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STRIDE TREGLOWN

Defence Equipment and Support

RAF CAM Relocation to RAF Cranwell

Utilities Survey and Review

Wood Environment & Infrastructure Solutions UK Limited – July 2020

Report for

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Document revisions

No.	Details	Date
1	Draft for comment	31st July 2020

Executive summary

RAF Henlow in Bedfordshire has been identified for closure by the UK Government and as a consequence it is planned to relocate the RAF Centre of Aviation Medicine (RAF CAM) from RAF Henlow to a new build facility at RAF Cranwell in Lincolnshire. The RAF has selected a site to the east of Trenchard Hall at RAF Cranwell as the preferred location for this development. See Appendix A for site location plan.

This Utilities Survey and Review Report has been prepared by Wood Environment and Infrastructure Solutions UK Ltd (Wood), in conjunction with Stride Treglown Ltd (STL), for and on behalf of Defence Equipment and Support (DE&S). The purpose of this report is to:

a) Review and assess the services utility requirements for the RAF CAM relocation development;

b) Assess the impact of these additional requirements on the existing Station infrastructure;

c) Identify suitable connection points to the existing Station infrastructure and any upgrade works required to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

The following services and utilities have been considered by this report:

- Power
- Gas
- Water (potable and firefighting)
- Storm and foul drainage
- Communications and Information Systems (CIS) including remoted alarms and Station tannoy.

The utilities and services review has been based on the following:

a) RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;

b) East of Trenchard Hall indicative site development plan (See Appendix B)

c) RAF CAM Capability User Requirements Document (URD);

d) Consultation with appropriate utility and services stakeholders and providers at RAF Cranwell;

The table overleaf summarises the load requirements and connection points for the utilities and services considered by this report.

It is recommended that an ongoing dialogue is maintained with the key utility and services stakeholders and providers, throughout the procurement process, in order to identify any changes in their capability to support the RAF CAM development.

In particular the Station overall power consumption should be reviewed regularly to make sure that the spare capacity identified by this report, within the 5.2MVA limit, is still available to the RAF CAM development. If the situation should change and additional power is required from the network provider Western Power then negotiations to increase the power supply from Western Power should be instigated by through DIO

For individual utility/service recommendations see Sections 2 to 7 of this report.

Utility	RAF CAM Requirement	Connection Point	Comment
Power	600 to 800kVA range	Substation DSS 'T'	New 1000kVA substation required to replace existing DSS 'T'. Dialogue to be maintained with the Station and DIO regarding the availability power.
Gas	374kW / 47m^3/hr	Gas main to south of Cranwell Avenue to north of RAF CAM site	Gas governor/meter required at connection point required. .
CIS	MoDNet (O&S), telephone/VOIP (O&S), non-MoD internet, VTC (O&S)	Existing CIS pit on western edge of site and/or new pit and duct connection to equipment rooms in Trenchard Hall.	CIS Specification to be developed by Air 38Gp CIS Infra prior to ITT/ITN. Surveys required to confirm connection points and any upgrades to existing equipment rooms.
Station Tannoy	Connection to Station broadcast system	Multi-pair control cable at DSS 'T'	
Alarms	Security and Fire	Cross site link via existing duct system to 24hr manned point on station.	Security alarm may require a direct wired link.
Water	5.5l/s domestic supply. 20l/s per fire hydrant	Exiting 150mm dia water main on western side of site adjacent to Trenchard Hall and fire hydrant FH 142.	Pumped booster set required to provide required flow rates to new fire hydrants.
Foul Water	TBD at detail design	Existing foul system that crosses site to be diverted and upgraded for RAF CAM requirement.	Diversion includes new pumping station and pumping main.
Storm Water	TBD at detail design	New local piped system discharging to soakaways.	No connection to existing storm water systems required.

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1. Introduction

1.1 Terms of Reference

Under commission number PMFTDS-0723-2019 Wood Environment and Infrastructure UK Limited has been commissioned by Defence Equipment and Support (DE&S) to undertake a review of the services and utility requirements for the proposed RAF CAM development at RAF Cranwell.

1.2 Background

RAF CAM are currently based at RAF Henlow in Bedfordshire which has been identified for closure by the UK Government. In order for the closure of RAF Henlow to proceed RAF CAM must be relocated to an alternative location within the MOD estate.

An Assessment Study was undertaken By GVA (now Avison Young) into the relocation of RAF CAM and considered a number of sites at RAF Cranwell and RAF Wittering. Following publication of the final version of this study in January 2019 the RAF selected a site to the east of Trenchard Hall at RAF Cranwell (Option E) as the preferred location for a new build RAF CAM facility. See Appendix A for the site location.

The GVA Assessment Study included a concept design and indicative site plan. The concept design provides 6,718 sqm (GIA) of floor space in a predominantly single story building. A copy of the site plan is at Appendix B.

In addition to the Assessment Study the Capability User Requirements Document (Version 0.1 dated January 2020) has been prepared by the project Requirements Manager. This document includes an infrastructure annex setting out the office and technical accommodation requirements based on the GVA Assessment Study. This accommodation assessment does not reflect a capability based assessment and may be subject to further development as the project develops.

1.3 Purpose of this Utilities Survey and Review

The purpose of this report is to:

a) Review and assess the services utility requirements for the RAF CAM relocation development;

b) Assess the impact of these additional requirements on the existing Station infrastructure;

c) Identify suitable connection points to the existing Station infrastructure and any upgrade works required to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

The following services and utilities have been considered by this report:

- Power
- Gas
- Water (potable and firefighting)
- Storm and foul drainage
- Communications and Information Systems (CIS) including remoted alarms and Station tannoy.

