar dish.

2.27 Apart from the C2 garage, which is graded condition 'C' (in need of major repair or refurbishment), all buildings are graded condition 'B' (in need of minor repair or refurbishment). Notwithstanding this, an informal assessment of the 'Transmit' and 'Receive' cabins at each end of the 500m test range (buildings C6 and C7) indicates that these are no longer fit for purpose and should be replaced if they are to be used for any purpose in the future.

2.28 The existing main building provides a mix of workshop, amenity, office and laboratory spaces, along with two bedrooms for overnight stays when operating research equipment in extended hours. Constructed in 1964, it is not of modern accommodation standards and if additional people were to be based at the site its internal configuration would need to be reconsidered and adapted.

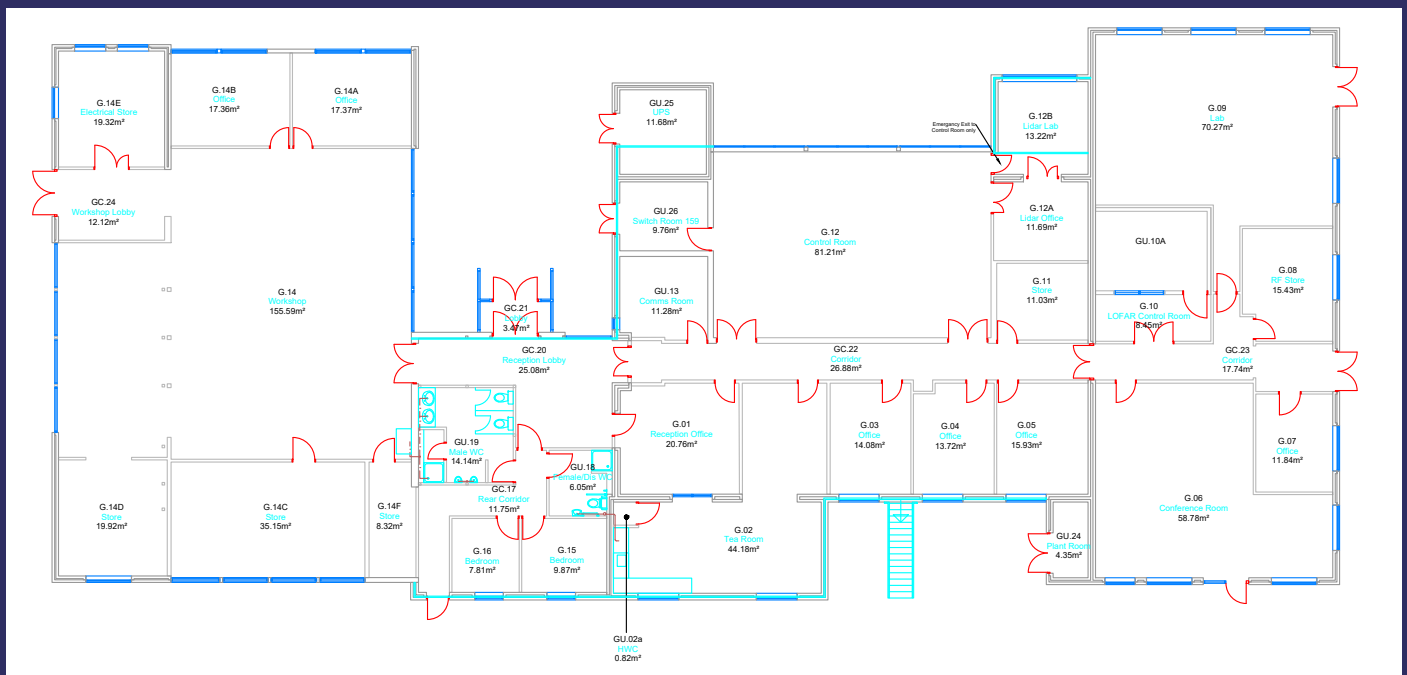


Figure 20: Main observatory building interior floor plan

2.29 New safety fencing around the 25m antenna has been approved for installation to ensure safe working in the vicinity of the dish, and is awaiting funding.

2.30 The main building relies on fuel oil heating and an external grid connection to provide electrical heating to other outlying buildings (if needed). In order to ensure that Chilbolton Observatory can be brought to Net Zero standard as part of the Development Plan, oil heating will need to be replaced with electric heating, and opportunities to generate and use renewable energy will need to be explored. The main building will require improved insulation to support this.

2.31 The main building is currently fully occupied with no desk spaces available. There is a large workshop which houses some fabrication equipment, an electrical workshop, a radar dish control room, and considerable storage space. There is no available space for visiting researchers to use.

2.32 The C1 building also houses two small bedrooms for researchers to use when operating experiments overnight. These cannot be charged to research budgets as they are not serviced, and share the main building WC with staff.

Planning Policy Context

2.33 The site is in the administrative area of Test Valley. The Development Plan comprises the policies of the Test Valley Borough Revised Local Plan (2011 – 2029), which was adopted by the Council on 27 January 2016, and also five Neighbourhood Development Plans (including that at Chilbolton).

2.34 The Development Plan sets out the long-term vision and objectives for Test Valley for the plan period up to 2029, including strategic policies for steering and shaping development. The Plan includes overall targets for the provision of homes and jobs and identifies specific locations for new strategic housing and employment together with the transport and other infrastructure required to support development.

2.35 The Local Plan identifies Chilbolton as a 'Rural Village' and determines that these villages do not contain the range and number of facilities and services or have the accessibility of the 'Major Centres' (like Andover) or the 'Key Service Centres' (like Chilworth) in the plan area, which would support strategic development allocations. However, because of the level of facilities available to help support and sustain communities either individually or shared, some additional development may be appropriate.

2.36 The potential for any residential development in Chilbolton is set out in the Local Plan, at policy COM2, where it is essentially restricted to small scale and infilling, inside the settlement boundary, unless, it is a community led project, meets specific housing needs (and is a rural exception site) or is for employment use, or a necessary agricultural use. The Local Plan policies map excerpt below shows the settlement of Chilbolton in yellow (areas not coloured yellow are considered outside of the boundary) and the Observatory is to the south of the map excerpt:

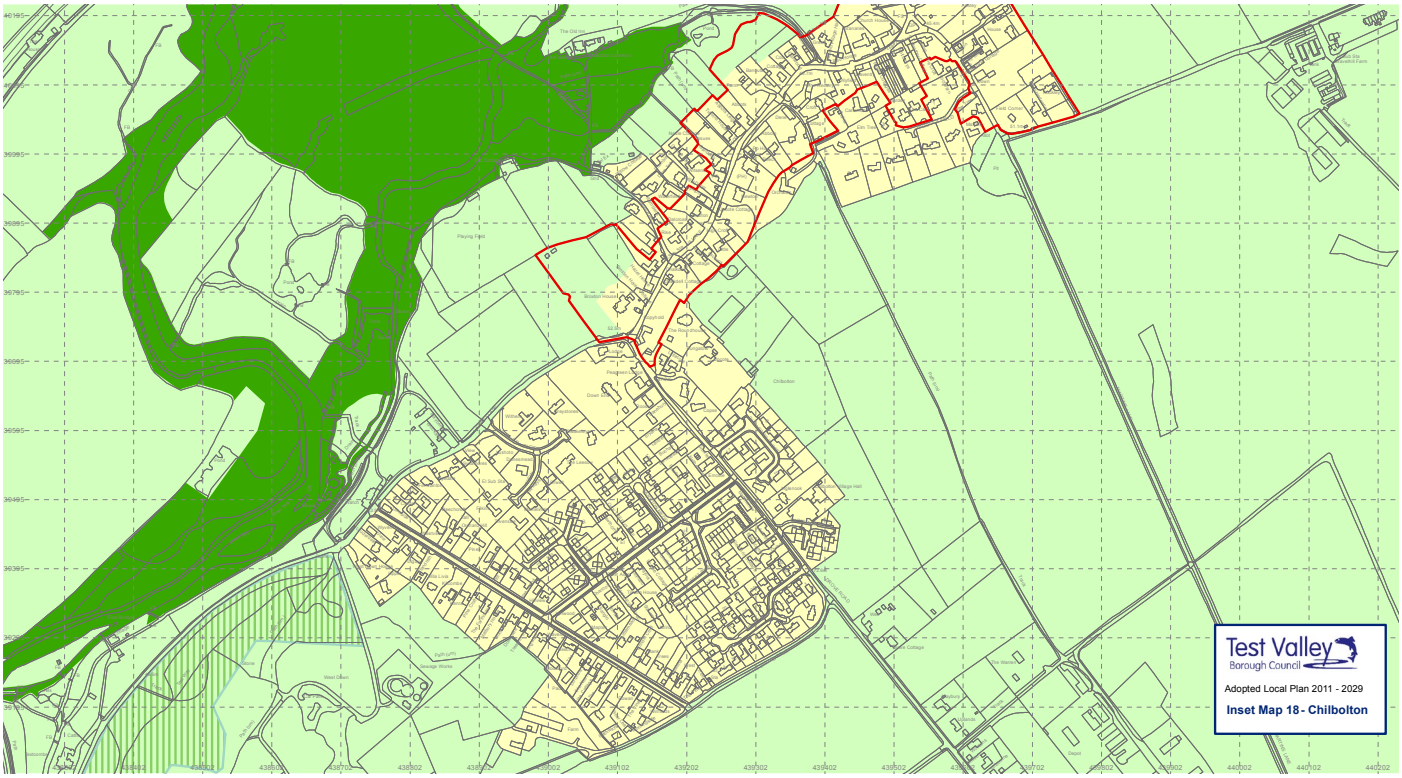


Figure 21: Extract from Test Valley Local Plan policies map

2.37 Test Valley Council 'made' (or adopted) the Chilbolton Neighbourhood Development Plan (NDP) in May 2021. The Neighbourhood Plan does not allocate any land for development. It contains policies towards design quality, energy efficiency and community facilities. There are also a range of Local Green Spaces designated. None of these policies directly affect the site of the Observatory.

3.0 Key Issues and Opportunities

3.1 The review of the site's position today has indicated a number of key issues that need to be resolved by the Development Plan so that the site can continue to deliver high-quality research and contribute towards STFC's overall strategy. It has also found, through stakeholder engagement and analysis, a number of opportunities that the Development Plan should enable.

Image credit: National Centre for Atmospheric Science

3.2 The key issues and opportunities identified are:

Resolving and safeguarding site access arrangements: at present the site is accessed from an unadopted road with unknown legal ownership and responsibility. STFC should ensure that it retains potential access to the adopted public highway within its land.

Security and access points: the site is currently secured manually, which presents challenges to out of hours operations and the ability for non-STFC staff (e.g. BID incubation companies) to function on site. Future security arrangements should consider the number and type of people to be based on site.

