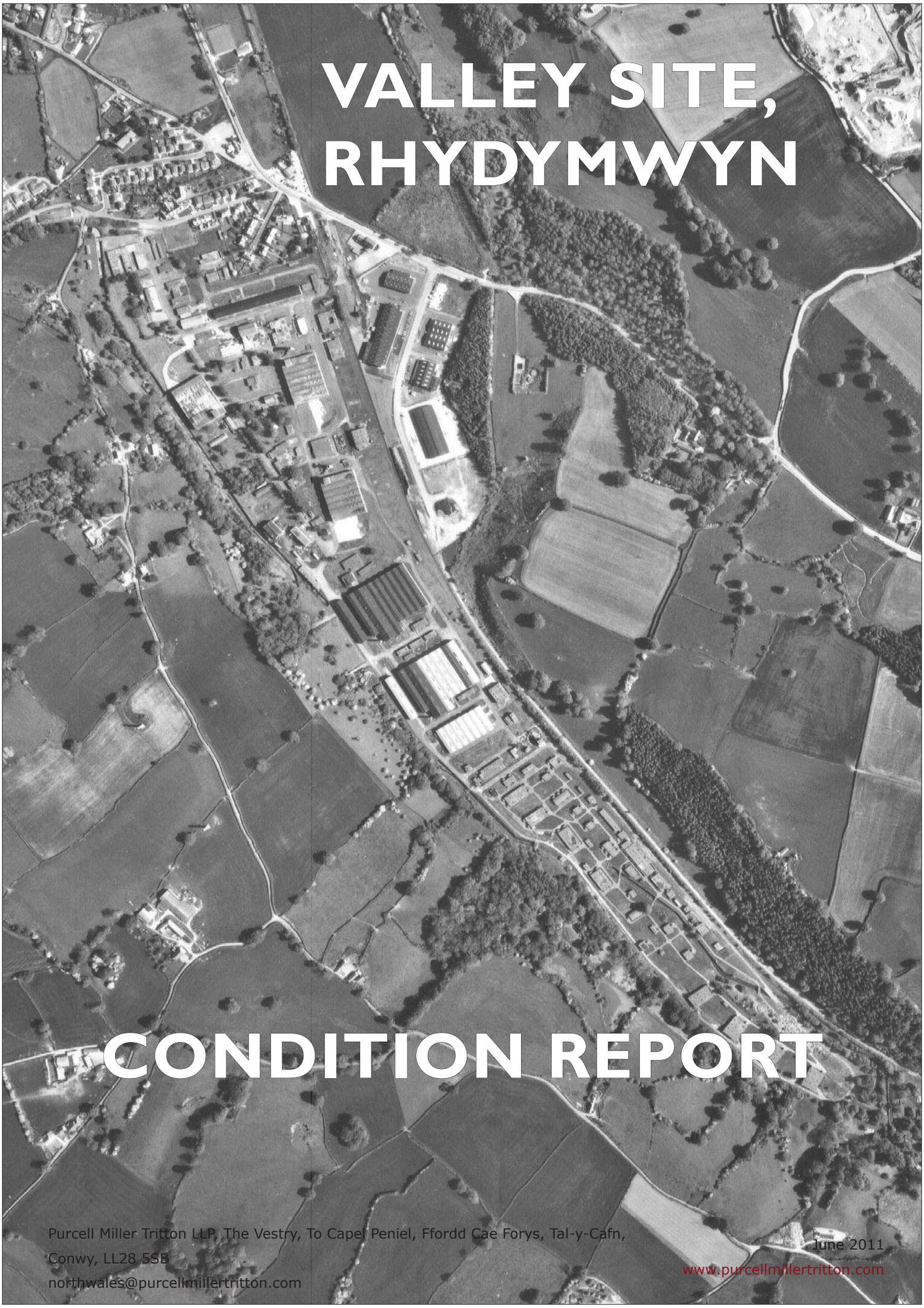

VALLEY SITE, RHYDYMWYN

CONDITION REPORT

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June 2011

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Valley Site, Rhydymwyn, Condition Report

VALLEY SITE, RHYDYMWYN

Condition Report

CONTENTS

APPENDICES

1.0 Introduction

Purcell Miller Tritton was commissioned by the Department for Environment Food and Rural Affairs (DEFRA), to undertake a condition survey and security survey on and for the former MS Valley Site, Rhydymwyn, Flintshire, North Wales. Survey work was undertaken during November and December 2010.

Background work has included:

- Assessment of the onsite documentary archive held at the Valley Site Visitor Centre, and documents held by the Rhydymwyn Valley History Society.
- Discussion with the on-site team to understand the day-to-day management and issues relating to the building and site, how the site operates and a profile of its use and users.
- Review of existing reports, including the Birmingham Archaeology Historic Environment Management Plan (2006). This report has been invaluable in providing background information.

1.1 The Format of the Report.

The report has been split into two distinct sections, the condition survey and the security survey and recommendations. The condition survey, which follows this introduction, splits the site into the following sections:

- The West Bank and pre WWII features.
- The Process Area
- The Danger Area
- Other Features.

A series of different systems have been used in the past to identify individual buildings. This report follows the methodology identified within the Birmingham Archaeology report, and uses the system known as the 'carillion' or 'citex' numbering system, which are the most commonly used across the site. This allows ready cross-referencing with other reports and identification of individual buildings. Some of the pre-WWII features do not have these references, and consequently these are referred to by their SMR (scheduled monument record) numbers, identified by Birmingham Archaeology.

1.2 The Valley Site

The site occupies around 35 hectares of the Alyn Valley, to the south of the village of Rhydymwyn, Mold, Flintshire. Once part of the extensive Gwysaney Estate, the Parish of Rhydymwyn was established in 1865. Lead mining in the area is known to have been extensive, and a foundry associated with nearby mines is depicted on several early maps for the area. Following the closure of the foundry land use on the site was largely agricultural in character. During this period, the Ministry of Supply was reviewing options, nationwide, for the development of a chemical weapons production and storage facility. Rhydymwyn was identified as an option, and consequently purchased in 1939 for development as MS valley.

The site was bounded to the east by the Chester to Denbigh railway, and a rail network was developed within the site, with sidings adjoining the main line. The River Alyn was culverted to create a level site, and over 100 buildings were constructed to serve the site and its substantial workforce. A complex network of subterranean tunnels were constructed under the hillside to the west of the site to provide secure storage.

During World War II the plant produced ordnance containing mustard gas, and has important links with the development of the Atom Bomb through the 'tube alloys' project. In the immediate Post-War period the site was used to store German nerve gas. In the 1960's Britain determined to relinquish its chemical weapons, and the site became redundant. The site however remains on the international register of chemical weapons related sites. Subsequently the site became used as a buffer store for foodstuffs and emergency rations, finally closing in 1994. Subsequently a programme of demolition was undertaken, which involved the removal of some 75% of the original buildings.

The site is currently managed on behalf of DEFRA by interserve, who have a permanent staff based on site. The site is also home to North-East Wales Wildlife (NEWW), who have a permanent base on the site, and manage the wildlife and ecological aspects.

Following the significance appraisal undertaken by Birmingham Archaeology, the key process buildings (45, 50, 59 and 65) were listed, and the danger area designated a scheduled monument. The official descriptions are included in the appendices of the report.

1.3

Many of the buildings at MS Valley are now over 70 years old. With this in mind, that they have survived is testimony to their robust construction. However they are now suffering from significant problems, and many of the buildings will be lost if action is not undertaken in the near future.

The majority of the buildings also have statutory protection, following the scheduling of the danger area and the listing of buildings 45, 50, 59 and 65 in September 2008. There is therefore an obligation on the owners of the site to maintain the buildings and their environs. The site has, however, suffered from a lack of investment and maintenance since the buffer store for foodstuffs and emergency rations closed in 1994

The problems effecting the buildings can largely be attributed to water penetration, resulting in water retention in areas of reinforced concrete and consequent decay. The speed of construction, and consequent lack of consistency in the concrete and brickwork also contribute. The drains have been blocked, partly due to contamination, but this has resulted in water being retained in and around the buildings. To the majority of the buildings the rainwater goods were asbestos and have consequently been removed and no replacements provided. Other significant problems have been caused by distortion in roof slabs, subsidence (especially where the River Alyn has been culverted), tree growth (both planted and seeded) very close to the buildings and the lack of movement joints in some of the larger buildings.

