Design and Access Statement
New Engineering Faculty Building

Site Address: Montsaye Community College, Greening Road, Rothwell, NN14 6BB

Project Ref: 2903

Status: Full Planning

Date: March 2010

Applicant
Name Montsaye Community College
Address Greening Road
Rothwell
Northants
Post Code NN14 6BB
Telephone

Agent
Name Stimpson Walton Bond Architects
Address 59 York Road
Northampton
Post Code NN1 5QL
Telephone 01604 633155

DESCRIPTION OF SITE AND PROPOSAL INTRODUCTION

Montsaye Community College is a secondary school located on north western side of the Rothwell close to the A6 leading towards Desborough. The site has a mixture of buildings from the early 1960’s to various modern additions carried out in the last 10 years. The existing buildings are surrounded on 3 sides by playing fields including an artificial pitch and tennis courts. The rear gardens of houses in Geening Road form the boundary on the eastern side.

The new proposal is to construct a new exemplar Engineering Faculty building using highly sustainable energy efficient technology which in turn will be used as a teaching tool for students using the building. This will be a high profile building which was only one of 15 projects to receive specialist funding in the Country.

USE

The building will be used as an Engineering Faculty which includes the following operations:-

i. Entrance, Office, Staff facilities, Toilets, Plant Room and Stores.

ii. Engineering Laboratory - Use of computers, training resources and limited range of material testing.
iii. CAD/CAM Room - Use of computers, CNC laser cutters, CNC lathe and rapid prototyping machinery.

iv. Practical Workshop - A typical design and technology workshop including lathes, milling machines, heat treatment bays, welding equipment and thermo forming centres.

v. ICT Suite - Computer laboratory, printing, scanning and use of cutting edge computer programs.

vi. Engineering Studio - Primarily an IT Suite but utilising 3D Projection systems and cutting edge computer programs.

**AMOUNT**

The total floor area of the building is 869 sq/m. This area is split between the ground and first floor areas.

**LAYOUT**

The proposed building was originally single storey and located at the western end of the existing car parking area on part of the playing field. Initial consultations with Sport England and Northamptonshire County Council Planning Department resulted in a statement from Sport England confirming they would object to the building being located on a sports field resulting in a loss of sporting provision. Subsequent representation from the Architect resulted in an agreement that the location at the end of the Sports Hall would be preferable.

Other locations on the site were considered but would result in building on the sports field or in areas unacceptable for a building of this nature which would require a presence on the site and easy access. The location identified at the end of the Sports Hall would result in re-landscaping the recently created grassed bund but was considered by the Client, Architect and Sport England to be a good location, particularly as this existing area cannot be utilised as a sporting provision due to the existing contours.

Another defining factor in the layout of the building is that an Anglian Water 250mm Ø mains water supply runs across this area of the site which has a 6m easement. The location of the water main is identified on the planning drawings. The layout of the building was therefore influenced by the proximity of the artificial pitch, Sports Hall, rear boundaries to houses in Greening Road and the existing Anglian Water main.

**SCALE**

The overall scale of the building was established as part of the Montsaye College brief to provide a new exemplar Engineering Facility that would be of a sufficient size to suit the needs of delivering a programme of education to Students at Diploma level. The success of the funding bid was based on identifying a suitable scale, need, sustainability and delivery within an acceptable budget. This proposal satisfied all those requirements and was granted the funding accordingly.

The location of the building has influenced the architectural scale of the proposal. The proximity of the residential boundaries to Greening Road and the other influencing factors has resulted in a part single part two storey building. The single storey part faces the rear boundaries to the houses in Greening
Road and looks onto a landscaped mound which attempts to maintain the privacy of these gardens. The two storey part essentially faces the artificial pitch and avoids any overlooking to the properties in Greening Road. The windows in the two storey part facing the rear gardens are at clerestory level above 2.0m.

**LANDSCAPING**

The proposed building location is an area of land located at the end of the Sports Hall extending down to the northern boundary of the site between the artificial pitch and rear boundaries to the houses in Greening Road. This area has a large man made bund varying in height but on average 2.0m high x 80m long. The intention is to realign part of the bund to accommodate the building and vehicular circulation. This will involve re-creating a landscaped bund approximately 7m wide x 1.8m high between the rear of the Greening Road properties and the single storey part of the building. This bund will be grassed and landscaped the details of which will be subject to a planning condition. This landscaping arrangement will reduce the visual impact of the single storey and two storey part of the proposal from the neighbouring properties.

The unaffected length of bund will remain intact and any damage as a result of construction works will be reinstated.

**APPEARANCE**

The new building is located at the end of the linear Sports Hall and Swimming Pool. The Sports Hall has a curved roof and the changing rooms and swimming pool roof have a convex and concave roof profile which wraps around the Sports Hall. This building has influenced the appearance of the new Engineering Faculty which has a curved roof over the single storey section which abuts a clerestory of the two storey part which also has a curved roof.

During the public consultation a local neighbour expressed some concern relating to the height of the new building and requested if the Architect could look into reducing the height by 1-1.5m. This comment was taken on board and the height has been reduced by 1.5m. Other comments made during the consultation are attached to the application.

The visual appearance of the building is highly influenced by its sustainable design approach. Large areas of glazing facing the artificial pitch which admits significant amounts of natural light into the building whilst the external louvres on this elevation control the degree of glare. The structure is expressed externally by projecting roof beams supporting large overhangs to give increased protection to large glazed elements. A linear rooflight directly below the clerestory glazing both admit natural light to the rear of the classrooms thus improving the sustainability by reducing the need for artificial lighting.

The windows will be powder coated aluminium with double glazed tinted units.

The roof will be a standing seam aluminium powder coated roof similar to the Sports Hall. Along the top edge of the upper roof solar water heating tubes will extend along the full length.

The ‘brise soleil’ will have aerofoil fins on a secondary framework. Colour to be agreed.

The walls will be rendered, colour to be agreed.

The building will be heated with a bio mass rape seed oil boiler. This will result in a stainless steel
flue projecting above the roofline.

ACCESS AND APPROACH

Access to the School will remain unchanged via the main entrance from Greening Road. The existing car park will be extended to create a further 10 car parking spaces. The School travel plan is attached to the planning application. A new vehicular access to the building will be extended from the car parking area in front of the Sports Hall. This access road will only be used for the delivery of materials to the new building and no other purpose. The access onto this road which is located alongside the two storey glazed elevation will be controlled via bollards to prevent unauthorised vehicles accessing this area. The road width and turning will be suitable for a 7.5 ton delivery vehicle.

PUBLIC CONSULTATION

A public consultation event took place at the School on 26 January 2010 which invited local residents to come to the School to discuss the proposals and to register any comments concerning the proposals. Parents, staff and students have also been encouraged to comment on the proposals. The procedure and results are attached to the planning application documents and generally support the proposal. Concerns about the height of the building referred to earlier in the ‘Appearance’ section have been acted upon by reducing the height by 1.5m.

▲ View to proposed building location from car park towards Sports Hall
▲ View to proposed building location from car park looking towards Sports Hall
▼ View to proposed building location alongside Sports Hall and ‘All Weather’ pitch
▲ Close up view to proposed building location showing grass bund.

▼ Aerial view of School site
Planning Statement

New Engineering Faculty Building

Site Address: Montsaye Community College, Greening Road, Rothwell, NN14 6BB

Project Ref: 2903

Status: Full Planning

Date: March 2010

Applicant

<table>
<thead>
<tr>
<th>Name</th>
<th>Montsaye Community College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Greening Road</td>
</tr>
<tr>
<td></td>
<td>Rothwell</td>
</tr>
<tr>
<td></td>
<td>Northants</td>
</tr>
<tr>
<td>Post Code</td>
<td>NN14 6BB</td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
</tr>
</tbody>
</table>

Agent

<table>
<thead>
<tr>
<th>Name</th>
<th>Stimpson Walton Bond Architects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>59 York Road</td>
</tr>
<tr>
<td></td>
<td>Northampton</td>
</tr>
<tr>
<td>Post Code</td>
<td>NN1 5QL</td>
</tr>
<tr>
<td>Telephone</td>
<td>01604 633155</td>
</tr>
</tbody>
</table>

This should be read in conjunction with the Design & Access Statement which is submitted with this application.

NORTH NORTHAMPTONSHIRE CORE SPATIAL STRATEGY POLICY REFERENCES

Policy 1: **Strengthening the Network of Settlements**

This Policy identifies Rothwell as a secondary focal point for Development within the urban core.

This proposal looks to improve the strengthening of an educational establishment for the benefit of the students and wider community in creating an exemplar facility which will influence other similar developments. The development will also enhance the School as a focal point for learning in the local area and beyond.

Policy 2, 3 & 4: **Connecting North Northamptonshire with surrounding areas, the urban core and enhancing local connections**

The new building on the School site will not have any adverse effects on the Transport Strategy and Travel Plan prepared by the College. The addition of 10 car parking spaces will improve the provision at the School thus reducing any impact on the neighbouring residential area. The School location in Rothwell is ideally located for walking from the Town and already has adequate cycling provision at the School which promotes sustainable means of transport. The location of Rothwell Town Centre is
approximately 700m from the School and in close proximity to public transport bus stops in Rothwell. It is intended that visitors to the School, as a direct result of the new building, will utilise the existing public transport, walking, cycling and motor vehicles either by car or minibus. The creation of additional car parking will accommodate the increased requirement during the day and for after school use the existing car parking provision will be adequate in the evening.

Policy 5: **Green Infrastructure**

The building proposal ethos is based around teaching sustainable engineering techniques to students in a 'green' sustainable energy efficient built environment which can also be used as a teaching tool. The building will achieve a BREEAM 'very good' rating which takes into consideration all the green sustainable references which looks to promote protection and enhancement of the local environment and bio diversity.

Policy 6: **Delivering Infrastructure**

This additional provision to Montsaye Community College will improve the School facilities in an area where the housing provision in Rothwell and Desborough has increased and intends to increase further. The development of this proposal has previously referred to the NNDC urban regeneration of this region. The ability to supply young skilled recruits with an engineering based knowledge meshes well with the future development plans for the area.

Policy 8: **Delivering Economic Prosperity**

This building proposals looks to help individuals study and train in partnership with local business, the community, higher education and industrial partners to promote economic prosperity by encouraging and developing the skills of individuals to attract new business and employment opportunities.

Policy 9: **Distribution and location of Development**

The building proposal is located on an area of land within the confines of the existing School site with an established framework to deliver secondary school education in the area. The building location does not impact on the existing sports field provision at the School but instead looks to develop an area of the site in a sympathetic ecologically friendly way without affecting the amenities of the local residents.

Policy 13: **General Sustainable Development Principles**

The driving principle of this building proposal is based on a sustainable environmentally friendly building which looks to raise the standards of architecture whilst respecting the environmental character of the site. The building looks to design out anti-social behaviour which School sites can be subject to. It also maintains and improves the general access and transport/parking provision on the site and does not lead to the loss of recreational facilities but does increase the involvement of the community.

The building does not reduce the amenities of the local residents in respect of unsatisfactory increase in noise, vibration, smell, light or overlooking. The building is not in an area of risk of flooding but the increased rainwater drainage requirements look to use harvesting and disposal to satisfy the requirements of Anglian Water and the Environment Agency.

Policy 14: **Energy Efficiency & Sustainable Construction**

The new building looks to meet the BREEAM rating ‘very good’ and is supported by a statement from the M/E Consultant in respect of the energy efficiency credentials.
MONTAYE HAS BEEN SUCCESSFUL IN ATTRACTING FUNDS FROM THE DCSF AND THE LOCAL AUTHORITY TO BUILD AN ENGINEERING CENTRE COSTING OVER TWO MILLION POUNDS.

THIS WILL BE USED BY OUR OWN STUDENTS, STUDENTS FROM ACROSS NORTHAMPTONSHIRE AND BEYOND (INCLUDING PRIMARY AGED CHILDREN), THE BUSINESS AND LOCAL COMMUNITY

The bid:

We intend to build an Engineering Study Centre in Kettering. A key concept that has shaped the bid is that the sector needs to take an increasing account of sustainability issues in the 21st Century. The North Northants Development Agency is committed to green living and through its Core Spatial Strategy is committed to green industries and sustainable transport.

Students undertaking the engineering Diploma will ultimately become the engineers charged with leading the world in developing sustainable manufacturing and transport systems. Several universities have, or intend to, introduce sustainable engineering courses at degree level.

Therefore the study centre will be housed in a new facility which will itself be engineered for sustainability, using a range of green, energy saving measures designed to reduce the carbon footprint of the building. As the engineering Diploma can be taught in a number of contexts, including construction engineering, the building will feature cutaways to showcase the green measures and students will not only learn in the centre but also from the centre.

Employer engagement:

Cummins UK: sited just 20 minutes drive from the college in Wellingborough and the world’s largest manufacturer of diesel engines, Cummins UK has been involved with the bid from the beginning. Indeed we were already discussing how they could support the delivery of the engineering Diploma before the Exemplar Diploma Funding was announced. At present Cummins UK has a small training centre – at their Wellingborough facility – where they train their apprentices. We have plans to deliver jointly some aspects of the diploma, and Cummins apprentices will access the facility alongside other 14-19 learners. We are hoping to develop the young apprenticeship in engineering with Cummins UK.

Mercedes Benz High Performance Engines: situated in Brixworth, less than fifteen minutes drive from the college, MBHPE has a high tech engine manufacturing facility – where they make the engines used in many Formula One cars including both McLaren and Brawn – which we hope to access as part of our Diploma offer. Representatives of the college have met with MBHPE to discuss how they might support the delivery of the engineering Diploma in Northamptonshire and they are currently developing a strategy for engaging with the four schools in the county delivering the Diploma on behalf of their learning partnerships.

Working in partnership:

Tresham College: Tresham College is a Centre of Vocational Excellence in Motorsport and High Performance Engineering. As joint leads on the engineering Diploma, we have worked together to ensure that this new facility complements rather than duplicates the facilities already available. While Tresham teach basic practical engineering and tool making skills – identified by our employer engagement work as a skills shortage for many young people embarking on engineering apprenticeships – the new facility will allow for more high tech engineering learning to take place.
Northampton University: The Level 3 Diploma duplicates much of the first year engineering degree work undertaken at Northampton University. We are very excited by the agreement to joint plan one or more units of the Level 3 Diploma so that they can be HE accredited. This would allow undergraduate students to broaden their curriculum upon embarking on a degree, thus ensuring continued personalisation of the curriculum for HE students in Northamptonshire.

What Diploma learners will experience and how will this make a difference for them:

Teaching Area 1: Engineering Practical Workshop

Focus: Equipped to carry out practical engineering skills and facilitate project work. Including the ability to fabricate and assemble design work utilising a range materials and process techniques.

This area should reflect the image of that in a modern manufacturing industry. Purveying a clean and high precision technical environment inspiring students to take pride in their facilities and in their working practices.

Teaching staff will have access to digital content via the whiteboard in an effort to reinforce any theory work whilst practical work is taking place.

Capacity: The room should facilitate groups of up to 20 students.


Teaching Area 2: Engineering Laboratory

Focus: The objective and underlying ethos of this area will be to blur the edges of the classroom and the workshop or the theory and the practical. This will apply to all three levels of the diploma.

