

BAE Systems Environmental Environmental Statement, Village Core Area, Bishopton

Bishopton



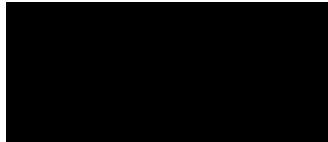
BAE Systems Property Investments Ltd



Environmental Statement, Village Core Area, Bishopton

Bishopton BAE Systems Property Investments Ltd

DOCUMENT CONTROL

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INVESTORS IN PEOPLE

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1. SITE PERSPECTIVE

The proposed “Village Core” area lies within the boundary of the wider Bishopton ROF site and was primarily used as a former stores yard and vehicle parking area when the Bishopton ROF was operational. There was no explosive production undertaken in this area of the site.

Details relating to the “Village Core” area are summarised below.

Title	Village Core area–Proposed mixed use development, including residential properties.
Location	North-east area within the Bishopton site, located adjacent to the Station Road access.
Site description and rationale	Village Core area – proposed mixed use development at the core of Dargavel Village comprising a food retail store, individual retail/commercial units, a library and learning resource centre, residential properties, a park and ride facility and open space. The Village Core area lies within LQMA 05 and LQMA 07. The north of the proposed development area bounds LQMA 21, which lies out with the factory fence.
Area	Approximately 5 ha (3.04 ha retail development)
National Grid Ref:	NS 437 703 at centre of area.
Site Development Zone	Core Development Area (CDA)
Elevation	Approximately 9.5-10 mAOD in south and 12.5-14mAOD in the north.
Adjoining land use	The proposed area (5Ha) is bounded to the north and east by the former Dargavel Road; to the east by the Glasgow-Greenock Railway line and to the south by the Craigton Burn.
Site Security	Currently factory area is securely fenced with 24 hr. security sentry and patrol.

Table 1 – Summary of Village Core Details

1.1. FUTURE DEVELOPMENT

There is planning permission “in principle” for a mixed use development at the core of the Dargavel Village, with the proposed area comprising the following:

- a food retail store,
- individual retail/commercial units,
- a library/learning resource centre,
- residential properties,
- a park and ride facility, and
- open space areas.

The “Village Core” planning application boundary covers an area of 5 Ha of which 3.04 hectares is proposed for retail usage. This area is located within the Core Development Area (CDA) and lies within Land Quality Management Areas LQMA 05 and LQMA 07, Figure 1. The recently revised LQMA 05 and 07 boundaries are also shown in the “Land

Quality Management Areas Justification Document”, Revision 1, November 2012, Report ref: B0091-0C-R1-4.

The south-western corner of the proposed development area lies within LQMA 05 and has been previously investigated in detail and remediated as part of the Phase 1 remediation and earthworks, Figure 2.

The northern area of the proposed development lies within LQMA 07 and has only been subject to Stage 1 and 2 investigations. Therefore there is a requirement to undertake further investigations in the north to inform remediation.

1.2. HISTORICAL BACKGROUND

The “Village Core” was historically used as a former stores yard and was primarily used for factory vehicle parking and the storage of non-explosive substances. This area contained a weigh-bridge, a fire station, stores, oil stores and an electrical sub-station.

Currently the only features which remain in the north of the site include security offices, administration buildings, former car-parking areas and a sub-station. In addition, there are two derelict residential properties and a small wooded area located in the north of the development area.

A portion of the development area lies to the east of the current factory fence and is occupied by former car parking areas. This area lies within the site planning boundary.