The basic causes of decay can be generally summarized as follows:

- Lack of adequate drainage.
- Deterioration and failure of roof coverings.
- Removal of rainwater goods (or blocked in the case of buildings 45, 50 and 59).
- Plant growth adjacent to the buildings and walkways.
- Horizontal cracking associated with distortion in the reinforced concrete roof slabs.

All of the above have been significantly exacerbated by a lack of routine maintenance.

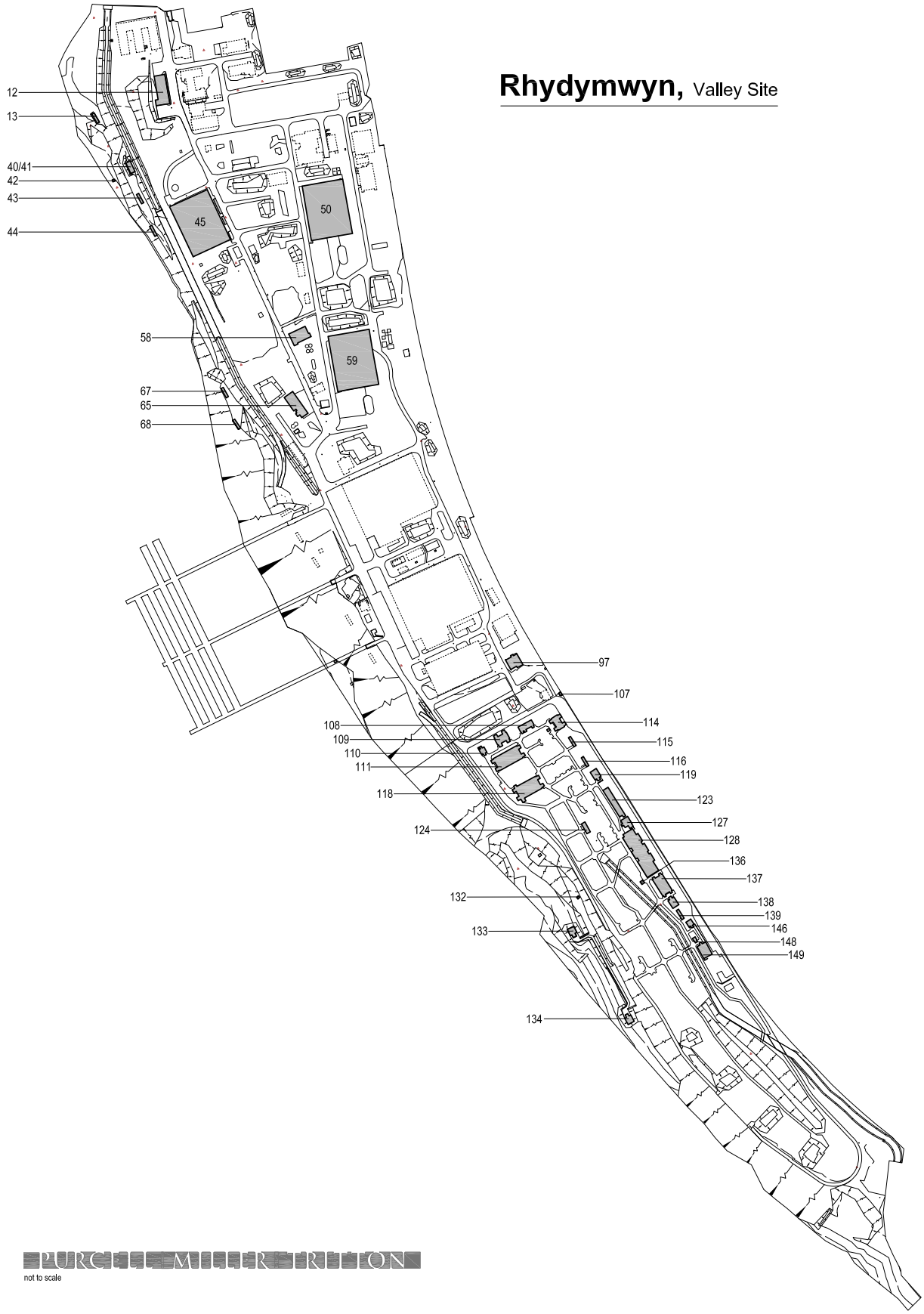

Fig. 001 - Citex Numbering System

2

THE WEST BANK AND PRE-WORLD WAR II FEATURES

2. THE WEST BANK AND PRE-WORLD WAR II FEATURES

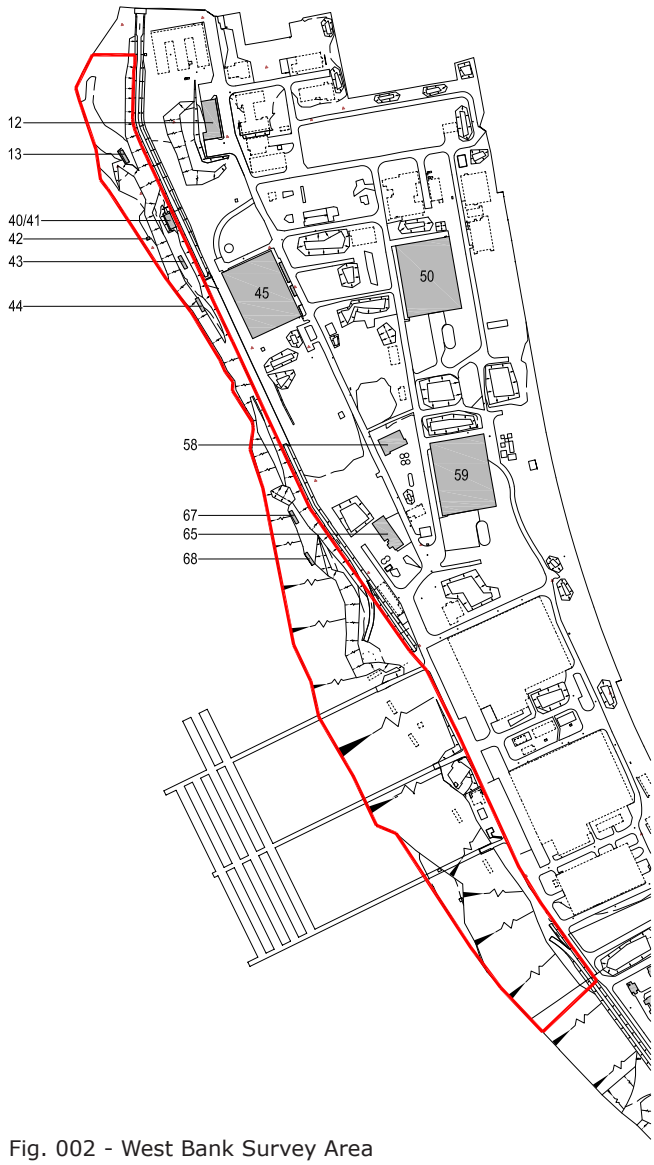

Fig. 002 - West Bank Survey Area

2.1 Building 13 ARP Shelter, West Bank

There are four ARP shelters along the western bank, with a further two in the danger area. There were two more shelters south of buildings 67 and 68, but these have been demolished. Building 13 is the Northern-most of the ARP shelters. The shelters follow the same pattern, comprising splinter-proof 14" walls, in English bond, with reinforced (in-situ) concrete roofs.

They are rectangular in plan, with entrances set at opposing ends; Building 13 has the doors at the south-west and north-eastern corners. Internally there were originally two curtained-off toilets at either end, segregated from the entrance lobbies by the internal blast walls (opposite the entrance doors). The entrances would originally have had angled gas curtains, with timber doors internally. The slab to shelter 13 is in reasonable condition when viewed from above. The shelters do not appear to have had a roof covering (i.e. an asphalt coating). The lack of an asphalt coating results in saturation of the slab and retention of moisture, subsequent corrosion of the reinforcing bars results in cracking. This is evident internally, where the northern portion of the slab is particularly wet. There are horizontal cracks at high level, and especially along the South Elevation.