The output of this report will assist in defining the scope of the RAF CAM development project with respect to external utility and services connections.

1.4 Basis of Utilities and Services Review

The RAF CAM development utilities and services review has been based on the following:

a) RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;

b) East of Trenchard Hall indicative site development plan (See Appendix B);

c) RAF CAM Capability User Requirements Document, including infrastructure annex;

d) Draft RAF CAM Equipment Specifications prepared by FsAST;

e) RAF Cranwell – General Site Layout Showing All Known Services (see Appendix C);

f) Topographical and GPR Detection Survey of the RAF CAM development site undertaken on behalf of Wood by Warner Surveys. Dwg No's RT/220/0592/P/0007 to P/0012 (six sheets in total);

g) Penetrating Radar Survey Report – RAF Cranwell - ref RT/220/0592 dated 16th March 2020 prepared by Warner Surveys.

The following were consulted were consulted in the preparation of this report:

• Mr Chris Holmes	Estate Development Manager	DIO - RAF Cranwell
• Mr Alan Phillips	Amey Site Manager	Amey Defence Services Ltd
• Mr Brian Scott	Amey Approved Person (AP) electrical	Amey Defence Services Ltd
• Sqn Ldr Colin Gibbon	OC C4i	RAF Cranwell
• Mr Mick Tweedie	C4i	RAF Cranwell
• Mr Kuldip Lehal	Estate Development Specialist	Severn Trent Services

2. Existing Site Services

2.1 Introduction

This section identifies the existing site services and utilities on and in the vicinity of the proposed RAF CAM development site located to the east of Trenchard Hall at RAF Cranwell.

2.2 Basis of Review

References:

1. RAF Cranwell – General Site Layout Showing All Known Services. Dwg No C-CRNC-FULL-SERV-001 dated 26th January 2017;
2. Topographical and GPR Detection Survey of the RAF CAM development site undertaken on behalf of Wood by Warner Surveys. Dwg No's RT/220/0592/P/0007 to P/0012 (six sheets in total).
3. Penetrating Radar Survey Report – RAF Cranwell - ref RT/220/0592 dated 16th March 2020 prepared by Warner Surveys.

The following were consulted regarding existing services on and in the vicinity of the proposed RAF CAM development site:

• Mr Chris Holmes	Estate Development Manager	DIO - RAF Cranwell
• Mr Alan Phillips	Amey Site Manager	Amey Defence Services Ltd
• Mr Brian Scott	Amey Approved Person (AP) electrical	Amey Defence Services Ltd
• Sqn Ldr Colin Gibbon	OC C4i	RAF Cranwell
• Mr Mick Tweedie	C4i	RAF Cranwell
• Mr Kuldip Lehal	Estate Development Specialist	Severn Trent Services

The following services have been identified on and in the vicinity of the proposed RAF CAM development site:

- High Voltage (HV) power substation and distribution
- Medium Voltage (MV) power distribution
- Gas
- Communication and Information Systems (CIS)
- Foul water drainage
- Storm water drainage
- Potable (domestic) and firefighting water systems

2.3 Site Review and Survey

Introduction

An extract from the site services plan (Reference 1) is lodged at Appendix C and shows the known services in the vicinity of the RAF CAM development site. It should be noted that the location of the services on this plan is indicative and there may be other service present, both live and abandoned, that the Station have no record of.

A copy of the combined Ground Penetrating Radar and Topographical Survey undertaken in March 2020 by Warner Surveys is at Appendix D. The underground services identified on this survey, which correlate with known services at Appendix C, have been annotated using the same reference. The survey identifies a number of potential underground services not identified on Appendix C. Some of these services are considered to be from the previous development of the site. The Status of these services has not been determined at this stage and may include live as well as redundant disconnected services.

The previous development of the site comprised accommodation huts / technical buildings, an internal road network and a number of air raid shelters. This development is understood to have been established in WW2 and had been removed by the 1970s. The site has since been landscaped and the current trees planted. The only visible evidence of this development today are the air raid shelter entrances to the south of the site identified as assets S120 to S122 and S134 to S137 at Appendix C.

The following paragraphs describe the existing services identified on and adjacent to the RAF CAM site by type.

High Voltage (HV) Systems

A HV ring main dog legs across the south east of the site. The location of this main is clearly shown on both Appendices C and D. This main forms part of the southern airfield ring. Substation DSS 'T' is located immediately to the east of the RAF CAM site area and is linked to this ring main by a loop that that runs north to south and to the east of South Airfield Road, see Appendix C.

Substation DSS 'T' is rated at 200kVA and currently supplies the Air Traffic Control Tower complex (Buildings 309 to 311), the foul pumping station, and street lighting to the west and north of the RAF CAM site on Trenchard Drive.

To the north of the site between Trenchard Drive and the Station boundary a number of HV mains are identified on Appendix C. These have not been picked up on Appendix D as they are outside the RAF CAM survey and development area. These are a combination of the incoming Station supplies from Western Power and a ring main serving the domestic accommodation to the north of Cranwell Avenue (B1429)

Medium Voltage (MV) Systems

An MV supply from DSS 'T' crosses the site from east to west to supply street lighting to the western and northern boundaries of the RAF CAM site on Trenchard Drive. The cabling to the street lights runs within the RAF CAM site in the verge to Trenchard Drive.

The cross site cable has been picked up on the survey at Appendix D but only a section of the street lighting cable along the northern boundary. This is considered to be due to the limitations of the GPR survey process, adjacent to the Trenchard Dive kerb line, rather than the cables not being present as indicated on Appendix C.