Ensuring the site is prepared for Net Zero by 2040: preparations should be made to move the main building to electric heat pump heating with appropriate insulation and adaptation measures put in place. The site has an opportunity to generate a significant amount of renewable energy within its boundaries, if certain technical hurdles can be overcome. This opportunity is discussed in more detail below.

Maximising biodiversity net gain and nature recovery: given the site's extensive landholding and rural location adjacent to a nature reserve, and close to an SSSI, there is significant potential for Chilbolton Observatory to contribute to STFC's nature recovery goals both here and more strategically. This opportunity is discussed in more detail below.

Maintaining and enhancing Chilbolton's role as a flexible location for observation and experimentation: the site performs a key role within STFC by providing a serviced, low-interference environment for a number of temporary experiments, many of which are from outside STFC and promote cross-public sector collaboration. This should be maintained and enhanced as an asset within the wider UKRI and UK government portfolio.

Defining the future role and function of the site: the Development Plan should support, through Estates provision, the chosen future vision and direction for Chilbolton within the wider RAL Space unit.

Considering building suitability under a range of future scenarios: the current main building is not configured to support an increase in staff on site, or to accommodate more flexibility in staff usage (e.g. hotdesking and temporary use by visiting researchers). There is an opportunity to align accommodation and uses on site with the site's future role and scale, ensuring that the estate is fit for purpose.

Making appropriate provision of facilities on site: depending on the future direction of the site, the current mix of supporting uses (e.g fabrication, amenity provision etc) may be insufficient or unnecessary, and the Development Plan should set out priorities accordingly to ensure the estate can most effectively support the people and science based on site.

Ensuring the site is able to be managed adequately: choice of landscape features, land management practices and building renovation will ensure that the site can be managed properly in the years to come, addressing a number of longstanding maintenance issues, such as rabbits damaging building foundations.

Strategic Sustainability Opportunities

3.3 The site has an opportunity to play a leading strategic role within STFC in two key areas of environmental sustainability:

- the move to Net Zero through on-site energy generation and decarbonisation of heating systems
- nature recovery of the estate, and supporting an organisational strategic approach to biodiversity net gain, enabling new facilities at RAL

Net Zero and Energy Generation Potential

3.4 The site is currently heated by kerosene (replacing a previous oil-fired system), electricity is sourced from the grid. STFC commissioned Hoare Lea in November 2023 to determine the potential for the site to become completely Net Zero Carbon, based on on-site energy generation and storage.

3.5 The study concluded that with current technology, it was economically infeasible for the site to go 'off-grid' for its energy consumption. This is primarily due to the need to have sufficient power for occasional peaks in usage, due to movement of the radar dish, requiring very large amounts of otherwise redundant capacity. However it identified a scenario where the site could be 75% self-sufficient, with the remainder provided from a rapidly-decarbonising grid in time of high power draw.

3.6 To achieve this, a PV array of 9900m2 (approx. 1ha) with supporting on-site battery storage would be required. This would need to be sited carefully to resolve both technical constraints (interference with experiments) and planning policy constraints (e.g. landscape impact or proximity to homes).

3.7 The PV array would need to be located away from LOFAR to avoid electrical interference. It would also need to be located as far out of the line of sight of the radar dish, either using the topography of the site to locate it in a low point, or locating it close to the dish/observatory complex to make use of the elevation of the dish to place the panels below the radar beam.

3.8 Considering the planning position, although this is a comparatively small installation to support the operation of the site, and not a 'solar farm' aimed at supplying wider power requirements, the policy review has highlighted constraints to the location of a PV array on site.

3.9 Large scale projects have received significant resistance from local residents with many arguing that the development would be contrary to the character of the area, although smaller scale projects (under 10MW) have been more successful.

3.10 The Chilbolton Neighbourhood Plan emphasises protecting views from the village, including those from Drove Road towards the dish. Policy EN1 stipulates that developments should protect the "View from the Southern end of Drove Road towards the Chilbolton Observatory". This therefore provides grounds to reject any application with panels to the north of the main access track to the main observatory complex. The land to the south of the main access track is not visible from the vantage point and therefore does not contravene Policy EN1. To minimise impact on neighbouring properties, the panels should be installed as far from Drove Road as possible.

3.11 This suggest that one of the potential areas for siting PV panels which would likely have limited impact on the operation of the radar dish, in the northernmost corner of the site adjacent to the village, would struggle to obtain planning permission. It would support provision in a second area much closer to the dish, subject to technical testing.

3.12 Both areas could be tested for technical feasibility, with the area closest to the dish prioritised due to its more favourable position in terms of planning.

Biodiversity Net Gain Potential

3.13 Although small in terms of floorspace, Chilbolton Observatory is the largest STFC site in terms of land area (approx. 75ha). The vast majority of this is let to a tenant farmer, and managed for intensive arable crop production. STFC have begun nature recovery projects on the much smaller area of land within their operational control.

3.14 The Environment Act 2021 set out the requirement for most new development going through the planning system to deliver a net gain in biodiversity (BNG) of at least 10% over the baseline, with units measured using the DEFRA v4.0 metric (with local authorities able to require higher than this level). This provision is now in force. This has implications for future potential large-scale facilities at RAL, which may need to make use of currently undeveloped land in good ecological condition. Chilbolton may be able to deliver new habitat to partially compensate for such development by delivering offsite BNG units that can either be traded or used by STFC in the future.

3.15 Offsite BNG units can be used for development anywhere in England. However, the statutory metric has trading rules that govern how this will work. A spatial risk multiplier is used when the development and the offsite BNG units are in different places. The rules discount the units depending on their location relative to the development. The creation of BNG units at Chilbolton could be used to support development at RAL. The RAL site is in the Vale of the White Horse LPA and the Berkshire and Marlborough Downs NCA. The LPA is more than two LPA's away from Chilbolton but the NCA's are adjoining. Applying the spatial risk multiplier to this means that STFC are likely to need 25% more BNG units if supplied from Chilbolton rather than RAL or immediate surrounds.

3.16 Chilbolton's location in the open countryside and its public ownership means that the 30-year commitment to habitat management under the Environment Act could feasibly be satisfied with little future risk to STFC beyond maintenance costs. Habitat creation would not necessarily be incompatible with continued farming on the site, and specialist ecological advice would need to be sought to understand the implications and included in a more wide-ranging nature recovery plan for the site.

3.17 Even if not used to offset development at RAL, the management of Chilbolton's land for nature recovery and biodiversity could also provide an income stream for STFC from other developers needing to offset biodiversity loss.

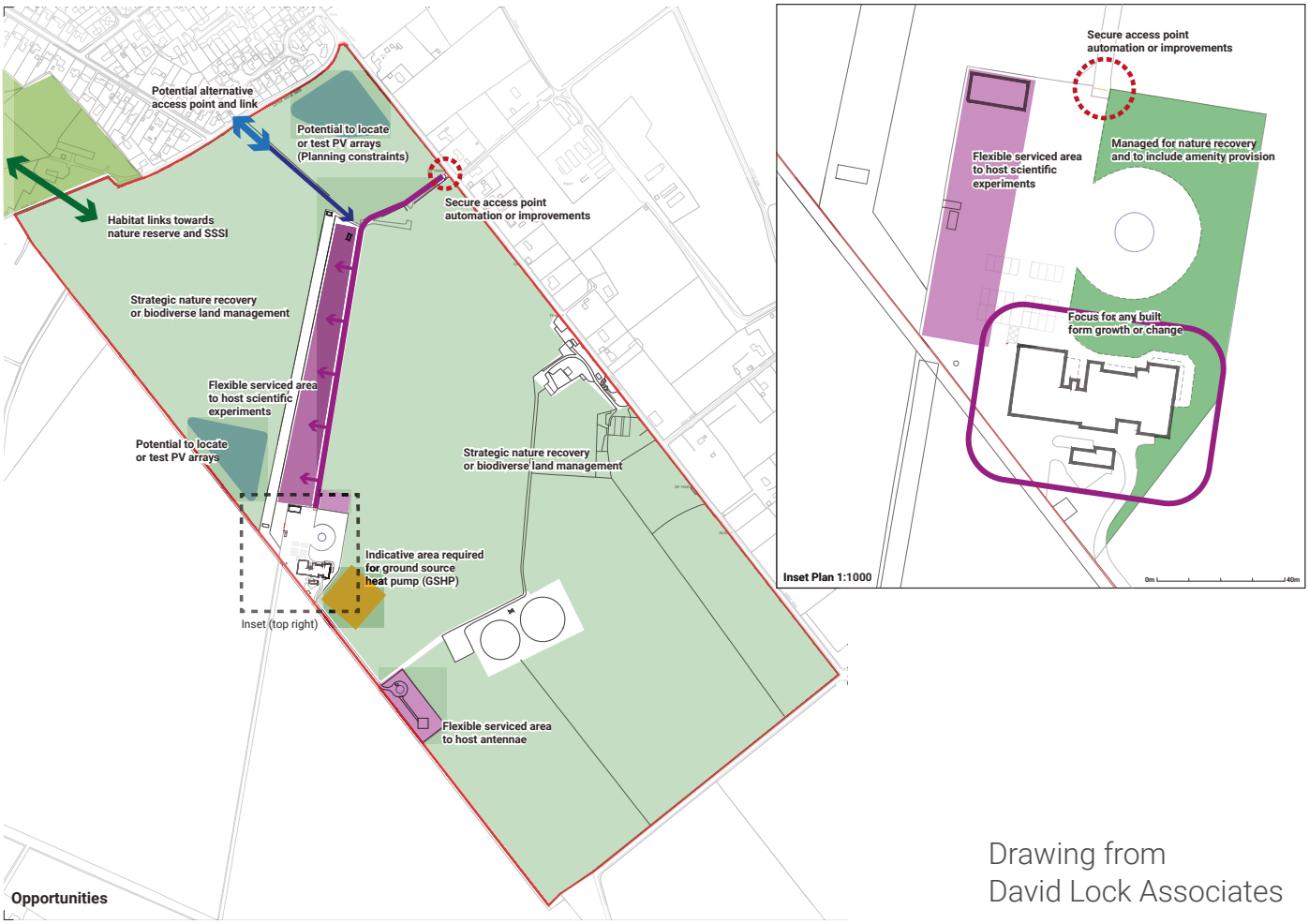
Nutrient Neutrality Bank

3.18 In addition to BNG requirements, the site is also within the catchment for the Solent. This means that the area is subject to NE's Nutrient Neutrality (NN) rules. This means that any new development that involves residential accommodation needs to demonstrate that it has no impact on the nutrient loading within the catchment. Although STFC are not proposing new residential development, the site can provide an offsetting resource/bank for other developers in the area, with credits traded on the open market.