Fig. 003 Building 13 ARP Shelter, West Bank

Fig. 004 Building 13 ARP Shelter, West Bank

2.2 Building 40/41 Former Booster Pump House and Sub-Station SS8.

Situated on the Western Bank towards the north end of the site is the former emergency booster pump house. Originally the building was designed as a back-up should the main pump house be out of commission. It housed a 2,000 gallon per minute Mather and Platt pump, which could be used in an emergency to take water from the discharge of the underground mine pumps, or the river, and deliver it at 250ft head to the cooling water circuit, boiler feed pumps or fire hydrants. In order to prevent mine water being inadvertently pumped into the Birkenhead supply thus contaminating the drinking water supply, a section of the inter-connecting line was left uninstalled until the any such emergency arose.

The pump house is a single storey brick building constructed with solid fourteen-inch thick walls with a reinforced concrete roof cast *in situ* that is further supported internally by steel joists. Extending above the roof line is a brick structure which housed a primer tank used to start the pumps, and adjacent to this is a metal framework, which formed part of the structure which carried the cables across the river Alyn.

2.2.1 Roofs

The bituminous covering to the reinforced concrete slab is visible where it turns down the face of the slab. The covering to the West elevation has extensively failed, with sections missing and the covering, where visible, is blistered and failing. There is extensive organic growth atop the roof slab with grass and small plants covering the roof. The extent of water ingress internally suggests that the covering has failed in numerous locations.

2.2.2 Walls

The walls are 14” thick brickwork in English bond. The general brickwork and pointing are in good condition, there are however ‘jacking’ cracks to each corner of the building, varying between two and three courses below the roof slab, these will need to be repaired and monitored.

There are cracks above the lintels over the doors into rooms 2 and 3 (west elevation) extending up towards the roof slab, suggesting some limited settlement to the South end of the building. Given the length and rigidity of the structure (there being no provision for thermal movement) some cracking is inevitable. There are a series of trees growing in very close proximity to the building fabric, particularly to the east, and the north-eastern corners. These should be removed before significant disruption to the building fabric occurs.

2.3.3 Interior

The building is divided into three spaces, the pump room (room 1, north), the sub-station and control room (room 2, centre) and the Fire extinguisher/battery room (room 3, south). There is extensive water ingress, particularly in room 2, suggesting extensive failure in the roof coverings.

The two substantial feeder pipes remain in-situ in room 1 and, whilst corroded, they remain in reasonable condition. The void surrounding the pipes is covered with a plate, which is corroded.

The interior of the building is very wet, particularly room 2, suggesting extensive failure of the roof coverings above.

Fig. 005 Building 40/41 Former Booster Pump House and Sub Station SS8

Fig. 006 Building 40/41 Former Booster Pump House and Sub Station SS8

Fig. 007 Building 40/41 Former Booster Pump House and Sub Station SS8

Fig. 008 Building 40/41 Former Booster Pump House and Sub Station SS8

2.3 Building 42 Lookout Post, near Booster Pump House.

Originally there were three lookout posts along the west bank, of which two remain; one adjacent to the gunpowder magazines (see building 132) and this one, building 42, adjacent to the pump house. The original purpose of the buildings was to undertake a fire watch during air-raids.

The building is a small rectangle in plan, with a cast in-situ reinforced concrete roof. Viewing slits are provided to the North, South and East, formed using in-situ concrete. The impression of the timber formwork is very clearly visible on the inside faces.

Building 42 is generally in good condition, there is extensive moss growth on top of the reinforced concrete roof slab, but the building is dry internally. There is no visible evidence that the slab ever had a covering, which seems probable given the intermittent use of the structure historically. There are a couple of spalled bricks, but the brickwork is also in good condition. There are a series of small trees in close proximity to the building (south-eastern corner), which will cause displacement in the medium term, these need to be removed.

Internally the space is dry, but there is accumulated debris as the building is used by animals for shelter. On the walls are remnants of the brackets for the telephone.

Fig. 009 Building 42 Lookout Post, near Booster Pump House

2.4 Building 43 ARP Shelter, West Bank

There are four ARP shelters along the western bank, with a further two in the danger area. There were two more shelters south of buildings 67 and 68, but these have been demolished. Building 43 is the Northern-most of the ARP shelters. The shelters follow the same pattern, comprising splinter-proof 14" walls, in English bond, with reinforced (in-situ) concrete roofs. They are rectangular in plan, with entrances set at opposing ends; Building 43 has the doors at the south-west and north-eastern corners. Internally there were originally two curtained-off toilets at either end, segregated from the entrance lobbies by the internal blast walls (opposite the entrance doors). The entrances would originally have had angled gas curtains, with timber doors internally.

There are significant spalled sections to the upper arris of the concrete slab, which has begun to expose sections of reinforcement. This, in turn, is starting to corrode. The brickwork is in poor condition, there are numerous badly spalled bricks, plants growing at high-level, including a tree centrally on the east elevation. There are similar cracks at high level as seen elsewhere, those on the South elevation being particularly noticeable.

Internally the underside of the roof slab is very wet. This is most likely due to the amount of organic growth present on the roof retaining moisture, as it is unlikely that the roof had a covering. There is also a substantial crack in the concrete floor slab.

Fig. 010 Building 43 ARP Shelter, West Bank

Fig. 011 Building 43 ARP Shelter, West Bank

2.5 Building 44 ARP Shelter, West Bank

Building 44 follows the same pattern as Building 43. The doors are to the North-East, and South-West corners.

The roof slab is completely covered in growth, with ivy, grass, plants and small trees. All of which is retaining significant moisture on top of the slab, and the roots of the plants will be accelerating the deterioration of the surface of the roof slab. It seems probable that it is the retention of this moisture which has resulted in corrosion of the reinforcement, and consequent cracking to the slab visible internally. The slab has also has spalled sections to the upper and lower arises.

The brickwork is badly spalled, particularly along the east elevation, although the 'jacking' cracks are less pronounced than on building 43.

The west elevation is very overgrown, preventing inspection.

Once again the vegetation could do to be cut back from the immediate vicinity of the building.

Internally the underside of the slab is saturated, with significant cracking (which is now allowing direct ingress of water).

Fig. 012 Building 44 ARP Shelter, West Bank

Fig. 013 Building 44 ARP Shelter, West Bank

2.6 Building 67 ARP Shelter, West Bank

Building 67 is located further south, but still follows the same pattern as Building 43. The doors are, once again, to the North-East, and South-West corners.

The roof slab is covered in a very large ivy, the trunk of which is situated in the North-Eastern doorway. Some of the branches of the ivy are starting to grow within the mortar joints, resulting in displacement of the surrounding masonry. Consideration should be given to removing this plant. There are some spalled sections visible to the Northern edge of the slab, however the remainder is obscured from view.

The brickwork is generally in slightly better condition. There are spalled bricks to the east, but the high-level cracking is less pronounced. There is cracking to the south, which is being exascerbated by the presence of the ivy growing within the cracks.

Internally the underside of the roof slab is very wet, and there are cracks running east-west where the reinforcing bars are corroding. There is a crack across the floor slab also. The adjoining tree growth is contributing to this distrurbance.

Fig. 014 Building 67 ARP Shelter, West Bank

Fig. 015 Building 67 ARP Shelter, West Bank

2.7 Building 68 ARP Shelter, West Bank

Building 68 follows the same pattern as neighbour Building 68. The doors are to the North-East, and South-West corners. The South-Eastern corner is partly built into the hillside.

The roof slab is covered in ivy and plant growth, but the exposed sections are in slightly better condition than building 67. There are some substantial trees growing in very close proximity to the building along the west elevation, consideration needs to be given to their removal before they cause significant displacement in the adjoining building fabric. There are spalled faces to the bricks evident particularly along the west elevation.

Internally the brick is very wet where the building is set into the hillside and to the underside of the roof slab. There is a depth of debris on the floor, which may conceal cracks to the slab beneath.

Fig. 016 Building 68 ARP Shelter, West Bank

Fig. 017 Building 68 ARP Shelter, West Bank

2.8 Pre-war industrial features.

To the western bank there are a range of features identified which pre-date the development of MS valley. Many of these features relate to the use of the site for mining during the 19th and early 20th centuries. These features do not have allocated building numbers and are therefore referred to by their SMR (scheduled monument record) numbers. These also allow cross-referencing with the Birmingham Archaeology documentation. Only those features readily identified within the boundary of the site (as defined by the wartime palisade fencing) and whose condition is relevant and likely to necessitate works, have been surveyed.

