6. SITE HISTORY

6.1 GENERAL

The history of the site has been traced in order to establish the nature of any potentially contaminative operations which may have been conducted in the past and to identify the types and quantities of any hazardous materials which may have been used during such operations.

The history of the Georgetown site has been compiled from a number of sources, including the Mitchell Library in Glasgow, the public libraries at Paisley, Renfrew and Bishopton, RO Archives and from anecdotal evidence gained from former and current RO employees. Extracts of the relevant Ordnance Survey maps and plans are included as Appendix 6.

Georgetown was originally conceived as a single factory, but demands for increased production led to the construction of a second factory to the west of the Dargavel Burn. The original factory was known as the No. 1 (Cartridge) Factory and the later facility became known as the No. 2 (Shell Filling) Factory. A plan of the factory is included as Appendix 7.

6.2 PRE-DEVELOPMENT HISTORY

First Edition County Series Ordnance Survey maps dated 1863 show the site area to mostly comprise agricultural land, bounded to the south by the Renfrew to Bridge of Weir road and to the east by the Caledonia Railway line. Field boundaries are shown to be angular, suggesting that the land has been extensively drained. A large area of moss is shown over the northern part of the eastern site area, and the Barochan Moss, Fulwood Moss and Fulwood Plantation are shown to lie to the north west of the site. The Dargavel Burn is shown to flow through the central and south eastern parts of the site, towards the River Gryfe.

Hareshaw Farm is shown close to the northern edge of the site, and a property designated as Blackburn is shown just inside the northern site boundary. A track leads from the Bridge of Weir road northwards to these two properties. Dargavel House is shown further to the north. A property known as Loanhead is shown on the northern side of the Bridge of Weir road, immediately to the west of the site. The south east part of the site is occupied by a property designated as West Fulwood, and Houston Station is shown to lie immediately to the east.

Second Edition County Series maps dated 1898 show that little change had occurred to the western half of the site and the southern eastern part of the site. However, a mineral railway is shown to diverge from the main Caledonia Railway line just to the north of the eastern half of the site, which loops round into the north eastern part of the site and ends in a siding surrounding by several buildings, close to the main rail line.

County Series maps dated 1913/1914 show little change had occurred to the site. The mineral railway is shown as dismantled, and the collection of buildings around the sidings at the end of this rail line are shown as Fulwoodmoss. The main railway line along the eastern edge of the site is generally shown to be constructed on a low embankment. A disused pumping station is shown where the railway line crosses the River Gryfe, immediately to the south east of the site. A number of benchmarks along the access track to Hareshaw shows the land to be very level, at an elevation of between 25.1 feet and 25.8 feet (7.6 m to 7.9 m AOD).

6.3 ORIGINS OF GEORGETOWN NO. 1 FACTORY

At the end of May 1915 David Lloyd George, then Minister of Munitions, took the decision to construct four large shell filling factories within Great Britain. The Director of Munitions in Scotland, William Weir, was deputed to arrange for the construction and management of National Factory No. 4.

Weir appointed a Board of Management whose first task was to select a suitable site. Such a site was rapidly sought and surveyed by the Board, who chose 250 acres of agricultural land at Fulwood near Erskine in Renfrewshire. This site was close to a labour source, being only 10 miles from Glasgow, 3 miles from Paisley and 12 miles from Greenock, and therefore there would be no requirement for new housing to accommodate workers. The main Glasgow to Greenock line of the Caledonian Railway ran adjacent to the site, and could provide facilities for both passenger and goods traffic. The site was relatively level, which would enable new rail lines to be constructed, and over 1,000 acres of level land was available allowing room for expansion if required. An abundant water supply was available from the River Gryfe, Dargavel Burn and the Paisley civic supply, providing water for power, domestic use and firefighting purposes. The site was also relatively isolated.

The first meeting of the Board took place in September 1915, during which a General Manager for the factory was appointed, Gilbert M'Pherson, who immediately travelled to the Royal Arsenal at Woolwich to familiarise himself with shell filling and cartridge manufacture and to obtain plans and information to aid the design and construction of the factory.

The factory was to assemble 40,000 items of Quick Firing (QF) ammunition and 200,000 lbs of Breach Load (BL) cartridges per week. Architects were engaged to draw up a factory layout, which included cartridge and ammunition assembly rooms, rooms for the filling and assembly of fuzes, gaines and primers, TNT and Cordite Magazines, Black Powder Magazines, Finished Ammunition Magazines, plus assorted Stores, Workshops, Offices, Shifting Houses, Canteens, Boiler House, administrative staff accommodation, guards accommodation and a railway station. The estimated construction cost was placed at £160,000.