3.19 A landowner can create NN credits by committing to stop the application of Nitrate and or Phosphate for 125 years. Although a significant commitment, this opportunity could be considered as part of a long term change in farming or land management practices at the site as part of a Nature Recovery Plan.

Key Issues and Opportunities

3.20 Overall spatial opportunities are summarised on the plan below.



Drawing from
David Lock Associates

Figure 22: Site opportunities plan

4.0 Preferred Development Scenario

4.1 The Development Plan has considered a range of potential scenarios for the future of the site, to help inform and align with the emerging science strategy. These are summarised in Appendix A. This chapter sets out the anticipated preferred development scenario.

Site Vision and Strategy

4.2 Chilbolton Observatory will develop to become a hub for experimental work in the fields of atmospheric science, space situational awareness and future communications technologies, building on its current specialisms and leads. The site's flexibility offers much potential for short-term experiments and working with other research organisations beyond STFC, including the private sector.

4.3 With these fields of specialism, Chiilbolton's scientific future will be defined by the two core themes of Sustainability and Resilience, and the site itself must be developed as an exemplar environmentally sustainable site to embody and reflect these themes.

4.4 Although there would likely be only minor increases in permanent staffing, the site would host a much wider community of visiting researchers from other organisations and within STFC, making use of the site's flexible nature and its unique location with excellent, uninterfered visibility of the sky.

4.5 This vision, to be realised through the science strategy, requires some changes to the Estate infrastructure to accommodate more flexible use, and to improve the working environment for permanent and visiting staff.

Key Priorities

4.6 To deliver this site vision, the Development Plan must address the following priorities:

- Rapid decarbonisation of the site
- Sorting out backlog and ongoing maintenance and management issues
- Improving site resilience
- Securing the site and making it accessible and usable by a wider range of users
- Rationalising the existing accommodation to support new users and uses
- Nature recovery and considering the wider land management approach
- Safeguarding land for future experiment flexibility

4.7 These will be addressed below through a combination of:

- Key site infrastructure changes
- Changes to the existing buildings and accommodation
- Improvements to the outdoor spaces and landscape
- A resulting spatial plan, which sets out what land is to be used or safeguarded for the future

4.8 Finally a set of priority projects are set out. These are intended to form a short term plan of action for the site and should be reviewed annually

Image credit: National Centre for Atmospheric Science

Infrastructure Requirements

4.9 To deliver the overall vision set out, along with STFC's objectives set out in the introduction, a series of infrastructure changes and improvements to the site have been identified. These requirements across a range of categories are set out below.

Access

- Under relatively minor increases in staff numbers, no new access road provision would be needed
- A formal agreement on maintenance of Drove Road to the adopted highway would be advisable

Security

- Replacement intercom system for automated electronic security gates at compound boundary
- Automated electronic security gates at site boundary
- Electronic access control on building entrances
- CCTV provision on access points, along the main drive, within the main compound and at LOFAR. CCTV should be accessible both at RAL and Chilbolton.

Buildings

- Rationalisation of existing floorspace
- Office floorspace configured to host multiple organisations
- Offices configured to allow hotdesk working and occasional visitors to site
- Flexible laboratory space
- Rationalisation of storage
- Measures to limit impacts of damage from rabbits to buildings

Amenity

- Flexible meeting spaces on-site
- High quality outdoor amenity space

Natural/GI

- Improved planting and landscape within compound to support mix of outdoor amenity uses and BNG

Power and Utilities

- Power and data upgrades to allow temporary experiment users to plug in seamlessly within designated areas
- A backup data connection
- Exploration of feasibility of a backup power connection to the grid

Sustainability

- Electrification of heating system in main observatory buildng (C1)
- 9,900m^2 photovoltaic array with grid connection and on-site battery storage

Other

- Consideration given to workshop provision on site versus delivered as a service from RAL fabrication facilities
- Permanent safety fencing around radar dish

Buildings

4.10 The existing buildings at Chilbolton will need some adaptation to support the future direction of the site. It is not anticipated that there will need to be additional accommodation on-site, except where replacements are needed as set out below.

4.11 The main objective of changes to buildings is to support a move to more flexible working arrangements, including an increase in visiting researchers from other organisations, and to provide a more welcoming and collaborative environment for research on site. There is an opportunity to fix long-standing operational issues such as the overnight accommodation being within the main observatory building, without its own facilities.

C1 Main Observatory Building

4.12 The main C1 building will be the focus of any changes to enable changed working practices and to support the development of the site overall. Given the limited scale of growth at the site anticipated at presented, it is not envisaged that a major new building is required on site. However, reconfiguration of the existing building can yield efficiencies:

- Removal of the accommodation to its own serviced block, with its own kitchenette and WCs, would reduce operational conflicts with this and the office/research function of the building. It could also allow the accommodation to be chargeable to research budgets.
- Combining and reconfiguring the existing offices into a modern, open-plan area with more desks and areas for visiting researchers would yield efficiencies.

4.13 By doing this, the following could be provided:

- More desk spaces
- Flexible desk spaces for visiting researchers
- More informal meeting spaces
- An improved welcome and amenity space
- More flexible lab space
- Appropriate provision of accessible WCs for both men and women

Image credit: National Centre for Atmospheric Science

4.14 A plan of the current uses within the main observatory building is set out below.

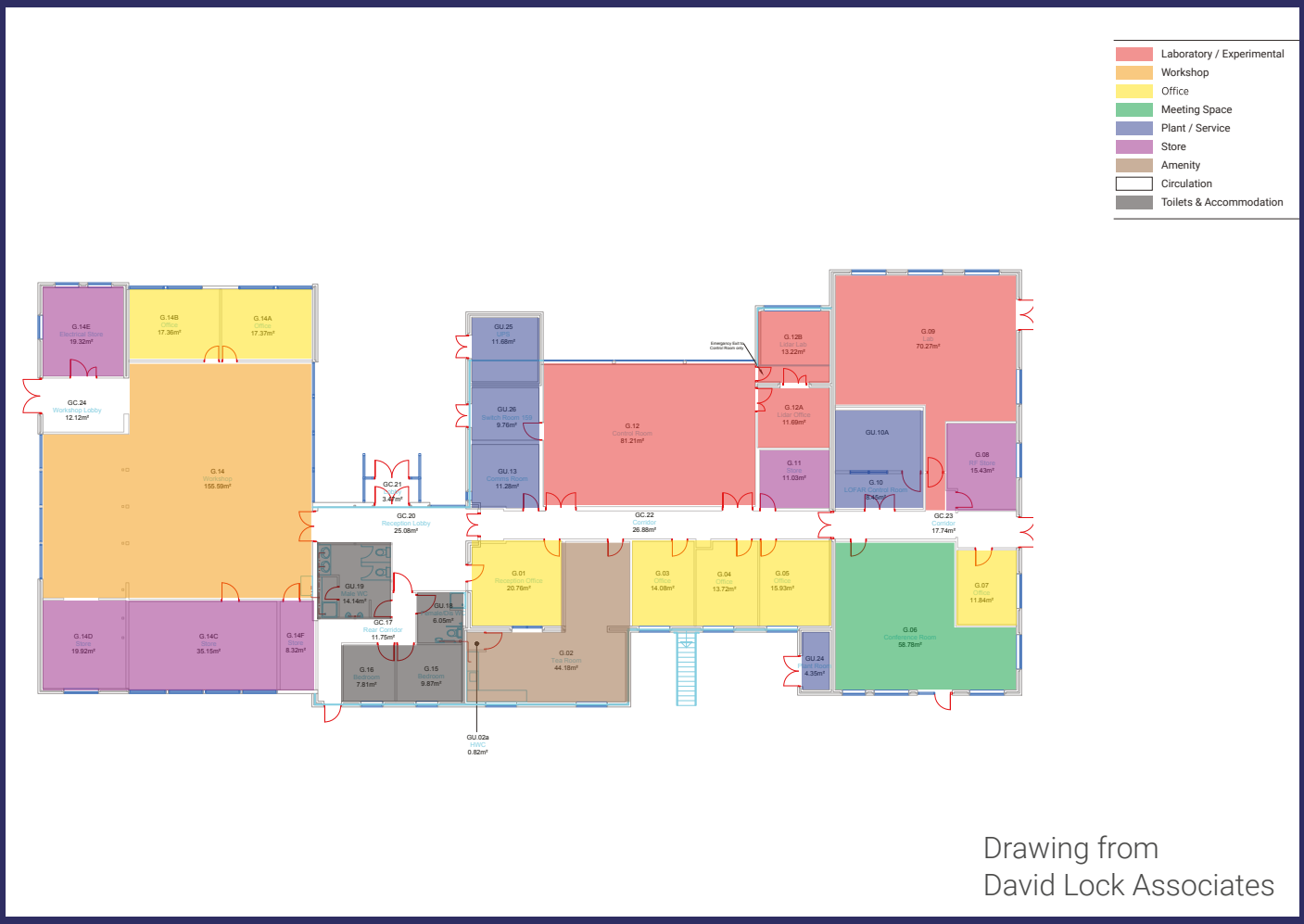


Figure 23: Existing floorspace uses within C1 building

4.15 A proposed future configuration for the main building and a new accommodation block is set out in the figure below. This is an indicative scenario and would require further feasibility testing, but sets out a potential direction of travel for C1 which would deliver on many of the objectives and opportunities set out in this Development Plan. It makes use of existing walls where possible and clusters uses appropriately.