2.9 SMR 98049 Foundry Wall

The foundry wall dates from the second half of the 19th century, and would have formed the western elevation of the foundry building itself. This section of wall is probably the earliest remaining on the site. To the west the ground level is higher, and the wall serves as a part retaining wall for the banking above. To the east, the excavation of the culvert has resulted in additional build-up of material which will bolster the stability of the wall.

Towards the northern end of the wall a section has partly collapsed, but the growth around the debris indicates this is historic. Generally the wall is stable but there is significant growth to the wall head and trees in quite close proximity to the southern end. The wall should be monitored for stability and some limited consolidation is needed to the wall head, and to remove some of the more disruptive plants.

2.10 SMR 98050, 98051 & 98052 Revetment and Trackway.

To the north of the foundry wall is a revetment wall cut into the hillside. Above the wall are the remaining sections of trackway, much of which is outside the modern site boundary. The wall is of dry stone, built into the hillside, and remains up to 1m in height. Once again the spoil from the construction of the culvert is evident to the east, which may conceal more extensive structure.

The wall is suffering from displacement by tree roots, and this is particularly evident to the southern end of the wall where two trees (with trunks of some 150-200mm diameter) are growing out of the wall head, this is causing significant displacement of the structure in these areas. Consideration should be given to the removal of these two trees, and some of the more prevalent undergrowth.

2.11 SMR 98062 & 98072 Garden and Boundary Wall.

North of the foundry features, the garden of the adjacent house has been curtailed with the boundary wall extending within the site (SMR 98072). A terrace is clearly visible, delineated by a row of yew trees to the east.

The boundary wall extends down the valley side, to the north of the garden. The wall remains intact outside the site, with a section missing where the path adjoins the palisade fence. A further fragmentary section remains in situ below the path. The Birmingham Archaeology report suggests that this formed the northern boundary of the foundry site.

The section of wall within the site is generally stable, albeit largely concealed with undergrowth. It's stability should be monitored, and action taken if the adjacent growth starts to disrupt the fabric of the wall.

2.12 The Underground Storage Caverns

The Valley Site was designated the principle national store for mustard and consequently required storage for material from other sites as well at that produced at the valley. A key principle in the choice of Valley was the steep limestone hillside, which facilitated the excavation for underground storage. Work began in 1939 on excavating the underground storage caverns and was completed in 1942.

The underground storage caverns extend under the hillside to the west of the site. The caverns comprise of two c.4m-wide access tunnels driven c.250m into the hillside and a slightly wider (c.5m) central tunnel. The ends of the north and south tunnels are connected to two smaller ventilation shafts that emerged near the top of the hillside via sixty-foot high chimneys (these have since been curtailed).

Running approximately east-west, interconnecting with the access tunnels are the storage tunnels (perpendicular to the access tunnels). These are designated A-D running east-west (refer to Wardell Armstrong Report, June 2010). Originally, Chambers A-C were designed to be c.170m long by 9m wide, and D was 2m wider in order to accommodate bulk storage containers. The extensions approved in 1940 meant that Chamber C was also widened to 12m, and Chamber A extended 68m north and Chamber B 82m north. Both Chamber A and Chamber B were also provided with overhead cranes to aid the distribution of store munitions (Birmingham Archaeology vol. 2. P.54)

During the course of this survey the tunnels were not surveyed as a restricted spaces license is required. However, Wardell Armstrong Engineer's completed a survey of the tunnels in June 2010.

In summary the tunnels were generally found to be in reasonable condition, however issues were identified with the buttressing at Position D1 (which should be removed and the wall assessed), and a 6m x 6m section of the roof of cavern a which is at risk of collapse, which should be cordoned off from access.

It is important that the periodical monitoring (5 yearly), currently being undertaken continues and that the tell-tales continue to be monitored. Remedial work should be considered to the key areas above and as identified in the separate Wardell Armstrong report.

Fig. 018 Pre WWII Features Garden Wall

Fig. 019 Pre WWII Features Garden Terrace

Fig. 020 Pre WWII Features Foundry Wall

Fig. 021 Pre WWII Features Foundry Wall

Fig. 022 Pre WWII Features Revetment Wall

Fig. 023 Pre WWII Features Foundry Remains of Former Farm Building adjacent to Magazines

3

THE PROCESS AREA

3. THE PROCESS AREA

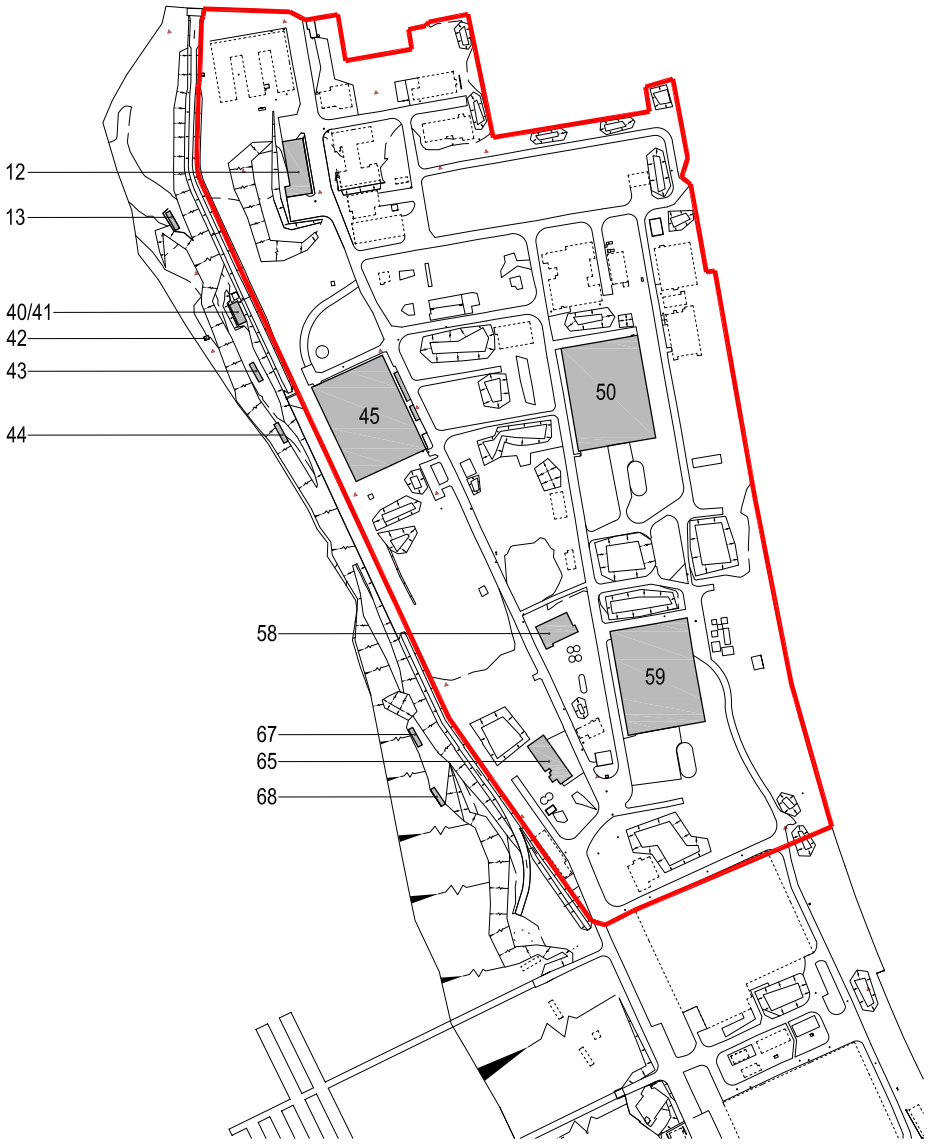

Fig. 024 - Buildings in the Process Area

3.1 Building 12 – the Process Garage

Building 12 originally served as the garage and workshop for vehicles on the valley site. It is a single-storey building with a steel trussed roof structure, which is exposed internally. The garage originally had three inspection pits (now infilled) and an oil store, in a flat roofed annexe, at the southern end of the building. The walls are one brick thick and laid in English Bond, with piers internally supporting the truss bearings. The piers were one and a half bricks thick, supporting ten steel roof trusses on concrete pads that are visible externally in the east and west elevations of the building.

3.1.1 Roof

The roof to the process garage has been renewed in a profiled metal sheet with a series of polycarbonate roof lights. At time of survey this was generally in good condition.