6.4 DESIGN AND CONSTRUCTION OF NO. 1 (CARTRIDGE) FACTORY

A local civil engineering firm, Robert McAlpine and Sons, offered to construct the factory on a cost plus 1% basis, which was immediately accepted by the Board. Construction began on the Fulwood site on 25th of September 1915.

No. 1 Factory was located adjacent to the western edge of the Caledonian Railway Company's (CRC) Glasgow to Greenock main line. The factory was bounded to the south by the Renfrew to Bridge of Weir road, to the west by the Dargavel Burn and to the north by agricultural land. Soils within the north eastern part of the factory are recorded as being soft and peaty, forming part of the Fulwood Moss.

Railway sidings were already present on the site, connecting to the Caledonian Railway Corporations Glasgow to Greenock line. These sidings were owned and used by the Glasgow Corporation to reclaim moss-land by tipping refuse conveyed by rail from Glasgow.

The proposed railway layout included a new Georgetown Station, and covered platform located three quarters of a mile north of the existing Houston station, designed to accommodate trains carrying between 800 and 1,000 passengers. This station was situated on the eastern edge of the factory, and covered walkways enabled workers to make their way into the factory without being exposed to the elements. The walkways led to the Time Office, General Offices, Canteens, Power Station, Laundry and the Fire Hose Drying Tower, a landmark of the factory some 18 m (60 feet) in height. An observation post was located at the top of the Tower to enable patrols to detect fires, enemy aircraft and approaching storms.

The Ammunition Box Store and Joiners Shop were located beside the Power Station, and the Box Conversion Store was situated between the Georgetown and Houston Stations. No. 10 Store was positioned opposite the Box Conversion Store and was used for the storage of large empty shells. The Shifting Houses were also located in this area, and provided the only permitted access to the Danger Area of the factory. The Danger Area of the factory contained those buildings which are used for explosive processes or storage. The extreme west and south of the Danger Area contained 47 no. small Cordite and TNT Magazines, three 100-Ton Cordite Magazines and three 3-Ton Black Powder Magazines, all linked to one another and to the workshops by light railways carrying trolleys propelled by hand or by pony.

Stores for components and other non-explosive components were located to the west of the General Offices, with supplies brought in by broad gauge railway linked to the main CRC line. These supplies were conveyed by trolley as required to the Workshops to the north and south of the stores. The Workshops comprised eight long buildings situated parallel to the Component Stores, and were used for a variety of purposes, including:

- Bag Stamping Store - cartridge bags were stamped with date, lot number etc
- Cylinder and Box Stencilling Stores - cylinders and boxes for the packing and despatch of cartridges were stencilled with name, weight, type of cartridge etc
- Igniter Filling Rooms
- Cordite Cutting Stores
- Trotyl (TNT) Filling Shops - filling of exploder bags and cartons and metal containers
- Assembling Rooms - assembly of various charges and components to form the completed cartridge

A number of small Expense Stores for the temporary storage of explosives drawn from the magazines were located within the Workshop area.

14 no. Finished Ammunition Stores were positioned to the north of the Workshops, and eight Finished Ammunition Stores were located to the south. The finished ammunition was handed over to the Army Ordnance Department (AOD) and then despatched by rail as required.

The factory was visited by Lloyd George in December 1915, and at the request of the Board the area in which the new factory was located was named "Georgetown" after the Minister of Munitions.

6.5 ORIGINS OF GEORGETOWN NO. 2 FACTORY

TNT was the most commonly used high explosive, and a shortage of TNT coupled with the high cost of manufacture of this explosive was causing production problems by February 1916. To overcome these problems, Lloyd George instructed Georgetown to use Amatol in powder form to fill shells. Amatol is a mixture comprising 80% Ammonium Nitrate and 20% TNT, commonly known as 80/20 Amatol, and the powder form of this explosive could be poured into the shells and consolidated by hydraulic pressure. However, the Georgetown factory had not been originally conceived to conduct this type of filling, and therefore a new factory would be required.

The Board visited sites such as Chilwell which were already using Amatol to fill shells. A location for the new factory was suggested, immediately to the south west of the existing Georgetown factory. The existing factory was to become known as No. 1 Factory, and the new factory as No. 2 Factory.