This area should be implemented as a highly technical Research and Design facility. The emphasis on learning and teaching of engineering principles and applications through practical investigation.

Students will develop their understanding of the engineered world through a variety of multimedia and hands on activities which are designed to engage the students in the more academic elements of engineering through applied learning.

Capacity: This area should accommodate groups of 24 students.


Teaching Area 3: CAD/CAM Computer Control Laboratory

Focus: Much of today’s modern engineering and manufacturing techniques have at their heart computer control systems. This area shall be designed to allow students to not only explore how these systems impact engineering but also through practical learning they shall develop skills in the programming of and monitoring of computer control applications.

The area shall be designed to offer the flexibility of structures and managed learning activities and also open access for project work.
The additional of the Rapid Prototyping unit will make this area particularly interesting to any industrial partners involved in R&D work and as such the facilities could be utilised by local businesses.

**Capacity:** The area should be sufficiently designed to accommodate 1 to 2 users per machine.

**Includes:** ICT Equipment, CNC Router, CNC Lathe, Laser Cutter, PLC Training System, Process Control Trainer and a Rapid Prototyping Machine, Furniture and Storage.

**Teaching Area 4:** Engineering Classroom

**Focus:** This multiuse classroom should be adaptable in its implementation. Allowing for different configurations of furniture to accommodate traditional front of class teaching, individual study and also group project and team working activities.

It should also be considered that this room may be used as a conference facility within the centre. There will be a need for ICT resources such as Interactive whiteboards and network connection points.

**Capacity:** This area should accommodate up to 24 students.

**Includes:** Interactive whiteboard, Network points, ICT workstation, moveable furniture.

**Teaching Area 5:** IT Suite & Comms Room

**Focus:** This well equipped ICT space will be used as accommodation to teach the ICT diploma and well as a teaching resource for the engineering diploma. The perimeter style implementation will allow for a spacious and comfortable environment.

Equipped with Interactive Whiteboard and projector for teacher centred presentation in the break out area.

**Capacity:** This suite shall accommodate at least 28 students.

**Includes:** ICT Suite (30 Student PCs, Printer, Teacher PC), Network points, Interactive Whiteboard, Server Equipment and Storage, Modern Suite of Furniture. VLE Curriculum Licenses (5 Year plan)

**How learners from across the consortium will access the facilities:**

Through the excellent relationships within our Area Improvement Partnership - we provide primary swimming and languages - we intend to extend our work to include the provision of STEM activities to pupils from this phase as well as our own Key Stage 3 students.

The LA has agreed to work with the college to develop a range of activities and resources at the centre, which will support the delivery of the engineering Diploma across the county. Students from outside the consortium will have access to the facilities on site. A travel plan has been drawn up for Diploma delivery across the county to negate possible access issues for 14-19 learners.

The college has a strong tradition of working with the community to provide extended services. This facility will be part of that provision to encourage work based learning providers to engage with the community, including hard-to-reach groups.

The centre will remain open in the evening in order to allow adult learners to access the facilities as we contribute to the reskilling of the Northamptonshire workforce to meet the demands of the growth of high tech engineering.
To whom it may concern

We are pleased to announce that the college has secured funding from the Department of Children, School and Families in order for us to construct a new teaching block dedicated to engineering and related subjects. The proposed location of the centre is illustrated on the site map below.

In order for us to share more detailed plans with members of the public, we are holding a consultation evening on Tuesday 26th January in the college's main conference room from 5:00 pm to 7:00 pm. Members of the college staff, the architect and a member of the project management team will be available to answer questions.

We look forward to meeting with you on the evening.

Yours faithfully,

Susan Fennell
Headteacher
SUSTAINABLE ENGINEERING BLOCK

CONSULTATION EVENING WITH NEIGHBOURS
26TH JANUARY 2010

REVIEW/FEEDBACK

The neighbours and associated interested parties were invited to view plans and talk to relevant staff and professionals involved with the project about the new propose Sustainable Engineering Block.

The college displayed the plans for the development in the Conference Room of the college and in the Library. The following people were available to talk to whoever came along. Mr Bernard Taylor (Project Manager – Lendlease Ltd), Mr Adrian Ringrose (Architect – Stimpson Walton Bond) and Mr Mark Poole (Site Manager – Montsaye Community College).

The evening was attended by 4 local neighbours and several associated interested parties. Each was given the opportunity to view the plans, talk to the professionals on site and give both written and verbal opinion. The majority were in favour of the development and came to see how the new development would impact on the college and the local area.

One of the residents was very interested in the whole concept of the development and the impact it would have on his property as he lived in the end house on Greering Road. After some discussion he generally felt that the building was a good idea but had some concerns with regards to the run off of water to the brook on the north side of the site. Both Mr Ringrose and Mr Taylor took time to explain how the building would be designed to lessen this impact on the local area and he left assured that his concerns would be dealt with.

All other parties who attended agreed that it would be a good facility for the college and that more was needed to promote sustainability as a whole.

In general the plans were very well received and a lot of support was given on the night.
CONSULTATION EVENING 26TH JANUARY 2010

FEEDBACK FORM

Please leave any feedback/comments with regards to the proposed project.
Excellent project!
Vital to engage with local manufacturing industry to ensure relevance.
Promotion of resources to local industry also important - i.e., Rapid Prototyping
MONTSAYE COMMUNITY COLLEGE

CONSULTATION EVENING 26TH JANUARY 2010

FEED BACK FORM
Please leave any feedback/comments with regards to the proposed project

Looks to be an exciting development.
Fully support this new initiative.
Excellent additional facility
MONTSAYE COMMUNITY COLLEGE

CONSULTATION EVENING 26TH JANUARY 2010

FEED BACK FORM
Please leave any feedback/comments with regards to the proposed project

1. Fully support this venture
FANTASTIC NEW DEVELOPMENT THAT LOOKS LIKE
THE STUDENTS WILL GAIN HUGE BENEFIT FROM
LET'S HOPE IT OPENS ASAP.
MONTSAYE COMMUNITY COLLEGE
CONSULTATION EVENING 26TH JANUARY 2010

FEED BACK FORM
Please leave any feedback/comments with regards to the proposed project

- Consideration to the surface water that builds up at the rear of 6 greyling road & access gate.
- Does the height height of the roof on the rear elevation need to be so high. Could it be reduced by 1-1.5 metres?
<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Denton</td>
<td>12 Greening Road, Romsey</td>
</tr>
<tr>
<td>D C Dax</td>
<td>14 Greening Road, Romsey</td>
</tr>
<tr>
<td>R Marshall</td>
<td>5 Charles St, Pothwell</td>
</tr>
<tr>
<td>Neil Durrar</td>
<td>6 Greening Road, Romsey</td>
</tr>
</tbody>
</table>
Statement of Community Involvement

New Engineering Faculty Building

Site Address: Montsaye Community College, Greening Road, Rothwell, NN14 6BB

Project Ref: 2903

Status: Full Planning

Date: March 2010

<table>
<thead>
<tr>
<th>Applicant</th>
<th>Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name Montsaye Community College</td>
<td>Name Stimpson Walton Bond Architects</td>
</tr>
<tr>
<td>Address Greening Road, Rothwell, Northants</td>
<td>Address 59 York Road, Northampton</td>
</tr>
<tr>
<td>Post Code NN14 6BB</td>
<td>Post Code NN1 5QL</td>
</tr>
<tr>
<td>Telephone</td>
<td>Telephone 01604 633155</td>
</tr>
</tbody>
</table>

Upon preparing the initial bids for the funding of the new Engineering Building the School set out how this new facility would establish Partnerships with other schools, industrial partners, further education institutions and the community.

Tresham Institute and other consortia within Northamptonshire have expressed an interest in using the facility and it is intended that these will be converted into formal agreements for 2011/2012. Periods outside the school timetable will be utilised by students within the North Northants Learning Partnership (NNLP). The facility will be open in the evening from 6.00 p.m. for use by adults for work based qualifications such as City and Guilds Performing Engineering Operations developed in conjunction with other educational institutions. Primary age children will also use the building for STEM Clubs and special events.

The building will help businesses recruit skilled young workers who can demonstrate occupational relevant skills, which is supported by the Strategic Area Review Consultation document for Northamptonshire. The technology based teaching offered in this sustainable building will give the various Partners a good understanding of the standards students can attain at this exemplar facility.

The success in the funding bid and the creation of an ‘Exemplar Engineering Building’ means that it must demonstrate an exemplar delivery of Engineering based education in a building that shows its sustainable credentials as a teaching tool to the students using the facility. As such the building will be visited by the wider community as a precedent to demonstrate how it functions and how such a building can influence other similar developments in the Country.

A public consultation event took place at the School on 26 January 2010 which invited local residents to come to the School to discuss the proposals and to register any comments concerning the proposals. Parents, staff and students have also been encouraged to comment on the proposals. The procedure and results are attached to the planning application documents and generally support the proposal.
Tony Atkinson Esq.
Sport England Development Team
Grove House
Bridgford Road
West Bridgford
Nottingham
NG2 6AP

Dear Tony,

Re: Montsaye Community College, Rothwell, Northants New Engineering Block.

We have been appointed as Architects by Northamptonshire County Council and Montsaye Community College in Rothwell, Northants to design a new highly sustainable energy efficient Engineering block at the College. This is a high profile exemplar building which is the only one of its kind to receive funding in Northamptonshire.

We are currently workings towards the Completion of RIBA Stage C which involves the initial scheme design leading to a full planning application in October. We have already carried out a public consultation at the College and discussed the proposals and location with Mr Peter Moore from the Northamptonshire County Council Planning department. Mr Moore was generally in favour of the proposal and siting of the building but made us aware that Sport England would be involved in the planning consultation process and recommended that we forward the proposals to you for comment particularly because the building is located on the perimeter of the existing sports field.

The existing college has been developed considerably over the last 10 years with the addition of existing teaching blocks, new sports hall and swimming pool and a new rubber crumb all weather sports surface. Considering the importance of the new Engineering Building it is felt that this exemplar building must have a presence when one enters the site, particularly because other schools and colleges will be invited to use the facility.

The current proposed location is a the south west end of the existing car park which appears to be the perfect location for the building in planning terms. It is however located on the sports field which will straddle the grass 400m running track. The other sporting provision for football can be accommodated by re-orientating various pitches. However due to the profile of the surrounding sports fields and contours the 400m track cannot be accommodated. The school have stated that they do not use the 400m track and are quite happy to utilize a 300m running track instead. These proposals are indicated on the attached drawing. Other 400m track facilities do exist in the Kettering area which the school could utilize if necessary.

Another thing to consider is that it has been intimated to the College they may be subject to a BSF re-build which would involve an additional area of land to the south west beyond the existing 400m grass running track. The area is approximately 20,000m² and is subject to a 106 Agreement. However it is uncertain when this is likely to happen.

Partners: Maurice Walton MCD BAch RIBA MRTPi
Adrian Ringrose BA(Arch) DipArch
RIBA
In association with: Stuart Long Architect 18A Cottingham Way Thrapston Northants NN14 4PL Tel: 01832 735201
We are keen to complete all the preliminary consultations before submitting a planning application so your earliest comment would be appreciated. For your information the following may be of use:

**Montsaye Community College**

<table>
<thead>
<tr>
<th>Site Area</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Students:</td>
<td>1200</td>
</tr>
<tr>
<td>Playing fields (green spaces)</td>
<td>47,799 m²</td>
</tr>
<tr>
<td>All weather pitches</td>
<td>7,425 m²</td>
</tr>
<tr>
<td>Hard courts</td>
<td>3,603 m²</td>
</tr>
<tr>
<td>Area between Sports Hall and all weather (currently a large bund)</td>
<td>6,962 m²</td>
</tr>
<tr>
<td>Net loss in area of sports field due to new Engineering Block</td>
<td>2,087 m²</td>
</tr>
</tbody>
</table>

If you require any more information or if you would like to meet me on site please contact me at your earliest convenience. Clearly we are keen to move forward quickly. We have a design team meeting arranged for 29 September so your response before this date would be greatly appreciated.

Yours sincerely,

Adrian Ringrose

Adrian Ringrose
Adrian Ringrose  
Stimpson Walton Bond  
Chartered Town Planning Consultants  
59 York Road  
Northampton  
NN1 5QL

Your ref: AR/AMW

29th September 2009

Dear Adrian

Our ref: EM/NR/2009/17814/S  
Engineering Block at Montsaye Community College - Pre-application consultation.

Thank you for consulting Sport England on the above.

The development will have an impact on playing fields. A playing field is defined in the 1996 Statutory Instrument No.1817 (as amended by 2009 Statutory Instrument No.453). As the whole of a site which encompasses at least one playing pitch. In accordance with Planning Policy Guidance Note 17 and its playing field policy, Sport England will object to the loss of any area within playing fields to development unless one of five exceptions is met. The exceptions relate to the following:-

E1 - A proven excess of provision.
E2 - The use is ancillary to the playing field.
E3 - The site is incapable of forming part of a pitch.
E4 - Equivalent or better replacement will be provided elsewhere.
E5 - An alternative sports use is proposed, outweighing loss

Sport England has considered this proposal in the light of its playing fields policy. The aim of this policy is to ensure that there is an adequate supply of quality pitches to satisfy the current and estimated future demand for pitch sports within the area. The policy seeks to protect all parts of the playing field from development and not just those which, for the time being, are laid out as pitches. The policy states that;

"Sport England will oppose the granting of planning permission for any development which would lead to the loss of, or would prejudice the use of, all or any part of a playing field, or land last used as a playing field or allocated for use as a playing field in an adopted or draft deposit local plan, unless, in the judgement of Sport England, one of the specific circumstances applies.”
Reason; Development which would lead to the loss of all or part of a playing field, or which would prejudice its use, should not normally be permitted because it would permanently reduce the opportunities for participation in sporting activities. Government planning policy and the policies of Sport England have recognised the importance of such activities to the social and economic well-being of the country.

The proposal comprises the construction of a New Engineering Block and additional car parking at Montsaye Community College. The New Engineering Block would, as proposed, be site on the school playing field. The proposal would result in the reorganisation of pitches, the loss of the ability to provide a 400m grass athletics track and it would appear from the aerial photographs that the cricket pitch would also be affected. I cannot find within our system that Sport England has been consulted on the proposals for the Sports Hall and swimming pool, but I understand that these works did not impact on the playing field. Indeed there does not appear to be a record of a consultation on the provision of the Astro-turf pitch. It would also appear from the aerial photographs that the large bund has been constructed on playing field area.

On the basis of the information provided it would not appear that the proposed New Engineering Block meets any of the exceptions listed above. Sport England would have therefore no option but to object to the development as proposed. In order to overcome the objection details must be submitted to show how the proposal could meet one of the exceptions. For example the provision of replacement playing field area. It would however be more appropriate to site the proposed building which does not impact so significantly on the school playing fields. This would also apply to the additional parking spaces proposed.

