ICOMOS

INTERNATIONAL COUNCIL ON MONUMENTS AND SITES
CONSEIL INTERNATIONAL DES MONUMENTS ET DES SITES
CONSEJO INTERNACIONAL DE MONUMENTOS Y SITIOS
МЕЖДУНАРОДНЫЙ СОВЕТ ПО ВОПРОСАМ ПАМЯТНИКОВ И ДОСТОПРИМЕЧАТЕЛЬНЫХ МЕСТ

Our Ref. GB/AA/1594_Add Info1

Charenton-le-Pont, 10 October 2018

Mr Matthew Lodge
Permanent Delegation of the United Kingdom of Great Britain and Northern Ireland to UNESCO
35 rue du Faubourg St Honoré
75383 Paris CEDEX 08

World Heritage List 2019
Jodrell Bank Observatory (United Kingdom of Great Britain and Northern Ireland)

Dear Sir,

ICOMOS is currently assessing the nomination of 'Jodrell Bank Observatory' to the World Heritage List, and an ICOMOS evaluation mission visited the property to consider matters related to protection, management, conservation and interpretation. ICOMOS is very grateful for the time, expertise and support given to the evaluation mission by the State Party, local experts and other involved in the nomination process.

In order to help with our overall nomination process, we would be grateful to receive further information to clarify several points and to augment the material that has already been submitted in the nomination dossier.

We would be grateful if the State Party could consider the following points and kindly provide additional information on these matters:

Documentation
The nominated property presents evidence of every stage of the post 1945 emergence of radio astronomy, which was adapted to the evolution of radio astronomy and new discoveries. Could the State Party provide mapping of the various phases/periods of scientific instruments and attributes that are reflected in the nominated area?

Comparative Analysis
The Comparative Analysis is built around the identification of five values which are presented on page 108 of the Nomination dossier. These values are used as a basis for the comparisons of the nominated property with other comparable sites. Among these values, there is the one called "Pioneering role in the emergence of radio astronomy" which is not mentioned for the comparisons with the other sites, but which is part of the summary statement for all comparators presented in Table 3.3, which includes the five values (p. 129). ICOMOS would be pleased if the State Party could provide analytical text addressing this value for the relative comparators.

Proposed Justification for Outstanding Universal Value
In relation to the justification of criterion (ii), one of the key interchanges identified by the State Party relates to very large paraboloid dish telescopes. On page 88, it is written that 'What was new, and significant, was [the Transit Telescope's] phenomenal size...'. ICOMOS would be interested to receive further information about the influence of the Transit Telescope on later such instruments elsewhere in the world, such as provided for the Australian example at Dover Heights.

The Nomination dossier refers to 'international scientific dialogue and influence' as part of the proposed justification related to criterion (ii) (p. 91). ICOMOS would be pleased if the State Party could provide further explanations on this matter, detailing in which way this international scientific dialogue took place and contributed to the influence Jodrell Bank Observatory had.

Integrity and Authenticity
ICOMOS noted that the Nomination dossier (page 98) mentions "early poor modern extension" that remains in the Control Building and that "later poor quality additions" will be removed. As indicated to ICOMOS in June 2018, there is a project of restoring the original Control Building, together with a sympathetic replacement of a more recent (unlisted) annex to this. At this date, the project was on hold pending funding. ICOMOS would be pleased if the State Party could provide updated information on this project.

Could the State Party please clarify which structures are in poor condition (p. 136)?

Is there a timeframe for completion of the conservation project/s to ensure the good state of conservation of the attributes (p. 137)?

ICOMOS would be pleased to receive further information regarding the projects for the new heritage gallery/visitor facilities and carpark that are planned to be ready and open to the public in early 2021 and their potential impact on the proposed Outstanding Universal Value.

Management

As the technological elements of the nominated property and buildings are mostly still in use, ICOMOS would be pleased if the State Party could explain how the management of the property would enable the balance between the conservation of the attributes of the proposed Outstanding Universal Value, and the need to continue the scientific research by improving the instruments and/or buildings.

ICOMOS noted that an Initial draft Tourism Management Plan has been provided as part of the Nomination dossier. As it is presented as an initial draft, could the State Party provide information on the completion and finalization of this Tourism Management Plan?

ICOMOS appreciates that the timeframe for providing this additional information is short. Brief responses are required at this stage, and can be discussed further with the State Party if needed during the ICOMOS World Heritage Panel process.

We look forward to your responses to these points, which will be of great help in our evaluation process.

We would be grateful if you could provide ICOMOS and the UNESCO World Heritage Centre with the above information **by Friday 9 November 2018 at the latest.**

Please note that the State Party shall submit two copies of the additional information to the UNESCO World Heritage Centre so that it can be formally registered as part of the nomination.

We thank you in advance for your kind cooperation.

Yours faithfully,

Gwenaëlle Bourdin
Director
ICOMOS Evaluation Unit

Copy to Jodrell Bank Observatory
Historic England
UNESCO World Heritage Centre

Clarifications following ICOMOS evaluation mission

Please find below the responses to the various points of clarification requested.
Two separate documents are attached:

- *Oxford Archaeology Report on Control Building*
- *Tourism Management Plan*

Documentation

The nominated property presents evidence of every stage of the post 1945 emergence of radio astronomy, which was adapted to the evolution of radio astronomy and new discoveries. Could the State Party provide mapping of the various phases/periods of scientific instruments and attributes that are reflected in the nominated area?

The following series of maps of the site represent development through the eras 1945, 1950, 1957 and 1970. They use the field boundaries and landscape features from the 1911 Ordnance Survey map as a background. Identification of the individual buildings & structures on the site and shown in these maps can be made via the first map overleaf showing the current site from the Nomination Document p.23.

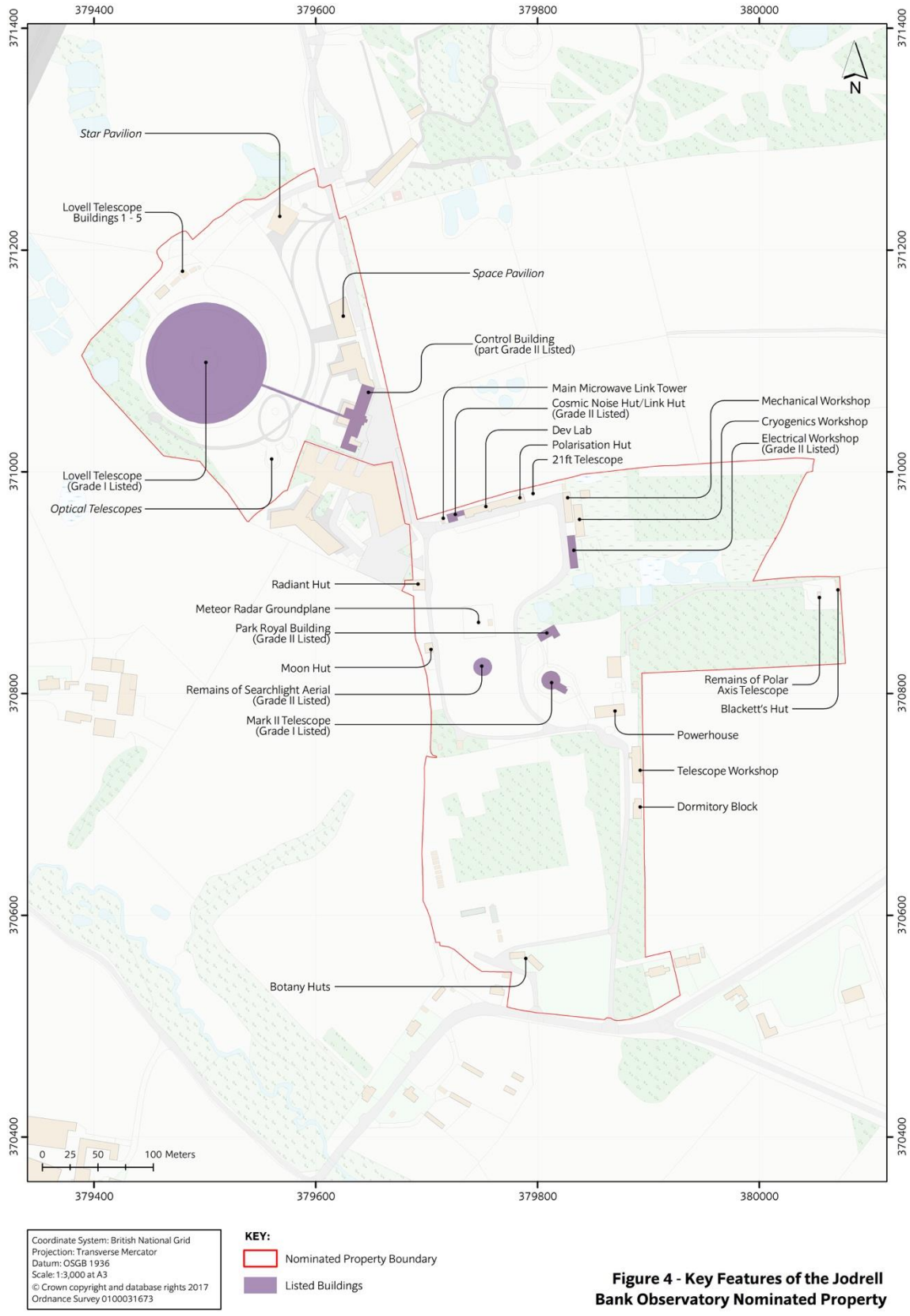
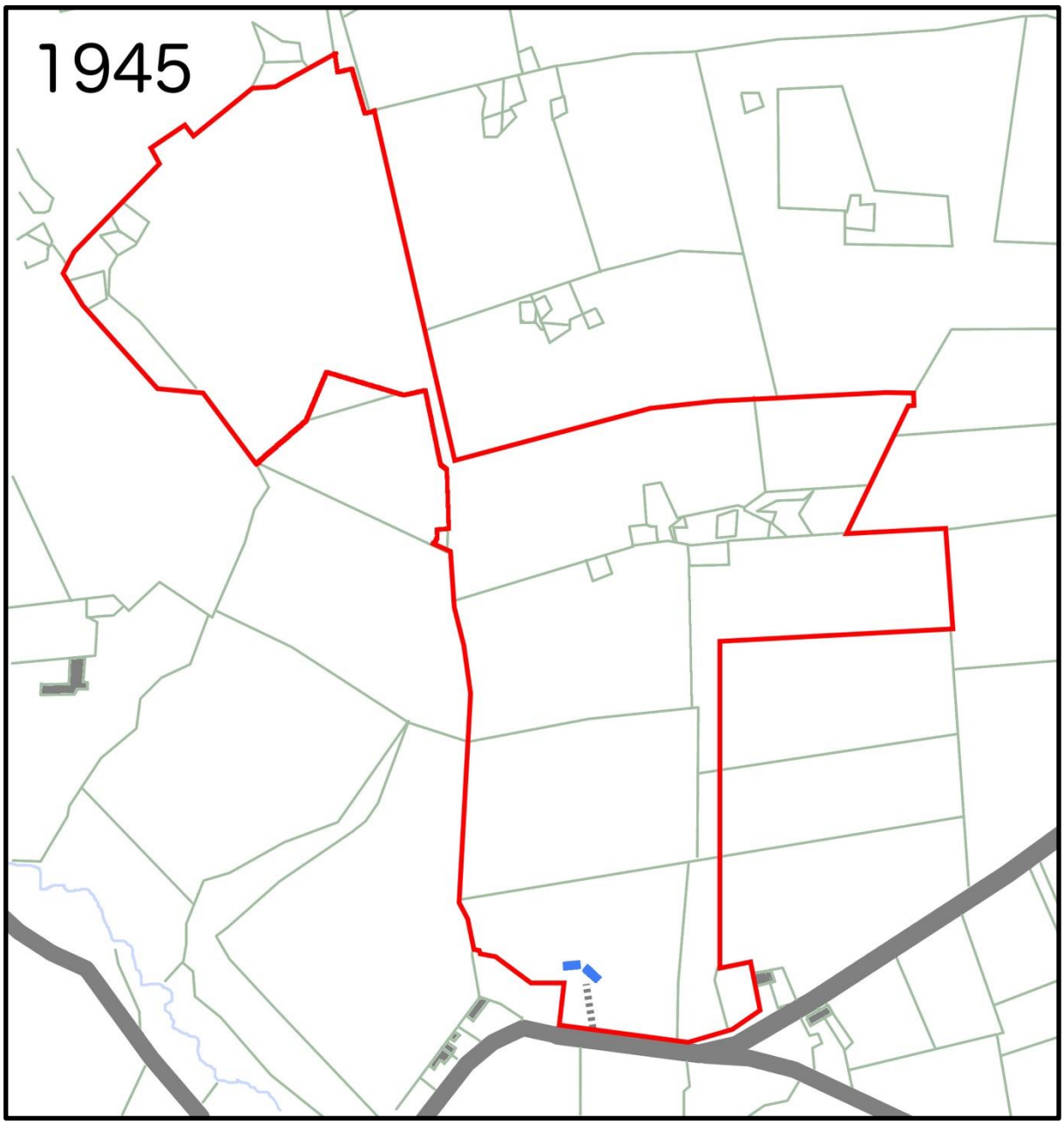
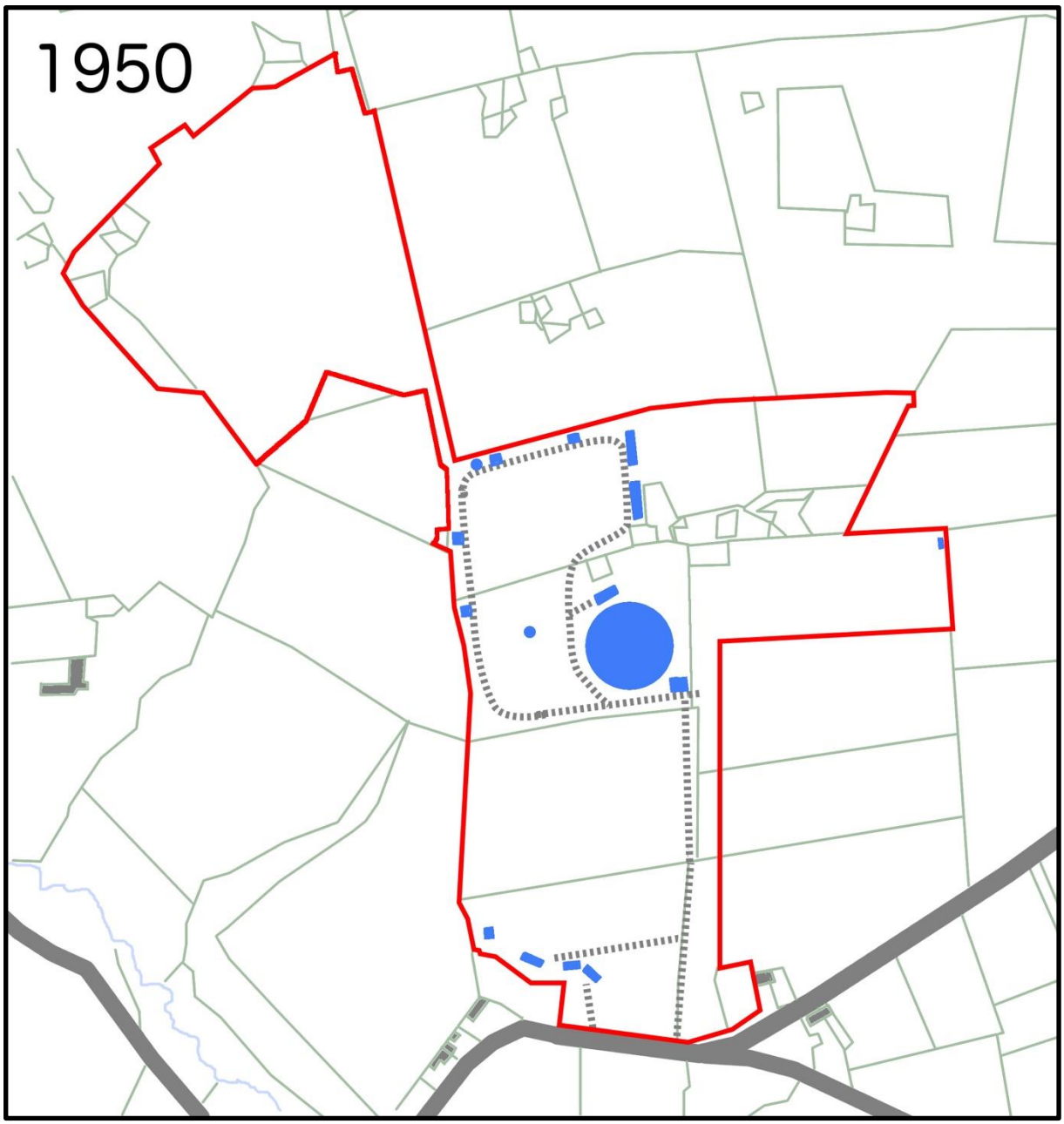


Figure 4 - Key Features of the Jodrell Bank Observatory Nominated Property

Extract from Nomination Document showing the site today.

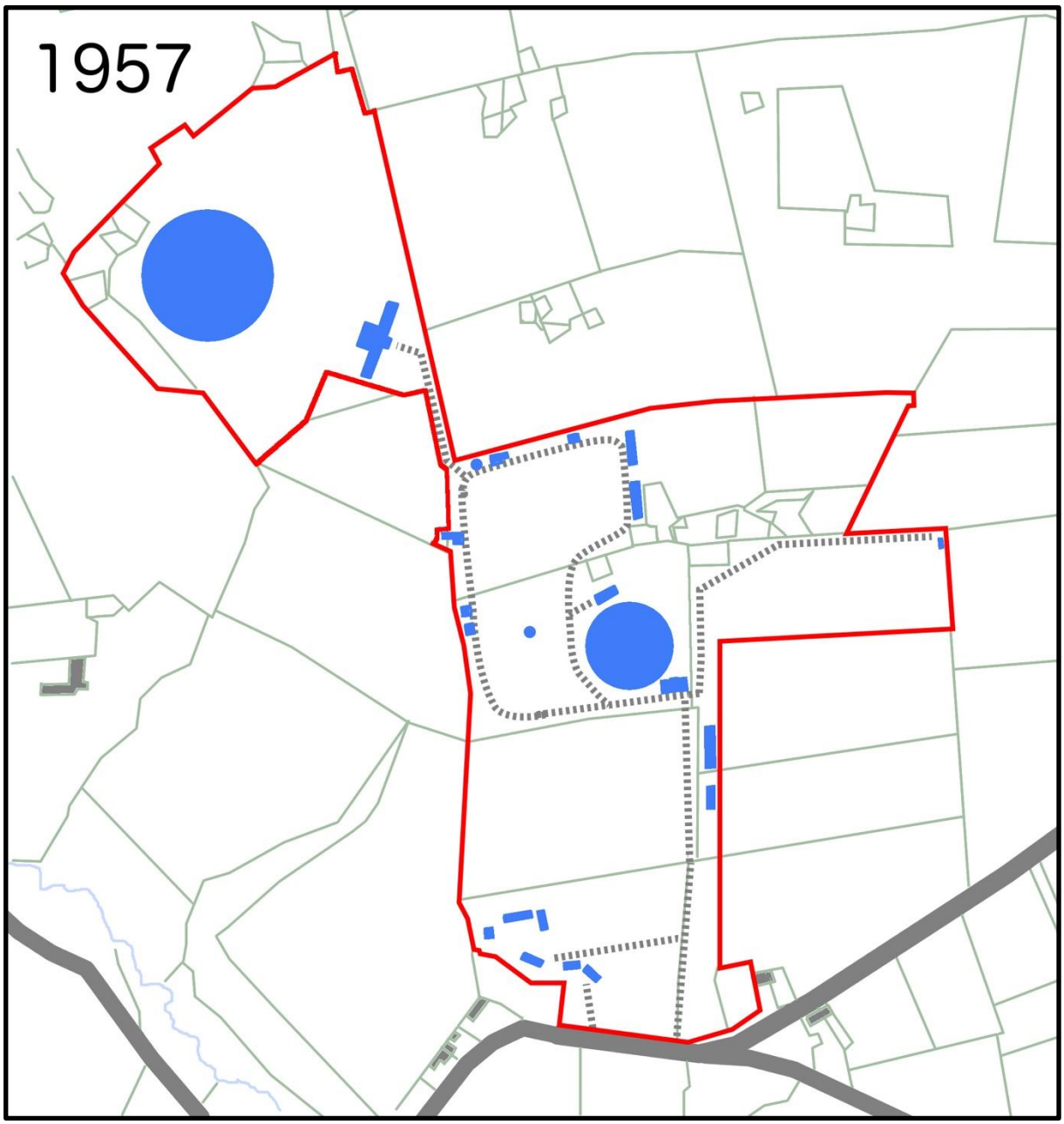


In 1945, when Bernard Lovell arrived at Jodrell Bank to begin his radio astronomy work, the only structures on the site are the Botany Huts (shown in blue) at the southern edge. The original approach track is indicated by the dashed line. It is important to note that the place where the very first use occurred is still part of the Site and hence preserves the attribute of the Landscape and Layout as well as the attribute of the Botany Huts.

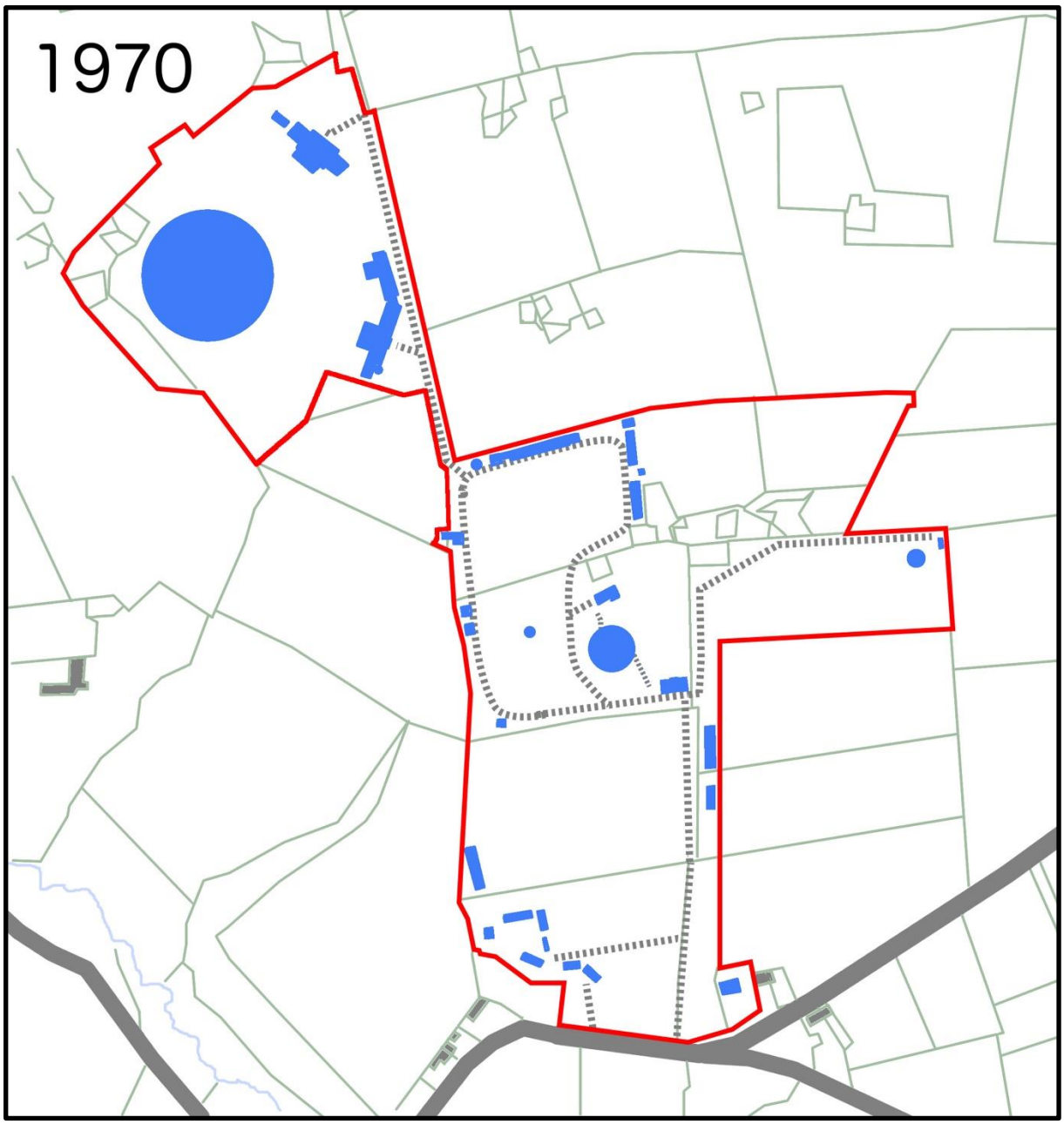


By 1950, the basic layout of the site around the Green, has been established. Lovell began work in this area, the fields north of the original Botany Grounds, in 1946, building the track indicated running north from the Botany Huts area. The first purpose-built instrument, the Searchlight Aerial, was placed in the middle of the Green in 1946. The permanent buildings, all still present, are in place from circa 1949 alongside an encircling road. The large Transit Telescope had been constructed in 1947 in the southeast corner of the Green and the 30-foot Telescope is in place at the northwest corner of the Green. Blackett's Hut is also in place at the eastern extremity of the site.

This area and era of the site's development contributes to the attributes of Landscape & Layout, the Green and Associated Observatory Buildings, the Site of the Transit Telescope and Sites and Remnants of Other Early Scientific Instruments.



The major development by 1957 was the construction of the Mark I Telescope (now the Lovell Telescope) and its associated Control Building in the field to the northwest. The Observatory has been further augmented by the Canteen and Dormitory buildings along the southern access road.
This area and era of development contributes the attributes of the Lovell Telescope and the Control Building, as well as to Landscape & Layout in that it is the final extension of the site to the northwest.



By 1970, the Transit Telescope has been replaced by the Mark II Telescope (1964). Other additions include: a wooden building (still present as the Development Lab, or Dev Lab) on the northern edge of the Green between Noise Hut and Polarisation Hut; Control Building extensions to the north and a 50-foot Telescope towards its southern extremity (the site of the 42-foot Telescope since 1982); the first permanent visitor buildings (the Concourse Building; mid 1960s) at the northern edge of the site; the Polar Axis Telescope (1962) alongside Blackett's Hut.

This era contributes the final attribute of the Mark II Telescope as well as Landscape & Layout.

After 1970 there were no significant changes. Modifications included: a few further extensions to the Control Buildings; extension of visitor facilities (demolished in 2003, replaced from 2011); Cryogenics extension linking Electrical and Mechanical Workshops;

dismantling of 30-foot and Polar Axis telescopes. This leaves the site is as it is seen today in the map shown in the Nomination Document p23 and in this document on p2.

Comparative Analysis

The Comparative Analysis is built around the identification of five values which are presented on page 108 of the Nomination Dossier. These values are used as a basis for the comparisons of the nominated property with other comparable sites. Among these values, there is one called "Pioneering role in the emergence of radio astronomy" which is not mentioned for the comparisons with the other sites, but which is part of the summary statement for all comparators presented in Table 3.3, which includes the five values (p. 129). ICOMOS would be pleased if the State Party could provide analytical text addressing this value for the relative comparators.

As described on page 108 of the Nomination Document, the value "Pioneering role in the emergence of radio astronomy" is defined as belonging to those sites which took place in developments during the 1930s and 1940s. The period of time over which work was carried out at each site was therefore used to populate Table 3.3. A brief narrative describing this value for each comparator site operating through this period is presented below:

- *Bell Telephone Laboratories, USA* – Jansky's work on the first detections of extra-terrestrial radio waves was conducted at this site between 1931 and 1934. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Wheaton, USA* – Reber's work in building the first parabolic dish telescope and mapping radio emissions across a large part of the sky was conducted at this site between 1937-1947. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Richmond Park, UK* – Hey's work as part of the British Army group was conducted at this site during the period 1945-48, including important studies of the discrete radio source Cygnus A. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Jodrell Bank Observatory, UK* – Lovell arrived at Jodrell Bank in 1945, working first on radar studies of meteors and then on wider radio astronomy using the Transit Telescope constructed in 1947. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Sydney Field Stations, Australia* – these were in operation from 1945 (in some cases) to mostly the 1950s and 1960s (1998 in one case). Significant work was undertaken at several of these sites during the 1940s. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *'Rifle Range' site, Cambridge, UK* – Martin Ryle, Graham Smith and others did significant work in radio astronomy, particularly interferometry, at the 'Rifle Range' Site between 1946 and 1956. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Naval Research Laboratory, Washington DC, USA* – This site was in operation from 1946 where observations were undertaken from the roof of the building. This site therefore did play a pioneering role in the emergence of radio astronomy.

- *Kootwijk, Netherlands* – Important radio astronomy work using a Wurzburg dish was carried out here between 1948 and 1955. This site therefore did play a pioneering role in the emergence of radio astronomy.
- *Tokyo Astronomical Observatory, Japan* – This site conducted radio astronomy research (primarily solar) from 1949 to 1969. This falls just within the period where we could say the site did play a pioneering role in the emergence of radio astronomy.

None of the other comparator sites contributed to radio astronomy in the period of the 1930s or 1940s. As such, although their work is in many cases significant to the subject of radio astronomy, they cannot claim to have played a pioneering role in its emergence.

Proposed Justification for Outstanding Universal Value

In relation to the justification of criterion (ii), one of the key interchanges identified by the State Party relates to very large paraboloidal dish telescopes. On page 88, it is written that "What was new, and significant, was [the Transit Telescope's] phenomenal size…'. ICOMOS would be interested to receive further information about the influence of the Transit Telescope on later such instruments elsewhere in the world, such as provided for the Australian example at Dover Heights.

It should first be noted that the 218-foot (66-metre) Transit Telescope was a demonstration that very large paraboloidal dishes were feasible and could achieve important results. There is always a desire to build as large a telescope as possible, to push collecting area to an extreme and hence both increase its sensitivity to faint sources as well as its resolving power. This desire is tensioned against the engineering difficulties of building a huge instrument. The simplest way of achieving a large collecting area is to construct some sort of fixed antenna. But, since a fixed dish is limited in the area of sky which it can observe, the desire always remains to make the antenna steerable. The Jodrell development, moving from a very large fixed dish to a very large steerable dish encapsulates this widely-held ambition. An ambition which in many cases is limited by the availability of funds.

A recent paper (and presentation) by Richard Strom[1], discusses various of these type of transit telescopes, in chronological order:

- The 66-metre Jodrell Bank Transit Telescope;
- The 22-metre (later extended to 23.4m) Dover Heights "hole-in-the-ground" telescope in Australia and described on p88-89 of the Nomination Document;
- Around the same time as the Dover Heights telescope, a 30-metre "hole-in-the-ground" telescope was built at Kootwijk in the Netherlands – this was tilted at an angle of 10 degrees to move observations south of the zenith but it was not extensively used;
- A pair of 31-metre diameter tilted "hole-in-the-ground" type transit telescopes were built at Katsiveli in the Crimea in the mid-1950s, as noted on p118 of the Nomination Document.

[1] Short history of fixed-reflector telescopes, Strom. R. (2016), ASPC 502, 73 http://articles.adsabs.harvard.edu/pdf/2016ASPC..502...73S and presentation at http://astron.nl/Wimsym77/Documents/Wimsym77_Strom.pdf

There is a further transit instrument not mentioned by Strom and that we did not mention in the Nomination Document because it was not intended for radio astronomy. In the USA, the Naval Research Laboratory (NRL) constructed a very large "hole-in-the-ground" style fixed paraboloid of size 220x260 foot (67x79m) at Stump Neck, Maryland, in 1951. This had a classified remit to carry out lunar radar and to intercept communications reflected from the Moon[2,3,4]. However, in 1954, this NRL radar/intelligence team joined forces with their radio astronomers to move, as had Jodrell Bank, from a transit instrument to a fully-steerable design. They proposed a gigantic 600-foot (183m) steerable paraboloid for which, incidentally, Charles Husband's views as a consulting engineer were sought as noted on p90 of the Nomination Document. Construction, funded from military sources, began at Sugar Grove, West Virginia, but the project was cancelled due to spiralling costs in 1962.

Other instruments that followed include the Arecibo Telescope in Puerto Rico (1963) and most recently, the largest of all, the 500-metre FAST telescope in China, inaugurated in 2016.

As previously noted, the 218-foot Transit Telescope explicitly influenced the development of the Dover Heights telescope (during a visit to Jodrell Bank on a tour of Europe in 1950 by John Bolton of the Radiophysics Laboratory in Sydney[5]). We are not aware so directly of influence for others but clearly techniques built upon experience. Strom summarises the process of development in these instruments as follows:

> *The history of fixed reflector antennas provides us with lessons in how ingenuity can be used to overcome the limitations of an original design. The Jodrell radio astronomers quickly realized that off-axis observing was possible, and could be exploited to gain greater sky coverage. The possibility of tipping the axis of the parabolic reflecting surface, to provide access (albeit unchangingly) to part of the sky away from the zenith was used in just the second instrument built (at Kootwijk). The major innovation, providing constant access to a large region of sky, was achieved with the spherical reflector at Arecibo.*
>
> *Jodrell's 218' aerial was supported by poles, completely above the ground. Its three successors at Kootwijk, Dover Heights and in the Crimea, used natural depressions and excavation to provide inexpensive support for the reflecting surface. The final step was to find a naturally occurring, large bowl-shaped valley, something available in profusion in a karst landscape, as occurs near the town of Arecibo, in the north of Puerto Rico. It is then unsurprising that the huge FAST telescope is being constructed in the world's most extensive karst terrain, in Guizhou Province. FAST already comes with its own innovations: an active surface constantly in the form of a paraboloid, and a nearly hemispherical reflector for maximum sky coverage. If history is anything to go by, we can expect more innovation from the astronomer users of FAST.*

[2] van Keuren, D.K. (2001), Social Studies of Science, 31, 207
[3] https://history.nasa.gov/SP-4217/ch2.htm
[4] https://ieeexplore.ieee.org/document/4065256
[5] In *Cosmic Noise: A History of Early Radio Astronomy*, p 334, Woody Sullivan

It should also be remembered that ultimately a steerable telescope is to be preferred (if it can be engineered and afforded) and it is the direct development at Jodrell Bank from the 218-foot fixed telescope to the 250-foot fully-steerable telescope that certainly inspired others. For example, the originator and first Director of Arecibo noted in his review of 1964 that "*In 1958, when the size required for the antenna was established, it was not clear that an antenna of such size could be built. The largest antenna at that time was the 76-meter (250-foot) reflector at Jodrell Bank. To achieve an economical construction, the ground, properly shaped, would have to be exploited to support the reflector*."[6] Hence, in the Arecibo example, a much larger instrument than the Lovell Telescope required a return to a fixed transit telescope design, of course with additional technical improvements over the original Jodrell Transit Telescope.

This discussion of influence should also be balanced with the generally held view that there was no point in simply copying someone else's approach. It was likely to prove advantageous to develop one's own independent technique to attack a problem from a different angle, or simply to study different problems altogether[7]. Of course, this is itself also influence.

The Nomination dossier refers to 'international scientific dialogue and influence' as part of the proposed justification related to criterion (ii) (p. 91). ICOMOS would be pleased if the State Party could provide further explanations on this matter, detailing in which way this international scientific dialogue took place and contributed to the influence Jodrell Bank Observatory had.

There are several ways in which international scientific dialogue and influence takes place:

- Through publication of scientific results in international research journals (typically reviewed by colleagues internationally prior to publication)
- Through attendance at international conferences and meetings (either Jodrell Bank staff attending these abroad or hosting them at Jodrell Bank and international colleagues attending)
- Through visits to other Observatories and scientific establishments and hosting visits to Jodrell Bank Observatory
- Through exchange of staff and research students e.g. scientists working or being trained at Jodrell Bank and then moving to work elsewhere around the world, and similar moves taking place from elsewhere into Jodrell Bank.
- Beyond the direct arena of scientific research, impact and influence can be achieved by international media interest in the research and activities at the site.

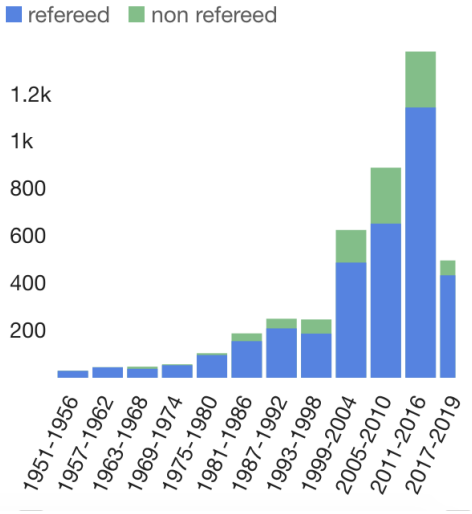
There are many examples of each of these mechanisms in play for Jodrell Bank Observatory, some of which we provide below. In addition, the Jodrell Bank archive held in the John Rylands University Library of Manchester contains extensive records including Lovell's correspondence which demonstrates this international influence.

[6] The Arecibo Ionospheric Observatory, Gordon, W.E., Science 1964 http://science.sciencemag.org/content/146/3640/26

[7] In Astronomy Transformed, Edge & Mulkay, p234- on Competition and Cooperation

Research publications

Searching the SAO/NASA Astrophysics Data System[8] (ADS) for publications where an author affiliation includes the word "Jodrell" returns 4,363 publications distributed by year as shown in the graph at right. These publications have been cited in other publications 159,075 times, demonstrating their influence in the development of the subject. The most highly cited papers report Planck spacecraft observations of the cosmic microwave background from 2013 and 2015, observations of pulsars (a prime activity for the Lovell Telescope since their discovery in 1967) and the discovery of the first gravitational lens in 1979.



These publications are archived in the print editions of journals and of course now on internet archives such as ADS.

Conferences

A fundamental mechanism for international dialogue and influence is via papers presented and discussions which take place at conferences. Jodrell Bank has hosted very many meetings and conferences on topics in radio astronomy, which continue to the present day. A few early examples are described below.

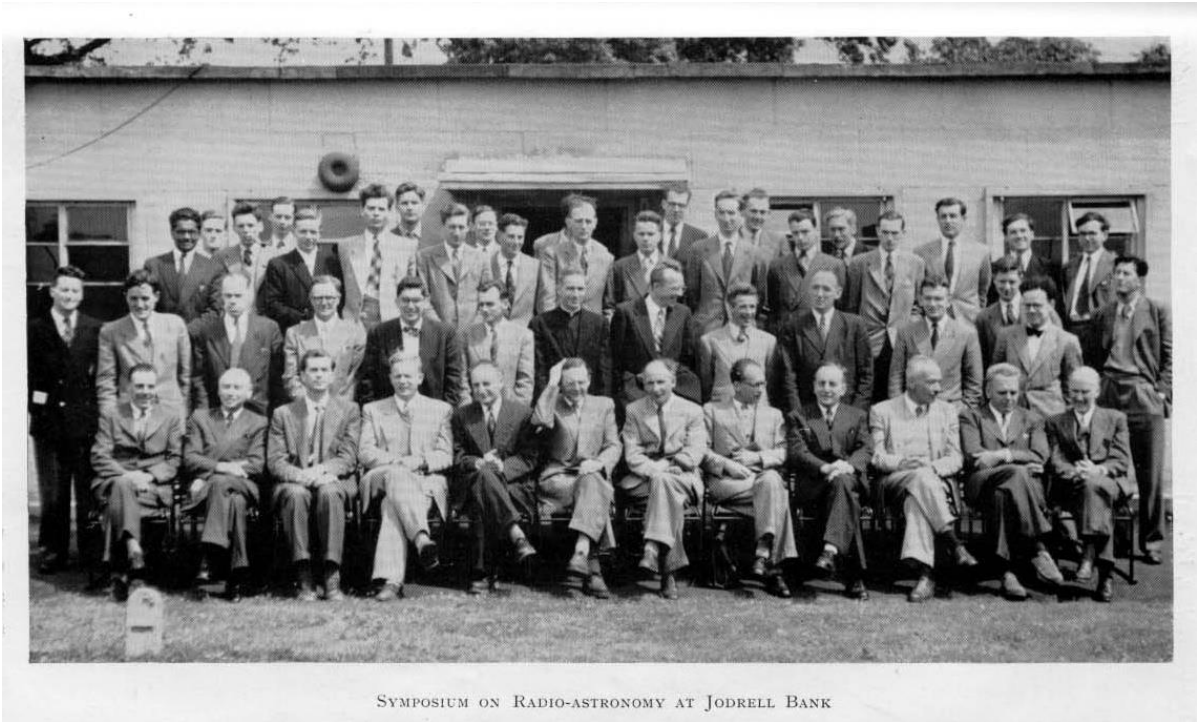
The professional body for world astronomy, the International Astronomical Union (IAU) was formed in 1919. The fourth IAU Symposium[9] – the first on Radio Astronomy – was held jointly with URSI (Union Radio-Scientifique Internationale) in August 1955 at Jodrell Bank. It was the first event in the new Control Building constructed for the Lovell Telescope and brought together 108 participants from 18 countries (Australia, Belgium, Canada, Czechoslovakia, Finland, France, Germany, Great Britain, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, USA, USSR and Yugoslavia). Reports on progress in radio astronomy were made from around the globe and ideas and learning exchanged. This had followed on from the URSI meeting on Radio Astronomy held in Sydney, Australia, in 1952 at which 63 overseas astronomers from 13 countries attended, including Hanbury Brown from Jodrell Bank[10]. There was much discussion of the nature of discrete radio sources including results from the Transit Telescope in comparison with observations in Cambridge and Australia in particular. This was itself followed by a symposium in July 1953 at Jodrell Bank attended by about 50 radio astronomers from around the world, see group photograph below[11].

[8] https://ui.adsabs.harvard.edu/

[9] https://www.cambridge.org/core/journals/symposium-international-astronomical-union/volume/CEDAAB6AE7A39208FA7ED8EC65CBE607#

[10] http://articles.adsabs.harvard.edu/cgi-bin/nph-iarticle_query?1953Obs....73...23B&data_type=PDF_HIGH&whole_paper=YES&type=PRINTER&filetype=.pdf

[11] http://articles.adsabs.harvard.edu/pdf/1953Obs....73..185H



Attendees at the 1953 symposium on radio astronomy at Jodrell Bank. The group are positioned in front of the current Electrical Workshop building, at that time housing the seminar room and Lovell's office.

Visits

Beyond formal conferences, scientists commonly make individual visits to other institutions to discuss ideas. Again, there are far too many examples to discuss in detail but the story of the development of Very Long Baseline Interferometry – the technique of combining radio telescopes across and between continents to create a planet-sized instrument – is an interesting example.

The development of VLBI is presented in Kellerman & Cohen (1988)[12] – hereafter KC88. They note that one reason for their interest in the USA in the mid 1960s was that they were "all aware of the radio-linked interferometer system at Jodrell Bank which was giving dramatic results" – this was the work of Henry Palmer in particular from the 1950s onwards, providing extremely sharp views of radio sources. If VLBI could be made to work, it offered the potential of an even sharper view.

Two teams in the USA and another in Canada were attempting to develop VLBI using different approaches, a friendly competition that the Canadians just won in early 1967. KC88 explain their US team went on to work with a telescope in Sweden early in 1968, effectively extending baselines from one million wavelengths (as in the Jodrell system), to around 100 million wavelengths (with the consequent increase in sharpness of view).

At around the same time as their collaboration with Sweden, the US team wrote to astronomers in Russia to enquire about linking to one of their telescopes. Five years earlier, during a visit by Bernard Lovell to the USSR (in which he was shown various secret facilities

[12] http://adsabs.harvard.edu/abs/1988JRASC..82..248K

in the Crimea), there had been discussions about Jodrell Bank and the USSR developing VLBI. This led to internal discussions within Jodrell Bank that went unrealised until later in the 1960s but, according to KC88, "Lovell's early contact with the Russians apparently played a significant role in getting support from Shklovsky and other Soviet astronomers for the US-USSR experiment". This experiment was successful in Oct 1969 and the discussions between all parties have led to continued work and collaboration on intercontinental radio astronomy through to the present day.

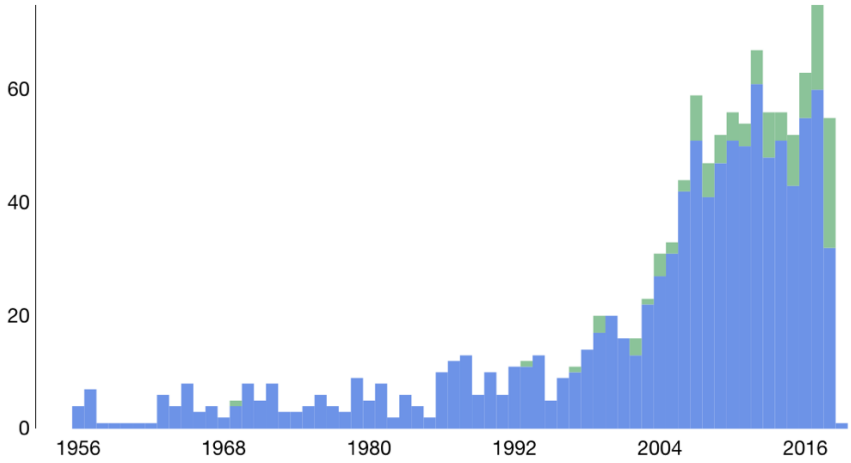
This story combines a traditional route of influence in scientific research, where scientific and technical developments and discoveries are communicated through research papers and conferences (in this case, the achievements in long-baseline radio-linked interferometry at Jodrell Bank influencing developments in VLBI in the USA and Canada), with the added stimulus of a personal visit by Bernard Lovell years earlier helping to set the scenes for extending the links to the USSR.

Movement of staff & students

Another mechanism for international dialogue and influence is through people taking up posts at other institutions and carrying with them information, experience, and ideas. There are many examples associated with Jodrell Bank, several of which were already mentioned in the Nomination Document p91. Another excellent example is the story of Hanbury Brown and John Davis.