No. 2 Factory was to fill shells with 80/20 Amatol, and to incorporate Ammonium Nitrate and TNT into 40/60 Amatol, using a hot melting process. Ammonium Nitrate and TNT would be handled and stored within No. 2 Factory, and it was envisaged that with a TNT allocation of 60 tons per week, weekly production targets shell filling with 300 tons of 80/20 Amatol and 150 tons of 40/60 Amatol could be achieved.

No. 2 Factory would fill each week 240,000 no. 18-Pounders HE (a figure later revised to 160,000), 45,000 no. 4.5" HE rounds (also later revised to 50,000),

15,000 no. 60-Pounder HE shells and 15,000 no. 6" HE shells. No. 1 Factory, meanwhile, was to concentrate on the production of QF ammunition, producing 120,000 no. 18-Pounder rounds per week. To facilitate the production of these quantities of munitions, some 285,000 no. fuzes and gaines would also be required each week.

However, it was realised that No. 1 Factory would be unable to fulfil the required production of QF ammunition, and it was decided that it should turn over production to BL cartridges and that all QF ammunition would be handled at the No. 2 Factory.

6.6 DESIGN AND CONSTRUCTION OF NO. 2 (SHELL FILLING) FACTORY

No. 2 Factory was sited immediately to the west of No. 1 Factory, and was bounded to the east by the Dargavel Burn, to the south by the Renfrew to Bridge of Weir road and to the west and north by agricultural land. Construction of No. 2 Factory began in March 1916. Foundation soils were recorded as stiff marls or clays.

No. 2 Factory was designed so that "dead" material such as empty shells and components were brought in and stored on the southern side and that "live" material or explosives be brought in to the east side. These materials were assembled in the central part of the site and passed on to the northern edge of the factory to the AOD stores.

Two means of access were provided to the factory: through a gateway in the south east corner of the site leading from the Renfrew to Bridge of Weir road, and from the covered walkway which led from Houston Station, this latter route being reserved for the factory workers. Cleanways within this factory were also covered to protect the workforce as they covered the large distances between the various buildings.
The Power House, General Offices, AOD Offices, Shifting Houses, Canteens, Laundry and Ambulance Station were all located within the south east corner of No. 2 Factory. To the left of the gateway, running along the southern boundary of the factory, were four large Stores linked by railway sidings. These buildings housed the Empty Shell Store and Painting Shop, Brass Cartridge Store, Component Store and Empty Box Store, located such that goods could be transported from these Stores around the factory on the broad-gauge and light railway network.

Propellant charges prepared and assembled in No. 1 Factory were brought into No. 2 Factory on the railway line along the southern factory margin, and stored in the five 100-Ton Magazines in the western part of the site. Two well-traversed Black Powder Magazines were located to the east of these 100-Ton Magazines, also served by railway lines, and to the east of these structures were the 12 no. stores for fuzes, gaines and primers. Materials and components were drawn from these stores as required, and conveyed by trolley and light railway to the Assembling Rooms further to the east.
Ammonium Nitrate and TNT, the raw materials for the production of Amatol, were brought into stores situated in the north eastern part of the factory. Two Ammonium Nitrate Stores and the Disintegrating House formed a complete unit, the interiors of

the stores being divided into stalls to separate the different grades of the chemical. Ammonium Nitrate was crushed, dried, cleaned and weighed in the Disintegrating House, located between the two stores buildings, and then transported by trolley to the Incorporating Houses to the west.

Heavily mounded TNT Stores were located further to the north, in an isolated location, from which daily supplies of TNT were conveyed to the TNT Supply Store located between the Disintegrating House and the Incorporating Houses. The Ammonium Nitrate and TNT were milled together in the four Incorporating Houses to form Amatol, which was then transported to the 32 no. Press Houses where it was stemmed and pressed into shells. Power for the presses was drawn from the Hydraulic Pump House, located to the north of the Incorporating Houses.

Filled and pressed shells moved from the Press Houses to the Assembling Rooms, comprising six blocks containing 90 no. small rooms where the shells were assembled, fuzed and packed. 6" shells, however, moved from the Press Houses to the Finishing House, where they were stencilled and grummeted ready for despatch.

Finished ammunition was conveyed to the 11 no. AOD Bonded Stores along the northern boundary of the factory, ready for storage and despatch by rail as required.