Yours sincerely

Steve Beard
Planning Manager
Email: steve.beard@sportengland.org
Tel 020 7273 1770
Mr Steve Beard  
Planning Manager  
Sport England  
Grove House  
Bridgford Road  
West Bridgford  
Nottingham NG2 6AP  

Dear Mr Beard,

Re: New Engineering Block, Montsaye Community College, Rothwell, Northants  

Thank you for your e-mail dated 3 November in response to my letter to you dated 22 October. We are pleased to see that Sport England are supportive of the schools sporting activities and links with the community which clearly demonstrates the schools commitment to a sustained and active approach to sport in Rothwell and the surrounding area.

Your e-mail seems to make it clear that based on the information already supplied to you we need to make a clear case in respect of at least one of the 5 Exceptions which would result in your objection being removed. We have looked in to the 5 Exception categories and consider that a case can be made for the following:

E4 ‘The playing field or playing fields, which would be lost as a result of the proposed development, would be replaced by a playing field or playing fields of an equivalent or greater quantity in a suitable location and subject to equivalent or better arrangements prior to the commencement of development.’

Our proposals demonstrate that the location of the New Engineering Block on part of the playing field would result in the loss of a 400m grass running track at the school. Our drawing 2903/105A identifies that a new 300m running grass track can be provided on the existing playing fields at the school. Whilst we understand this suggests a loss of provision the school have clearly stated that they currently use the purpose built athletic facilities at Kettering Leisure Village 4.5miles away and Corby Triangle athletics track 11miles away. The school consider the use of these facilities offer a significantly better quality facility which forms part of that long term sporting strategy. This arrangement is supplemented by the provision of the new grass 300m grass running track on the school playing fields. The school currently provides the transport arrangements for students using these improved off site facilities and will continue to do so.

The school has made it clear that the current grass 400m running track is used infrequently and that a provision of the athletics facilities in nearby towns together with the 300m grass track at the school will provide them with a provision in excess of their requirements to deliver athletics to their students. Since the management for these off site arrangements is already in place the commencement of the development will not affect them.

The existing cricket pitch location would be affected by the location of the new building. However with the re-ordering of the various pitches a junior sized cricket pitch with a ‘protected wicket’ can be located on another part of the site namely between two football pitches. The outfield of the cricket pitch would be shared with the football pitch but a double wicket would be located between 2 football pitches and protected accordingly. Whilst this demonstrates that this provision would not be lost the improvement and enhancement of the cricket facility will be provided by an arrangement with Rothwell Town Cricket Club for school matches that is located only 300metres from the school.
Other sporting activities currently used on the school playing fields will not be affected. We believe the provisions set out above provide an adequate substitute and improvement of the existing facilities as set out in paragraph E4.1 of A Sporting Future for Playing Fields of England – Policy on planning application for development on playing fields, and will still enable the school to fulfill its clear commitment to provide a high quality sporting facility at the school which is demonstrated by the impressive number of people using the facilities.

The school have informed us that as part of the Rothwell Town expansion additional land equivalent to 2No football pitches will be made available to the school under a Section 106 Agreement. Whilst no date has been set when this will happened the provision of 2 football pitches is in excess of the loss of a 400m grass running track which will be partly compensated by a new 300mm grass track on the site.

E5 ‘The proposed development is for an indoor or outdoor sports facility, the provision of which would be of sufficient benefit to the development of sport as to outweigh the detriment caused by the loss of a playing field or playing fields.’

We have referred to the provision of off site sporting facilities being used in the previous Exemption Category E4 together with a re-ordering of pitch layouts as part of the proposed development in mitigation for building on part of a sports field. In addition to this the completion in 2007 of the 4 badminton sized sports hall, swimming pool, full sized all weather football pitch and associated changing facilities cannot be ignored. This increase in sporting provision and the massively increased numbers of people using the facilities since the opening of the building has led to the decline in the grass pitch usage which is a fact confirmed directly by the School. This decline in use has not led to a reduction in sporting activity in the school or by the community but has clearly led to significant increases on this site. Relaxation E5 states ‘...that proposed indoor or outdoor sports development should be of sufficient benefit to the development of sport as to outweigh the detriment caused by the loss of the playing field or playing fields.’ Whilst you comment in your e-mail that this would not be considered retrospectively, at the time the Sports Centre was developed the consideration of its effect on grass playing fields was not considered at all. However since its opening it is clear that the use of the grass playing fields has diminished but the number of people participating in Sport has significantly increased. It is in light of this fact that the Engineering Building has been located on what is considered in our and our Client’s opinion as the best location and does not adversely impact on the sporting provision offered by the school to its students or the community. We therefore believe that for this reason this proposal should be considered in the context of paragraph E5 Exception.

Your e-mail also referred to the question of whether the building could be located closer or even on the car park. The funding of £2m made available for this project was based on avoiding as much as possible the disruption of existing facilities and associated costs. Our initial feasibility study located the new building on the car park and re-constructed part of the car park elsewhere. Unfortunately the number of parking spaces to be relocated was significant and would not be accepted as part of the funding bid. This inevitably resulted in maintaining the current parking provision and locating the building in an area to avoid such costs. The building was then located on the playing field but located further towards the car park than it is now until we discovered a 250mm diameter water main with a 6m easement serving a large area of Rothwell and surrounding villages. This resulted in the building being reconfigured and pushed slightly further away from the parking area which is where it is currently located. Considering this building is an Exemplar Building which is 1 or only 15 schools to receive this specialist funding nationwide the location of the building has to have a presence on the site and considering the options available the current location certainly achieves this which the limited other locations do not.

We clearly hope that the justification set out here for locating the building on the sports field will be sufficient for you to support the proposal. We have also sent a copy to Peter Moor at the Northamptonshire County Council Planning Department for his comment. We would welcome your comments as a matter of urgency stating whether Sport England considers the issues addressed in this letter would afford their support. We certainly hope so and look forward to your reply so we can move the whole scheme forward as we are currently behind programme.

Yours sincerely,

Adrian Ringrose

Adrian Ringrose
From: stimpson walton bond [mailto:swbarchitects@btconnect.com]  
Sent: 26 January 2010 15:58  
To: Steve Beard  
Cc: s.w.b.repos@gmail.com  
Subject: FW: Montsaye Community College Engineering Block

Dear Steve

Further to our consultation with Sport England last year we have re located the building alongside the Sports Hall and re landscaped the bund. I will formally send you a hard copy of the drawing in the post with a descriptive letter but as you can see from the attachment we do not interfere with any playing field and have redesigned the building to part single and part 2 storey. We will present the scheme to the College and the local residents tonight. We would welcome any comments you have in relation to the planning application which will be submitted in mid February once the consultation process has been completed with the school, students and public. We have also send a copy to the Peter Moor at NCC planning for any early comments.

Regards

Adrian Ringrose  
Architect & Partner


Morning Adrian,

I can confirm Sport England’s in principle support for the amended proposals. The relocation of the proposed Engineering Block appears to affect only a part of the playing field which is incapable of being used for sport. Hopefully any planning application submitted will contain evidence to confirm this view.

Regards

Steve Beard  
Planning Manager

T: 020 7273 1770  
M: 07775 752 451  
F: 0115 945 5236  
E: steve.beard@sportengland.org

Sport England, Grove House, Bridgford Road, West Bridgford, Nottingham, NG2 6AP
Drainage Statement

ENGINEERING BLOCK
MONTSAYE COMMUNITY COLLEGE
ROTHWELL
NORTHANTS

February 2010

REF: 4261
DRAINAGE

This development is less than 1 hectare in area and lies in Flood Zone 1. Therefore, under standing advice, the Environment Agency does not need to be consulted.

Surface water:

There is no spare capacity in the existing site drainage system for surface water from the proposed buildings and associated external works. Soakaways are not practical on this site due to the very low permeability of the underlying Boulder Clay. Surface water from the proposed development will therefore be drained to the brook on the northern site boundary.

Surface flows from the development will be from roofs and a occasionally used access road so it should not be necessary to pass through any pollution control device other than trapped gullies. The discharge rate will be reduced to green field run-off rates by use of a flow control device and flows attenuated in a below ground attenuation tank located beneath the landscaped area.

Foul water:

Foul water from the buildings will be connected to the existing foul water drainage system at the nearest point. Due to the existing foul drain levels it will be necessary to pump into the existing chamber. Anglian Water will be asked to confirm that their sewers have capacity to take the flows from the new building via an indirect connection and we await their response.

Levels:

The existing levels would dictate a floor level of approx. 133.0m.

The existing water main and electricity cables should be located using trial holes to determine their levels.
SITE INVESTIGATION REPORT

MONTSAYE SCHOOL
GREENING ROAD
ROTHWELL
KETTERING
NN14 6BB

C11831A

On behalf of:-

Lend Lease Projects Limited
c/o County Property Services
County Hall
Northampton

February 2010
INTRODUCTION

Ground Engineering Limited was commissioned by Lend Lease Projects Limited, the client, through Brian Cole Associates Limited, the Engineer, to carry out a site investigation of a plot located at Montsaye School, Greening Road, Rothwell, Kettering, NN14 6BB.

The proposed development is understood to comprise a part two-storey and part single storey engineering building and associated vehicle access road. Column loads in the order of 200kN are anticipated and the formation level will be 133.00mOD. An existing large mound of stockpiled soil that is partially within the footprint of the proposed building is to remain on site, however, it will be re-contoured and or moved as part of the development.

A previous investigation was undertaken by Ground Engineering Limited, report reference C11831 dated September 2009, of a plot at the school some 150m to the south-west of the site, and included three cable percussion boreholes.

This report summarises the findings of a ground investigation including five machine excavated trial pits and laboratory testing on recovered samples. Comments regarding
foundation design are provided together with an assessment of any ground contamination encountered. This report should be read in conjunction with report C11831.
LOCATION, TOPOGRAPHY AND GEOLOGY OF THE SITE

Montsaye School is located approximately 400m west of Rothwell town centre and 1.3km north-east of the A14 and A6 junction. The site was located to the north-east of the existing school buildings and is centred at National Grid Reference SP 809 814 as shown on Figure 1.

At the time of the investigation the roughly 45m by 30m rectangular site was covered by a landscaped earth mound and an area of flat, grassed, ground between an artificial surfaced sports pitch to the south-west, and the gardens of neighbouring dwellings to the north-east. A sports hall was adjacent the south-east of the site and a gravel track to the north provided access from Greening Road. The mound, which covered an area of approximately 60m by 15m oriented north-west to south-east, was approximately 2.5m high and covered about two-thirds of the site on its western side and extended beyond the site boundary. This mound had a covering of grass as well as shrubs/sapling trees including Rowan, along its ridge. Additional trees are located along the boundary of the neighbouring gardens as well as toward the south-east corner of the site, tentatively identified species include Oak, Cypress and Poplar. It is understood that buried services, including a water main and electricity cable, cross the site from south-west to north-east beneath the mound.

The ground level toward the north of the site is at about 131.5mOD and gently rises to an approximate elevation of 133mOD at the southern end of the site. The mound is up to approximately 2.5m higher than ground level. The River Ise is approximately 2.3km to the north-west where at an elevation of 90mOD. Slade Brook is approximately 1.2km to the south of the site where its floodplain is at an elevation of 100mOD.

The 1:63,360 scale geological map for the area, Sheet 170 ‘Market Harborough’ shows the site to be underlain by Boulder Clay drift deposits resting on the solid geology of the Lower Estuarine Series overlying Northampton Sand.

Ground conditions encountered in three boreholes, undertaken as part of an investigation within the south-western part of the school and as discussed in report C11831
comprised; a surface cover of topsoil to 0.20m overlying Boulder Clay to depths of between 4.70m and 5.20m. This was in turn underlain by clay and sand of the Lower Estuarine Series to depths of between 5.10m and 6.50m. The Northampton Sand was met beneath the Lower Estuarine Series, and the boreholes were completed with this stratum at depths between 6.00m and 9.40m following a period of chiselling. Two standpipes were installed to depths of 7.00m and 9.00m, and during subsequent monitoring were recorded as being dry.
SITE WORK

The site work was undertaken on 21st December 2009 and comprised five machine excavated trial pits. The locations of the exploratory holes are shown on Figure 2.

Service plans were provided by the client and used to avoid the location of likely utilities beneath the site prior to the commencement of the ground investigation. Prior to drilling, the available service plans were consulted and a service scan was made using a Cable Avoidance Tool (CAT).

The exploratory hole records are presented in Appendix 1 and give the descriptions and depths of the various strata encountered, details of all samples taken, results of the in-situ tests and the groundwater conditions observed during and on completion.

The trial pits were excavated using a wheeled backhoe excavator to depths between 3.40m and 5.25m from surface. A single pit was excavated through the mound whilst a further two were located upon or close to the edge of the mound. The exposed strata were logged and sampled by a Geotechnical Engineer in accordance with BS5930:1999. In-situ tests were conducted and samples collected for subsequent laboratory testing.

Representative disturbed, bulk and undisturbed samples were taken at selected depths throughout the depth of each pit. Samples of the made ground were sealed in either polycarbonate pots or glass jars pending possible selection for contamination testing.

Where cohesive deposits were encountered, an indication of the apparent shear strength was made using a hand shear vane. The average of three tests is presented on the trial pit records.

On completion, each pit was backfilled with spoil in compacted layers.
LABORATORY WORK

The samples were inspected in the laboratory and assessments of the soil characteristics have been taken into account during preparation of the exploratory hole records. The soil descriptions have been made in accordance with BS5930:1999.

Samples recovered from the exploratory holes were tested in accordance with the recommendations of British Standard BS1377:1990 ‘Methods of Tests for Soils for Civil Engineering Purposes’. The results of geotechnical testing and laboratory chemical testing are presented as Laboratory Summary Sheets in Appendix 3.

Geotechnical Laboratory Testing

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The results are quoted as the percentage water with respect to the dry weight of soil. The liquid limit was determined by a cone penetrometer.

The undrained shear strength was determined by single-stage (Q) compression testing carried out on selected undisturbed samples. The moisture content, bulk and dry densities of the specimens were also determined as part of the test procedure.

The index properties of selected soil samples were determined as a guide to soil classification and behaviour. The results are quoted as the percentage water with respect to the dry weight of soil. The liquid limit was determined using the cone penetrometer method.

Selected samples of soil were analysed to determine the concentration of soluble sulphates. The pH values were also determined.

Chemical Laboratory Testing

Selected samples recovered from the exploratory holes were tested for total concentrations of arsenic, cadmium, chromium, lead, mercury, selenium, nickel, benzo[a]pyrene and phenols (the CLEA suite) together with speciated polyaromatic hydrocarbons (PAH), boron,
copper, hexavalent chromium and zinc, total and free cyanide, soluble sulphate, sulphide, organic content and pH. In addition, selected samples were tested for total petroleum hydrocarbons.
GROUND CONDITIONS

The ground conditions encountered comprised made ground underlain by Boulder Clay in turn underlain by the Lower Estuarine Series and Northampton Sand. A Soil Profile is presented as Figure 3 to the rear of this report.

Made Ground

Made ground was encountered in all of the trial pits with a thickness of between 0.40m and 3.50m, the thicker made ground being encountered through the mound.