Brown had worked on the development of radar in the Second World War, including a secondment to the US Naval Research Laboratory in Washington DC. There his work "led directly to the NATO 'identification friend or foe' (IFF) system of today, along with the civilian system of ground-based air-traffic control now used throughout the world" [13].
He returned to England to a position at Jodrell Bank. Here, he turned the 218-foot Transit Telescope to cosmic radio waves, discovering radio emission from the Andromeda Galaxy and Tycho's Supernova Remnant, amongst other things. Realising the need for long-baseline interferometry to study details of the new radio sources, he developed a brand-new technique called intensity interferometry which was used to reveal, for example, the double nature of Cygnus A (now known to be the result of jets from a supermassive black hole). He then applied the technique to optical wavelengths and measured the diameter of the star Sirius from Jodrell Bank. As a by-product, this optical technique was a key contribution leading to the development of the field of quantum optics and whose lasting (and increasing) influence can be judged by the numbers of subsequent papers year on year which cite the original paper "Correlation between Photons in two Coherent Beams of Light", Brown & Twiss (1956), illustrated below.

[13] https://www.nature.com/articles/416034a



Citations to Brown & Twiss (1956) each year since its publication in 1956.

Hampered by the cloudy skies of England, Brown moved to Australia in 1962 where he built the Narrabri Stellar Intensity Interferometer. He was aided in this by John Davis who had conducted his PhD at Jodrell Bank under Lovell and followed Brown to Australia. Davis[14] went on to develop and operate its successor, the Sydney University Stellar Interferometer opened in 1991. This has itself influenced the design of subsequent interferometers, including the current Very Large Telescope Interferometer in Chile and CHARA at Mt Wilson, USA.

This story shows how techniques and experience developed in wartime radar in England and the USA were transferred to radio astronomy at Jodrell Bank, then to optical astronomy (with an offshoot into a whole new science of quantum optics) in Australia and with influence extending to other facilities across the world.

The movement of staff/students is also discussed at length by Edge & Mulkay in "Astronomy Transformed". In their analysis, they trace the movement of people who joined the British groups up to the end of 1960 and describe exchange and contact between the British, Australian and American groups. They comment that, "It is clear that both Jodrell Bank and Sydney provided a significant proportion of trained manpower for the American expansion: if the NSF [US National Science Foundation] Panel's figures are to be believed, there would, by 1960, be not far short of one Manchester [Jodrell Bank] or Sydney radio astronomer active in America for each 'native' American worker…These figures seem to bear out the verdict of one of our respondents that '…the main achievement of Jodrell Bank is, in my opinion, a general fertilisation of radio astronomy throughout the world.'"[15]

<u>Media</u>

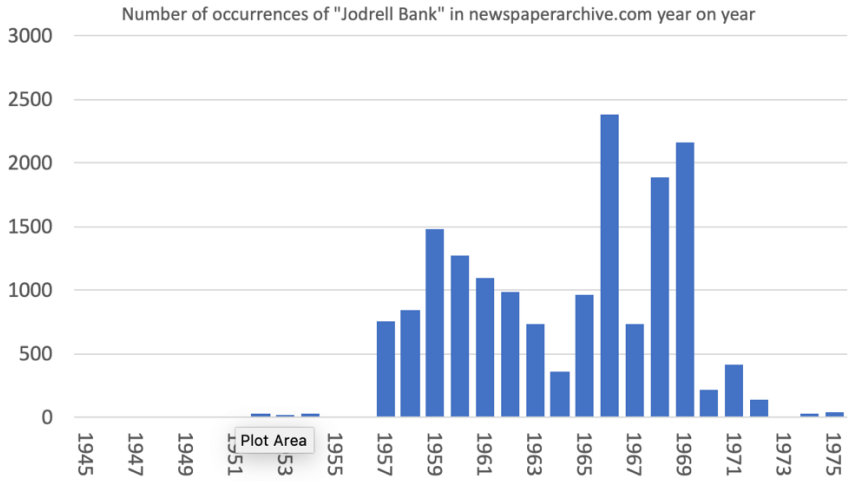
The impact of Jodrell Bank's work extends beyond the academic world, featuring in national and international media, particularly stimulated by its role in the space race from 1957 with the launch of Sputnik I. The Jodrell Bank archive contains many press cuttings, as do online archives. A selection of these media reports is provided below.

[14] https://maas.museum/observations/2010/03/23/in-memory-emeritus-professor-john-davis/
[15] In *Astronomy Transformed*, Edge & Mulkay, pub. John Wiley & Sons, 1976, p54

Forty film reel extracts from British Pathe and Reuters which feature Jodrell Bank are available online[16]. One of these film reels, from Reuters in 1960, entitled *"USA: Washington: Eisenhower Tribute To Professor Lovell Of Jodrell Bank"* [17], has the following description:

> "U.K. scientist, Professor A.C.B. Lovell, director of Jodrell Bank, the West's largest radio telescope, near Manchester, was received by President Eisenhower at the White House, Washington, July 7 and was later presented by the National Aeronautics and Space Administration with a miniature replica of Pioneer V, the solar satellite which he and his staff helped to track. The replica plays "God Save the Queen. The invitation came from the N.A.S.A. which wished to express its thanks for the work of Jodrell Bank and to draw attention to this example of what Professor Lovell today called "historic cooperation". Professor Lovell also received a scroll "in recognition of the unique and valuable contribution made by him and his associates at the Jodrell Bank experimental station to the space research programme of the United States. Mr. Keith Glennan, Administrator of the N.A.S.A. said that without the participation of Jodrell Bank, contract with Pioneer V would have been lost several weeks earlier. The station's 250 ft radio telescope was the largest of its kind in the West, and the only instrument capable of tracking and interrogating the five-watt transmitter of Pioneer V beyond 10 million miles. The last intelligible message from Pioneer V was received on June 26 over a distance of 22,500,000 miles, when he satellite was travelling at 21,000 m.p.h.".

A search of the online newspaper archive at newspaperarchive.com (primarily containing local newspapers from the USA) for the phrase "Jodrell Bank" reveals 17,082 records. Although this will undoubtedly be an incomplete record, the general trends are indicative of global interest/influence. The graph below of numbers of items year on year from 1945 to 1975 shows how the launch of Sputnik I in 1957 generated worldwide interest, boosting newspaper mentions from the few 10s annually into the high hundreds. This rises to a peak in 1959/60 (Luna 2 reaching the Moon, Pioneer V), and peaks again in 1966 (interception of Luna 9 photographs of the Moon's surface) and in 1969 with the Apollo 11 Moon Landing, before dropping back to a background level of a few 10s.



[16] https://www.britishpathe.com/search/query/%22jodrell+bank%22

[17] https://www.britishpathe.com/video/VLVADXA30JCWI2H3GFJ23QUUDYDS9-USA-WASHINGTON-EISENHOWER-TRIBUTE-TO-PROFESSOR-LOVELL-OF-JODRELL/query/%22jodrell+bank%22

Integrity & authenticity

ICOMOS noted that the Nomination Dossier (p. 98) mentions "early poor modern extension" that remains in the Control Building and that "later poor quality" additions will be removed. As indicated to ICOMOS in June 2018, there is a project of restoring the original Control Building, together with a sympathetic replacement of a more recent (unlisted) annex to this. At this date. The project was on hold pending funding. ICOMOS would be pleased if the State Party could provide updated information on this project.

The most recent heritage assessment of the Control Building, conducted by Historic England and published in 2017, resulted in the earliest sections being listed at Grade II. The full listing can be read online[18].

Prior to this, the University obtained planning permission in Mar 2016 for refurbishment of the original Control Building, removal of the northern extensions and the first-floor addition to the southern wing, and construction of a two-storey extension to the north. Listed building consent was sought and received for this proposal, assuming that the building was listed as it was in the curtilage of a Grade I listed structure (the Lovell Telescope).

Before summarising the current position on this project, it is worth describing how the University arrived at the proposal to refurbish the building.

The Conservation Management Plan (original version published 2014) assessed the condition and significance of the site and its various structures and contains recommendations for action (see answer to next question which gives details on any structures deemed to be at least in part in poor condition).

The condition of the Control Building was deemed to be Good for the original sections and early extensions but only Moderate-Poor for the later extensions.

The discussion of significance of the Control Building from the CMP is as follows:

> "The original symmetrical brick building with central control room is of high significance. It forms a designed group with the subterranean concrete link tunnel and the Grade 1 listed Lovell Telescope. The whole group remains in its original use. It is central to the historical development of both the Jodrell Bank site, marking the most significant phase in its history, and also to the scientific research with which the Lovell Telescope has been involved. The building is a decent example of the modern architecture of its period. However, although the building has some character and decent materials, it is not ambitious or ostentatious and is no different from many functional buildings built in that period for universities, schools and private companies.
> The 1960s brick extensions to the original building maintain its symmetrical form and design language in a sensitive manner, although they do dilute the intended original prominence of the entrance and control room.

[18] https://historicengland.org.uk/listing/the-list/list-entry/1443868

The 1960s northern extension has significance in terms of its function and associations. It also represents the rapid pace at which the site was developing in the early years after the Mk 1 telescope was constructed. The extension has no architectural significance. It has a negative impact on the character and appearance of the original building, but this is mitigated to some degree by its location and orientation.
The 1970s rooftop extension to the original building has significance in terms of its function and associations but is of poor quality in terms of design, materials and siting and has a detrimental effect on the character, appearance and significance of the original building.
Whilst the original building had, and retains, some character and quality, these secondary extensions are almost entirely characterless.
As the buildings developed to meet an expanding population and increasing workload, so the uses of the rooms changed to meet new requirements. In most areas of the building, uses changed from time to time, functions shifted between office and research, and rooms were subdivided or remodelled. Most of these uses seem to have had little lasting physical impact on the rooms, leaving nothing to identify previous uses. In a way, this is helpful in a working building which needs to continue to adapt to changing needs since, with the notable exceptions of the entrance, Control Room and Lovell's office, there is no imperative to preserve rooms in any particular state or configuration due to their historical associations. The early finishes and fittings should be preserved but they are, for the most part, still entirely serviceable and so this should not create any difficulties. The historical interest of specific pieces of research equipment resides very much in the equipment rather than in its location, which may have shifted several times. A good example of the nomadic nature of the research is the Link Room, which was located in two different rooms in this building, then moved to the Radiant Hut, before returning again to the Control Building."

The CMP recommendation for these later extensions was "Consideration should be given to their demolition which would remove a long-term maintenance cost and enhance the character and appearance of the earlier parts of the building."

The University then commissioned (via their consultants Capita) a more detailed Historic Building Survey and Impact Assessment Report from Oxford Archaeology (attached; published Sep 2015) to inform their proposed approach to conservation and refurbishment of the building.

Some useful staged development plans were generated in this report, see figure below, here showing the areas of the building and approximate date of construction, together with an assessment of significance. Note here National significance is afforded to Scheduled Monuments and listed buildings (Grades I, II* and II).

Plans of ground (left) and first (right) floors of Control Building from Oxford Archaeology report (2015). Each area is indicated with its approximate construction date and its level of significance.

The relevant discussion of significance in the Oxford Archaeology Report is as follows:

> "The buildings have been individually assessed for their importance as heritage assets.
>
> *Buildings A, B and C* are the primary Control Buildings; they were part of the original design for the telescope and were integral to the operation of the telescope and, as such, must, along with the telescope, be considered to be of National Importance.
>
> *Buildings D, F and G* were added between 1959 and 1971 and although holding less significance, sought to retain the architectural design of the original buildings. Their removal would require significant reconstruction of the eastern elevations of the northern and southern wings (Buildings B and C). These buildings can therefore be considered to have a Local/Borough Importance.
>
> *Buildings E and H* are of a similar date to D, F and G but they detract slightly from the original design intentions. They do, however, contribute to the developmental story and can on balance be considered to be of Local/Borough Importance.
>
> *The remaining buildings*, including I, J, K, L, N, O, P and Q are significant detractors from those buildings that are identified as being of National and Local/Borough Importance. They are of temporary, pre-fabricated designs, constructed to a template common across Britain, at a time when the need for speed of construction outweighed the need for quality and permanence. They have little intrinsic historical value in their own right but do contribute to the development story of the observatory as a whole. They can therefore be considered to have a Low Local Importance."

In 2017 Historic England listed the elements of the building coded A, B, C, E, F & G at Grade II. This extends the assessment of national importance beyond buildings A, B & C in the Oxford Archaeology report. But is consistent in deeming the later extensions to the north and the first-floor extensions to be of lower significance.

As noted earlier, the University obtained planning permission and listed building consent in Mar 2016 for refurbishment of the original Control Building, removal of the northern extensions and the first-floor addition to the southern wing, and construction of a two-storey extension to the north. However, these works have not yet begun because, within the constraints of a limited budget, it was subsequently decided to prioritise works on the Lovell Telescope over and above refurbishment of the Control Building. The telescope works include the lower bowl replacement, wheel-girder repairs and foundation repairs (see timescale of conservation works below).

The existing proposals to restore the Control Building will now be carefully reviewed in light of the developments in the World Heritage process and learning from that process, combined with the level of available funding once telescope conservation works are completed. In the meantime, a range of minor maintenance tasks have been conducted on the building, including inspection of brickwork and timber repairs to the first-floor extension.

Could the State Party please clarify which structures are in poor condition (p. 136)?

We include below a summary extract from the Conservation Management Plan Gazetteer listing the structures deemed, in part or in whole, to be in poor condition. We also include summaries of the CMP recommendations and a note on any works done subsequent to CMP publication (2014-2016) and the current status.

For each structure, the condition was categorised as follows:

Good	The asset is in good physical condition with no major issues.
Moderate	The asset is in an acceptable condition with few if any major issues.
Poor	The asset requires attention and has some major issues.
Mixed	The condition is mixed, and the asset is likely to require some attention
Removed	The asset has been removed hence condition does not apply.
Unknown	The condition is unknown, sometimes due to lack of access. This category has been predominately used for archaeological features.
N/A	Condition does not apply, e.g. findspot or lost feature.

Similarly, the significance is categorised as

High	The asset as a whole is of high intrinsic heritage value and makes an essential contribution to the overall heritage significance, integrity and authenticity of the Site.
Medium	The asset as a whole is of moderate intrinsic heritage value but makes a positive contribution to the overall heritage significance, integrity and authenticity of the Site.
Low	The asset as a whole is of low heritage value and makes a limited contribution to the overall heritage significance, integrity and authenticity.

Of course, structures that are of high significance to the history of the site will be conserved and, where work is required, put back into good order. Only a combination of low significance and poor condition allows removal (with due recording) as an option.

Structures at least in part deemed to be in poor condition (as of CMP 2014):

Control Building

Condition:

Original building and brick extensions – Good.

Northern extensions and first floor extension – Moderate-Poor.

Significance:

More details given in previous section but to summarise, the original symmetrical brick building with central control room is of high significance. The 1960s northern extension has significance in terms of its function and associations but no architectural significance. It has a negative impact on the character and appearance of the original building, but this is mitigated to some degree by its location and orientation. The 1970s rooftop extension to the original building has significance in terms of its function and associations but is of poor quality in terms of design, materials and siting and has a detrimental effect on the character, appearance and significance of the original building. Whilst the original building had, and retains, some character and quality, these secondary extensions are almost entirely characterless.

Recommendations:

The physical problems with the timber-clad extensions are inherent in their design, materials and construction and so restoration would be a costly, and ultimately pointless, exercise. Consideration should be given to their demolition which would remove a long-term maintenance cost and enhance the character and appearance of the earlier parts of the building. Although some important scientific activities have taken place from time to time within the later extensions, it is arguable that, given the many changes of use, and the adaptations that have taken place, the significance of the events rests most strongly either with the Control Building as an entity, or with the equipment used, rather than in specific rooms.

Note:

The current status is discussed in more detail in the answer to the previous question.

Lovell Telescope Buildings 1-5

Condition:

Building 1 (Contractors' toilet) Poor.

Building 2 (Contractors' welfare facilities) Poor.

Building 3 (Store for maintenance equipment) Moderate.

Building 4 (Store for maintenance equipment) Mixed.

Building 5 (Store for maintenance equipment) Mixed.

Significance:

It seems likely that all buildings have previously served another use elsewhere on the Site. Any assessment of significance would require further investigation to determine whether any had been associated with important research or individuals. The most interesting is, potentially, Building 3 as a number of similar huts were previously

used onsite. A similar building, possibly the wooden Moon Hut, is seen on the west side of 'The Green' in Photo H4 and H7. In the latter, the gable wall features a central door opening or infill, which, unusually, extends right up to the eaves. Lovell Telescope Building 3 has a similar feature, general form and roof pitch (as does the existing Wood/Metal Store). Information gleaned from a workshop would however suggest that Building 3 is the former Venus Hut (which succeeded the wooden Moon Hut, as seen on image H14).

Of course, these may all simply represent different examples of a stock building which was used throughout the Site over an extended period. If so, the supplier's records may be of use.

Recommendations:

Building 1 Replace.
Building 2 Replace.
Building 3 Maintain.
Building 4 Maintain.
Building 5 Maintain.

Note:

These are huts within the Lovell Telescope compound. Yet to be reviewed/implemented

Development Laboratory (Dev Lab):

Condition:

Poor

Significance:

Low - Part of the secondary expansion which took place around 1970 [now thought to be circa 1965], but not known to be directly related to significant research or events. Some of the content is of significance, but is unrelated to the building. On site of former Home Element of 125 MHz Intensity Interferometer (first long baseline interferometer).

Recommendations:

Approaching the end of its useful life. Repair and restoration is unlikely to be economic. Consider demolition.

Retain and conserve artefacts as necessary.

Note:

It has been decided not to demolish this building at this stage since the space may be useful for observatory operations. Some maintenance and repair works have been undertaken in the last two years to ensure that it is still functional.

Remains of Antenna Tower (North of Link Hut)

Condition:

Poor

Significance:

High – remains of early radio astronomy equipment/activities; forms part of the evidence for the development of the field of Radio Astronomy at the Site.

Recommendations:

Retain concrete element, refurbish ironwork if practicable.

Presumption in favour of preservation in situ, or if necessary preservation by record

Note:
This is the base of an old telescope that sat behind the Link (Cosmic Noise) Hut. Vegetation has been removed around it to prevent deterioration. Ironwork to be assessed, although note that most of what is present is a later addition relating to cable runs.

Remains of 71MHz Searchlight Aerial

Condition:
Poor
Significance:
High - remains of early radio astronomy equipment/activities; forms part of the evidence for the development of the field of Radio Astronomy at the Site.
Recommendations:
Removal of trees from meteor searchlight structure, stabilise structure and interpret.
Presumption in favour of preservation in situ, or if necessary preservation by record.
Note:
Trees and other vegetation have been removed from around the aerial. The area has been stoned and a membrane laid down to inhibit regrowth. Interpretation will be implemented as part of our First Light project (fully funded). Some further work required on corrosion protection.

Various above and below ground cable ducts

Condition:
Moderate-Poor
Significance:
High - remains of early radio astronomy equipment/activities; forms part of the evidence for the development of the field of Radio Astronomy at the Site.
Recommendations:
Retain one section and refurbish.
Presumption in favour of preservation in situ, or if necessary preservation by record.
Note:
The ducting has been retained and vegetation growth removed. Some work to protect against further corrosion may be required.

Blackett's Hut

Condition:
Poor
Significance:
High - Although a modest building, Blackett was a Nobel Prize winner (1948) and made some important discoveries. He also has a strong association with Lovell and with the genesis of the JBO site. Other significant work was carried out within, or in association with, the building.
Recommendations:
The surrounding vegetation and overhanging trees should to be removed to enable a full inspection to be made.

Repairs are urgently required if the building is to be saved. The scope currently unknown, but will certainly include the repair of the roof and renewal of the roof finish.

Note:

Further details are given below but vegetation etc has been removed from all around the building. The area has been stoned and a membrane laid down to inhibit regrowth. The building has been surveyed and a plan of works is being developed to conduct the essential repairs necessary to conserve the building within the next 6-12 months.

Botany Huts

Condition:

Poor

Significance:

High.

Originally thought only to have been used by Lovell as a base during the first few weeks following his arrival at Jodrell Bank in December 1945, good anecdotal evidence (Stakeholder Reunion Workshop 30th July 2014) suggests that the buildings were used by astronomers during the following 10 years. One hut was used as a dormitory and the other as a canteen and research space. This seems entirely logical, since the site was relatively remote, transport was presumably poor and there is no record of any other facilities of this nature until building work commenced in earnest in 1949.

Important association with Sir Bernard and with the early development of the Jodrell Bank site as a centre for Radio Astronomy.

Recommendations:

Ensure buildings are secure.
Carry out emergency repairs to roofs.
Carry out urgent arboricultural work to reduce trees in immediate area.
Reduce build-up of leaf litter around base.
Undertake a detailed assessment of condition.
Investigate possible future uses.
Carry out repairs.

Note:

Further details below. Buildings have been secured, all the arboricultural work and vegetation removal has been completed. The area around the huts has been stoned and a membrane laid down to inhibit regrowth. The buildings have been surveyed and a plan of works is being developed to conduct the essential repairs necessary to conserve the building within the next 6-12 months.

Remains of Structures associated with the Botany Department

Condition:

Poor

Significance:

Low/Moderate – related to the botanical research carried out at the Site.

Recommendations:

Clear vegetation

Note:
This has yet to be completed

Is there a timeframe for completion of the conservation project/s to ensure the good state of conservation of the attributes (p. 137)?

Works have already been conducted on many of the structures listed above that were deemed to be at least in part in poor condition in the Conservation Management Plan. Further works are conducted as part of long-term maintenance and some projects have been carried out as part of the £15million University of Manchester Capital Masterplan for the Jodrell Bank site. The present situation is summarised below.

The University of Manchester Directorate of Estates and Facilities works in collaboration with Jodrell Bank Discovery Centre and the School of Physics and Astronomy to care for its built assets across the Jodrell Bank Observatory site.

Schedule of Condition

The Directorate of Estates and Facilities manages all buildings on behalf of the University. The University undertakes visual condition surveys of all built assets to understand and monitor building fabric and services infrastructure. Understanding of the condition reports and preparation of ensuing long term maintenance schedules is the responsibility of the Directorate's Professional Services Unit which comprises teams of building surveyors, services engineers, asbestos managers, fire officers and energy engineers.

Building condition surveys are reviewed every five years to ensure continuous updating and tailoring of long-term maintenance investment. Condition is recorded based upon RICS published criteria A (as new) to D (unusable) and CIBSE (Chartered Institution of Building Services Engineers) criteria for services infrastructure. For the Observatory site building assets, this condition data is more fully described in the Site Gazetteer (part of the Jodrell Bank Observatory Site Conservation Management Plan) produced by heritage consultants, Chris Blandford Associates.

The Directorate of Estates and Facilities undertakes maintenance in accordance with an agreed Maintenance Strategy. The summary below interprets this strategy as relevant to the Jodrell Bank Observatory site.

Long-Term Maintenance Planning

The Directorate of Estates and Facilities is responsible for compiling the University's long-term maintenance investment plan and associated budget. The content of the condition surveys for the Observatory site are analysed and works packages extracted and prioritised against the appropriate year for investment planning.

Each year (subject to securing sufficient funds) the projects list is reviewed and successful projects allocated for design and implementation.

In financial year 2017/18 these included:

- External repainting of buildings around the Green;

- Painting of the 7m (21-foot) and 13m (42-foot) telescopes;
- Painting to the Green Tower on the Lovell Telescope (including pre-paint steel work repairs);
- Resurfacing of the access road around west side of the Green;
- Vegetation removal and detailed assessment of Blacketts/Botany Huts and the Searchlight Aerial;
- Roof/asbestos surveys to buildings around the Green and along the south access road.

Reactive Repairs/Maintenance

In addition to planned maintenance there is a site-based maintenance co-ordinator who inspects buildings on a daily basis and initiates, liaises and checks quality of maintenance work. This is in conjunction with Estates and Facilities Professional Services staff who can be called upon to advise on more significant repairs requiring a specific course of action or preliminary specification production.

Examples of daily management repair items identified at Jodrell Bank Observatory recently are as follows:

- Lift repairs to Red/Green Tower lifts on the Lovell Telescope;
- Cutting back overgrown areas which may affect access to buildings around the Green;
- Inspection of brickwork;
- Timber repairs to Control Building penthouse;
- Replacement of pumps to biodigester at the Discovery Centre;
- Replacement fire doors to various locations (fire remedial works).

Planning Law which influences project execution

Much of this planning legislation is referred to in the Jodrell Bank Observatory Conservation Management Plan and in the World Heritage Site Management Plan. The following aims to outline the main processes undertaken by Estates and Facilities. Listed building consent is required for any works to Grade I listed structures and any works over and above maintenance items to Grade II listed assets. Recent new buildings notably the Discovery Centre Pavilions and the SKA Headquarters followed the planning application process and received full discharge of conditions upon completion.

Any project involving an existing listed structure or building, including its curtilage, will initially involve council consultation with Cheshire East Planning Authority, Conservation Office (and Historic England where appropriate). This will run concurrently with ecological surveys to determine and minimise impact upon wildlife and local vegetation as required (particularly if new build or extension is the desired output), in accordance with University sustainability policies and local biodiversity action plans. Similarly, the Council's Conservation Officer will be consulted regarding non-listed buildings as required to ensure the proposed works ally with the heritage of the site generally. Heritage impact assessments will be undertaken as necessary together with photographic diaries of replacement works undertaken, e.g. roof coverings.

Over the next 6-12 months the following projects are planned to be undertaken:

- Conservation works to Blacketts/Botany Huts (long-term maintenance funding in place; subject to advice from Historic England and external heritage consultants, adopting a conservation principle of repair not restoration);
- Construction of the First Light Pavilion in the gardens to the north of the proposed boundary of the nominated property;
- Proposals to restore the Control Building (part of the Capital Masterplan) will be reviewed in light of its subsequent Grade II listing and the developments in the World Heritage process (when planning permission was received in 2016, the Building had not yet been reviewed by Historic England resulting in its Grade II listing in 2017, however listed building consent as if it were a Grade I listed building was received for the proposal and included the attached Historic Building Survey and Impact Assessment Report carried out by Oxford Archaeology in 2015);
- Undertake the second phase of replacement of steel sections of the old bowl backing structure to the Lovell Telescope (part of the Capital Masterplan);
- Plan the execution for improvements to the foundation pile caps and rail track supporting the Lovell Telescope (part of the Capital Masterplan);
- Replacement of roof coverings to the Power House, Telescope Workshop and Dormitory Block plus repairs to the Link (Noise) Hut, Dev Lab and Cryogenics Workshop roof covering (long term maintenance funding in place);
- Pre-paint repairs and painting of a designated segment of the Lovell Telescope structure;
- Plan the execution of repairs to the wheel girder on the Lovell Telescope.

ICOMOS would be pleased to receive further information regarding the projects for the new heritage gallery/visitor facilities and carpark that are planned to be ready and open to the public in early 2021 and their potential impact on the proposed Outstanding Universal Value.

<u>Car Park</u>
The new visitor car park was completed by October 2018 and is now in use.
The new car park in fact did not expand the boundaries of the former car park,
but simply rationalised the arrangement of spaces, access roads and areas of hedgerow, so that the number of spaces has increased as set out below.

Previous capacity
- 155 regular spaces, 7 accessible spaces, 2 coaches
- or 167 regular spaces, 7 accessible spaces (when no coaches)

New capacity
- 255 regular spaces, 20 accessible spaces, 4 coaches
- or 305 regular spaces, 20 accessible spaces plus 50 temporary spaces (when no coaches and circulation modified for use with car park marshals)

The new car park has no adverse impact on the proposed Outstanding Universal Value, and has been retained in its original location, at some distance from the Attributes of Outstanding Universal Value, in order to protect them and their setting.

The maps below indicate the layout of the former (left) and the new car park (right; with indication of proposed boundary of nominated property in red).

Heritage gallery/visitor facilities

The new visitor facilities and heritage gallery are to be housed in a new building, the 'First Light Pavilion' located in the gardens (arboretum) at Jodrell Bank. The gardens are not part of the nominated property but are part of the Buffer Zone, so the building will be set apart from the Attributes of OUV.

The location for the new gallery has been carefully selected (see below) so that it has no adverse impact on both the Attributes of Outstanding Universal Value and their setting in the landscape. The location has also been carefully selected so that it does not harm the biodiversity of the gardens.

The First Light Pavilion will be constructed in the gardens to the east of the visitor car park and outside the proposed boundary of the nominated property. The building is single storey and under a mound, both to sit sympathetically within its garden setting and to reference ancient structures which aligned with astronomical events.

The design of the new building has been governed by the principles that govern the area around Jodrell Bank – i.e. it is single storey and below the tree line so that it does not intrude into the setting (and operation) of the Lovell Telescope and the rest of the property.

The building is being created as part of the overall strategy to manage visitor engagement with the heritage of Jodrell Bank Observatory. It is intended that almost all visitors will learn about the heritage within the new gallery, and will then be able to explore the areas of the site that are currently open to the public (i.e. the 'Telescope Pathway' area, which is a fenced area lying between the Control Building and the Lovell Telescope).
This area has been in operation in its current mode for circa 15 years and is managed well so that there are no adverse impacts on the Attributes of OUV (which are behind fences).

The new visitor gallery project includes a new initiative that will give restricted numbers of visitors the opportunity to visit the southern 'Green' area of the site on guided tours.
The tours will be outdoor walking visits around the road around the 'Green' and will be limited to groups of 30 people. Each tour group will be supervised by trained guides, who will ensure that visitors keep to designated walking routes.
This is not only in order to protect the Attributes of Outstanding Universal Value, but also because the 'Green' area is a working science site, with specific safety requirements in terms of the circulation of people and equipment.
There will be 2 tours per day during the working week and up to a maximum 4 tours per day at weekends and in holiday periods.

This will allow the owners and managers of the property to strike an appropriate balance between the need to promote the heritage of the property and the protection of its Attributes of Outstanding Universal Value and their setting. It should also be noted that the Site is private property and boundaries are delineated by fences and access barriers ensuring numbers of visitors are entirely under control.

The design for the new gallery is currently progressing through RIBA (Royal Institute of British Architects) Stage 4 (detailed design). The schedule currently indicates building contractors to be on site in May 2019 with completion in Dec 2020.

Management

As the technological elements of the nominated property and buildings are mostly still in use, ICOMOS would be pleased if the State Party could explain how the management of the property would enable the balance between the conservation of the attributed of the proposed Outstanding Universal Value, and the need to continue the scientific research by improving the instruments/buildings.

Many of the technological elements of the nominated property are still in use – particularly the Lovell and Mark II Telescopes – although the property does also have remnants of former instruments that remain on the site. The tradition of scientific experiment has continued since the first use of the site for science, and is part of the property's 'Spirit of Place'. The management of the property, over many decades, has preserved these operational elements. In order to secure the long-term maintenance and conservation of

the telescopes, and to some extent the other buildings, it is vital that they remain in functional use. The need for the structures to remain in safe and effective working order is therefore important to their conservation and contributions to current and future generations. This requirement to develop to meet changing scientific needs must be considered with due regard to conserving and enhancing their significance.

All this is controlled within the context of UK planning law. It should be noted that the Lovell Telescope has been Grade I listed by Historic England since 1988. It has been possible to keep the telescope at the cutting edge of scientific research whilst still applying the highest level of heritage protection consistent with the Grade I listing. It is this approach that will be taken going forward for the whole site. Any work required is developed in close consultation with the local planning department at Cheshire East Council and with Historic England. Formal listed building consent is required for any work on the telescope. This ensures that heritage issues are given the highest regard.

Much of the work which improves the telescope's scientific performance relates to radio receiver and backend computer development which have no impact on heritage aspects of the main structure but some maintenance issues have required closer concern. For example, the whole of the main reflecting surface was replaced in 2001/02 due to corrosive deterioration. A scientific advantage of this was that a better paraboloidal figure was achieved whilst the use of galvanised steel has slowed the rate of further deterioration. The lifts in the two towers were also required to be replaced in 2013 for maintenance and health & safety reasons. Again, listed building consent was sought and received (as is required by law for a listed building). In this case Historic England (or English Heritage as it was then) in supporting the proposal, commented "The contribution of the lift structure to the overall significance lies largely in its structural, technical and aesthetic characteristics. The proposed lifts will be located within the same location and structural framework of the original lifts, and designed to meet the overall aesthetic of the element, including the retention of key features." The key retained features in this case were: re-use of the existing main steel guide rails within the lift shaft, the lift counter balance weight, the entrance frame, the existing landing push button face plates, the car push station face plates and the car indicator face plates. The gates were replaced but the new gates were of the same manual folding type design as the existing. This approach underpins all work carried out on site. A major current task under the same regime of planning consent is the replacement of the 1957 reflecting surface, as it has reached the end of life. Overall design, methods and materials are controlled in this process from a heritage perspective. Sections of this steel plating will be used in the new heritage exhibition.

Exactly the same legal planning and consent processes apply to buildings and some detail on this has been given above in the section dealing with Integrity and Authenticity.

The heritage management of the site has recently been formalised through the adoption of the Conservation Management Plan, which has as its guiding principles:

- All decisions about the management of the Site will aim to conserve, and where possible enhance, the significance of the Site.

- Appropriate methods and materials will be used for maintenance and conservation works to telescopes, scientific equipment, buildings and the landscape; all works are to be undertaken by suitably qualified professionals in accordance with established best practice and relevant published guidance.
- Adequate levels of capital/revenue funding and resources will be provided to support the future management and on-going operation, conservation and maintenance of the Site.
- The site's significance will be communicated to as wide an audience as possible in inspiring and exciting ways.
- Where appropriate, new works will be subject to a heritage impact assessment to evaluate potential impacts/risks on the Site's significance.

Our past experience and current management procedures mean we can therefore be confident that future scientific needs will be met in ways that will in no way harm the Outstanding Universal Value of the site and its Attributes.

ICOMOS noted that an initial draft Tourism Management Plan has been provided as part of the Nomination dossier. As it is presented as an initial draft, could the State Party provide information on the completion and finalization of this Tourism Management Plan?

The latest version of the Tourism Management Plan has been attached.

Jodrell Bank Observatory World Heritage Site
Tourism Management Plan

V3. 06.11.18

Executive Summary

- Jodrell Bank Observatory is an icon of Science Heritage and is preparing for Nomination as a prospective World Heritage Site. Jodrell Bank Discovery Centre is the window on the site for visitors, open throughout the year to engage visitors with the site's achievements, past and present, via its exhibitions, activities and leaning programme for which it has a reputation as a centre of excellence.

- Jodrell Bank Discovery Centre is responsible for managing visitor interactions with the site and its setting.

- The Centre welcomes around 180,000 visits per year (c2018) by people drawn to the site as the home of the iconic Lovell Telescope and to engage with exhibitions, public programme, educational programme, gardens and cultural activities.

- Located in rural Cheshire, 20 miles south of Manchester it is the single site now remaining, worldwide, that shows the whole story of the development of radio astronomy.

- Due to the conjunction of visitor engagement, scientific practice, and iconic heritage, the site has a unique potential to forge connections for those that visit with history, science, astronomy as well as to engage, empower and excite via its universally shared themes.

- In future, the site will engage visitors in the truly remarkable story of the history of the site as it emerged. At its core this is a human story – combining a mix of vision and challenges; determination and chance; politics and personal relationships – and, perhaps even more remarkably, it's a story that is laid down upon a site and its landscape, embodied in its buildings and telescopes, and the traces of former structures that remain.

- The new 'First Light at Jodrell Bank' project, which has been funded by the Heritage Lottery Fund, the Department of Digital, Media, Culture and Sport, will deliver a spectacular new heritage gallery situated in the gardens in the Buffer Zone of the nominated property, which will engage visitors via exhibitions, digital artworks and architecture, with the story of the emergence of the Observatory and the birth of the new science of radio astronomy. The project will incorporate a programme of education, visitor and volunteering activities to raise awareness of the landmark site's outstanding science heritage.

- Following inscription, the World Heritage Convention and UNESCO will be promoted as part of visitor engagement within the tourism management strategy

1. Existing Visitor Management

1.1. Components of the Jodrell Bank site

The Jodrell Bank site as a whole is owned and managed by the University of Manchester. The Jodrell Bank site has three main management components.

1. The site is the home of the Grade I-listed Lovell Telescope, an icon of UK science and engineering. The Telescope is a working scientific instrument, and is operated, maintained and managed by the **Jodrell Bank Observatory**, which is itself part of the University of Manchester's School of Physics and Astronomy. The Observatory carries out world-leading research and is also the location of the main 'heritage' elements of the site.

2. Jodrell Bank is the location of the international headquarters of the **Square Kilometre Array Organisation** (SKAO), an Inter-Governmental Organisation and international partnership to construct arrays of radio-telescopes in southern Africa and Australia.

3. The site is home to the **Jodrell Bank Discovery Centre and Gardens**, which are both open to the public. The Discovery Centre is responsible for public access to and engagement with both the science and heritage of the Jodrell Bank site. The Discovery Centre is leading on future improvements to the visitor experience, through improved facilities via the 'First Light at Jodrell Bank' project and enhanced interpretation which will deepen understanding of the destination's OUV. The Discovery Centre team are responsible for the development of a sustainable tourism strategy, including visitor management planning and have developed multi-year business and activity forecasts.

We describe the Jodrell Bank Observatory and the SKA Organisation briefly below, before moving on to explain how the Discovery Centre works and how it will manage sustainable visitation for the nominated property.

1.2. Jodrell Bank Observatory

Sits within the University of Manchester's School of Physics and Astronomy and specifically the Jodrell Bank Centre for Astrophysics, which is the astronomical research centre of the University of Manchester and operates e-MERLIN, the UK's national radio astronomy facility.

The observatory is in use as a working science facility throughout the year and is a place of learning, teaching and research for the many engineers, astronomers and students who develop and use the radio telescopes here, of which the iconic Lovell Telescope is the most famous.

The Grade-I listed Lovell Telescope is 76m in diameter and stands 89m high, dominating the Cheshire plains. It remains a working scientific instrument, and is operated, maintained and managed by the Observatory. It was the first very large fully steerable radio telescope in the world on completion in 1957, and still operates as the third largest on the planet.

The Lovell Telescope constitutes a huge public landmark within an area that stretches west from the Pennines out to the coast and is visible for many miles. However, despite the fact that it is

the most publicly recognisable part of the Jodrell Bank site, it effectively represents the culmination of the work that went before it.

There are many other elements of the site that are also highly important in terms of its heritage, and underpin the case for inscription as a UNESCO World Heritage Site, including a number of buildings and workshops on the site's south side and three additional radio telescopes including the 25m diameter 'Mark II' telescope, all of which are in use. In recognition of this, Historic England announced the listing of six further structures on site (in addition to the Lovell Telescope) in August 2017. These include:

- The Mark II telescope, Grade I listed; completed in 1964, which was the first telescope in the world to be controlled by a digital computer and shows an innovative and beautiful use of concrete.
- The 'Park Royal' building, Grade II listed, built in 1949, housed receivers for the Transit Telescope and was subsequently used as the control room for the Mark II Telescope.
- The Control Building, Grade II listed, completed in 1955.
- The remains of the 71MHz searchlight Aerial, Grade II listed
- The Electrical workshop, Grade II listed, built 1949 and originally housing laboratory space, a seminar room and Bernard Lovell's office.
- The Link Hut (or the Cosmic Noise Hut as it was originally known), Grade II listed, built 1949, and used as the Control Room for the 30-foot Telescope.

Jodrell Bank is now also the hub of the UK's national array of 7 radio telescopes ('e-MERLIN') and this network is managed from the Control Bulding. The signals from all 7 telescopes are combined at Jodrell Bank so that the array operates as if it is a Telescope that is 217km across, which has a similar resolving power to the Hubble Space Telescope. The Lovell and Mark II Telescopes are used as part of this array.
The nominated property encompases the Telescopes, buildings and landscape, as described in the Nomination Document and Management Plan.

1.3 Square Kilometre Array Organisation (SKAO)

In 2015 Jodrell Bank was selected as the location of the SKAO's international headquarters, the extended offices for which were opened in 2018, and which will soon be designated by Treaty as an Inter-Governmental Organisation. The SKAO is an international organisation which currently has 12 full member countries and 20 partner countries. It aims to build and operate arrays of radio-telescopes in South Africa and Australia, which will combine to create the largest science project known to humanity.
The SKAO HQ is situated just outside the boundary of the nominated property.

1.4 Jodrell Bank Discovery Centre and Gardens

The Discovery Centre, which is situated partly in the nominated property, is responsible for public access to and engagement with both the science and heritage of the Jodrell Bank site. The Jodrell Bank Discovery Centre is a not-for-profit visitor attraction and operates as a social enterprise.

The current Centre was opened in April 2011 and comprises three individual buildings, the 'Planet Pavilion', the 'Space Pavilion' and the 'Star Pavilion' (added in 2015) linked by public walkways which also provide the visitors with a footpath walk around the Lovell Telescope. In addition, it includes the Jodrell Bank Gardens, which comprise 35 Hectares of woodland, lawn and planted areas.

1.5 Organisational structure of the Jodrell Bank Discovery Centre

Jodrell Bank Discovery Centre is managed by the University of Manchester. The University of Manchester has charitable status granted via a Royal Charter in 1880. The Discovery Centre is regulated by the University of Manchester and operates in compliance with the University's established policies and procedures, encompassing all aspects of employment, access, protection, equality and diversity.

The Discovery Centre sits as one of the University of Manchester's Cultural Institutions. Its primary objective as such is to provide inspirational experiences for a wide range of visitors, including school-age children, their families and supporting adults in our own locale, Greater Manchester, the wider community of the North West of England and the UK as a whole. In this, we pay particular attention to 'hard to reach' audiences in order to ensure that this opportunity is available to the widest range of people possible.

The Centre has already been recognized for impacts in delivering a high quality visitor offer and its contribution to public engagement with the following awards.

- 2014 The Institute of Physics Kelvin Medal and prize: awarded jointly to its Director, Dr Teresa Anderson MBE and Professor Tim O'Brien, Associate Director of Jodrell Bank Observatory
- 2013 Marketing Cheshire Annual Awards, Tourism Event of the Year : Live from Jodrell Bank
- 2012 Marketing Cheshire Annual Awards, Visitor Attraction of the Year
- 2012 UK Festival Awards, Extra Festival Activity Award: For 'Extreme Creativity' in initiating the Live from Jodrell Bank Science Arena
- 2011 Marketing Cheshire Annual Awards, Small Visitor Attraction of the Year

1.6 Management and Human Resources

The Discovery Centre employs a team of 36 permanent staff. It's education programme, public events programme, exhibitions, visitor services, gardens and commercial activities are managed by a team of senior managers, comprising of the Director, Deputy Director, Head of Education and Interpretation, Education Manager , Operations Manager and the Gardens and Interpretation Manager.

The Education team is responsible for the development and delivery of the Centre's highly successful schools programme which delivers 26,000 learning engagements per year. It is also

responsible for the development of the Centre's public events programme comprising of lectures, and holiday activities.

Financial processes and income generation are overseen by the Deputy Director, including retail and marketing.

Visitor services, including our admissions desk and the café are managed by the Operations Manager and the Visitor Services Manager, who also oversee site maintenance and health and safety processes. They are jointly responsible for ensuring that the visitor experience at Jodrell Bank is of very highest quality in order to deliver the exceptional standards expected of an internationally renowned site, and promote a culture of best practice within the visitor services team, which comprises of permanent and seasonal positions.

The Discovery Centre is committed to providing professional skills development for young people. It does so by offering students opportunities in science heritage engagement through an undergraduate summer intern programme, who provide guided tours of the site.

'Our tour guide was Isaac. His passion for the subject was obvious and his interaction with the crowd was exemplary... make sure you join a walking tour and if you run into Isaac please ask him about his love of quasars.'

The Discovery Centre participates in the University of Manchester's Graduate Programme, employing two students on 12 month contracts as Explainers delivering gallery based engagement to visitors and to schools.

Further opportunities are provided to young people from the local rural community to take on seasonal work as visitor services assistants, including the Planet Pavilion Café and shop.

The Director and senior management team have a proven track record in managing capital projects at Jodrell Bank Discovery Centre. In addition to the projects outlined below, which are specific to the Discovery Centre, it is important to note that the delivery of the Capital elements is governed and overseen by the University of Manchester Directorate of Estates. These teams have a rigorous framework of procedures that are applied to every capital project undertaken by the University.

1.7 Financial Resources

The Discovery Centre operates a robust business model which has resulted in an increase in annual turnover from £1m in 2012/13 to £1.8m in 2017/2018. The Centre receives a modest amount of core funding ranging from 20% to 30% each year from the University of Manchester and covers all other running costs with self-generated income. It is therefore dependent on elements such as the sale of entry and event tickets, its education programme, and commercial income derived from the café, shop and corporate hire. The Centre periodically receives a modest amount of funding from other organisations for specific activities or exhibits etc.

The Discovery Centre is regulated by the University of Manchester's Directorate of Finance, and there are numerous financial controls and clear lines of reporting and budget responsibilities. The Centre is required to observe the University of Manchester's financial planning procedures, which include the preparation of a rolling 5-year plan (each January) and an annual forecast for

the coming financial year (each January). The Centre also undertakes an annual review of financial performance.

The Discovery Centre submits its annual budget for review and finalization by the Deputy President and Deputy Vice Chancellor each year. The draft budget is prepared by the Director and the Deputy Director of the Discovery Centre in consultation with the Head of Faculty Finance and senior management accountants from the Directorate of Finance. These measures, which are supported by the University's in-house Accountants and Financial planning teams, ensure that its financial performance is robust and well-scrutinised.

- Monthly management reports of the Centre's financial performance are produced and submitted to the Discovery Centre by senior management accountants.
- The Centre's Deputy Director meets on a monthly basis with the Accountant responsible for the Library and Cultural Institutions to receive updates on policies and procedures.
- The receipting of income and cash handling is performed in accordance with regulations stipulated by the University of Manchester's Income Department.
- There is a strict protocol regarding expenditure requests and there are clear procurement procedures. Ultimate approval for all expenditure rests with the Director of the Discovery Centre.

The Discovery Centre's sustainability is based on its continued financial success. The Discovery Centre's year ends are consistently better than forecast and the Centre is able to reinvest its profits into improvements to the visitor experience, exhibits and facilities.