A foul water pumping station is located centrally within the southern section of the site and has a power supply. This supply is not shown on Appendix C and cannot be clearly identified from the GPR survey at Appendix D.

These supplies will require to be diverted around the RAF CAM development as part of the enabling works for the project.

Gas

There are no gas mains on or in the immediate vicinity of the RAF CAM development site. The nearest distribution mains are the gas mains that run along, and immediately to the south, of Cranwell Avenue. These gas mains are shown on Appendix C. These mains are managed by the District Network Operator (DNO) Cadent Gas.

In recent years the Station have been replacing area district heating systems with decentralised gas heating systems to each facility. As a result the existing Station facilities to the west and north of the site now have local gas distribution networks. These are not shown on Appendix C. A meeting with DIO in October 2019 indicated that there may be spare capacity in 'Network 7' to the north of Cranwell Avenue. To determine if sufficient spare capacity is available the existing network analysis of this local distribution would need to be updated with the RAF CAM development loading.

RAF Cranwell has an uninterruptible gas supply. The supply to RAF Cranwell is reported to have spare capacity.

Communication and Information Systems (CIS)

A duct enters the RAF CAM site at the north west corner and dog legs down the site to exit on the southern boundary where it runs in a south-easterly direction towards the ATC tower. The route appears to follow the former road network of the previous development on the site. The Station C4i Squadron have no record of this duct route being in current use and consider it may have been for a former CCTV system. This duct is shown on Appendix C and can be traced on the GPR survey, see Appendix D, apart from the north west corner adjacent to the existing car park.

At the south west corner of the RAF CAM site a pit and duct system encroaches into the site along the kerb line to Trenchard Drive, see Appendix C. This system runs from the south east corner of Trenchard Hall to a duct system on the airfield to the south. The C4i Squadron have confirmed that this is an active CIS system. The survey at Appendix D has picked up the pit located within the RAF CAM site but not the underground ducts due to the GPR equipment not being able to get close to the kerb line.

Foul Water Drainage

A gravity foul water drain from the ATC Tower enters the RAF CAM site at the south east corner and discharges into a below ground pumping station located centrally within the southern half of the site. A pumping main then runs in a north westerly direction to discharge into a gravity system immediately to the east of Trenchard Hall. This system then runs in a north easterly direction to the Anglian Water sewage treatment works to the north of Cranwell Avenue (B1429). In doing so it crosses the north east corner of the RAF CAM site under the existing Trenchard Hall car park. The foul water system is clearly shown on Appendices C and D.

Under Project Aquatrine the foul water system is managed by Severn Trent Services and the pumping Station is designated as an Aquatrine asset. As noted in the MV section above the route of the power supply to the pumping station has not been identified.

Storm Water Drainage

Surface water from existing built up areas on the Station is drained to ground via soakaways.

On the RAF CAM site surface water drainage is evident within the car park and to the perimeter roads by the presence of road gullies. Appendix C indicates a local piped storm water system to the north east corner of Trenchard Hall which encroaches onto the RAF CAM site. There is no indication of any soakaways being present on the site.

Appendix D has identified the location of the gullies but no soakaways or local piped systems connecting the gullies have been picked up by the survey.

Under Project Aquatrine piped storm water systems are managed by Severn Trent Services.

Potable and Firefighting Water Systems

The following combined domestic and firefighting water mains have been identified on the site:

a) A 100mm diameter main runs east-west across the northern section of the site and serves fire hydrants FH147 and FH 148. Severn Trent Services (STS) have advised that this main has been disconnected/capped at its western end. This is marked as point 1 on Appendix C. The eastern end of the main has been picked by the survey at Appendix D.

b) A 75mm diameter main crosses the southern section of the site in an east west direction and serves the ATC Tower including FH149. This main is shown on Appendix C and its location verified on Appendix D. This supply may require to be diverted as part of the enabling works for the RAF CAM project due to its proximity to the development footprint.

c) A further 75mm diameter main runs north-south down the western edge of the site and connects the two mains noted above and serves fire hydrant FH143. The northern end of this main is fed from the west by a 150mm dia supply which includes fire hydrant FH142. The southern end is also fed from the west but the size of this main has not been determined. STS have confirmed that it is currently planned to cap the north-south main immediately to the north of fire hydrant FH 142, see point 2 on Appendix C, so that FH 143 is fed from the south only. This distribution is shown on Appendix C and its location only partly verified by the site survey at Appendix D.

STS have confirmed that as of 2019 the following flow rates have been recorded at the fire hydrants:

- FH142: 20.5l/s Located to north west of RAF CAM site
- FH143: 3.6l/s Located centrally on western edge of RAF CAM site
- FH147: Disconnected Located on northern edge of RAF CAM site
- FH 148: Disconnected Located on north east edge of RAF CAM site
- FH 149: 2.5l/s Located to south east of RAF CAM site at ATC

Under Project Aquatrine piped storm water systems are managed by Severn Trent Services. It should be noted that the water main diameters quoted are based on record information and will need to be verified.

The

Unidentified Services

In addition to the services noted above the GPR survey at Appendix D recorded a number of unidentified linear features that appear to be underground services. These are considered, at this stage, to be redundant services that supported the previous development of the site. It is feasible that some of these services/utilities may still be connected and the works contractor will need to verify the status of these services as part of the site clearance and preparation works. Any cables will need to be checked by the Station electrical Approved Person (AP) before removal to ensure that they are not live. If they are live then they will need to be terminated at source or if still required diverted.