1.3. PREVIOUS INVESTIGATIONS AND WORKS

The following is a summary of reports which relate to previous intrusive site investigations works and Phase 1 remediation works undertaken to date in and around the “Village Core” development area:

- Perimeter Investigation, Environmental Services Group, 2002
- Preliminary Geotechnical Investigation, ROF Bishopton, 2003, Report Ref: P501-0D-R3-B
- Preliminary Risk Assessment for Land Contamination, Desk Study, BAE Systems Environmental, 2005, Report Ref A138-00-R1-1),
- Stage 1 Site Investigation, 2005, Report Ref A0385-00-R4-1
- Stage 2 Site Investigation Interpretative Report, 2009, Report Ref B0060-00-R2-1
- LQMA 05 Interpretative Report, March 2012, Report Ref B0091-0C-R20-2
- Remediation Method Statement, LQMA 05, Bishopton, April 2012, Report Ref B0091-0C-R29-3
- Land Quality Management Areas justification document, Revision 1, November 2012, Report ref B0091-0C-R1-4
- Southern Access Ground Investigation Report 2010, Report Ref: B0110-00-R1-1

1.4. POTENTIAL CONTAMINANTS OF CONCERN

Given the historical usage of this area of the Bishopton ROF site, a number of potential contaminants across the “Village Core” area have been previously identified.

These primarily relate to historical raw materials storage and vehicle storage/handling. In addition, made ground is present beneath former store yard areas and areas of former car parking. It was considered that contaminants in this area of the site may include metals, total petroleum hydrocarbons (TPH), poly aromatic hydrocarbons (PAH) and asbestos in both soil and building fabric.

It should be noted that there has been no production of explosives within this area of the site, therefore explosive residues and fragments are not anticipated within this area of the site, however explosives have and will be routinely tested in soils and waters across the entire ROF Bishopton factory.

Previous investigations have identified the following potential sources across the “Village Core” area and are summarised below.

Potential Source(s)	Contaminants of Concern
Spillages and leakages during transport of materials.	Possible explosives residues and fragments of explosives
Made ground/waste materials in south of “ Village Core” area.	Possible explosives residues and fragments of explosives
Made ground beneath car parking areas	Metals, PAHs
Main Stores Yard and fuel tanks	Metals, PAHs & TPHs
Storage of vehicles	TPHs
Asbestos-containing materials in building fabric	Asbestos
Asbestos hotspots in made ground	Asbestos

Table 2 – Summary of Contaminants of Concern identified from previous investigations

2. ENVIRONMENTAL SETTING

This section presents the current understanding of the ground conditions, geology, hydrogeology within the “Village Core” area and the water quality of the nearby Craigton Burn.

Our understanding of the broad conditions anticipated in the “Village Core” area is based upon the findings of previous site investigations undertaken in and around LQMA 05 and 07.

2.1. MADE GROUND

Made ground is known to be approximately 0.5 to 1.0m in thickness across the Village Core area, thickening towards the south-west at the Craigton Burn, where over 2m thickness of made ground has been recorded. Made ground was generally recorded as ash, blaes and brick. The made ground recorded in the vicinity of the Craigton Burn was noted to contain a proportion of glass, wood and metallic waste materials.

Beneath the eastern car park area, made ground (>1m) has also been identified in the central portion of the car park area. In the north of this car park area, thin tarmac is recorded as overlying natural glacial till deposits.

In general, it is anticipated thinner layers (typically <0.5m) of reworked natural material and construction fill are likely to be present beneath associated buildings, roads, and other areas of hard standing.

2.2. SUPERFICIAL DEPOSITS

Results of investigations have recorded both the presence of glacio-marine/deltaic (Linwood and Paisley Formation) and glacial till deposits beneath made ground deposits in the “Village Core” area.

The thickness of the Linwood and Paisley Formations vary across this area and appear to thicken in a south, south-westerly direction. Deposits were found to be thickest in the vicinity of the Craigton Burn, where up to 12m of soft clays and silts were encountered. Localised thin peat/organic soils deposits were also recorded in the vicinity of the Craigton Burn.

The glacial till deposits which underlie the Linwood and Paisley Formations have been recorded at shallow depths in the north of the development area, with the surface of this formation dropping off to 10-12 metres below ground level in the south and south west of the site.

Locally, within the centre of the “Village Core” area, glacial till deposits may be present at shallower depths. Available borehole information also shows that the till deposits may be absent in close proximity to the Craigton Burn.

2.3. BEDROCK DEPOSITS

The geological maps indicate the wider Bishopton site to be underlain by sedimentary and volcanic rocks of Carboniferous Age. Structurally, the strata broadly dip in an easterly direction and are locally intruded by igneous dykes. The Upper Carboniferous strata are displaced by a number of predominantly east-west trending faults.