1.8 Visitor Management

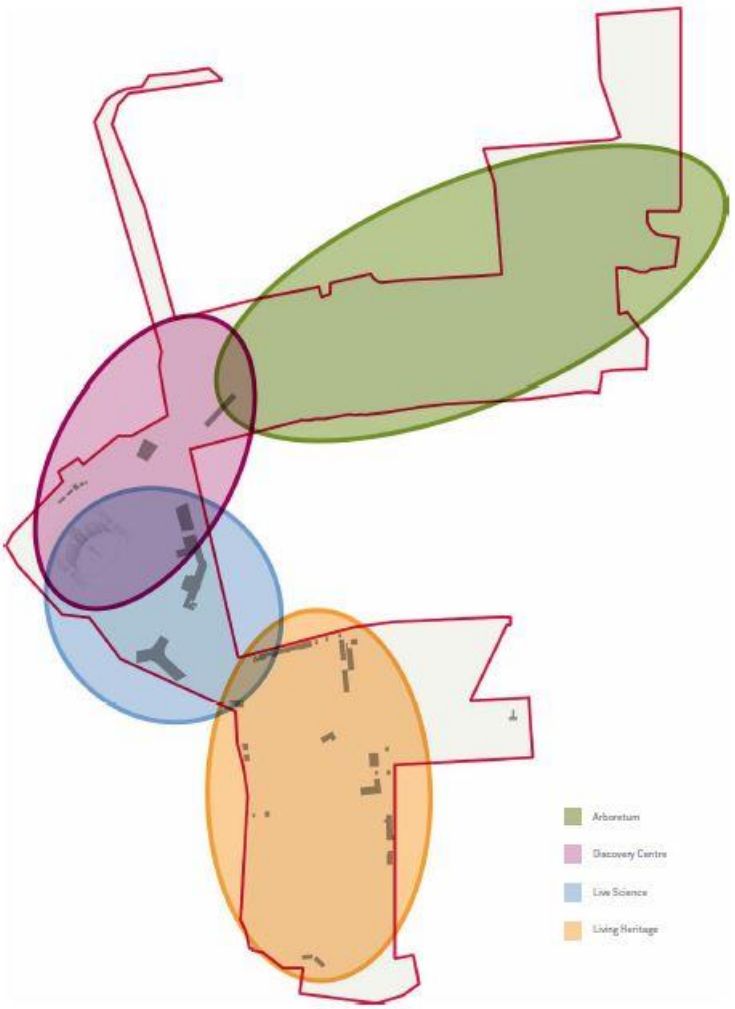
The Discovery Centre team are practiced at managing responsible visitation to the site. As a working science facility which permits year round public access to 180,000 visitors per annum, we carefully and sensitively facilitate visitor engagement order to protect the heritage attributes and mitigate potential conflicts that might impact on the science performed.

The Discovery Centre consists of three buildings, the Planet Pavilion, the Space Pavilion and the Star Pavilion. The Planet Pavilion, which comprises the main entrance, a café, shop and small Orrery Gallery lies outside the nominated property boundary. The Space Pavilion and the Star Pavilion are within the nominated property boundary.

Visitors are directed to arrive via Bomish Lane entrance which is at the North end of the side; no unauthorised entry is permitted via the South Entrance.

Visitor access is carefully controlled. No access is currently permitted to the sensitive elements of the site (both for heritage and for scientific operations) comprising the Observatory itself and the south side of the site around the Green.

Publically accessible areas of the site are illustrated in green (Arboretum) and pink (Discovery Centre) in the diagram below.



Visitor behavior is managed through our access restrictions, communications, messaging, signage and in person interactions on arrival.

- All visitors are asked to switch off their mobile phones and observe radio silence in order to protect the site's science
- Public access to the site is only from the north
- Currently no public access is permitted to the Observatory or the South Side of the site
- A retractable automatic gate restricts vehicle access from the North side of the site
- Pedestrian access around the site is restricted by metal fencing and raised barriers
- The Lovell Telescope sits within a fenced off compound, and can be viewed by visitors from a perimeter pathway
- The Control Building is off limits, the west aspect of which is visible to the public from behind a fence

Current Visitor Journey to Jodrell Bank Discovery Centre

- Visitors arrive at the car park and enter the Planet Pavilion and proceed to the admission desks.
- The visitor journey begins in the Orrery, a clockwork exhibit showing how the planets move around the Sun.
- Visitors leave the Orrery and Planet Pavilion to outside, and can choose to proceed to the 35 acres gardens/woodland or towards telescope and the rest of the Discovery Centre.

- En-route to the Telescope perimeter pathway, which takes visitors on a journey around part of the base of the structure, there are some outdoor exhibitions including 'whispering dishes'.
- Entering the Space Pavilion directly opposite the telescope there are exhibitions about radio astronomy, interferometry and the scientists of Jodrell Bank.
- The Star Pavilion is used for school visits. School parties enjoy age appropriate education workshops on a variety of subjects. This building is used during school holidays for events such as Science Shows and Lovell Lectures.
- Visitors return to the Planet Pavilion to visit the café and shop and may go back to the gardens or the telescope before leaving.

Capacity Management

The management team are committed to improving the visitor experience and to cultivating an appreciation of the significance of the site's heritage. Since its redevelopment in 2011 the staff team has doubled, visitor numbers have increased, the foot print of the site has expanded, our offer has evolved and we have delivered innovative events.

One of our strengths is our experience in managing fluctuations in visitor patterns, and in dealing with seasonal peaks. We are practiced in deploying visitor dispersal techniques to ease congestion as well as suppression measures to limit dwell time when necessary, in part due to the limitations of our existing facilities.

The Discovery Centre's current facilities can reach their maximum carrying capacity at peak times and when levels of visitations exceed 1000 visitors per day. At such times the Centre has experienced pressure points in the car park, at the admissions desk and in the café. Effective measures to manage visitor flows and daily surges of arrival times include:

- Monitoring of arrival patterns to inform planning
- Careful programming of activities, including shows and tours to disperse visitors across the publically accessible parts of the site
- Curtailing our activity programme in order to suppress dwell time
- Visitors are encourage to purchase tickets online in advance in order to speed up entrance processes
- Encourage visitors to enjoy the surrounding gardens and woodland by devising trails and providing outdoor activities during the school holidays

The Discovery Centre continually reviews its strategic plan in order to ensure sufficient resources and facilities are in place for capacity management and engagement.

Car park and coaching

A capital project to extend the capacity of the Discovery Centre's car park and provide a new visitor entry portal has recently been completed. The project was funded by a loan from the University of Manchester to address previous limited capacity which had caused vehicle congestion and queues stretching to the public highway at busy times. By utilising adjacent pockets of land and remodeling access roads, the project has succeeded in doubling the number of parking bays available without increasing the overall footprint. The expansion ensures that

the Centre can properly accommodate the number of visitors it currently receives at peak times as well as future proof the site in preparation for forecast visitor growth.

The extended car park can accommodate 255 cars, 4 coaches and has 20 disabled parking bays. At peak times the parking configuration can be actively managed to create an additional 50 spaces (with no coaches).

Disabled Access

The site is fully accessible for those who have impaired mobility. Wheelchair access is provided to all publically accessible areas including the gardens. Our access statement is published on our website.

Cyclists

The site is surrounded by rural lanes including National Cycling Network routes. It is 2.5miles from Goostrey rail station and 10 miles from Macclesfield Rail station. Our café is a popular destination for cycling clubs and individual cyclists from around the North West and we have a covered, well-lit bike shed in which to store bikes.

Pedestrians

There is a 2.5m walk via narrow country lanes from the nearest railway station in the village of Goostrey. The station is on the line between Manchester and Crewe.

1.9 Visitor Engagement

Our staff are expert at extensive science engagement and have developed a talented and diverse delivery team, all STEM graduates. Our female staff are prominent, reflecting our ambition to encourage an attitude that science is for all, and to challenge gender stereotypes in the sector. Our vocation to make science thinkable underpins all of our interactions; from the products we sell in our shop to the lecturers we invite to speak to the workshops we deliver to visiting schools. Our education programme is just one facet of this approach, for which we are trusted and respected.

As a team, we are well versed in delivering well organised mass public events, such as our Live from Jodrell Bank one day music and science festivals, our Watch the Skies outdoor film event organised as part of the BFI's Watch the Skies Sci-fi season and most recently our critically acclaimed Bluedot festival to thousands of attendees. Such events require careful in depth planning involving multiple stakeholders, participants, artists, agencies, crew, volunteers, partners and attendees. The combination of clear strategic objectives, meticulous logistical preparation, a creative dynamic and a strong team result in a highly successful festival format delivering outstanding science and cultural engagement, enabling face to face interactions between researchers and visitors, platforming experimentation and promoting dialogue.

The scale of visitation to festival events requires rigorous capacity management and close consultation with all stakeholders, including colleagues and co-workers at the Observatory and the SKA, and with local communities. Audiences are firmly managed and controlled, resulting in responsible and respectful compliance with the strict access restrictions imposed.

1.10 Community Engagement

We actively recognise the importance of links with community groups who have long standing connections to the site and how community involvement will add to and enrich understanding of Jodrell Bank's heritage.

We understand that community engagement facilitates the passing on of knowledge and skills and enables the involvement of expertise not already in place. Furthermore it can foster and strengthen a sense of place and its contribution to regional identity.

"I wonder if the staff of JBO appreciate just how much local residents see the Lovell Telescope as a loved, living neighbour whose mood is constantly changing. It is a scientific instrument but also a work of art."

We routinely consult local communities be it to listen to them in relation to new developments or the bluedot festival which is held on site, or to learn from them in relation to specific expertise. Local residents are invited to meetings held at local parish councils and offered discounted tickets to festivals.

Throughout the development phase of our First Light project we have undertaken an extensive programme of consultation, pilot events and community engagement activities to inform future interpretation.

We have provided opportunities for communities both to learn about the project as well as to contribute to it. These opportunities have varied from participating in surveys, focus groups, community evenings, to direct engagement with the project be it taking tours, partaking in school workshops, or volunteering across the site. Reminiscences from local communities will be an integral element of future exhibitions and heritage engagement.

Local suppliers are showcased in our café and in our shop, and we collaboratively develop new visitor offers with local partners, such as the Blackden Trust, Macclesfield Astronomical Society and various schools.

1.11 Relationships with regional tourism industry

Cheshire East Visitor Economy Strategy 2016-2020

Cheshire East first adopted a visitor economy strategy in 2011. This has recently been updated with a new Visitor Economy strategy (2016 to 2020), which has an emphasis on increasing performance, prosperity and wellbeing. The regional tourist economy in Cheshire is buoyant, having achieved a healthy 6% growth in the past year. It is valued at £900k per annum and employs 12,000 people in high value jobs.

Jodrell Bank is cited directly in the Strategy as an important and invaluable asset to the local visitor economy. It is already regarded as one of the county's 'crown jewels' for its contribution to local 'flavour' and for having a high quality offer that provides significant impacts for the local tourist economy. The site is closely aligned with Cheshire East's priorities for supporting the growth of the regional visitor economy its future developments feature prominently in the strategy document.

Jodrell Bank plays a valuable role in strengthening perceptions of regional identity. The Visitor Economy strategy identifies 'quality of place' as a key characteristic of Cheshire East, an attribute that the unique, internationally significant science heritage of Jodrell Bank and its prolific reputation for longstanding innovative science reaffirms.

Future inbound tourism to the region will further benefit from major regional transport infrastructure projects such as the £1billion expansion of Terminal 2 at Manchester Airport, which will increase annual passengers. This will be supported, in particular, by the introduction of new international direct routes to America, China and India. Inbound tourism will also benefit from the development of HS2 and the Crewe intersection.

Destination Management Organisations (DMOs)

Jodrell Bank has a close working relationship with Marketing Cheshire. The Director of the Centre is a member of the DMO Board, and the Centre is a partner in their Cultural Destination programme (for which the bluedot festival has been adopted as a cornerstone).

Jodrell Bank has a leading role in both the Visit Britain 'Brilliant Science' project (which is managed by Marketing Cheshire) and their pan-Cheshire 'Amazed by Science' festival. The Chief Executive of Marketing Cheshire will be a member of the World Heritage Site Steering Group, once inscription on the World Heritage list is confirmed).

The Visit Britain Brilliant Science pilot project was proposed by the Director of the Discovery Centre, who chairs the project's board. The project works to showcase the UK's rich and important science heritage and visitor opportunities, particularly to international visitors. The projects forges connections between tourism and the business market in order to attract a bigger share of science conferences to the region, and to build awareness of the North West's heritage offer to visiting international science conference delegates. The project showcases and celebrates the UK's position as one of progressive innovation with the second highest number of Nobel prizes in the world. Positioning the North West as a region of firsts and the birthplace of ideas that changed the world - from radio astronomy - to graphene - to the chemical industry, the project seeks to establish science tourism as an authentic and internationally appealing characteristic of our region.

The Discovery Centre team also works closely with Marketing Manchester (e.g. Nick Brook-Sykes, Director of Tourism for Marketing Manchester, will also be a member of the World Heritage Site Steering Group, once inscription is confirmed).

Marketing Manchester is viewed by Visit Britain as a key partner for inbound Chinese tourism, with a particular remit on increasing tourism in the wider region and positioning Manchester as a gateway to the UK. Jodrell Bank will partner with Marketing Manchester to promote the First Light Project as a future destination for international organised travel itineraries with particular appeal for the Chinese market.

Staff at the site have participated in China Welcome training over the last 12 months, especially in light of an increase in tourism following the launch of direct flights from China to Manchester Airport

1.12 Communications

Visitor communications are managed by the Marketing and Business Performance Manager, in consultation with the Director and Deputy Director. Where appropriate, staff consult with the Associate Director for Public Engagement at the Jodrell Bank Centre for Astrophysics. An annual marketing plan is devised allocating advertising, digital, photography and print budgets in accordance with audience development targets.

The Discovery Centre adheres to stringent brand guidelines, and adopts the Jodrell Bank Observatory core branding in accordance with the overall requirements set by the University of Manchester.

The Discovery Centre ensures consistent messaging across all media, adopting a friendly and inclusive tone of voice, celebrating our site's science heritage whilst conveying curiosity and wonder.

Digital Interactions

The Discovery Centre has a dedicated website, representing the science and heritage of the house to audiences remotely as well as providing general information, publicizing events and providing online ticket sales to visitors who attend in person. The website has a global reach and has had 1,187,315 hits in the last 12 months.

UK	204,736	93.43%
USA	4,101	1.87%
France	805	0.37%
Australia	797	0.36%
Canada	668	0.30%
Germany	630	0.29%
Spain	488	0.22%
China*	477	0.22%
Netherlands	467	0.21%

Jodrell Bank has a joined up approach to social media platforms, with Twitter, Facebook and Instagram representing the whole site rather than distinguishing between the Observatory and the Discovery Centre. Social media engagements similarly have international appeal, with 215,000 followers on Twitter, and 17,000 followers on Facebook. Demographic analysis of digital engagement demonstrates an even gender balance, e.g. 61% of our FB followers are female.

Media communications are dealt with by the Discovery Centre and the Observatory jointly, with support from the University of Manchester's Communications Department.

As a site of national and international interest, Jodrell Bank receives a high level of requests for filming and photography throughout the year. These requests come from the media and press, businesses and corporations, and professional photographers or filmmakers, amongst others.

Any media or corporate access to Jodrell Bank for the purpose of filming or photography must be granted permissions to do so at the discretion of the Directors of the Observatory and Discovery Centre. Filming and photography for commercial purposes is not permitted, and we insist that any television broadcasts represent the science and/or education/public engagement that is performed by Jodrell Bank.

If permission is granted, filmmakers and photographers will be required to adhere to a set of rules regarding the use of equipment while on site. This relates to mobile phones, radio mics and other radio and satellite equipment that could cause interference and impact the science of Jodrell Bank.

1.13 Site wide Initiatives

There have been visitor facilities since 1967 in response to public interest. The Visitor Centre operated well for many decades, attracting 150,000 visitors at its peak. In the 1990s this declined, and in 2003 the University demolished the buildings, citing safety concerns and indicating a desire to refresh the facilities.

In 2006 a process began to revitalize visitor facilities and enhance public engagement with the site. This involved a number of studies, including market research, concept testing, benchmarking of the science and heritage sector.

In 2010, £3.1million funding was secured from the North West Development Agency (since disbanded) and the ERDF for a modest 'first step' towards redeveloping the visitor offer as a whole.

Following an options appraisal, the vision for the new Discovery Centre was refined to concentrate primarily on positioning as a family destination with an emphasis on the live science of the site. A conscious decision was taken not to focus on the heritage and history of the site as it was thought that it would not be possible to do justice both to the science and to the heritage with such a modest budget.

The current visitor facilities at the property comprise three visitor buildings, the 'Planet Pavilion', 'Space Pavilion' and 'Star Pavilion'. To date, there is no provision of public engagement with the heritage of the site, and this is recognised as a major need.

1.14 Development of new facilities - the First Light Project

Since 2012, options have been developed which would realise the full potential of the site. Key considerations were the need to address visitor disappointment (i) that the new Discovery Centre did not tell 'the story of Jodrell Bank' itself, i.e. there was no engagement with the heritage of the site, and (ii) not to be able to experience a sense of wonder and awe at the vastness of space and humanity's place in the Universe.

Support for the creation and running of new visitor facilities has been awarded from a variety of funders, including the UK Heritage Lottery Fund (circa £12million); the UK government (£4million); various Trusts and Foundations (£2.5million) and the University of Manchester (circa £4million).

Design of the new facilities is complete and the various statutory permissions acquired prior to construction. This is due to commence in 2018/19 and the new facilities are scheduled to open in 2020/21.

The First Light at Jodrell Bank project will enable increased visitor capacity, and will deliver a spectacular new heritage gallery situated in the Arboretum, which will engage visitors via exhibitions, digital artworks and architecture, with the story of the emergence of the Observatory and the birth of the new science of radio astronomy. The project will incorporate a programme of education, visitor and volunteering activities to raise awareness of the landmark site's outstanding science heritage. It will also offer a carefully-controlled opportunity to visit the southern side of the site on limited guided tours.

2. Strategic Overview of New Facilities

2.1 Aims and Outcomes

The project to create new facilities has three core aims. They are:

1. To transform the opportunity for understanding and engagement with the heritage of Jodrell Bank
2. To build a new heritage gallery at Jodrell Bank. The 'First Light Pavilion' will be a dedicated space in which visitors can engage with the heritage of Jodrell Bank and its work.
3. To extend and responsibly manage physical access to areas which were the birthplace of Jodrell Bank and which are the focus of its nomination for UNESCO World Heritage Site status in order to foster understanding and appreciation of the site's OUV.

These aims are described in more detail below:

1: To transform the opportunity for understanding and engagement with the heritage of Jodrell Bank: *As explained in above, this is the first opportunity that Jodrell Bank has had to address the need for visitor engagement with its heritage. The site's heritage is of both national and international importance, as evidenced by the Grade I listing of the Lovell Telescope and the pending nomination of for UNECSO World Heritage Site inscription.*

The University has a duty to conserve and protect the site for future generations, and a parallel obligation to provide public engagement with it for the nation. It is meeting this, as far as is possible in the current financial climate, via an investment in the conservation and restoration of the fabric of both the Lovell Telescope and the original Control Building.

2: To build a new heritage gallery – the 'First Light Pavilion' at Jodrell Bank, a dedicated space in which visitors can engage with the heritage of Jodrell Bank and its work: As set out in the Nomination Document, Jodrell Bank Observatory is a working scientific research station, which operates 24 hours a day. Public access to working areas is therefore restricted to specific occasions in guided groups (see Aim 3, below). This means that the site alone cannot be used as an opportunity for public engagement and interpretation. The existing visitor facilities are not large and are full at busy times and completely full with school groups. A new gallery and associated spaces is therefore needed that will provide a dedicated space for people to visit and in which school groups can undertake learning. As the Centre is full to capacity in busy holiday periods, new indoor space and new outdoor circulation areas are also needed to accommodate the increase in visitor numbers that is anticipated when the project reaches delivery.

3: To extend visitor access to areas which are at the heart of the nominated property: Although Jodrell Bank Observatory is a working scientific site, it is also important that some access is provided for the public to the areas of the site that bear important heritage attributes.

The new project will also therefore, for the very first time, offer visitor access on guided visits to the 'South Side; of the site, which is the location of the work at the very origins of Radio Astronomy. Visitor Access will be via guided tours and include 'behind the scenes' visits into at least one of the buildings, an opportunity to view the Mark II Telescope at close hand and briefings on the stories related to particular locations and structures.

In addition the project will carry out conservation work on the modest original buildings around the Green (mostly post-war 'Orlit' huts), preserving these for future generations.

It is at the heart of the twin aim (for the organisation as a whole) of engaging the public with science and with heritage –and provides the first opportunity for a relatively new Centre to achieve this for the first time, completing the commitment it has made to the public to do so. The interaction between the project aims and the aims of the Centre is described more fully in the next section.

2.2 Details of new Facilities and Activities

The project to create new visitor access will celebrate and enshrine the heritage of Jodrell Bank, sharing the history of the site, which was a pioneer in the development of radio astronomy – a science that has transformed our understanding of the universe. The project will create an inspiring visitor experience in which to connect audiences, via new interpretation, new content and new facilities to the heritage of the site. It will communicate the essence of Jodrell Bank, encapsulating the vision and resulting endeavor, across all visitor touch points, placing the human story, and its can-do attitude at the heart of our approach and interpretation.

The new exhibition and activities will seek to narrate the story of the site's evolution within their historical, cultural and political context, addressing the risks, pitfalls, innovations, discoveries and resilience along the way and in so doing convey the heritage in a relatable and relevant way.

The project will extend physical and intellectual access to the site, increase and diversify audiences, enable rich learning and participation activities and offer extensive volunteering opportunities. It will transform how visitors engage with the site's heritage, via the creation of an amplified and extended public programme of diverse participation opportunities. It will enable partnership with communities in the widest sense, making Jodrell Bank an accessible attraction for all and extending the audiences with which it engages. The new developments will establish heritage as the basis for a new programme of formal and informal learning engagements for visiting schools and via an outreach programme. Details of the various elements of the project are given below:

2.2.1 New gallery building

The project will provide new visitor facilities, via the construction of the 'First Light Pavilion' in which to house interpretative content that will animate and bring the heritage to new audiences in a spectacular and stimulating way.

The project will create an additional 1975m² of visitor engagement space that will transform the visitor experience, creating a stunning, modern, new exhibition space dedicated to the heritage of Jodrell Bank as well as an auditorium devoted to displaying immersive digital presentations.

2.2.2 Access to the Green

Access to the south side of the site is currently off limits and the visitor has no opportunity to understand the evolution of the site in parallel with its scientific achievements – a fundamental facet of the Jodrell Bank story. A new programme of guided tours will bring this area into the visitor experience for the first time.

2.2.3 Volunteer programme and Community Engagement

The project will enable a new Volunteering Programme, facilitating an entirely new set of ways in which people can engage with the site and its heritage. A new Volunteer Coordinator within the Discovery Centre team will facilitate this work. New facilities in the First Light Pavilion will provide a space for volunteers to take breaks and talk to staff. The First Light Project will actively involve our local communities to build and sustain community support, and will recognize the role the community has played in the distillation of the property's 'sense of place' via responses to and shared ownership of the site in its broader sense. The project will also

provide a space in which to acknowledge the role of the science community, the cohort of colleagues near and far, past and present who have played their part in the evolution of the site's story.

2.2.4 New Visitor Activities

The variety of activities routinely available to a visitor will be vastly increased as a result of the project. These include 'on-gallery' activities for families with 'explainer' staff; an improved website; Lectures and talks; artist installations and musician performances; outdoor activities in the grounds and gardens (mainly in the visitor area in the Buffer Zone).

3. Tourism Facility Appraisal

3.1 Need for new facilities

A visit to Jodrell Bank is enjoyed by many people, and the site has a long standing tradition of public inclusion. It has welcomed one million visitors since its redevelopment in 2011. Visitor growth has been consistent, prior to redevelopment visitors numbered 80,000 and since 2011 have steadily increased to 180,000. It is now the 15th most popular paid for tourist destination in the North West region of England. Public awareness of the site is high and there is growing demand for engagement with the heritage.

The following section sets out our analysis of existing visitors, provides evidence measured over the last ten years and includes data which has informed our long term visitor strategy, future capacity management and sustainable business planning.

The visitor centre is on a growth path, largely because it is run with a high degree of prudence and bases commercial decisions on a high volume of accurate visitor and market data.

3.1.1. Visitor analysis

We have routinely surveyed our visitors and collected data from a range of sources (including ticket sales, event attendance, post code analysis and externally commissioned market intelligence) in order to understand our audience profile and measure our success in reaching audiences. Consequently, our organisation has a sound and robust understanding of audience profile, behaviour, motivations and expectations

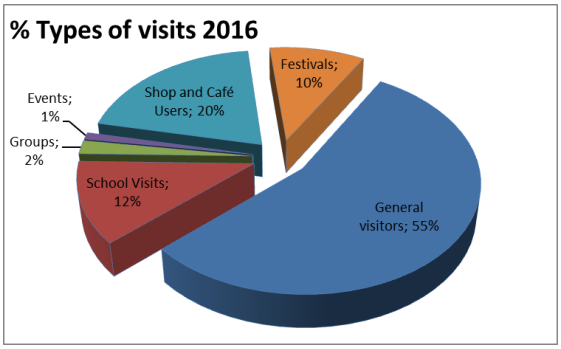
Our knowledge has been refined and augmented by a series of reports provided by The Audience Agency based on 30 months of post code data captured between 2014 – 2017. Furthermore we can draw insights from a number of Harris Polls conducted before and after the Centre's redevelopment. Detailed research has been conducted by Morris Hargreaves Macintyre to provide an in-depth understanding of current audiences to inform the projects audience development plan.

The Centre has performed methodical evaluation according to specific strands of our existing activity programme, such as schools, festivals and events. Data resulting from in house evaluation is outlined for each separate strand below. Audiences at our bluedot festival in 2016 were surveyed as part of Morris Hargreaves Macintyre market appraisal brief.

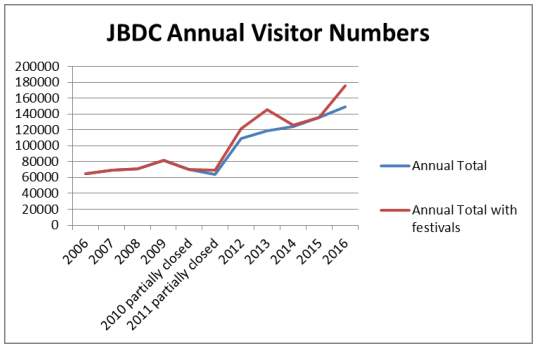
We have consistently sought to understand our visitors motivations for coming, of specific relevance to us as a science centre is their level of science education – we look to find out whether they are already 'warm' to science in order to test whether we are succeeding in reaching those who think science is not for them. And of course, we want to know what type of experience they had and whether we delivered an enjoyable day out. Summary findings in relation to motivation and visitor satisfaction are drawn from the Centres in house surveys and the research performed by Morris Hargreaves Macintyre (the Audience Development Plan resulting from this is included in the Nomination Dossier).

3.1.2. Visitor Numbers

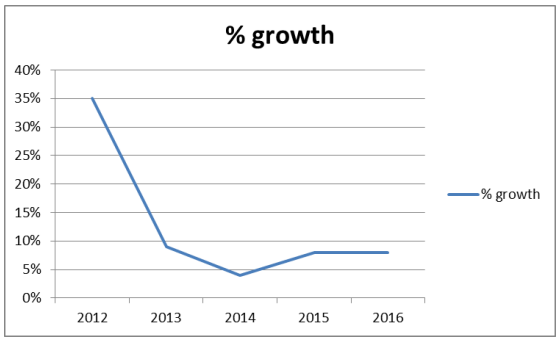
The popularity of the Discovery Centre has driven consistent visitor growth since opening in 2011. The Centre experiences peak footfall during the school holidays and on bank holidays. On busy days the Centre cannot meet the demand and experiences queues in the car park, at admission and for the café.



Segmentation of our audience by type of visit



Number of visitors per annum, with and without festivals



Year	Additional visitors	% increase
Pre closure	81243	
2012	45350	35%
2013	9818	9%
2014	4978	4%
2015	11723	8%
2016	12910	8%

% increase of growth (this pattern has been used to inform our business forecasts)

2011	J	F	M	A	M	J	J	A	S	O	N	D	% Change	Total
Number of visitors	0	0	0	9332	6635	5779	11971	12166	4995	9759	4739	3805		69181
% Change on previous year														
2012														
Number of visitors	5731	10183	8673	12192	8374	20973	10742	16221	8215	9314	7213	3697		121528
% Change on previous year				30.6	26.2	262.9	-10.3	33.3	64.5	-4.6	52.2	-2.8	50.2	
2013														
Number of visitors	6370	11571	9882	12913	11149	9238	21904	30448	9739	10314	7536	4229		145293
% Change on previous year	11.1	13.6	13.9	5.9	33.1	-56.0	103.9	87.7	18.6	10.7	4.5	14.4	21.8	
2014														
Number of visitors	9258	10760	9904	12972	12236	9321	11857	16402	8846	12681	7491	4314		126042
% Change on previous year	45.3	-7.0	0.2	0.5	9.7	0.9	-45.9	-46.1	-9.2	22.9	-0.6	2.0	-2.3	
2015														
Number of visitors	7063	11312	11760	15342	13909	9509	11050	19064	9308	13173	8855	5700		136045
% Change on previous year	-23.7	5.1	18.7	18.3	13.7	2.0	-6.8	16.2	5.2	3.9	18.2	32.1	8.6	
2016														
Number of visitors	7922	16082	13729	14250	14407	13554	39517	19034	11807	13722	10030	5420		179474
% Change on previous year	12.2	42.2	16.7	-7.1	3.6	42.5	257.6	-0.2	26.8	4.2	13.3	-4.9	33.9	
2017														
Number of visitors	9525	13217	11344	16641	13755	13225	42536	18493	11903	15067				165706
% Change on previous year	20.2	-17.8	-17.4	16.8	-4.5	-2.4	7.6	-2.8	0.8	9.8			1.0	

Our visitor numbers are recorded by a combination of recorded sales through our EPOS system and those reported by the door counter which records all visits including those to the shop and to the counter (and which are outside of the pay barrier).

3.1.3. Visitor Origin

Analysis of visitor origination is drawn from two data sets, (i) from the visitor survey performed by Morris Hargreaves Macintyre (MHM) based on a sample of 285 surveys collected between August 2016 and March 2017 and (ii) a catchment report compiled by the Audience Agency (AA) based on 44,900 postcodes from visitors to the Centre between October 2014 and April 2017. Their combined analysis provides the following information:

Drive time - distance

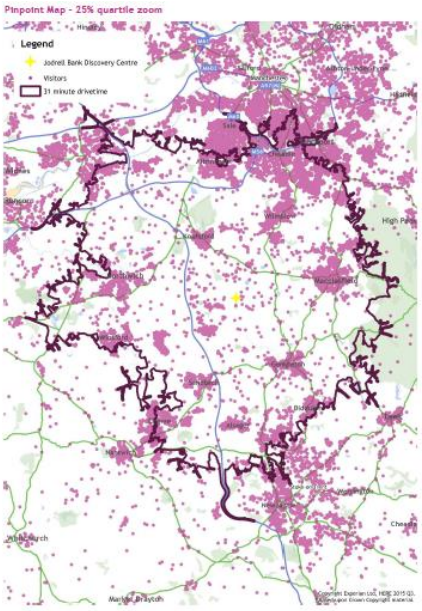
- 75 % of visitors travel from within a 60 mile radius and an 84 minute drive time incorporating Lancaster to the North, Sheffield to the East, Birmingham to the South and Merseyside to the West *(AA)*
- 25% of our visitors are travelling from a distance exceeding 60 miles (*AA)*

Drive time - journey duration

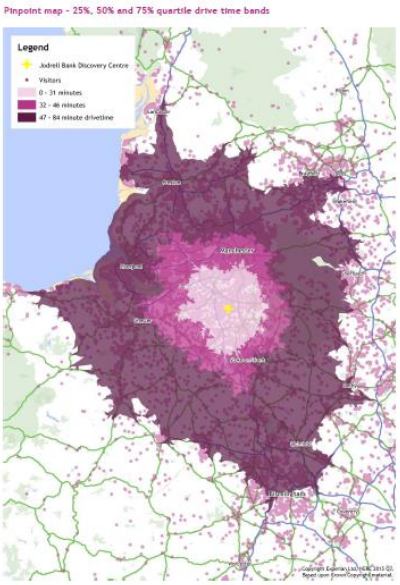
- 21% of visitors are from within a <30 minute drive time *(AA)*
- 64% live within an hour's drive time, with 43% of our overall visitors living within a 30><60 minute drive time of Jodrell Bank *(AA)*
- Three out of four visitors to the Centre live beyond a 30 minute drive time, and beyond the immediate locale of Cheshire East (AA)
- 36% are visiting from outside the North West (MHM* and using a different data set to the Audience Agency)

Further Statistics

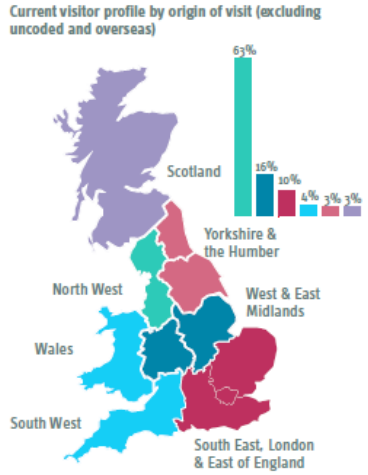
- One in ten visits are from London, South East or East of England (*MHM)*
- The school holiday periods attract more visitors from outside of the local area than the weekday visits (46% from outside the North West versus 21% during the weekdays) *(MHM)*
- 2% of visitors that are from overseas *(MHM)*
- Internal surveys conducted after the Centre's redevelopment in 2011 and on the cessation of the ERDF funding period illustrate that one in four is on a staying trip in the region or the wider North West (22%).
- Maps illustrating the radius of visitor origin across the North West are provided below.

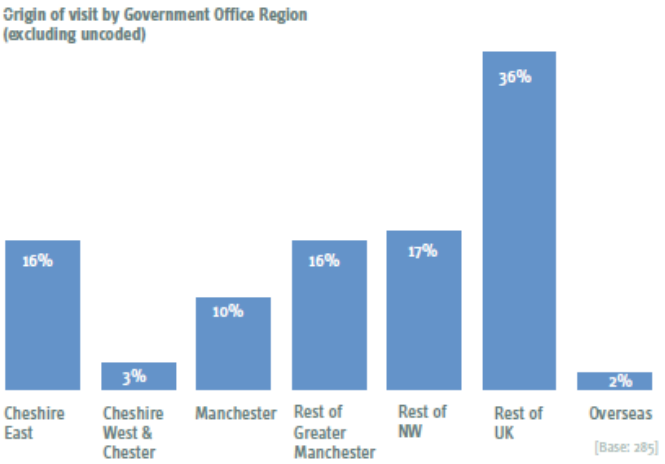


25% quartile (The Audience Agency, 2017)



25%, 50% and 75% quartile driving times

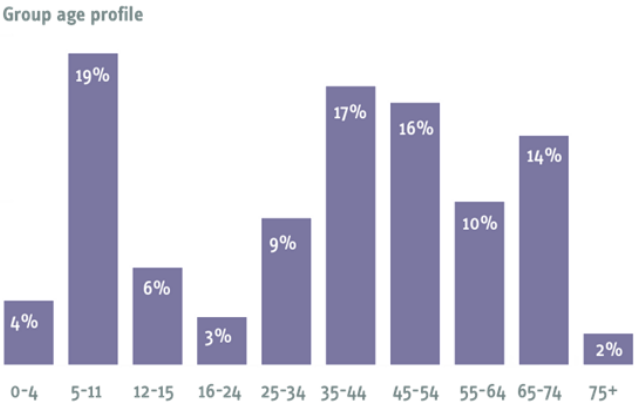


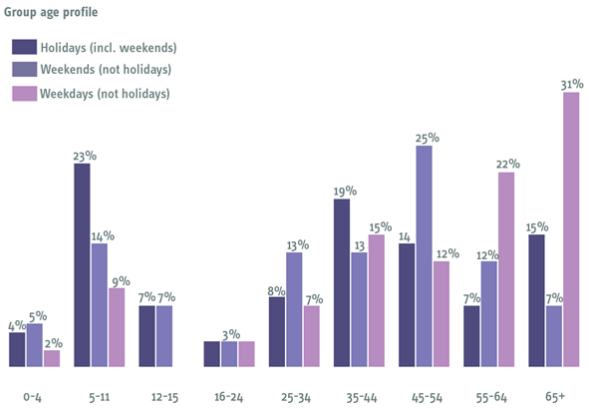


Analysis of the demographics of this wider population is detailed later on in this section when we turn to the potential future expansion of the visitor group.

3.1.4. Visitor Profiles

- Half of visits are made by families; this increases to 61% during the school holidays, which is when 58% of our footfall occurs (and when the Centre augments its offer to include science shows and other forms of mediated visitor engagement for no additional charge).
- The gender of our visitors is evenly split, although this depends on whether the visit is during the holidays when the ratio of women increases.
- The majority of our visitors identify themselves as White British (97%) and 3% as from Black and Minority Ethnic backgrounds, which is representative of the immediate catchment area.
- Approximately 1 in 10 of our general visitors has a disability
- One third of our visits are from children.
- The typical age profile of our visitors is illustrated below.





- 56% are first time visits to Jodrell Bank and 44% are repeat visits. This has increased from 50% in 2011.

3.1.5. Current Audience profiles by strand of engagement

The following analysis is the result of our own internal evaluation and data collection.

Current Audiences - Special Events

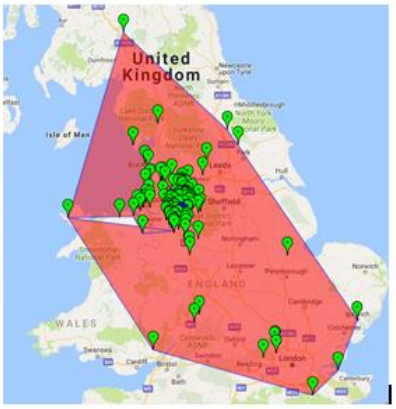
The centre runs a successful range of ticketed events as part of its public programming strategy which has science at its core. These include our successful and sell out Lovell Lecture series and Girls Night Outs, for which we have built up a committed audience as well as newly developed Family Stargazing evenings, and Astrophotography events.

The Lovell Lecture series which were launched in 2011 are delivered by resident and visiting academics and have developed a strong audience base. With a capacity of 200, consisting of approximately 6 lectures per year these are consistently sold out.

The centre has pioneered events aimed at engaging hard to reach audiences with science such as 'Girls Night Out's'. Targeted at secondary school age girls participants join workshops and attend a talk delivered by a practicing female scientist, (such as Libby Jackson, Astronaut Flight Education Programme Manager for the UK Space Agency). The impact of the science engagement achieved by the Centre has been ranked as of international and world leading standing in a Research Excellence Framework assessment.

Typically our events attract a loyal following, achieve a higher proportion of repeat visits than do general admissions and are from a wide geographical area and a considerable driving time as illustrated below.

Girls Night Out



Astrophotography

Family Stargazing Night

Data reports the following demographic for event attendees:

Events demographic data	Ethnicity		Gender			Disability		Age						First Visit	
	White	BME	M	F	Other	Yes	No	16-24	25-34	35-44	45-54	55-64	65+	Yes	No
Bike rides															
Lovell Lecture	100%	0%	61%	37%	2%	0%	100%	0%	10%	3%	22%	45%	20%	0%	100%
Girls Night Out	95%	5%	0%	100%		6%	94%	6.00%	19%	13%	31%	31%	0%	17%	83%
Astrophotography	97%	3%	60%	37%	3%	6%	94%	0	14%	22%	20%	30%	14%	34%	66%
Family Stargazing	90%	10%													
Stargazing Night* those that bought the tickets surveyed				100%		10%	90%	0	30%	20%	40%	10%	0%	36%	64%

Current Audiences - bluedot

Our bluedot festival, which runs each July, enables us to reach out to and engage with a demographically diverse audience.

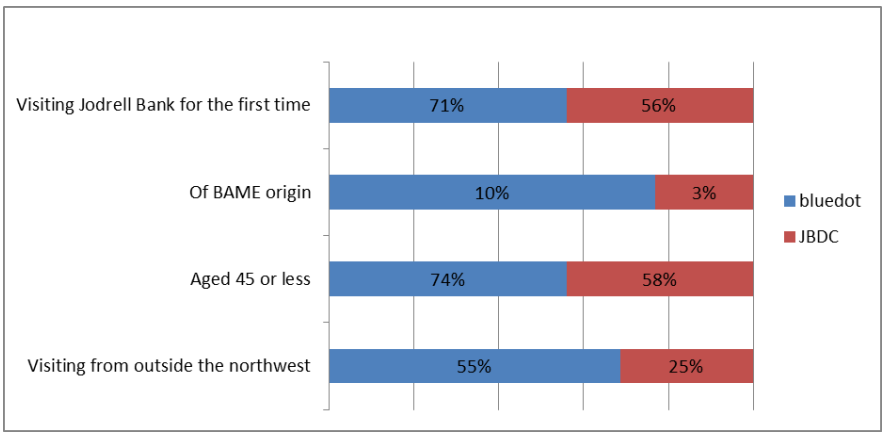
In 2018, for example, the four day camping festival engaged an audience of 25,000 across the entire long weekend with a bill blending culture and science, performance and engagement, and programme filled with installations, exhibitions, shows, workshops and science fairs.

Bluedot is co-curated and organised in partnership with an established team of festival programmers and production companies and worked in close collaboration with the local community, Cheshire East Council and the University of Manchester.

The festival is successful in reaching a more diverse audience, with those who are from outside the northwest, of BAME origin and aged 45 and under comprising a higher proportion than that typical for the Discovery Centre.

75% of attendees aged under 45 compared to 48% of current visitors to Jodrell Bank Discovery Centre

91% of attendees are white and 9% BME, compared to 97%/3% of the Centre's usual audience.



The festival achieves a very high satisfaction rate, 97% rating it as excellent or good, and this year 82% of those surveyed saying they would return the following year.

Current Audiences - Schools Visits

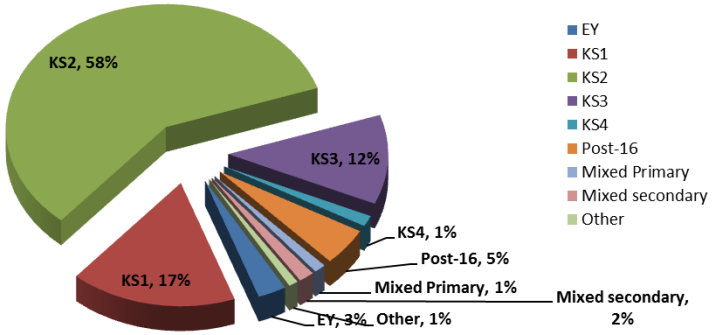
Our schools programme, for which we have a reputation as a centre of excellence, has engaged 100,000 school children since it was established in 2012. In 2017/18 academic year the scheme reached 24,000 children including outreach delivered free of charge to schools from areas of high deprivation.

Proportionate to our overall visitor numbers, school visits comprises 12% of our visitor profile.

Data analysis reveals that:

- 75% of visiting schools are travelling from within the North West, typically a 90 minute drive time.
- The proportion of visiting schools travelling further is one in four, made up by the West Midlands (12%), Yorkshire (6%), Wales (3%), and the East Midlands (2%)
- 30% of school visits are from BAME backgrounds
- The number visiting pupils eligible for Free School Meals is 13%
- The number of those with English as an Additional Language 19%
- 28% of visiting schools are in the bottom quartile of the IMD
- 58% of teachers are visiting for the first time, 42% of teachers have visited previously
- For learners visiting the Centre, the estimated ratio of girls to boys is 52% to 48%

10% of learning engagements were delivered specifically to school children from target areas of deprivation via the University of Manchester's widening participation (devised to encourage more students from diverse backgrounds to study STEM subjects at university). These engagements, whether delivered on site or as outreach, are provided free of charge to schools that meet the eligible criteria, which is measured by a high proportion of pupils eligible for Free School Meals.



Map of visiting schools Aug 2017 to Jul 2018 ***Age of learners Aug 2017 to Jul 2018***

'A brilliant school trip with my Y5 class! Cannot fault the enthusiasm of the staff and the workshops ticked all the boxes! For the price, a fabulous day that was well organised, well put together and enjoyed by all who attended!'

Current Audiences - Group visits

The Centre is a popular destination for organised group visits, receiving an average of 100 per year, typically comprising of U3A's, Probus Clubs, WI's, the Open University, Rotarians, Astronomical Societies, Friends organisations and local interest groups.

Groups can choose to augment their self-guided visit with an optional talk or a guided tour of the gardens and can select from a variety of group catering options. The Centre does not currently receive a large amount of organised visits from coach tour operators and we do not currently receive a large amount of organised visits from coach tour operators.

Typically comprise of those aged over 60.

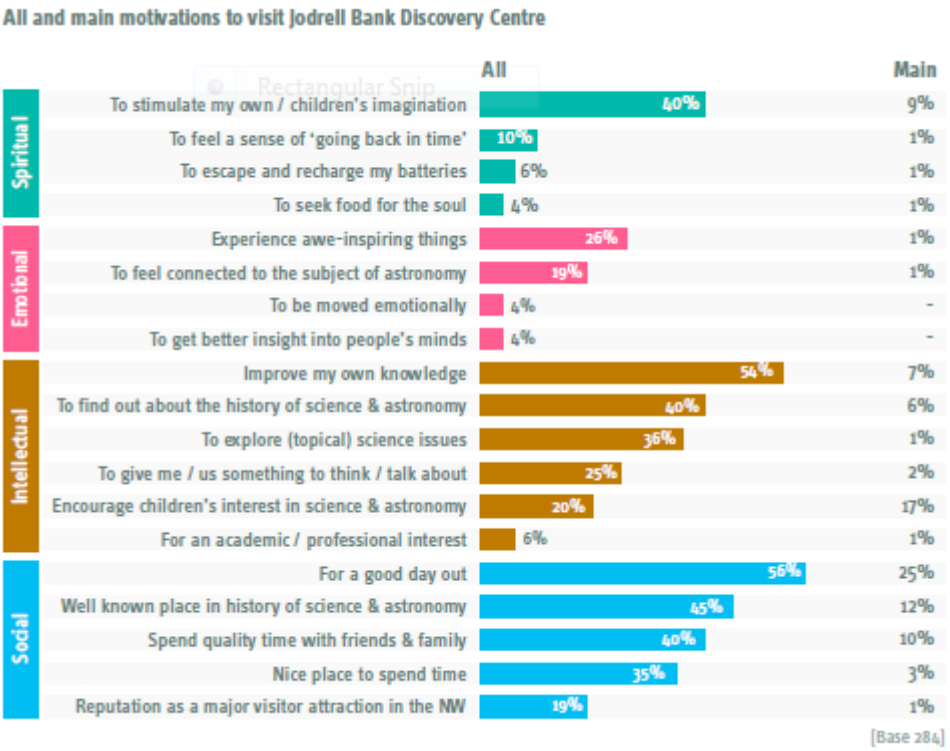
- 87% of organised group visits are from outside of the immediate catchment area (50% of which exceeding a driving time of one hour)
- Three out of four groups choose to receive an optional talk on the history and heritage of the site
- 100% have rated their visit as excellent or very good.