Trial pits TP1 and TP5 were located on the mound and encountered firm, brown, grey and dark brown mottled, locally slightly sandy, slightly gravelly clay. In trial pit TP5 slightly gravelly, organic clay was encountered between 1.00m and 2.00m overlying soft, slightly sandy, slightly gravelly, organic clay. The gravel fraction comprised sub-angular to sub-rounded chert, limestone, flint, sandstone, chalk, brick, coal, tile, and clinker. Pieces of rubber, wood and plastic sheeting were encountered below 2.40m in TP1 and pieces of straw, wood, metal, cloth and plastic sheeting were encountered below 2.00m in TP5.

The made ground in trial pits TP2 to TP4, located to the east or on the southern edge of the mound, encountered made ground to depths of 0.40m and 0.80m. This made ground comprised firm, brown, grey-brown and dark brown, mottled, slightly gravelly clay with silt partings. The gravel fraction comprised sub-angular to sub-rounded limestone, flint, chert, ironstone, coal and brick.

The base of the made ground was encountered at depths of between 129.00mOD and 132.40mOD. The deeper made ground encountered in TP1 may also be due to placing of buried services prior to the stockpiling of soils as a mound.

Boulder Clay

The Boulder Clay was encountered in all of the trial pits from depths of between 0.40m and 0.80m in pits TP2 to TP4 excavated from ground level, and 3.30m and 3.50m in TP1
and TP5, excavated through the mound. The surface of the Boulder Clay lies at between 129.00mOD and 132.40mOD and its surface apparently dips to the south.

This stratum comprised firm, becoming stiff, or stiff from surface, fissured below depths of between 1.50m and 4.00m (129.20mOD and 130.30mOD), brown, grey, blue-grey and light grey-brown mottled, locally slightly sandy (locally iron stained), locally slightly gravelly clay with silt partings and localised sand partings with depth as well as cobbles. Carbonaceous flecks were also noted in TP4 between 0.90m and 1.50m. The gravel fraction comprised angular to sub-rounded flint, chalk, sandstone, mudstone and limestone. The cobbles comprised flint, limestone and sandstone.

The base of the Boulder Clay was proved in trial pits TP1 to TP4 at depths of between 3.00m and 4.80m (127.90mOD and 128.20mOD) and with a thickness of between 0.90m and 4.40m, the thickness reduced from south to north. Trial pit TP5 was completed within the Boulder Clay at 3.40m depth (131.00mOD).

**Lower Estuarine Series**

The Lower Estuarine Series was encountered in pits TP1 to TP4 at depths between 3.00m and 4.80m (127.90mOD and 128.20mOD).

This stratum comprised light brown, orange-brown, brown, dark brown, light grey, grey and black, locally silty, gravelly sand with localised clay pockets. The gravel fraction comprised angular and tabular limestone, sandstone and carbonaceous plant fragments to depths of between 3.70m and 5.20m (127.50mOD and 127.70mOD). Trial pit TP1, was completed within this stratum at 5.10m (127.40mOD) depth.

**Northampton Sand**

A layer of sandstone rock was encountered beneath the Lower Estuarine Series, thought to be the Northampton Sand, in trial pits TP2, TP3 and TP4. The trial pits were abandoned within this layer at depths of between 3.75m and 5.25m (127.45mOD and 127.65mOD).
Groundwater and Observations

The trial pits remained dry during excavation and on completion.

The sides of trial pit TP5 became unstable within made ground below 2.00m, however, the sides of pits TP1 to TP4 remained stable during and on completion of excavation.

Fibrous roots were encountered in all of the pits to depths of 0.30m and 0.40m in trial pits TP1 to TP4. Roots encountered in TP5 were noted to 2.00m depth.
COMMENTS ON THE GROUND CONDITIONS IN RELATION TO FOUNDATION DESIGN AND CONSTRUCTION

The proposed development is understood to comprise a part two-storey and part single storey engineering building and associated vehicle access road. Column loads in the order of 200kN are anticipated and the formation level will be 133mOD, raised from the existing ground level of about 131.5mOD toward the northern end of the site and at the same elevation of about 133mOD toward the south of the site.

This investigation encountered the base of the made ground at depths of between 129.00mOD and 132.40mOD. Beneath the made ground, firm and stiff, becoming very stiff, Boulder Clay was met. This Boulder Clay is considered to have more than adequate bearing properties to support the anticipated modest foundation loads, however, the thickness of made ground, including fill yet to be placed, may require the use of piled foundations and a suspended floor slab or ground improvement. Ground improvement, if used, is likely to entail vibrated concrete columns. Should piled foundations be required additional investigation of the site would be recommended, and should include deep boreholes.

Spread Foundations

Testing of samples of the Boulder Clay indicated modified plasticity indices of between 6% and 29%, which rates this stratum as having low to medium volume change potential, according to the National House Building Council (NHBC) Standards Chapter 4.2 "Building near Trees" (2007). A minimum foundation depth, therefore, of 0.90m below ground is considered applicable where foundations are within naturally deposited clay soils, in accordance with NHBC standards. Notwithstanding, foundations may have to be locally deepened due to the thickness of made ground.

Foundations will require deepening where scheduled within the influencing distance of trees, including both trees to be retained and trees which have been removed as part of the development. As an example, with reference to the above cited NHBC Standards, where
foundations are scheduled 10m from an Oak, a high water demand tree of up to 24m height, a minimum foundation depth of 2.30m would be required within the Boulder Clay.

It is recommended that foundations depths should be determined at zoned intervals from the existing trees taking into account the proposed formation level and the relative elevation of the trees. Also, foundations should be deepened to at least 0.50m beneath the deepest live root where within shrinkable soil.

Consideration must be given to incorporation of some void forming or compressible material against the sides of foundations to accommodate vertical or horizontal movement as a consequence of volume change of the clay. Further guidance on this is given in the National House Building Council (NHBC) Standards Chapter 4.2 “Building near Trees” (2007).

Based on the results of triaxial testing and incorporating a factor of safety of 3.0, the Boulder Clay would have a net safe bearing capacity of 120kN/m² for a 1.30m by 1.30m pad foundation. Settlement is anticipated to be within tolerable limits for these foundations. A 1.30m by 1.30m pad footing, therefore, will be capable of supporting the envisaged 200kN column load.

**Excavations**

Groundwater was not encountered within any of the trial pils. During the previous investigation of a site within the school grounds, some 150m south-west and at a similar elevation, standpipe installations to depths of 7.00m and 9.00m were recorded as being dry during three return visits. Excavations for foundations into the Boulder Clay are expected to remain dry, however, water seepages may occur due to surface infiltration, although it is expected that such water could be controlled by screened sump pump techniques.

The Boulder Clay and made ground is expected to readily excavate using modern plant. The sides of excavations through the Boulder Clay are expected to remain stable, however, the sides of excavations through the made ground may become unstable. If excavations are scheduled to remain open for an extended period it is recommended that trench supports are used, especially through made ground.
The base of foundation excavations should be inspected on completion to ensure that the condition of the soil complies with that assumed in design. Should pockets of inferior material or made ground be present, they should be removed and replaced with well-graded, well compacted hardcore or lean mix concrete. The excavated surface should be protected from deterioration and a blinding layer of concrete used where foundations are not completed without delay.

Safety precautions should not be neglected especially where personnel are to enter deep excavations, when close side support will be required in order to maintain excavation stability.

**Floor Slabs**

As part of the development the ground is going to be raised from the existing levels of between about 131mOD to a formation height of 132.4mOD. This is scheduled to include the placing and compacting of granular fill in a controlled manner. Where the building is located upon the mound the surface of the mound will be reduced to formation height. An assessment of the proposed fill material and the method of compaction to be utilised is outside the scope of this investigation. The made ground across the site is not considered suitable for the use of ground bearing floor slabs, especially the made ground within the footprint of the existing mound that appeared to have been placed in an uncontrolled manner and also contains organic clay as well as general building waste. The made ground encountered in trial pits TP2 and TP3 with a thickness of between 0.40m and 0.80m may react well to additional compaction, however, should this material be left in place prior to the placing of additional fill it is recommended that further assessment is carried out to allow an evaluation of projected settlement should a ground bearing floor slab be used.

The condition of the made ground as encountered in the stockpile, including soft and firm organic clay, is unlikely to react well to ground improvement using vibrated stone columns due to the lack of lateral support. The close proximity of existing buildings and buried services including a water main and electricity cable are likely to preclude the use of dynamic
compaction ground treatment; therefore consideration may be given to vibrated concrete columns, however, it is recommended that a specialist contractor should be consulted with regard to viable treatment methods and feasibility.

In the absence of ground improvement, consideration may be given to either the use of a suspended floor slab resting upon piles bearing upon the underlying Boulder Clay or removal of the made ground and replacing it with engineered fill. Due to the condition of much of the made ground within the stockpile it is considered likely that such fill will have to be imported from off-site. Such fill would have to be subjected to earthworks suitability testing prior to use and subsequent validation during and after placing and compaction. Should the made ground be replaced by engineered fill, consideration may be given to the use of a ground bearing floor slab, and possibly shallow spread foundations resting on the made ground, subject to confirmation testing and additional assessment. From plans provided by the client a buried water main and electricity cable cross the site; these services may have to be re-routed around the site should ground improvement take place.

**Sulphate Conditions**

Sulphate analysis of the made ground yielded concentrations within Design Sulphate Classes DS-1 and DS-2 of the appended BRE Special Digest 1 (2005), Table C2 (Appendix 3). Sulphate analyses on samples of Boulder Clay also yielded concentrations within Design Sulphate Class DS-1.

The pH values of the made ground and Boulder Clay samples ranged from 7.1 to 9.0 indicating alkaline conditions. Based on these results, an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1s applies, which should be considered when specifying a Design Chemical Class (DC Class) for buried concrete on this site, as detailed in the above document.
COMMENTS ON THE CHEMICAL TEST RESULTS

The results of the laboratory chemical testing from the investigation have been compared to CLEA Soil Screening Values (SSV), which have been used as a screening tool for use in the assessment of land affected by contamination.

CLEA Soil Screening Values based on CLEA model v1.04 (SSV)

Atkins Limited have derived ATRISKsoil SSVs based on the 2009 guidance (SC050021/SR3 (the CLEA Report) and SC050021/SR2 (the TOX report)) for residential with home grown produce, playing fields and commercial/industrial end uses. They have based these on the default assumptions provided in the CLEA report which, it is understood, will be used in the development of future Soil Guideline Values by DEFRA and the Environment Agency. Atkins SSVs for 6% soil organic matter (SOM) have been derived using CLEA model v1.04. These are provided under licence to Ground Engineering, and respective toxicology reports and technical details on the derivation of the SSVs can be provided on request.

Soil Assessment

The following standard land uses form the basis of the assessment in relation to soils:

- Residential with home grown produce end use, representative of most sensitive land uses such as private rear gardens.
- Playing fields
- Commercial and industrial usage representative of buildings and areas covered by hardstanding, representative of commercial/industrial usage.

The intended purpose of the SSV is as “intervention values” in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.
In summary, Table 5 compares the test results of the investigation with the SSVs in relation to the specified usage. The number of test results, which exceed these values, are also provided.
### Table 5: Comparison of Chemical Test Results with SSVs for Made Ground

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Number of Samples</th>
<th>Min Value (mg/kg)</th>
<th>Max Value (mg/kg)</th>
<th>Number of Samples Exceeding Soil Screening Criteria SSVs</th>
<th>Measured 95th Percentile (mg/kg)</th>
<th>Soil Screening Criteria SSVs (for 6.0% SOM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Residential with home grown produce</td>
<td>Playing fields</td>
<td>Commercial/Industrial</td>
</tr>
<tr>
<td>Arsenic</td>
<td>6</td>
<td>14</td>
<td>37</td>
<td>1</td>
<td>0</td>
<td>29.88</td>
</tr>
<tr>
<td>Cadmium</td>
<td>6</td>
<td>&lt;0.10</td>
<td>0.19</td>
<td>0</td>
<td>0</td>
<td>0.18</td>
</tr>
<tr>
<td>Chromium</td>
<td>6</td>
<td>23</td>
<td>38</td>
<td>&lt;5</td>
<td>0</td>
<td>210</td>
</tr>
<tr>
<td>Lead</td>
<td>6</td>
<td>34</td>
<td>110</td>
<td>0</td>
<td>0</td>
<td>95.61</td>
</tr>
<tr>
<td>Mercury</td>
<td>6</td>
<td>&lt;0.10</td>
<td>0.60</td>
<td>0</td>
<td>0</td>
<td>0.39</td>
</tr>
<tr>
<td>Selenium</td>
<td>6</td>
<td>&lt;0.20</td>
<td>&lt;0.20</td>
<td>0</td>
<td>0</td>
<td>0.20</td>
</tr>
<tr>
<td>Nickel</td>
<td>6</td>
<td>20</td>
<td>33</td>
<td>0</td>
<td>0</td>
<td>32.01</td>
</tr>
<tr>
<td>Phenols</td>
<td>6</td>
<td>&lt;0.3</td>
<td>&lt;0.3</td>
<td>0</td>
<td>0</td>
<td>&lt;0.30</td>
</tr>
<tr>
<td>Benzo[a]pyrene</td>
<td>6</td>
<td>&lt;0.1</td>
<td>7.2</td>
<td>&lt;1</td>
<td>0</td>
<td>14.77</td>
</tr>
<tr>
<td>Boron</td>
<td>6</td>
<td>1.0</td>
<td>1.7</td>
<td>0</td>
<td>0</td>
<td>1.52</td>
</tr>
<tr>
<td>Copper</td>
<td>6</td>
<td>24</td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>34.06</td>
</tr>
<tr>
<td>Zinc</td>
<td>6</td>
<td>71</td>
<td>160</td>
<td>0</td>
<td>0</td>
<td>125.17</td>
</tr>
<tr>
<td>Free Cyanide</td>
<td>6</td>
<td>&lt;0.5</td>
<td>&lt;0.5</td>
<td>0</td>
<td>0</td>
<td>&lt;0.50</td>
</tr>
<tr>
<td>Sulphide</td>
<td>6</td>
<td>1.6</td>
<td>18.0</td>
<td>0</td>
<td>0</td>
<td>12.04</td>
</tr>
</tbody>
</table>
Discussion of Chemical Test Results

The results of laboratory analysis indicate that, of the six samples of made ground tested, a single sample contained an elevated concentration of arsenic, which exceeds the SSV for residential with home grown produce end use. A further sample contained an elevated concentration of benzo[a]pyrene, which exceeds the SSV for residential with home grown produce and playing fields end uses. Furthermore, of the samples tested, all six contained an elevated concentration of chromium that exceeds the SSV for residential with home grown produce end use. None of the concentrations of the elements or compounds tested exceeded the screening values for commercial/industrial end uses.

Statistical analysis, based on the mean value tests, indicates that the US95 values for chromium and for benzo[a]pyrene exceed the corresponding screening values for residential with homegrown produce end use. None of the US95 values exceed the screening values for playing fields or commercial/industrial end use.