The solid geology beneath the north eastern areas of the site comprises sedimentary deposits of the Lawmuir Formation, which are broadly characterised by a sequence of

sandstones, siltstones, mudstones, marine and non-marine limestones and thin coals. Sandstone bedrock was encountered at 12.80 metres below ground level in the vicinity of the Craigton Burn, which is located in the south of the proposed development area.

Possible weathered sandstone bedrock was also encountered at approximately 2 metres below ground level in the north of the “Village Core” area.

2.4. COAL MINING

BAE Systems Environmental has obtained a Coal Mining Report from The Coal Authority for the wider ROF Bishopton site. The report indicates that there are unlikely to be any physical risks from historical underground coal mining and that there are no recorded coal mining entries within the wider Bishopton site.

2.5. HYDROGEOLOGY

Previous investigations have confirmed that shallow groundwater has been encountered both within made ground and natural superficial deposits, with no shallow granular aquifers identified in the vicinity of the “Village Core” area.

Shallow groundwater has been encountered within the clays and silts of the Linwood and Paisley Formations, with interpreted groundwater flow in a south, south-westerly direction, given the general westerly reduction in the elevation of the site. Locally, components of shallow groundwater flow will be anticipated to be towards the Craigton Burn in the south of the development area.

Limited groundwater has been encountered at shallow depth within the near surface (weathered zone) of the till deposits or within the more granular units within the till deposit. Groundwater movement within the till deposits is anticipated to be very limited.

Limited groundwater flow is anticipated within the bedrock, with groundwater movement restricted to localised fractures and joints.

BAE Systems can also confirm there are no current groundwater abstractions from superficial deposits or the underlying bedrock aquifer within the wider Bishopton site or the “Village Core” area.

2.6. CRAIGTON BURN

The Craigton Burn lies along the southern boundary of the “Village Core” area and flows in a westerly direction into the wider Bishopton site.

An assessment undertaken by SEPA during 2008 of the surface water quality across the Bishopton site indicated that the general water quality of the Dargavel Burn and its tributaries was good to excellent (Ref SEPA, 2008, ‘Survey of Watercourses at BAE Systems, Bishopton: Ecology Report No. E08). However, it has been noted locally that surface waters in the Craigton Burn have occasionally been impacted by sewage discharges from up gradient of the wider site.

3. PREVIOUS ASSESSMENTS

3.1. RISK ASSESSMENT

Results of previous investigations confirmed a number of relevant pollutant linkages in the central and southern area of “Village Core” area in relation to both human health and the water environment resulting from the contaminants of concern identified. LQMA 05 interpretative report (B0091-0C-R20-2) and Remedial Method Statement report (B0091-0C-R29-3) summarise the locations where exceedances of assessment criteria were considered significant and which required risk management.

3.2. HUMAN HEALTH

The majority of exceedances were recorded within the shallow made ground with an average depth of only 0.4m, with a limited number of exceedances found within materials classified as natural deposits. The nature of the contamination included metals, PAH's, TPH's, and asbestos.

Identified contamination was related to the presence of made ground associated with the former maintenance and stores yard, made ground beneath car park areas, and localised hot spots.

Much of the material from the former storage yard area in LQMA 05 was remediated by the blanket removal of ash/waste made ground deposits.

3.3. GAS RISK ASSESSMENT

The assessment undertaken to date indicates a normal soil-gas regime and gas protection measures are not considered necessary for LQMA 05, which lies in the south of the Village Core area. All boreholes in LQMA 05, including the “Village Core” area were classified as “Green” using the NHBC methodology or Characteristic Situation 1 using the Wilson & Card/CIRIA methodology. To date, no significant gas risks have been identified to potential end users within areas of LQMA 05 which lie within the “Village Core” area.

3.4. WATER ENVIRONMENT

A screen of soils data against derived soil remedial targets confirms that mitigation measures will be required to break potential linkages to the water environment. The key hotspots identified primarily relate to presence of PAHs within the shallow made ground soils.