As noted in the MV paragraph above the only known electrical service that has not been identified at this stage is the electrical supply to the foul water pumping station.

At Appendix D the known live services that correlate with Appendix C have been clearly marked.

3. Electrical Power

3.1 Introduction

This section assesses the power requirement for the proposed RAF CAM facility and in particular the following:

a) The impact of this additional power requirement on the existing Station infrastructure;

b) Identification of a suitable connection point to the existing Station infrastructure;

c) Determine any upgrade works required to the Station power infrastructure to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

3.2 RAF CAM Load Assessment

References:

1. RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;
2. East of Trenchard Hall indicative site development plan (See Appendix B);
3. RAF CAM Capability User Requirements Document, including infrastructure annex;
4. Draft RAF CAM Equipment Specifications prepared by FsAST.

Based on the above references an independent assessment of the RAF CAM development power requirement was undertaken by Ibex Environmental Ltd. A copy of the output report from this assessment is lodged at Appendix E.

The power requirement has been assessed to be in the range of **600 to 800kVA**.

It should be noted that this is based on the infrastructure annex to Reference 3 which in turn is based on Reference 1 and may not fully reflect the developed System Requirement Document (SRD) for the project.

3.3 Connection to Existing Station Infrastructure

The following were consulted to determine the current status of the RAF Cranwell power infrastructure and the availability of power to support the RAF CAM development:

• Mr Chris Holmes	Estate Development Manager	DIO - RAF Cranwell
• Mr Frank Finch	Senior M&E Manager	DIO
• Mr Alan Phillips	Amey Site Manager	Amey Defence Services Ltd
• Mr Brian Scott	Amey Approved Person (AP) electrical	Amey Defence Services Ltd

Discussions were held with Frank Finch, Chris Holmes and Brian Scott in September and October 2019 and revalidated in March and April 2020, with Chris Holmes and Alan Phillips, regarding the availability of power to the RAF CAM development from the current Station infrastructure. The following was ascertained:

Current Station power availability is 3.2MVA which is sufficient to meet current (April 2020) Station power demand except for the new UKMFTS facility. As a consequence the UKMFTS facility is currently supported by temporary generators until the overall Station supply can be increased. The current Station intake substation is limited in capacity to 3.2MVA.

To rectify this situation the external Station power infrastructure is in the process of being upgraded from 3.2MVA to 5.2MVA. This project received funding in October 2019 and is due to be completed by early 2021. This project involves the upgrade of the Station and Western Power intake substations (adjacent to the Hive and opposite the Guardroom) and an upgrade of the Western Power external supply. Once these works are completed UKMFTS will be connected to the Station internal power network and the temporary generators removed. The Western Power tariff available to the Station will be limited to 5.MVA.

Once these works are complete a further increase in the external power supply to 7.2MVA would be feasible without modification to the Station intake sub-station and without reinforcement of the Station internal power distribution network. The 7.2MVA limitation being due to the size/capacity of the Station power distribution cabling. Reference 1 indicates that the below ground HV ring main cabling was upgraded ten to fifteen years ago. The Station are currently in the process of replacing RMUs (ring main units) on the power distribution network due to their age.

An uplift of the external Western Power supply / tariff from5.2MVA to 7.2MVA would be subject to Western Power capacity and availability. To determine if Western power could provide a further uplift a formal application would be required. Any such request for a power increase would be managed via DIO at Cranwell and any costs borne by the RAF CAM project.

Brain Scott (AP) confirmed in October 2019 that they had been monitoring UKMFTS power usage and it was less than forecast. The overall Station power usage is also monitored and including UKMFTS the maximum demand is in the order of 4.2MVA. This leaves 1.0MVA available for future developments on the Station.

Based on the above monitoring there will be sufficient spare capacity within the 5.2MVA tariff limit to meet the requirements of the RAF CAM development. Although further developments are planned at RAF Cranwell, at the time of writing this report, RAF CAM is currently the next in line and would be able to utilise the current 1.0MVA spare capacity.

RAF CAM Power Connection

The nearest substation to the RAF CAM development is DSS 'T' immediately to the east of the proposed development, see Appendix C. Currently this is a 200kVA transformer and primarily serves the Air Traffic Control Tower. Following discussions with the AP it is proposed to replace this transformer with a 1.0MVA unit to serve both RAF CAM and ATC. Thus RAF CAM will connect to the upgraded DSS 'T' substation located immediately to the east of the development area.

In order to upgrade DSS 'T' the current Station Power Grading Study will require to be rerun to include the upgraded DSS 'T' substation. The RAF CAM project will bear the cost of this grading study.

Replacement of DSS 'T' will need to be carefully managed to limit outages and disruption to air traffic control.

To procure the power supply for RAF CAM application is to be made via DIO at RAF Cranwell.

Risks / Uncertainties

The main risks identified at this stage are:

- Increase in Station external power supply above 5.2MVA due to a currently unforeseen increase in usage or new projects within the same time frame as RAF CAM.
- Local upgrade / replacement of power distribution cables is required following the grading study.

3.4 Summary and Recommendations

The estimated RAF CAM development maximum power requirement is in the order of 600 to 800kVA. It is proposed to replace the existing DSS 'T' 200kVA transformer with a 1.0MVA unit to supply RAF CAM.

The Station power supply is currently being upgraded from 3.2MVA to 5.2MVA. When this project is completed in early 2021 the Station will have spare capacity in the order of 1.0MVA. This will be sufficient to meet the RAF CAM requirement.

It is recommended that dialogue is maintained with the Station and DIO regarding the availability of this spare power capacity to the RAF CAM project.