Image credit: National Centre for Atmospheric Science

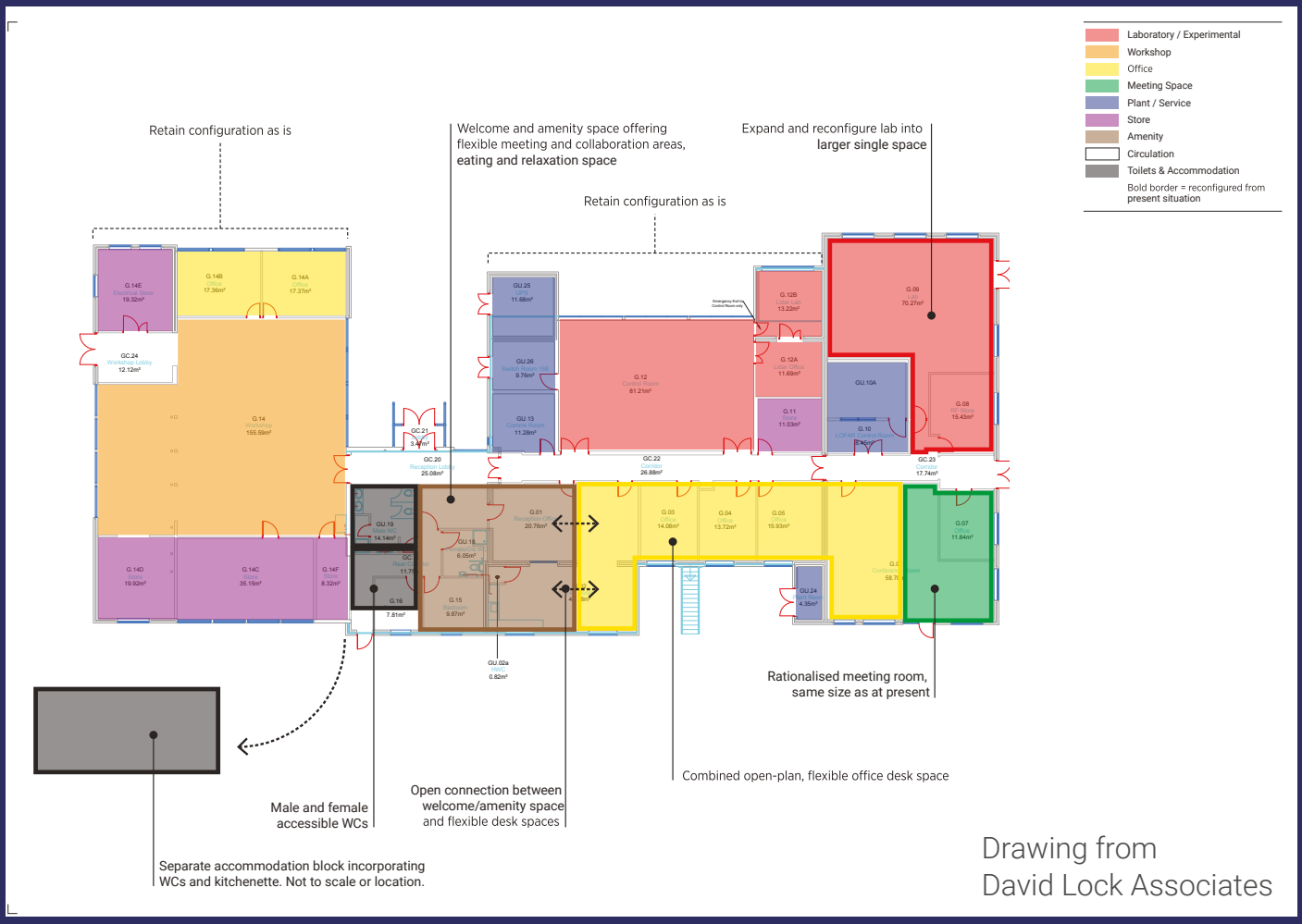


Figure 24: Proposed future concept for layout within C1 building

Radar Dish

4.16 The existing radar dish was first used in 1967. Although it remains functional and its working life is likely to be able to continue for another 20 years, the existing dish surface was built to tolerances possible in the 1960s. Higher frequency radar beams would enable new areas of research into atmospheric physics and space situational awareness, but would require a new radar dish built to modern tolerances.

4.17 Although the Development Plan does not set aside land for such a possibility, it is noted as an item of future potential for the site. This potential should be considered when undertaking projects which require long-term land management commitments, in particular biodiversity net gain and habitat creation which require management for a minimum of 30 years.

4.18 The long-range efficacy of the existing radar observations from the 25m antenna could be compromised by new onshore wind turbines. The moratorium on these installations has been lifted by the UK government. STFC should monitor for applications within the observation range of Chilbolton.

Communications Compound

4.19 The existing communications compound, located to the west of LOFAR, has the potential to support additional ground stations. Some of the equipment in place is disused and could be removed, but space around the compound should be safeguarded for potential expansion to support the overall site vision.

Other Buildings

4.20 The C6 and C7 Receive and Transmit cabins, at each end of the 500m test range, are end of life and unsuitable for research use. The range itself could continue to support atmospheric and environmental observations and should be retained. The cabins should be replaced with low two storey structures, with laboratory space below and observation space above.

4.21 Space should be safeguarded for a potential future new building within the main compound, that could be delivered in stages, should site expansion require it. To ensure continued use of the compound for housing experiments and other equipment, a potential extension of the compound onto the former bungalow site should also be safeguarded.

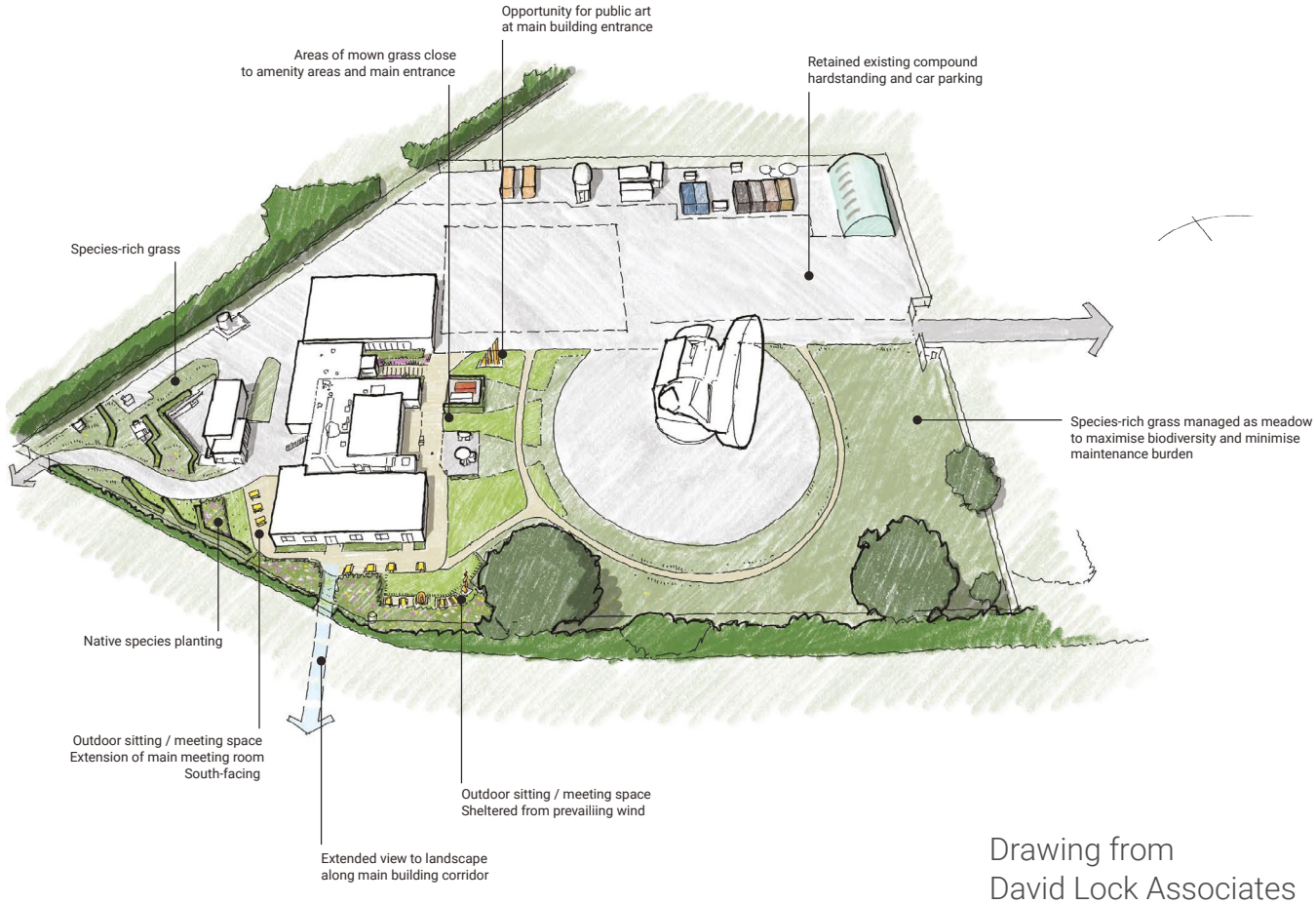
Landscape and Outdoor Space

4.22 As noted in the previous section, the site has considerable potential to support new habitats and biodiversity net gain, through changed land management practices and land use. This should be considered at a strategic level within STFC to ensure opportunities for cross-site benefits are not missed.

4.23 Within the main compound, a changed approach to the site's landscape provision from more managed and ornamental species to native species and space given over to nature could deliver improvements to biodiversity, increased quality outdoor amenity space for staff and visitors, and reduce the overall maintenance requirements. Servicing requirements for the radio antenna must be considered and safeguarded.

4.24 An illustrative landscape and outdoor amenity space scheme is shown on the following page.

Image credit: National Centre for Atmospheric Science



Drawing from
David Lock Associates

Figure 25: Illustrative landscape concept

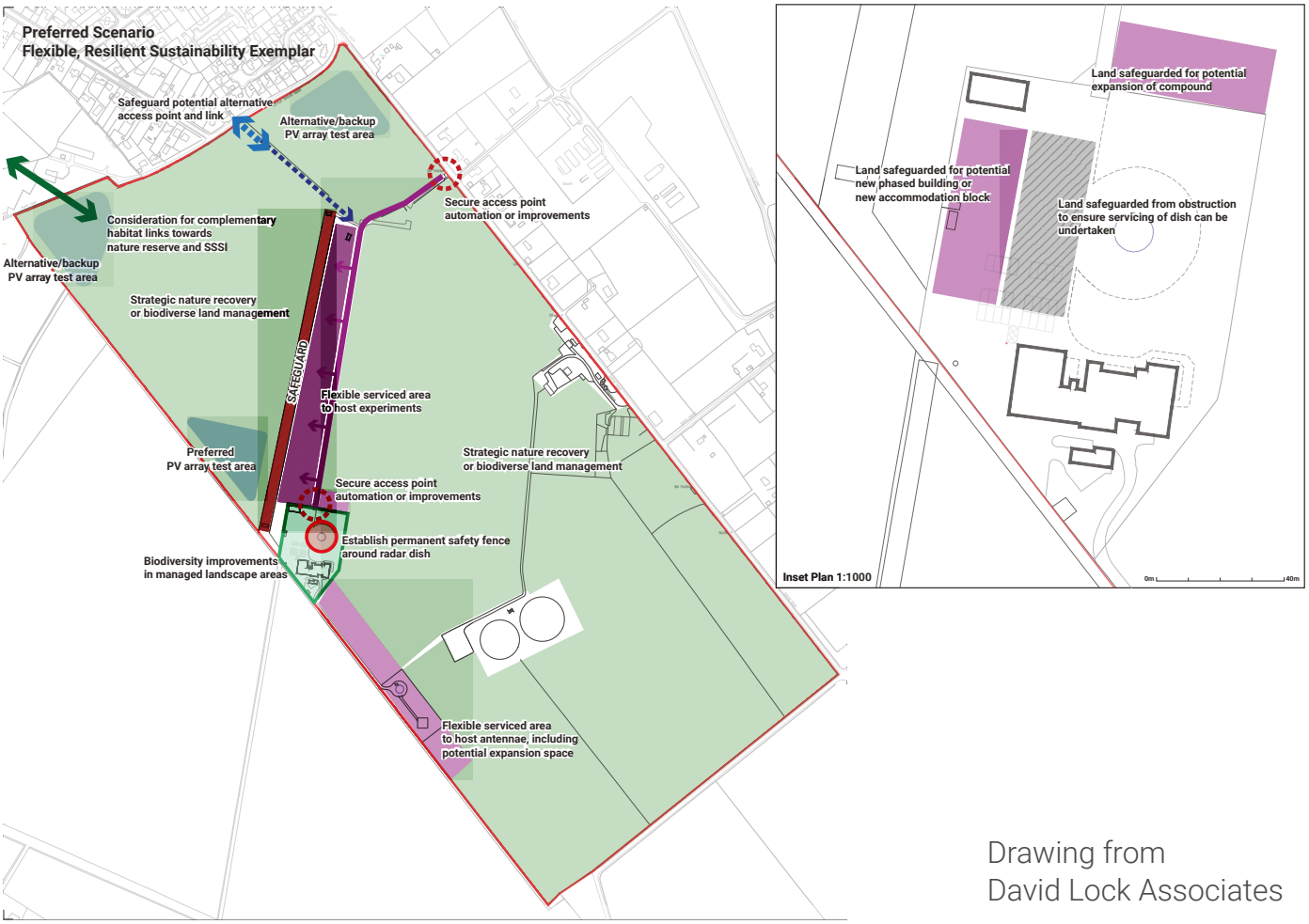
Image credit: National Centre
for Atmospheric Science