Results of modelling indicate that contaminants (PAH) which have entered the shallow groundwater pathway do not pose a risk to the key surface water receptor (Craigton Burn).

No sources of contamination have been identified within the groundwater within the bedrock aquifer within the wider LQMA 05, which will cause significant pollution or require remediation prior to site development.

3.5. PROPERTY RISK ASSESSMENT

An assessment of potential risks from ground materials on concrete classification and infrastructure from aggressive soils and made ground materials recorded on the wider LQMA 05 site are not indicated to be significant and can be readily mitigated through detailed design.

A design sulphate class (DSC) DS-1 and aggressive chemical environment for concrete class (ACEC) AC-1 was recommended for the “wider” LQMA 05.

Following the results of this assessment, it is recommended that appropriate mitigation measures are considered by designers at the design and material selection phases for utilities infrastructures. The findings of LQMA 07 investigations will need to be considered.

3.6. SUMMARY OF LQMA 05 ASSESSMENT

The relevant pollutant linkages within LQMA 05 including the southern area of the “Village Core” were identified and formed the basis of the Phase 1 remediation works:

Source	Pathways	Receptor	Contaminants
Site Wide			
Minor constituents of made ground including ash, clinker, blaes and tarmac.	Inhalation, direct contact, ingestion	Humans in the CDA residential zone.	Vanadium & PAHs, including B(a)P
Hot Spots			
Minor constituents of made ground including ash, clinker, blaes and tarmac.	Inhalation, direct contact, ingestion	Humans in the CDA residential zone.	Arsenic, lead & nickel
Made ground (ash waste deposits adjacent to Craigton Burn)	Inhalation, direct contact, ingestion	Humans in the CDA	Picrite (single exceedence)
UST's	Inhalation, direct contact, ingestion	Humans in the CDA.	Hydrocarbons
Asbestos-in made ground TP2627 (at single location)	Inhalation	Humans in the CDA.	Asbestos (single identification)

Table 3 - Human Health Relevant Pollutant Linkages

With regards to the water environment, exceedances generally related to the presence of poly-aromatic hydrocarbons (PAH's) in shallow made ground deposits. Only at one trial pit located in the south of the “Village Core” area adjacent to the Craigton Burn, Nitroglycerine and 2-4 DNT were found in the made ground/waste materials at concentrations exceeding the water environment assessment criteria.

Contaminants have been primarily identified within made ground across the “Village Core” beneath car parking areas and ash waste deposits located adjacent to the Craigton Burn. In summary, the made ground has been the key consideration in determining any potential risks to human health, the water environment, future property and infrastructure.

3.7. PARTIAL REMEDIATION WORKS UNDERTAKEN

Remediation works identified were outlined in the LQMA 05 remediation method statement document, with the verification of the remediation and earthworks to be presented in the LQMA 05 remediation verification report.

For the proposed “Village Core” area development, the following partial remediation works has been undertaken as part of the current Phase 1 remediation works:

- Decontamination and demolition of buildings and structures and substructures;
- Decommissioning and removal of any redundant drainage and utility services;
- Screening, sorting and crushing (where required) of excavated materials;
- Excavation, verification and backfilling of known contamination hotspots and areas of contamination;
- Removal of unsuitable/desirable soil materials in the former store yard area;
- Consideration of ex-situ process based methods for treatment of impacted soils and materials to minimise use of landfilling;
- Undertaking of a comprehensive verification programme.

3.8. CONSTRAINTS ON REMEDIATION

Currently there remain constraints within the “Village Core” area. These include the following;

- Existing high voltage underground cabling exists in the eastern area of the site;
- Low voltage underground cabling exists within the site;
- Foul drainage from Sachel Court Avenue exists within the site;
- Gas main will remain in LQMA 05 until site’s main administration building is vacated;
- Electrical sub-station in LQMA 07 will remain until site’s main administration building is vacated;
- BT fibre optic telecom links along eastern boundary of site (out with current boundary fence-but within planning boundary) will need to be protected and/or diverted during proposed remediation works;
- Surface water drains exist within the north of the site;
- Widening of the Craigton Burn requires to be undertaken in 2013, as part of the wider site flood alleviation works, therefore made ground materials in close proximity to the Craigton Burn will be removed as these widening works are undertaken.