The rainwater goods to the building consist of half-round upvc guttering to the east elevation connecting into plastic downpipes which run horizontally across the north and south elevations of the

building, round to the rear, or west, elevation where they connect into gulleys at low level. The rain water goods are in good condition although there are climbing plants on the east elevation which require cutting back, and a section of gutter to the north-eastern corner requires realigning.

3.1.2 Elevations

The north and south elevations both have large vehicular doors with galvanised roller shutters. Above the northern door there is a substantial concrete lintel, there is a vertical crack running down from the bearing of this lintel down through the wall. There is also some horizontal cracking above the lintel.

The brickwork to the north elevation is generally in good condition, with only a few spalled bricks. The brickwork to the east elevation is largely obscured by planted ivy growth, some of which extends up into the gutters and needs to be cut back to prevent blockage. The visible brickwork on this elevation is quite pitted and would appear to have been blast cleaned at some point in the past. Once again there are a number of spalled bricks but generally the brickwork is in reasonable condition. Visible at high level, projecting through the wall, are concrete padstones. These extend from the inside of the building where they cap the piers supporting the steel trusses. To each end of the east elevation are pedestrian doors with concrete lintels. At low level there is a planted bed hard up against the building in which are planted ivy and other plants. It is noted that the floor level in the education space is below the general floor level and with the additional build up of this raised bed it is likely to promote the retention of damp in the walls at low level, this should be monitored.

The south elevation mirrors the north with a large vehicular opening centrally. Once again this has a galvanised roller shutter with substantial concrete lintel over. There are cracks to the bearing points of this lintel and also a horizontal crack above. In general terms however the brickwork to this elevation is in reasonable condition. This elevation has a certain amount of its original camouflage paint remaining in-situ.

To the west elevation there is a small outrigger comprising a single storey with a reinforced concrete roof structure. This has had (probably timber) bearers added to form a fall to the west, with timber barge boards to each side draining into a half round UPVC gutter on the west elevation. A former doorway on the south has been infilled with modern brickwork. Once again the brickwork is in reasonable condition.

3.1.3 Interior

Internally, the Process Garage was open full length and consisted of two flanking walls with piers, between which span steel lattice trusses with wind bracing to the end bay but one (in line with the roof pitch). During the works to create the education space in the northern part of the building a modern concrete blockwork wall was inserted to create the education space to the north and the vehicular garage to the south.

The garage consists of 6 bays, it is open to the underside of the steel roof decking with a lining sheet beneath. The roof structure and the sheeting is generally in reasonable condition. The walls are finished in a modern masonry paint, this is now peeling and flaking particularly to the east and west walls. The floor is a concrete slab of similar type to those found in other buildings elsewhere on the site. It is evident from the floor that there were originally three inspection pits to the northern end of the space which have been subsequently backfilled with concrete. The education room to the northern end of the building formed of five bays, once again the space is open to the roof structure. The trusses and bracing etc. are in a better decorative state given the public access to this space. Once again the walls are finished in a modern masonry paint, in this space this is generally in much better condition. There is a small brick building within the space with a reinforced concrete roof slab which has been modified for use as toilets associated with the education space. The floor in this space has been repaired and finished with a thermo plastic floor paint and is generally in good condition.

Fig. 025 Building 12 The Process Garage

Fig. 026 Building 12 The Process Garage

Fig.027 Building 12 The Process Garage

Fig.028 Building 12 The Process Garage

3.2 Building 45, The Tube Alloys Project (P6)

Originally it was planned to have three buildings devoted to the production of Pyro mustard at Valley. However as the threat of attack diminished, production was reduced and only two plants were needed. As a result, Building 45 (P6) was effectively redundant. In late 1941 it was decided that building 45 should be adapted to house the 'tube alloys' project, the code name given to the programme of future experimentation on the gaseous diffusion of uranium.

Building 45 (and buildings 50 and 59) has a reinforced concrete frame, in seven bays running north-south and five bays running east-west. The central five bays (north-south) have arched concrete vaults and flat roofed sections to the North and South. The flat-roof sections and the first springing of the arches were probably cast *in situ*, but a clear constructional break in the arches suggests that these were cast separately either *in situ*, or elsewhere and lifted into position (Birmingham Archaeology Vol 2 p10). There is also a concrete tower over the second bay from the west, at the southern end of building 45 (this is to the north on buildings 50 and 59).

The reinforced concrete frame is infilled with brick panels 9 inches thick, in English bond. These walls are quite 'rough and ready' with inconsistent bed depth and pointing. On occasion these panels are also proud of the adjacent concrete which has resulted in deterioration (refer to condition).

Smaller doorways and openings are generally provided with concrete lintels. Larger openings and fans also had steel frames, as do the slam doors. The steel beams of the overhead gantry crane structures are built into the walls, and project through the face of the brickwork.

Changes were made to building 45 when it was adapted for the 'Tube Alloys' Project. The most significant of which were to introduce office and laboratory spaces along the eastern side of the building. As a result, many of the larger openings were in-filled and windows provided. Internally the space was partitioned. A number of large access doors were also inserted; one of which involved increasing the height of the concrete frame in the fourth sub-bay from the southern end of the building (see elevations).

3.2.1 Roof

The roof, as previously referred to is divided into seven bays (running North-South). The central five bays have arched concrete vaults and flat roofed sections to the North and South ends. The roof was covered in a modern bituminous roofing felt in the late 1980's. As part of the current survey, roof access was not available however, views of the roof are available from the west bank.

When viewed from the banking it is evident that the roofing felt is starting to deteriorate and losing its coating of solar chippings. This type of felt only has a life-span of 10-15 years so some failure is inevitable. This is further evidenced by the water ingress internally (refer to interior). It is also possible to see that the valley gutters between the arched vaults are backed up with water, caused by blocked gulleys and outlets. There is growth evident in most of these outlets (see below). It is recommended that a full inspection of the roof coverings be undertaken, however it is likely that full renewal of the roofing felt will be required in the near future.

3.2.2 Rainwater Goods

Rainwater pipes, 01 – 06 on the western elevation 07 - 12 on the east elevation and should therefore be read in conjunction with the notes regarding those elevations.

All of the rainwater goods appear to be cast iron with simple hoppers at high level, collecting rainwater by means of lead chutes. These discharge from the flat roof sections and between each of the arched roof sections. To the east there is a projecting horizontal reinforced concrete beam at high level which necessitates a swan-neck to the down pipes. To the west elevation, without the projecting horizontal beam at high level, these are simple vertical rainwater pipes, fixed back to the concrete piers by means of iron collars.

Rainwater pipe 01 is in reasonable condition, with no significant signs of deterioration or freeze thaw cracking, however, the pier upon which it sits is saturated particularly at high level, suggesting that the outlet and the gulley are partially blocked, resulting in a section of spalled concrete immediately adjacent to the hopper.

Rainwater pipe 02 looks in reasonable order but, as with rainwater pipe 01, the wall around it is entirely saturated suggesting that the gulley and valley gutter are blocked. This is further evidenced by the visible organic growth growing over the parapet, from within the gulley area. These need cleaning as a matter of some urgency if they are not going to result in significant decay to the reinforced concrete structure.

Rainwater pipe 03 exhibits exactly the same problems; the brickwork and reinforced concrete pier are saturated and there is visible organic growth and plant matter in the gulley and in the valley gutter beyond.

Rainwater pipe 04 is also blocked, with growth evident in the valley gutter above. Here the problem has extended to cause significant deterioration in the reinforced concrete pier to such an extent that there is a build up of lime on the adjacent surface of the concrete. This pipe also has a section of galvanised steel repair at low level and would appear to have a freeze thaw crack some 2.5m off the ground (to the rear of the pipe) which is resulting in a further discharge of water onto the fabric to the building.

Rainwater pipe 05, once again the same issues with blocked hopper, blocked valley gutter and chute. There is visible growth in hopper and in the gutter beyond, saturated brickwork and concrete at high level. Once again the pipe has been repaired at low level using galvanised sheet. The leaks and overflowing water caused some decay in the reinforced concrete pier already and unless some action is taken as a matter of some urgency, this will only deteriorate.

Adjoining rainwater pipe 06 the pier is entirely saturated with further evidence that the hopper is blocked, however the rainwater pipe is in slightly better condition. All of the gulleys to the west elevation are obscured from view with extensive undergrowth and plant matter and it is likely that the below ground drainage is therefore blocked also. Given the proximity of the rainwater pipes to the River Alyn, it should be a simple matter to clear these and allow water to flow away.