Spatial Plan

4.25 The spatial plan brings together these considerations and requirements where they have a spatial implication for the development of the site.

4.26 It is anticipated that the overall layout of the compond would remain as it is today, save for the removal of the oil fuel storage tank, and inclusion of a new accommodation block, likely in a modular building.

4.27 Wider site projects and spatial areas are set out below.



Drawing from David Lock Associates

Figure 26: Chilbolton Observatory Spatial Development Plan

Priority Projects

4.28 A set of immediate priority projects for the implementation of the Development Plan are set out below:

- Testing of PV array equipment to determine if it is compatible with the site's ongoing research, and where it might best be located
- A Net Zero plan for the site, bringing together PV and battery storage with a change in C1 building heating from kerosene to electric
- A wider Strategic Nature Recovery Plan for the site which considers the potential for the entire landholding and land management practices
- A feasibility study into adaptation of building C1 internal space as noted in the Development Plan, and a new accommodation block on site
- A plan for new security and access infrastructure to support the site's overall vision
- An assessment of what landscape and management measures can be undertaken to prevent damage by rabbits to the existing buildings
- Set up planning application monitoring within the observational range of the 25m antenna's radar equipment (approx. 50 miles) for proposed onshore wind turbines

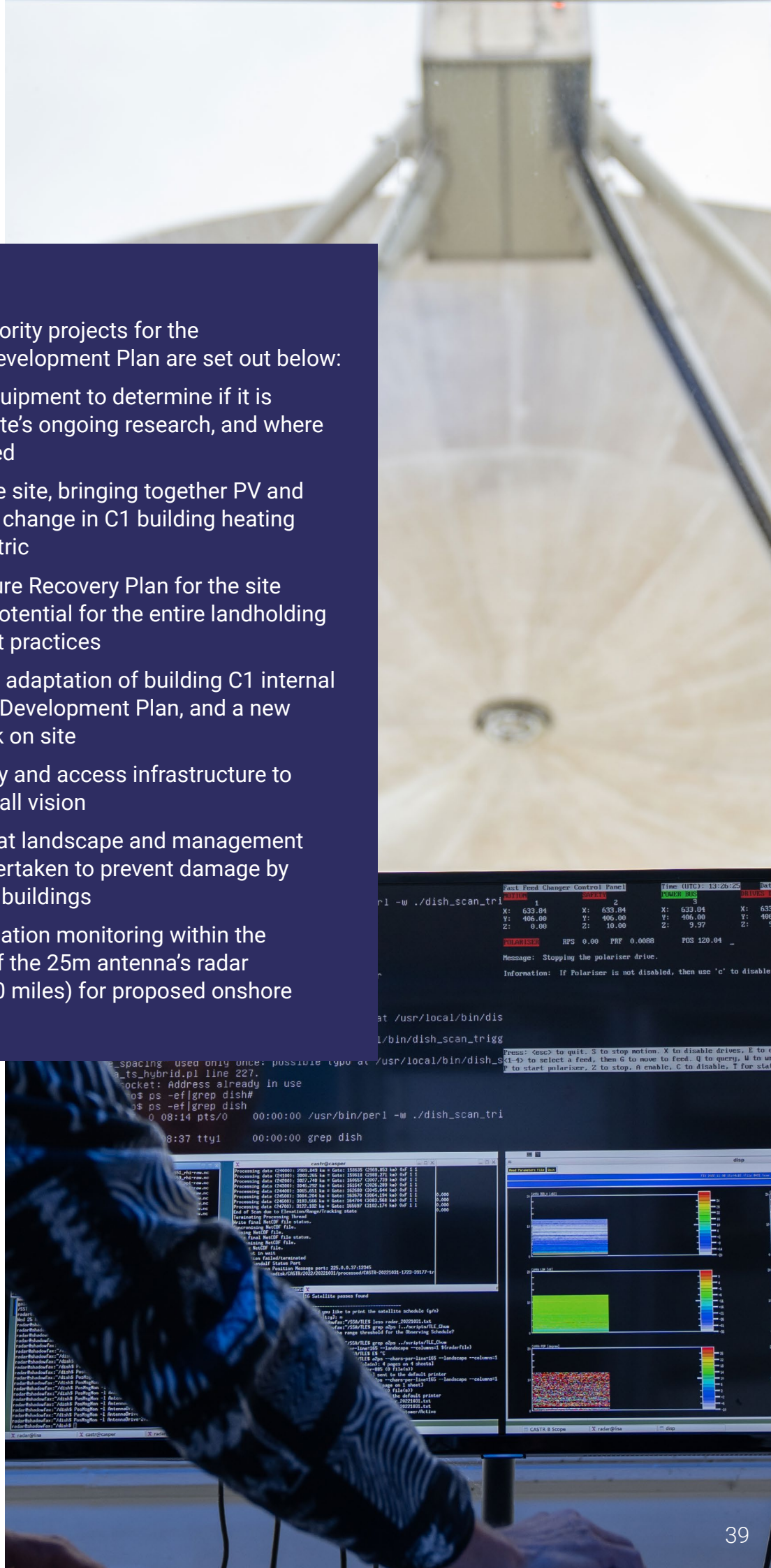


Image credit: National Centre for Atmospheric Science

Figure 1: Site boundary on aerial plan

Figure 2: Main access road

Figure 3: Looking back from compound to main access

Figure 4: Main entrance to building C1

Figure 5: 25m radar dish

Figure 6: Building C1 from above

Figure 7: Front of building C1

Figure 8: Rear of building C1

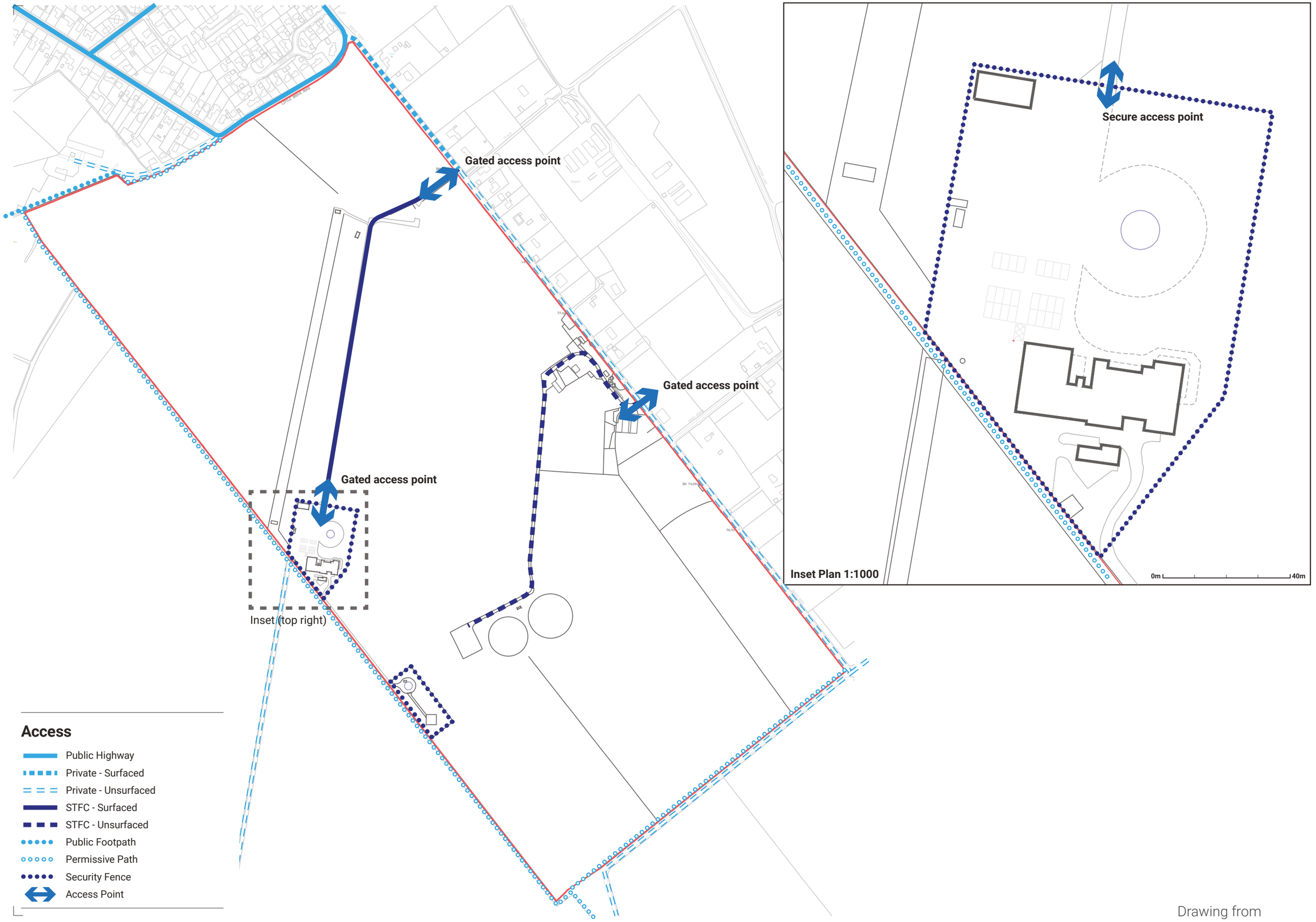
Figure 9: Garage C2 at rear of main C1 building