3.1.6. Current Audiences - Visitor motivation

As part of their visitor surveys Morris Hargreaves Macintyre asked visitors about their motivations for coming to Jodrell Bank. Their findings conclude that visitors are largely motivated by the prospect of a good day out, and the opportunity to learn and be inspired. They have summarised their findings according to social, intellectual, emotional and spiritual experiences – asking visitors to list all of their motivations, and then selecting which of these was their main driver.

- **Social - A good day out:** 51% of visitors cite a social motivation as the main driver of their visit and are seeking an enjoyable day out, to visit a place that is well known for its science heritage and to spend time with family and friends.
- **Intellectual - A chance to learn:** 34% of visitors stated the opportunity to improve their knowledge was their main motivation for coming to Jodrell Bank. Families in particular are looking for a creative learning experience for their children. 17% said that their desire to encourage their children's interest in science and astronomy was their main reason for visiting.
- **Spiritual – to be inspired:** When looking at all motivations, spiritual motivations for visiting Jodrell Bank are higher than the norm for a museum and are more typical of a gallery. 9% of visitors said their main reason for visiting was to stimulate their children's imagination or creativity.

- **Active – stimulation:** Visitors are attracted by the proposition of visiting the gardens, and enjoy a mix of science and nature.



3.1.7. Current Audiences – stated reasons for visiting and experiences

When asked to cite their reasons for visiting, the Lovell telescope is the biggest attractor for a visit (77%) along with the opportunity to look around generally. The opportunity to explore the heritage of Jodrell Bank is an attractor for just under a third of visitors. The gardens and grounds at Jodrell Bank had significant appeal for one in five visitors.

MHM's survey reports that the average dwell time is 3 hours. However it is worth noting that the majority of their surveys were collected during the school holidays when the Centre offers free family activities such as science shows and meet the expert sessions. Our own research suggests that the mean average dwell time is currently in the region of 90 minutes.

Expectations

- Pre-visit expectations are high; 87% of visitors expect the visit to be excellent or good
- 65% of visitors found their visit to exceed their expectations
- For 12% of visitors, even though they expected their visit to be absolutely excellent, their actual experience still exceeded their expectations
- First time visitors are significantly more likely to have their expectations exceeded (more than half) than repeat visitors (a quarter)

Satisfaction

- Overall enjoyment of the visit is high, at 93%
- 55% of visitors rated their visit as excellent and a further 38% think it was good
- 95% of visits rate the Centre's current facilities as good or excellent
- 84% of visitors rate their visit as being good or excellent value for money

Recommendation

- 95% of visitors are likely to recommend a visit to a friend (this has increased from 86% in 2011).
- 1% of visitors state that they are unlikely to recommend a visit

3.1.8. Current audiences by segmentation profiles

We have commissioned analysis of our audiences according to the different segmentation methods used by MHM, the Audience Agency, and Mosaic. These profiles will help to inform our future audience development strategy and marketing activity.

MHM's in depth analysis reaffirms that our visitor base consists primarily of families, and make up 48% of the visitor profile.

Of these, 'Learning Families' represent 27% and are identified as seeking structured activities and an educational and fun trip for their children.

The second highest group are 'Kids First' (21%) who want an entertaining experience, without the need for parental facilitation and a quick win.

Non-family visits make up 32% of the visitor profile, consisting of first time visitors making a general trip and repeat visitors who are using the venue as a sociable place.

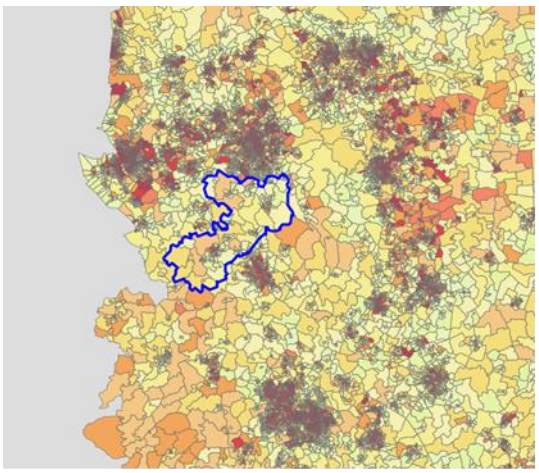
However, they also demonstrate that:
24% of current visitors are from audiences with typically low levels of cultural engagement.
54% of the Centre's audience belongs to a medium engaged segment compared to 42% nationally (Audience Spectrum).

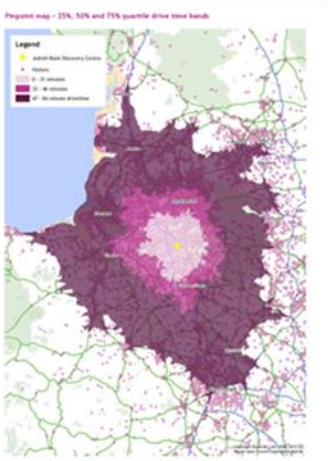
This analysis demonstrates that the Centre has been successful since its re-development in consolidating the perception of Jodrell Bank as a family-friendly destination, and that we are delivering against our mission to provide opportunities for shared family experiences which make for a great day out and promote increased scientific literacy along the way.

These segmentation profiles will inform our marketing activity and will be used to demonstrate and measure the diversification of our audiences in future.

3.1.9 Current Audiences by socio-Economic profile

Post code analysis of our ticket holders made in the 12 months (1 Sept 16 to 31st Aug 17) report that despite its location in rural Cheshire, 32% of visitors to Jodrell Bank Discovery Centre come from areas on the lowest half on the Indices of Multiple Deprivation (IMD).
Audience profile analysis performed by The Audience Agency and Morris Hargreaves Macintyre report that 24% of our visitors are from less economically active groups





Indices of Multiple Deprivation map, 2015 compared to our audience quartiles UK Visitor Origin

3.3 The wider picture – the potential for increased visits

Jodrell Bank is located within the unitary authority of Cheshire East, which is the 3rd biggest unitary authority in the North West after Manchester and Liverpool. The population of Cheshire East is 370,000. The region has a higher level of affluence and higher than average levels of educational attainment than the national average but there are large disparities across the county. The region has areas that have significant levels of economic disadvantage, and contains 16 out of 231 statistical areas which are in the top 20% deprived areas in England.

It has the following statistics:

- Higher proportion of the population is in the highest socio economic group than whole NW
- Low levels of ethnic diversity
- Age profile is older than average
- Average levels of households with dependent children

Social Grade	Cheshire East	CWaC	North West	England
AB	30%	26%	20%	23%
C1	29%	29&	30%	30%
C2	20%	21%	22%	22%
DE	20%	24%	28%	25%

Ethicity	Cheshire East	CWaC	North West	England
White	30%	26%	20%	23%
BAME	29%	29&	30%	30%

Qualifications	Cheshire East	CWaC	North West	England
No qualifications	20%	21%	25%	22%
Level 1 (1-4 O Levels/GCSE)	12%	213&	14%	13%
Level 2 *5+ O Levels/GCSE)	16%	16%	16%	15%
Apprenticeship	4%	4%	4%	4%
Level 3 (2+ A Levels)	12%	13%	13%	12%
Level 4 (Degree or above)	32%	29%	29%	27%
Other qualifications	4%	4%	4%	6%

Age	Cheshire East	CWaC	North West	England
16 to 24	12%	13%	15%	15%
25 to 44	30%	31%	32%	34%
45 to 64	35%	34%	32%	31%
65 to 74	12%	12%	11%	11%
75+	11%	10%	9%	10%

Analysis of visitors to Jodrell Bank Discovery Centre since 2014 demonstrate that just one in four visitors to the Discovery Centre are from the immediate catchment area (less than a 30 minute drive time), and that 75% are from a broader 60 mile radius and an 84 minute drive time.

Therefore it is pertinent to consider and include the demographics of the broader region and not just the immediate constituency.

Demographic data pertaining to the overall population within an 84 minute drive time has been supplied by the Audience Agency.
This reports that:

- The population of the overall area is 10.7m, comprising of 8.4 million adults.
- 44% of the population are households with dependent children aged 0 - 18, which is slightly higher than is typical for Great Britain as a whole.
- Within an 84 minute drive time of Jodrell Bank Discovery Centre there are approximately 1.4m people aged 5 – 15, 6m aged 16 – 59, and 2.4m aged 60 and over.
- Around 87% of the population describe themselves as white, 8% Asian, 2% Black and 3% as of mixed ethnic origin or other. There are districts within the catchment area with highly diverse ethnic populations.
- Around 20% of the population describe themselves as limited in their day to day activities by having a long term health problem or disability, which is slightly higher than the national average.
- The area has a higher proportion of people in lower socio economic C2/DE household than the nation as a whole.

Approximated social grade	84 minute drivetime %	United Kingdom %
AB	19%	22%
C1	30%	31%
C2	21%	21%
DE	30%	26%

In depth market research performed by Morris Hargreaves Macintyre has provided further analyses of the demographics within the 90 minute drive time catchment area in relation to attitudes to science and heritage, levels of engagement, awareness of Jodrell Bank and barriers to participation.

Their findings are the result of the range of surveys listed below:

Population survey
This profiled the potential audience and their desire to engage with both the scientific and heritage elements of the First Light Project. The market was defined as, those who had either visited (within the past three years) or would consider visiting, a museum, science or discovery centre or planetarium. The final sample in market after cleaning of data was 993.

Omnibus Survey
Conducted by YouGov, consisting of 5 questions to gauge potential visitors at a national level.

Audience Forum
Held to bring together members of the public representing a cross-section of the target audiences (current and potential) to explore the proposals for Jodrell Bank in more detail and to gather responses to the interpretative themes.

3.4 Forecasting future audience growth

We have developed a detailed business strategy to improve the visitor offer and visitor capacity, incorporating ten year commercial forecasts for the operation of the Discovery Centre and its longer term sustainability.

Various scenarios of future visitor growth have been modelled forecasting total visitors achieved per annum for 10 years to inform our commercial planning, as illustrated below.

Option/Scenario	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Do Nothing	179,000	180,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000	182,000
Do Minimum	179,000	180,000	182,000	185,640	189,353	193,140	197,003	200,943	198,933	196,944	194,975	193,025	191,095
Do More (A and B)	179,000	180,000	182,000	230,411	266,197	279,921	294,350	300,000	291,486	288,571	285,685	282,828	280,000
Reference Low	179,000	180,000	182,000	224,300	238,200	243,100	248,100	250,000	252,000	254,400	255,900	258,000	260,000
Reference Central	**179,000**	**180,000**	**182,000**	**288,014**	**332,746**	**349,901**	**367,938**	**375,000**	**367,291**	**365,454**	**363,627**	**361,809**	**360,000**
Reference High	179,000	180,000	182,000	340,231	419,100	451,350	486,075	500,000	468,459	463,775	459,137	454,545	450,000

- Low = forecasting 260,000 visitors per annum (and as per our HLF submission)
- Medium = forecasting 350,000 visitors per annum
- High = forecasting 450,000 visitors per annum

We have based our income and expenditure forecasts on the most conservative estimate. This pattern of growth is based on that experienced by the Centre following its redevelopment in 2011.

The growth model used is well within forecast future levels of visitation estimated in the market appraisal performed by consultants Morris Hargreaves Macintyre. As part of the audience development research performed in connection with the First Light Project Morris Hargreaves Macintyre were commissioned to assess the size of the potential market for Jodrell Bank Discovery Centre once the First Light Project has been delivered.

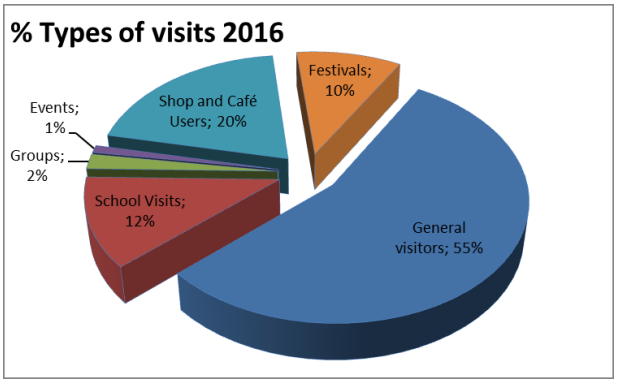
The market appraisal carried out indicates that the attraction of superb visitor facilities and an exciting activity programme will reach more visitors. The research demonstrates that there is strong demand for the project and that the interpretative content has a breadth of appeal to an extensive and diverse audience. Barriers to access and participation are removed across every facet of the project, (be they physical or intellectual) and this will increase audience diversity, especially via outreach and community engagement.

A substantial increase in the level of visits to Jodrell Bank Discovery Centre is therefore anticipated following the completion of the First Light Project.

The methodology used by MHM to predict future growth is presented for information below.

Market Appraisal Methodology

The independent forecast performed by MHM calculates a rise in ticketed visitors to 177k per annum, and is based on one strand of visitors the ticketed (paying) general visitors (which comprises just 55% of overall visits to the Centre), rather than the whole visitor body which includes schools, groups, ticketed events, festivals and non-paying visits. The proportion of each visitor type is illustrated in the chart below.



The overall market and penetration rates analysis produced by MHM is included for information below.

3.4.1. Awareness

Jodrell bank enjoys a high profile amongst people across the UK, the population survey performed by MHM reports that 37% of adults are aware of Jodrell Bank nationally.

Within the market catchment area of 90 minute drive time the level of awareness is 56% (compared to 21% for the Whitworth Art Gallery for example).

Recognition within the North west is particularly high (69%), the site not only enjoying a literal visibility from the Peak district to the Welsh borders but also cherished as an iconic regional landmark, acting as a signifier of the 'North', for the tenacity and achievements that it represents.

There is high awareness of Jodrell Bank as a centre of world leading research (70%) and for its iconic post war significance (65%) and awareness is not determined by having a pre-existing interest in science.

3.4.2. Conversion

Jodrell Bank has the 5th highest proportion of visits out of all 15 venues tested by MHM in the area and enjoys a higher conversion rate from awareness to attendance than many of the other local and national venues tested. It is interesting to note that for Jodrell Bank the conversion rate is 43% compared to 37% for MOSI and 28% for IWM North.

57% of the market are likely to visit, 29% are not sure. Four in ten of those likely to visit would visit with children aged 0 to 12.

3.4.3. Potential Visitors

Market testing performed by MHM demonstrates that there is a high level of interest in the proposition, with 75% of those surveyed expressing an interest in visiting.

MHM have assessed the size of the potential market for Jodrell Bank based on the criteria set out below;
The target catchment area is the population that lives within a 90 minute drive time of Jodrell Bank. This is corroborated by post code analysis of current visitors which demonstrates that three out of four visitors to the Centre originate from this radius.
The overall population of this catchment area is 11.9m
The potential market for visiting museums/science and discovery centres is represented at 71% (8.5 million) of the catchment area. This is the market represented by the population survey. *Public Attitude to Science Survey 2014

The population survey indicated that:

- **14%** would **definitely** visit (1.2m people)
- **43%** would **probably** visit (3.7m people)

MHM attest that only a proportion of these will attend, and that conversion rates (based on their previous research) depend on a number of factors such as the efficacy of marketing campaigns and how closely the proposition tested matched the final offer.

For the purposes of the FLP audience development plan MHM have assumed a modest 7.5% conversion rate of those who stated they would definitely attend, and 1% of those who said they would probably attend to reach a potential annual market of **127,000** visitors.

However, it is prudent to assume that the final offer will attract visitors from beyond this immediate catchment area as analysis cited previously demonstrates that between 25% and 36% of our audience travel from beyond the 90 minute drive time.

3.4.4. Audience diversification

MHM analysis demonstrates that the offer will attract a core audience of families, those within a 60 to 90 minute drive time, those that have a prior awareness of the site and those who have a keen interest in science.

The extended capacity and new strands of engagement afforded by the First Light Project will enable increased levels of visitation and facilitate engagement with the site's OUV for new audiences:

Volunteering opportunities will increase community participation, enhance our workforce, generate a sense of belonging and create opportunities for improved wellbeing.

Community engagement will be promoted via co curation, collaboration and the establishment of activities and events which will foster and strengthen sense of place and its contribution to the regional identity.

International visitation will be supported by participation in regional marketing campaigns, creation of content for group travel itineraries and investment in strategic advertising at major travel intersections will enable us to better reach the international travel market.

People with a disability; the project will provide new physical and sensory facilities, accessible content and interpretation, new guided tours for the visually impaired, autism friendly early opening sessions.

Off-site engagement will be provided by publication of online digital content for those who are unable to visit in person, and to deepen engagement and extend the sites national reach.

BME Communities; the 2011 census demonstrates that 13% of residents in the target catchment area are of black, Asian or mixed ethnic origin. According to our surveys, 3% of our audience are from these backgrounds and the baseline of demographics within our catchment area is not currently reflected in our general visitors. We will work to tackle these imbalances by appealing to families and communicating that a trip to the Jodrell Bank will provide consistently high quality, inspiring and memorable experiences for all our visitors.

Families with dependent children; The North West has a higher than average percentage of households with dependent children. We recognize that children are imperative to how families chose to spend their leisure time, be it to promote their education, enjoy new experiences as a family or seek entertainment and the value of early exposure to science is well proven. Through the projection space and on gallery experiences, the project will use the theme of astronomy and its rich history, which is universally accessible, with personal and cultural relevance for all and is recognised as meeting point between science and culture.

Lower socio economic groups; the Centre will deploy hold free fortnights at set times of the year, and targeted schemes to ensure affordable admission is offered in order to mitigate barriers to access including discount vouchers for school children to revisit with their families, free periods of admission and passes for locals.

Young People; The Discovery Centre's education programme has experienced 100% growth over 4 years, demonstrating not just consistent demand, but that science is perceived as relevant, universal and open to all regardless of socio-economic status. The future inclusion of heritage as an educational theme will provide new opportunities for young people to learn vital skills, such as problem solving, critical thinking and perseverance – imperative to a career in science but also important life lessons. We will encourage repeat visits from school children and their accompanying families via discounts and vouchers informed by the success of our pilot scheme.

3.4.5. Baseline targets for audience development

We anticipate a substantial increase in the level of visits to Jodrell Bank Discovery Centre following the completion of the First Light Project, estimating that the project will reach over 1,000,000 visitors in the first 5 years.

We aim to build visits from 180,000 per year on opening through to 225,000 after the first year of operation and 250,000 by the 5th year of operation. We have based our financial forecasts on this primary scenario, and have provided a sensitivity analysis which considers both a worst case scenario assuming 225,000 visitors and a best case of 300,000 visitors are achieved by the 5th year of operation respectively.

Jodrell Bank Discovery Centre	Baseline	Delivery Year 1	Delivery Year 2	Post project Year 1	Post project Year 2	Post project Year 3	Post project Year 4	Post project Year 5	Post project Year 6	Post project Year 7	Post project Year 8	Post project Year 9	Post project Year 10
First Light Project Visitor Growth Forecast - mid case scenario	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
All visitors per annum including festivals	179,000	180,000	182,000	224,300	238,200	243,100	248,100	250,000	252,000	254,400	255,900	258,000	260,000
Additional visitors per annum				*45300*	*59200*	*64100*	*69100*	*71000*	*73000*	*75400*	*76900*	*79000*	*81000*
Festival attendees (assuming 30,000 attendees over 3 days)	30000	30000	32000	32000	33000	33000	35000	35000	35000	35000	35000	35000	35000
Annual total excluding festivals	**149000**	**150000**	**150000**	**192300**	**205200**	**210100**	**213100**	**215000**	**217000**	**219400**	**220900**	**223000**	**225000**
Schools	26000	26000	26000	30,000	30,000	31,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Groups	3000	3000	3000	3500	4000	4500	4500	5000	5000	5500	5500	6000	6000
Ticketed day visitors	81000	82000	82000	117000	129000	131000	133000	134000	136000	137500	139000	140000	142000
Event attendees	2000	2000	2000	2800	3200	3600	3600	4000	4000	4400	4400	5000	5000
Non Paying visitors	37000	37000	37000	39000	39000	40000	40000	40000	40000	40000	40000	40000	40000
Total additional visits compared to baseline				45300	59200	64100	69100	71000	73000	75400	76900	79000	81000
% increase on baseline p/a all visits				25%	6%	2%	2%	1%	1%	1%	1%	1%	1%
% increase on baseline p/a a ticketed visits				44%	10%	2%	2%	1%	1%	1%	1%	1%	1%
Avg				*35%*	*8%*	*2%*	*2%*	*1%*	*1%*	*1%*	*1%*	*1%*	*1%*

This scale of visitation is corroborated by our own experience which demonstrated a 35% growth in visitor numbers following the redevelopment of the Centre in 2011 and engenders confidence that a similar model of growth is achievable and realistic.

In fact we believe this is a cautious and modest forecast compared to those provided by our market appraisal. This forecast is further validated by analysis provided by MHM of growth experienced by attractions following redevelopment, illustrating an initial surge of growth in the first year followed by subsequent years of modest increases.

3.5 Conclusion

Our market appraisal tells us that the attraction of superb visitor facilities and an exciting activity programme, will reach more visitors, enabling a connection to heritage by working with communities to enrich the story that we tell, and create more points of relevance for a diverse audience.

Research demonstrates that there is strong demand for engagement with the distinctive heritage of the site, in the next section we will set out our strategy for managing future visitor growth whilst continuing to protect and preserve the heritage of the site.

4. Future Visitor Management Plan

Objectives

- To ensure that the physical heritage of the site is better managed, protected and conserved according to the standards required, addressing risks and ensuring its care and maintenance for future generations.
- To transform the extent and depth of participation in the site, providing opportunities for people through activities, involvement, learning and engagement.
- Integrate training, learning and skills development via to public engagement, education programme, volunteering, community outreach and job creation.
- To transform the opportunity for understanding and engagement with the heritage of Jodrell Bank, relaying, revealing, interpreting and explaining our story, so that a wider range of people can understand and appreciate the unique turning point that occurred with the emergence of radio astronomy.
- To involve our communities and to diversify audiences, attracting new generations of young people, hard to reach groups, families and overseas visitors.
- To conserve the heritage of the site that is embodied on the South Side of the site, and to preserve elements of the original surface of the Lovell Telescope as tangible interpretation.
- To better identify and record the heritage of Jodrell Bank be it in relation to reminiscences, archives, ephemera or physical artefacts.
- To create a lasting difference for the communities and residents of our region and the North West, boosting the local rural economy via the creation of a must see national heritage destination, a world class visitor attraction and a thriving cultural and community venue.
- Achieve a transformative moment for the site, extending physical access to areas which were the birthplace of Jodrell Bank and which are the focus of outstanding universal value, as well as intellectual access to a pivotal pioneering chapter in British scientific and cultural history.

4.1 Extending engagement with the outstanding universal value of the site

- We will ensure that all visitor touch points encountered on the visitor journey articulate our key messages as an icon for science heritage in the UK, a must see national heritage destination and a world class visitor attraction.

- We will communicate our authenticity, warm and welcoming approach, commonality, and strength of purpose through all marketing platforms, encompassing all visitor interactions.

- We will devise events to extend physical access to the site such as walking tours of the south side which have previously been off limits, and cycle tours of the network of regional radio telescopes at which the Lovell is at the Centre.

- We will establish a new school heritage programme, providing educational opportunities for hundreds of thousands of school pupils (many of which will originate from areas with high Indices of Multiple Deprivation

- Through our activities and interpretation we will deliver a new strand of heritage engagement via group visits, ticketed events, immersive projection screenings, planetarium sessions, live link ups and cultural interactions

South side of the site

- The First Light project will help to conserve the important heritage of the South Side of the site.
- Access to the South Side of the site, which is at the heart of the case for the site's inscription as a UNESCO World Heritage Site, is currently off limits and the visitor has no opportunity to understand the evolution of the site in parallel with its scientific achievements – a fundamental facet of the Jodrell Bank story.
- The First Light project will extend opportunities, for visitors to engage with the whole site via guided tours.
- The project includes conservation of buildings around the Green but the Radiant Hut will receive particular attention in order to create a mixed use environment to house and display archive material, accessible to participants who take up a guided tour of the south side, bringing this area into the visitor experience for the first time. It will also be used as a venue in which to deliver premium talks to visiting groups.
- Pre-bookable guided tours will occur daily during term time and more frequently during holiday periods and at weekends. Tours will be limited to 20 participants and will be led by members of the Engagement Team and former Observatory staff volunteers. Training for the Engagement team will be available through working with former Observatory staff volunteers and the Heritage Officer.

4.2 Managing Capacity and Demand

In accordance with our forecast visitor growth we have modelled the impact this may have at peak times on visitor flow.

Using existing visitor arrival data, we have planned how to manage surges in visitor flow and mitigate potential limitations to capacity. Capacity control measures will include:

- We will adopt a visitor dispersal strategy to encourage a spread of arrival times and distribution of visitors across the site.
    - Apply a pre-bookable timed ticket procedure.
    - Implement extended opening hours.
    - Introduce a programme of pre-bookable immersive projection sessions at the beginning and the end of the day to encourage a more even spread of visitation throughout and deter the surge of arrivals that is currently experienced in the morning.
    - Introduce discounted tickets for late arrival to also mitigate this arrivals surge.

- Provide a full range of activities across the whole site (in line with our current practice) programmed at different times to discourage a concentration of visitors in one area.
- Extend the visitor journey, and suggest alternative routes to take around the site in our map, along with trails to participate in along the way and promote opportunities to visit the gardens and the arboretum
- Utilise the area around the Hornbeam tree as an orientation point and as an opportunity for redirection, by employing a greeter roles to assist and inform visitors of the range of activities taking place
- Utilise science buskers at congestion points to provide engagement

4.4 Future Extended Visitor journey

- Visitors will arrive via the new visitor entry plaza. The construction of this is included as a package of the car park project; it will be in place and operational prior to the delivery of the First Light Project.
- The pay perimeter will consist of two ticket booths (for up to 4 staff). The visitor journey will commence along a pathway leading past the Hornbeam tree (planted by Sir Bernard Lovell) towards the First Light Pavilion through the gardens.
- As such visitors will be drawn away from the Lovell Telescope at the start, but lead back to it at the culmination of the visit.
- Whilst the gardens are currently included as part of the visitor offer, levels of engagement are low – in future they will become an integral part of the visitor journey
- Visitors will proceed to the First Light Pavilion and will be able to experience the exhibition and the short film animating the history of Jodrell Bank that will be screened in the auditorium.
- After leaving the First Light Pavilion they will walk through the gardens and will be encouraged by mapping and signposting to proceed to the Space Pavilion exhibition, the Telescope Pathway and outdoor exhibits.
- They will leave the site by first visiting the Orrery before proceeding to the Planet Pavilion exit, at which point they can also chose to visit the Planet Pavilion Café and shop.

5. Jodrell Bank Visitor Management Action Plan

This schedule sets out in further detail the deliverable actions specifically applicable to the policies which relate to presentation and visitation, as set out in the Jodrell Bank Observatory World Heritage Site Management Plan (section 5.3).

Principle 4
Commitment to a comprehensive programme of presentation and education, including a commitment to sustainable visitation.

Policy 4a **Management of visitors should be of the highest standard and comply with relevant national and international guidance on sustainable tourism.**		
Action	Lead	Implementation Target
Maintain the site's high standard of visitor management, ensuring national quality accreditation is achieved each year. • Ensure ongoing sustainability of public engagement with the site's science heritage through continued financial success, maintaining existing numerous financial controls and clear lines of reporting and budget responsibilities • Ensure adequate resources are in place in order to manage visitation to the site effectively and responsibly and in order to protect the distinctive heritage of the site	JBDC	Ongoing
Adopt a sustainable strategic approach to future visitor growth, through policy and practice • Ensure that growth does not adversely impact the OUV of the site • Production of 5 year budget forecasts • Production of 10 year tourism strategy • Production of visitor growth forecasts according to range of scenarios • Production of risk register to inform management strategy • Ensure adequate business continuity plan is in place	JBDC	Ongoing
Devise visitor carrying capacity plan to manage visitor engagement limitations • Provision of visitor engagement must be context of respecting and conserving the OUV of the WHS and its environs • Maintain a flexible approach to managing visitor distribution across the site in order to be able to respond to visitor behaviour fluidly and to deploy measures that are appropriate to our business model • Ensure adequate visitor EPOS and CRM management systems are in place to provide data on potential pressures and to support provision of clear advance information and choices to visitors	JBDC	Ongoing

• Apply pre-bookable timed tickets, implement extended opening times, • Encourage more even spread of visitation by offering additional content at the start and end of the day • Spread capacity by developing off season offer • Manage visitor dispersal across site via programming at peak times • Introduce raised ticket cost for special access areas • Undertake safety audits / risk assessments in relation to staff and visitor safety		
Improve the site destination product and the visitors' experience, through improved visitor facilities and enhanced information, interpretation and orientation. • Expansion of and improvements to the café offer • Provide facilities to cater for visitors with impaired mobility in line with relevant disability legislation	JBDC	Ongoing
Undertake regular visitor surveys and evaluation in order to generate information on which to base developments of the management of the visitor experience. • Routinely perform monitoring and evaluation • Perform quantitative and qualitative research • Gather visitor profile data on visitor profile (demographics, origin, audience type, spend, behaviour, motivations, method of transport, loyalty, experience).	JBDC	Annually
Facilitate staff understanding of the site's Outstanding Universal Value and World Heritage Site status • Produce policy statement in relation to informing University of Manchester about staff and partner access to the World Heritage Site • Devise engagement plan for all staff working across site • Hold training event for all staff and develop training matrix for new staff • Embed communications on sites OUV in recruitment processes • Ensure obligations under the World Heritage Convention are highlighted in staff training	JBDC	Short term
Publish the Tourism Action Plan following review every 2 – 3 years.	JBDC	Short term

Policy 4b **Develop new visitor arrival facilities and interpretation spaces with due regard for OUV**		
Action	Lead	Implementation Target
Create new arrival facilities in order to mitigate queueing at busy times and provide a more rounded visitor experience. • Construction of new visitor arrivals plaza	JBDC	Short term

• Implementation of new pay perimeter • Revised visitor navigation on arrival extending visitor journey in and appreciation of the setting of the WHS • Phase 1 • Phase 2 • Provide strategic WHS interpretation and orientation for visitors		
Create a new gallery and projection space in which visitors can engage with the stories of the history and heritage of the property. • As per project programme	JBDC + JBO +UOM	Mid term
Ensure that all visitor touch points encountered on the visitor journey articulate the OUV of the site as an international icon of science, a showcase of international cooperation and endeavour that exemplifies astronomy and engineering at its best • New website development • Site signage development, production and installation • Updated visitor guidebook development and production • Ensure interpretation features UNESCO and World Heritage Convention	JBDC	Mid term
Communicate our authenticity, warm and welcoming approach, commonality, and strength of purpose through all marketing platforms, encompassing all visitor interactions • Update and promote visitor material relevant to private and public transport to the WHS and its setting	JBDC	Short term

Policy 4c **Develop arrangements for managed and sustainable access to the area of the property around the Green**		
Action	Lead	Implementation Target
Develop managed visitor access to the heritage area around the Green • Develop appropriate visitor access to and around site in a safe and sustainable manner • Develop programme of guided visits to the Green, with restricted capacity (15) and a maximum of 3 per day • Develop a dedicated south side tour for KS3 (secondary school) pupils as part of the Discovery Centre's learning programme	JBDC+JBO	Mid term
Deliver improved interpretation both in the properties around the Green themselves and the surrounding area that is alongside it • Refurbish Radiant Hut to create visitor facility, meeting room and small exhibition • Develop signage for various buildings/strcutures/areas	JBDC+JBO	Mid term

• Develop script for 'Walk and Talk' heritage tours of south side • Train guides to deliver tours • Develop acoustic-guide		

Policy 4d **Involve local communities and communities of interest in the WHS via initiatives such as volunteering programmes, community access days, and particular events for special people.**		
Action	Lead	Implementation Target
Develop inclusive and collaborative approach to enabling community engagement with the site and to recognize the role the community has played in the distillation of Jodrell Bank's sense of place. • Enable community engagement with the site via co curation, collaboration and the establishment of activities and events which will foster and strengthen sense of place and its contribution to the regional identity. • Hold regular community entrance days for both local communities and communities of interest • Maintain a functional database of community contacts • Develop a locals pass scheme providing events, café and retail discounts and advance booking opportunities • Ensure enagement with local communities promotes role of UNESCO and obligations under World Heritage Convention	JBDC	Ongoing
Develop volunteer programme to provide opportunities for skills development and training for those in the local community • Set up volunteering programme framework including policies, procedures, benefits and incentives • Extend existing opportunities to engage communities in protecting the **environmental and ecological diversity of the site's setting** such as: volunteer garden workshops and a locally focussed Goostrey Gooseberry Project • Opportunities include **event volunteering** such as astronomy, cyclists, environmental groups; **heritage volunteering**, in particular with former Observatory staff for events and training; **corporate volunteering** • Set up placements and apprenticeships with partners	JBDC	Ongoing
Hold regular events for special groups Increasing access: • autism friendly award • day for visually impaired/blind people planning	JBDC	Ongoing
Develop provision for local societies such as; local history societies, Probus, WI, U3A, astronomical group	JBDC	Ongoing

Involve local communities, groups and volunteers in interpretation and service testing • Invite to preview visits of future new facilities • Organise FAM trips for businesses in the local community – e.g pubs, taxi drivers etc.	JBDC	Mid term
Establish annual business and community engagement workshop on; • relevant tourism initiatives • provision of sustainable visitor facilities • promotion and sharing of benefits of WHS status	JBDC	Short term
Showcase local suppliers in our café and retail outlets	JBDC	Ongoing
Develop a green scheme to encourage visitors to choose environmentally sustainable options • Provide update on foot and cycle path provision	JBDC	Short term

Develop new, high quality, interpretation and presentation both on and off site, in order to promote an understanding of Jodrell Bank and its attributes, along with the values for the WHS convention and enhance the enjoyment and appreciation of the site by the widest possible range of people.

Policy 4e **Develop new, high quality, interpretation and presentation both on and off site, in order to promote an understanding of Jodrell Bank and its attributes, along with the values for the WHS convention and enhance the enjoyment and appreciation of the site by the widest possible range of people.**		
Action	Lead	Implementation Target
Interpretation • Develop new exhibition and projection content for new gallery and projection space, promoting OUV of the property and its attributes along with the values of the World Heritage Convention • Installation of new exhibition • Develop new outdoor interpretation and audio guide system for the Lovell telescope • Audit existing interpretative materials which promote and explain the message of Outstanding Universal Value with a view to improving and /or enhancing	JBO+JBDC+FLP project team	Mid term
Engagement Development of new public activity programme dedicated to the OUV of the site and comprising of; • On-gallery interactions - object handling and archive materials • Immersive theatre experience - Projection space 'night sky' show • Temporary exhibition • Family shows and activities	JBO+JBDC+FLP project team	Mid term

• Under 5s session d Archives – access to on site and at distance via creation of on-line portal summarising location of archival material		
Communications • Devise Heritage Engagement Communications Plan • Establish marketing and communications working group responsible for World Heritage Site Communications Plan • Define core messaging and brand positioning to reflect the development distinctiveness and authentic nature of the site • Incorporate message from Statement of Outstanding Universal Value into digital, social, printed and interactive communications and promotional material Redevelop website in order • to promote engagement amongst people who are unable to visit • create links to relevant information sources including World Heritage Site Build relationships across the wider tourism industry to; • devise itineraries for organised travel companies in collaboration with partner visitor attractions • enable rural tourism businesses to benefit from WHS status • Consultation with internal and external stakeholders and local communities Work with Destination Management Organisations (DMOs) to; • Participate in regional marketing campaigns to drive domestic visitation • Build relationships with organisations and businesses in neighbouring cities and national parks • Develop distinct bookable product for sale on DMO websites • Promote science heritage tourism in the region • Grow international market • Engage with regional transport services and investment in strategic advertising at major travel intersections	JBO+JBDC+FLP project team	Mid term

JODRELL BANK CONTROL BUILDING

Cheshire East

Historic Building Survey and Impact Assessment Report

Oxford Archaeology North

September 2015
Issue No: 2015-16/1670
OAN No: L10868
University of Manchester
Capita Property and Infrastructure

Document Title: **JODRELL BANK CONTROL BUILDING, MACCLESFIELD, CHESHIRE EAST**

Document Type: **HISTORIC BUILDING SURVEY AND IMPACT ASSESSMENT REPORT**

Client: **CAPITA PROPERTY AND INFRASTRUCTURE**

Issue Number:	2015-16/1670
Planning Application:	
OA Job Number:	L10868
National Grid Reference:	379500 371099

Prepared by:	Andy Phelps	
Position:	Project Officer	
Date:	September 2015	
Checked by:	Karl Taylor	Signed
Position:	Senior Project Manager	
Date:	September 2015	
Approved by:	Alan Lupton	Signed
Position:	Operations Manager	
Date:	September 2015	

Oxford Archaeology North
Mill 3
Moor Lane Mills
Moor Lane
Lancaster
LA1 1GF
t: (0044) 01524 541000
f: (0044) 01524 848606

Oxford Archaeology Ltd (2015)
Janus House
Osney Mead
Oxford
OX2 0EA

t: (0044) 01865 263800
f: (0044) 01865 793496

w: www.oxfordarch.co.uk
e: info@oxfordarch.co.uk

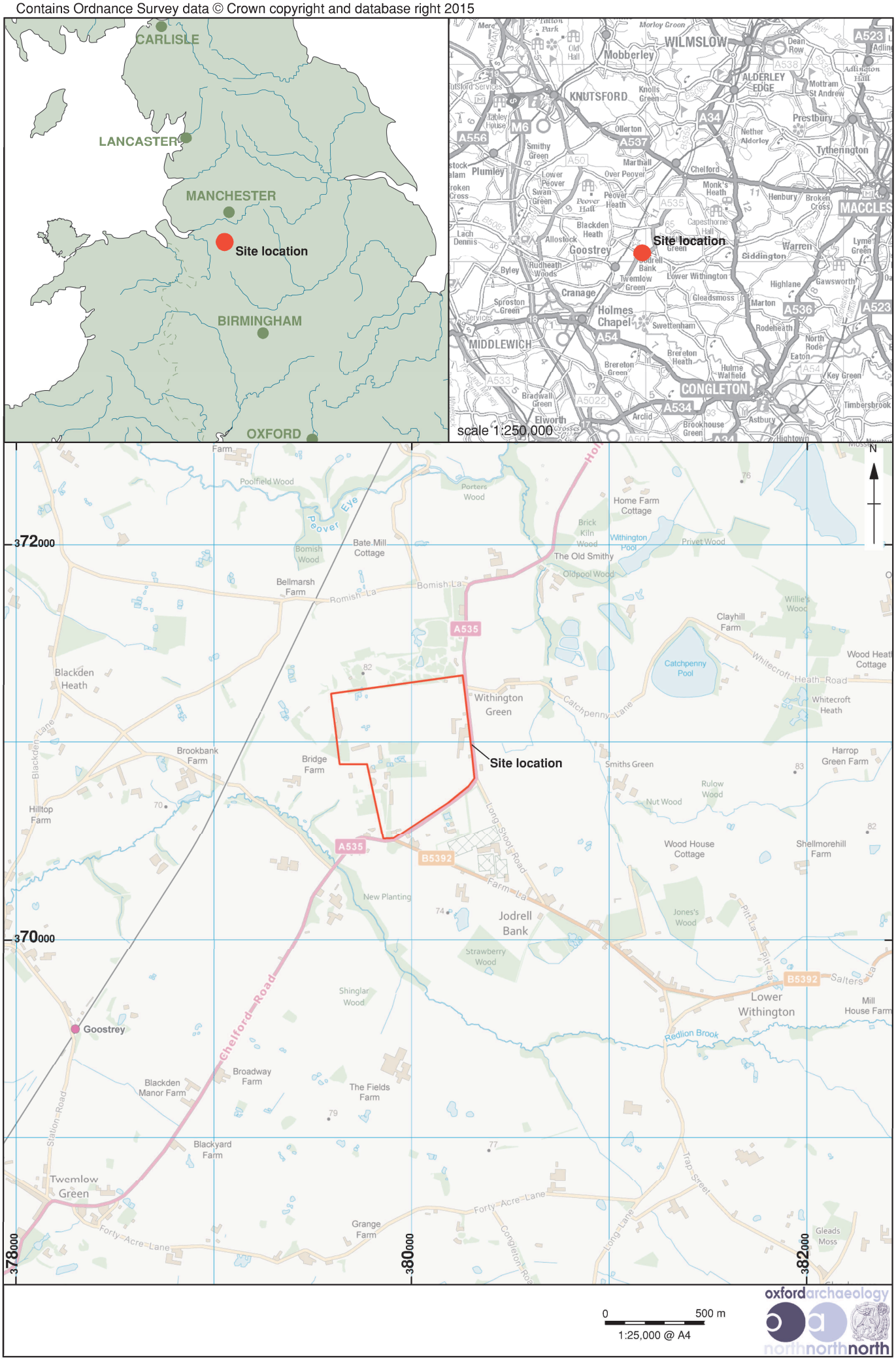


Figure 1: Site location

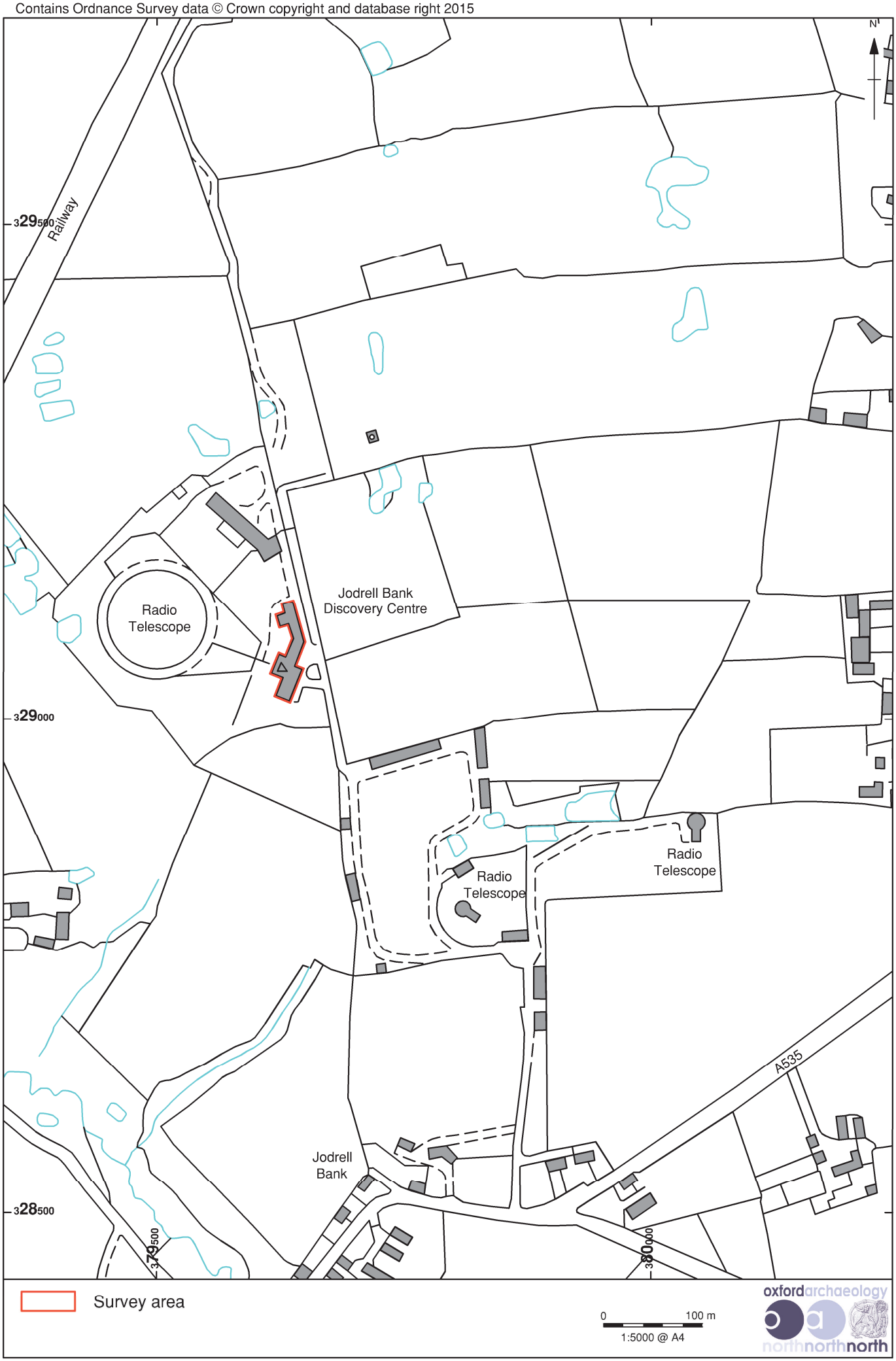
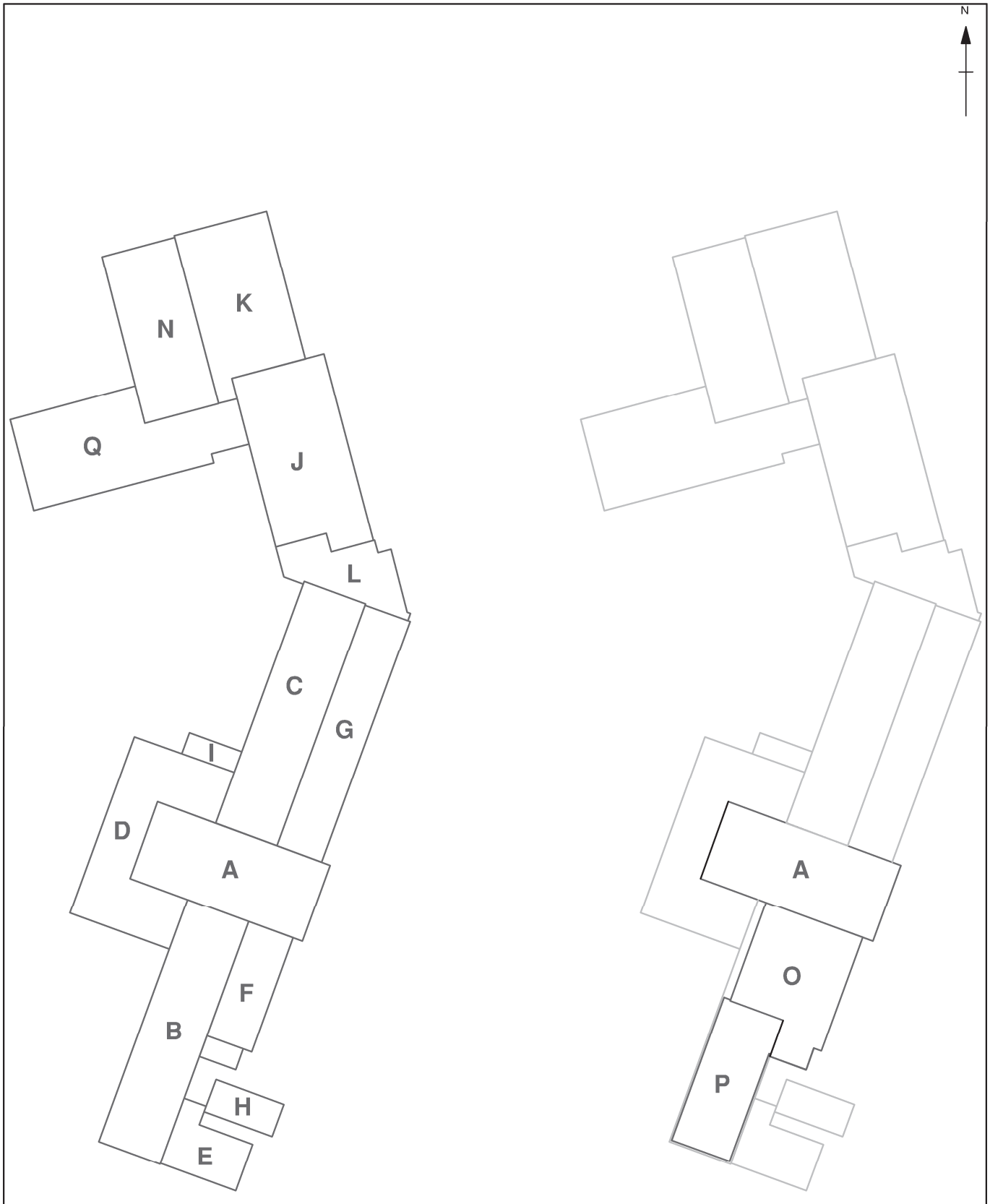