Should this spare capacity be allocated to other projects, prior to the RAF CAM project being approved, then there is a risk that the RAF CAM project would bear the cost of increasing the Station external supply from Western Power above the current 5.2MVA limit.

4. Gas Supply

4.1 Introduction

This section assesses the gas requirement for the proposed RAF CAM facility and in particular the following:

a) The impact of this additional gas requirement on the existing Station infrastructure;

b) Identification of a suitable connection point to the existing gas infrastructure;

c) Determine any upgrade works required to the Station gas infrastructure to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

4.2 RAF CAM Load Assessment

References:

1. RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;
2. East of Trenchard Hall indicative site development plan (See Appendix B);
3. RAF CAM Capability User Requirements Document, including infrastructure annex;
4. Draft RAF CAM Equipment Specifications prepared by FsAST.

Based on the above references an independent assessment of the RAF CAM development gas requirement was undertaken by Ibex Environmental Ltd. A copy of the output report from this assessment is lodged at Appendix E.

The maximum gas consumption has been assessed to be **374kW / 47m^3/hr**.

It should be noted that this is based on the infrastructure annex to Reference 3 which in turn is based on Reference 1 and may not fully reflect the developed System Requirement Document (SRD) for the project.

4.3 Connection to Existing Gas Infrastructure

The following were consulted to determine the current status of the RAF Cranwell gas infrastructure and the availability of gas to support the RAF CAM development:

- Mr Chris Holmes — Estate Development Manager — DIO - RAF Cranwell
- Mr Alan Phillips — Amey Site Manager — Amey Defence Services Ltd
- Cadent Gas Representatives

As outlined in Section 2 of this report the following gas distributions are adjacent to the RAF CAM development area:

a) 'Network 7' to the north of Cranwell Avenue (BI429) and the RAF CAN development site.

b) Gas mains that run along Cranwell and immediately to the south of Cranwell Avenue.

Following discussions with DIO it is recommended that the RAF CAM development is connected to the gas main in Cranwell Avenue immediately to the north of the RAF CAM development area, see Appendix C. This will require a connection to be made to the gas main and a governor/meter installed as it is a direct connection to the DNO managed distribution.

This connection is nearer to the RAF CAM site and does not need to cross Cranwell Avenue which would be the case if a connection was made to Network 7.

A formal application will be required to the DNO Cadent Gas to obtain a quotation and outline design for this connection. This is recommended as it will establish the cost of the works and any upgrades required. The connection works can only be programmed by Cadent gas once their quotation for the connection has been accepted.

Risks / Uncertainties

The main risk identified at this stage is that Cadent Gas have insufficient capacity to supply the RAF CAM development. This risk could occur if other developments in the local area, external to RAF Cranwell, increase the demand on the local network. This risk could be mitigated by reducing or eliminating the need for gas in the RAF CAM design but this would inevitably increase the electrical power demand which is limited if the 5.2MVA capacity is not to be exceeded, see Section 3 above.

4.4 Summary and Recommendations

The maximum gas demand for the RAF CAM development has been assessed as 374kW / 47m^3/hr. It is proposed to connect to the Cadent Gas mains immediately to the south of Cranwell Avenue.

It is recommended that a formal application is made to Cadent Gas as soon as possible within the limitations of the RAF CAM procurement process in order to establish the cost and availability of supply.

It is recommended that the RAF CAM facility is designed to minimise CO2 emissions, and thus gas consumption, by the use of combined heat and power (CHP) systems and renewable energy sources, such as PV panels, heat recovery systems and passive measures to maximise thermal efficiency.

Gas consumption could be reduced to zero but this would be to the detriment of the electrical power supply which would increase to make up some of the resultant shortfall in heating energy. This approach would be limited by the available power supply, see Section 3 above.

5. Communication and Information Systems (CIS)

5.1 Introduction

This section assesses the CIS external connectivity required for the proposed RAF CAM facility and in particular the following:

a) The impact of this additional requirement on the existing Station infrastructure;

b) Identification of a suitable connection point to the existing CIS infrastructure;

c) Determine any upgrade works required to the Station CIS infrastructure to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

5.2 CIS Requirement Assessment

References:

1. RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;
2. RAF Centre of Aviation Medicine Relocation Project – Capability User Requirements Document (URD) – Version 0.1 dated January 2020.

The following were consulted in the assessment of the RAF CAM CIS requirements and connectivity:

- Sqn Ldr Colin Gibbon OC C4i RAF Cranwell
- Mr Mick Tweedie C4i RAF Cranwell

The URD (Reference 2) includes an infrastructure annex comprising an accommodation schedule, based on the GVA Assessment Study concept design, annotated with guidance on the functional areas including an indication of the CIS requirement for the development.

The URD infrastructure annex has been reviewed to identify the RAF CAM CIS and Security requirements. A copy of the resultant CIS and Security Overview matrix is lodged at Appendix F and forms the basis of this CIS assessment.

It should be noted that Appendix F is based on the infrastructure annex to Reference 2 which in turn is based on the GVA Assessment Study (Reference 2) and may not fully reflect the developed System Requirement Document (SRD) for the project.

Appendix F identified the following communication and data systems to be installed within the RAF CAM development:

- MoDNet (Official)
- MoDNet (Secret)
- VTC - Video Tele-Conference (Official and Secret)
- Telephones / VOIP (Official)

- Telephones (Secret S and SSS)
- CAMNet (LAN)
- External Broadband/Internet for software and systems that are not accredited for use on MODNet

The proposed maximum RAF CAM occupancy will be 143 permanent staff and 116 trainees. The URD requirement is for each desk to have access to MoDNet and a telephone/VOIP. On this basis connectivity will be required for approximately 150 MoDNet connections and a 150 telephones/VOIP. Note VOIP may be hosted over MoDNet.