The rainwater pipes on the east elevation are further obscured by trees, which are planted between the access road and the building.

Rainwater pipe 07 is in reasonable condition at high level, however, there is a large freeze thaw crack, about 700mm from the ground which has resulted in a section of the cast bracket breaking away completely. The gulley is entirely full of water, and appears to be blocked, overflowing onto the ground adjacent to the building.

To rainwater pipe 08 there is evidence of a blockage at high level as the reinforced concrete pier behind is very wet. There appears to be freeze thaw crack about half way down, as there is further saturation of the concrete behind. The pipe has been repaired at low level with a section of galvanised steel.

Rainwater pipe 09 is blocked at high level and the pier is entirely saturated. At low level there are trees growing out of the gulley immediately adjacent to the shoe of the rainwater pipe. Unless this is addressed urgently, there will start to be some significant deterioration in the reinforced concrete. Similar issues exist around rainwater pipe 10, however, there has started to be deterioration in the reinforced concrete pier at high level and adjacent to the lower of the horizontal reinforced concrete beams. It would appear that there is probably a crack somewhere into the rear of this pipe given the level of saturation at low level.

The upper most joint of rainwater pipe 11 is leaking with water cascading down the sides of the pipe, saturating the reinforced concrete pier, causing the presence of limes on the wall and the pier adjacent. At low level there is a substantial tree adjacent to the gulley which is evidently completely blocked.

The tree has also disrupted sections of the culvert/drain which runs along the east elevation of the building.

Rainwater pipe 12 is in slightly better condition, however, there is evidence of leaks and the reinforced concrete pier is saturated, particularly at lower level. There is a tree growing out of the gulley immediately adjacent to the shoe of the downpipe. To the east elevation a tree to the southernmost bay has caused the jacking of the corner of the drainage channel.

There is a further rainwater pipe centrally on the southern elevation, this is a UPVC pipe and hopper which has been introduced presumably in 1989 when the buildings were re-roofed. This drops through the soffit of the building internally into another UPVC pipe then through the wall and into an external downpipe where it drains away to the south.

3.2.3 Walls

The north elevation is split into six bays with the reinforced concrete frame forming piers dividing the elevation. The bays are then infilled with brickwork panels and above the whole is surmounted by a reinforced horizontal concrete beam which extends up to form the parapet.

There is deterioration at high level to the pier on the north eastern corner with a section of cracked concrete adjacent to the parapet. Generally, however the piers on this elevation are distinctly better than those to be found on building 59.

The beams for the longitudinal cranes once again project through the brickwork on this elevation being supported on small sections of RSJ built into the wall. The easternmost of these has caused extensive cracking in the adjoining brickwork. This would appear to be primarily through distortion and movement rather than deterioration in the steelwork itself and there is a crack extending some 2’ down from the bearing plate.

To the easternmost bay there is deterioration and delamination of brickwork faces, this extends across the facade but the eastern bay is definitely the worst. There are a series of openings which have been infilled with modern brickwork. The slam door emergency exits at high level have steel frames which remain in-situ, there is some corrosion to these frames which will eventually cause distress in the adjoining brickwork panels, but currently these are in reasonable condition. The louvre openings have been infilled with modern brickwork including large vehicular doors centrally. A modern door has been inserted to provide access through one of these openings.

To the western-most bay there is a vehicular door which remains in-situ. It has an iron lining which has limited signs of corrosion and does not appear to be causing any distress in the adjoining brickwork, but is should be treated with a rust inhibitor or painted.

The south elevation is also sub-divided into six bays with reinforced concrete columns projecting proud of the wall face to form piers and a horizontal beam at high level extending up to form the parapet. The westernmost pier has significant deterioration at parapet level with sections in imminent danger of falling.

The piers to this elevation are in worse condition, particularly at high level, than those on the north, the third pier from the east, in particular, has further spalling at high level.

The brickwork panels are in better condition, failing and delaminating bricks are limited to a handful particularly in the western most panel. There are some spalled sections to the base of the reinforced concrete beam at high level.

There are a series of openings which have been infilled with modern brickwork although it would appear that the frame and the infill here are much nearer the time of the building probably related to the change of use from mustard gas to the tube alloys project. The steels associated with the lifting beams extend through the wall. Several have had reconstruction of the brickwork around the beam ends and concrete pad stones inserted, presumably as a result of previous deterioration.

Fig.029 Building 45 The Tube Alloys Project (P6)

Fig. 030 Building 45 The Tube Alloys Project (P6)

Fig.031 Building 45 The Tube Alloys Project (P6)

Fig.032 Building 45 The Tube Alloys Project (P6)

Fig. 033 Building 45 The Tube Alloys Project (P6)

Fig. 034 Building 45 The Tube Alloys Project (P6)

Fig. 035 Building 45 The Tube Alloys Project (P6)

Fig. 036 Building 45 The Tube Alloys Project (P6)

Above this bay the reinforced concrete tower extends above from ground level of the three visible elevations. These all appear to be in reasonable condition with limited if any signs of spalling or failing concrete. Once again a series of openings have been infilled at low level but these are smaller scale than those on the north, generally all in reasonable condition.

Both north and south elevations have an extensive plant growth adjacent to the building and whilst this has not caused any significant problems in terms of jacking of brickwork or damage to the concrete so far, it will inevitably do so in the near future.

The east elevation was originally constructed with a series of openings matching those on the west elevation of building 59. When the building was adapted for use by the Tube Alloys project, the spaces were reconfigured as offices and laboratories, consequently the openings where partially infilled and windows introduced. The evidence of these changes is very visible on the elevation. There are two reinforced concrete beams; one at high level and one at lower level, forming the heads to the original openings. This lower beam is in quite poor condition with extensive spalling, particularly to the heads of the door openings, there are long sections of concrete missing exposing the reinforcement and this needs attention to almost every opening. There are also areas of deterioration both in the brickwork and the reinforced concrete piers, generally associated with leaking rainwater goods (refer to rainwater goods).

The brickwork infill panels have spalled in a number of locations, particularly at high level where the brick panels are slightly proud of the concrete beam, or at least, the run off from the concrete beam is saturating the upper courses of the brickwork. The deterioration is particularly evident in these upper courses. Either side of each pier there are retaining plates for the brackets supporting the gantry guide rails internally. These are in reasonable order currently but will require decoration or the application of a rust inhibitor to prevent causing damage to the brickwork in the relatively near future.

To the second bay from the south of the building, the lower of the two reinforced concrete beams has been modified to step up forming a vehicular door. It seems likely that this was probably associated with the Tube Alloys project but does not appear to have compromised the strength of integrity of the reinforced concrete frame.

The west elevation of the building faces the canalised River Alyn, this elevation is very simple. There are fewer openings and those that existed have been infilled with modern brickwork. Once again there is deterioration in the reinforced concrete frame, the pier to the south end of the elevation has deterioration at high level with a section in danger of falling. Immediately adjacent to this (in the southern most bay), the high level reinforced concrete beam and parapet is in poor condition, with exposed sections of reinforcement. It would appear that the reinforcement to this elevation and to the high level beams, in particular, are very shallow with limited concrete cover consequently resulting in extensive areas of deterioration.

The southern most of the five arched gables is also in very poor condition, with exposed reinforcement horizontally and vertically, resulting in spalled sections of concrete. This will require conservation and repair, if it is not to deteriorate quite rapidly. All the piers have deterioration at high level, and all of the gulleys and rainwater goods are in very poor condition (refer to rainwater goods). The central arched gable exhibits similar issues with a lack of adequate depth of cover over the reinforcement, resulting in deterioration.

The northern most bay with the flat roof also has some sections of the concrete covering which would appear to be in imminent danger of coming away, as they are delaminated from the substrate.