4. FUTURE INVESTIGATION WORKS

4.1. INTRODUCTION

Within the planning application boundary for the “Village Core” Area, there is a requirement to undertake additional site investigation works as part of wider LQMA 07, Phase 2 site investigations. There are few potential sources remaining within the LQMA 07 area of the “Village Core” area, therefore it is anticipated site investigations will be limited.

A Conceptual Site Model (CSM) is a simplified representation of environmental conditions that enables an understanding of a site and its surroundings to be formulated. It describes the possible relationships between contaminants (sources), pathways and receptors and therefore underpins the risk assessment process. The development of a CSM also highlights data gaps, (identifying the data that is required to be collected through site investigation).

The revised Conceptual Site Model (CSM) for the “Village Core” area has been developed taking cognisance of both the previous site wide and LQMA 05 investigation information.

4.2. POTENTIAL SOURCES IN LQMA 07 (VILLAGE CORE AREA)

The potential sources identified within the LQMA 07 area of the “Village Core” area have been identified as follows:

Description	Location and geometry	Contaminants
Made Ground beneath storage yard and car parking areas	Ashy made ground associated with former store yard and car parking areas in east of development area.	Metals and PAHs.
Roads and tarmacadam areas	Areas of former roads and car-parking areas.	PAH/metals, hydrocarbons
Two derelict houses	Non explosive buildings	Metals, PAH, hydrocarbons, explosives.
Non explosive buildings	Security offices	Metals, PAH, hydrocarbons, explosives.
Asbestos containing materials from building fabric	Asbestos in shallow soil mainly adjacent to buildings	Asbestos
Sub-station	Substation currently located within LQMA 07 area of “Village Core”.	PCB’s and hydrocarbons

Table 4 – Potential Sources

No explosive buildings have been identified within the “Village Core” area, however explosives testing for fragments and residues will be routinely undertaken as part of any future investigations, given the history of the wider ROF Bishopton site.

4.3. POTENTIAL PATHWAYS

Standard potential pathways identified in the “Village Core” area are considered in the following table:

Pathway	Description
Inhalation, dermal contact and ingestion	Human exposure to soil e.g. residential/open space/landscape areas.
Direct exposure	Pathway for contaminant exposure to building materials.
Wind blown	Migration of contaminants from surface soils.
Tracked	Migration of contaminants from near surface soils by plant.
Soil vapour/gas migration in unsaturated zone and underground services	Migration of vapours and gases from contaminated soil and groundwater.
Deflagration, burning	Possible harm caused by explosives.
Migration in unsaturated zone.	Leaching of contaminants from potential soil source materials.
Surface water	Migration of contaminants within surface waters. Entry of dissolved and suspended contaminants directly into the Craigton Burn.
Surface water drains	Migration of contaminants in surface water drains.
Existing service runs	Preferential flow paths along service routes.
Groundwater in superficial deposits	Migration of contaminants via groundwater within superficial deposits.
Groundwater in bedrock	Migration of contaminants via groundwater within the bedrock.
Runoff (drainage)	Migration of contaminants via surface water run-off.

Table 5 – Pathways

4.4. POTENTIAL RECEPTORS

The following are key future receptors that are routinely considered as part of the risk assessment process:

Receptor	Description
Humans	Future residents and workers
Groundwater	Groundwater in the bedrock
Surface Water	Craigton Burn
Property (infrastructure)	Proposed residential and commercial buildings within the Village Core development area.

Table 6 – Potential Receptors

Assessment of potential risks to humans will be assessed by the screening of soils relative to Generic Site Assessment Criteria (GSACs) for the most conservative land use. Residential land use has been identified in the “Village Core” area. This approach of screening relative to a GSAC is considered to be a conservative approach.