Figure 2: Location of buildings included in survey



a) Ground floor

b) First floor

Not to Scale

oxfordarchaeology northnorthnorth

JQ*L10868*AMS*130815

Figure 3: Location of rooms, as referred to in the text

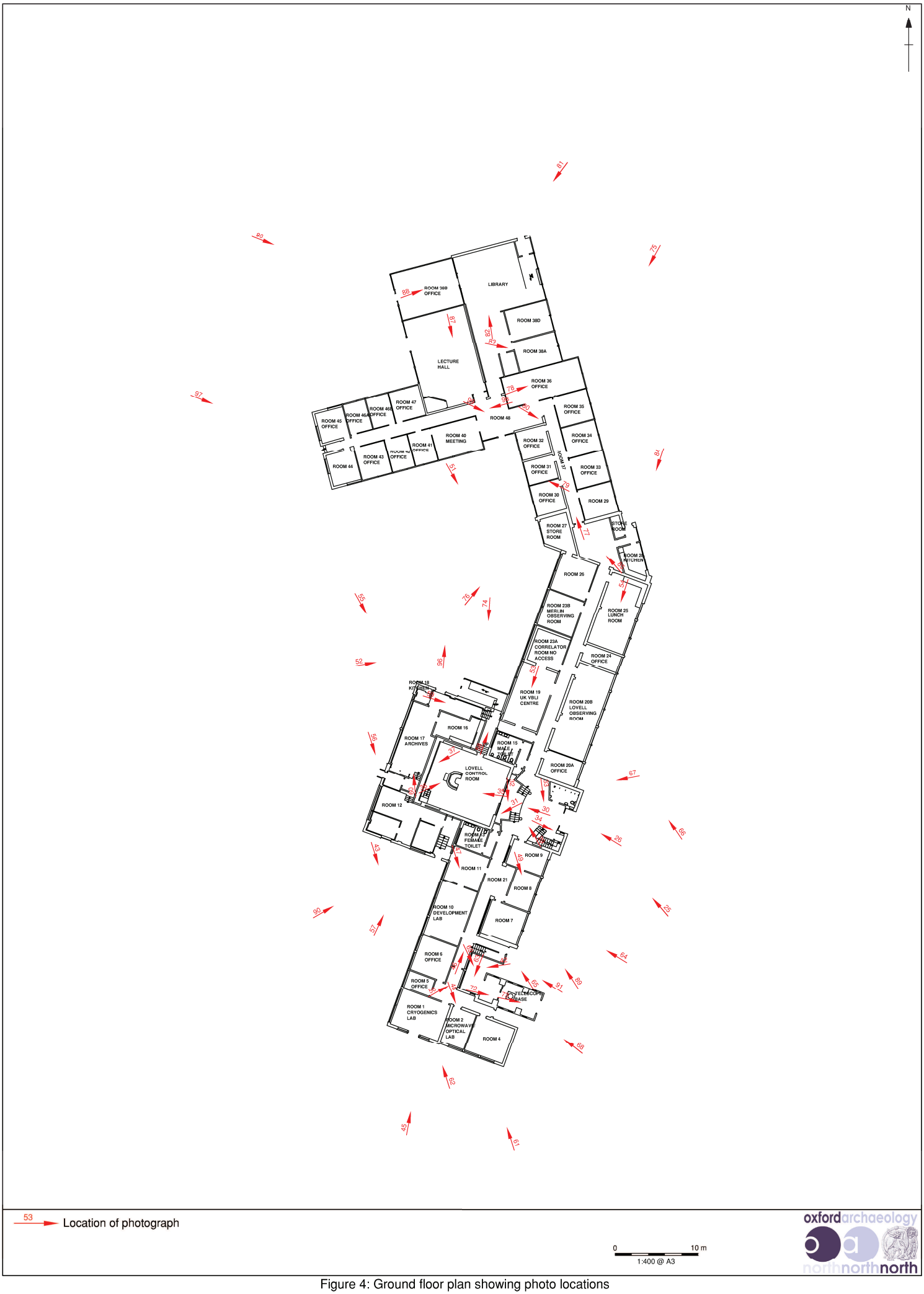


Figure 4: Ground floor plan showing photo locations

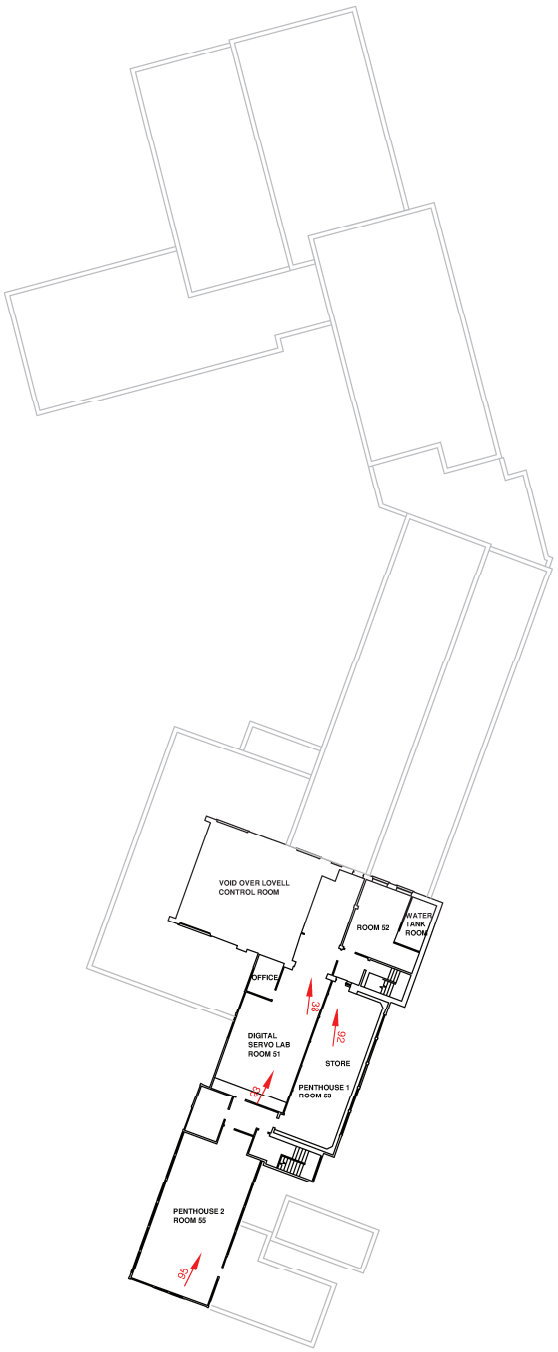
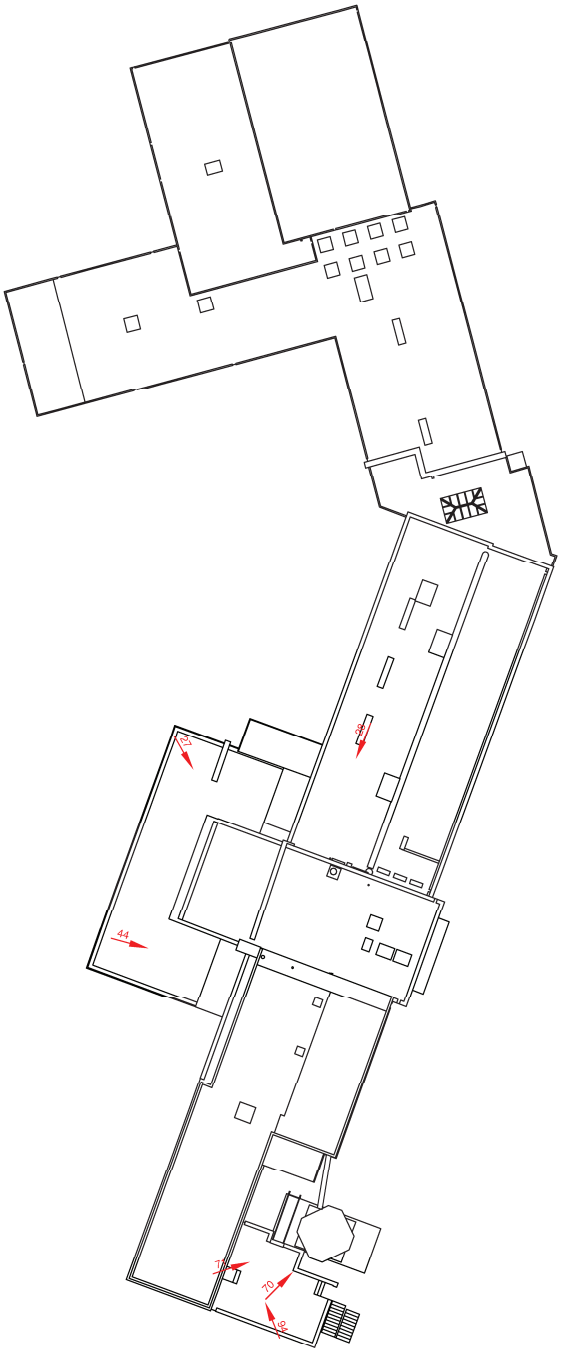


Figure 5: First floor plan showing photo locations



Roof Plan

53 Location of photograph

0 10 m
1:400 @ A3

oxfordarchaeology
north north north

Figure 6: Roof plan showing photo locations

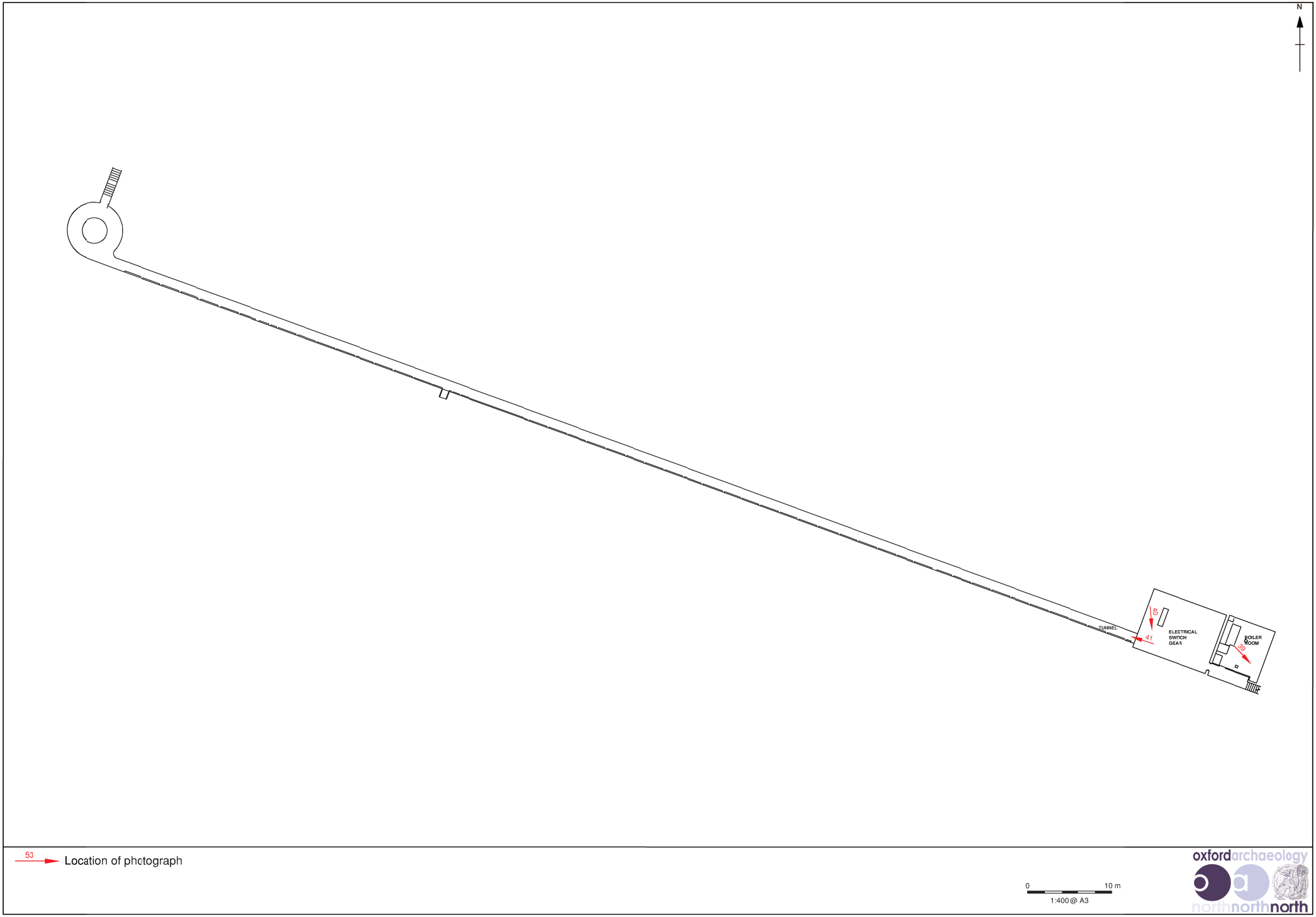


Figure 7: Basement plan showing photo locations

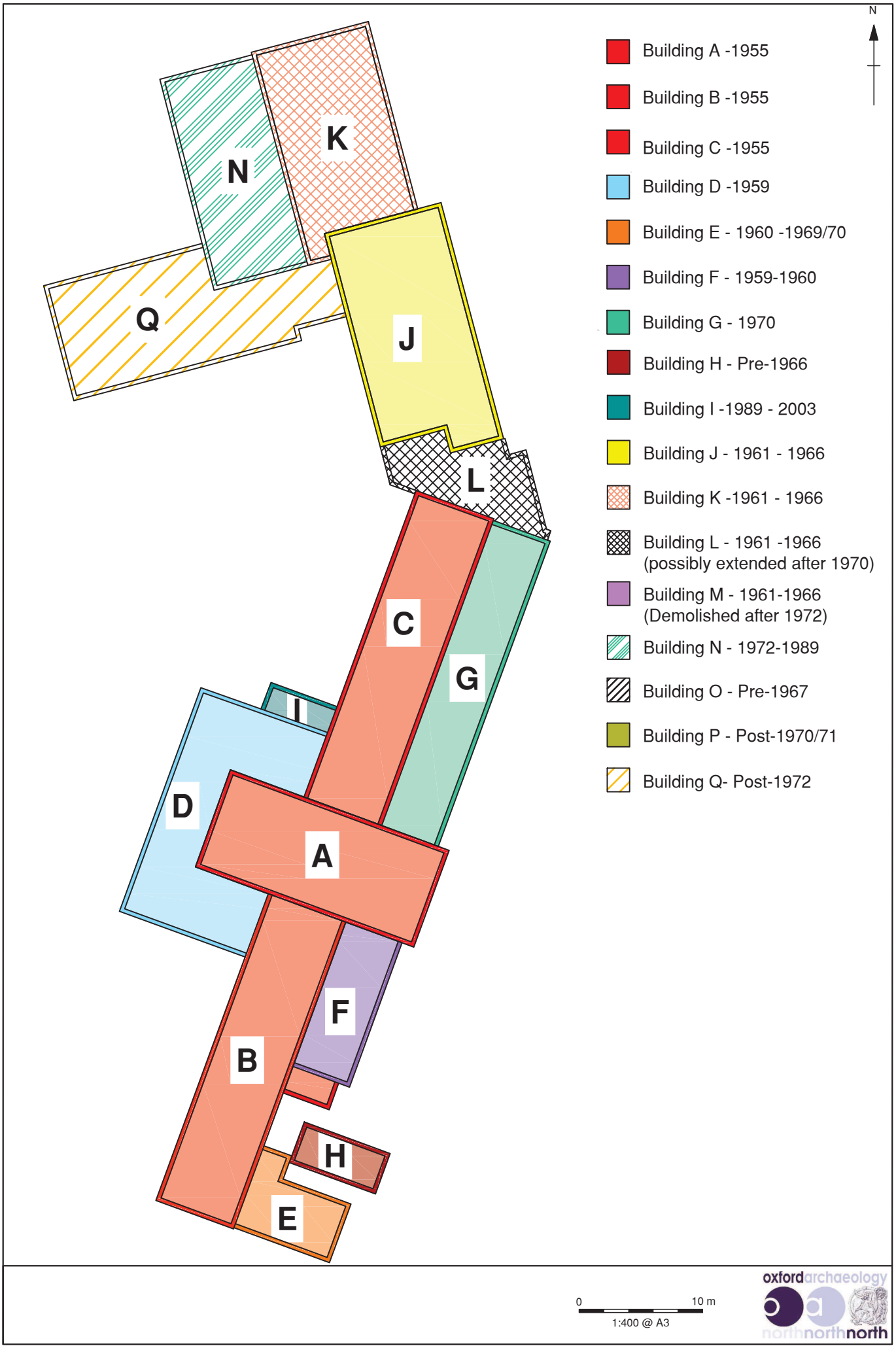


Figure 8: Ground floor phase plan

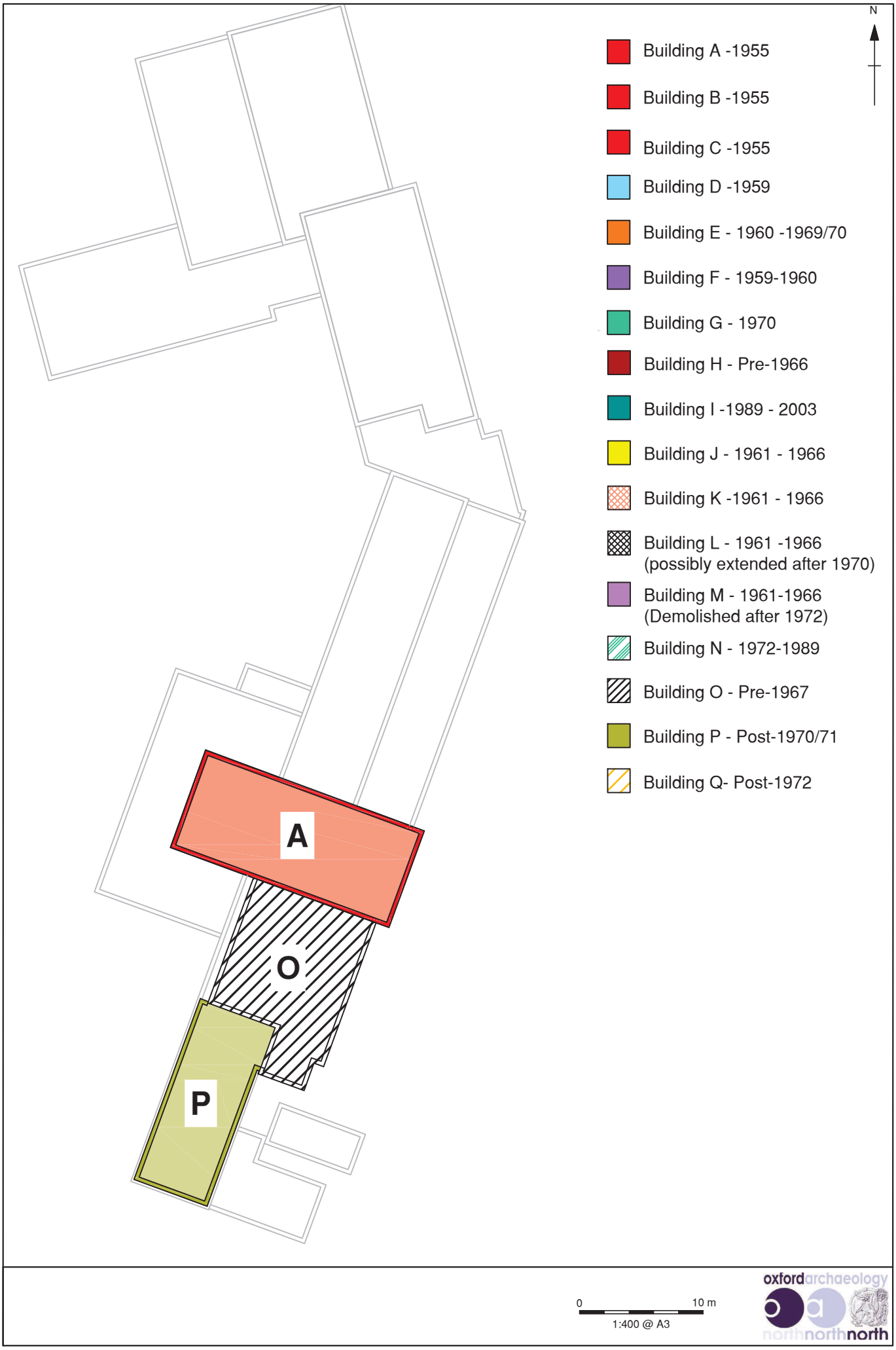


Figure 9: First floor phase plan

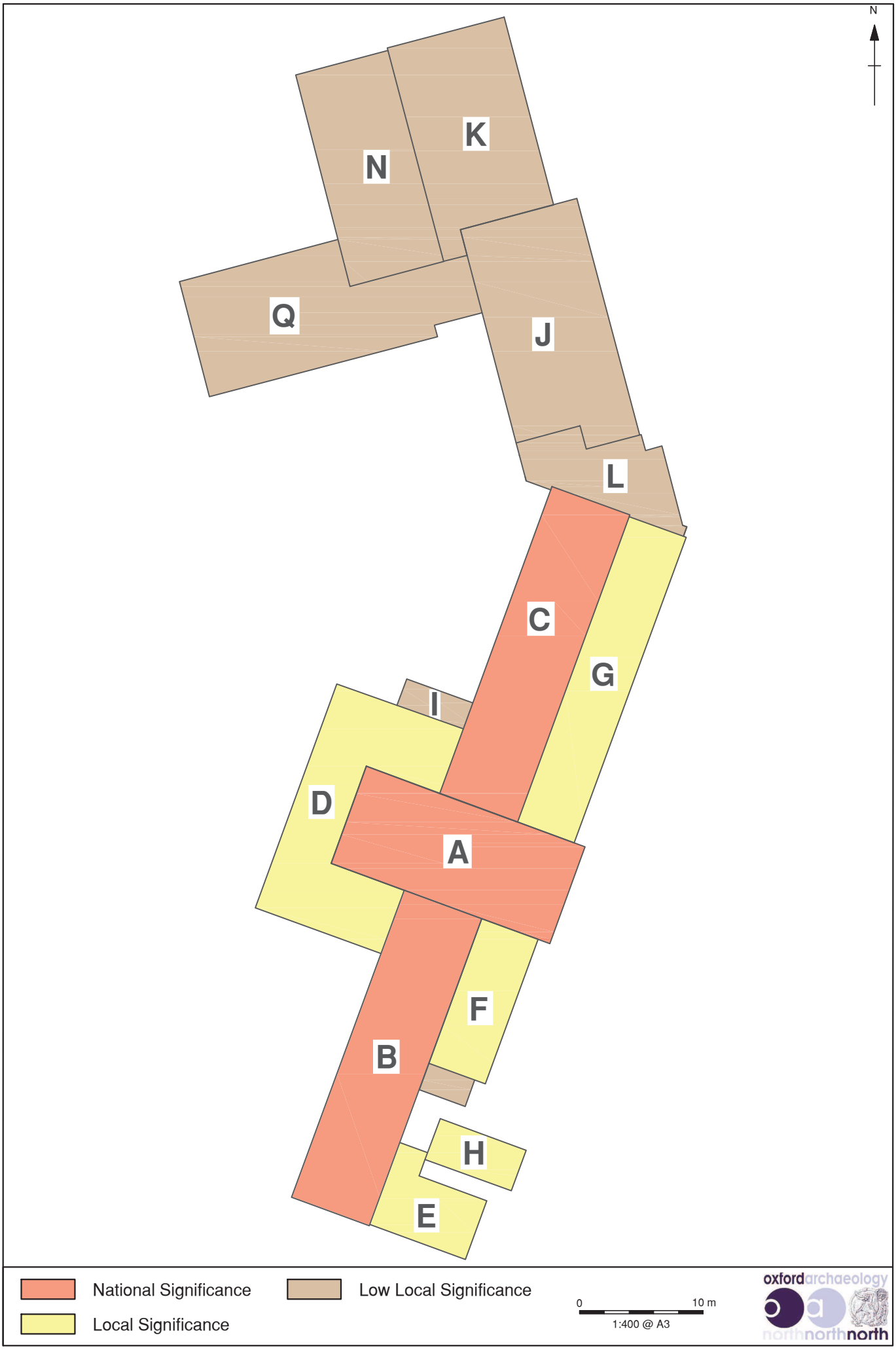


Figure 10: Ground floor significance plan

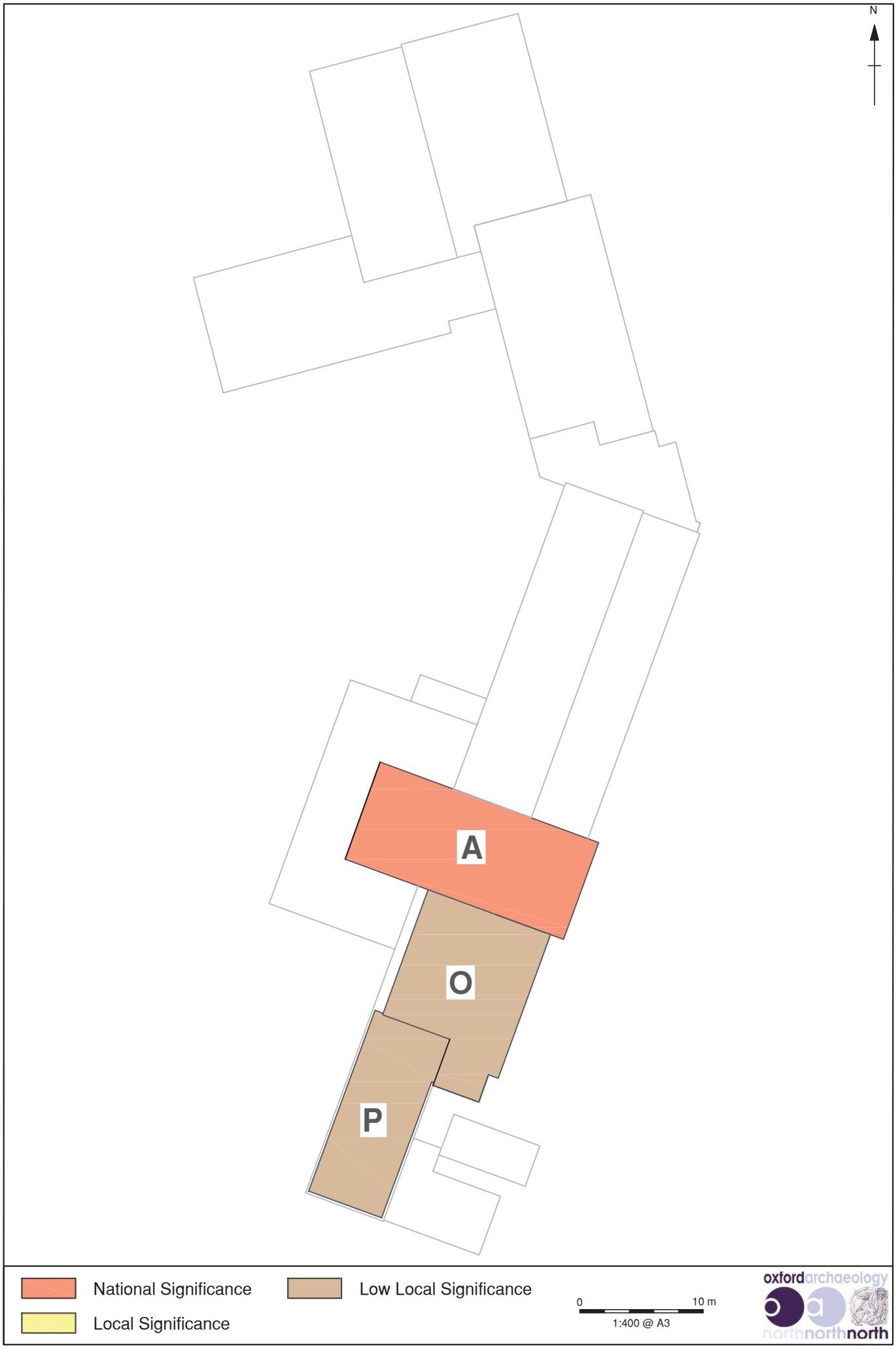


Figure 11: First floor significance plan

CONTENTS

ACKNOWLEDGEMENTS

Oxford Archaeology North (OA North) would like to thank Linsey Stansfield, of Capita Property and Infrastructure for commissioning the project and Mike Anderson of The University of Manchester for facilitating access to the building. Thanks are also due to the staff of Jodrell Bank Observatory for their patience and information during the survey.

The building survey and impact assessment was undertaken by Andy Phelps, who also wrote the report. Helen Quartermaine carried out the background research and the drawings were produced by Mark Tidmarsh, Anne Stewardson and Andy Phelps. The project was managed by Jamie Quartermaine and Karl Taylor, who both edited the report.

SUMMARY

As part of a planned program of renovation works to the Control Buildings at Jodrell Bank, Macclesfield, East Cheshire, Oxford Archaeology North (OA North) was commissioned by Capita Property and Infrastructure on behalf of The University of Manchester to undertake a heritage assessment upon the buildings. The following report includes the results of the historic building survey, followed by a statement of the archaeological significance of each part of the building. It concludes with an assessment of the impact of the proposed redevelopment. The fieldwork was carried out on the 29th and 30th of June 2015.

Jodrell Bank Observatory is situated on the Cheshire plains, upon former agricultural land to the west of the A535 at NGR 379500 371099. It lies 12km to the west of Macclesfield and 5km to the north of Holmes Chapel and is bordered to the west by the line of the Crewe to Manchester railway. The Observatory now centres upon the Lovell Radio Telescope, the largest fully steerable radio telescope in Britain, which is served by a range of control buildings to its south-east (Plates 1 and 2).

The Telescope and observatory buildings were erected between 1952 and 1957, and played an important role in the development of astrophysics, as well as making a significant contribution to the birth of the space age in the late 1950s. The Telescope was granted Grade I listing status in 1988 and holds an important place in the British public's collective consciousness, appearing in numerous television programs, stamps, cigarette cards etc. The Jodrell Bank Observatory is presently being considered for inclusion upon UNESCO's list of World Heritage Sites.

The original control buildings, consisting of a central two-storey control building flanked on either side by a northern and south wing, were finished in 1955 and became fully operation in 1957 with the completion of the telescope. Since this time the site has seen numerous additions, with significant extensions to all three of the original buildings. The earliest of these sought to maintain the architectural uniformity of the building but subsequent extensions and alterations, completed to tight budgetary constraints have eroded the symmetry and character of the original design. Despite this, the original control buildings can be firmly placed within the category of nationally important structures, with the central control building, and in particular the lobby and observation room, retaining their original layout and many of their internal features.

Plate 1: Western elevation of Control Buildings

Plate 2: The Lovell Telescope

1. INTRODUCTION

1.1 CIRCUMSTANCES OF PROJECT

1.1.1 The University of Manchester proposes to refurbish and extend the existing main Control Building at the Jodrell Bank Observatory, Macclesfield, Cheshire (NGR SJ 796 710). The Observatory is the home of the Lovell Telescope, which is a Grade I Listed Structure, completed in 1957. The core of the Control Building was constructed at the same time as the telescope but has since been altered and extended, mainly in the 1960s.

1.1.2 In December 2014, a pre-application meeting was held between Cheshire East Council and English Heritage (now Historic England) during which the principal strategy for the refurbishment was outlined. No objections were raised from this and, in early 2015, a RIBA Stage 2 Concept Design was produced (Fielden, Clegg, Bradley Studios 2015) that outlined the design proposals, including the restoration of the 1950s exterior facades of the Control Building, together with the removal of the later extensions and the construction of new extensions. The proposals also include rationalisation and refurbishment of the internal spaces to enable better utilisation of space.

1.1.3 During the pre-application meeting, it was noted that in common with the telescope, the Control Building was also considered to be Grade 1 listed, although not specifically mentioned on the listing schedule. It was considered by Cheshire East Council that, as the building is physically linked to the telescope via a tunnel and also operationally linked, it should be included.

1.1.4 In order to understand the Control Building and its relationship to the surrounding complex, as well as the internal relationships and phasing, Capita Property and Infrastructure commissioned Oxford Archaeology North (OA North) to carry out a programme of archaeological works. This was undertaken in order to provide an understanding of the likely impact of the development proposals. It included a desk-based assessment, an Historic England Level II building survey and a heritage impact assessment.

1.1.5 The desk-based assessment comprised a search of both published and unpublished records held by the Cheshire East Historic Environment Record (HER), Cheshire Record Office and the libraries of the Jodrell Bank Observatory, OA North and The University of Manchester. The sections of the National Planning Policy Framework (NPPF, DCLG 2012) relating to heritage assets were considered during the assessment. The results of the archaeological works are set out in the following report. The desk-based assessment was carried out in May 2015 and the building survey was carried out between 29th –30th June 2015.

1.2 LOCATION AND GEOLOGY

1.2.1 ***Location:*** the Mark I Telescope was built at Jodrell Bank in 1952-7 at NGR 379500 371099 (Fig 1), in a remote part of the flat Cheshire Plain, to the south-west of the expanding conurbation of Manchester. At the time, the whole site was deliberately located in fields and farmland away from the 'electrical interference' of the trams in the immediate environs of The University of Manchester (Lovell 1987, 2). At this time, the site comprised a fairly flat landscape of fields surrounded by farms: Blackden Farm, Jodrell Bank Farm, Old Farm and Beechtree and to the north-east

was a small Brick Works (OS 1:10,560 map, 1954). The Control Building was sited to the east of the telescope, 'just far away enough to give the operator an overall view of the Telescope' (Lovell 1987, 61).

1.2.2 ***Geology:*** the bedrock geology is of Sidmouth Mudstone Formation formed in the Triassic Period. The local environment was previously dominated by hot deserts. The superficial deposits were of Till, Devensian - Diamicton formed up to 2 million years ago in the Quaternary Period. Ice age condition prevailed in this area with glaciers forming the landscape and depositing moraines of till, sand and gravel (www.mapapps.bgs.ac.uk).

1.3 DESIGNATION

1.3.1 The Telescope at Jodrell Bank is a Grade 1 Listed (List Entry Number 1221685) and the Listed Building Entry is presented below (*Historic England* - The List www.list.historicengland.org.uk):

> **JODRELL BANK TELESCOPE LISTED BUILDING ENTRY**
>
> This building is listed under the Planning (Listed Buildings and Conservation Areas) Act 1990 as amended for its special architectural or historic interest.
>
> Name: SIR BERNARD LOVELL TELESCOPE, JODRELL BANK LABORATORY
>
> List entry Number: 1221685
>
> Location
>
> SIR BERNARD LOVELL TELESCOPE, JODRELL BANK LABORATORY, A 535
>
> Grade: I
>
> Date first listed: 13-Jul-1988
>
> Asset Groupings
>
> This list entry does not comprise part of an Asset Grouping. Asset Groupings are not part of the official record but are added later for information.
>
> Radio Telescope. Built 1952-57. Designed by engineers Husband and Company of Sheffield to the requirements of Sir Bernard Lovell. Bowl of welded sheet steel, carried on a space frame of structural steel. Paraboloid bowl or 250 feet in diameter, with supporting lattice triangles to left and right or 180 feet high, braced to form a yoke under the bowl. and mounted on a track of 2 concentric rails of an overall diameter of 353 feet. The Sir Bernard Lovell Telescope (formerly known as Mark I) was the largest fully steerable radio telescope in the world of its time.
>
> Listing NGR: SJ7950071099
>
> Selected Sources
>
> Pevsner, N, Hubbard, E, The Buildings of England: Cheshire, (1971), 249
>
> Sivewright, W J, Civil Engineering Heritage, 192-4

1.3.2 The Control Building was not described or referred to within the Listed Building Description. The Jodrell Bank Observatory is also included upon UNESCO's tentative list as a proposed World Heritage Site (Ref 5676).

2. METHODOLOGY

2.1 INTRODUCTION

2.1.1 The work was carried out in accordance with the relevant Chartered Institute for Archaeologists (CIfA) and Historic England guidelines (CIfA 2014a, *Standard and Guidance for the archaeological investigation and recording of standing structures;* CIfA 2014b, *Code of Conduct*; CIfA 2014c, *Standard and Guidance for Archaeological Desk-based Assessments*; English Heritage 2006a, *Management of Research Projects in the Historic Environment* (MoRPHE), and English Heritage 2006b, *Understanding Historic Buildings, A guide to good Recording Practice*) and generally accepted best practice.

2.2 DESK-BASED ASSESSMENT

2.2.1 ***Policy and Guidance:*** current policy and guidance relating to proposed development and the historic environment (National Policy Planning Framework (NPPF), DCLG 2012) refers to sites of archaeological or cultural heritage significance as 'heritage assets' (*ibid*). These are viewed as being an '*irreplaceable resource*', and their conservation can bring '*wider social, cultural, economic and environmental benefits...*' (*op cit*, Section 12.126). The policy framework states that the '*significance of any heritage assets affected, including any contribution made by their setting*' should be understood in order to assess the potential impact of a proposed development (*op cit*, Section 12.128), and in line with this a '*desk-based assessment and, where necessary, a field evaluation*' should be undertaken to inform the planning process (*ibid*).

2.2.2 The aim of the desk-based research is not only to give consideration to the heritage assets in and around the site, but also to put the site into its historical context. The principal sources of information consulted were historical and modern maps of the study area, although published and unpublished secondary sources were also reviewed. The results of the assessment were analysed using the set of criteria used to assess the national importance of an ancient monument (DCMS 2010). The sources consulted include:

2.2.3 ***Cheshire HER:*** maintains the Historic Environment Record (HER), which is a Geographical Information System (GIS) and linked database of records relating to known heritage assets. It is supported by an extensive archive, including reports, site records and publications;

2.2.4 ***Documentary and Cartographic Sources:*** the catalogues of the Cheshire Record Office and the online sources accessible from Manchester University were consulted for information relating to the study area. There is a considerable archive associated with the Jodrell Bank works, now held at The University of Manchester Library (referenced under GB 133 JBA with approximately 1980 items dated to *c* 1924-1993 but these are not yet fully catalogued or detailed). This Archive was not examined for the purposes of this desk-based assessment.

2.2.5 Historic mapping was examined, and copies of historic photographs and building drawings were very kindly made accessible by The University of Manchester. Some of these were in the Blue Book, a memorandum compiled in 1951. Aerial

photographs held by the Historic England Archive were also consulted. In addition, a number of secondary sources by Bernard Lovell were consulted.

2.2.6 ***Oxford Archaeology North:*** OA North has an extensive archive of secondary sources relevant to the study area, as well as numerous unpublished client reports on work carried out, both as OA North and in its former guise of Lancaster University Archaeological Unit (LUAU). These were consulted where necessary.

2.3 BUILDING SURVEY

2.3.1 A building survey and assessment was carried out on the Control Building in order to record the structure and to relate the results of the desk-based research to the existing structure. The investigation entailed the compilation of a descriptive record, the production of site drawings, and the generation of a photographic record. One of the main aims of the survey was to assess the impact of the RIBA Stage 2 Concept Design upon the existing historic fabric.

2.3.2 ***Descriptive Record***: written records to English Heritage Level 2 (2006b), using OA North *pro-forma* record sheets were made of the principal internal and external building elements, as well as any features of historical or architectural significance.

2.3.3 ***Site Drawings:*** existing plans of the buildings supplied by the client were used as the basis for the drawn record and were manually annotated on site to show the form and location of all structural features of historic significance (Figs 2-5). The final drawings were created within an industry-standard CAD package (Autocad 2004), before being incorporated in to the report.

2.3.4 ***Photographic Record:*** a 14-megapixel Canon digital SLR camera with a selection of lenses was used to capture images for the photographic record. The images were captured in both .jpeg and .cr2 (Canon raw file format) and data are stored on two separate servers, each on different sites and with appropriate back-up and disaster plans in place. In addition, hard copies of the images printed on paper of appropriate archival quality were produced. The locations of all of the photographs included in the report are included on the plan (Figs 2-5) was created.

2.4 ARCHIVE

2.4.1 The Arts and Humanities Data Service (AHDS) online database *Online Access to the Index of Archaeological Investigations* (OASIS) will be completed as part of the archiving phase of the project. A copy of this report will also be deposited with the Cheshire HER for reference purposes and a copy will be deposited with the Cheshire Record Office.

3. HISTORIC BACKGROUND

3.1 EARLY YEARS

3.1.1 The genesis of the Jodrell Bank Radio Telescope Observatory can be traced back to the development of radar technology during the Second World War when it was noted by Professor Bernard Lovell, that radar operators were screening out unidentified radio transmissions, which they knew not to be aircraft (Lovell 1968). Lovell hypothesised that these transmissions might be cosmic ray particles passing through the atmosphere and at the end of the war he was able to use his military contacts to acquire surplus radar equipment with which to investigate his theory (*ibid*). With the permission of The University of Manchester, he set up at Jodrell Bank in 1945 on land at the time occupied by the botany department. The original timber huts still exist to the south of the present telescope (Plates 3 and 4).

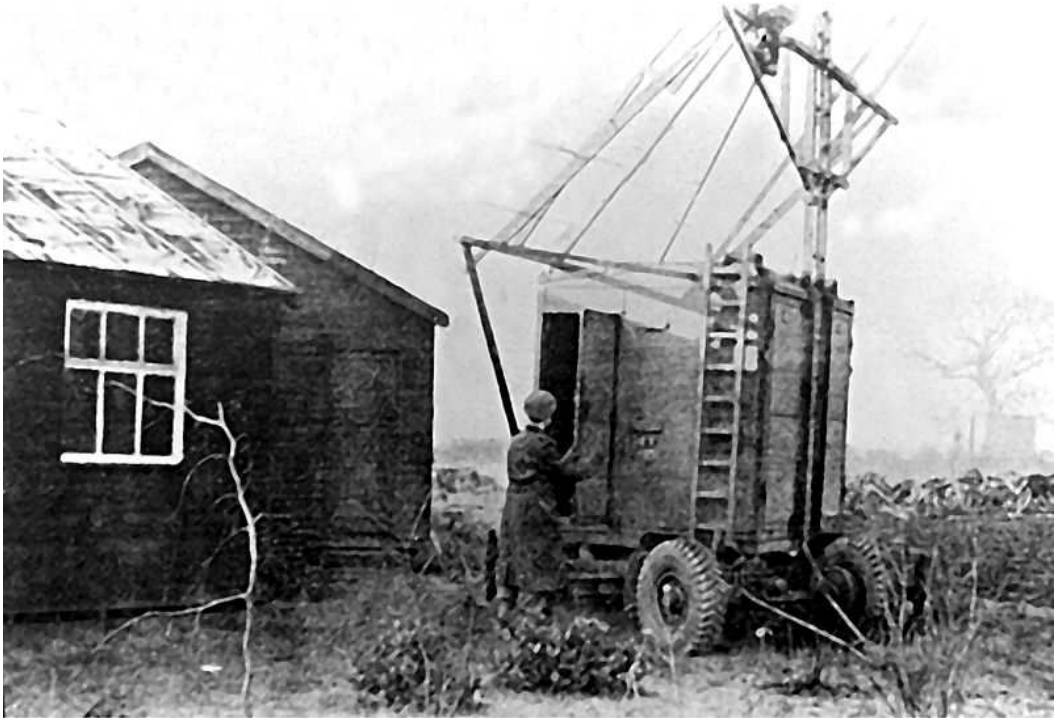


Plate 3: Jodrell Bank Hut in 1945 (University of Manchester)

Plate 4: Jodrell Bank Hut present day (University of Manchester)

3.1.2 Although his original hypothesis proved unfounded, the equipment was able to detect meteor trails and led to important research regarding the dust trails of comets (Lovell 1968). The success of this work prompted the construction of the 218-ft parabolic reflecting aerial in 1947 at what had now become the Jodrell Bank Experiment Station (*ibid*). At the time, this aerial, constructed of wire mesh suspended upon poles above the ground, was the largest radio telescope in the world and was responsible for receiving the first radio signals ever detected from outside our own galaxy (www.jb.man.ac.uk).