5.3 Connection to Existing CIS Infrastructure

The Station C4i Sqn have confirmed that the Station CIS equipment rooms for MoDNet and BT systems are located within Trenchard Hall immediately to the west of the RAF CAM development site. The hub for secret telephones is located elsewhere on the Station.

MoDNet

C4i propose connecting to the existing MoD pit and duct system that encroaches onto the RAF CAM site adjacent to the south east corner of Trenchard Hall. A new pit and duct system will be required from the RAF CAM Building Entry Point (BEP) to connect with the existing MoD pit located within the RAF CAM site and opposite Trenchard Hall. See Appendices C and D for location.

The feasibility of connecting to this pit and routing the cable(s) through the existing duct system will need to be determined by a survey undertaken by Fujitsu who manage the system on behalf of the MoD. This survey will also identify if any capacity upgrade works required to the MoDNet hub within Trenchard Hall. At this stage C4i Squadron are of the view that the MoDNet core switch has sufficient spare ways to accommodate the anticipated RAF CAM requirement.

These surveys will be undertaken once a detailed CIS Specification has been developed for the project by Air 38Gp A6 CIS Infra.

Telephones and External Broadband

The existing telephone system and external internet/broadband connectivity is manged by BT. Generally BT prefer to use a separate pit and duct system within the Station that they own. Although, with the agreement of the Authority they can duct share with MOD systems.

The site survey and C4i Squadron have not identified any BT duct systems within the vicinity of the RAF CAM development site at this stage. Connectivity for telephones and external internet/Broadband will be either be via the MoD duct system detailed above for MoDNet or by a new BT pit and duct system connecting the RAF CAM facility to the BT equipment room within Trenchard Hall.

The means of providing BT connectivity to the site will need to be determined by a site survey undertaken by BT. The survey will also identify any capacity upgrade works that are required the BT equipment room within Trenchard Hall. The survey process is managed by the Station C4i Squadron.

These surveys will be undertaken once a detailed CIS Specification has been developed for the project by Air 38Gp CIS Infra.

Secret phones will be connected via a new cross site fibre optic link to the secret hub. This will utilise existing secure pit and duct routes and share the MoDNet link for the final connectivity to the RAF CAM facility.

VTC Systems

The external connectivity for the proposed VTC systems will utilise, as appropriate, the MODNet and BT connectivity detailed above.

Risks and Uncertainties

The following risks and uncertainties have been identified at this stage:

- Existing pits and ducts cannot be utilised to connect MoD and BT systems to the equipment rooms in Trenchard Hall. This would be mitigated by the provision of a new pits and duct route to a suitable entry point into Trenchard hall.
- Upgrade of the existing MoDNet and BT equipment rooms within Trenchard Hall are identified by the pre-installation surveys.

5.4 Alarms and Station Tannoy

The fire alarm system will utilise a dedicated line within the telephone system to link to a 24 hour manned reporting centre on the Station.

The intruder detection system within the facility will utilise a SSG (Security Services Group) alarm panel. This will require to be linked to an SSG reporting panel within a 24 hour manned reporting centre on the Station. This is required to be a dedicated link and will utilise the existing MoD CIS duct system on the Station.

The Station Tannoy is distributed around the Station on a multi pair control cable that links the electrical supply substations. One of these pairs carries the Station Tannoy signal. For the RAF CAM development the connection point will be DSS'T' immediately to the east of the development area.

5.5 Summary and Recommendations

The RAF CAM MoDNet and BT CIS will be connected to the Station equipment rooms, located within Trenchard Hall utilising where possible existing pit and duct routes for part of the route. Where this is not possible new pit and ducts routes to a suitable entry point to Trenchard Hall will be required.

It is recommended that once the System Requirement Document (SRD) for the project has been sufficiently developed that Air 38Gp A6 CIS Infra are tasked with preparing the CIS specification for the project. Ideally this should be undertaken prior to ITT/ITN.

Once project funding is secured it is recommended that surveys are commissioned from Fujitsu/MoDNet and BT to confirm the CIS duct routes and any upgrade works to the network equipment accommodated in Trenchard Hall.

6. Water (Potable and Firefighting)

6.1 Introduction

This section assesses the water requirement for the proposed RAF CAM facility and in particular the following:

a) The impact of this additional water requirement on the existing Station infrastructure;

b) Identification of a suitable connection point to the existing water infrastructure;

c) Determine any upgrade works required to the Station water infrastructure to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

Under Project Aquatrine Severn Trent services manage water supplies and water distribution networks on the RAF Cranwell estate.

6.2 Water Demand Assessment

References:

1. RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;
2. East of Trenchard Hall indicative site development plan (See Appendix B);
3. RAF CAM Capability User Requirements Document, including infrastructure annex;

Based on the above references an independent assessment of the RAF CAM development water requirement was undertaken by Ibex Environmental Ltd. A copy of the output report from this assessment is lodged at Appendix E.

A water flow rate of **5.5l/s** should service the domestic requirements of RAF CAM based on Appendix E.

It should be noted that this is based on the infrastructure annex to Reference 3 which in turn is based on Reference 1 and may not fully reflect the developed System Requirement Document (SRD) for the project.

To comply with Defence infrastructure Fire Standards a fire hydrant with a minimum flow rate of **20l/s** is required to be located within 70m of the building entrance.

