JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Notes - Mechanical

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

ARUP

Subject	Jersey Future Hospital – Site Validation TN-M-001 Technical Note - Water Pressure Adequacy for Sprinklers Rev P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

Buildings and their contents are defined by a number of categories or hazard classifications. The volume of water stored is dependent on the building height and hazard classification. For the purposes of this technical note all of the building options have been classified as Ordinary Hazard 2.

Water supplies and pressures need to be capable of providing the required flow rates for the system and should have sufficient capacity to ensure that the sprinklers can remain in operation. Standard water pressure is available at all sites. There are no concerns of water pressure issues at this stage based on available information from suppliers.

2.1 Option A

Overdale Hospital
Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. Upgrade to existing incoming mains water supply required. Infrastructure is limited for high pressure supplies, but large capacity lower pressure supplies are available from Jersey Water tanks located nearby. New pipework would be required for supplying the site.

For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 30m is approximately 125 m^3.(i.e. 2no. tanks at 6 metres diameter and 3 meters high).

Existing General Hospital
Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. Upgrade to existing incoming

mains water supplies required. Existing surrounding mains water infrastructure is sufficient for continuous supply.

For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 45m is approximately 140 m³.(i.e. 2no. tanks at 6 metres diameter and 3.5 meters high).

2.2 Option B

Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. Upgrade to existing incoming mains water supply required. Infrastructure is limited for high pressure supplies, but large capacity lower pressure supplies are available from Jersey Water tanks located nearby. New pipework would be required for supplying the site. For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 45m is approximately 140 m³.(i.e. 2no. tanks at 6 metres diameter and 3.5 meters high).

2.3 Option C

Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. Upgrade to existing incoming mains water supplies required. Existing surrounding mains water infrastructure is sufficient for continuous supply. For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 45m is approximately 140 m³.(i.e. 2no. tanks at 6 metres diameter and 3.5 meters high).

2.4 Option D

Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. New incoming mains water supplies required. Jersey Water are unable to confirm at this stage that the existing surrounding mains water infrastructure is sufficient for continuous supply. For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 45m is approximately 140 m³.(i.e. 2no. tanks at 6 metres diameter and 3.5 meters high).

2.5 Option E

Water pressure for sprinkler system provided via pumps located in dedicated sprinkler pump plant room. Water supply provided from dedicated sprinkler storage tanks. New incoming mains water supplies required. Existing surrounding mains water infrastructure is sufficient for continuous supply. For guidance purposes only, minimum water volume capacity for sprinkler use in Ordinary Hazard 2 classification buildings with a maximum building height of 45m is approximately 140 m³.(i.e. 2no. tanks at 6 metres diameter and 3.5 meters high).

3 Risks/Opportunities

Height of buildings. – sprinkler tank volume is dependent on height of building relating to the Ordinary Hazard classification. Sizes indicated in this document are based on BS requirement.

Jersey Water are unable to confirm at this stage that the existing surrounding mains water infrastructure is sufficient for continuous supply.

Sprinkler tank for the People's Park option to be located within below ground plant room. Plant room temperature to be controlled to prevent excessive high room temperatures.

Fire Engineer to advise final sprinkler system pressure and tank requirements required.

4 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-M-002 Technical Note - Medical Gas Storage Rev P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise that forms Change Request Nr. 21 as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

This document should be read in conjunction with Mechanical Services High Level Description report and supportive drawings which details requirements further.

2 Commentary

2.1 Option A

Medical gas bottle storage area serving various hospital departments for both Existing General Hospital and Overdale Hospital sites. Access required for deliveries.

Existing General Hospital medical gas bottle storage areas will remain in use and remain accessible throughout the phased construction work period. Access required for deliveries.

Existing Overdale Hospital medical gas bottle storage areas will remain in use and are to remain accessible throughout the phased construction work period.

2.2 Option B

Requirement for medical gas bottle storage rooms serving various hospital departments local to the medical gas plantrooms. Access required for deliveries.

2.3 Option C

Requirement for medical gas bottle storage rooms serving various hospital departments local to the medical gas plantrooms. Access required for deliveries.

Existing medical gas storage areas will remain in use and to remain accessible throughout the phased construction work period.