Measured total chromium concentrations were between 23mg/kg and 38mg/kg, with all samples tested exceeding the residential with home grown produce SSV of 14mg/kg. The toxicity of chromium depends upon its oxidation state, which generally comprises trivalent and hexavalent forms. Trivalent compounds are stable and most naturally occurring chromium is in the trivalent (chromic) state. Hexavalent chromium (chromate) rarely occurs naturally and the presence in soil is most likely to be from pollution. Hexavalent chromium is significantly more toxic than the trivalent form, and consequently the SSV assumes that all the chromium is present in the hexavalent form. The hexavalent chromium test results for the six samples analysed were all less than 0.5mg/kg, a concentration well below the SSV of 14mg/kg, and therefore the measured chromium concentrations would not be considered to present a significant risk even for residential with home grown produce end use, being regarded as the most sensitive end use.
Discussion of Hydrocarbon Test Results

The results of laboratory testing for total petroleum hydrocarbon testing is summarised in Table 6.

Table 6: Total Petroleum Hydrocarbon Concentration Test Results

<table>
<thead>
<tr>
<th>Sample Reference</th>
<th>Sample Depth</th>
<th>Total Petroleum Hydrocarbon Concentration (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1, D2</td>
<td>0.50m</td>
<td>&lt;10</td>
</tr>
<tr>
<td>TP2, D1</td>
<td>0.20m</td>
<td>510</td>
</tr>
<tr>
<td>TP3, D1</td>
<td>0.20m</td>
<td>&lt;10</td>
</tr>
<tr>
<td>TP5, D2</td>
<td>0.50m</td>
<td>&lt;10</td>
</tr>
<tr>
<td>TP5, D5</td>
<td>1.50m</td>
<td>&lt;10</td>
</tr>
<tr>
<td>TP5, D7</td>
<td>2.60m</td>
<td>140</td>
</tr>
</tbody>
</table>

No visual or olfactory evidence for the presence of petroleum hydrocarbons was observed within the sampled soils.

Laboratory testing of the six samples for total petroleum hydrocarbons indicated concentrations of between <10mg/kg and 510mg/kg, however, as the samples did not exhibit any signs of petroleum contamination the total petroleum hydrocarbons indicated within TP2 and TP5 is more probably due to carbonaceous material such as coal and clinker as well as the organic content of the sample. Notwithstanding, the concentrations indicated are low and are unlikely to pose a risk either during or following construction.
COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

Anticipated exposure scenarios relating to the site and proposed future development are discussed as follows.

This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that may appear to be contaminated.

Contaminated Soil

With the exception of the mounded stockpile of made ground, the site is underlain by a 0.40m to 0.80m thick covering of made ground overlying Boulder Clay. Statistical analysis of the chemical test results revealed an elevated concentration in the made ground of benzo[a]pyrene when compared to the SSV for residential with home grown produce end use. None of the determinands within the suite of analysis were statistically elevated when compared to the screening values for playing fields or commercial/industrial end use.

Existing Drainage

Redundant drains, if present, should be removed from beneath the site and precautions should ensure that any remaining foul water is directly disposed off-site. The integrity of existing drainage should be checked, and where they are to be retained, any damaged sections should be replaced prior to development. The latter measures should remove any future risk to human health and to the water environment.
**Human Health - Construction Workers**

Standard precautions must be adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers during groundworks the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to groundworkers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

**Human Health - Users of Possible Future Development**

The results show that the shallow soils are uncontaminated with respect to the proposed engineering building end use and may be retained beneath buildings and hardstanding or within soft landscaped areas. The made ground, however, would not be suitable for retention within areas to be used for school vegetable gardens. Consideration should also be given to the geotechnical suitability of any soils to be retained.

The monitoring of ground gases was outside the scope of this investigation. There are no recorded landfills within the vicinity of the site. Assuming the stockpiled made ground is to be removed from the footprint of the proposed building, the site would be underlain by between 0.40m and 0.80m, locally to 1.80m of made ground with some organic content. With reference to CIRIA document C665, should the locally deepened made ground be left in-situ it is recommended that gas protection measures are incorporated into the design of the building. Gas protection measures could include, as an example; (i) reinforced concrete cast in-situ floor slab (suspended, non-suspended of raft) with at least 1200g damp proof membrane, (ii) beam and block or pre-cast concrete slab and minimum 2000g damp proof/reinforced gas membrane and
(iii) possibly underfloor venting or pressurisation in combination with (i) and (ii) dependent on use. In addition, all joints and penetrations should be sealed. Further guidance pertaining to gas protection measures is provided in the aforementioned document. Should the made ground be removed from beneath the building and replaced with engineered fill, that is certified as clean, gas protection measures should not be required.

**Off-site Disposal of Soil Arisings**

Excavated material and excess spoil should always be classified prior to removal from site as required by ‘Duty of Care’ (Environmental Protection Act, 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal. The site plan, exploratory hole records and certificates of chemical analysis should be sent to the Environmental Agency or a suitably licensed waste disposal contractor for classification of the material prior to disposal off-site during the development works.

It is expected that clean arisings from the natural soils across this site would fall into the inert category under the European Waste Catalogue description ‘Soil and Stones’, EWC code 17 05 04 with restrictions excluding topsoil and peat.

**GROUND ENGINEERING LIMITED**

A. N. COGHLAN

B. Sc. (Hons.), F. G. S.

**Geo-Environmental Engineer**

J. H. GIBB

B. Sc. (Hons.), M. Sc. (Eng.), C. Geol., F. G. S.

**Senior Geo-Environmental Engineer**

S. J. FLEMING

M. Sc., M. C. S. M., C. Geol., F. G. S.,

**Director**
Figures

Figure 1 - Site Location Plan
Figure 2 – Trial Pit Location Plan
Figure 3 – Soil Profile
KEY TO LEGENDS

- TOPSOIL
- BOULDER CLAY
- LOWER ESTUARINE SERIES
- NORTHAMPTON SAND

SITE: MONTSAYE SCHOOL, GREENING ROAD, ROTHWELL
CLIENT: LEND LEASE PROJECTS LTD
Soil Profile

Contract No. 11831A
Vertical Scale 1:50

© GROUND ENGINEERING, NEWARK ROAD, PETERBOROUGH.
Date 02/02/10
Fig. No. 3
APPENDIX 1

Trial Pit Records
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Type</th>
<th>Result</th>
<th>Water</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>D1</td>
<td></td>
<td></td>
<td>MADE GROUND - Firm, brown and dark brown, locally slightly sandy, slightly gravelly CLAY. Gravel comprises sub-angular chert, limestone and flint. Live fibrous roots.</td>
</tr>
<tr>
<td>0.50</td>
<td>D2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.90</td>
<td>D3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.10</td>
<td>D4</td>
<td></td>
<td></td>
<td>MADE GROUND - Firm, brown, grey and dark brown, mottled, locally slightly sandy, slightly gravelly CLAY. Gravel comprises sub-angular to sub-rounded flint, limestone, brick, clinker, sandstone and chalk. Pieces of rubber, wood and plastic sheeting below 2.40m depth.</td>
</tr>
<tr>
<td>1.60</td>
<td>D5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>D6</td>
<td></td>
<td>V1</td>
<td>(49)</td>
</tr>
<tr>
<td>2.00</td>
<td>V2</td>
<td>(63)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>D7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>D8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.60</td>
<td>D9</td>
<td></td>
<td>(76)</td>
<td></td>
</tr>
<tr>
<td>3.60</td>
<td>V3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>D10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.10</td>
<td>V4</td>
<td>(114)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.60</td>
<td>D11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.10</td>
<td>D12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legend

- **Key**: D - Disturbed Sample, B - Bulk Sample, U - Undisturbed Sample, R - Root Sample, W - Water Sample, J - Jar Sample, X - Water Sticke, Y - Water Rise, MC - Level on completion, MP - Mackintosh Probe, PP - Penetrometer, V - Vane Shear Test, H - Cohesion (kPa), E - Pore Pressure

**Remarks**

1. Pit dry
2. Fibrous roots observed to 0.30m depth
3. Pit sides stable
4. Pit completed at 5.10m depth due to limit of excavator
5. Pit excavated through side of mound

Project No 11831A
Scale 1:50
Page 1/1
<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Type</th>
<th>Result</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>D1</td>
<td></td>
<td>MADE GROUND - Firm, brown and dark brown, slightly gravelly clay with silt partings. Gravel comprises sub-angular to sub-rounded limestone, flint, coal and brick.</td>
</tr>
<tr>
<td>0.60</td>
<td>D2</td>
<td></td>
<td>/Firm, brown and brown-grey, mottled CLAY with silt partings. (BOULDER CLAY)</td>
</tr>
<tr>
<td>0.90</td>
<td>D3</td>
<td>U1</td>
<td>Firm becoming stiff, brown and grey, mottled, slightly gravelly CLAY with silt partings and cobbles. Gravel comprises angular to sub-rounded flint, chalk, limestone and sandstone. Cobbles comprise flint and sandstone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.60</td>
<td>V1</td>
<td>(111)</td>
<td>Stiff, fissured, brown and grey, mottled, slightly gravelly clay with silt partings and cobbles. Gravel comprises angular to sub-rounded flint, chalk, limestone and sandstone. Cobbles comprise flint and limestone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>2.00</td>
<td>D4</td>
<td></td>
<td>Grey, brown, dark brown and black, silty, gravelly SAND. Gravel comprises sub-angular sandstone and carbonaceous plant fragments. (LOWER ESTUARINE SERIES)</td>
</tr>
<tr>
<td>2.50</td>
<td>D5</td>
<td></td>
<td>/Brown and grey SANDSTONE. (PROBABLE NORTHAMPTON SAND)</td>
</tr>
<tr>
<td>2.50</td>
<td>V2</td>
<td>(122)</td>
<td>Pit abandoned at 3.75m depth</td>
</tr>
</tbody>
</table>

**KEY**
- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- H - Root Sample
- W - Water Sample
- J - Jar Sample
- V - Water Rise
- Mc - Level on completion
- MP - Mackenzie Probe
- P - Hand Penetrometer
- Cohesion (kPa)
- V - Vane Shear Test
- Cohesion (kPa)

**REMARKS**
1. Pit dry
2. Pit sides stable
3. Fibrous roots observed to 0.3m depth
4. Pit abandoned on bedded rock at 3.75m depth

**GROUNDD ENGINEERING**
Geo-Environmental Specialists
01733 566566

**Site:** MONTSAYE SCHOOL, GREENING ROAD, ROTHWELL

**Date:** 21/12/09

**Pit Size:** 4.00m L x 0.70m W x 3.75m D.

**Ground Level:** 131.20 m O.D.
<table>
<thead>
<tr>
<th>Depth m</th>
<th>Type</th>
<th>Result</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>D1</td>
<td></td>
<td>MADE GROUND - Firm, brown, grey brown and dark brown mottled, slightly gravelly CLAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>with silt partings. Gravel comprises sub-angular to sub-rounded flint, limestone, coal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and brick.</td>
</tr>
<tr>
<td>0.40</td>
<td>D2</td>
<td></td>
<td>Stiff, brown and grey-brown, mottled, slightly gravelly CLAY with silt partings and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>localized pockets of ferruginous sand. Gravel comprises angular to sub-rounded flint,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>chalk and limestone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>0.80</td>
<td>V1</td>
<td>(102)</td>
<td>Stiff, fissured, grey and brown, mottled, slightly gravelly CLAY with silt partings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gravel comprises angular to sub-rounded flint, chalk and limestone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.10-1.55</td>
<td>V2</td>
<td>(104)</td>
<td>Stiff, fissured, grey, blue grey and brown, mottled, slightly gravelly CLAY with silt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>partings. Gravel comprises flint, limestone and mudstone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.80</td>
<td>V4</td>
<td></td>
<td>Stiff, orange-brown, grey and black, silty, gravelly SAND. Gravel comprises sub-angular</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>sandstone and carbonaceous fossil plant fragments. (LOWER ESTUARINE SERIES)</td>
</tr>
<tr>
<td>2.00</td>
<td>V5</td>
<td></td>
<td>Slight reddish brown sandstone. (PROBABLY NORMANDAN SAND)</td>
</tr>
<tr>
<td>2.40</td>
<td>D5</td>
<td></td>
<td>Pit abandoned at 4.15m depth</td>
</tr>
<tr>
<td>3.00</td>
<td>D6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.50</td>
<td>D7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.90-4.00</td>
<td>B1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**
1. Pit dry
2. Pit sides stable
3. Fibrous roots observed to 0.3m depth
4. Pit abandoned on bedded rock at 4.15m depth

**Legend:**
- D: Disturbed Sample
- B: Bulk Sample
- U: Undisturbed Sample
- R: Root Sample
- W: Water Sample
- J: Jar Sample
- V: Vane Shear Test
- X: Water Rise
- Xc: Level on completion
- MP: Mackintosh Probe
- PK: Hand Penetrometer
- C: Kakuna Sandstone (kPa)
- D: Disturbed Sandstone (kPa)

**Project No:** 11831A

**Scale:** 1:50

**Page:** 1/1
**Site:** MONTSAYE SCHOOL, GREENING ROAD, ROTHWELL  
**Pit Size:** 3.80m L x 0.70m W x 5.25m D.  
**Ground Level:** 132.80m O.D.