3.1.3 The 1954 Ordnance Survey map (Plate 5) shows the site of the experimental station with two long narrow rectangular buildings aligned north/south on the eastern side of a perimeter track. Three smaller buildings lay to the south, with another in the south-eastern corner of the site. An undated, but probably broadly contemporary aerial photograph shows the same basic arrangement but includes two additional square buildings along the northern edge of the field and two more along the western boundary (Plate 6). The 218-ft telescope can clearly be identified in the south-eastern corner of the site, with the small square building in the south-eastern corner of the field housing its diesel generator. A further two astronomical receptors maybe identified towards the centre of the site.

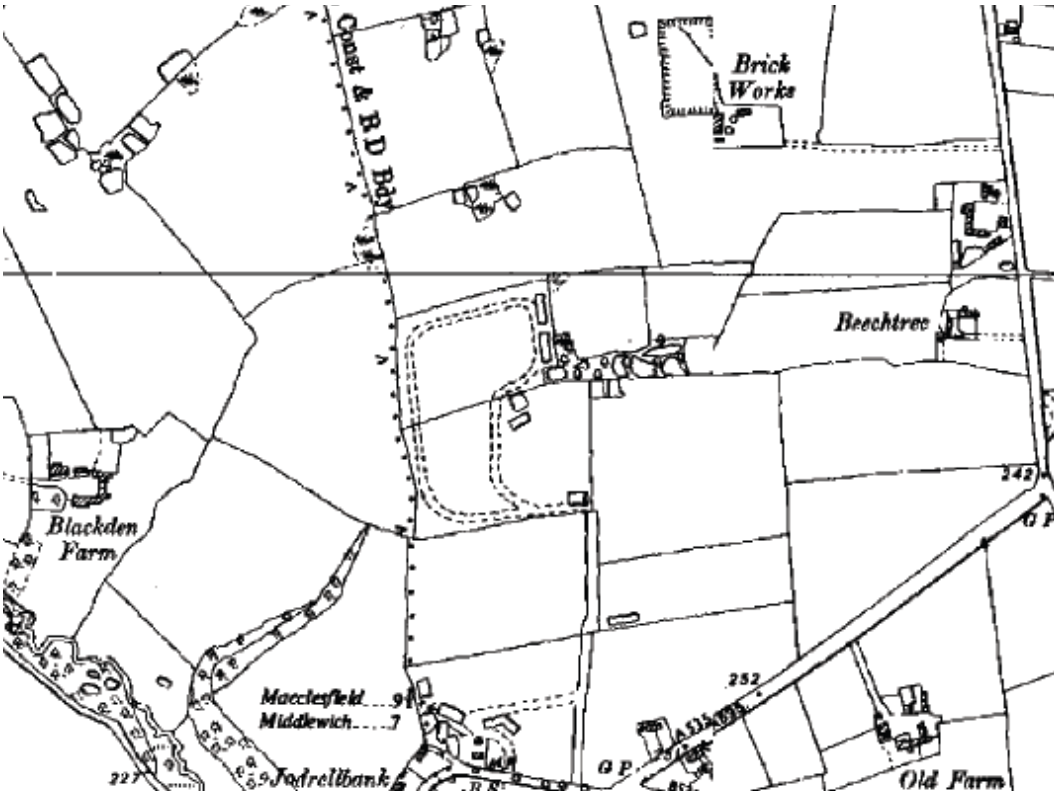


Plate 5: Extract from OS map 1:10,560 1954

Plate 6: Undated (post 1947) aerial photograph (University of Manchester) (www.jb.man.ac.uk)

3.2 THE MARK I TELESCOPE

3.2.1 Despite its success, the 218-ft telescope was restricted in what signals it could receive, being relatively immobile. The solution was to build a fully rotatable telescope capable of observing the entire visible sky. Between 1952-57 the Mark I Radio Telescope was planned and constructed (<www.jb.man.ac.uk>). An original plan shows the proposed site of the telescope further to the north on land presently occupied by the visitors centre; in the final design the location was changed to the field just to the north-west of the original experimental station (Plate 7).

3.2.2 Charles Husband and Co were commissioned as engineers and architects to design the telescope and Control Building. The construction of the building was carried out by Z and W Wade (of Whalley Bridge) Ltd. The Control Building was sited to the south-east of the telescope and housed laboratories, the main entrance foyer, a lecture room and offices (Lovell 1987, 61). At its centre lay the Control Room, from where the movement, angles and observations of the telescope could be managed. An artist's concept drawing shows an early design for the telescope, with the Control Building in the foreground (Plate 8).

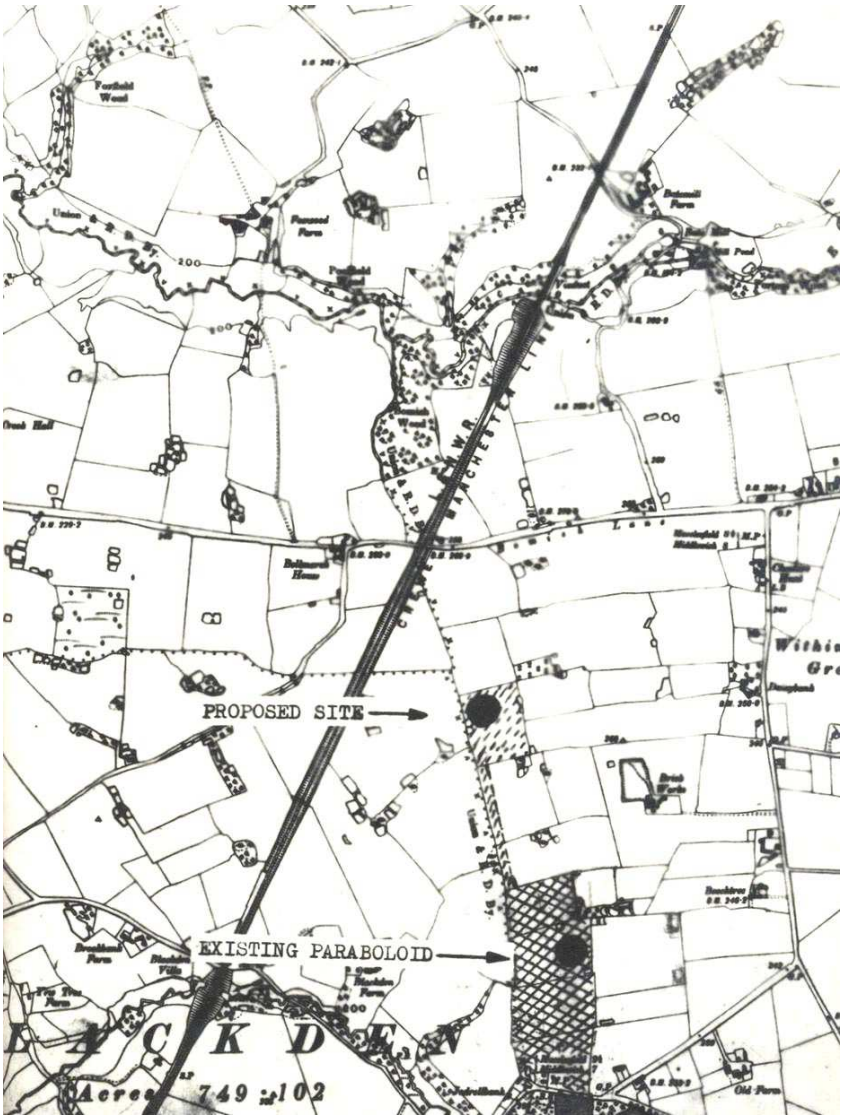


Plate 7: Location map of the early 1950s (University of Manchester) (*Location Map* Blue Book 086, Jodrell Bank, pers.comm, 2015)

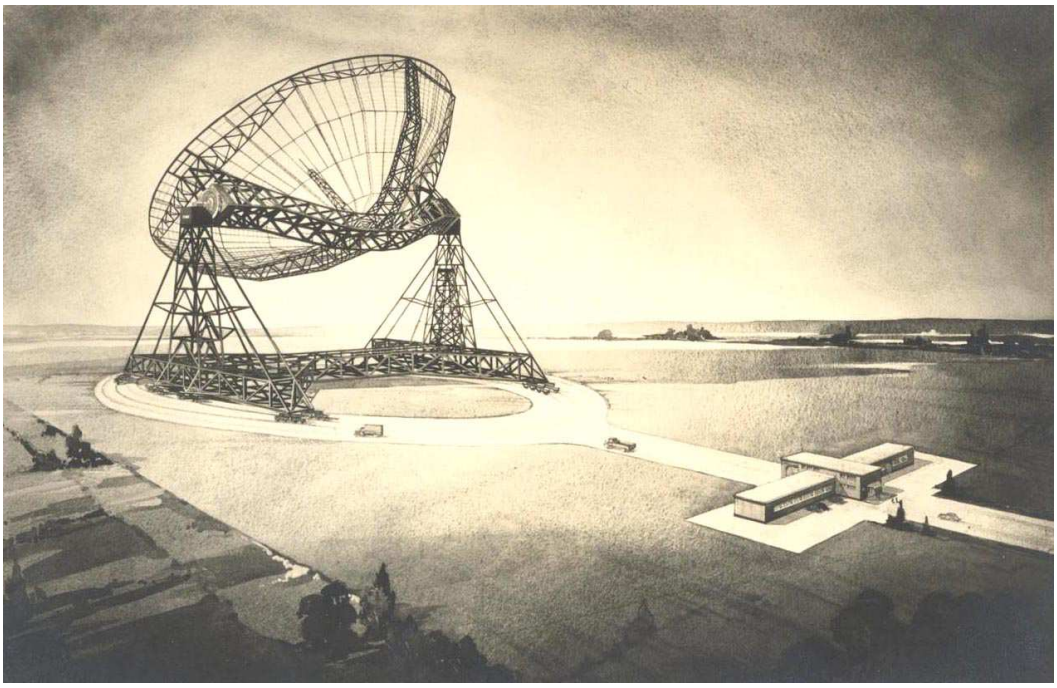


Plate 8: Drawing of the envisaged Telescope and Control Building (University of Manchester)

3.2.3 The original architectural drawings for the Control Building from 1952 show the plans and elevations of the building in great detail, with only minor changes in the final design (Plate 9). It depicts a central two-storey structure with large observation windows to the west above a basement. Single-storey elongated wings project to both the north and the south. In the final construction, the stairs in the lobby were switched from the north-eastern corner to the south-western corner, the tea-room was also relocated and the locations of the male and female toilets were swapped. The building can seen nearing completion in a photograph taken from the telescope in 1958 and shortly after completion in about 1959 (Plates 10 and 11).

3.2.4 The Control Building was completed in August 1955 and the Control Console was installed in April 1957 just days before the telescope became operational (Lovell 1987, 64-5) (Plate 12). Amid a financial crisis, the telescope proved its worth in October of that year when it was the only telescope in the world that was able to detect the booster rocket of the Sputnik I satellite (Lovell, 1987, 86); thus it was completed just in time to witness the birth of the space age. The telescope went on to track numerous further space missions from both the US and Soviet Union throughout the 1960s. Lord Nuffield made a substantial donation to the observatory in 1960, which secured its future and lead to its being renamed as the Nuffield Radio Astronomy Laboratories (www.jb.man.ac.uk).

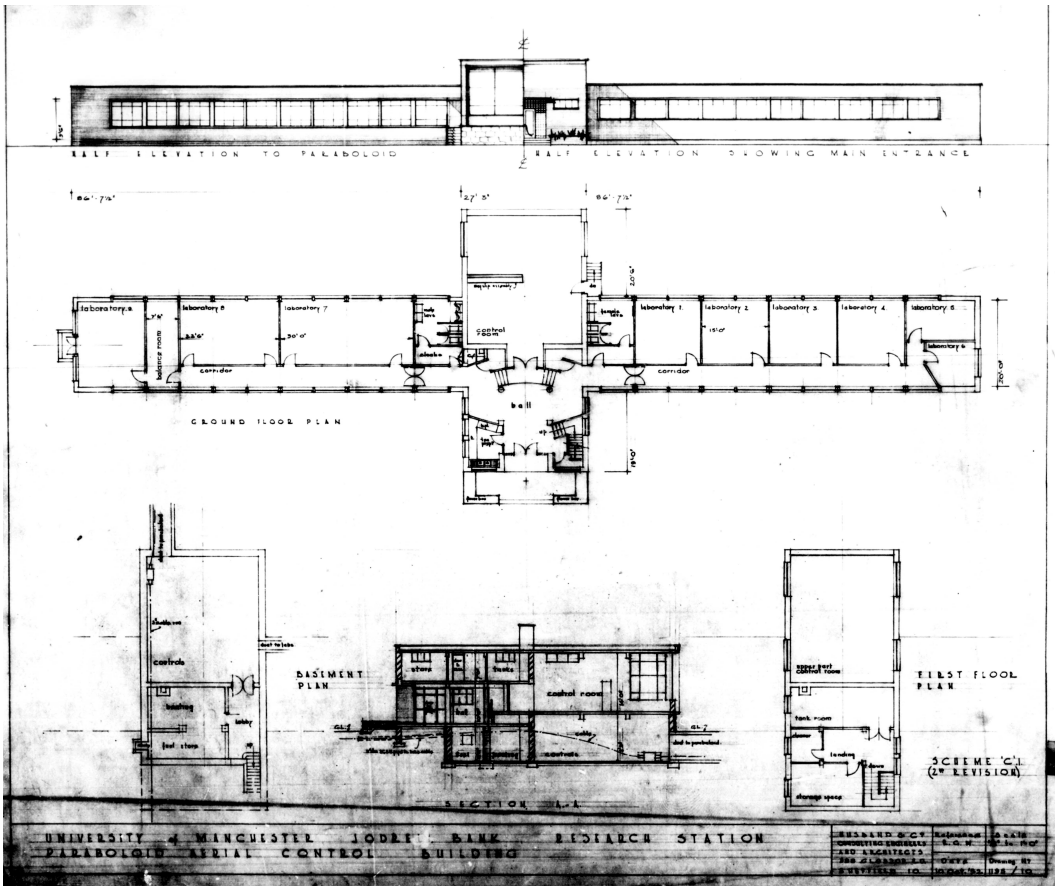


Plate 9: Architectural Drawing for Control Building dated 1952 (University of Manchester)

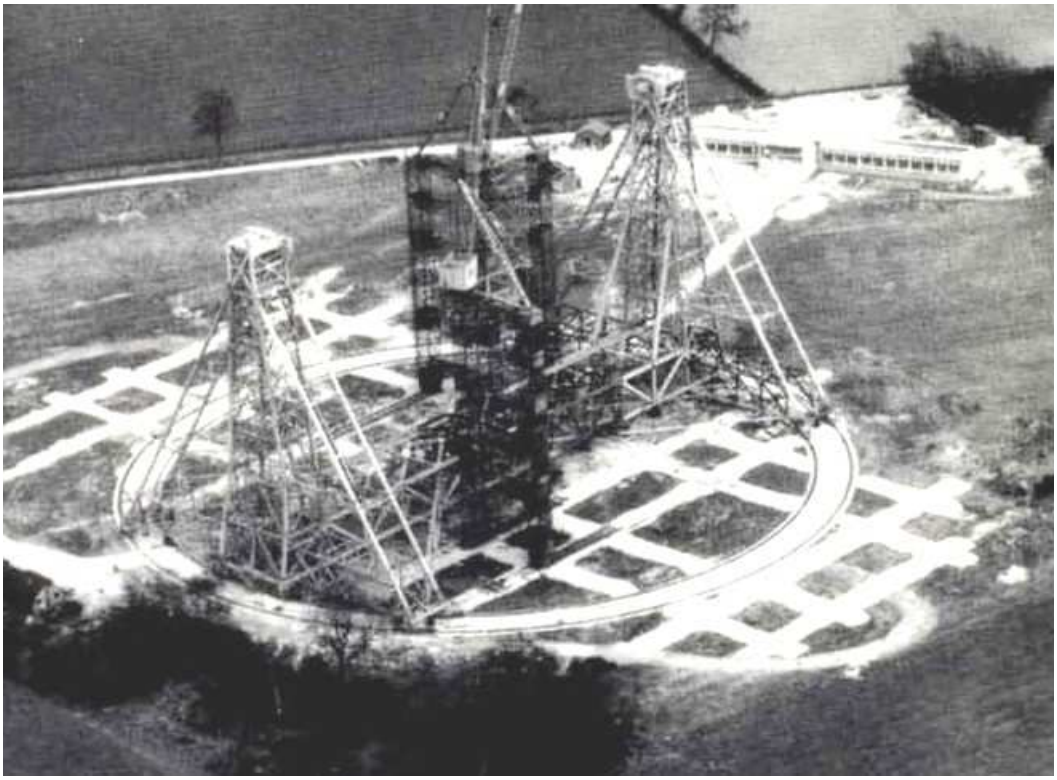


Plate10: Construction of the Telescope, with the completed shell of the Control Building behind, April 1958 (The Story of Jodrell Bank, Lovell)

Plate11: Photograph taken from Mark I Telescope *c* 1960 (Wayne Young/University of Manchester)

Plate 12: The Control Room showing the original layout in *c* 1960s (www.jodrellbank.manchester.ac.uk/history/mk1.html)

3.3 DEVELOPMENT OF THE BUILDINGS

3.3.1 Very quickly, new adaptations were made to the ground floor structure to the west of the Control Building, with the installation of a half basement. An aerial photograph, reportedly dating to 1959, shows that the grounds in front of the Control Building had been disturbed, presumably indicating the early stages of construction of this building (Plate 13). It also shows a large detached shed to the north of the Control Building, with a smaller shed attached to the northern gable elevation.

3.3.2 Two photographs taken shortly after (Plate 14 and 15) shows this building completed and a new building on the eastern side of the southern wing part-way through construction. This second extension had apparently been completed in 1960 when it is seen in a photograph of the front entrance and it is clear that a deliberate attempt has been made to retain the original architectural form of the eastern elevation (Plate 16).

3.3.3 It was evident that more accommodation was necessary, however, as an aerial photograph of 1966 (OS/66106/917, 1966 (no permission to reproduce) shows the addition of four (seemingly temporary and pre-fabricated) rectangular buildings, a little to the north-west of the northern arm of the Control Building and in alignment with the access road.

Plate 13: Aerial photograph facing south, dated to 1959, RAF/58/3089/F21/0467 1959

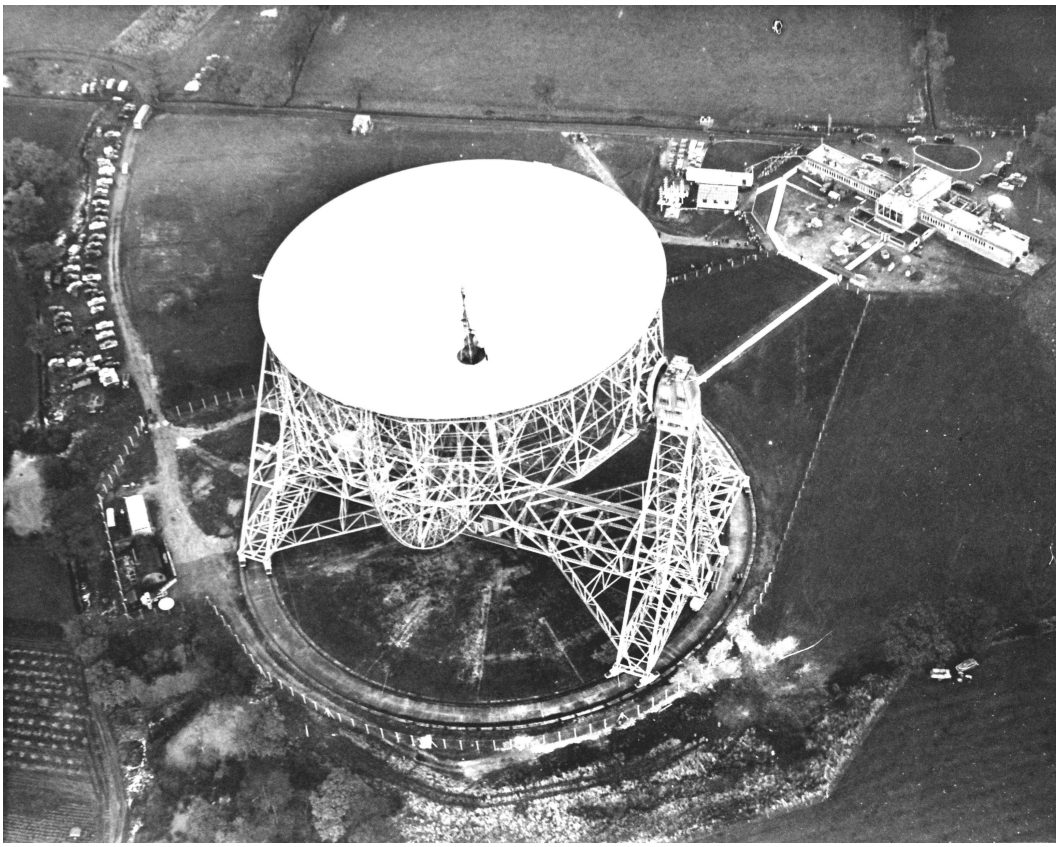


Plate 14: Aerial view of the Lovell Telescope taken *c* 1959 (University of Manchester)

Plate 15: Photo from North *c* 1961 (Wayne Young/University of Manchester)

Plate 16: Photograph of the Front Entrance *c* 1960 (Wayne Young/University of Manchester)

3.3.4 These buildings were flat roofed and of slightly differing heights, and were close to an area of hard-standing visible to the south-west (this is more easily observable in an aerial photograph of 1971 (MAL/71091/139, 1971), no permission to reproduce). They were joined to the northern wing of the Control Building by a link at their southern end to form an angled footprint.

3.3.5 Surviving architectural plans demonstrate that a first floor had been added to the northern end of the southern wing by 1967 (Plate 17) and further additions had been made to the east of this wing by 1969-70 (Plate 18), together with two small extensions at the southern end. The telescope was upgraded in 1970-71 and two photographs taken at this time show the extension of the northern wing to its east (Plates 19 and 20). As with the extensions to the southern wing, efforts had been made to retain the architectural form of the original eastern elevation. Both photographs show the 49-ft telescope, prior to its removal and replacement in 1984 with the 42ft telescope. It is unclear as to whether the 42-ft telescope was mounted upon a pre-existing building or a new structure was built especially for the purpose, but the OS map of 1972 shows a building of similar dimension to the present one (Plate 21).

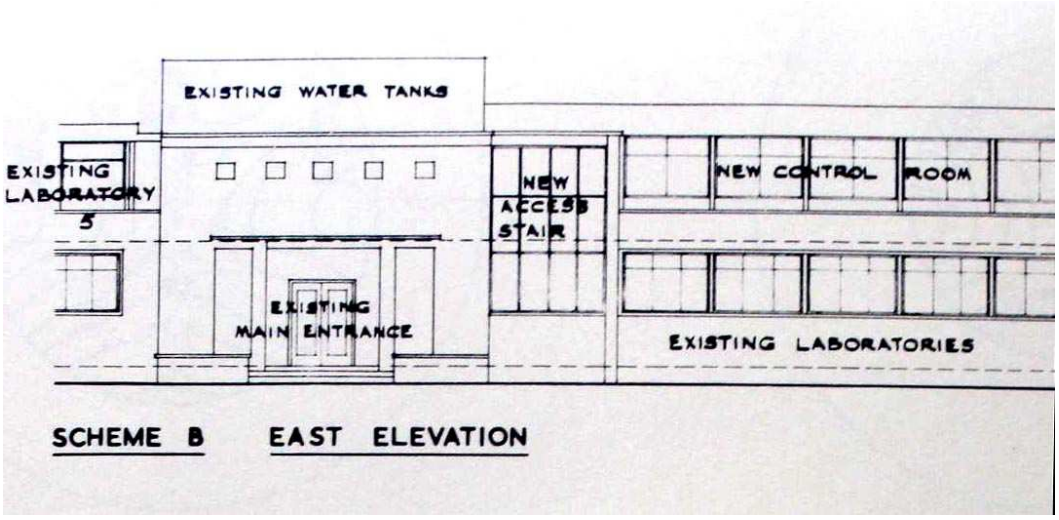


Plate 17: Architectural proposal for a first-floor extension to the northern wing which was never carried out. Note the 'existing laboratory' above the southern wing (Jodrell Bank Archives)

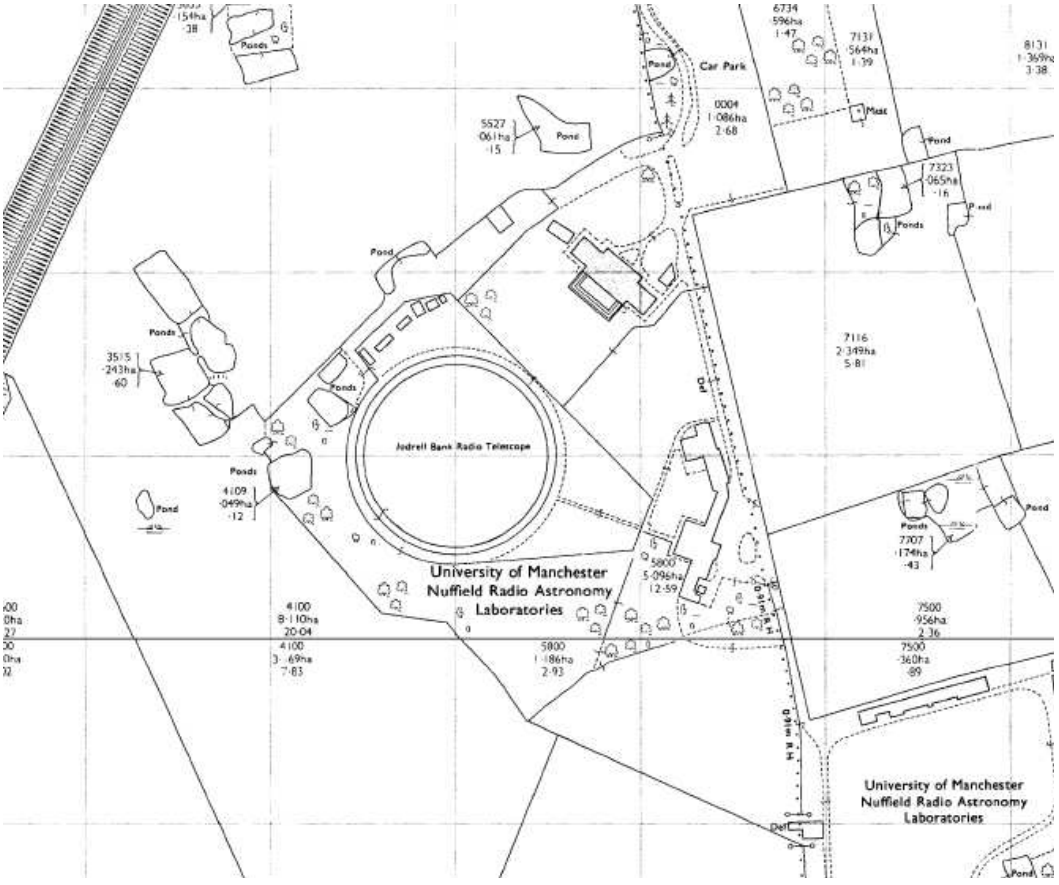


Plate 18: Extract from the OS 1:2,500 map of 1969-70

Plate 19: Photograph from *c* 1970-1 of the upgrading of the telescope. Note the Control Building in the foreground (University of Manchester)

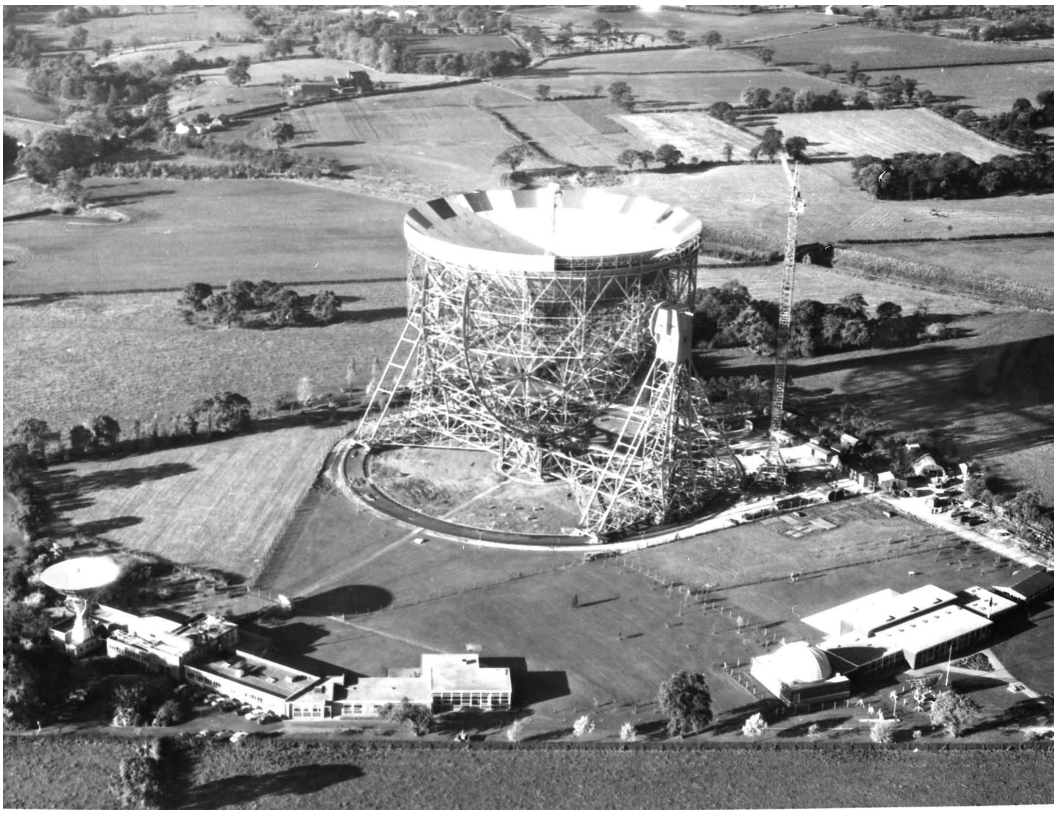


Plate 20: Aerial photograph from *c* 1970-71 of the upgrading of the telescope. Note the Control Building in the foreground (University of Manchester)

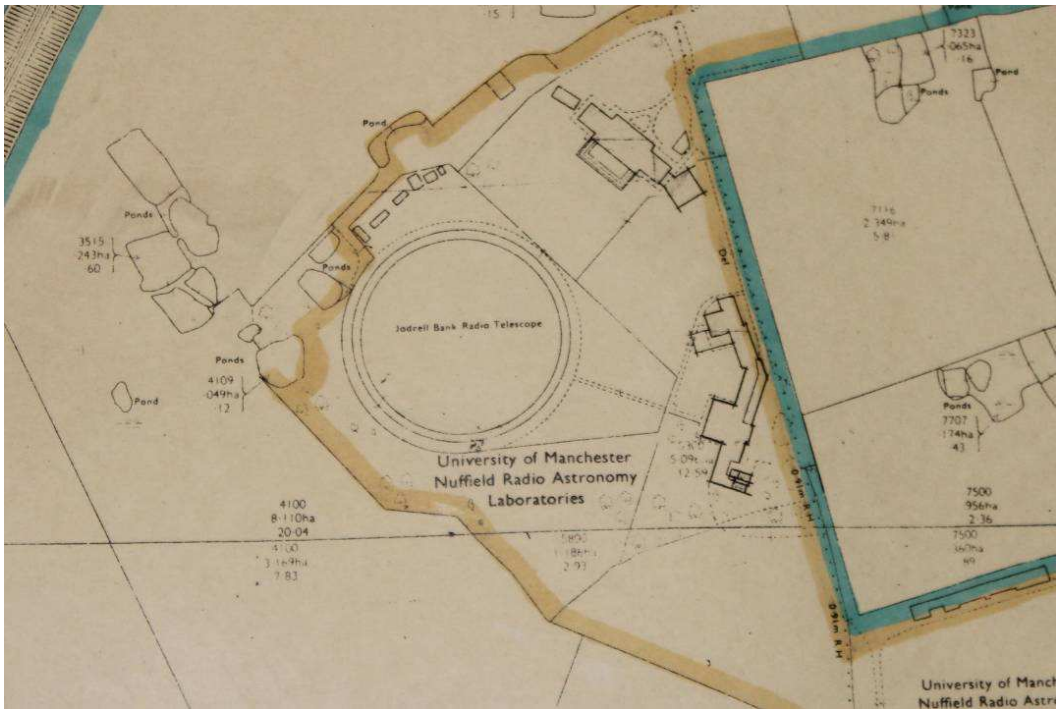


Plate 21: Ordnance Survey map of 1972, 1:2500

3.3.6 An aerial photograph of 1989 (OS/89230/015 1989, no permission to reproduce), shows that at some point between 1972 and 1989, one of the single-storey extensions to the north had been demolished and was replaced with a slightly larger building. A new east/west aligned single-storey building had also been added to the west of these buildings. The final extension occurred between 1989 and 2003, when a small single-storey structure was erected in the north-western angle between the northern wing and the central Control Building (Plate 22).

3.4 VISITORS TO JODRELL BANK

3.4.1 Public engagement has been a key part of the Observatories plans from the start and a separate building for visitors to view models and displays, as well as the telescope, was constructed in 1966. This building was known as the Concourse Building (Lovell 1987, 178) and lay to the north-west of the Control Building. By 1971, the Concourse Building had been considerably enlarged to form the Visitor's Centre (Lovell 1973, 225). It was demolished in 2003 leaving just part of the building supplemented by a large marquee (*ibid*) until the new Space Pavilion was opened in 2011 as part of the modern Jodrell Bank Discovery Centre (www.jb.man.ac.uk) (Plate 23). The Space Pavilion has been built on a new site between the old visitor centre and the northern pre-fabricated extensions of the Control Building.

Plate 22: Aerial Photograph showing the original visitors centre prior to demolition. The small extension to the west of the angle northern wing can just be seen (Google Earth Image 2003)

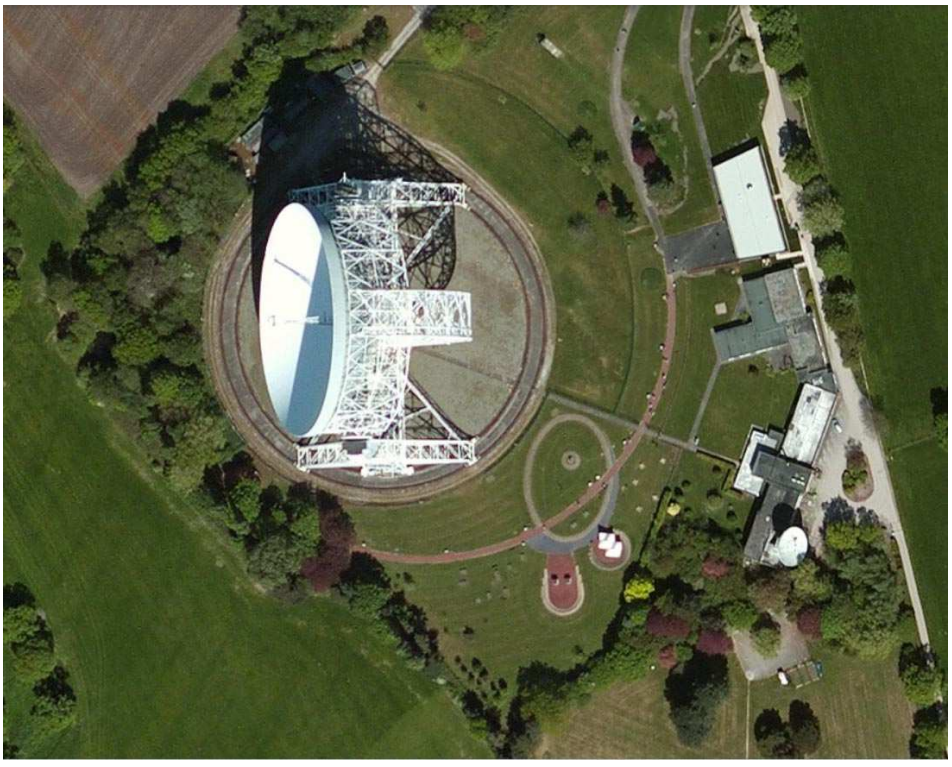


Plate 23: Aerial Photograph taken after the new Discovery Centre had been built *c* 2011 (British Geological Survey)

4. BUILDING SURVEY

4.1 OVERVIEW

4.1.1 There are a total of 16 buildings (Buildings A – Q) within the complex, at the centre of which lies the original Control Building which is situated approximately 80m to the south-east of the Lovell Telescope, and within these buildings there is a total of 66 individual rooms. It consists of a two-storey observation building (Building A) with two single-storey elongated wings (Buildings B and C) (Figs 2-3 Plate 24). Its north-east/south-west alignment was designed to allow observation of the telescope in its entirety from the central observation room. The main entrance lies on the opposite side where it faces the primary access road and car park. The core of the building has been extended several times with Buildings D and I added to the west; E, F and H to the east of Building B and Building G added to the east of Building C. First floor extensions (Buildings O and P) have been constructed above Building B and F and a range of additional structures have been appended to the north of Building C in several stages (Buildings J, K, L, M, N and Q) (Figs 2-4).

4.1.2 Although parts of the building are not presently in use, the majority is still occupied by technicians and scientists with a considerable amount of equipment and documentation stored in most rooms. Access was generally good, however, with the majority of rooms available for inspection. The only room not available for access was the Merlin Observation Room 23B in Building C, which needed to maintain a constant controlled climate and could not be accessed. The interior of all the buildings had been decorated with modern finishes throughout, leaving only occasional features of historic note.

Plate 24: Aerial view of the Control Buildings, facing east

4.2 BUILDING A (Figs 2-4)

4.2.1 ***External:*** Building A is constructed from textured red brick laid in a Flemish bond with a flat roof of reinforced concrete behind a low brick parapet topped by a course of concrete coping stones. Where visible, the fenestration comprises steel-framed 'Crittal'-style windows with textured concrete or cream coloured stone surrounds.

4.2.2 The principal elevation of Building A incorporates a set of glazed doors with timber frames and brass pull handles, recessed back from the centre within a covered entrance porch (Plate 25). The doors are framed within a wall of square glass blocks and the north and south walls of the porch each have a small rectangular opening in the upper half with brick surrounds. A wide flat concrete awning projected out from the wall above the centre of the elevation to form a cover for the entrance and a set of steps led down to the car park to the east, flanked by raised brick flower beds with an access ramp (Plates 25 and 26). Across the top of the wall beneath the parapet are five small square blind panels with two more large vertical blind panels either side of the double doors. A tubular metal guard-rail is present at the head of the wall.

4.2.3 At ground-floor level, the west elevation is part-obscured by the single storey Building D; however, the elevation is visible above first floor height and comprises a bank of four large vertical observation windows (Plate 27). Each window is set within a thin profile, fixed steel, frame and recessed back from the face of the wall by approximately 0.3m.

4.2.4 Only the upper floor of the north elevation is visible, the remainder being hidden by Buildings C, G and D. It has a 12 light window at the west end, incorporating two large square central pivoting lights (Plate 27). At the centre of the elevation, a three-light window contains double-glazed uPVC units (Plate 28). A pair of two-light windows are situated at the east end of the elevation, the west light of each containing a central pivoting light. A doorway, with brick jambs and a concrete lintel, lies to the west of these windows, providing access to the roof over Buildings C and G. A second doorway of similar design, between this and the three-light window to the west, is blocked with brick but a concrete sill demonstrates that it had first been converted into a window, before being blocked.

4.2.5 Only the western end and extreme eastern end of the south elevation of Building A is visible externally, the remainder being enclosed by the first floor extension above the northern end of the south wing (Building O). The only visible opening is a large 12-light window at the west end, which mirrors that on the principal elevation, the only difference being that two of the lights at the western end have been replaced with a glazed door to provide access to the roof of Building D from the control room.

Plate 25: Main entrance, Building A with Building G to right of frame

Plate 26: Main entrance, Building A

Plate 27: West elevation of Building A, facing south-east towards the Lovell Telescope

Plate 28: First-floor north elevation of Building A

4.2.6 ***Interior - Lobby:*** entering Building A from the main entrance leads into a central lobby area with a raised platform at the opposite side accessed by two short flights of marble steps (Plate 29, Fig 2). Square-section iron railings, topped by a wooden hand-rail, front the platform and steps, with a brass plaque mounted at the centre

recording the names of the organisations involved in the buildings erection (Plate 30). A wooden bench with backrest is situated beneath the plaque, and is flanked by round-section structural columns. At the rear of the raised platform a low stud partition is surmounted by three large, raking, rectangular timber-framed windows providing a view into the observation room. Three vertical straight joints near the centre of the low partition wall may indicate the former position of a double width doorway. A pair of flanking walls define two, small, irregular spaces to the north and south of the observation windows one of which, contains a small dial-operated safe (Plate 31). The remnants of one of the telescope's original indicator racks has been preserved, minus its mounting case, and is situated in one corner of the platform (Plate 32).

4.2.7 In the north-eastern corner of the lobby, is a small room occupied by a modern disabled toilet, with a cast-iron column radiator that is similar to others elsewhere in the building. In the south-east corner of the room a staircase with quarter and half turns allows access to the first floor (Plate 33). The stairs are finished with marble fascias, with square-section baluster bars topped by a curving timber hand-rail, and are of the same appearance as those serving the raised platform. The south wall of the lobby contains a central doorway with another, larger, double doorway at the west end through which, access to Building B is available (Fig 2). At the eastern end of this wall, a large square niche faces onto the staircase landing, perhaps indicating the former position of a now blocked window (Plate 33). The northern wall contains a set of double doors leading into Building C (Fig 2). A doorway in the east side leads down to the basement beneath. An original brass light switch was fitted to the wall to the north of this door (Plate 34).

4.2.8 ***Lovell Telescope Control Room***: the Control Room was a large open rectangular room to the west of the lobby, which formerly would have been accessed from the lobby directly but was now entered from a doorway near the centre of the northern wall (Fig 2). The room is focussed upon the commanding views of the Lovell Telescope offered through the four vertical lights on the western wall and the principal feature of historic interest is the original control desk at the centre of the room from which the telescope was originally operated (Plate 35). The control desk was enamelled in grey and constructed of steel panels, forming a seven-sided horseshoe around a central operator's chair (Plate 36).

4.2.9 The majority of the remaining fixtures and fittings were of modern date but some of the furniture may have been contemporary with the original building. A free standing optical telescope lies in the south-western corner of the room, which from its serial number can be dated to 1914 and a pair of tripod mounted German Second World War anti aircraft binoculars were noted next to the observation window (Plates 37). In the south-western corner of the room is a set of timber steps, which led onto the flat roof of Building D, via the glazed door in the 12 light window on the southern wall.

4.2.10 The eastern half of the ceiling has been lowered with the installation of a false ceiling, which then sloped upward towards the observation windows and was intended to maximise light and views. Three ceiling-mounted glass oval light shades lit the space in front of the observation windows and the room was heated by what may have been the original cast iron column radiators, which were affixed to the western and northern walls.

Plate 29: Platform at western end of entrance lobby, facing north-west

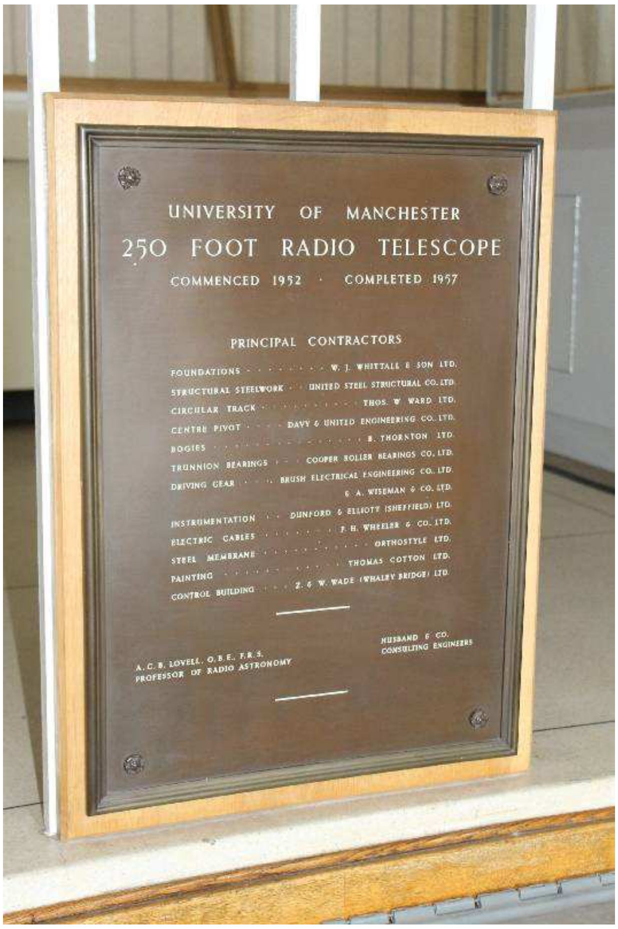


Plate 30: Brass plaque in lobby

Plate 31: Dial-operated safe to south of observation window in lobby

Plate 32: Remnants of an original telescope indicator rack

Plate 33: Staircase to first floor in south eastern corner of lobby

Plate 34: Original brass plate light switch

Plate 35: Lovell Telescope Control Room, facing west. Note the timber steps to the left of frame

Plate 36: Original seven-sided control desk, facing north-east

Plate 37: German WWII anti-aircraft binoculars, used to inspect the telescope

4.2.11 ***First Floor:*** the stairs in the south-eastern corner of the lobby led up to a landing with a small square cell beyond, from which access was available to an office to the north (Room 52, Fig 3), with a partitioned-off water tank in the north-eastern corner. To the west lay a rectangular room, with roof access to the north, which had been incorporated into a larger technicians lab and office to the south (Room 51) and partly within Building O. Neither the office or lab had any features of historic note, except for a bank of blocked internal windows along the western wall of the lab, which must have once looked down onto the observation room on the ground floor (Plate 38). The windows had timber surrounds stained a natural antique pine colour; consistent with the stain used on the surviving original features in the lobby.

4.2.12 ***Basement:*** the basement was accessed via a doorway in the south-eastern corner of the lobby, which led down a flight of concrete steps to a narrow east/west aligned corridor (Fig 5). To the north of the corridor lay the boiler room, a large square room with brick walls coated in thick grey paint. The room housed the services for the Control Building and, with the exception of several mid-twentieth century enamelled electrical boxes, offered little of historic interest (Plate 39). A doorway at the western end of the narrow corridor led into a second basement area - for the Electric Switch Gear.