3.2.4 Interior

The configuration of the spaces within building 45 is very similar to Pyro buildings P4, P6 i.e. buildings 50 and 59. There is a central dividing wall which would have been originally intended to divide the toxic and non-toxic sections of the building. When the building was adapted for use by

the Tube Alloys project, a further internal dividing wall was introduced between bays D and bay E (refer to plan). Between this introduced partition and the east elevation, there are a series of office spaces evidenced by the openings created in the east elevation. Longitudinally, the building is split into seven bays. Over bays 1 and 7, is the section of flat roof, bays 2 to 6, being the barrel vaulted sections, the vaults spanning north - south on downstand beams and then onto reinforced concrete columns. Within the space, the roof structure is exposed internally limewashed to the inside. The roof appears to be in better condition than building 59. The decorative condition of the inside of the vaults and of the soffit of the flat section of the ceiling is still generally intact and there are fewer signs of water ingress. In fact, the majority of the water ingress within building 45 is associated with the rainwater goods and blocked outlets as noted outside where staining exists in almost every situation.

There are cracks in the barrel vaults running north-south in bay two on the western side of the building. This is likely to be a result of water ingress due to the failure of the finishes above. Once any ingress issues have been addressed the cracking internally should be monitored for any sign of deterioration.

Where the valley gutters are blocked it is evident that these are backing up and consequently there are longitudinal cracks some of which are now quite extensive, extending along the barrel vaults, particularly evident in bay five and bay six but actually applies in a number of other cases as well. This is presumably associated with the corrosion in the longitudinal reinforcing bar in these locations.

On the underside section there are now areas of iron staining suggesting there is corrosion to bay seven. On the eastern side of the building there is a diagonal crack extending back to the eastern wall in the soffit. Extensive iron staining suggests corrosion in the reinforcement, which will eventually lead to spalling off the concrete unless the water ingress issue above is addressed.

To the original non toxic, or western, part of the building, there are a series of vents. Those in close proximity to the downstand beams are causing problems through the roof, with significant water ingress following the backing–up of the valley gutter or failure of the flashings. To bay three there are two ventilators which are covered with plywood sheets and there is evidence of water ingress particularly to the northern most of these. Similar problems exist with those to the west end of bay three. The central ventilators (at the apex of the vault) in bay three and four are in reasonable order with no signs of water ingress. In bay four those to the south have been covered with a timber frame and ply over-boarding, however there are no significant signs of water ingress.

To bay five there is a rectangular ventilator at the apex of the vault. This originally had a series of louvred vents at high level however, these have been bricked up.

Running perpendicular each of the vaults between the downstand beams (to the western bays only) are a series of steel tie rods. These all run to the western side of the central columns, save that in bay five which is to the east of the central columns. These appear to be in reasonable condition although they are unique to this building and the question arises as to why they were introduced.

There is a further roof ventilator at high level to the eastern end of bay six adjoining the dividing wall, this has also been covered with ply sheets although there is no evidence of water ingress.

The internal walls (reinforced concrete columns and adjacent brickwork) are saturated in corresponding positions to the rainwater goods on the external elevation. This is worse in some cases than in others (refer to external rainwater goods), this has resulted in deterioration of the internal finishes and will in time lead to spalling sections of both brickwork and reinforced concrete structures if the problems are not addressed promptly.

To the west elevation, in bay 7, there is a vertical crack between the reinforced concrete frame and the brickwork. It is probable that this is down to differential movement between the two different materials but should however be monitored regularly for deterioration. Further along the west elevation, in bay 4, there are two small niches which have been backfilled with brick in an ad-hoc manner. These bricks appear to be loose.

There is a vertical crack in Bay 1 (north-west), similar to that in Bay 7 (south-west), between the concrete frame and the brickwork, which also requires monitoring. The north elevation has significant failure to the finishes in sections A and B, largely due to the exposure to prevailing wind and rain, with consequential saturation of the brickwork. This moisture is drying out through the internal face, consequently causing the finishes to fail.

The dividing wall between the east and west part of the building (i.e. between Bays B and C) is generally in good condition. It is evident that this wall extended full length originally but an opening has been created through the second bay (bay no. 2). There is a shadow of the wall on the vault above.

To the eastern part of the building there are areas of migrating salts to the northern wall associated with saturated brickwork at high level. This is particularly evident in the north-eastern corner. Generally the wall is in fair condition however the decorative finish is failing quite extensively. The track associated with the overhead gantry cranes project through this wall and, at the points where they penetrate the wall there are areas of corrosion to the lifting beams themselves. Whilst this is currently not affecting the adjacent structure there is a significant imposed load on these beams from the mechanisms above and this should be monitored on a regular basis.

To bay E the crane track is bracketed off the eastern wall. Where this wall meets the north wall there is a crack (also evident on the exterior) which has been grouted with a cementitious grout.

To the north wall at high level, a galvanised steel duct extends across the beams supporting the mobile crane. The duct is partially supported on these beams and with supplementary support from a series of steel columns which extend down to the floor. The ductwork appears to be in reasonable order.

To the east elevation the openings which used to form the offices associated with the Tube Alloys project are much in evidence. These are the only elements that have not been decorated internally. There are a series of conduits running horizontally and vertically, some of which are starting to corrode. These should be removed if not of historic significance.

The dividing wall in the eastern part of the building which was introduced when the building was adapted for the Tube Alloys project generally appears to be in reasonable condition, although it has been evidently modified in bay six where part of the arch heading is infilled.

Further high level ducting, mirroring the north end of the building, extends across the south elevation, supported on the gantry beams and supplementary steel columns which extend down to the floor. Conduits and pipework continue along at high and low level with an electrical fuse board and distribution point in the corner of C7, near the dividing wall.

The floor is generally a concrete floor slab. To the western part of the building it is largely original with evidence of some lining out and fixings for the various machinery, however it was partly obscured by sand and debris at the time of survey. In general terms the western area of floor is in reasonable order and is reasonably level. To the eastern parts of the building the floor has undergone more change. There is evidence of walls and other modifications associated with the introductions of the laboratories and the offices to the east, and it would appear that there was a wall running between bays two and three and that possibly the floor was modified or strengthened beyond this point to support the heavy equipment associated with the testing processes. The floor is quite uneven around the area of the laboratory where partitions and other things have been removed. The southern end of the space associated with the incoming electrical supplies, there is an uncovered trench in the floor and the floor is quite uneven adjacent to this. The floors generally are in serviceable condition given that the building is largely out of use except for the storage of various materials.

3.3 Building 50 Former Pyro Building P5

Building 50 follows the same pattern as building 45. It comprises a reinforced concrete frame, in seven bays running north-south and five bays running east-west. The central five bays (north-south) have arched concrete vaults and flat roofed sections to the North and South. The flat-roof sections and the

spring of the arches were probably cast in situ, but a clear constructional break in the arches suggests that these were cast separately, possibly in situ, or perhaps lifted into position. As per building 45 the concrete tower extends above the second bay from the west, at the north end of building.
The reinforced concrete frame is infilled with brick panels 9 inches thick, in english bond. These panels are quite 'rough and ready' with inconsistent bed depth and pointing. On occasion these panels are also proud of the adjacent concrete which has resulted in deterioration (refer to condition). To the west elevation there is a lower level reinforced concrete ring beam which forms the heads of the original door openings.

Smaller doorways and openings are generally provided with concrete lintels. Larger openings had steel sub-frames, as do the slam doors. The steel beams of the overhead gantry crane structures are built into the walls, and project through the face of the brickwork.

3.3.1 Roof

The roof was over-felted in the late 1980s. At the time of survey high level access was not available to assess the condition of the roof coverings. The felt was dressed over the parapet walls both to the arched sections and the horizontal sections, and where visible this felt looks in reasonable order. However, given the condition of the other buildings and the water ingress internally it seems highly likely that the roof coverings are essentially life expired. It is recommended that high level access be arranged to inspect the coverings in the outlets as soon as possible, perhaps associated with the cleaning of the outlets and the valley gutters and that a programme of re-roofing be scheduled in the near future.

3.3.2 Rainwater Goods

The building has a series of twelve rainwater goods consisting of simple iron hoppers extending into substantial round iron downpipes supported on each of the reinforced concrete piers. To both elevations these swan-neck around a projecting horizontal beam at high level. For the purposes of this survey the rainwater pipes are described as 1 to 6 on the western elevation and 7 to 12 on the east elevation.

Rainwater pipe 01 has a freeze-thaw crack where it swan-necks around the high level reinforced concrete ring beam. There is significant discharge of water down the face of the pipe and the adjoining pier. A lower section is also damaged with further freeze-thaw cracking evidenced by the saturation of the pipe and adjoining surfaces from 2½ metres above ground down to the floor. Between the central two brackets the reinforced concrete pier has a significant concrete section of spalled concrete exposing the reinforcement associated with the fixings of the upper of the two brackets.