2.4 Option D

Requirement for medical gas storage bottle rooms serving various hospital departments local to the medical gas plantrooms. Access required for deliveries.

2.5 Option E

Requirement for medical gas storage bottle rooms serving various hospital departments local to the medical gas plantrooms. Access required for deliveries.

3 Risks/Opportunities

Phased construction, including demolition of some areas where medical gas plant/storage accommodation is present, will occur in options A, B and C. New construction of replacement facilities prior to demolition and subsequent reconfiguration of infrastructure will be required in order to maintain these systems live throughout the works.

Good road access for regular medical gas bottles deliveries needs to be provided to Options A, B, C and Peoples Park. This includes maintained provision of storage area throughout.

Hospital Medical Gases Approved Person to agree location of medical gas bottle storage locations for all Options.

4 Derogations

N/A

ARUP

Subject	Jersey Future Hospital – Site Validation TN-M-003 Technical Note – Chimneys Rev P4. Date 18.09.2015. Final Preliminary Issue		
Date	18 September 2015	Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

2.1 Options A-E

There is a requirement for flue chimneys from oil or gas fired boilers serving each of the site options.

Chimney height to comply with health and safety legislation and building heights.

Existing General Hospital chimney flues will remain operational throughout the phased construction work period.

The current provision for each option is for oil / gas heating with the chimney provision as follows:

Option A (Existing site) - 1 No. chimney serving the refurbished energy centre.

Option A (Overdale) - 1 No. chimney serving the new energy centre.

Options B, C, D - 2 No. chimneys per site serving 2 No. energy centres per site.

Option E (People's Park) - 2 No. chimneys serving the 2 No. energy centres.

No chimneys are required for heating plant if electrical heating plant is installed.

3 Risks/Opportunities

New chimney height for Options A-E to comply with health and safety legislation and building heights. Estimated to be at least 4m above the highest building in the local area.

Demolition of existing chimney on Options A and C following completion of the new hospitals.

4 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-M-004 Technical Note - Fire Hydrants Rev P4. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

2.1 Option A

Overdale Hospital
BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- 2no. fire hydrants are on the Overdale Hospital site project and working on the average hydrant pressure they can deliver 1500 litres per minute but this may not always be possible during peak demand periods.
- Average fire hydrant pressure would be approximately 3 - 4 bar.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

Existing General Hospital
BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- Working on the average hydrant pressure they can deliver 1500 litres per minute, but this may not always be possible during peak demand periods.
- Average fire hydrant pressure would be approximately 3 - 4 bar.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

2.2 Option B

BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- 2no. fire hydrants are on the Overdale Hospital site project and working on the average hydrant pressure they can deliver 1500 litres per minute but this may not always be possible during peak demand periods.
- Average fire hydrant pressure would be approximately 3 - 4 bar.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

2.3 Option C

BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- Working on the average hydrant pressure they can deliver 1500 litres per minute, but this may not always be possible during peak demand periods.
- Average fire hydrant pressure would be approximately 3 - 4 bar.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

2.4 Option D

BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- Working on the average hydrant pressure they can deliver 1500 litres per minute, but this may not always be possible during peak demand periods.
- Average fire hydrant pressure would be approximately 3 - 4 bar.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

2.5 Option E

BS 9990:2015 states that generally a water supply capable of providing a minimum of 1500 litres per minute at all time is required.

Jersey Water have confirmed:

- 2no. fire hydrants are in the People's Park area, both are off the 6" main. This main has the capacity to supply in excess of 1500 litres per minute.
- Jersey Water's policy is to provide a minimum of 2 bar at the hydrant.

Fire Engineer, Fire Brigade and Building Control to determine location of fire hydrants.

3 Jersey Water Information

Copy of fire hydrant information from Jersey Water.

4 Risks/Opportunities

Loss of water pressure during peak demand.

5 Derogations

None identified at this stage.