Figure 10: Planting on southeast side of building C1

Figure 11: C7 Transmit Cabin

Figure 12: 500m test range, looking towards C6 Receive Cabin

Figure 13: Main compound hardstanding, storage and C10 vehicle store

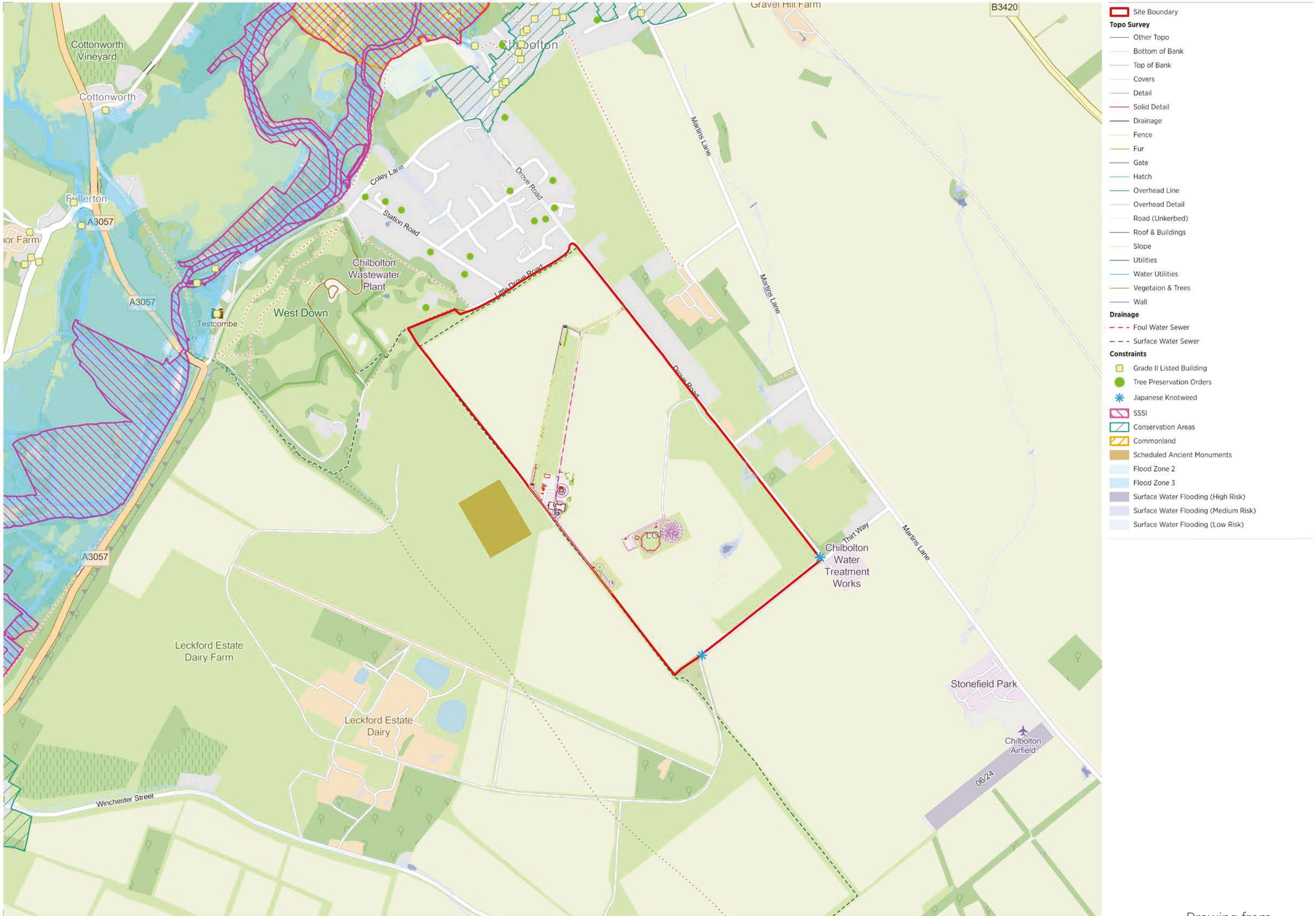


Drawing from
David Lock Associates

Figure 15: Site analysis plan - Access and Security

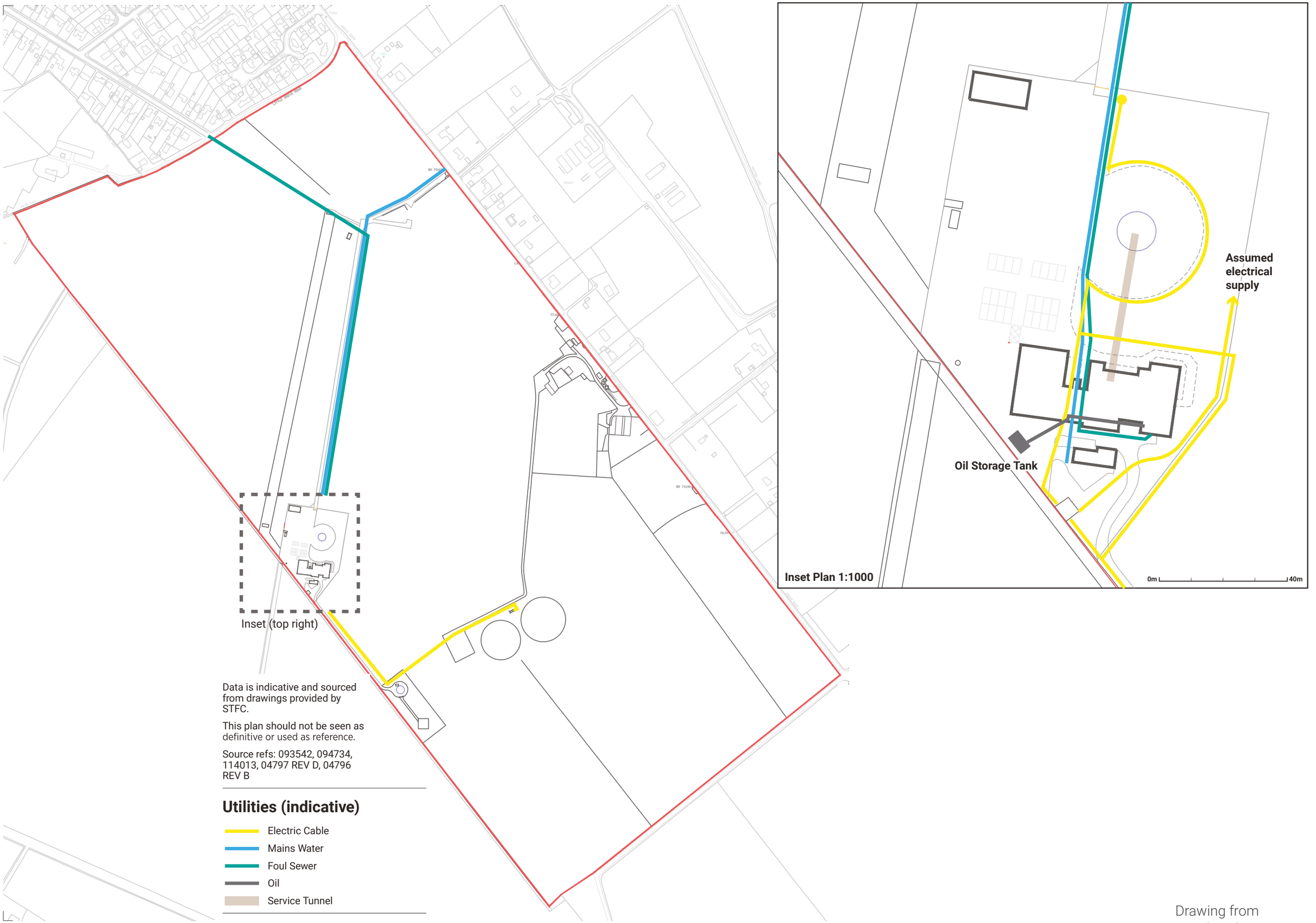
Drawing from
David Lock Associates

Figure 16: Site analysis plan - Environment



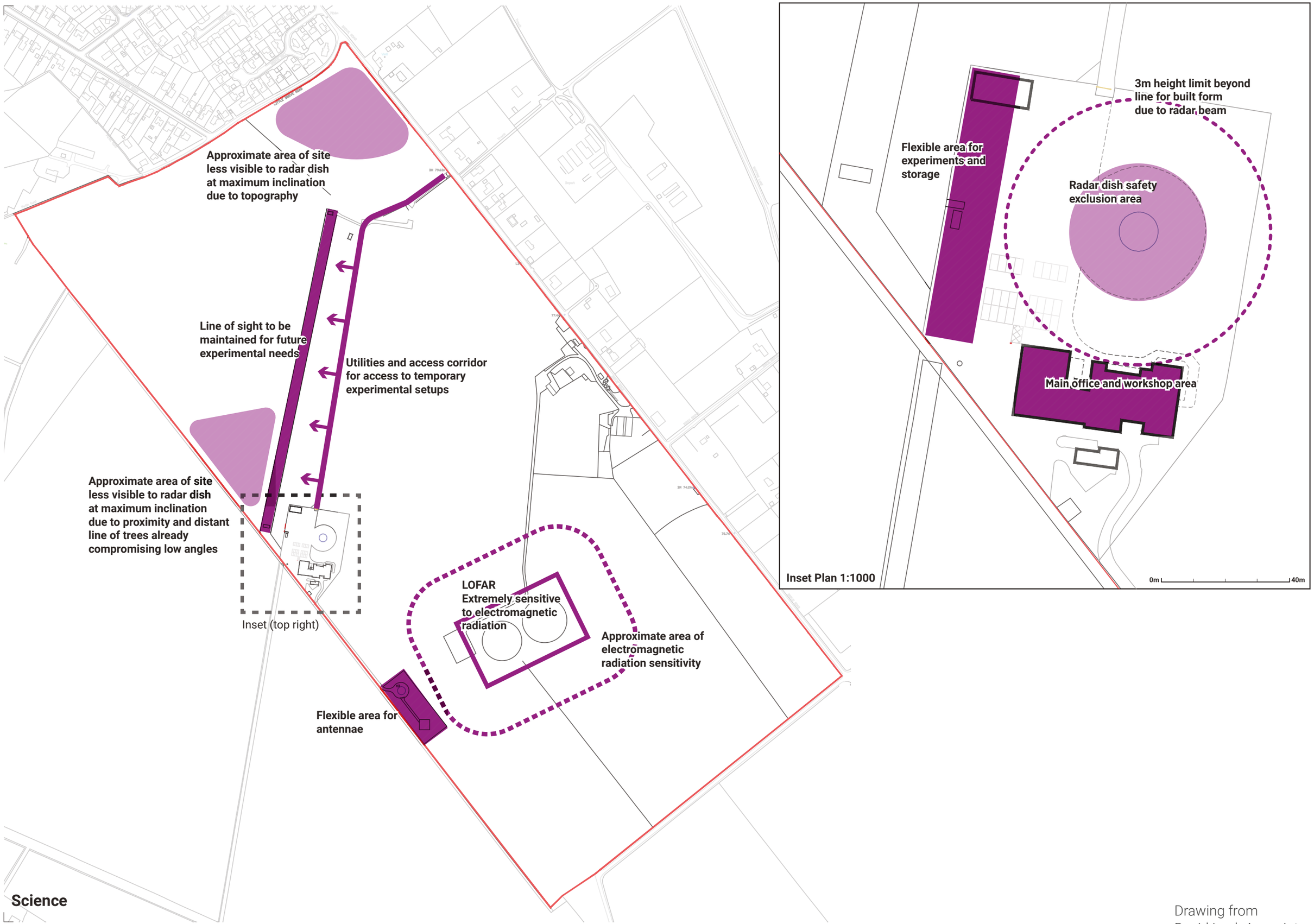
Drawing from
David Lock Associates

Figure 17: Environmental and policy constraints context plan



Drawing from David Lock Associates

Figure 18: Site analysis plan - Utilities (indicative, awaiting full topographic survey)



Drawing from