### Samples and In-situ Tests

<table>
<thead>
<tr>
<th>Depth m</th>
<th>Type</th>
<th>Result</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.20</td>
<td>D1</td>
<td></td>
<td>MADE GROUND - Firm, brown and dark brown, slightly gravelly CLAY with silt partings. Gravel comprise sub-angular to sub-rounded limestone, flint, ironstone, chert and brick.</td>
</tr>
<tr>
<td>0.60</td>
<td>D2</td>
<td></td>
<td>Firm, dark brown, slightly gravelly CLAY with silt partings. Gravel comprises sub-angular to sub-rounded flint and limestone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.00</td>
<td>D3</td>
<td></td>
<td>Firm becoming stiff, locally firm, brown and light grey brown, slightly gravelly CLAY with rare flint cobbles, silt partings and carbonaceous flecks. Gravel comprises sub-angular to sub-rounded flint, chalk and limestone. Carbonaceous flecks absent below 1.50m depth. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.10-1.55</td>
<td>U1</td>
<td></td>
<td>Stiff, fissured grey and grey brown, slightly gravelly CLAY. Gravel comprises sub-angular to sub-rounded flint, sandstone, chalk and limestone. (BOULDER CLAY)</td>
</tr>
<tr>
<td>1.50</td>
<td>D4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>D5</td>
<td>(92)</td>
<td></td>
</tr>
<tr>
<td>2.50</td>
<td>D6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td>D7</td>
<td>(111)</td>
<td></td>
</tr>
<tr>
<td>3.40</td>
<td>D8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.00</td>
<td>D9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.90</td>
<td>D10</td>
<td></td>
<td>Grey, light grey and brown, gravelly SAND with occasional gravel size clay pockets. Gravel comprises sub-angular to sub-rounded sandstone and carbonaceous fossil plant fragments. (LOWER ESTUARINE SERIES)</td>
</tr>
<tr>
<td>5.00-5.10</td>
<td>B1</td>
<td></td>
<td>Grey and light grey, silt, gravelly SAND. Gravel comprises sub-rounded, very weak sandstone. (LOWER ESTUARINE SERIES)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grey and light grey SANDSTONE. (PROBABLY NORTHAMPTON SAND)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pit abandoned at 5.25m depth</td>
</tr>
</tbody>
</table>

### Key
- D: Disturbed Sample
- B: Bulk Sample
- U: Undisturbed Sample
- R: Root Sample
- W: Water Sample
- J: Jar Sample
- V: Water Sample
- X: Water Rise
- Y: Level on completion
- MP: Mackintosh Probe
- H: Hand Penetrometer
- C: Cohesion (kPa)
- V: Vane Shear Test
- C: Cohesion (kPa)

### Remarks
1. Pit dry
2. Pit sides stable
3. Live roots observed to 0.40m depth
4. Pit abandoned on bedded rock at 5.25m depth
**Ground Engineering**

**Site:** Montsaye School, Greening Road, Rothwell

**Date:** 21/12/09

**Fit Size:** 3.50m L x 0.70m W x 3.40m D.

**Ground Level:** 134.40m O.D.

<table>
<thead>
<tr>
<th>Depth m</th>
<th>Type</th>
<th>Result</th>
<th>Description of Strata</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>D1</td>
<td></td>
<td>Made Ground - Firm, brown and dark brown, slightly sandy, slightly gravelly CLAY. Gravel comprises angular to sub-rounded flint and brick. Live fibrous roots.</td>
</tr>
<tr>
<td>0.50</td>
<td>D2</td>
<td></td>
<td>Made Ground - Firm, brown and brown grey CLAY with silt partings. Occasional dead fibrous root traces.</td>
</tr>
<tr>
<td>0.90</td>
<td>D3</td>
<td>(36)</td>
<td>Made Ground - Firm, grey brown, slightly gravelly organic CLAY. Gravel comprises sub-rounded chert and flint. Occasional live fibrous roots.</td>
</tr>
<tr>
<td>1.00</td>
<td>V1</td>
<td></td>
<td>Made Ground - Soft, brown and grey brown, slightly sandy, gravelly organic CLAY. Gravel comprises sub-angular to sub-rounded flint, limestone, brick, coal, tile, clinker and sandstone. Occasional pieces of straw, wood, metal, cloth and plastic sheeting.</td>
</tr>
<tr>
<td>1.10</td>
<td>D4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.50</td>
<td>D5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.10</td>
<td>D6</td>
<td>(38)</td>
<td></td>
</tr>
<tr>
<td>2.20</td>
<td>V2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.60</td>
<td>D7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.20</td>
<td>D8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.40</td>
<td>D9</td>
<td>(69)</td>
<td>Firm, brown and grey brown, slightly gravelly CLAY. Gravel comprises sub-angular flint. (Boulder Clay) Pit completed at 3.40m depth</td>
</tr>
<tr>
<td>3.40</td>
<td>V3</td>
<td>(69)</td>
<td></td>
</tr>
</tbody>
</table>

**KEY**

- D - Disturbed Sample
- B - Bulk Sample
- U - Undisturbed Sample
- R - Roto Sample
- W - Water Sample
- J - Jar Sample
- S - Water Strike
- Wc - Water Rise
- Le - Level on completion
- MP - Mackintosh Probe
- P - - Hand Penetrometer or Cohesion (kPa)
- V - Vane Shear Test or Cohesion (kPa)

**REMARKS**

1. Fibrous live roots observed to 2.00m depth
2. Pit dry
3. Pit sides collapsed below 2.00m depth
4. Pit excavated from top of mound

---

**Project No:** 11831A

**Scale:** 1:50

**Page:** 1/1
APPENDIX 2

Geotechnical Laboratory Test Certificates
Chemical Laboratory Test Certificates
## LABORATORY TEST RESULTS

<table>
<thead>
<tr>
<th>Trial-pit</th>
<th>Sample</th>
<th>Depth m</th>
<th>Classification</th>
<th>Liquid Limit %</th>
<th>Plastic Limit %</th>
<th>Plasticity Index</th>
<th>Moisture Content %</th>
<th>Bulk Density Mg/m³</th>
<th>Dry Density Mg/m³</th>
<th>Type</th>
<th>Principal Stress Difference kPa</th>
<th>Cell Pressure kPa</th>
<th>Shear Strength kPa</th>
<th>Angle of Shear Resistance degrees</th>
<th>Soil Total % Dry Wt.</th>
<th>Water Aqueous Extract mg/l</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>D4</td>
<td>1.10</td>
<td></td>
<td>51</td>
<td>21</td>
<td>30</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP2</td>
<td>U1</td>
<td>1.10 - 1.55</td>
<td></td>
<td>53</td>
<td>20</td>
<td>33</td>
<td>24</td>
<td>2.05</td>
<td>1.66</td>
<td>Q</td>
<td>91</td>
<td>50</td>
<td>46</td>
<td>0</td>
<td>115</td>
<td>7.6</td>
<td>SOIL CLASSIFICATION = CH 27% retained on 425μm sieve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP3</td>
<td>U1</td>
<td>1.10 - 1.55</td>
<td></td>
<td>51</td>
<td>19</td>
<td>32</td>
<td>19</td>
<td>2.19</td>
<td>1.84</td>
<td>Q</td>
<td>220</td>
<td>50</td>
<td>110</td>
<td>0</td>
<td>122</td>
<td>7.7</td>
<td>SOIL CLASSIFICATION = CH 9% retained on 425μm sieve</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TP4</td>
<td>U1</td>
<td>1.10 - 1.55</td>
<td></td>
<td>21</td>
<td>18</td>
<td>29</td>
<td>20</td>
<td>2.15</td>
<td>1.78</td>
<td>Q</td>
<td>103</td>
<td>50</td>
<td>52</td>
<td>0</td>
<td>88</td>
<td>7.7</td>
<td>SOIL CLASSIFICATION = CI 4% retained on 425μm sieve</td>
</tr>
<tr>
<td>D5</td>
<td></td>
<td>2.00</td>
<td></td>
<td>47</td>
<td>18</td>
<td>29</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

U - UNDISTURBED SAMPLE  
D - DISTURBED SAMPLE  
B - BULK SAMPLE  
W - WATER SAMPLE  
C.U. - CONSOLIDATED UNDRAINED  
C.D. - CONSOLIDATED DRAINED  
Q. - IMMEDIATE UNDRAINED  
Q.M. - IMMEDIATE UNDRAINED MULTISTAGE  
Aqueous Extract 2:1 Water:Soil  

GROUND ENGINEERING PETERBOROUGH
Ground Engineering
Newark Road
Peterborough

PE1 5UA

FAO Andy Coghlin
11 January 2010

Dear Andy Coghlin

Test Report Number 110192
Your Project Reference Montsaye High School, Rothwell - C11831A

Please find enclosed the results of analysis for the samples received 23 December 2009.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely

[Signature]

Authorised Signatory

Notes to accompany report:
• The sign < means 'less than'
• Tests marked 'U' hold UKAS accreditation
• Tests marked 'M' hold MCertS (and UKAS) accreditation
• Tests marked 'N' do not currently hold UKAS accreditation
• Tests marked 'S' were subcontracted to an approved laboratory
• n/e means 'not evaluated'
• i/s means 'insufficient sample'
• u/s means 'unsuitable sample'
• Comments or interpretations are beyond the scope of UKAS accreditation
• The results relate only to the items tested

Test Report 110192 Cover Sheet
LABORATORY TEST REPORT

Results of analysis of 6 samples received 23 December 2009

Montsaye High School, Rothwell - C11831A

| Sample ID | Matrix | CAS No | Units | TP1 | TP2 | TP3 | TP5 | D1 | D2 | D5 | D7 | 0.5m | 0.2m | 0.2m | 0.5m | 1.5m | 2.5m |
|-----------|--------|--------|-------|-----|-----|-----|-----|----|----|----|----|------|------|------|------|------|------|------|
| AE58084   | 110192 | TP1    |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |
| AE58085   |        | TP2    |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |
| AE58086   |        | TP3    |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |
| AE58087   |        | TP5    |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |
| AE58088   |        | D1     |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |
| AE58089   |        | D2     |       |     |     |     |     |    |    |    |    |      |      |      |      |      |      |      |

<table>
<thead>
<tr>
<th>SOIL</th>
<th></th>
<th>SOIL</th>
<th></th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
<th>SOIL</th>
</tr>
</thead>
</table>

Cyanide (free) 57125 mg kg⁻¹ M <0.50 <0.50 <0.50 <0.50 <0.50 <0.50
Cyanide (total) 57125 mg kg⁻¹ M <0.50 <0.50 <0.50 <0.50 <0.50 <0.50
Sulfide 18496258 mg kg⁻¹ M 1.6 2.7 3.1 10.0 6.1 18.0
Organic matter % M 4.7 5.9 4.0 4.8 6.7 2.1
Boron (hot water soluble) 7440428 mg kg⁻¹ M 1.7 1.4 1.3 1.0 1.4 1.0
Sulfate (2:1 water soluble) as SO₄ 14808798 g l⁻¹ M 0.05 0.02 0.04 0.01 0.03 0.50
Chromium (hexavalent) 18540299 mg kg⁻¹ M <0.5 <0.5 <0.5 <0.5 <0.5 <0.5
Arsenic 7440382 mg kg⁻¹ M 17 37 14 27 21 23
Cadmium 7440349 mg kg⁻¹ M 0.15 0.19 0.17 0.17 0.15 <0.10
Chromium 7440473 mg kg⁻¹ M 34 38 31 37 37 23
Copper 7440508 mg kg⁻¹ M 24 28 35 34 34 25
Nickel 7439976 mg kg⁻¹ M 0.16 0.16 0.14 0.80 0.27 <0.10
Lead 7440020 mg kg⁻¹ M 27 32 20 33 31 21
Selenium 7782492 mg kg⁻¹ M <0.20 <0.20 <0.20 <0.20 <0.20 <0.20
Zinc 7440686 mg kg⁻¹ M 96 91 71 100 160 73
Petroleum Hydrocarbons mg kg⁻¹ M <10 510 <0.10 <0.10 <0.10 140
Naphthalene 91203 mg kg⁻¹ M <0.1 0.62 0.39 0.16 0.84 0.69
Acenaphthylene 208968 mg kg⁻¹ M 0.78 0.38 0.31 <0.1 0.65 0.61
Acenaphthene 83329 mg kg⁻¹ M 0.78 0.38 0.39 0.16 0.79 1.9
Fluorene 86737 mg kg⁻¹ M 0.26 0.12 <0.1 0.1 0.13 1.5
Phenanthrene 85018 mg kg⁻¹ M 0.43 0.33 0.32 0.15 0.15 1.5
Anthracene 120127 mg kg⁻¹ M 0.16 0.19 <0.1 0.1 0.15 1.5
Fluoranthene 206440 mg kg⁻¹ M <0.1 1.3 0.57 0.3 0.15 1.5
Pyrone 129000 mg kg⁻¹ M 0.32 0.1 0.54 0.33 0.37 11
Benzo[a]anthracene 56553 mg kg⁻¹ M <0.1 0.57 0.27 0.22 <0.1 6.5
Chrysen 216019 mg kg⁻¹ M <0.1 0.66 0.35 0.22 0.2 7.9
Benzo[b]fluoranthene 200392 mg kg⁻¹ M <0.1 0.77 0.33 <0.1 <0.1 7.9
Benzo[k]fluoranthene 207089 mg kg⁻¹ M <0.1 0.71 0.27 <0.1 <0.1 5.3
Benzo[a]pyrene 50328 mg kg⁻¹ M <0.1 0.91 0.13 <0.1 <0.1 7.2
Dibeno[a,b]anthracene 53703 mg kg⁻¹ M <0.1 <0.1 <0.1 <0.1 <0.1 1.2

All tests undertaken between 24-Dec-2009 and 8-Jan-2010

This report should be interpreted in conjunction with the notes on the accompanying cover page.
LABORATORY TEST REPORT

Results of analysis of 6 samples
received 23 December 2009

Montsaye High School, Rothwell - C11831A

<table>
<thead>
<tr>
<th>Substance</th>
<th>AE58084</th>
<th>AE58085</th>
<th>AE58086</th>
<th>AE58087</th>
<th>AE58088</th>
<th>AE58089</th>
</tr>
</thead>
<tbody>
<tr>
<td>2700 Indeno[1,2,3-cd]pyrene</td>
<td>193395</td>
<td>191242</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzo[g,h,i]perylene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (of 16) PAHs</td>
<td>193395</td>
<td>191242</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2920 Phenols (total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010 pH</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td>M</td>
</tr>
</tbody>
</table>

All tests undertaken between 24-Dec-2009 and 8-Jan-2010

* Accreditation status

This report should be interpreted in conjunction with the notes on the accompanying cover page
APPENDIX 3

Aggressive Chemical Environment for Concrete (ACEC) Classification, BRE
Special Digest 1 (2005)
# Table C2 - Aggressive Chemical Environment for Concrete

(ACEC) Classification for Brownfield Locations

<table>
<thead>
<tr>
<th>Sulfate and magnesium</th>
<th>Design Sulfate Class for location</th>
<th>Groundwater 2:1 water/soil extract</th>
<th>Groundwater</th>
<th>Total potential sulfate*</th>
<th>Static water</th>
<th>Mobile water</th>
<th>ACEC Class for location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>DS-1</td>
<td>&lt; 500</td>
<td>&lt; 400</td>
<td>&lt; 0.24</td>
<td>≥ 2.5</td>
<td></td>
<td></td>
<td>AC-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-2</td>
<td></td>
<td>AC-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-3</td>
<td></td>
<td>AC-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-4</td>
<td></td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-2</td>
<td>500–1500</td>
<td>400–1400</td>
<td>0.24–0.6</td>
<td>&gt; 5.5</td>
<td></td>
<td></td>
<td>AC-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-4</td>
<td></td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-3</td>
<td>1600–3000</td>
<td>1500–3000</td>
<td>0.7–1.2</td>
<td>&gt; 5.5</td>
<td></td>
<td></td>
<td>AC-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-4</td>
<td></td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-4</td>
<td>3100–6000</td>
<td>≤ 1200</td>
<td>3100–6000</td>
<td>≥ 1000</td>
<td>1.3–2.4</td>
<td>&gt; 5.5</td>
<td>AC-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-4</td>
<td></td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-4m</td>
<td>3100–6000</td>
<td>&gt; 1200*</td>
<td>3100–6000</td>
<td>&gt; 1000*</td>
<td>1.3–2.4</td>
<td>&gt; 5.5</td>
<td>AC-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-4</td>
<td></td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC-5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-5</td>
<td>&gt; 6000</td>
<td>≤ 1200</td>
<td>&gt; 600</td>
<td>≤ 1000</td>
<td>&gt; 2.4</td>
<td>&gt; 5.5</td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>≥ 2.5</td>
<td></td>
<td>AC-5</td>
</tr>
<tr>
<td>DS-5m</td>
<td>&gt; 6000</td>
<td>&gt; 1200*</td>
<td>&gt; 600</td>
<td>&gt; 1000*</td>
<td>&gt; 2.4</td>
<td>&gt; 5.5</td>
<td>AC-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>≥ 2.5</td>
<td></td>
<td>AC-5</td>
</tr>
</tbody>
</table>

Notes:
- Brownfield locations are those sites, or parts of sites, that might contain chemical residues produced by or associated with industrial production (Section C5.1.3). 
- The limits of Design Sulfate Classes based on 2:1 water/soil extracts have been lowered from previous Digests (Box C7).
- Applies only to locations where concrete will be exposed to sulfate ions (SO₄²⁻), which may result from the oxidation of sulfides such as pyrite, following ground disturbance (Appendix A) and Box C8).
- An additional account is taken of hydrochloric and nitric acids by adjustment to sulfate content (Section C5.1.3).
- The limits on water-soluble magnesium does not apply to brackish groundwater (chloride content between 12 000 mg/l and 17 000 mg/l). This allows m' to be omitted from the relevant ACEC classification. Seawater (chloride content about 18 000 mg/l) and stronger brines are not covered by this table.