Two Melt Houses were located within the southern part of the factory, immediately to the south of the Press Houses, which were originally designed for shell filling by the poured Amatol process but which were later used for the "Hot Mix" process. The Melt Section contained its own Ammonium Nitrate crushing and drying plant, TNT Expense Stores, and melting, milling and mixing plant. Filled shells were loaded directly onto trucks and despatched from the Melt Siding along the western edge of the Melt Section.

Completion of No. 2 Factory meant that the Georgetown site occupied a total area of some 540 acres. The boundary fence was a total length of 5 miles, and 80 miles of steam pipes had been laid within the complex. Total construction expenditure for the two factories was calculated to be £1,451,354.

6.7 ANCILLARY BUILDINGS AND PLANT

The power houses contained coal fired boilers which generated steam for power and heating purposes. The steam mains were generally constructed from steel or wrought iron, although cast iron was used in some areas. All the workrooms and most of the magazines were steam heated, and all of the offices were heated by steam radiators. All of the buildings were lit using electricity.

An extensive system of fire mains extended throughout the factories, with some 280 no. fire hydrants located at easily accessible points. The Incorporating Houses, Disintegrating House, TNT Supply House, the Melt Houses and some sections of the covered ways in No. 2 Factory were fitted with drenching apparatus in case of fire. The TNT magazines were also fitted with automatic sprinklers.

The factory water supply was obtained from the Burgh of Paisley. Drainage was divided into two systems, one system carrying clean water and the other system carrying sewage. Some difficulties were experienced in obtaining sufficient gradients to maintain flow due to the flat nature of the land.

Six locomotives were employed in both factories for shunting purposes. Some seventeen miles of 4 foot 8.5 inch gauge railway track were laid for the factory, and fifteen miles of 2 foot gauge trolley track for internal transport. In addition, there were five mechanical haulage systems, comprising an endless series of trolley wagons for moving materials around the factories. There were some 1,000 no. special six-wheeled trolleys designed to run either on the haulage system or on the floor, with each trolley accommodating a load of around 1,000 lbs.

A garage was established at the factory in 1916 for the upkeep of the vans, passenger vehicles and ambulance required for transport around the factories. Roadways within the factories were tarmacked and were generally well-maintained.

A large number of buildings were located outside the southern boundary fence of No. 1 Factory, comprising mainly housing for the resident staff and workers. These comprised eight furnished hostels, Netherfield Cottages (36 no. houses), Gryfe Cottages (54 no. houses), Mosside Cottages (10 no. houses), eight bungalows and West Fulwood Farmhouse. There was also a meeting hall and a military barracks. Additional guard rooms were located at the north, east, south and west boundaries of the factory.

6.8 PRODUCTION

During construction of the factory, the Board visited a number of other factories already in production, including the Derwenthaugh New Filling Factory in Newcastle upon Tyne, the Woolwich Arsenal, the National Filling Factory at Chilwell and Nobel's factory at Faversham. Works managers and overlookers were sent to Derwenthaugh and to Woolwich for training.

Production began at No. 1 Factory in January 1916, with the factory employing 200 girls to assemble 60-Pounder NCT cartridges, 9.2" cordite cartridges, and 4.5" NCT cartridges. By early March shell filling had begun, and production of 18-Pounder shrapnel and 4.5" shrapnel shells was under way, and by the end of the same month 60-Pounder shrapnel shells were being produced. Filling of 18-Pounder High Explosive (HE) shells began at the beginning of April. By the end of June the factory employed 3,229 staff, excluding office workers.

Production at No. 2 Factory began during the first week in July 1916, with 200 workers involved in the liquid filling of 4.5" Howitzer shells. No. 1 Factory continued to block fill 18-Pounder HE shells until March of 1917, the conversion of this factory to cartridge filling being a gradual process.
Production at the two factories continued to gather pace during 1917, with the introduction of a number of new munitions including 8", 9.2" and 12" Howitzer shells and cartridges, 60-Pounder shrapnel shells, 105 mm shells and 13-Pounder and 18-Pounder HE Anti-Aircraft shells. In the first six months of 1918 the two factories

began to produce 3" HE Anti-Aircraft shells, 4" and 12-14-Pounder star shells and 6" Trench Mortar Bombs. During the year ending 31st March 1918 Georgetown produced 16,000,000 complete rounds. By the end of June 1918 the two factories employed 11,088 workers on munitions production.