David Lock Associates

Figure 19: Site analysis plan - Science

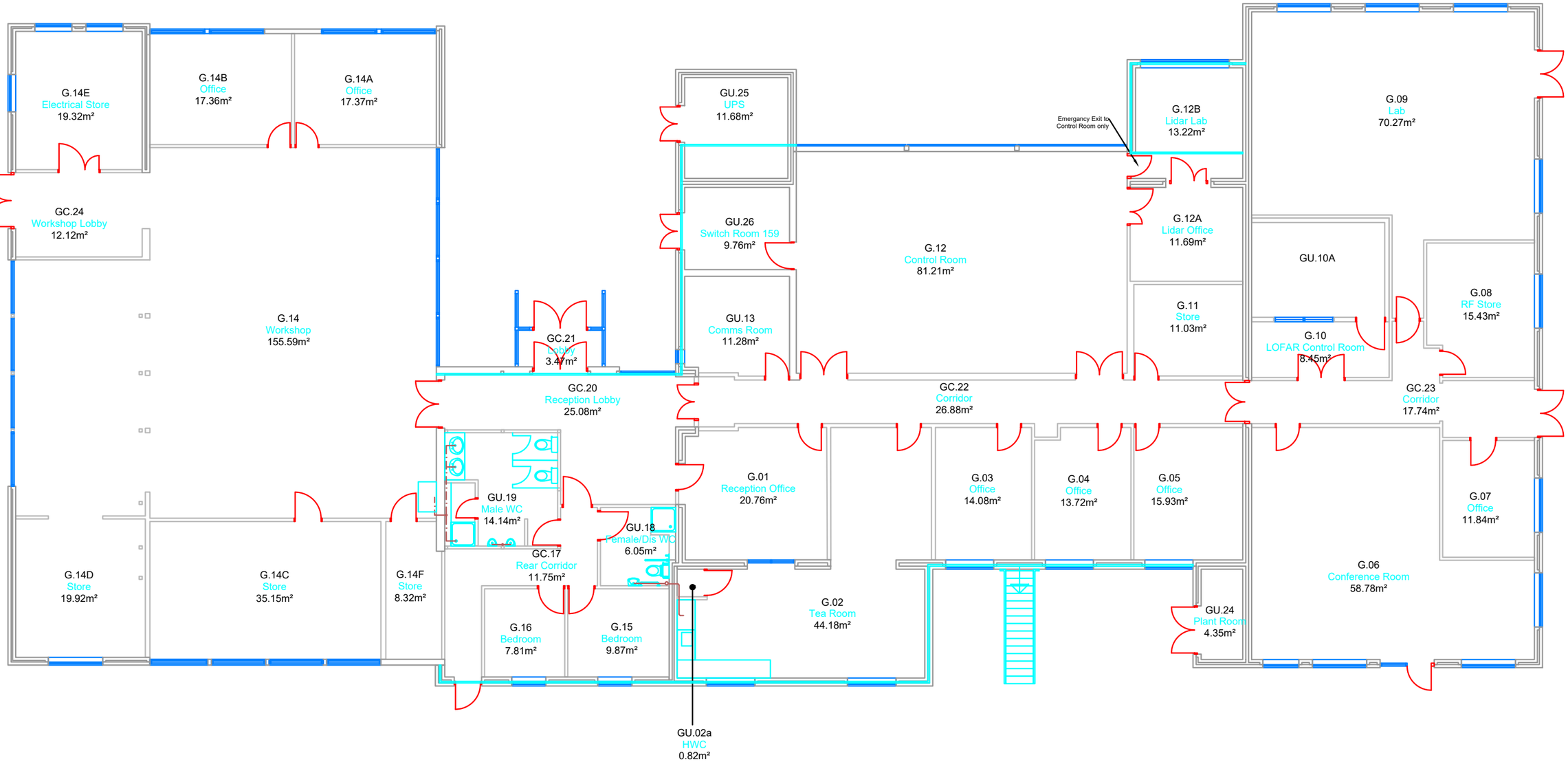


Figure 20: Main observatory building interior floor plan

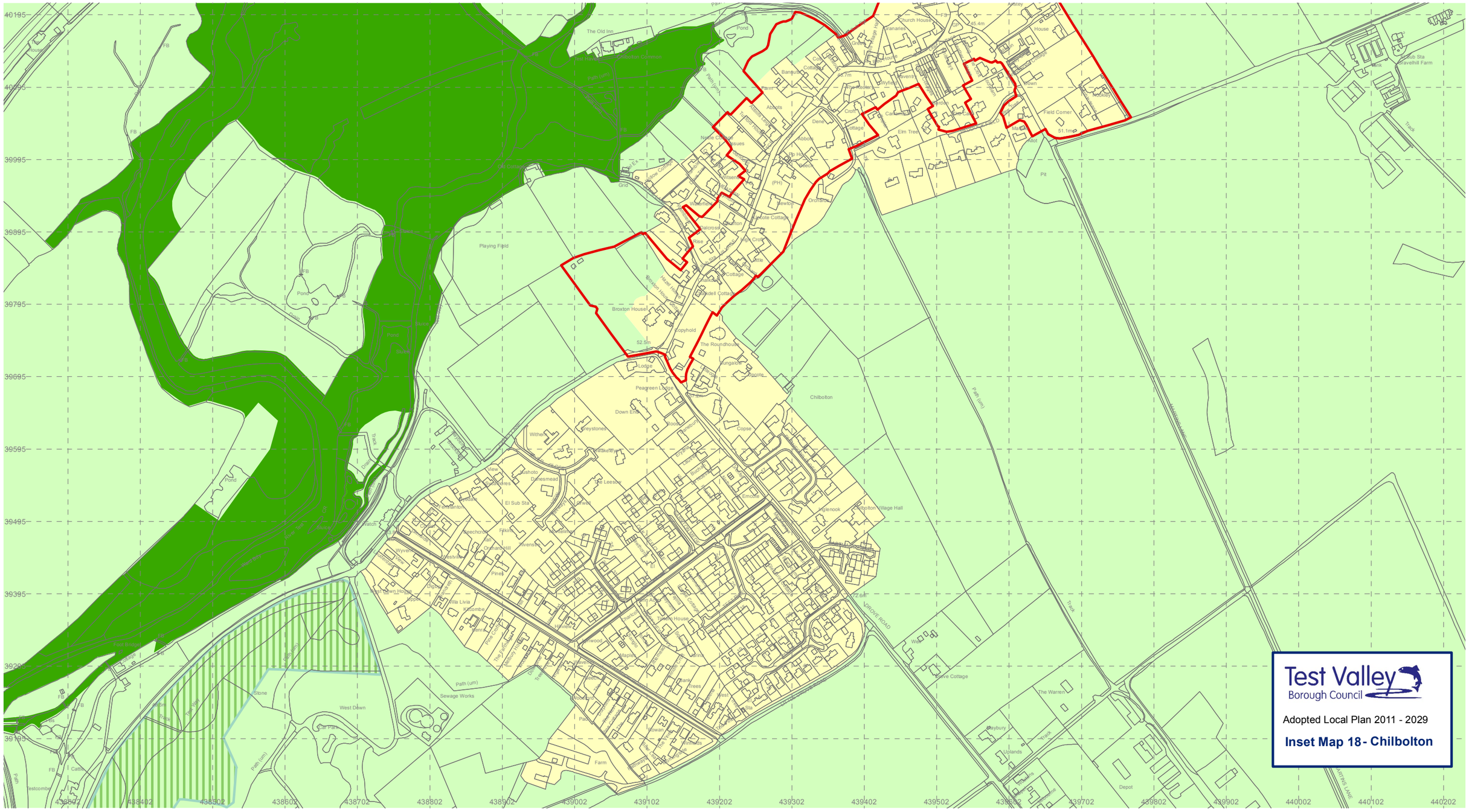


Figure 21: Extract from Test Valley Local Plan policies map

Potential alternative
access point and link

Potential to locate
or test PV arrays
(Planning constraints)

Secure access point
automation or improvements

Habitat links towards
nature reserve and SSSI

Strategic nature recovery
or biodiverse land management

Flexible serviced area
to host scientific
experiments

Potential to locate
or test PV arrays

Strategic nature recovery
or biodiverse land management

Indicative area required
for ground source
heat pump (GSHP)

Inset (top right)