Explanation of suffix symbols to ACEC Class:
- 'S' indicates the water has been classified as static.
- 'm' relates to the higher levels of magnesium in Design Sulfate Classes 4 and 5.

© Crown Copyright
Produced from Building Research Establishment Special Digest 1, June 2005, by permission of the Controller of HM Stationery Office.
Renewable Energy and Climate Change Statements  (19th Feb 2010)

The Client has the following requirements for The New Engineering Block Project.

The project target is to achieve a “Very Good” rating under the BREEAM Education Scheme dated 2008.

General Energy Efficiency

To demonstrate the design intention and proposals that the predicted CO₂ emissions, the Energy Performance Certificate rating shall be a maximum level of below 40 to achieve the minimum 6 credits required (new build). However the desired level of below the range of 20 to 25 will be targeted to achieve 10 or more BREEAM Ene 1 credits.

This will thereby enhance the ‘world class’ sustainable credentials of the building, help achieve the BREEAM ‘Very Good’ Rating and dramatically reduce the running costs for the building.

These measures should provide a reduction of 60% based on notional 2002/3 level BER and is to be achieved by the use of low and zero carbon technologies and more efficient existing technologies. These are described later in this report.

The existing school TREND 963 BMS will be linked to the new building. The new building shall have a new TREND BMS that shall be fully compatible with the existing BMS, which shall be used to control all room set points, control plant and meter energy use.

A Requirement to achieve 6 credits under the BREEAM Ene 1 credit is also required. This has been discussed above, and the target is to achieve a minimum of 10 credits!

Carbon Emissions Reduction

The Carbon Emissions reduction will be greater than 60% below the 2003 notional building level.

Passive measures will be used with improved U values, orientation to minimise unwanted solar gain, maximise daylight availability,
CLIMATE CHANGE STATEMENT

The building has been designed to address the complete range of climate change issues.

Management
The project shall be constructed to minimise disruption to the local area, commissioned to operate effectively.
The contractor shall be required to join the considerate contractors scheme and achieve a very high score throughout the project.

Health
The building shall provide a very good environment to work in, using high frequency lighting, natural ventilation, achieving very high comfort levels, etc.

Energy
The project will employ passive design to reduce primary energy use, through adjusting orientation, fabric improvements, thermal mass, etc.

The building shall also reduce energy use by use of efficient systems and climate change issues by use of low / zero systems

Waste
Site waste generated during construction shall be minimised by setting of targets and monitoring of waste sent to landfill. Techniques shall be used that naturally produce less waste.

Transport
The project is an addition to an existing site located in a small town and will serve the local area. The location is ideal for this purpose and will minimise travelling distances and times, thereby reducing energy used and carbon emissions.

Materials
The building shall utilise sustainable materials with selections made using the BRE Green Guide as a design guide.
The green guide reflects embodied energy, extraction of materials, process and long term disposal issues and forms an overall rating, for a majority of building materials.

Ecology
The building shall be located on an area of land of low ecological value adjacent to the swimming pool.

Pollution
The building shall reduce light pollution from the site providing a partial block between the existing all weather pitch and local residential areas.
RENEWABLE ENERGY STATEMENT

MECHANICAL & ELECTRICAL SERVICES

The mechanical services proposed will be designed in accordance with the DFEE Building Bulletins 87, 95, 101 an 102, all relevant CIBSE guides and Approved Document Part L2.

Heating Installation

The following systems have been considered to provide water for under floor heating systems. The options below can also be made to work in combinations, to provide an energy efficient integrated heating system.

Biomass Boiler (Rape seed Oil)

The biomass system would consist of the preferred choice of rape seed oil fired boiler plant which would be fitted with stainless steel twin walled flues to above.

HWS system shall be heated via the biomass boiler (with primary connections serving a high efficiency output calorifier), to meet local hot water requirements, supplemented by small solar thermal systems.

The biomass system would be the same as a standard oil fired boiler heating systems, utilising Bio Oil (Rape Seed) for fuel rather than fossil fuel based fuels.

This option has been selected as this is the most cost effective installation, on capital cost, payback period and offers the lowest carbon dioxide emissions of the three options proposed.

Heat Pumps

The use of ground cooling systems using a closed loop borehole system, operating in parallel with a ground source heat pump.

The use of heat pumps shall provide suitable turn down ratio to match the building cooling load and may also be used to supplement heating.

The use of under floor heating shall reduce peak heating requirements, reducing peaks and troughs in heating energy demand.

The system shall operate constantly during peak heating requirements and shall utilise thermal mass of fabric to reduce peak load.

The heat pump(s) would use R744, R600 series, or similar refrigerants, where practical to maximise the sustainability aspects of the building.

The solution would produce lower carbon dioxide emissions than a natural gas fired heating solution, but would be much higher than the bio oil based heating system. The system would also have a higher capital cost and payback period compared with natural gas fired boiler system would be 5 years or more.
Solar Thermal

The solar thermal system shall have circulation system charged with ethylene glycol or similar to prevent freezing and shall have evacuated panels located on ‘south’ facing roof space.

The system shall be BMS controlled to include automatic actuation of circulation pump when primary solar thermal fluid temperature / static pressure increase, monitoring / comparison with heating and HWS system temperatures.

The solar thermal system has been proposed to supplement the bio oil boiler system, which will save fuel. The payback period for this type of system is typically below 10 years, and will serve as an aid to education.

The solar thermal system shall also top up the under floor heating system when spare capacity is available and shall feed into the low temperature system via a heat exchanger.

The heating system shall be supplemented by the biomass boiler system as required.

Under floor heating
The under floor heating water and radiant panel heating water shall also be weather compensated, with control valve located in the Plant rooms.

Hot Water Installation

HWS is proposed to be provided by the primary heating circuit which would be served by solar thermal systems which shall be supplemented by a biomass boiler (Rape Oil), as required depending on main source selected.

Solar thermal will save fuel used by the boiler systems, during warmer more suitable radiant conditions, operating all year round.

The building shall be fitted with central storage calorifier to provide HWS to all outlets with the solar thermal and Biomass boilers providing the heat sources.

The solar thermal option will always need to be supplemented when external conditions cannot provide the required energy levels.

The hot water service shall be circulated throughout the school (class, staff and all Toilet areas etc) by HWS return system fitted with bronze / stainless steel pumps.

The hot water shall be supplied from the twin coiled calorifiers located within the main plant room.

Cold Water Services

Water Saving Devices

The following water saving devices are proposed to reduce mains water use and reduce energy use:

- Dual flush cisterns 4 / 2 litres capacity,
- No urinals are shown at present.
- No showers are shown present
Push type water taps with adjustable time off delay, PIR controlled valves to shut off water supply to toilet areas and building out of hours (BMS control presence detection with adjustable time delay, Flow restriction valves, to reduce water flow rate to taps of maximum of 2 litres/minute for HWS outlets and 4 / 2 Litres / minute. Leak detection systems monitoring under ground leakage and internal building water leakage.

**Water Reclamation Systems**

**Rain Water Harvesting**
A rain water harvesting system is to be considered subject to further investigations, site conditions / limitations. This system would be used to demonstrate the principles of rainwater harvesting and used as an aid to education. The system would be likely to be sized to meet flushing demand for all of the WC flushing demand based on 20 days storage, with an estimated tank size of 8.0 m³.

If the system is required then a small break tank located in the plant room would be installed, with the main buried tank located externally.

The buried RW harvesting tank would be located underground with the overflow feeding into the adjacent rainwater attenuation tank.

**Ventilation Installation**

**Mechanical Ventilation**
The ventilation requirements to specific areas are met by individual ceiling void / exposed / plant room roof / wall mounted fans and ductwork systems, which shall have presence detection (demand) control fans are time controlled.

- Supply and Extract heat recovery ventilation systems for offices, teaching areas, IT room, CAD/CAM room, staff and social areas, to provide fresh air and also heat removal from room heat gains etc.
- Extract and Supply ventilation with heat recovery to main toilets, to be controlled by PIR detectors and BMS.
- Individual toilets shall have local extract ventilation controlled by PIRs with local time controlled over run and no heat recovery.

Heat recovery systems shall be a minimum of 70 % with target value of at least 75% efficient based on temperature, and should include enthalpy recovery where practical.

**Natural Ventilation**
The ventilation requirements to specific areas are met by individual high level actuated windows or wall mounted louvres fitted with actuated mechanical dampers and manually opened windows at low level.

These systems shall be controlled via the BMS and shall include carbon dioxide detection, room and external temperature detection, rain detection at roof level, with local internal override in each room, controls logic provide night cooling.

The areas that these systems shall generally serve will all teaching areas, and staff room.
Comfort Cooling

The primary ground source system shall have pumped system to circulate condense water through borehole pipework and circulated through chilled beams. The ground water system shall be subject to suitable ground conditions and thermal response tests. This system would be supplemented by a ground source heat pump to provide additional cooling as ground source availability reduces.

The computer Server Room, IT suite and CAD / CAM room shall be served by a dedicated air source heat pump or ground cooling system comprising: -

- Ground Cooling is proposed using a small number of boreholes or horizontal ground collectors. This shall provide very low energy cooling for the small number of comfort cooled areas with minimum COP of 12.0.
- Chilled beams and panels, if ground cooling system used.
- Internal high level units if VRF systems used
- Integrated with a Heat Recovery Ventilation Unit to provide supply and extract ventilation and Fresh Air provision.
- The system will be controlled via a local wall mounted controller providing automatic and manual control options.

Other high level occupancy areas with particularly high heat gains from equipment, lighting etc, may require comfort cooling, however this shall be minimised by passive design of building, using thermal mass and ventilation.

Controls Installation - Building Management System

The BMS proposed will be TREND system and shall be fully compatible with the existing site based TREND 963 controller. The system shall have password protection providing control and monitoring of a site wide network and also a web based system is also proposed for the new building only.

The BMS shall utilise will have new outstation in the building plant room with the following minimum features to provide a fully automatic mechanical services system -

- Optimum start/stop controls.
- Weather compensation for under floor heating based on +5 deg C and 23 deg C.
- Three stage frost protection.
- Room temperature sensing and set point control.
- Occupancy / holiday facilities.
- Off site/remote access to the system via modem link if required.
- Enable / shut down of all mechanical plant ie boilers, pumps, fans,
- HRV fan speed control via BacNet / Lonworks control gateways.
- Metering of all energy sources as identified in the metering strategy below.

Monitoring

The building services shall be monitored by a BMS system. The functions the monitoring system shall have are listed below

- BMS monitoring of all heat, electric, oil and gas meters / sub meters
- Metering of all LZC energy produced by systems on site and included above
- Sub meters kW hours, cumulative flow,
- Control and Monitoring of all minimum room temperatures (heating).
Monitoring of all heating system flow and return temperatures and main system flow rates, including HWS, LTHW, and solar thermal, etc.
Control of compensated VT heating flow temperature with maximum setting.
Identification of all room temperature set point
Identification of all plant run/fault status.
Calculation of energy used from all data including low carbon energy used.

Metering shall include all electrically based systems serving heating, ventilation, cooling plant, lighting systems, small power, external lighting systems, kitchens, computer suites, etc. and all natural gas based system, and all LZC systems, such as PV, solar thermal, ground cooling.

**Controls**
The building services shall be controlled to enable the occupier / school energy manager to identify, where energy is being used and to further identify energy wasted.

- Set point adjustment of room temperatures
- Set point adjustment for all heating system temperatures, including HWS storage, Heating Flow, and solar thermal via pump speed adjustment.
- Plant enable including all pumps, fans, comfort cooling units

All low and zero carbon energy systems such as PV, solar thermal, ground cooling, biomass etc, shall also be sub-metered to identify energy developed by each system and thereby identify the effectiveness in the field compared to the information provided at design stage.

**Metering Strategy**
All meters shall have pulsed output connected to the BMS.

The building services shall be separately sub-metered to enable the occupier to identify, where energy is being used and to further identify energy wasted. This shall be in accordance with CIBSE TM 38 as a minimum.

This shall include all electrically based systems serving heating, ventilation, cooling plant, lighting systems, small power, external lighting systems, computer suites, engineering rooms, etc.

The sub-metering strategy shall be capable of separately identifying a minimum of 95% of the electrical energy used on the site as a whole.

All low and zero carbon energy systems such as Photovoltaic Arrays (PV), Solar Thermal, Biomass Boilers, oil supply, etc, shall also be sub-metered to identify energy developed by each system and thereby identify the effectiveness in the field compared to the information provided at design stage.

**Proposed Metering Below:**

**Heat**
- Solar Thermal System (Heat) 1 No.

**Cooling**
- Ground Cooling (Heat) 1 No.
- VRF Condenser / GSHP (Electric) 1 No.
- GSHP (Heat) 1 No.
Natural Gas (If Required)
Hearth and furnace. (Gas) 1 No

Fuel Oil (Biomass)
Boilers 1 No.

Water
Water feed to HWS storage 1 No.
Main feed to building 1 No.
Rainwater 1 No.

Electrical
Lighting 1 No.
External Lighting 1 No.
Small Power 1 No.
Server Room 1 No.
Computer Suite 1 No.
Engineering Workshop 1 No.
Ventilation Plant 1 No.
Pump sets 1 No.
Photovoltaic Cells 1 No.
General Lighting Installation

The general lighting installation shall comply with CIBSE codes of interior lighting, Building Bulletin 77, 90 & 102.

Lighting will be provided by recessed direct/indirect modular fluorescent fittings in offices, and by suspended direct/indirect linear fluorescent fittings in teaching rooms. Fluorescent lamps will be proven T5 technology (16mm diameter fluorescent tubes), fittings with high Light Output Ratio will be selected to minimise the number of fittings required. All fluorescent luminaires shall be fitted with high frequency ballasts. Where appropriate, suspended luminaires will be equipped with acoustic side panels to assist with the sound attenuation in the rooms.

WCs will be lit generally by recessed down lighters utilising compact fluorescent lamp technology or LED lamp technology. Energy efficient LED spotlights/task lights will be used for task lighting on worktops and lab workstations.

Entrance area, reception counter and feature lighting will be by energy efficient compact fluorescent lamps or LED lights, recessed or track mounted as appropriate.

Stores, plant rooms and switch rooms will be lit by surface linear T5 fluorescent fittings, splash- and vandal-proof as required.

Work area emergency lighting will be provided by a central battery system installation utilising non-maintained dedicated LED emergency lights.

Along escape routes and in low-occupancy areas, emergency lighting will be provided by dedicated LED emergency luminaires. Emergency Lighting installation shall comply with BS 5266 2008 and will provide adequate illuminance to reduce hazard of escape.