At RAF Cranwell domestic and firefighting water supply is on a combined distribution system.

6.3 Connection to Existing Water Distribution

The following were consulted to determine the current status of the RAF Cranwell water infrastructure and the availability of a water supply to support the RAF CAM development:

- Mr Kuldip Lehal Estate Development Specialist Severn Trent Services

As outlined in Section 2 of this report the following live water mains are located adjacent to the site:

a) A 150mm diameter water main serving fire hydrant FH142 located to the north west of the site.

b) A 75mm diameter water main along the western boundary of the site that serves fire hydrant FH 143 to the front of Trenchard Hall

c) A 75mm diameter water main that runs west to east across the southern section of the site to fire hydrant FH149 and the Air Traffic Control Tower.

See Appendices C and D for the location of these mains and fire hydrants. The fire hydrant flow rates supplied by Severn Trent services are as follows:

- FH142: 20.5l/s Located to north west of RAF CAM site
- FH143: 3.6l/s Located centrally on western edge of RAF CAM site
- FH 149: 2.5l/s Located to south east of RAF CAM site at ATC

This demonstrates that only FH142 meets the required flow rates for a hydrant and that the 150mm diameter main that serves it has sufficient capacity for the domestic supply requirement of 5.5l/s. However, if the RAF CAM 5.5l/s supply was to be connected to this main it could potentially reduce the hydrant capacity below the required flow rate of 20l/s.

It is therefore proposed to connect to the 150mm water main adjacent to FH142 to supply the RAF CAM development and fire hydrants to meet the Defence Infrastructure Fire Standards. To make sure that the required flow rates can be achieved a booster set is proposed, adjacent to Fire Hydrant 142, to provide sufficient flow when the demand from the building or fire hydrants demand it.

Alternatively, rather than boost the supply to the RAF CAM site emergency water storage (EWS) tanks could be provided in lieu of fire hydrants connected directly to the water supply. This solution is generally not preferred but would be an option if there are issues connecting the existing supply and achieving the required flow rates with a booster set. The final solution will be determined at the detailed design.

All installations are to comply with the Severn Trent Services specifications under there Project Aquatrine contract. Firefighting water supplies and number and location of hydrants to be agreed with the Defence Fire Safety Regulator through the DIO Building Regulations consultation process.

The 75mm diameter water main that runs west to east across the southern section of the site to supply ATC may require to be diverted as part of the enabling works for the RAF CAM project due to its proximity to the development footprint.

Risks and Uncertainties

The following risks and uncertainties have been identified at this stage:

- The detailed design cannot provide sufficient water flow when boosted to meet the RAF CAM firefighting requirement. This could be mitigated by the provision of emergency water storage adjacent to the RAF CAM development.

6.4 Summary and Recommendations

It is proposed to connect to the existing 150mm diameter water main that supplies fire hydrant FH 142 located adjacent to the north east boundary of the site, see Appendix C for location. This flow rate from this supply will need to be increased by a pumped booster set to meet the RAF CAM requirement.

7. Foul Water Drainage

7.1 Introduction

This section considers the foul drainage provision to the RAF CAM development. As detailed in Section 2 of this report a foul drainage sewer / pumping main crosses the RAF CAM development site from the ATC tower. A foul pumping station is located within the RAF CAM development foot print, see Annex C.

There is a further encroachment on to the RAF CAM site at the north west corner beneath the Trenchard Hall car park. This sewer is one of Station outfalls to the Anglian Water sewage treatment works located to the north east of RAF Cranwell.

Under Project Aquatrine Severn Trent Services manage the foul water drainage systems on the RAF Cranwell estate.

7.2 Connection to Existing Foul Water System

References:

1. RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;
2. East of Trenchard Hall indicative site development plan (See Appendix B);
3. RAF CAM Capability User Requirements Document, including infrastructure annex;

The following were consulted to determine the current status of the RAF Cranwell foul water infrastructure in the vicinity of the RAF CAM development:

- Mr Kuldip Lehal Estate Development Specialist Severn Trent Services

The existing foul water sewer, pumping station and pumping main that cross the site are within the RAF CAM development footprint and will need to be diverted around the RAF CAM development. The gravity sewer beneath the Trenchard Hall car park is outside the envisaged RAF CAM development footprint and will not require to be diverted.

As part of the enabling works for the RAF CAM project a new pumping station will be constructed together with a rerouted gravity sewer from ATC that discharges into the pumping station. A new pumping main will be installed from the new pumping station to the existing discharge point adjacent to the east elevation of Trenchard Hall. A new power supply will be required to the pumping station from DSS 'T'.

The diverted foul system will be designed for discharges from the ATC tower and from the new RAF CAM development. The pumping station will be sized accordingly and located to the south east of the site

Consultation with Severn Trent Services confirmed this approach and that there is sufficient capacity within the Station sewer network for the additional foul flows.

All foul water systems are to be designed to adoptable standards in accordance with Severn Trent Services specifications and standards.

Risks and Uncertainties

The GVA Assessment Study, Reference 1, identified that there is potentially insufficient capacity within the Anglian Water sewage treatment works for the additional flows from RAF CAM. They had confirmed to GVA

that they would take the necessary steps to provide and fund any additional capacity required once planning permission for the RAF CAM development was granted.

Expansion of the sewage treatment works, if required, would require amendment to Anglian Water's existing effluent disposal permit with the Environmental Agency. This could be sensitive give that RAF Cranwell lies within a Zone III Source Protection Zone. Early engagement between Severn Trent Services/DIO and Anglian Water is therefore recommended to confirm the requirement for and timescale for any additional capacity. This cannot meaningfully take place until the preliminary design for the RAF CAM facility has been completed post contract award.