The bedrock groundwater is a receptor in its own right and, as it has resource potential, any potential risks to the bedrock groundwater within LQMA 07 will be assessed through

the monitoring of bedrock borehole(s) (compliance point) and potential groundwater modelling using assessment points.

The Craigton Burn is the key surface water receptor in the vicinity of the “Village Core” area and is routinely monitored via the site wide monitoring programme.

4.5. POTENTIAL POLLUTANT LINKAGES

The sources, pathways and receptors have been described in the preceding sections. Although each of these elements can exist independently, they only pose a potential risk where they are linked together, so that a particular source (contaminant) affects a particular receptor through a particular pathway. The term pollutant linkage (PL) is used to describe a particular combination of source-pathway-receptor for this preliminary risk assessment.

4.5.1. Further investigations

Based on the potential pollutant linkages remaining within LQMA 07 area of the “Village Core”, the following complimentary site investigation works have been proposed to be undertaken within the LQMA 07 area of the “Village Core” development area, Figure 2. A summary of the proposed additional investigation points required is presented below:

Exploratory Method	LQMA 07
No. of Trial Pits	11
No. of Bedrock Boreholes	1
No. of Superficial Boreholes	11
No. of Hand Augers	3
Total No. of Exploratory Points	26

Table 7 – Summary of Exploratory Point Locations

4.5.2. Geotechnical Information

In addition to the above investigation points, which are required from an environmental point of view, there is also a requirement to improve the understanding of the ground conditions in the vicinity of the proposed residential and retail development plots, within the “Village Core” area, hence the requirement for 9 No. cable percussive boreholes, with associated geotechnical testing.

Given the potential for future changes to land use layouts within the “Village Core” area, investigations points may vary slightly from those detailed above.

4.5.3. Remediation Buffer Zone Extension Area

The above design takes cognisance of the investigations required within the LQMA 07 area of the “Village Core” area, however if the design were to include a 130m remediation buffer zone as part of LQMA 07, there would be a requirement for additional investigation points, which would include an additional 15 trial pits, 5 No. boreholes and 5 No. hand augers.

5. ASSESSMENT

Upon completion of additional site investigation works in the wider LQMA 07, there will be a requirement to undertake further assessment, interpretation and reporting. This will include the “Village Core” area plot within LQMA 07.

Based on the revised interpretation of data, there will be a requirement to develop a remediation method statement for LQMA 07 including the “Village Core” Area.

6. REMEDIATION WORKS

6.1. PROPOSED REMEDIATION WORKS

Remediation of the “Village Core” area (within LQMA 07) will likely include the following:

- Decontamination and demolition of remaining buildings and sub-station structure;
- Decommissioning and removal of redundant drainage and utility services; drainage;
- Screening, sorting and crushing (where required) of excavated material;
- Excavation, verification and backfilling of known contamination hotspots/areas of contaminated materials;
- Removal of unsuitable soil/waste materials.
- Consideration of ex-situ process based methods for treatment of impacted soils and materials to minimise landfilling,
- Undertake a comprehensive verification programme, and
- Possible capping of made ground materials.

6.2. VERIFICATION REPORTING

Following completion of the remediation works, as outlined in the proposed LQMA 07 remediation method statement, given that the “Village Core” area will cover both areas within LQMA 05 and 07, BAE Systems Environmental are minded that there will be the requirement for a site specific verification report for developer uses.