4.2.13 This room was larger than the Boiler Room, but again had plain brick walls coated in white paint and contained modern server banks and early switch boxes concerned with the operation of the radio telescope (Plate 40). A concrete tunnel

led from the southern end of the western wall to the base of the telescope, some 125m to the west, carrying with it electrical cabling in ducts along both walls (Plate 41). At approximately the mid point a steel ladder, within a recess to the south, gave access to the exterior via a hatch. The tunnel was illuminated by electrical lighting at regular intervals but was supplemented by occasional panels of six pairs of glass blocks set into the ceiling above. At the far end of the tunnel lay a circular room around a central circular core, which denoted the base of the telescope. A doorway in its northern side led up a flight of steps to the ground surface below the telescope.

Plate 38: Laboratory on the first floor of Building A (Room 51) looking north. Note the blocked observation windows on the western wall to the left of frame

Plate 39: Enamelled electrical boxes on south-eastern wall of the eastern Boiler Room

Plate 40: Electrical Switch Gear in western basement room

Plate 41: Tunnel to the base of the Lovell Telescope

4.3 BUILDING B

4.3.1 ***Exterior:*** Building B is a single storey elongated rectangular structure which projects south from the southern elevation of Building A (Figs 2-4). Buildings F and E have been appended to its eastern elevation and Buildings O and P have been constructed upon its flat concrete roof. It was built in textured red brick using courses laid in stretcher bond.

4.3.2 The later addition of Buildings E and F have obscured nearly all of the original eastern elevation of the Building B, leaving just a short section of two bays exposed towards the southern end. Both bays were fitted with three steel-framed windows with a fixed light to the centre and a casement on either side (Plate 42). All three windows had over-lights above but only that above the central window opened as a ventilator. The openings were fitted with sandstone or textured concrete surrounds of identical form to those used on Building A.

4.3.3 Most of the original western elevation is still exposed, revealing the same triple window design across a continuous bank of eleven equal bays; however, here the windows incorporate a second transom near the bottom, creating a third light at the base of each window (Plate 43). The northern two bays were partially hidden behind Building D, although their original over-lights could still be identified above the flat roof of the extension (Plate 44). The addition of Building P above the seven

southern bays has necessitated the removal of the buildings original brick parapet, but it has survived complete to the north

4.3.4 The southern elevation had a centrally placed set of French windows with a two-light window to the east and west, all employing steel frames (Plate 45). Although the lintels of both windows were located at approximately mid height, the outer jambs of both windows continued unbroken to the ground, framing a plain brick panel beneath the window and either side of the doors. A set of two concrete steps lay immediately in front of the doors. At the eastern end, the southern elevation of Building B was abutted by Building E, with Building P having been erected over the southern end of the building and Building O over the northern end.

Plate 42: Remaining two exposed bays on the eastern elevation of Building B

Plate 43: Western elevation of Building B, with Building P above, facing south-east

Plate 44: Partly obscured over-lights at northern end of western elevation of Building B, with Building O above

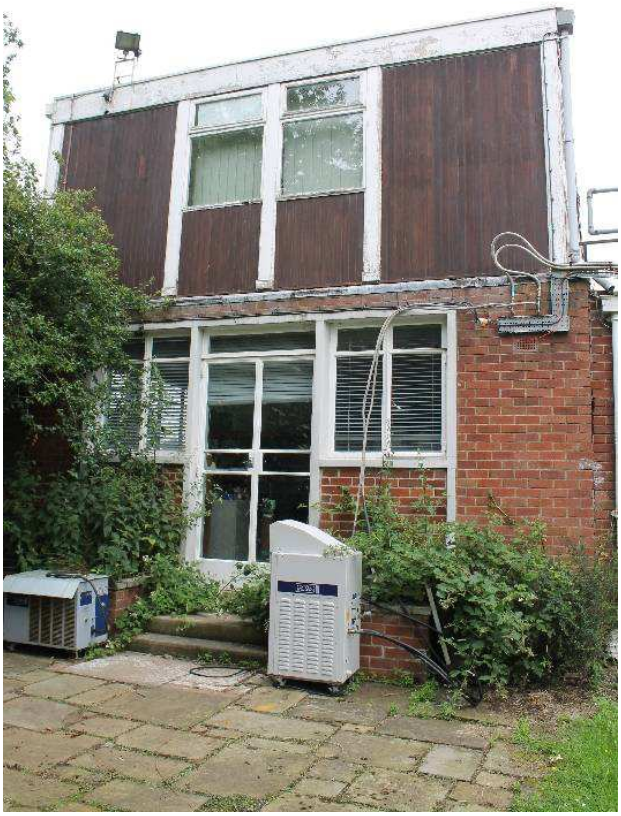


Plate 45: Southern elevation of Building B, with building P above

4.3.5 ***Internal Appearance:*** internally, Buildings B, E and F formed a single integrated ground floor space and, as such, are described below under the same heading (Figs 2-3). A lateral corridor ran along the eastern side of Building B giving access to rooms along the western side of the building (Plate 46). These included a toilet (Room 13) at the northern end with two interconnected labs to the south and an office beyond (Rooms 10 and 11) (Plate 47). A much smaller office (Room 6) lay to the south of this with a lab (Room 1) occupying the southern end of the building from which the French doors, described externally, opened. A second corridor then extended to the east giving access to a pair of labs (Rooms 2 and 4) within Building E and a fire escape at the far end (Plate 48). The eastern wall of Building B had been much altered to accommodate the erection of Building F at the northern end and Building E to the south. A stairwell had been added mid-way along the corridor at the southern end of Building F presumably at the same time as the addition of Building P above (Plate 46). These additions had required the blocking of windows in bays 1, 2, 7, 8 and 11, from the south and the complete removal of the original eastern wall in bays 3, 6, 9 and 10. Only bays 4 and 5 retained their original windows towards the southern end of the corridor. Building F was divided into three cells, with the northern cell (Room 9) occupied by reception, the southern cell housing a small library and meeting room (Room 8). The western third of the central cell had been partitioned off and had been incorporated into the central corridor, while the remaining two thirds were being used as a reprographics area (Plate 49). Cast iron panel radiators were used throughout all three buildings (Plate 50).

Plate 46: Corridor along the eastern side of Building B facing north. The later stair block can just been seen to the right of frame

Plate 47: Adjoining laboratories at the northern end of Building B (Rooms 10 and 11), facing south

Plate 48: Laboratory / office (Room 4) in Building E, facing south

Plate 49: Central cell (Room 8) in Building F, facing south

Plate 50: Cast iron panel radiator of the form used through out buildings E, F and G

4.4 BUILDING C

4.4.1 ***External Appearance:*** Building C is a single storey elongated rectangular structure, of identical dimensions and using the same constructional materials as Building B (Figs 2-4). It extended northwards from the centre of Building A's northern elevation and was abutted to the east by Building G, and at the southern end of the western elevation by Buildings D and I. Building L abutted the structure at its northern end.

4.4.2 The eastern elevation of Building C had been completely enclosed by the later erection of Building G, with the original northern elevation similarly enclosed by Building L. The only remaining elevation lay to the west, where, of the original eleven bays, just the northern eight remained unaltered, and these were identical to those described on the same elevation of Building B (Plates 51 and 52). The southern three bays had been enclosed by the erection of Buildings D and I, again leaving just the over-lights exposed above.

Plate 51: Western elevation of Building C, facing south-east

Plate 52: Western elevation of Building C, facing north-east

4.4.3 ***Internal Appearance:*** the addition of Building G to the east of Building C has resulted in the full integration of the buildings and, as such, the two are described below together (Figs 2-3). From the southern entrance at the centre of the northern wall of Building A, a north/south aligned central corridor ran the length of the building providing access to a suite of rooms to the east and west. To the west of the corridor the southern cell was occupied by a male toilet (Room 15), with a short corridor to its north leading west into Building D. North of the short corridor there was a large rectangular lab (Room 19) which incorporated the correlator room (Room 23a) at the northern end into which access was not available (Plate 53). Beyond this lay the Merlin observation room (Room 23b) and a workshop/office room (Room 26) to its north. To the east of the corridor within Building G there was a small office space (Room 20a) at the southern end, with the large Lovell observation room (Room 20b) to the north. A second small office (Room 24) divided the observation room from the kitchen and lunch room (Room 25) at the northern end.

4.4.4 The only features of note were the use of cast iron panel radiators in the majority of the rooms of identical form to those used in Building's B, E and F. The exception was in the kitchen/ lunch room (Room 25) where column radiators had been preferred (Plate 54). Several of the rooms in both Buildings C and G also retained their original wooden parquet flooring.

Plate 53: VBLI observation room (Room 19), facing south

Plate 54: Lunch room (Room 25), facing south

4.5 BUILDING D

4.5.1 ***External Appearance:*** Building D was a single-storey building, constructed of red brick laid in stretchers upon a 'U'-shaped plan which abutted the western elevations of Buildings B and C, and enclosed the western end of Building A below first-floor

height (Plate 55, Figs 2 & 4). It had a flat felt-covered reinforced concrete roof with coping stones to the north, south and west but no parapet.

4.5.2 The western elevation had a doorway to the south of centre with concrete surrounds projecting forward towards the top to form a shallow covered porch (Plate 56). To the north of this doorway lay a bank of 14, vertically-set, rectangular lights divided at the centre by a single concrete mullion. The windows had steel frames, with panes alternating between fixed frames and casements and the surrounds were formed in textured concrete similar to that used on Buildings A, B and C. Another bank of seven lights, of identical character, lay to the south of the doorway.

4.5.3 The eastern end of the northern elevation was obscured by Building I, but the western end had a pair of low, double doors near its centre, which were glazed in their upper halves and had concrete surrounds. The southern elevation had a similar pair of double doors in the corresponding position but also had a three-light window, of the type previously described on the western elevation, at the centre of its southern half and a pedestrian doorway at the eastern end (Plate 57). The eastern end of the elevation was raised slightly above the remainder and the latter doorway was accessed from two steps rising to a concrete platform surrounded by steel railings. Between the three light window and the double doors was a steel ladder bolted to the wall, giving access to the flat roof above.

4.5.4 ***Internal Appearance:*** internally, the building was connected to the Lovell Telescope Control Room by a short north/south aligned corridor with a doorway at the southern end reached via a flight of timber steps (Plate 58, Fig 2). The western wall of this corridor incorporated a bank of raking observation windows, looking down into the room (Room 16) to the west. A doorway at the northern end of the corridor led into Building I, with another to the east leading into Building C via another short corridor. The north/south corridor turned west at its northern end, descending a second flight of steps and continuing along the northern end of the building into Room 17 (Plate 59).

4.5.5 A small kitchen (Room 18) area lay in the north-western corner of the building at the western end of the corridor and a large rectangular room (Room 17) housing the observatory's archives lay to its south (Plate 60). A doorway at the northern end of this rooms eastern wall opened into a smaller rectangular room (Room 16), presently used for storage, and was lit to the east by the observation windows in the corridor described above. At the eastern end of the southern wall of the archive room a set of steps climbed to a raised corridor, with the western elevations external doorway at its western end. A second set of steps to the south then led down into a computer workshop (Room 12) with a small office partitioned off in its south-western corner. A second cell, presently used as a computer server room, lay to the east of the computer workshop with a north/south aligned corridor to the east. The corridor connected this end of the building to Building B via a flight of steps and a doorway in the adjoining eastern wall.

4.5.6 With the exception of the archives room (Room 17), which had had its walls covered in cork panels, the remaining spaces each had exposed brick walls coated in thick white paint. Excluding the corridors the ceilings had been fitted with suspended tiles, obscuring the detail above.

Plate 55: Building D facing south-east with Building A behind

Plate 56: Covered porch of western door, facing south-east

Plate 57: Building D facing north with Building A behind

Plate 58: Corridor from Control Room, facing north

Plate 59: Corridor at the northern end of the building, facing east

Plate 60: Archives room (Room 17), facing north

4.6 BUILDING E

4.6.1 ***Exterior (for Internal description see Building B):*** Building E was a small rectangular building with a north/south alignment attached to the southern end of the eastern elevation of Building B (Figs 2 & 4). It was constructed of textured red brick laid in stretcher bond and had a flat concrete roof surrounded on three sides by a low parapet topped by a tubular steel guard rail. The southern elevation included three adjoining, three-light windows of a very similar form to those previously described on Building C, except that the concrete surrounds had a smooth, rather than textured, finish (Plate 61). The joint between Buildings B and E was clearly evident at the western end of the elevation where the two southern elevations were mis-aligned and appeared to incorporate a butt joint (Plate 62).

4.6.2 The eastern elevation had no openings of any kind but a two stage, steel staircase, with a mid-height landing, had been bolted to the wall, giving external access to the flat roof (Plate 61). The plan of the building appeared to have been designed to incorporate the pre-existing or contemporary Building H and this was reflected in the width of the building, which was wider to the west than to the east and resulted in a two stage northern wall. The eastern half had no openings but formed one side of a narrow open corridor opposite the southern wall of Building H, with a fire escape exit at the western end. The western end of the wall had just a single vertically set rectangular window with brick jambs and single piece concrete sill and lintel (Plate 63)

Plate 61: Building E, facing north-west

Plate 62: Butt joint between Building B to the left and Building E to the right

Plate 63: Building E, facing south

4.7 BUILDING F

4.7.1 ***External Appearance: (for Internal description see Building B):*** Building F is a single-storey rectangular building constructed in textured red brick laid in a stretcher bond, that was erected in the south-eastern angle formed between Building A and B (Figs 2 & 4). It extended across the length of the five northernmost bays of Building B and nearly doubled the width of this building at the northern end. It had five triple-light windows along the length of its eastern elevation of a form similar to that of Building B's western elevation, but the building's southern elevation had been hidden by the erection of the stair-block (Plate 64). Only at the extreme eastern end did the exposed south-eastern corner suggest the former presence of a window or possibly blind panel behind the stair block (Plate 65).

Plate 64: Eastern elevation of Building F, facing west

Plate 65: South-eastern corner of Building F, facing north-west. Note the obscured window or blind panel at the centre of the frame

4.8 BUILDING G

4.8.1 ***External Appearance (for Internal description see Building C):*** Building G is a long rectangular, single-storey, structure of ten bays, constructed of textured red brick laid in stretcher bond (Fig 2 & 4). It had a flat concrete roof with a parapet wall to the east and north, and topped by a single course of coping stones. It abutted Building A to the south and Building C to the west, effectively increasing the width of the latter by nearly double. At its northern end Building L connected the structure to building J, making the eastern wall the only exposed external elevation. This wall had a bank of ten, triple-light windows, identical in form to those used on the western elevation of Building C (Plate 66). A butt joint is evident at the southern end of the wall, where the building adjoined Building A's northern wall (Plate 67).

Plate 66: East elevation of Building G, facing north-west

Plate 67: Butt joint at the southern end of the eastern elevation, facing south-west

4.9 BUILDING H

4.9.1 ***External Appearance:*** Building H is a small single storey rectangular structure, rendered in concrete and with a flat roof designed to carry the base of the 42-ft telescope (Plate 68, Figs 2 & 4). The building is almost detached, sharing only the western end of its southern wall with Building E and there is no internal access between the two structures. Access to the building is via a set of double doors at the centre of the western elevation, with a corresponding set of doors at the centre of the opposing elevation (Plate 69). The northern elevation had a row of four round, porthole-style windows equally spaced across the length of the wall. The southern wall had the same but where the fourth window might once have been at the western end the building now adjoins Building E (Plate 70).

4.9.2 The base of the telescope formed a four-sided pyramid, which housed the pivot gear that allowed the telescope to rotate 360 degrees (Plate 71). A steel gantry, accessed from a ladder and bridge to the west, surrounded the base of the telescope with the vertical pivot mounted upon a second stage above.

4.9.3 ***Internal Appearance:*** internally, the building is divided into three equal cells by two pairs of opposing concrete buttresses (Fig 2). A set of doors had been installed between the western two buttresses to divide the two eastern cells from the western cell and the central cell held the telescopes vertical pivot shaft which is bolted to a steel plate on the floor (Plate 72). The room was clearly designed as a maintenance area and contained no further architectural features of note; however, at the eastern end of the building a scale model of a telescope is mounted on a circular track, affixed to a table (Plate 73). The model is part of the proposed design for a 400-foot telescope, the Mark V, which in the end was never built and now lies in storage.

Plate 68: Building H, facing west

Plate 69: Western wall of Building H, facing south-east

Plate 70: Southern wall of Building H from above

Plate 71: Pyramidal mounting base for the 42-foot telescope upon the roof of Building H

Plate 72: Interior of Building H, facing east, with vertical pivot shaft to centre

Plate 73: Model of proposed 250-foot telescope

4.10 BUILDING I

4.10.1 ***External Appearance:*** Building I is a small, rectangular, single-storey timber structure upon an east/west alignment, which had been appended to the eastern end of the northern elevation of Building D and the southern end of the western elevation of Building C (Plate 74, Figs 2 & 4). It consisted of only two walls, one to the north which is glazed with three, three-light horizontally-arranged windows set within wooden frames and another to the west which is entirely taken up with a pair of pedestrian doors separated by a central wooden mullion. It has a flat timber roof covered in roofing felt and sits slightly above the height of the roof of Building D.

4.10.2 ***Internal Appearance:*** internally, the building had a modern wheel chair access ramp running along its northern wall, with a guard rail to the south, which then turned at the eastern end to connect to Building D via a doorway in the southern wall (Fig 2). A short set of steps lay to the south of the ramp for able-bodied acceess.

Plate 74: Building I, facing south

4.11 BUILDING J

4.11.1 ***External Appearance:*** Building J is a rectangular, single-storey, building upon a broadly north/south alignment, but, unlike the previously described buildings which had been sited principally around the telescope, it also followed the slightly north-west/south-east line of the modern access road to the east (Figs 2 & 4). The building is constructed of modular-style stud walls, clad in vertical timber tongue and groove boards and sits upon a low, red-brick plinth (Plate 75).

4.11.2 It is connected to the northern end of Building C and G by Building L and is abutted to the north by Building K. Building Q projected from the northern end of the building's western elevation. The southern elevation is completely enclosed by Building L, and only the extreme eastern end of the northern elevation is exposed to the east of Building K.

4.11.3 The eastern elevation comprised ten equal bays, with bays 1-3 and 5-9 from the south, fitted with a three-light horizontally-arranged window with a plain white plastic panel beneath (Plate 75). The larger central light of each window opened as a ventilator with the smaller ones above and below set within fixed frames. The remaining two bays had been clad in timber boarding, and a continuous strip of weather-boarding ran across the head of the entire wall.

4.11.4 The western wall is divided into five bays; bays two and five from the south were fitted with the same style of windows as described to the east, with bays one and three fitted with a single large pane beneath a narrow over-light ventilator (Plate 76). Bay four is clad in vertical timber boards and, again, a continuous strip of weather-boarding ran across the head of the wall.

4.11.5 ***Internal Appearance:*** internally, the building had a central corridor, lit by two elongated skylights, running along its length and a series of oval glass light shades, of the type described in the Control Room within Building A (Plate 77, Fig 2). Towards the northern end, the corridor turned west into Building Q, and beyond

this lay a large rectangular office (Room 36), lit from above by four pairs of square skylights (Plate 78). To the east of the corridor there were four equal-sized square office spaces (Rooms 29, 33-5) with another three (Rooms 30-32) of similar size to the west. No fixtures or fittings of particular historic interest were noted in any of the rooms, although one office included an acrylic sign warning of an aerial paint hazard, which was clearly of some age (Plate 79).

4.11.6 A brass bell, mounted from a timber post hung at the northern end of the corridor, apparently to announce the time of the next lecture (Plate 80) and the building is typically fitted with cast iron column radiators in each room.

Plate 75: Building J, facing south-west

Plate 76: Building J, facing north with Building L to right of frame

Plate 77: Central corridor of Building J, facing north

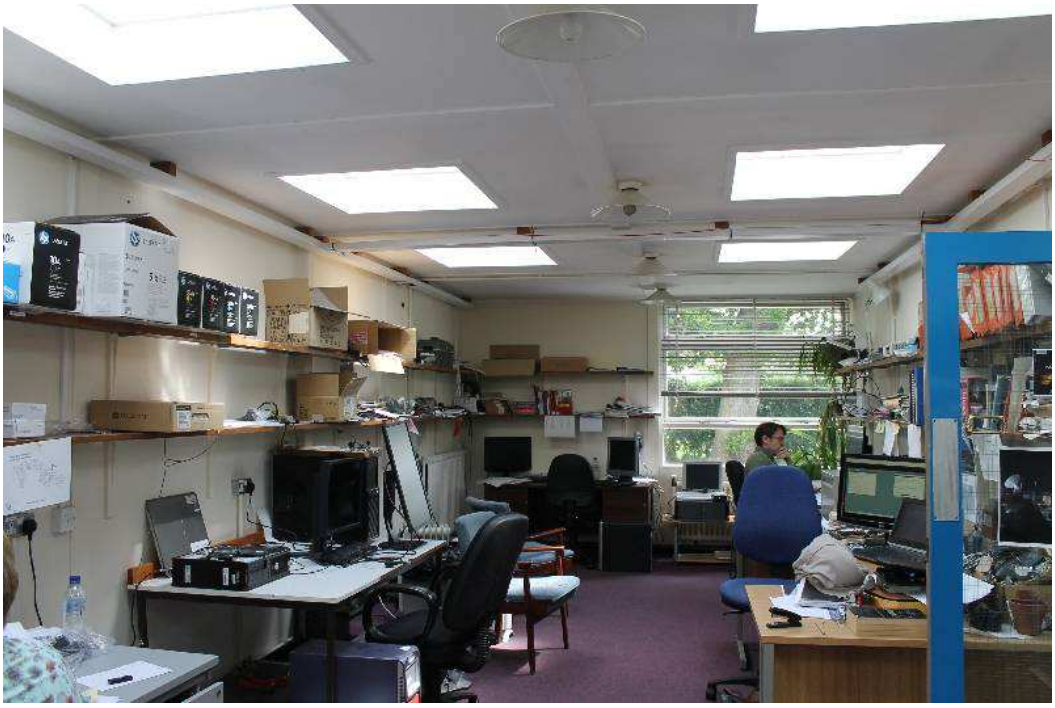


Plate 78: Office room at northern end of Building J (Room 36) facing east

Plate 79: Acrylic warning sign

Plate 80: Brass bell at the northern end of the corridor, facing south

4.12 BUILDING K

4.12.1 ***External Appearance:*** Building K is a rectangular single-storey structure with a flat roof lying at the northern end of the complex (Fig 2 & 4). It shared its alignment with Building J to which it is abutted to the south and is adjoined to the west by Building N.

4.12.2 The buildings northern wall is constructed in red-brick, laid in stretcher courses, and had a single doorway at the eastern end (Plate 81). The eastern wall is divided into eight equal bays, with odd bays fitted with two large lights beneath a ventilator window and a fixed frame over-light. The even bay windows were of similar design but had an additional narrow-light at the base and the larger light above opened as a ventilator. All the bays had a plain white plastic panel at the bottom resting upon a red brick plinth. As with Building J, a narrow strip of weather-boarding ran across the head of both the northern and eastern walls.

4.12.3 ***Internal Appearance:*** internally, the northern half and south-western corner of the building housed the library (Plate 82, Fig 2). It could be entered either externally via the doorway at the eastern end of the northern wall, through a small entrance lobby, or internally from a set of double doors at the western end of the southern wall. The northern and western walls were lined with tall shelving racks, stained in a natural antique pine colour, upon which were stored reference journals. The

central space is occupied by a row of large desks. A doorway towards the northern end of the western wall led into a large office in the northern end of Building N.

4.12.4 The south-eastern corner of Building K had been partitioned-off to form two large rectangular office spaces (Rooms 38a and 38d) accessed from the west, and a smaller cupboard room lay to their west at the centre of the building's southern wall (Plate 83). The eastern wall is fitted with cast iron column radiators and the room is illuminated by ceiling-mounted bulbs fitted with glass cone-shaped down-lighters.

Plate 81: Building K, facing south-west

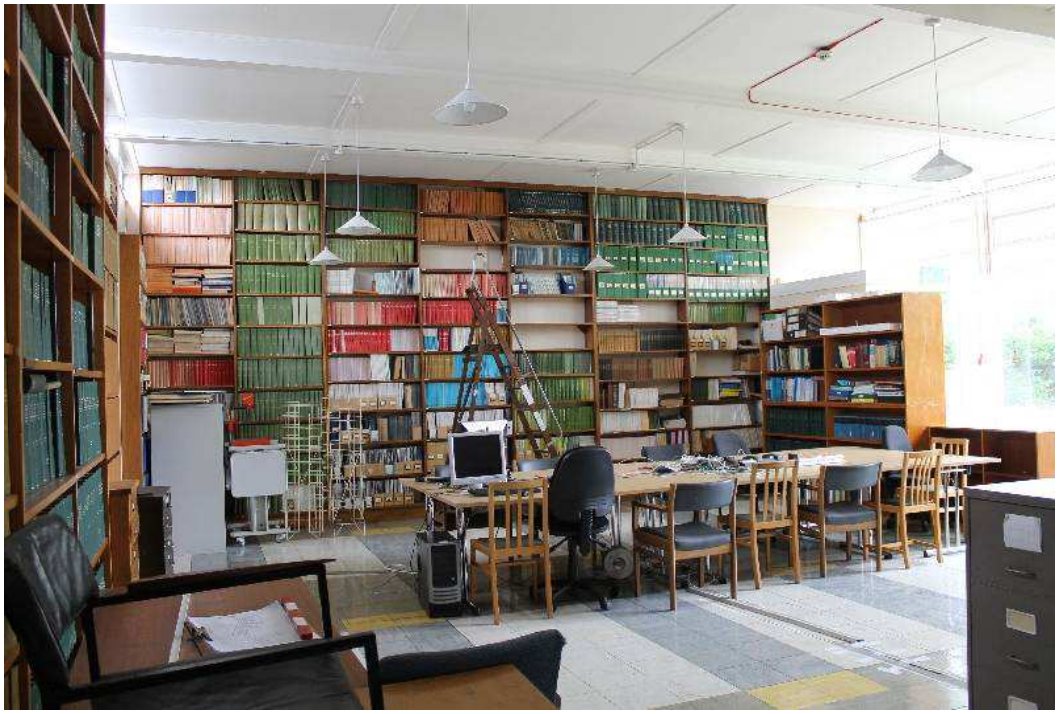


Plate 82: Library, facing north

Plate 83: Office space (Room 38A) in south-eastern corner of Building K, facing east

4.13 BUILDING L

4.13.1 ***External Appearance:*** Building L is triangular in plan and connects Building C and G, to the south, to Building J to the north (Fig 2 & 4). It is a single-storey structure of red-brick and had three, horizontal three-light windows to the east above plain white plastic panels, with the central light opening as a ventilator (Plate 84). A return wall at the northern end of the eastern wall provided just enough space for a single doorway, covered by an open flat-roofed porch, supported by a steel pole at the north-eastern corner. The western elevation formed the narrow part of the triangle and had just a single two-light horizontal window at its centre, with a plain timber panel beneath (Plate 76).

4.13.2 ***Internal Appearance:*** internally, the building had a central rectangular hall lit by an elongated triangular roof light (Plate 85, Fig 2). The room is connected to Building C via a doorway at the centre of the southern wall and to Building J through a doorway at the centre of the northern wall. To its west is a storeroom (Room 27), which could only been accessed from the northernmost room of Building C, while in the south-eastern corner is a small kitchen room (Room 28) entered from the north, off a short corridor to the east of the central hall. To the north of this short corridor is a fire exit with a store room to its west. The building is decorated throughout in modern finishes and contained no features of historic interest.

Plate 84: Building L, facing south

Plate 85: Central hall facing north

4.14 BUILDING N

4.14.1 ***External Appearance:*** Building N is a single-storey, rectangular structure, abutting Building K to the east and the eastern half of Building Q to the south (Fig 2 & 4). It has a flat roof and a red-brick plinth where visible beneath the northern and western elevations (Plate 86). The northern elevation is clad in vertical tongue and groove timber boards and had no openings of any kind, while the western elevation is divided into seven equal bays. Bay 1,2, 4,5 and 7 from the south had been fitted with large horizontal lights, beneath two narrow over-lights and above plain white panels (Plate 86). Bay 3 had a set of double doors with a pair of over-lights above and there is a single doorway to the centre of bay six, which is flanked by a pair of vertical lights and topped by another pair of overlights. A strip of weather-boarding ran across the head of the wall, returning along the northern elevation.

4.14.2 ***Internal Appearance:*** internally, Building N had a large rectangular room at the southern end, which is accessed from the eastern end of Building Q's central corridor (Fig 2). This room had a raised stage at the northern end and a projector room in the south-western corner and is laid out as a lecture theatre (Plate 87). The northern third of the building could only be accessed internally from the northern end of the adjoining library wall and is occupied by an office space Room (Room 38b)(Plate 88).

Plate 86: Building N, facing east

Plate 87: Lecture theatre in Building N, facing south

Plate 88: Office at northern end of building, facing east (Room 38b)

4.15 BUILDING O

4.15.1 ***External Appearance:*** Building O is a rectangular building, which had been added to Building F and the northern end of Building B as a first-floor (Plate 89, Figs 3-4). It abutted the first-floor of Building A to the north and is adjoined to the south

by Building P. A stair block at the eastern end of the southern elevation was presumably constructed at the same time as Building O.

4.15.2 The building's walls were constructed of light-weight stud partitions, clad externally in vertical tongue and groove timber boards and finished internally with modern plasters. The eastern elevation had a continuous bank of five large, horizontally-set, fixed timber frame windows; each fitted with a ventilator above (Plate 89). The western elevation had three windows of identical form at its northern end and a strip of weather board ran across the head of both exposed elevations (Plate 90). The stair-tower block is also clad in vertical timber boards and is topped with a timber weather strip (Plate 91). It has a single large horizontal window at the head of its eastern elevation and a ground-floor level fire escape door at the northern end of the same elevation.

4.15.3 ***Interior:*** internally, the building is divided into two primary cells, one to the west (Room 51) lying above the northern end of Building B and the second to the east (Room 53) lying above Building F (Fig 3). The eastern cell is being used to store electrical components and retained no features of historic interest, although it is noted that the room's northern wall is of brick coated in white paint (Plate 92). This wall had a single doorway at its western end, accompanied immediately to the east by a vertical light which helped to light the stair landing beyond. A second door lay at the southern end of the western wall, connecting the room to the small corridor and stair block. The western room is used as a technician's lab and server room and has been integrated into the western end of the first floor of Building A (Plate 93). A small workshop space had been partitioned-off in the north-western corner of the room. A doorway at the centre of the room's southern wall led back into the corridor and stair tower block beyond.

Plate 89: Eastern elevation of Building O, facing north-west, with Building F beneath

Plate 90: Western elevation of Building O, facing north-east, with Building B below

Plate 91: Stair tower block, facing west

Plate 92: Doorway at the northern end of the electrical components store, facing north. Note that the wall here is constructed of brick

Plate 93: Technicians lab and server room on the first floor, facing north

4.16 BUILDING P

4.16.1 ***External:*** Building P is a rectangular building which had been constructed over the southern end of the roof of Building B as a first floor extension (Figs 3-4). It is clad in vertical tongue and groove timber boards in a similar fashion to Building O but its bay divisions were emphasised by painting the vertical dividing timbers in white (Plates 43 and 94).

4.16.2 The western elevation had eight equal bays, each fitted with the same type of windows as described in Building O, except for the northernmost bay which had no opening (Plate 43). The eastern elevation had six exposed bays, the position of the northern two being occupied by the stair tower block (Plate 94). Bays 1, 3-6 from the south each had a window, while bay 2 had been fitted with a doorway which gave access, down two steel steps, to the roof above Building E. The southern elevation had a pair of square windows in timber frames with ventilators above (Plate 45). A strip of weather boarding ran across the head of all three elevations and the corners were highlighted with similar vertical boards.

4.16.3 ***Internal Appearance:*** the interior comprised the small corridor to the north, linking the building to the stair tower block and Building O, a small office space to the west of the corridor and a large open plan office area (Room 55) which accounted for the remainder of the building's floor space (Plate 95, Fig 3). The interior had no specific internal features of historic interest.

Plate 94: Building P, eastern elevation

Plate 95: Building P, interior facing north (Room 55)

4.17 BUILDING Q

4.17.1 ***External Appearance:*** Building Q is a single-storey rectangular building upon a broadly east/west alignment, which abutts Building J to the east and Building N to the north (Fig 2 & 4). Its southern elevation is composed of 12 equal bays with the eastern two bays occupied by a recessed entrance and accompanying window beneath a covered porch (Plate 96). Bays 4-6, 8-9 and 11 from the east were fitted with horizontal windows with an over-light above and corresponding narrow light below. A plain white plastic panel lay beneath each window in the now familiar style. Bays 3,7 and 10 were clad in vertical tongue and groove timber boards while the westernmost bay is of red brick laid in stretcher courses, returning along the western elevation in the same. This elevation had a central doorway recessed into the wall and was accessed via two concrete steps (Plate 97). It is flanked on either side by a three-light window of the same type as described on the southern elevation.

4.17.2 The northern elevation had seven equal bays (2-6 from the east) being occupied by three-light windows, bay one being clad in vertical timber boards and bay six being finished in red brick. A timber weather-board at the head of the wall returned along all three exposed walls.

4.17.3 ***Internal Appearance:*** internally, the building had a central corridor running along its full length with four roughly equal office spaces to the north (Rooms 45, 46a, 46b, and 47) and another four to the south (Rooms 41-4) (Plate 98, Fig 2). An additional and larger meeting room (Room 40) is located at the eastern end of the southern range of rooms, and is entered from the east off of a large access hub (Room 48) at the eastern end of the building (Plate 99). This hub had a doorway at the centre of the southern wall, giving access to the exterior of the building, but also formed an internal link to Buildings J, K, N and Q.

Plate 96: Building Q, southern elevation facing north

Plate 97: Building Q, western elevation facing east

Plate 98: Central corridor, facing west

Plate 99: Access hub (Room 48) at the eastern end of Building Q, facing south-east

5. DISCUSSION

5.1 DEVELOPMENT OF THE SITE *(Figs 6-7)*

5.1.1 ***Late 1940s - Early 1950s:*** excluding the pre-existing botanical huts which were used for a short time in the late 1940s the earliest purpose-built structures were erected in the late 1940s or early 1950s on the margins of the original observatory site to the south-east. Several of these single storey buildings survive to the present day and are still in regular use.

5.1.2 ***Early 1950s - 1957:*** Between 1952 and 1957 the central Control Building (Building A) and its northern and southern wings (Buildings C and B) were erected in a field a short distance to the north-west of the earlier site, along with the telescope itself. The buildings design incorporated elements of both Modernist Architecture and Art Deco styling but was restrained in its use of ornament, reflecting the tight budgetary constraints that plagued the project from the outset.

5.1.3 The original telescope was expected to have a relatively short life span but observatory buildings might have been expected to last longer. The surviving original plans suggest that the two wings each had a corridor running along their eastern side from which a series of laboratories could be accessed to the west and at the end of each wing. The laboratories in the southern wing were larger and there is a narrow cell towards the southern end referred to as the Balance Room.

5.1.4 ***Late 1950s – Early 1960s:*** in 1959 an extension was added to the western end of the main Control Building (Building D). This building was of broadly the same style as Building A and was sunk into the ground as a half basement to ensure the maintenance of views of the telescope from the large vertical windows on the western elevation of the control room. This was followed almost immediately by the addition of a single-storey extension (Building F) to the northern end of the eastern elevation of Building B.

5.1.5 ***Mid 1960s:*** the specific date of construction of Buildings E and H is unclear, although the 49-ft telescope can be seen in the 1966 aerial photograph and must have been mounted upon Building H. The relationship between Buildings E, F and H suggests that H was erected before E, preventing the linking up of E and F to form a continuous symmetrical extension to the wing, as was subsequently carried out to the north. Whatever the sequence, Building E was certainly in place by 1969/70. Buildings J, K and L were erected between 1961 and 1966 and represent a fairly rapid and large scale expansion. The limited budget available for such buildings is reflected in their modular, pre-fabricated and semi-permanent nature.

5.1.6 ***Late 1960s:*** proposals were put forward in 1967 to add a new control room either immediately above the original one or above the first floor of Building C. Both schemes would have required the addition of a new stair block to the north of the eastern end of Building A's northern elevation, but clearly neither was implemented. The architectural designs drawn up in preparation of this scheme show that Building O was already in place above Building F and the northern end of Building B. In 1969 another proposal was put forward to add a first floor to Building C but this too was rejected in the end, in favour of a ground floor extension to the east (Building G), nearly doubling the width of the building. This extension probably also resulted in the extension of Building L to the east to allow the full integration of Building G

with the northern range of buildings. Building M first appears after 1969, when it was added to the west of Building K.

5.1.7 ***1972 - to present:*** Building M was demolished after 1972 and the larger Building N was built in its place as a lecture hall just to the west of the library. There was evidently a need for increased office space in the last quarter of the twentieth century, with Building Q being constructed to the west of Building J and Building P added as a first floor to the southern end of Building B. The dish was again replaced and upgrades were made in 2001-2002 and the original control desk was re-enamelled at the same time.

5.2 CONCLUSION

5.2.1 Despite being just 60 years old the Control Building has had a considerable number of extensions, resulting in significant alterations to the interior and exterior of the earliest buildings. The documentary record has provided a good chronology for these extensions, allowing us to confidently date the majority of the structures to within a couple of years and the sequence is supported by the archaeological record. The majority of the buildings are of relatively low quality, modular construction and retain few features of historical interest. They reflect the increasing access throughout the mid-twentieth century to cheap construction materials and, in particular, the popularity of prefabrication in the years after the Second World War. It is probable that these buildings were erected as budget solutions to expanding the capacity of the observatory as quickly as possible. These structures are well represented elsewhere and at Jodrell Bank their principal value lies in the contribution that they make to the story of the observatory's overall development.

5.2.2 The earlier buildings are generally of more substantial construction and were probably expected to have had a greater longevity to match or even outlive the present Telescope. The documentary record nevertheless indicates the tight budgetary constraints placed upon their construction too and this might go some way to explaining the relative sparsity of internal details within these buildings. These building were, however, not without architectural pretensions and their form draws upon both Art Deco and Modernist architectural principles. This is perhaps most clearly demonstrated in the central Control Building and, in particular, the entrance lobby. This was the principle entrance to the building with the stage at the western end effectively forming a viewing platform from which the monumental scale of the telescope could be appreciated across the control room.

5.2.3 The buildings can therefore be interpreted as a reflection of the development of astrophysics in post-war Britain set against the backdrop of a changing political map and the budgetary constraints imposed upon an essentially non-commercial research facility. The architecture and internal fixtures and fittings are thus a blend of original and, yet perfectly serviceable, equipment and state of the art technology, with replacement occurring only when and where required, subject to funding.

5.2.4 The Jodrell Bank Telescope is one of only a handful of buildings in Britain of the period that hold the imagination of the general public and, although not as well recognised, the Control Buildings form an integral part of that structure. The observatory is exceptional in having such an iconic structure at its centre, and unusual in its dual character as an important part of the Nation's heritage and as a symbol of post-war modernity.

6. ASSESSMENT OF THE SIGNIFICANCE

6.1 INTRODUCTION

6.1.1 In the National Planning Policy Framework (NPPF), the Department of Communities and Local Government (DCLG 2012) sets out the Government's planning policy and framework for England, and how these are expected to be implemented. NPPF places particular emphasis on assessing the development proposals in line with an up-to-date local plan (*op cit*, Section 3.28). Consequently, Cheshire East Council's Local Plan Strategy (March 2014), which provides guidelines for the determination of planning applications affecting listed buildings, was consulted. In determining applications, local planning authorities must be able to understand the significance of any heritage assets affected by the proposed development in order to assess its impact. This would enable the conservation of '*heritage assets in a manner suitable to their significance so that they can be enjoyed for their contribution to the quality of life of this and future generations*' (*op cit*, para 17), or else they can be recorded in order to '*advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible'* (*op cit*, Section 12.141).

6.1.2 Therefore, the following section will determine the nature and level of the significance of the heritage asset, as detailed in *Sections 3* and *4*. This is an iterative process, beginning with the guideline criteria outlined in Table 1, below. In general terms, the recording of a heritage asset, such as a listed building, and any subsequent grading thereafter, by its nature, determines its importance. However, this is further quantified by factors such as the existence of surviving remains or otherwise, its rarity, or whether it forms part of a group. There are a number of different methodologies used to assess the archaeological significance of heritage assets, but that employed here is the 'Secretary of State's criteria for scheduling ancient monuments' (Annex 1; DCMS 2010).

Importance	Examples of Heritage Asset
National	Scheduled monuments (SMs), Grade I, II* and II listed buildings
Regional/County	Conservation Areas, Registered Parks and Gardens (Designated Heritage Assets) Sites and Monuments Record/Historic Environment Record
Local/Borough	Assets with a local or borough value or interest for cultural appreciation Assets that are so badly damaged that too little remains to justify inclusion into a higher grade
Low Local	Assets with a low local value or interest for cultural appreciation Assets that are so badly damaged that too little remains to justify inclusion into a higher grade
Negligible	Assets or features with no significant value or interest

Table 1: Guideline criteria used to determine Importance of Heritage Assets

6.2 QUANTIFICATION OF IMPORTANCE

6.2.1 The documentary research and the architectural elements of the Control Building were considered using the criteria for scheduling monuments with the results outlined below. This information will contribute to the overall assessment of the importance of the heritage asset.

6.2.2 ***Period:*** the original building was completed in 1955 and became operational in 1957 at the dawn of the space age, but additions quickly followed in the late 1950s and throughout the 1960s. The buildings architectural style demonstrates the influence of early post-war 1950s optimism and its inspiration can be identified with the Festival of Britain in 1951. It also shows the influence of a reserved style of Art Deco in its symmetry and detailing, indicative of the budget restrains placed upon the project.

6.2.3 ***Rarity:*** a handful of earlier radio telescopes exist world wide but the Control Buildings appear to be the earliest purpose-built radio telescope control buildings in Britain. At the time of its construction, the telescope *was the largest fully steerable radio telescope in the world (*Historic England, list description*)*. Sixty years later it remains the third largest in the world and is still the largest in Britain.

6.2.4 ***Documentation:*** the documentary record relating to the construction of the facility, and its subsequent operation, is excellent, allowing us to uncover the building's development and understand its practical everyday use. There is a mass of archive (approximately 1980 items dated to *c* 1924-1993) associated with the Jodrell Bank works, which is not yet fully catalogued or detailed. Its research would undoubtedly reveal a great deal more about the use of the buildings.

6.2.5 ***Group Value:*** the original Control Buildings in particular have an obvious and important group value with the Lovell Telescope, but also form part of the wider development of the Jodrell Bank Observatory. This includes the surviving buildings on the original site to the south-east in the vicinity of the earlier 218ft transit telescope, the maintenance buildings to the north-west of the Lovell Telescope and the botanical buildings to the south, which were used in the first days of the observatory. These structures as a group demonstrate the historical development of the site from the late 1940s to the present day.

6.2.6 ***Survival/Condition:*** externally, the buildings are in good condition, although significant alterations to the original structures have taken place and, in particular, almost nothing remains of the original eastern elevations of the two wings (Buildings B and C). The internal layout of Building's B and C has been altered but comparison with the original architectural plans demonstrates the preservation of some of its original partitions. The relative sparsity of contemporary internal features in these two buildings might in part be explained by the nature of the buildings, which were primarily designed as office and laboratory space. The internal layout of Building A, however, although modified at first floor level, appears to be substantially intact at ground floor level. It is also here that the majority of the buildings original Art Deco features survive and, perhaps most significantly, the control desk in the Lovell Telescope Control Room is still extant.

6.2.7 ***Fragility/Vulnerability:*** although the building are in relatively good condition they are at present inefficiently used with much redundant space. They also fall below modern standards with regards to heating and ventilation, bringing those surviving features which add historic character to the building, such as the steel-framed windows and radiators, at threat from replacement and renewal.

6.2.8 ***Diversity:*** the most important parts of the structure are the original Control Buildings but the complex as a whole demonstrates the growth in the interest and funding in astrophysics across the second half of the twentieth century. Each additional extension can be seen as a reflection of the needs, and perhaps wealth, of the facility at any given time.

6.2.9 ***Potential:*** further historic research into the extensive Jodrell Bank archives has the potential to reveal more practical details regarding the use of the building in general and the people that worked there. There is also some potential for further historic detail to be revealed during demolition and renovation works.

6.3 CONCLUSIONS OF IMPORTANCE *(Figs 8-9)*

6.3.1 If the complex is found to fall within the listing of the Lovell Telescope then in law the buildings as a whole are to be judged as Nationally Important and any alterations affecting the historic character of the buildings would require listed building consent. However, using the guideline criteria outlined in Table 1, together with further quantification (*Section 6.2*), and informed professional judgement; the buildings have been individually assessed for their importance as heritage assets.

- Buildings A, B and C are the primary Control Buildings; they were part of the original design for the telescope and were integral to the operation of the telescope and, as such, must, along with the telescope, be considered to be of *National Importance*.
- Buildings D, F and G were added between 1959 and 1971 and although holding less significance, sought to retain the architectural design of the original buildings. Their removal would require significant reconstruction of the eastern elevations of the northern and southern wings (Buildings B and C). These buildings can therefore be considered to have a *Local/Borough Importance*.
- Although Buildings E and H are of a similar date to D, F and G they detract slightly from the original design intentions. They do, however, contribute to the developmental story and can on balance be considered to be of *Local/Borough Importance*.
- The remaining buildings, including I, J, K, L, N, O, P and Q are significant detractors from those buildings that are identified as being of National and Local/Borough Importance. They are of temporary, pre-fabricated designs, constructed to a template common across Britain, at a time when the need for speed of construction outweighed the need for quality and permanence. They have little intrinsic historical value in their own right but do contribute to the development story of the observatory as a whole. They can therefore be considered to have a *Low Local Importance*.

6.4 DESIGNATED STATUS

6.4.1 Although the original Control Buildings (Buildings A, B and C) have been assessed above (Section 6.3.1) to be of National Significance, this does not necessarily mean that they also share the listed designation status of the Lovell Telescope. The Listed Building Description refers only to the telescope and not to any other ancillary buildings or structures. There is, therefore, some considerable doubt as to whether the Listed Building status of the telescope applies also to its service buildings. Typically, such buildings would come under the umbrella of the listing as part of the 'curtilage' of the primary listed building, but curtilage only applies to buildings constructed before 1948, whereas the telescope was not completed until 1957.