Subject	Jersey Future Hospital - Site Validation Note - Incoming Utilities & Diversions (Mechanical Services) 18.09.2015. Final Preliminary Issue		TN-M-005 Technical Rev P4. Date
Date	18 September 2015	Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

2.1 Option A

2.1.1 Water

2.1.1.1 Incoming Mains Water Supply

Overdale Hospital
Upgrade to existing incoming mains water supplies required due to increased capacity. Jersey Water confirm that infrastructure is limited for high pressure supplies but it is not envisaged that this will be required for this site. Large capacity lower pressure supplies are available from Westmount tanks located nearby and it is intended that these will be utilised for the new building.
Jersey Water confirm that the existing surrounding mains water infrastructure is sufficient for continuous supply.
New pipework would be required for supplying the Overdale site. Booster sets and break tanks would be required to provide sufficient water pressure to the buildings.
Any offsite diversions required will be carried out by Jersey Water. Existing water mains below ground serving the existing buildings will either be diverted, replaced or relocated as part of the phased construction programme. *Refer to existing Jersey Water site pipework distribution layout shown later in this technical note.*

Existing General Hospital
Upgrade to existing incoming mains water supplies required due to increased capacity.
Jersey Water confirm that the existing surrounding mains water infrastructure is sufficient for continuous supply. Sufficient pressure is available, but booster sets and break tanks may still be required to provide sufficient water pressure to the buildings.
Offsite diversions not envisaged at this stage, but if required will be carried out by Jersey Water. Existing water mains below ground serving the existing buildings will either be diverted, replaced or relocated as part of the phased construction programme.
Refer to existing Jersey Water site pipework distribution layout shown later in this technical note.

2.1.1.2 Incoming Mains Water Costs

Costs below for incoming mains water supply have been provided by Jersey Water.

Site Option A	Description of Works	Cost (£)
Overdale Hospital	External upgrade works associated with the mains supply on Westmount Road 4no. new connections to hospital taken from mains supply on Westmount Road	£70,168.99 (excluding GST at 5%) for external upgrade works, and £14,803.10 (excluding GST at 5%) for 4no. new connections Above cost excludes excavation, backfilling and reinstatement of trenches. This work will not be carried out by Jersey Water or a contractor appointed by them, but to be carried out by the Main Contractor
General Hospital	There are no upgrade costs associated with this option. Jersey Water can re-use the existing mains water infrastructure	Jersey Water have confirmed that there are no costs associated with this option

2.1.2 Gas

2.1.2.1 Incoming Gas Supply

Overdale Hospital
Natural Gas is currently supplied to the existing site serving gas boilers and the kitchen in the Westmount Centre. However a new larger incoming gas main to site would be required with new gas meters (numbers and locations to be confirmed). New gas infrastructure required to site with works carried out on public highway by Jersey Gas, but trench work on site will be carried out by others.

Existing General Hospital
Natural Gas is currently supplied to the Pathology Laboratory and Kitchen only. However there is a large gas main located near the existing site routed along Gloucester St. (r*efer to existing Jersey Gas site pipework distribution layout shown later in this technical note).* A new incoming gas main to the site would be required with new gas meters (numbers and locations to be confirmed). New connection required to new meter location off Kensington Place. Possible modifications and connections required to the existing gas infrastructure located around the site perimeter. Works carried out on public highway by Jersey Gas, but trench work on site will be carried out by others.

2.1.2.2 Incoming Gas Main Costs

Costs below for incoming mains gas supply have been provided by Jersey Gas.

Site Option A	Description of Works	Cost (£)
Overdale Hospital	Provision of gas to gas meter positions (numbers and locations to be confirmed). Costs assume all trench work on site will be carried out by others. Works carried out on public highway by Jersey Gas. Costs include to primary meter emergency control valve, twin stream rig	Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal
General Hospital	Provision of suitably sized service to specified meter location off Kensington Place, St Helier	Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal

2.1.2.3 Gas Usage

The p/kWh cost below is based on Jersey Gas tariff confirmed in via email on 11th February 2015.

Jersey Gas have confirmed that there are no standing orders.

Jersey Gas have confirmed that the tariff is exclusive GST.

Plant efficiency up to 95%.

Site Option A	Annual Gas Usage (kWh/year)	Average Gas Price (p/per kWh)	Total Annual Cost (£)
Overdale Hospital	1,572,929.60	6.25p	£98,308.04
General Hospital	5,451,891.17	6.25p	£340,743.20

2.1.3 Fuel Oil

Fuel oil tank serving oil fired boilers and generators required.