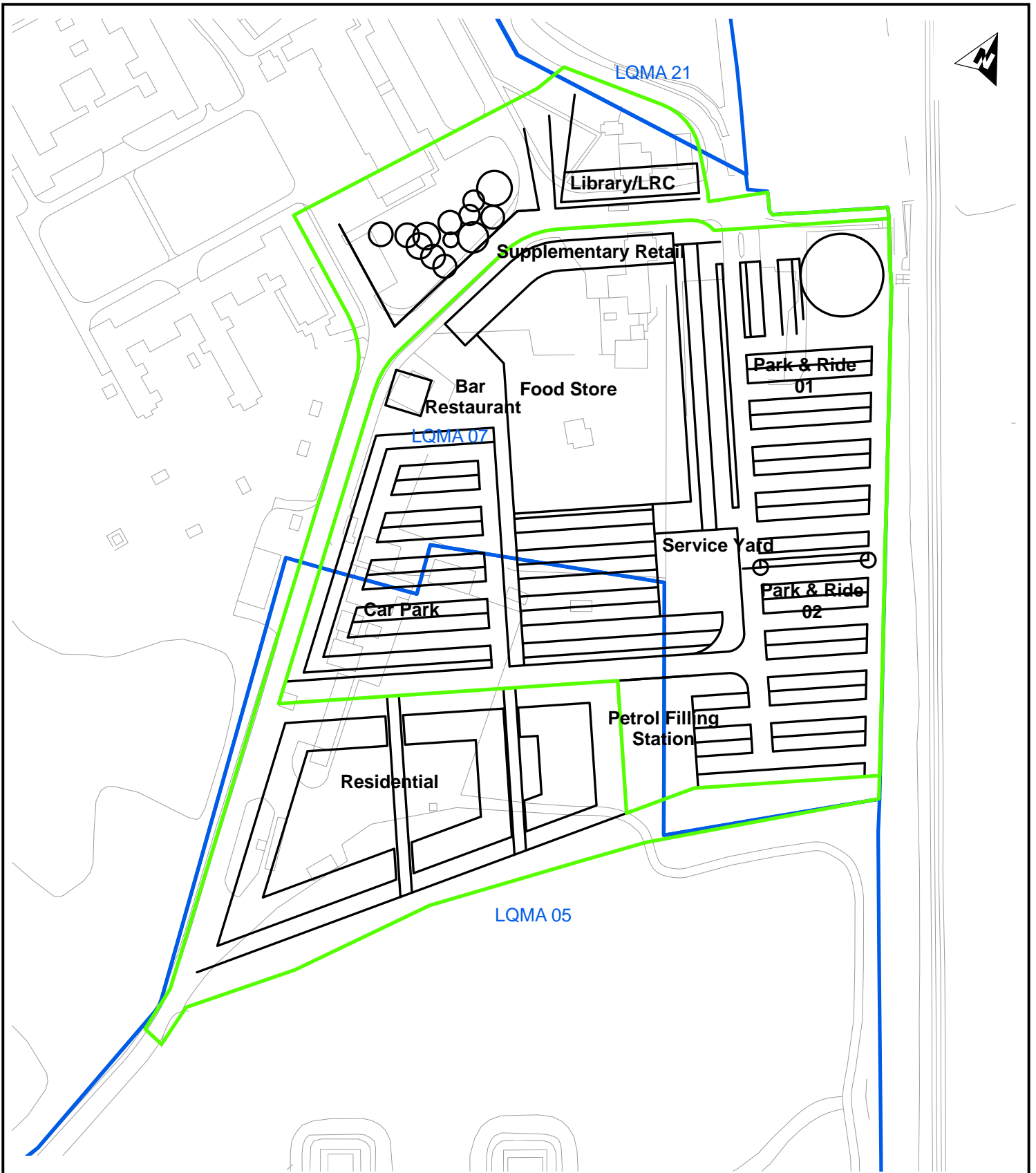





Figure Title:		
Figure 1 - Site Locations Plan and Layout		
Project:		
Food Retail Development		
Project No:	Report No.	Scale:
B0091-0C-11	B0091-0C-R58-1	NTS
		
BAE Systems Environmental Station Road, Bishopton, Renfrewshire, PA7 5NJ Tel. 01505 832025 Fax. 01505 832052		