Individual switching of lights at workplaces and in low-occupancy areas by way of PIR (motion) sensors is proposed. This will enable a considerable saving on electrical energy for lighting, as workplaces will only be lit when occupied.

Daylight dimming control of all rooms with windows is proposed, this will save considerable amounts of electrical energy for lighting by maintaining an even level of light at the workplaces.

In corridors and circulation areas, lights will similarly be on daylight dimming where skylights and clerestory windows allow ingress of daylight.

All lighting circuits will be centrally monitored/metered, and it is proposed that an output be provided for a small information panel located in the Reception area indicating the energy usage for lighting.

External Lighting Installation

The external lighting installation shall comply with CIBSE code for exterior lighting and shall consist of wall mounted, shielded bulkhead luminaires to limit upward light pollution. At the main entrance to the building, LED colour-change lighting shall be used to highlight the features of the entrance.
The façade onto the all-weather sports pitch will be lit by colour-change LED wall wash ribbon lights in the soffit of the roof eaves, to enhance and highlight the features of the façade.

The roadway leading to the stores area on the north side of the building shall be lit by bollards of a durable construction utilising LED lights or compact fluorescent lamps. It is anticipated that light spill from the existing all weather pitch flood lighting will provide sufficient light for the roadway for most working hours of darkness.

Switching of external luminaries will be via contactors, controlled by photo-cells and timer switches. Presence detection will also be utilised along the facades facing away from the main school (mainly north and east).

**Photovoltaic System**

Provision for connection of a future photovoltaic system utilising 12V/24V Battery storage, inverter and step-up transformer will be included.
CARBON DIOXIDE REDUCTION

The following method is proposed for this project to reduce the carbon dioxide emissions by at least 50% based on 2002/3 levels and to achieve a minimum of 6 credits under BREEAM Education 2008 Ene 1 section.

All include reduced U values for the building fabric and low air permeability for winter energy saving.

The following options have been developed using Hevacomp version 25 software L2 SBEM calculation software.

Biomass Boiler Nominal Total Capacity of 44 kW (heating)
Solar Thermal – 8 to 16 sq. m (Peak 8.0 kW)

From preliminary calculations the Option A Biomass option combined with small solar thermal system provides the lowest carbon dioxide building emissions rate (BER). The system seems to offers lowest payback period (based on simple payback). The options B and C could also utilise solar thermal for HWS production.

Proposed CO₂ Emission Reduction per Annum
The above technologies have been used to reduce the concept stage building emission rate (BER) to 14.6 kg CO₂ / m² per annum based on target emission rate (TER) of 25.0 kg CO₂ / m² per annum.
This would be a reduction of 41.6% based on reductions in energy used due to passive measures and the proposed technologies.

Base CO₂ Emissions per Annum
The base technologies would be natural gas fired heating plant and local electric water heaters. The resultant building emission rate (BER) to 20.8 kg CO₂ / m² per annum based on target emission rate (TER) of 25.1 kg CO₂ / m² per annum.
This would be a reduction of 17.1% based on reductions in energy used due to passive measures.

Notes:

1) Above options are all to offset 50% of Carbon Dioxide emissions based on L2 2002 / 3 Notional Building emission rate.
2) Costs shown are additional to associated general plant needed for systems, such as pumps, pressurisation units, pipe work.
3) Running Costs would be proportional to fuel used and maintenance requirements.
4) All heating is based on wet under floor heating in all areas, with supplementary radiant panels.
5) The building fabric shall have very low U values and air permeability to minimise energy used in heating.
6) Under floor heating flow temperature 35 to 40°C, boiler flow temperature based on 80°C.
7) Life Expectancy of Components and Technologies as below :

<table>
<thead>
<tr>
<th>Component</th>
<th>Life Expectancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP</td>
<td>10 years</td>
</tr>
<tr>
<td>Solar Thermal</td>
<td>20 to 25 years</td>
</tr>
<tr>
<td>PV</td>
<td>20 years</td>
</tr>
<tr>
<td>Biomass Boiler</td>
<td>20 years</td>
</tr>
<tr>
<td>Heat Pumps</td>
<td>15 to 20 years</td>
</tr>
</tbody>
</table>
Ground Cooling  25 to 50 years
Underfloor heating tubes  40 to 50 years
District Heating  30 to 35 years

Renewable Technologies Background Information

Low and Zero Carbon Technologies Selected for Montsaye Community College Engineering Block Project

We shall undertake an evaluation of each low and zero carbon technologies available and the feasibility and suitability for the building and college Site.

The choice of technologies has been based on the following criteria in order of priority:

- Site location / Planning Issues
- Energy requirement ie. heating, lighting, etc
- Suitability ie Photo Voltaics for electricity generation
- Cost of technology
- Site arrangement – rooms relation / space planning.

The requirement for the following technologies being selected has resulted for the following reasons:

- **Bio Oil Boiler** has been selected due to initial results Building Regulations L2 (Simplified Building Energy Method) CO₂ emission calculations undertaken to gain maximum carbon emissions reductions in a cost effective manner.
- **Solar Thermal Panel** has been selected due to initial results Building Regulations L2 (Simplified Building Energy Method) CO₂ emission calculations undertaken and reduce fuel used during ‘Summer’ months.
- **Ground Cooling** has been selected due to results Building Regulations L2 (Simplified Building Energy Method) CO₂ emission calculations undertaken and still maintain natural ventilation technology Philosophy. The number of boreholes used shall be subject to suitable ground conditions being found. GSHP shall be sized to supplement the main duty of the cooling system.
- **Photo voltaic arrays** shall be used to produce as small amount of on site generation and act as an aid to teaching.

**Ground Cooling**

The use of bore holes down to 150m deep into the ground with closed loop pipework fitted inside with is used to circulate water which can then be used for cooling the building. This would be typically by use of air handling plant, air conditioning units or chilled beams / ceiling panels.

The cooling coefficient of performance is expected to be 10.0 to 12.0, compared to a standard chiller COP of 2.5 to 3.0 which also require further power factor correction equipment and increase in the size of electrical feed to building.
This an extremely carbon efficient method of cooling saving large quantities of electrical energy that would normally used to power refrigerant based cooling plant. The system also uses no refrigerants, there by allowing more BREEAM credits and lower maintenance costs.

The system pipework and boreholes would be expected to last at least 50 years with no maintenance other than care not to excavate near buried pipework.

The site layout and existing geography does limit the proposed quantity of boreholes to around to between to 10 maximum, which should be more than adequate for the building requirements.

Payback period would be estimated at being less than 20 years based on present cost of chillers and electrical energy at 14.0 p per KWhr.

**Biomass**

The initial concept produced by ourselves for the LZC solution was to install a new Biomass boiler installation, as this provides a cost effective option.

The system would be subject to the requirements of the Clean Air Act and would have required a suitable high level discharge a new biomass boiler installation including boiler plant room, buffer vessel room and wood pellet hopper room / bunded oil tank would need to be installed. 
The wood store room would need to be located at high level relative to the boiler plant. Local delivery issues with wood chip may also prevent this from being practical. Therefore rape seed (bio oil) has been selected as the favoured option as storage area would be smaller and fuel is highly efficient and clean.

The Biomass Boiler would have been expected to be sized in the range of 40 to 50 kW heat output with a minimum recommended 3,000 litres capacity bunded oil tank. The buffer vessels would not be required for the used of bio oil fuelled system.

Flues would be required to rise to high level above roof by a minimum of 2 metres and subject to local planning and environmental restrictions.

The payback period of such systems compared to oil based heating systems would be between 3 and 7 years based on bio oil fuel use. Other wood based fuels payback period would be between 5 and 10 years.

**Solar Thermal Panels**

HWS generation and also heating for compensated heating systems. The method utilises solar collecting panels with water based fluids used as a heat transfer medium, which is piped to where heat is required, ie at HWS calorifiers and also compensated heating systems.

Very effective for up to 60% of annual HWS load and payback period within 8 to 15 years based on current natural gas costs.

These systems are however not required due to use of bio oil boiler. However a small system is proposed for HWS generation to reduce fuel use and act as an educational tool.
**Photo Voltaic Arrays**

The PV cells are installed in groups forming an array. These arrays produce direct current (DC) electricity by the action of electromagnetic radiation from the sun. This DC power then needs to be converted to alternating current (AC) and harmonised to grid supplied electricity before it can be used in the building wide electrical distribution system.

These systems have the advantage of local electrical generation on site typically in small quantities. As discussed the payback period is longer than design life of the equipment and we would not normally consider this technology.

Future developments in this technology and other generation technologies would be expected to supersede present installations in efficiency and payback period in the next five years.

The payback period for the PV arrays is typically in the order of between 40 to 45 years with design life of equipment being 20 years typically. The payback period should reduce as electrical energy costs increase.

**Ground Source Heat Pump**

Heat pumps compress and expand refrigerant in closed loops to extract and absorb thermal energy and are used to extract heat from ground via deep boreholes and heat water for use in buildings. The COP (efficiency) of up to 5.0 (500%) depending on ground conditions and heating water temperatures, can be very effective are carbon footprint reduction especially if compared with heating use electric panel heaters or similar.

Not selected as bore hole field not large enough to heat the whole of building and use large quantities of grid supplied electricity. Additional source would need to be provided for HWS production.

The payback period for such systems would be in the region of 20 to 25 years.

Ground cooling produces a more sustainable more efficient and longer term sustainable source of cooling water.

**Other Technologies / Passive Measures Proposed to reduce Carbon Dioxide Emissions**

**Phase Change Materials**

These materials use the effect of latent change from solid to liquid thereby absorbing heat at a temperature of typically 20 to 25 °C. The effect is to add considerable thermal mass in a relatively small volume of material at a specific temperature ie 23 °C.

The cost effectiveness is dependant on quantity used, amount of electrical equipment use by client cost of electrical energy saved and capital cost of chiller.

Payback would be expected to be less than 20 years for this project as some thermal mass is being provided and would be fitted only where required to reduce peak temperatures.
Building Management System

The BMS system will be used to restrict energy use by switching system off or reducing load delivered as demand reduces, thereby saving mainly electrical energy and reducing carbon foot print for building. The BMS shall be used to meter all services in the new building and have data link to public information displays to identify energy use of building and quantity of energy generated, with resultant CO₂ emission savings. Energy that is used or produced on site shall be monitored to identify usage patterns and raise alarm when use goes out of normal range.

Power Factor Correction

Power factor is the frequency difference in angle between electrical reactive load and active load, which creates an apparent load, which is the load that is recorded by the electrical meter and is therefore billed. The use of capacitors reduces the inductive / reactive load thereby creating an apart load that is closer to unity ie: similar to the active load, thereby saving energy used and reducing energy costs.

Brise Soleil / Building Roof Overhangs

Passive solar gain protection of internal areas provides opportunity for the use of natural ventilation systems to be used to operate as the main cooling mechanism of the building. The brise soleil will reduce external solar gains thereby reducing total heat gain to space, reducing requirement for / or duty of air conditioning / mechanical cooling.

Improved Building Fabric Thermal Performance and Thermal Mass

Increased thermal mass inside the building’s insulated envelope reduces peaks and troughs in internal temperatures by absorbing and releasing heat over typically a 24 hour period (or any time scale). This combined with night cooling and natural ventilation methods can provide a stable comfortable environment naturally with use of any other energy source.

The improvement in building fabric thermal performance shall assist in reducing heating energy requirement which is a significant amount of annual energy.

Lighting Installation

Lighting systems can be designed to use less annual energy using the following methods:

- Local control / presence detection activation employed with local controllers, switches luminaries off when people are not present.
- Daylight Control – for new offices and corridors, dims artificial light when natural light is available.
- T5 fluorescent / compact fluorescent lamps – for office areas, use less energy than the older T8 type lamps
- LED Lamps – for corridors and display lighting, utilise light emitting diode technology to produce the same Lux levels with less electrical use.

Ventilation
Natural Ventilation – to provide cooling and ventilation with minimal use of electrical energy there by providing comfort conditions with large air handling plant and use of large chillers. This philosophy save a large proportion of energy use that a ‘normally air conditioned’ office would use.

Mechanical ventilation is required heat recovery systems with low energy fans are proposed. These are expected to recover up to 75% of energy from extract and transfer the heat into the fresh air being supplied into the building. HR Fans shall be selected to use a maximum typical energy input of 1.5 Watts per litre per second compared to the maximum of 2.5/3.0 which is permitted under building regulations.

Supplementary Technologies

Heating Plant - CHP and Boiler Plant
New boiler plant has been proposed, and we would expect that all of the cost of all new boiler plant, associated controls and plant would be applicable to a similar oil fired installation.

The new boiler plant could also be installed to back up a CHP plant serving the building as a standby service.

Ancillary Plant Equipment
All ancillary installation such as boosted cold water systems, closed loop feed systems are required to improve operation of existing building and allow the construction of the new building. Therefore a proportion of these costs should also be applicable.

Sub Metering
The costs of sub metering new and existing plant and systems should be mainly applicable, as the existing building benefits from these additions.

Daylight Dimming of Artificial Lighting
The costs of any modifications to existing lighting installations that are fitted with dimming systems, any wiring/switching changes to existing, etc should be applicable.

Others Technologies Not Proposed

Combined Heat and Power
Combined heat and power generation is a very efficient method of energy conversion. However, as the amount of heat produced is considerably greater (roughly a factor between 2 to 3) than the electrical energy produced, the ability to utilise the heat is a governing factor in the suitability of CHP plants. With the improvements to building insulation levels, the heating requirements of buildings are generally reducing. This means that localised CHP plants covering the heating load of a building and will have lower electrical output to the building.

Payback periods for CHP plant are expected to be less than 8 years, dependant on the use, future connections to new district heating scheme, cost of natural gas and electricity.

District Heating Scheme
The district heating system pipework shall be sized to cater for a larger flow rate of heating water than is presently required for the theatre. Pump sets shall be installed to serve theatre demand with space for future pumps to be added as demand for district heating scheme and subsequent number of connections increases.

Payback period for the district heating scheme serving the site would be linked to the use of the CHP.

**Absorption Cooling (from Waste Heat or Solar Thermal)**

Absorption cooling utilises ‘high temperature’ waste heat to separate liquid and vapour in the chiller unit, which when remixed together the subsequent reaction produces a cooling effect which can then be used to produce chilled water for cooling the building.

This type of system is not applicable to the project without high temperature waste heat.

**Wind Power (Electrical Generation)**

Wind turbines generate electricity locally on site by as expected from the conversion of wind energy. They operate best during wind conditions of 5.0 m/s or more. Electricity is obviously only produced when the wind conditions are suitable and therefore this technology can be used in parallel with PV cells to compliant each other.

These units have not been selected for use in any reasonable size on this project due to the structural loads that would be put on the building. There are also budget constraints and planning issues that would probably restrict the use to at best insignificant levels.

Payback period of **20 years** with life expectancy of plant being approximately 20 years, which is an improvement on the use of PV cells. Installation on a more remote site would be more suitable, where large turbines would cause less potential opposition and wind conditions would be more favourable.
Appendix 1

Draft SBEM & EPC

(These are indicative and require finalisation on project completion)