6.9 RESEARCH ACTIVITIES

Georgetown was also involved in research and development work, mainly initiated by M'Pherson, the General Manager of the factories. During the summer of 1916 the "Georgetown Hot Mix Process" was developed as a method of preparing and dealing with Amatol. By September 1916 this process was in regular use for the filling of 6" HE shells, and the process was also to be used for the filling of 12" shells. In the summer of 1917, a method for the longitudinal sectioning of shells to examine the distribution of the filling after firing was perfected. Although this was a relatively dangerous process, over three hundred shells of various calibres were sectioned using this method without incident.

6.10 POST WAR USE OF THE FACTORY

In August 1918, with the Great War drawing to a close, the Board devised a scheme for the existing buildings within the factories to be converted into industrial factories and dwelling houses at the cessation of production, and for the Georgetown area to be established as a permanent Garden City. The scheme noted that whilst some of the buildings were built of brick, most of the buildings and indeed the cleanways between them were of wooden construction. Included amongst the buildings were workshops stores and magazines which could be converted into timber dwelling houses and hostels, and the power station, laundry, hospitals, canteens, gardens and allotments could provide services for the community. The larger stores and workshops could be used as factories, with carpet manufacture suggested as a suitable industry for the area, whilst the smaller stores, workrooms and magazines could be converted into dwelling houses. Georgetown was envisaged as housing in the order of 3,000 people, but these plans were never to come to fruition.

The Armistice was signed on 11th November 1918, and the factories were gradually wound down during that month. Orders to close the factories were issued at the end of that month, and Georgetown was officially closed on November 30th 1918. Some 1,500 workers were retained to clear up, handle stores, stock take and conduct other auxiliary services.

Negotiations between the Ministry of Munitions and the War Office resulted in No. 1 Factory being used for military demobilisation as a dispersal centre, after which it was appropriated as the Main Ordnance Depot for Scotland. All stocks of finished ammunition, material and components were signed over to the Royal Army Ordnance Corps on 16th December 1918, and No. 1 Factory was evacuated and ready for demobilisation by the 21st of that month. No. 2 Factory stocks were handed over to the Royal Army Ordnance Corps on 13th January 1919, and the factory was officially handed over to the military authorities on the 31st of that same month.

6.11 POST 1920'S SITE HISTORY

Aerial photographs dated May 1937 shows many buildings or building foundations to still be present within the Georgetown site. Within No. 1 Factory the Finished Ammunition Stores at the northern and southern ends of the site can be seen, as can the Stores, Box Converting Shops and possibly the southernmost of the Canteens. Most of the buildings or floor slabs within No. 2 Factory appear to be present, including the AOD Bonded Stores, the Fuzes, Gaines and Primers section, the westernmost Magazines, the Finishing House, the Ammonium Nitrate Stores, the Disintegrating House, the TNT Stores, the Incorporating Houses, the Stemming and Pressing Houses, the Expense Magazines, the Pump House, Shifting Houses and Canteens.

The actual date of demolition or removal of the buildings is unknown. In most cases, demolition of the buildings was to slab level only, with foundations and infrastructure remaining in situ. The road and rail magazines which currently occupy the northern parts of the Georgetown site are understood to have been built after World War II. In the 1950s, the Georgetown area was used to store large quantities of munitions, ranging in size from fuzes to 1,000 lb bombs, in readiness for breakdown. Anecdotal evidence suggests that large shells may have been stockpiled on soft ground at the sides of roads, resulting in the munitions slowly sinking into the mud. Munitions were known to have been stored for long periods of time on the site, with breakdown generally only being carried out when the commodities markets spot prices for metals were favourable. Anecdotal information suggests that munitions were stored within crates or pallets, which over time rotted and disintegrated, which may have led to the scattering of devices over the ground.

More recently, a burning ground has been located in the south eastern part of the site, mostly used for treating items cast from lead from the Nitroglycerine plants on the Royal Ordnance factory. The lead was heated over a fire in a small brick building to remove any Nitroglycerine which may have been absorbed, and allowed to melt and collect in sand laid beneath the fire. The crude lead ingots were then removed for refining. A decontamination oven was also located on this burning ground and was used to roast shells with TNT paint liners and to decontaminate items of plant and machinery. The decontamination oven was oil fired, and an oil tank was located nearby to supply the fuel.

The former location of the 3-Ton Black Powder Magazines in No. 1 Factory is understood to have been used for trials to assess Nitroglycerine detonation transmittability, and may also have been used for trials using Ammonium Perchlorate.

The area in the vicinity of the Rectifying and Pump House within No. 2 Factory is understood to have been formerly used as a sulphur dump.