6.4.2 The listing status of the primary structure or building can also be extended to ancillary buildings if these structures are 'fixed' to the primary building, which in the present instance is a telescope that rotates on a series of circular rails. Whether the Control Buildings can be deemed to be fixed to the telescope is very much a moot point. While there is a service tunnel that extends between the basement of Building A and a circular hub beneath the telescope, in legal terms there is a question of whether the service tunnel can be deemed to be a separate structure from either the telescope or the Control Building. If this is the case, then the service tunnel will be fixed to the telescope, and the service tunnel is then separately fixed to the basement of Building A. As such the service tunnel being fixed to the primary listed building (defined in the list), is therefore protected by listed building control, but Building A, which is fixed to the tunnel, may not afforded the same protection.

6.4.3 While there may be some doubt as to whether the control buildings (Buildings A, B and C) are listed, the other buildings (Buildings D to Q) will not come under the umbrella of the primary listing as they are all later structures, and their connections to the primary listed structure (the telescope) are too remote to be able to justify the extension of the listed status.

7. IMPACT ASSESSMENT

7.1 IMPACT ASSESSMENT

7.1.1 Heritage assets are considered to be '*a finite, irreplaceable and fragile resource*' (DCMS 2010). Therefore, it has been the intention of this assessment to identify the significance and potential of the Jodrell Bank Control Buildings, and assess the impact of the proposals, thus allowing the advice of National Planning Policy Framework (NPPF) (2012) to be enacted upon. Assessment of impact has been achieved by the following method:

- assessing any potential impact and the significance of the effects arising from the proposals;
- reviewing the evidence for past impacts that may have affected the building or features;
- outlining suitable mitigation measures, where possible at this stage to '*avoid, or minimise conflict between the heritage asset's conservation and any aspect of the proposal*' (*op cit*, Section 12, 129).

7.1.2 The impact is assessed in terms of the importance, or sensitivity, of the site to the magnitude of change or potential scale of impact during the proposed redevelopment. The magnitude, or scale, of an impact is often difficult to define, but will be termed substantial, moderate, slight, or negligible, as shown in Table 2, below.

Scale of Impact	Description
Substantial	Significant change in environmental factors; Complete destruction of the site or feature; Change to the heritage asset resulting in a fundamental change in ability understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Moderate	Significant change in environmental factors; Change to the heritage asset resulting in an appreciable change in ability understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Slight	Change to the heritage asset resulting in a small change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Negligible	Negligible change or no material changes to the heritage asset. No real change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.

Table 2: Criteria used to determine Scale of Impact

7.1.3 The scale of impact, when weighted against the importance of the building produces the impact significance. This may be calculated by using the matrix shown in Table 3, below.

Resource Value (Importance)	Scale of Impact Upon Heritage Asset			
	Substantial	**Moderate**	**Slight**	**Negligible**
National	Major	Major/ Intermediate	Intermediate	Neutral
Regional/County	Major/ Intermediate	Major/ Intermediate	Minor	Neutral
Local/Borough	Intermediate	Intermediate	Minor	Neutral
Local (low)	Intermediate/ Minor	Minor	Minor/ Neutral	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

Table 3: Impact Significance Matrix

7.1.4 ***Demolition of Buildings I, J, K, L, N, O and P:*** the proposed removal of several of the modular buildings to the north of the Control Buildings, the demolition of the first floor structures above the southern wing, and the removal of the stair block and glazed entrance porch to the west of the northern wing would inevitably have a substantial impact upon these heritage assets. However, the significance of these buildings has been adjudged as low local and their loss has already been mitigated by their recording during the present survey. The impact significance is rated as Intermediate/Minor but, to some degree, these extensions can be viewed as detractors from the original design of the Control Buildings and, on balance, their removal can be considered a positive impact.

7.1.5 ***Removal of Internal Partitions (Building D-G):*** Buildings D-G have been assessed as holding Local/Borough significance on account of their generally earlier date and/or their adherence to the original architectural design of the control buildings. Comparison with earlier plans suggests that these buildings do not form part of the original internal layout and may, in some cases, have been internally reorganised themselves. The proposed extensive removal of the present partitions and internal reorganisation of these buildings would therefore have only a slight impact upon them, contributing to a minor impact upon their heritage significance.

7.1.6 ***Removal of Internal Partitions (Buildings A-C):*** Buildings A-C have been attributed a National Significance due to their vital contribution to the operation of the Lovell Telescope from the observatory's earliest years and because they are integral to the original design of the telescope. Comparisons between the present layout and the proposed plans of 1952 suggest that buildings B and C have already seen significant internal reorganisation, although some of the original partition walls survive. The removal of further walls could be considered to have a slight impact upon these two buildings resulting in an Intermediate Impact upon their significance. This impact has been reduced slightly by the recording of the current layout during the present survey.

7.1.7 Building A has also been assigned National significance but comparison with earlier plans of the building suggests that it retains much of its original ground-floor layout. The removal of the northern wall of the lobby, in particular, would detract substantially from the room's designed focus, which was upon views of the telescope across the observation room from the platform to the west. In this instance, the impact upon the significance of the building can be considered as Major.

7.1.8 ***Replacement of Original Windows:*** the replacement of original windows across the building as a whole could potentially change the external character of the Control Buildings. The use of metal 'Crittal'-style windows with their original glazing is particularly evocative of mid-twentieth century styling and their removal could be considered as having a Substantial Impact upon Building A-G. In the case of building A-C this would result in a Major Impact upon their significance while buildings D –G would be only an Intermediate impact upon their significance.

7.1.9 ***New Extension:*** the present proposals include the construction of a new building to the north of the original Control Buildings and upon the present site of Buildings L, J, K, N and Q. The design incorporates a two-storey structure linked to the northern end of the northern wing. The position and massing of this building has the potential to dominate the control buildings, negating the aesthetic benefits of the removal of the present modular extensions. This impact can be adjudged to be of moderate impact, drawing an overall impact upon the control buildings of Major/Intermediate.

7.2 RECOMMENDATIONS

7.2.1 This heritage assessment has identified the original Control Buildings at Jodrell Bank to be of *National* Significance with later additions ranging from *Local/Borough* to *Negligible* significance. All attempts should be made to retain Buildings A, B, and C with buildings D-H only slightly less significant. Building I, J, K, L, N, O and P are of *Negligible* significance and with an appropriate record (See this report) their removal might be considered beneficial to our reading of the original Control Buildings.

7.2.2 The present survey has mitigated as far as possible the potential loss of internal partitions from Buildings B-G but the ground floor of Building A retains much of its original form and a significant number of architectural features. Particular care should be taken to preserve this layout and perhaps even enhance it by re-establishing the primacy of the views of the telescope from the western platform.

7.2.3 Careful consideration should be given to the replacement of the original windows, which contribute significantly to the building's external character and, if it is deemed unavoidable, then suitable replacements should be sourced which attempt to retain this character as closely as possible. Consideration should also be given to the impact upon any replacement structures to the north and ideally these should be aesthetically subservient to Building A.

8. BIBLIOGRAPHY

8.1 PRIMARY SOURCES

Lovell B, 1968 *The Story of Jodrell Bank*, Oxford

Lovell B, 1973 *Out of the Zenith*: Jodrell Bank 1957-70, Oxford

Lovell B, 1987 *Voice of the Universe: Building the Jodrell Bank Telescope*, New York

8.2 SECONDARY SOURCES

CIfA 2014a, *Standard and Guidance for the archaeological investigation and recording of standing structures*

CIfA 2014b, *Code of Conduct*

CIfA 2014c, *Standard and Guidance for Archaeological Desk-based Assessments*

Department of Communities and Local Government (DCLG), 2012 *National Planning Policy Framework (NPPF),* London

Department for Culture, Media and Sport (DCMS), 2010 *Scheduled Monuments: identifying, protecting, conserving and investigating nationally important archaeological sites under the Ancient Monuments and Archaeological Areas Act 1979*, London

English Heritage, 2006a *Management of Research Projects in the Historic Environment* (MoRPHE), London

English Heritage, 2006b *Understanding Historic Buildings, A Guide to Good Recording Practice* Swindon

Fielden Clegg, Bradley Studios 2015 *The Observatory Building Refurbishment and Extension,* unpubl rep

8.3 CARTOGRAPHIC SOURCES, PHOTOGRAPHS AND DRAWINGS

Ordnance Survey 1:10,560 map, 1954

Ordnance Survey 1:2,500 map, 1969-70

Ordnance Survey map 1:2500, 1972

Copies of Historic Photographs and Building Drawings were very kindly made accessible by the University of Manchester. Some of these were in the Blue Book, a memorandum compiled in 1951.

Aerial Photographs

Historic England Archive

RAF 58/3089/F21/0467, 1959

OS/66106/917, 1966

MAL/71091/139, 1971

OS/89230/015 1989

8.4 ONLINE SOURCES

History of Jodrell Bank, www.jb.man.ac.uk, accessed 12 May 2015

www.jodrellbank.manchester.ac.uk/history/mk1.html 12 May 2015

BGS geology, 2015 www.mapapps.bgs.ac.uk, accessed 07 August

Unesco World Heritage Sites www.whc.unesco.org/en/tentativelists accessed 07 August

www.list.historicengland.org.uk accessed 07 August

Google Earth accessed 07 August

9. ILLUSTRATIONS

9.1 FIGURES

9.2 PLATES

Plate 35: Lovell Telescope Control Room, facing west. Note the timber steps to the left of frame

Plate 36: Original seven-sided control desk, facing north-east

Plate 37: German WWII anti-aircraft binoculars, used to inspect the telescope

Plate 38: Laboratory on the first floor of Building A (Room 51) looking north. Note the blocked observation windows on the western wall to the left of frame

Plate 39: Enamelled electrical boxes on south-eastern wall of the eastern Boiler Room

Plate 40: Electrical switch gear in western basement room

Plate 41: Tunnel to the base of the Lovell Telescope

Plate 42: Remaining two exposed bays on the eastern elevation of Building B

Plate 43: Western elevation of Building B, with Building P above, facing south-east

Plate 44: Partly obscured over-lights at northern end of western elevation of Building B, with Building O above

Plate 45: Southern elevation of Building B, with building P above

Plate 46: Corridor along the eastern side of Building B facing north. The later stair block can just been seen to the right of frame

Plate 47: Adjoining laboratories at the northern end of Building B (Rooms 10 and 11), facing south

Plate 48: Laboratory / office (Room 4) in Building E, facing south

Plate 49: Central cell (Room 8) in Building F, facing south

Plate 50: Cast iron panel radiator of the form used through out buildings E, F and G

Plate 51: Western elevation of Building C, facing south-east

Plate 52: Western elevation of Building C, facing north-east

Plate 53: VBLI observation room (Room 19), facing south

Plate 54: Lunch room (Room 25), facing south

Plate 55: Building D facing south-east with Building A behind

Plate 56: Covered porch of western door, facing south-east

Plate 57: Building D facing north with Building A behind

Plate 58: Corridor from Control Room, facing north

Plate 59: Corridor at the northern end of the building, facing east

Plate 60: Archives room (Room 17), facing north

Plate 61: Building E, facing north-west

Plate 62: Butt joint between Building B to the left and Building E to the right

Plate 63: Building E, facing south

Plate 64: Eastern elevation of Building F, facing west

Plate 65: South-eastern corner of Building F, facing north-west. Note the obscured window or blind panel at the centre of the frame

Plate 66: East elevation of Building G, facing north-west

Plate 67: Butt joint at the southern end of the eastern elevation, facing south-west

Plate 68: Building H, facing west

Plate 69: Western wall of Building H, facing south-east

Plate 70: Southern wall of Building H from above

Plate 71: Pyramidal mounting base for the 42-foot telescope upon the roof of Building H

Plate 72: Interior of Building H, facing east, with vertical pivot shaft to centre

Plate 73: Model of proposed 250-foot telescope

Plate 74: Building I, facing south

Plate 75: Building J, facing south-west

Plate 76: Building J, facing north with Building L to right of frame

Plate 77: Central corridor of Building J, facing north

Plate 78: Office room at northern end of Building J (Room 36) facing east

Plate 79: Acrylic warning sign

Plate 80: Brass bell at the northern end of the corridor, facing south

Plate 81: Building K, facing south-west

Plate 82: Library, facing north

Plate 83: Office space (Room 38A) in south-eastern corner of Building K, facing east

Plate 84: Building L, facing south

Plate 85: Central hall facing north

Plate 86: Building N, facing east

Plate 87: Lecture theatre in Building N, facing south

Plate 88: Office at northern end of building, facing east (Room 38b)

Plate 89: Eastern elevation of Building O, facing north-west, with Building F beneath

Plate 90: Western elevation of Building O, facing north-east, with Building B below

Plate 91: Stair tower block, facing west

Plate 92: Doorway at the northern end of the electrical components store, facing north. Note that the wall here is constructed of brick

Plate 93: Technicians lab and server room on the first floor, facing north

Plate 94: Building P, eastern elevation

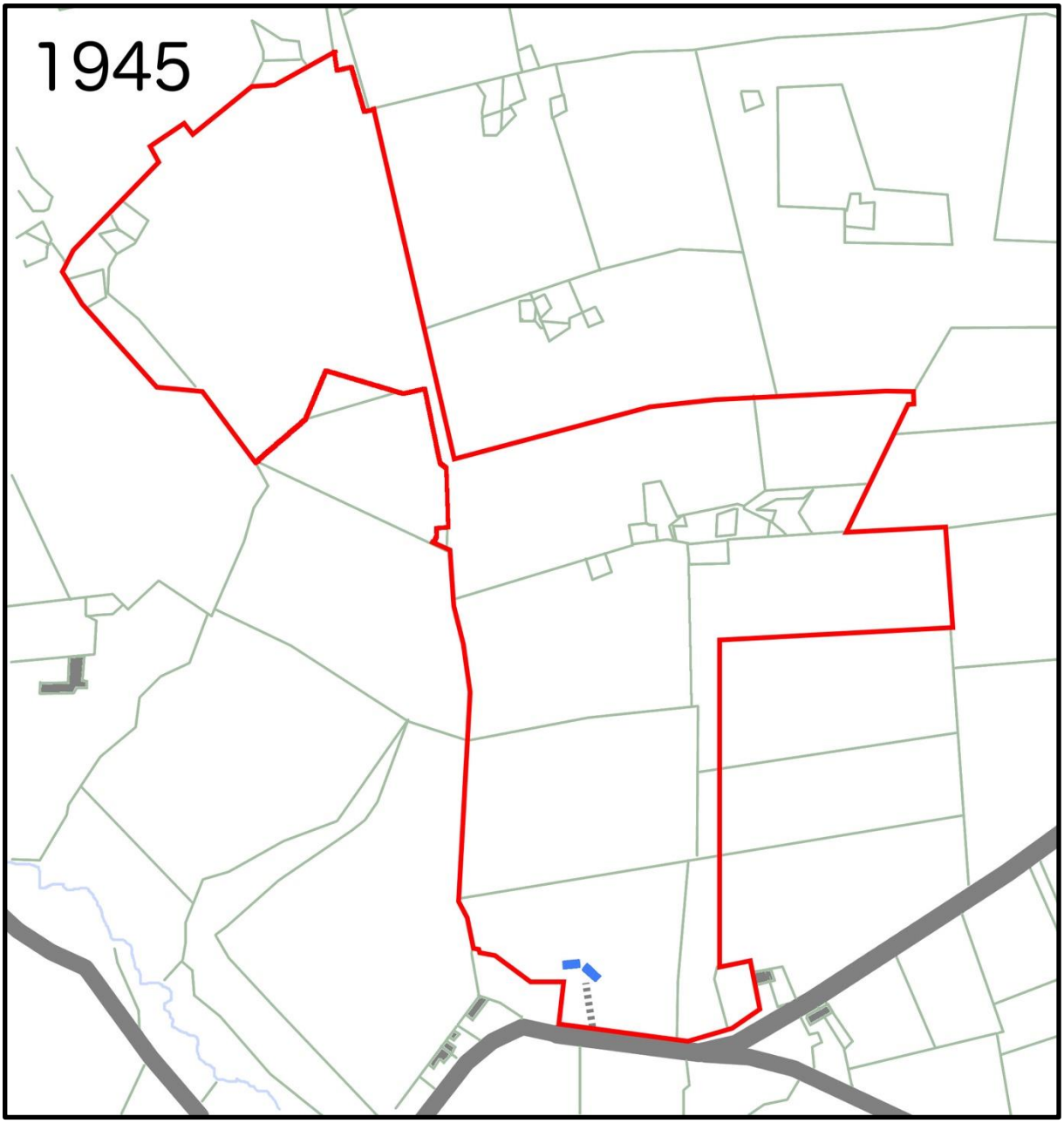
Plate 95: Building P, interior facing north (Room 55)

Plate 96: Building Q, southern elevation facing north

Plate 97: Building Q, western elevation facing east

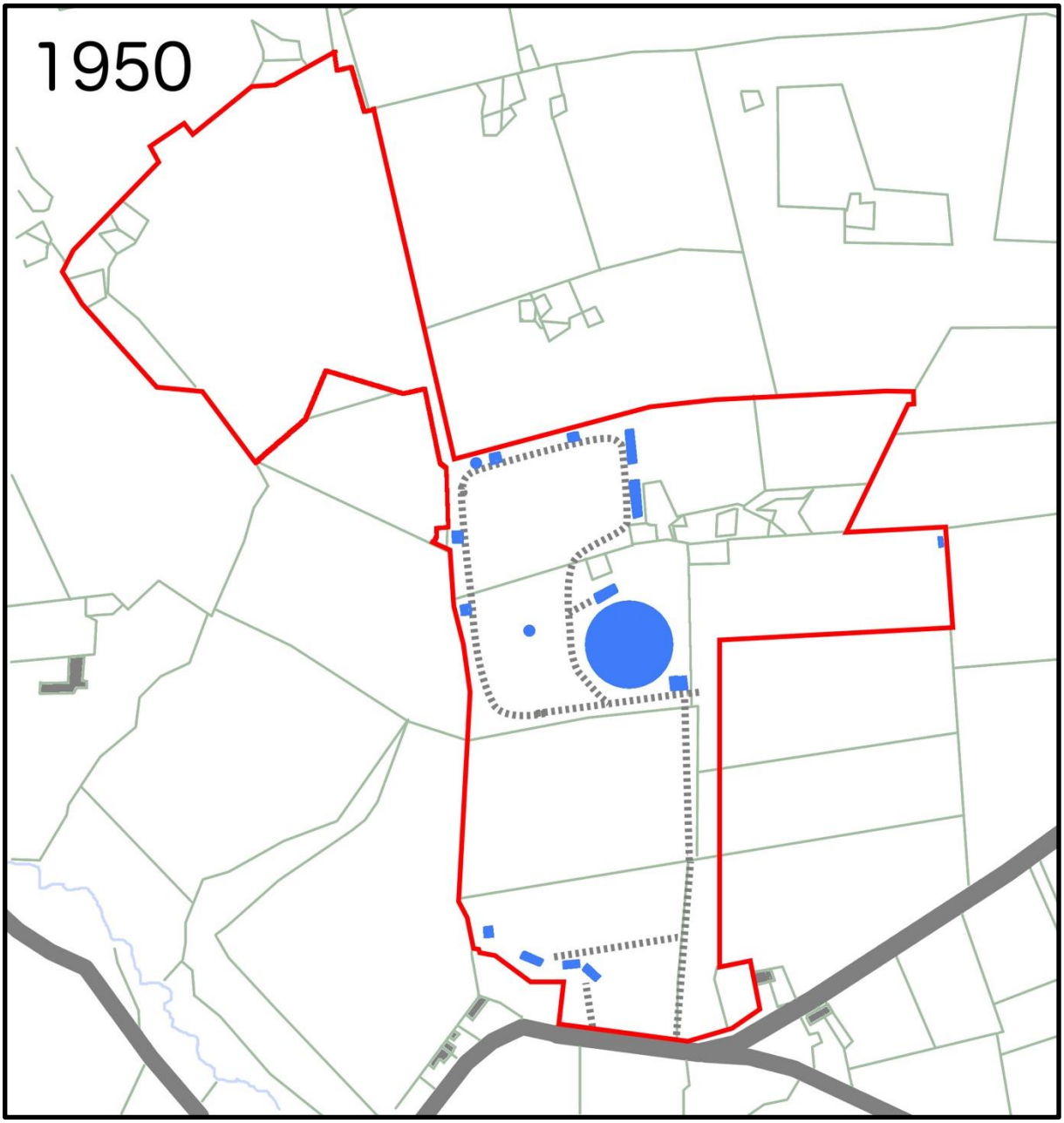
Plate 98: Central corridor, facing west

Plate 99: Access hub (Room 48) at the eastern end of Building Q, facing south-east

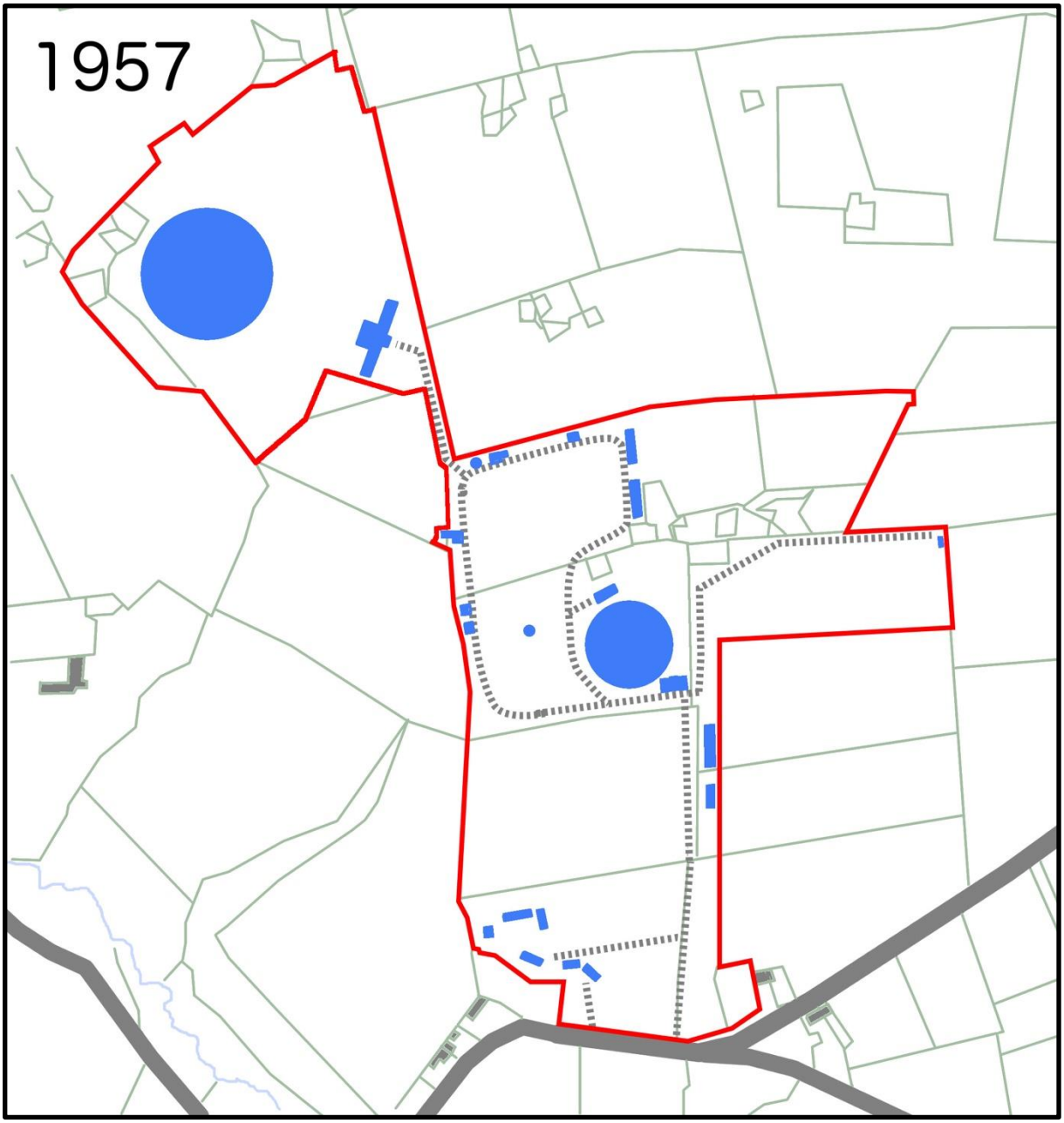


This series of maps uses the field boundaries and landscape features from the 1911 Ordnance Survey map as a background. It should be read in conjunction with the Nomination Documents which provide a key to individual structures.

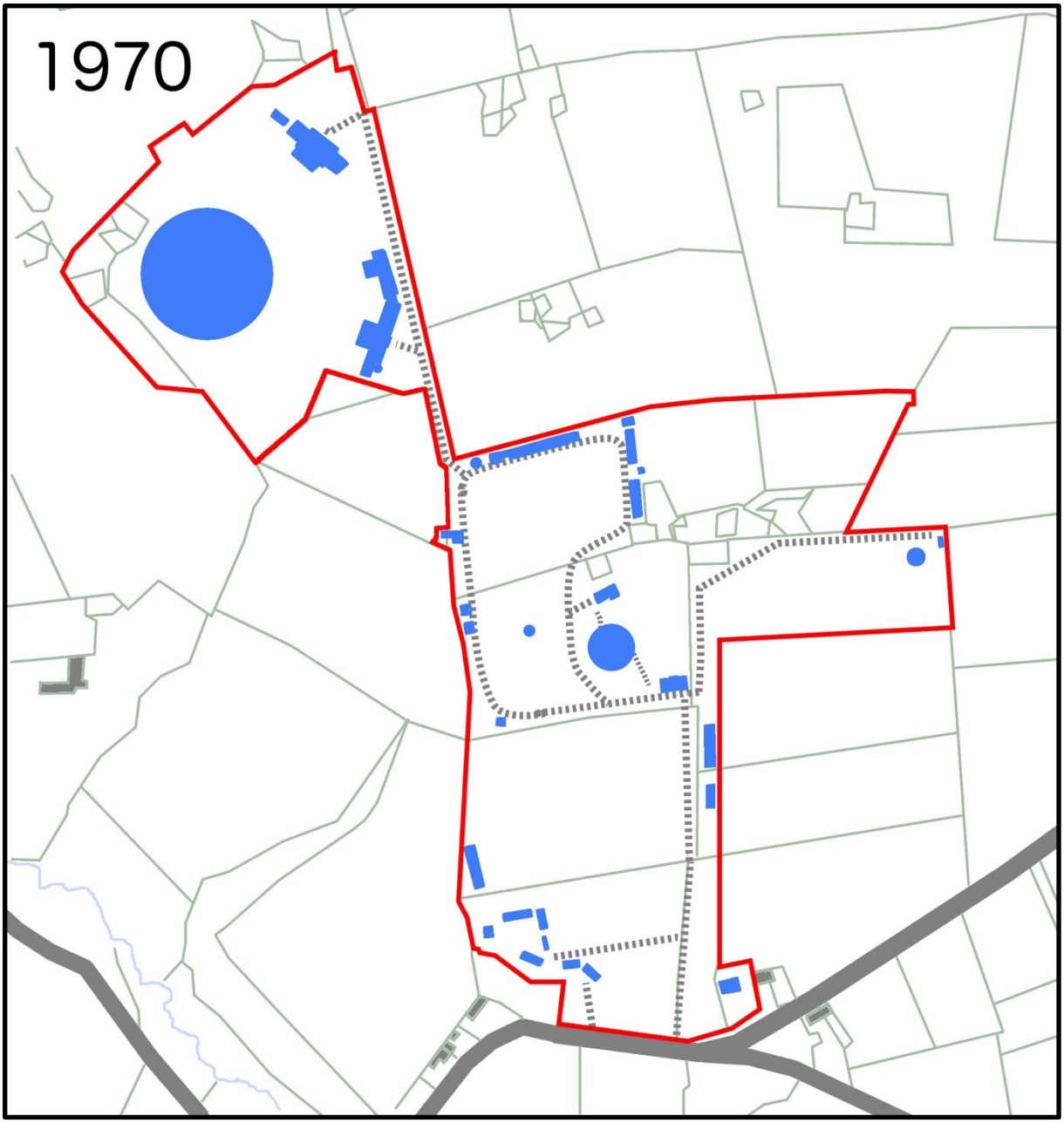
In 1945, when Bernard Lovell arrived at Jodrell Bank to begin his radio astronomy work, the only structures on the site are the Botany Huts (shown in blue) at the southern edge. The original approach track is indicated by the dashed line.



By 1950, the basic layout of the site around the Green, has been established. Lovell began work in the fields north of the original Botany Grounds in 1946, building the track indicated. The first purpose-built instrument, the Searchlight Aerial, was placed in the Green in 1946. The permanent buildings, all still present, are in place from circa 1949 alongside an encircling road. The large Transit Telescope had been constructed in 1947 and the 30-foot Telescope is in place at the northwest corner of the Green. Blackett's Hut is also in place at the eastern extremity.



The major development by 1957 was the construction of the Mark I Telescope (now the Lovell Telescope) and its associated Control Building in a field to the northwest. The Observatory has been further augmented by the Canteen and Dormitory buildings along the southern access road.



By 1970, the Transit Telescope has been replaced by the Mark II Telescope (1964). A wooden building (still present as the Development Lab) has been constructed on the northern edge of the Green between Noise Hut and Polarisation Hut. The Control Building has been extended to the north and a 50-foot Telescope has been placed towards its southern extremity (now the site of the 42-foot Telescope, since 1982). The first permanent visitor buildings (the Concourse Building) had also been constructed in the mid-1960s at the northern edge of the site. The Polar Axis Telescope (1962) has also been constructed alongside Blackett's Hut.

After 1970 there were no significant changes. There were a few further extensions to the Control Buildings, the visitor facilities were extended and then demolished in 2003, replaced by the new facilities dating from 2011, an extension was constructed linking the back of what is now Electrical and Mechanical Workshop to the east of the Green, and the Polar Axis telescope was dismantled. This leaves the site is as it is seen today in the map shown in the Nomination Document..

Additional Information for ICOMOS

1. Boundaries

> The ICOMOS Panel noted that the proposed boundaries for the nominated area differs from the Jodrell Bank Observatory Site boundaries. The ICOMOS Panel would be pleased if the State Party could explain how the proposed nominated boundaries are identifiable on site, as they do not contain the whole Observatory site.

The majority of the boundary for the nominated area does coincide with the Jodrell Bank Observatory site boundary – this is shown in red in the diagram below which is based on the map from section 1e of the nomination document.

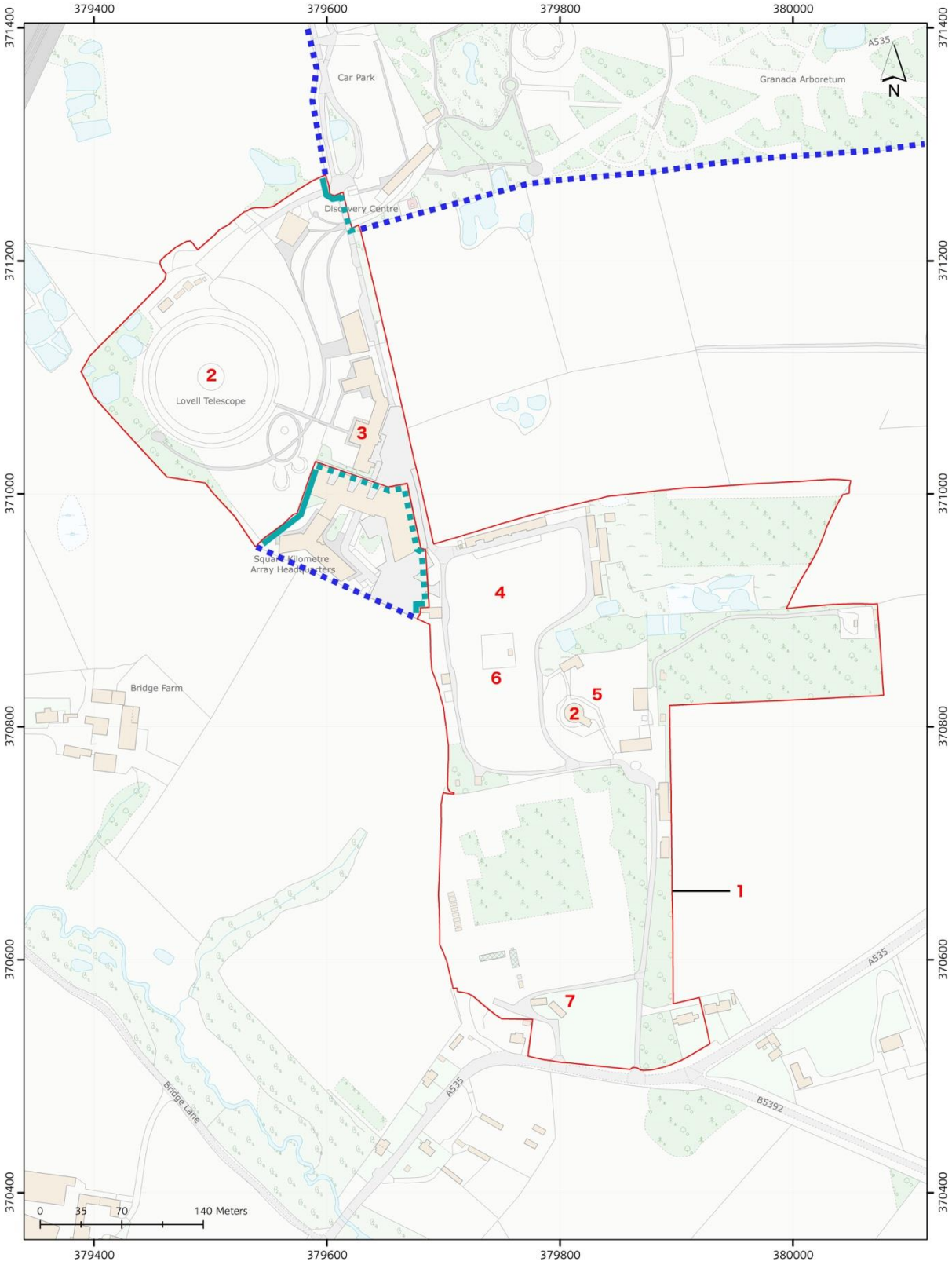
However, in two areas the boundary of the nominated area does differ from the overall site boundary. In the diagram below, the latter is indicated by a dashed blue line whereas the nominated area boundary is indicated by a green line alongside the red boundary line. This green line is shown as solid where there is an existing fence and dashed where it is identifiable by other features on the site. The two areas are:

1. In the north, the proposed boundary separates the Discovery Centre car park and arboretum from the Observatory proper. Where the green line is solid there is a fence, where it is dashed it runs alongside a road. Should the site be inscribed, this section of the boundary will be indicated with appropriate signage in order to inform visitors to the Discovery Centre that they are crossing into a World Heritage Site as they walk towards the Lovell Telescope.

2. In the centre, the new headquarters of the Square Kilometre Array Organisation (an area of the site which was not previously used by the Observatory for research activities – it contained a small overflow car park within a grassed area with some trees and bushes) is separated from the nominated area. The boundary to the west adjoining the visitor area around the Lovell Telescope (part of the nominated area) is already fenced. The section to the north and east runs alongside the SKA HQ building providing a natural delineation. The lower part of the eastern boundary runs from the corner of the building across the SKA HQ car park entrance (following the original hedge-line boundary) and meets the fence around the Radiant Hut.

There are no attributes of OUV in these two areas, both of which are outside the boundary of the nominated area but within the ownership of the University of Manchester. The attributes are indicated in the diagram below with numerical labels as follows:

1. The landscape and layout of the site (within the boundary of the nominated area from the Botany huts to the Lovell Telescope)
2. The Lovell Telescope and Mark II Telescope
3. The Control Building
4. The Green and associated Observatory Buildings
5. The site of the Transit Telescope
6. Sites & remnants of other early scientific instruments
7. The Botany Huts


379400
379600
379800
380000
371400
371200
371000
370800
370600
370400
Car Park
Discovery Centre
Granada Arboretum
A535
N
2
Lovell Telescope
3
Square Kilometre
Array Headquarters
4
6
5
2
Bridge Farm
1
7
A535
Bridge Lane
A535
B5392
0
35
70
140 Meters

2. Conservation

The conservation management plan appears to consider the removal of some attributes which are in poor condition (eg. the Searchlight Aerial). In this case, the plan presumes preservation *in situ* but also refers to preservation by record if necessary. The ICOMOS Panel would be pleased if the State Party could provide further information on the conservation approach for all identified attributes, on the Conservation management plan, especially on whether it will be revised and, if so, what would be the timetable for this revision.

Could the State Party confirm the date of the current Conservation Management plan gazetteer? The Nomination dossier refers to different dates for the current gazetteer – an updated version of 2016, and 2017. In addition, it appears only the 2014 version has been provided. Could the latest version also please be provided?

The ICOMOS Panel discussed the earlier buildings and additions or extensions at the Observatory, which tend to be simple utilitarian structures. They have little by way of aesthetic qualities and they do not reflect quality construction. However, this would appear to be part of their historical character. Could the State Party provide information on how the Management plan of the nominated property is taking into consideration these buildings, in particular in terms of future conservation approaches and associated changes?

The reference in the Nomination dossier to a version of the gazetteer dating from 2017 was incorrect and we apologise for the confusion. The conservation management plan and gazetteer were originally produced in 2014. The main body of the plan was updated in 2016 but the gazetteer has not yet been updated and still dates from 2014. Both are living documents and will be revised, particularly in light of the 2017 listings and the WHS nomination process. This updating is underway and revised versions will be completed by June 2019.

For the specific example of the Searchlight Aerial (ref A05), where the Gazetteer currently states “Presumption in favour of preservation in situ, or if necessary preservation by record”, it is now the case that the aerial will definitely be preserved in situ. It has been listed at Grade II by Historic England in 2017 (three years after the date of the Gazetteer), a status which also gives it statutory protection.

In any case, our conservation approach is that structures that are of significance to the history of the site will be conserved as required while preserving their authenticity and integrity as far as possible. A combination of both low historical/scientific significance and poor condition would be required before removal of a structure would even be considered. This approach has been adopted as a formal University policy applying to the nominated area but is yet to be clearly reflected in the current versions of the Conservation Management Plan and Gazetteer. This will be addressed in the next version which will be available before July 2019.

When any work is considered on the site a Heritage Impact Assessment will be conducted which will confirm both the historical/scientific significance and condition of any relevant feature. The approach described above can then be adopted with confidence that the attributes of the site will be protected. This will also apply to any utilitarian buildings with little aesthetic value and of low-quality construction but which may have historical/scientific significance.

3. Management

In addition to the major structures or instruments and the buildings, the ICOMOS Panel noted that there are smaller technological aspects of the Observatory that may have historical significance and deserve some consideration in overall conservation planning for the nominated property. Such items may continue in use, may be obsolete, or may become obsolete. The ICOMOS Panel is interested in knowing if there are future actions planned to identify such smaller items, evaluate their heritage value, and conserve them as part of the Observatory's heritage.

For several years we have been operating a policy of conserving a range of aspects of our technological heritage. For example, when data recording techniques in VLBI (Very Long Baseline Interferometry) have improved and equipment has become obsolete we have been careful to retain samples of the old hardware (tapes, recorders etc) which are labelled and catalogued. This approach is now embedded so that Observatory staff are conscious of the potential heritage value of all aspects of their work.

Jodrell Bank has long held an archive of documents, notably in the formal archive held at the John Rylands Library in the University of Manchester, but also in a more informal archive held at the Observatory. As part of our current First Light project (funded by the UK's National Lottery Heritage Fund), we are cataloguing this Observatory archive and transferring it into the formal archive. This project has been supported by the appointment of a Heritage Officer (funded by the National Lottery and the Jodrell Bank Discovery Centre).

The project also includes recording oral histories with retired staff and key representatives of the local community as well as collection of important photographic records of the Observatory's history. An online portal being developed for this archive will also include links to archives relating to Jodrell Bank which are held elsewhere.

4. Monitoring Indicators

The proposed monitoring indicators address a range of elements, which do not seem to directly address conservation of the identified site's attributes. Could the State Party provide information on the monitoring of the state of conservation of the identified attributes of the nominated property?

The attributes conveying the OUV are:

1. The landscape and layout of the site
    - Exemplifying the story of the development of a new science as the scientists move northwards across the site from the Botany Huts to the Green and on to the Lovell Telescope, laying down traces of its emergence on the landscape.
2. The Lovell Telescope and Mark II Telescope
    - The two iconic very large telescopes that dominate the site.
3. The Control Building
    - Purpose built for controlling the Lovell Telescope and including ancillary functions such as staff offices, laboratories and seminar rooms (all of which it still does today).
4. The Green and associated Observatory Buildings

    - The modest concrete framed huts, the first permanent buildings marking the institution of the Observatory, arranged around a central green space used for experimentation and leisure activities.
5. The site of the Transit Telescope
    - Where the Mark II Telescope now stands, some remnants of this early pioneering instrument still exist above and below ground in the area between the road and the original hedgerow.
6. Sites & remnants of other early scientific instruments
    - The evolution of the science has left a trail of locations and physical remains of instruments across the site, including the Grade II listed Searchlight aerial and a series of concrete bases, cable runs etc.
7. The Botany Huts
    - The two wooden huts present when Bernard Lovell arrived in 1945 and used by the gardeners from the Botany Department, later housing the astronomers before they built their own permanent buildings.

In Section 6a of the Nomination dossier and in the earlier clarifications to ICOMOS we describe a number of management tools and procedures for monitoring and ensuring the conservation of the site's attributes which we summarise below. In each of these, the attributes above as described in the Nomination dossier and the Conservation Management Plan/Gazetteer will be identified for special consideration.

Conserving the authenticity/integrity of telescopes and scientific equipment is monitored and managed through weekly engineering meetings chaired by the Associate Director (Observatory) and attended by all lead engineers. This team is responsible for the maintenance and conservation of telescopes, all of which are inspected and maintained regularly on regular daily, weekly and longer-term regimes as describe in section 6a. Any works required to maintain the structures are developed in consultation with Historic England (this system has been in place for the Lovell Telescope as a Grade I listed structure since 1988 and will be rolled out to the rest of the site and its attributes).

The University of Manchester Directorate of Estates and Facilities works with the various teams at Jodrell Bank to care for the built assets across the Jodrell Bank Observatory site. This includes undertaking visual condition surveys of all built assets to understand and monitor building fabric and services infrastructure. Understanding of the condition reports and preparation of ensuing long term maintenance schedules is the responsibility of the Directorate's Professional Services Unit which comprises teams of building surveyors, services engineers, asbestos managers, fire officers and energy engineers. Building condition surveys are reviewed every five years to ensure continuous updating and tailoring of long-term maintenance investment.

The Directorate of Estates and Facilities undertakes maintenance in accordance with an agreed Maintenance Strategy. The Directorate is responsible for compiling the University's long-term maintenance investment plan and associated budget. The content of the condition surveys for the Observatory site are analysed and works packages extracted and prioritised against the appropriate year for investment planning.

A condition survey for the property, which will use the original Conservation Management Plan and Gazetteer as a baseline, will be commissioned every 5 years from external consultants. This will form the basis for long-term monitoring of the attributes.

In addition to planned maintenance there is a site-based maintenance co-ordinator who inspects buildings on a daily basis and initiates, liaises and checks quality of maintenance work. This is in conjunction with Estates and Facilities Professional Services staff who can be called upon to advise on more significant repairs requiring a specific course of action or preliminary specification production.

The liaison between the people who work on the site and the University Directorate of Estates & Facilities is conducted through a quarterly user group meeting chaired by the Estates representative responsible for the site. This group, which will be attended by the Associate Director (Heritage) or representative, picks up a range of issues across the site and will champion its heritage.

Of course, Planning Law also influences project execution. Much of this planning legislation is referred to in the Conservation Management Plan and in the World Heritage Site Management Plan. Listed building consent is required for any works to Grade I listed structures and any works over and above maintenance items to Grade II listed assets. Initial consultation will take place with the Associate Director (Heritage). Any project involving an existing listed structure or building (and following inscription on the World Heritage List, any structure on site), including its curtilage, will involve consultation with Cheshire East Council Planning Authority Conservation Office (and Historic England where appropriate). Heritage impact assessments will be undertaken as necessary together with photographic diaries of replacement works undertaken, e.g. roof coverings. Ecological surveys are also used to determine and minimise impact upon wildlife and local vegetation as required (particularly if new build or extension is the desired output), in accordance with University sustainability policies and local biodiversity action plans.

Further to these management tools and procedures, on p186 of the Nomination dossier we proposed a set of indicators, effectively metrics for the state of conservation of the attributes. These covered:

Condition of the Lovell and Mark II Telescopes	Attribute 1
Any major conservation projects on the Lovell and Mark II Telescopes	Attribute 1
Repairs and maintenance to Observatory Buildings	Attributes 3, 4 & 7
Conservation & maintenance to archaeological remains	Attributes 5 & 6
Maintenance to landscape areas	Attribute 2
Level of visitation	Level of impact on any attributes
Condition surveys	All attributes
Conservation Management Plan	All attributes

The intention is that recording of the measures set out in these indicators will provide a good measure of whether the planned amount of time, investment etc within the annual cycle has proved sufficient to sustain the attributes in good condition or to have improved their condition where it is less than optimal. In the event that sustaining/improving the condition of attributes in one annual cycle falls short, the indicators will provide a trigger to invest more time and resources in future annual cycles.

We appreciate that the indicators presented in the Nomination Dossier could have more explicitly measured how the physical attributes of OUV are being sustained and where appropriate improved (e.g. the conservation work on the Botany Huts) rather than the processes by which this is achieved. So, for example, we suggested “days lost to unplanned maintenance” for the Lovell and Mark II Telescopes. This was intended to record the additional work required beyond the planned maintenance programme. However, it could instead present the number of days planned maintenance per year in order to keep the telescopes in good condition. For the Lovell Telescope, there could also be an indicator such as “completion of the removal and replacement of the panels comprising the original dish of the telescope by 2020”. For the Botany Huts, a specific indicator might be “completion of conservation and repair programme by 2020”.

We will revise the indicators before July 2019 so that they relate more explicitly to the maintenance of the attributes of OUV in good condition and to bringing into good condition those that are in less than good condition at the moment. It should also be noted that implementation of the measures set out in the Conservation Management Plan and the schedules for maintenance and repair of individual structures will ensure that the condition of all attributes of OUV will be sustained and, where necessary, improved.