Flexible serviced area
to host antennae

Secure access point
automation or improvements

Flexible serviced area
to host scientific
experiments

Managed for nature recovery
and to include amenity provision

Focus for any built
form growth or change

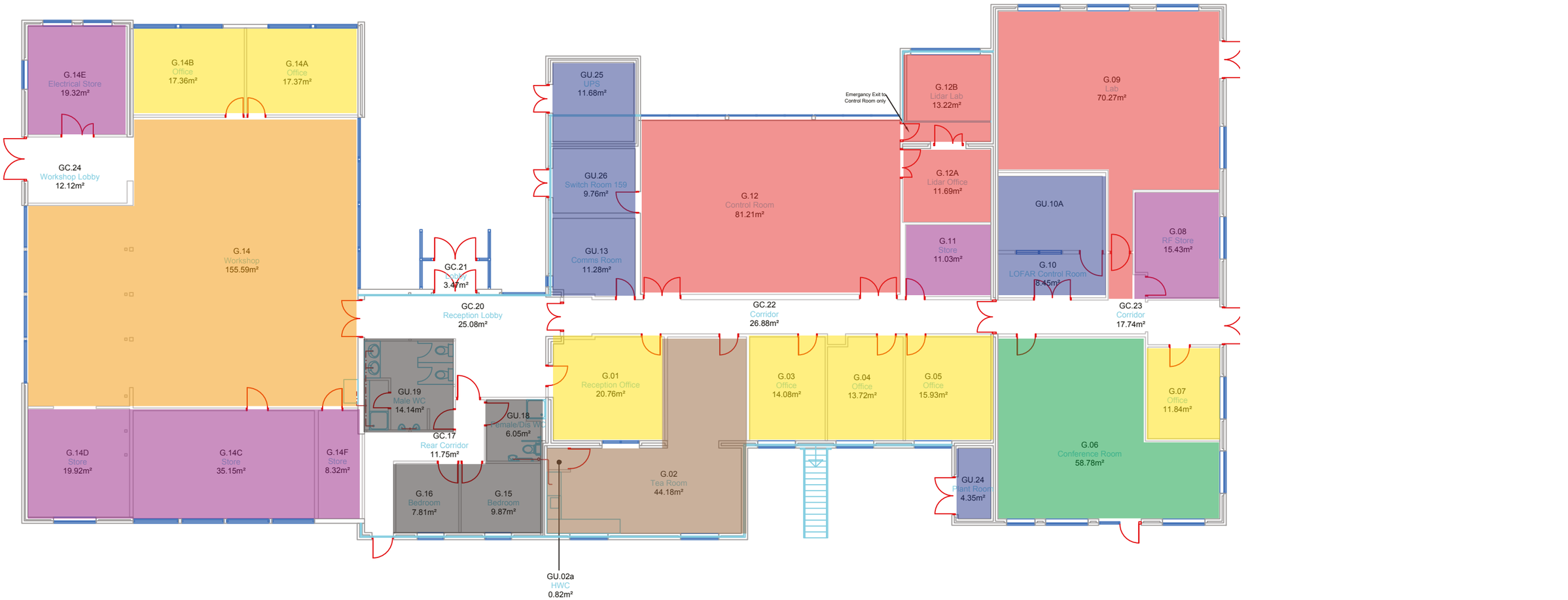
Inset Plan 1:1000

0m 40m

Opportunities

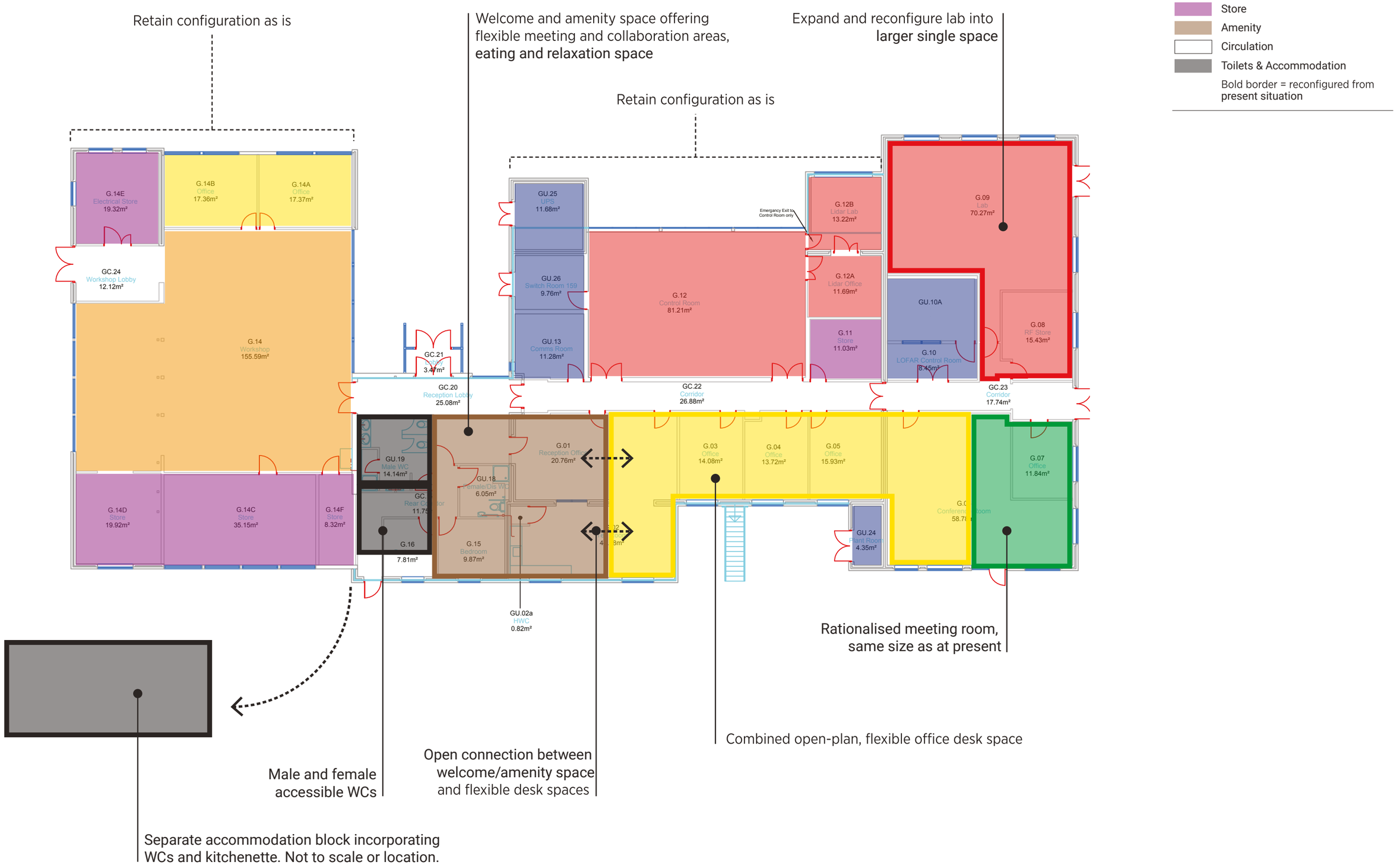
Drawing from
David Lock Associates

Figure 22: Site opportunities plan



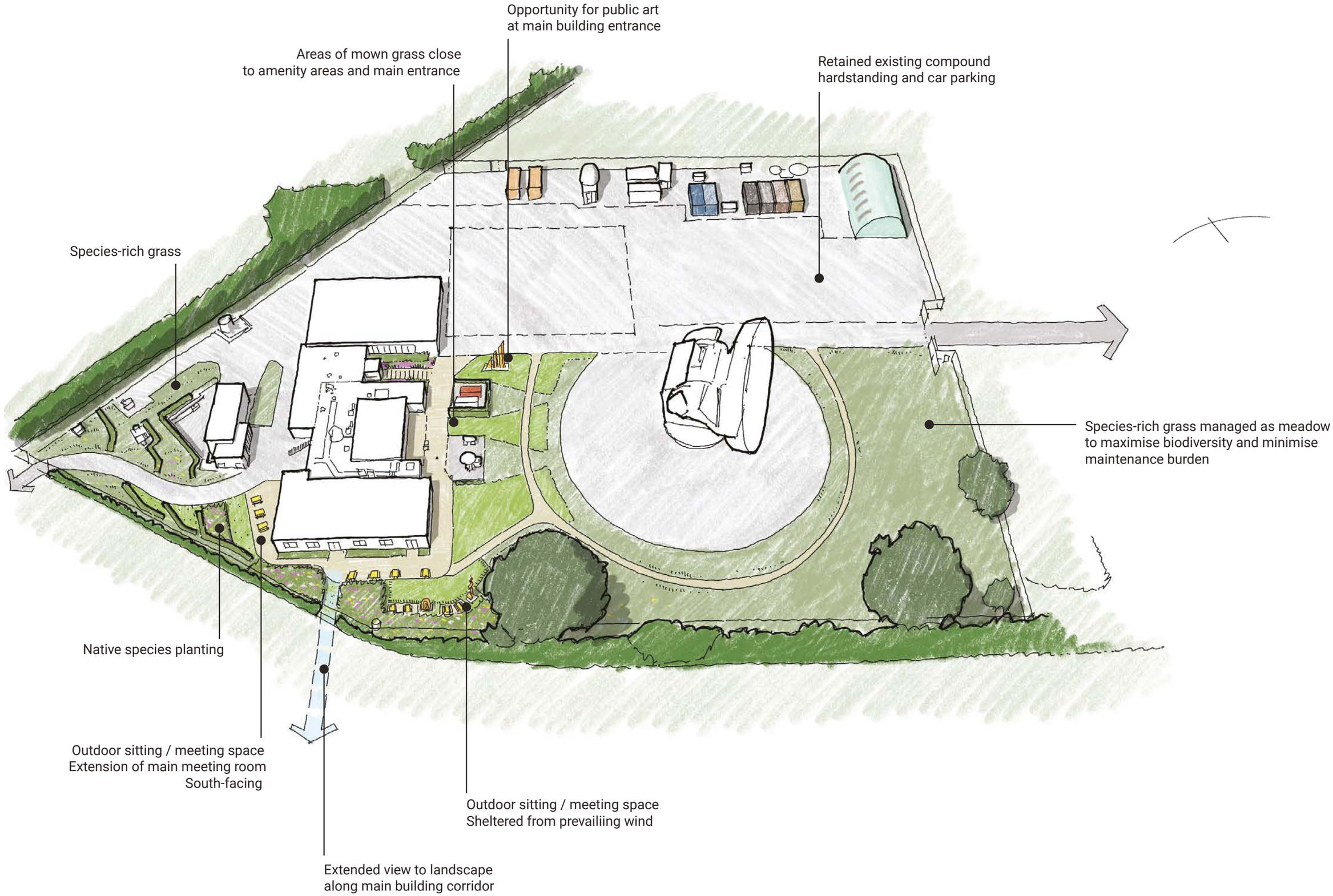
Drawing from
David Lock Associates

Figure 23: Existing floorspace uses within C1 building



Drawing from David Lock Associates

Figure 24: Proposed future concept for layout within C1 building



Drawing from
David Lock Associates

Figure 25: Illustrative landscape concept

Drawing from
David Lock Associates

Figure 26: Chilbolton Observatory Spatial Development Plan

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