Rainwater pipe 02 has a similar freeze-thaw crack associated with the swan-neck section and also the lowest section appears to be blocked as water is backing up and discharging down the pipe and wall face where the junction occurs between the two sections. The pier behind this rainwater pipe has quite badly spalled sections of concrete exposing the reinforcement within and there are sections in imminent danger of falling to the ground. It is clearly a risk and needs to be addressed.

Rainwater pipe 03 has a broken bracket at high level and the lowest bracket is no longer connected to the pier. Both the fixings are now missing. This needs to be reconnected as soon as possible. There is also a substantial tree growing out of the gulley immediately adjacent to this pipe which may have contributed to this displacement. The actual pier itself adjoining this rainwater pipe is in better condition than the other piers but there is still a small section of spalled concrete about three metres from the floor.

Rainwater pipe 04 has a broken bracket at high level and again the lowest section is displaced. A tree is growing out of the gulley which has resulted in the fixings to the lowest brackets becoming detached. The pier behind is very badly cracked and spalled between the second and third brackets from the ground. There are substantial sections of concrete which have either fallen or are in imminent danger of doing so with a particularly large section to the north side. Action to address this is urgent.

Rainwater pipe 05 has 2 freeze-thaw cracks at high level, evidenced by the water discharging down the face of the down-pipe. Once again the pipe is completely blocked at low level at least up to the point of the first junction and again this is evidenced by the fact that the water is discharging down the face of the pipe. The lowest pipe bracket is broken, one of the ears remains connected to the face of the pier, the other is loose with the fixing having become detached. The concrete pier to the back of this rainwater pipe is in slightly better condition, however there is a spalled section immediately below the high level reinforced concrete ring beam.

Rainwater pipe 06, has a freeze-thaw crack to the swan-neck. The swan-necks are particularly prone to blockage, consequent retention of water and therefore subject to freeze-thaw cracking in the winter months. Improved access for maintenance (provision of rodding eyes for example) would be beneficial. Immediately below the swan-neck there are significant areas of spalling cracking to the reinforced concrete pier. These appear to be associated with the corrosion in the fixings to the bracket, similarly to the next bracket. Down the wall there are further sections of spalling. The lowest section of this rainwater pipe has been repaired in an ad-hoc manner with a piece of galvanised steel sheet.

Rainwater pipe 07 has a freeze-thaw crack associated with the swan-neck where it circumvents the horizontal ring beam at high level, evidenced again by discharged water down the face of the pipe. All of the gulleys to the pipes on the east elevation are significantly obscured by organise growth, trees etc. particularly at low level. This needs to be partially cleared to ensure that the gulleys and drainage are clear. Behind rainwater pipe 07 is generally in reasonable condition, however there is a section of spalling concrete half way up the wall face.

Rainwater pipe 08, again there is corrosion associated around the brackets and associated with the swan-neck. It is particularly evident here that the valley gutter and the chute from the valley gutter which is formed in leadwork is discharging into the hopper. The valley gutter is clearly blocked as there is visible plant growth in the valley beyond the pier. The pier itself behind the rainwater pipe 08 is in very poor condition. There are significant vertical cracks, sections of spalled concrete exposing the reinforcement behind and this will only deteriorate if action is not taken in the near future.

Rainwater pipe 09 is extensively obscured by a substantial tree growing adjacent to it, which prevented inspection of the area around the hopper and swan neck, however the lower sections of the pipe has become displaced and the lower bracket has become detached from the wall. There are also some substantial sections of spalled concrete, exposing the reinforcement behind.

Rainwater pipe 10, once again it is evident that the hopper and chute are likely to get blocked with a significant plant growth out of the hopper and in the valley gutter behind. Further evidence that the area around the swan neck is either blocked or there is a freeze-thaw crack with water discharging down the outside of the rainwater pipe. The pier behind this rainwater pipe is also quite badly spalled with further sections of reinforcement exposed. Again there is a substantial tree growing out of the area immediately adjacent to the gulley which will be causing retention of moisture in the adjoining building structure and also potentially causing displacement of the building structure in the long term.

Rainwater pipe 11 has a broken bracket at high level which looks relatively recent, a freeze-thaw crack at high level and a freeze-thaw crack at lower level, resulting in water discharging down the outside of the pipe. The pier associated with this pipe is in slightly better condition, however there are spalled sections at low level.

Rainwater pipe 12 is in particularly poor condition with at least one if not two freeze-thaw cracks at high level associated with the swan-neck and broken bracket immediately below the horizontal concrete ring beam. The lower portion of this downpipe is currently obscured by organic growth.

3.3.3 Walls

The north elevation of the building is split into 6 bays with projecting reinforced concrete piers. Above this a reinforced concrete ring beam connects the heads of the columns and projects upwards to form a parapet wall. This is generally flush with the wall face except where the reinforced concrete tower

extends up above the roof line where the ring beam is proud of the wall face.

The western-most pier is in a relatively stable condition with small areas of spalled reinforcement. There is a crack in the reinforced concrete to the parapet at high level which runs down from the wall head diagonally downwards but this is only relatively minor. There are more significant sections of spalling concrete to the central pier where there is a section of projecting concrete and immediately below this there are two sections of concrete which are in imminent danger of spalling away. The eastern-most pier has some more substantial issues with cracked sections immediately below the parapet level.

Between the concrete piers the bays are filled with brickwork in English Bond. There are a range of former openings as seen previously on the other buildings. These have all been in-filled with modern brickwork at high level. Many have iron frames which are starting to corrode and cause some problems in the adjoining brickwork and these need to be treated in the future with a rust inhibitor. Generally, however, they are currently in reasonable order. At low level there are a series of openings some of which have been in-filled with modern brick or block and some of which remain open. One has been adapted from a wider vehicular opening to a single pedestrian doorway. The larger openings have steel or iron frames remaining and once again these will require treatment with a rust inhibitor or painting to reduce the risk of impacting upon the surrounding brick. One of the openings to the former electrical substation is obscured by mesh due to the presence of asbestos within, which needs to be addressed.

All of the openings are surmounted by concrete lintels and are generally in reasonable order. The brickwork panels on this elevation are generally in fair condition. There are a number of spalled bricks at higher level which is particularly evident in the bay to the west where the top 5 courses are in quite poor condition. Part of the cause of this would appear to be that the wall face at this point is slightly proud of the reinforced concrete above promoting water ingress into the brickwork and hence deterioration in freezing conditions. Introduction of a weathering above could mitigate this damage.

The west elevation consists of seven bays with the central five being beneath the arched vaults. At lower level there were originally a series of openings, these are surmounted by further reinforced concrete beam and divided centrally with a reinforced concrete column. All of these openings have been infilled with modern brickwork. The beam to the head of these doors is in poor condition with extensive spalling and failure to the face and arises. This would appear to be partly caused by the lack of cover on the reinforcement (i.e. there is insufficient concrete covering the metal to prevent it from corroding). Also this beam projects slightly from the brick wall face generally promoting water ingress into the head of the beam and consequent deterioration. Consideration could be given to introducing a weathering at this point which reduce the likelihood of further decay once consolidation has been undertaken.

Similar problems exist with the vertical columns between the original openings with sections of delaminating concrete exposing the reinforcement beneath. The whole of the reinforcement associated with these openings is in poor condition and will require some remedial and conservation work in the near future.

The brickwork panels above are generally in good condition with significant evidence of the original camouflage paint remaining in-situ. For notes on the condition of the projecting piers refer to rainwater goods. Either side of the projecting reinforced concrete piers is a tie and plate with two bolts, these are the fixing brackets supporting the internal horizontal gantry rails. Above the reinforced ring beam at high level there are approximately five courses of brickwork to the arched gables and then reinforced concrete above to the flat roof sections. The parapets are reinforced concrete. To the arched gables this brickwork is in quite poor condition in places with a number of spalled faces. Above, the reinforced concrete would appear to be in reasonable condition with only minor cracks and signs of deterioration.

Fig. 037 Building 50 Former Pyro Building P5

Fig. 038 Building 50 Former Pyro Building P5

Fig. 039 Building 50 Former Pyro Building P5

Fig. 040 Building 50 Former Pyro Building P5

Fig. 041 Building 50 Former Pyro Building P5

Fig. 042 Building 50 Former Pyro Building P5