7.3 Summary and Recommendations

It is proposed to divert and increase the capacity of the existing foul water drainage that crosses the RAF CAM site, to meet the requirements of the RAF CAM development.

Early engagement by Severn Trent Services/DIO and Anglian Water is recommended to resolve any potential capacity issues with the existing Treatment works prior to completion of the RAF CAM development.

8. Storm Water Drainage

8.1 Introduction

This section considers the storm water drainage provision to the RAF CAM development. As detailed in Section 2 of this report storm drainage across the RAF Cranwell estate is drained to ground via local piped systems and soakaways. There are no existing storm drainage systems within the footprint of the RAF CAM development site.

Under Project Aquatrine Severn Trent Services manage the foul water drainage systems on the RAF Cranwell estate.

8.2 Storm Water Provision

The following were consulted to determine the current status of the RAF Cranwell foul water infrastructure in the vicinity of the RAF CAM development:

- Mr Kuldip Lehal Estate Development Specialist Severn Trent Services

A new local storm water drainage system will be required to drain the surface water from the new RAF CAM facility and hard landscaping including car parks and access roads. Car parking areas will require bypass petrol interceptors to prevent potential ground contamination.

The development site is underlain by limestone which is compatible with ground infiltration drainage provide by soakaways.

All storm water systems are to be designed to adoptable standards in accordance with Severn Trent Services specifications and standards. This would discharge to ground via a number of concrete ring type soakaways. Ground permeability / infiltration tests will be required, prior to detailed design, to support the design of the soakaways.

It is imperative that the designers consult with Severn Trent Services on the design and specification of the storm water system to ensure that items such as interceptors, soakaways and attenuation tanks are within the scope of Project Aquatrine and fully meet Severn Trent Services adoptable standards.

Risks and Uncertainties

No risks or uncertainties have been identified at this stage.

8.3 Summary and Recommendations

A local piped drainage system specific to the RAF CAM development site is proposed and recommended that discharges to ground via soakaways.

9. Summary and Recommendations

9.1 Summary

The purpose of this Utilities and Survey Review report is to:

a) Review and assess the services utility requirements for the RAF CAM relocation development;

b) Assess the impact of these additional requirements on the existing Station infrastructure;

c) Identify suitable connection points to the existing Station infrastructure and any upgrade works required to support the RAF CAM development;

d) Identify any further investigations required at the detailed design stage.

The following services and utilities have been considered by this report:

- Power
- Gas
- Water (potable and firefighting)
- Storm and foul drainage
- Communications and Information Systems (CIS) including remoted alarms and Station tannoy.

The utilities and services review has been based on the following:

a) RAF CAM concept design prepared by GVA as part of the January 2019 Assessment Study titled RAF Centre of aviation Medicine;

b) East of Trenchard Hall indicative site development plan (See Appendix B)

c) RAF CAM Capability User Requirements Document (URD);

d) Consultation with appropriate utility and services stakeholders at RAF Cranwell;

The table overleaf summarises the load requirements and connection points for the utilities and services considered by this report:

Utility	RAF CAM Requirement	Connection Point	Comment
Power	600 to 800kVA range	Substation DSS 'T'	New 1000kVA substation required to replace existing DSS 'T'. Dialogue to be maintained with the Station and DIO regarding the availability power.
Gas	374kW / 47m^3/hr	Gas main to south of Cranwell Avenue to north of RAF CAM site	Gas governor/meter required at connection point required. .
CIS	MoDNet (O&S), telephone/VOIP (O&S), non-MoD internet, VTC (O&S)	Existing CIS pit on western edge of site and/or new pit and duct connection to equipment rooms in Trenchard Hall.	CIS Specification to be developed by Air 38Gp CIS Infra prior to ITT/ITN. Surveys required to confirm connection points and any upgrades to existing equipment rooms.
Station Tannoy	Connection to Station broadcast system	Multi-pair control cable at DSS 'T'	
Alarms	Security and Fire	Cross site link via existing duct system to 24hr manned point on station.	Security alarm may require a direct wired link.
Water	5.5l/s domestic supply. 20l/s per fire hydrant	Exiting 150mm dia water main on western side of site adjacent to Trenchard Hall and fire hydrant FH 142.	Pumped booster set required to provide required flow rates to new fire hydrants.
Foul Water	TBD at detail design	Existing foul system that crosses site to be diverted and upgraded for RAF CAM requirement.	Diversion includes new pumping station and pumping main.
Storm Water	TBD at detail design	New local piped system discharging to soakaways.	No connection to existing storm water systems required.

9.2 Recommendations

It is recommended that an ongoing dialogue is maintained with the key utility and services stakeholders and providers, throughout the procurement process, in order to identify any changes in their capability to support the RAF CAM development.

In particular the Station overall power consumption should be reviewed regularly to make sure that the spare capacity identified by this report, within the 5.2MVA limit, is still available to the RAF CAM development. If the situation should change and additional power is required from the network provider Western Power then negotiations to increase the power supply from Western Power should be instigated by through DIO.

For individual utility/service recommendations see Sections 2 to 7 of this report.

Appendix A

Site Location Plan

Appendix B

Indicative Site Development Plan

Appendix C

Station Services Plan (Extract)

Appendix D

Site Survey Plans

Appendix E

Ibex RAF CAM Services Report

Appendix C

CIS and Security Overview Matrix

July 2020
Doc Ref. 42438-00