-  Food Retail Boundary
-  Food Retail Layout
-  LQMA Boundary

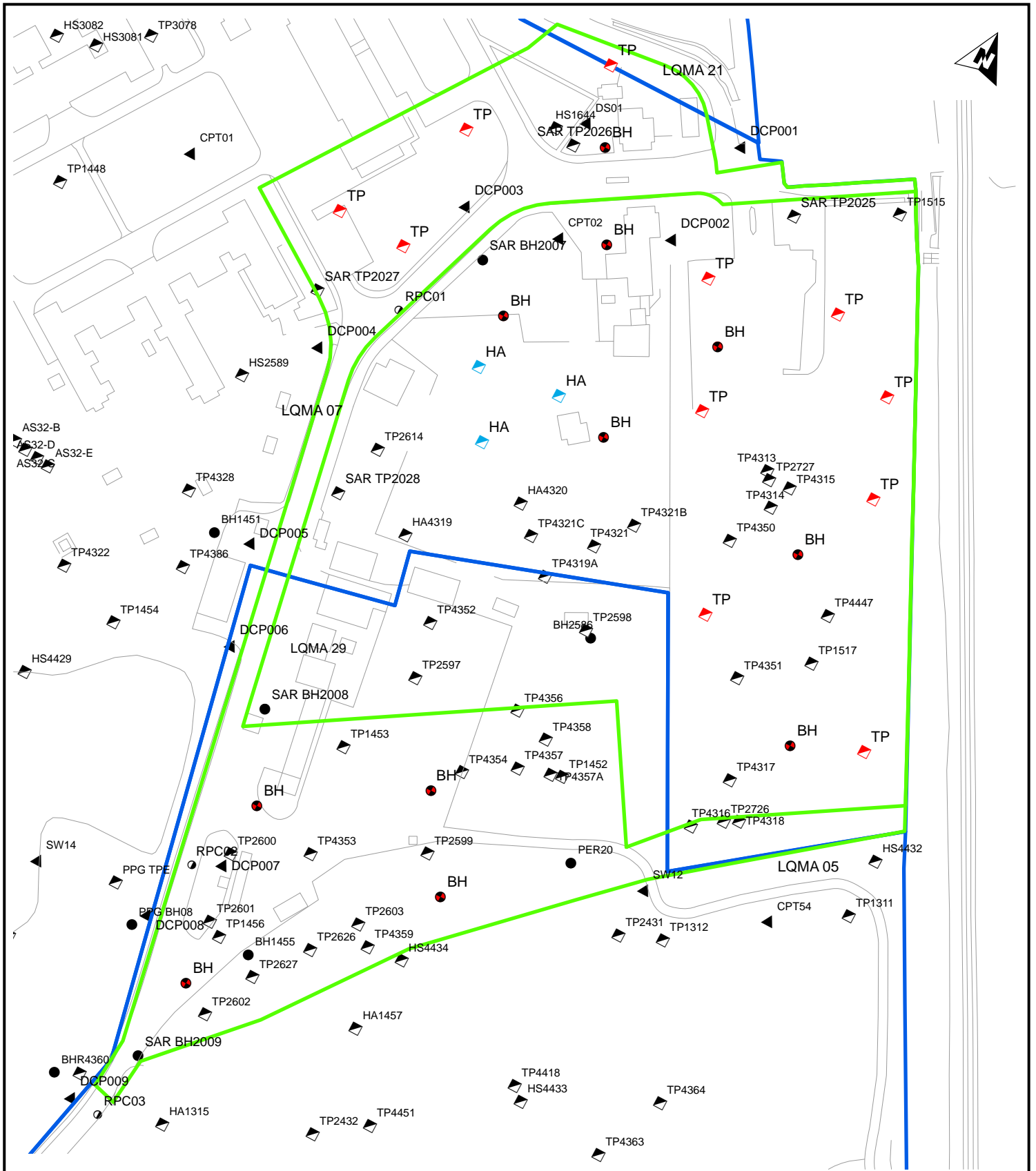


Figure Title:
Figure 2 - Proposed Site Investigation Design

Project:
Food Retail Development

Project No: B0091-0C-11 Report No: B0091-0C-R58-1 Scale: NTS

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Historical Exploratory Points

- ▲ CPT or DCP
- Asbestos Hand Sample
- Borehole
- Hand Auger
- Hand Sample
- Trial Pit
- Window Sample Borehole

Proposed Exploratory Points

- Borehole
- Hand Auger
- Trial Pit
- ▭ Food Retail Boundary
- ▭ LQMA Boundary