States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department which is for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Currently the '*average*' fuel oil cost per litre supplied by PDJ Ltd is 52.72p per litre based on December 2014 price.

Plant efficiency up to 95%.

Site Option A	Annual Fuel Oil Usage (kWh/year)	Average Fuel Oil Cost (p/per litre)	Total Annual Cost (£)
Overdale Hospital	1,572,928.60	57.72p	£82,924.80
General Hospital	5,451,891.17	57.72p	£287,423.70

2.2 Option B

2.2.1 Water

2.2.1.1 Incoming Mains Water Supply

Upgrade to existing incoming mains water supplies required due to increased capacity. Jersey Water confirm that infrastructure is limited for high pressure supplies Large capacity lower pressure supplies are available from Westmount tanks located nearby. New pipework would be required for supplying the Overdale site. Booster sets and break tanks would be required to provide sufficient water pressure to the buildings. Any offsite diversions required will be carried out by Jersey Water. Existing water mains below ground serving the existing buildings will either be diverted, replaced or relocated as part of the phased construction programme. *Refer to existing Jersey Water site pipework distribution layout shown later in this technical note.*

2.2.1.2 Incoming Mains Water Costs

Costs below for incoming mains water supply have been provided by Jersey Water.

Site Option B	Description of Works	Cost (£)
Overdale Hospital	External upgrade works associated with the mains supply on Westmount Road 4no. new connections to hospital taken from mains supply on Westmount Road	£70,168.99 (excluding GST at 5%) for external upgrade works, and £14,803.10 (excluding GST at 5%) for 4no. new connections Above cost excludes excavation, backfilling and reinstatement of trenches. This work will not be carried out by Jersey Water or a contractor appointed by them, but to be carried out by the Main Contractor

2.2.2 Gas

2.2.2.1 Incoming Gas Supply

Natural Gas is currently supplied to the existing site serving gas boilers and the kitchen in the Westmount Centre. However a new larger incoming gas main to site would be required with new gas meters (numbers and locations to be confirmed). New gas infrastructure required to site with works carried out on public highway by Jersey Gas, but trench work on site will be carried out by others.

2.2.2.2 Incoming Gas Main Costs

Costs below for incoming mains gas supply have been provided by Jersey Gas.

Site Option B	Description of Works	Cost (£)
Overdale Hospital	Provision of gas to gas meter positions (numbers and locations to be confirmed).Costs assume all trench work on site will be carried out by others. Works carried out on public highway by Jersey Gas. Costs include to primary meter emergency control valve, twin stream rig	Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal

2.2.2.3 Gas Usage

The p/kWh cost below is based on Jersey Gas tariff confirmed in via email on 11th February 2015.

Jersey Gas have confirmed that there are no standing orders.

Jersey Gas have confirmed that the tariff is exclusive GST.

Plant efficiency up to 95%.

Site Option B	Annual Gas Usage (kWh/year)	Average Gas Price (p/per kWh)	Total Annual Cost (£)
Overdale Hospital	7,875,277.95	6.25p	£492,204.87

2.2.3 Fuel Oil

Fuel oil tank serving oil fired boilers and generators required.

States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department which is for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Currently the 'average' fuel oil cost per litre supplied by PDJ Ltd is 52.72p per litre based on December 2014 price.

Plant efficiency up to 95%.

Site Option B	Annual Fuel Oil Usage (kWh/year)	Average Fuel Oil Cost (p/per litre)	Total Annual Cost (£)
Overdale Hospital	7,875,277.95	57.72p	£415,184.65

2.3 Option C

2.3.1 Water

2.3.1.1 Incoming Mains Water Supply

Upgrade to existing incoming mains water supplies required due to increased capacity. Jersey Water confirm that the existing surrounding mains water infrastructure is sufficient for continuous supply, but some work may need to be carried out to provide efficient supply. Sufficient pressure is available, but booster sets and break tanks may still be required to provide sufficient water pressure to the buildings. Offsite diversions not envisaged at this stage, but if required will be carried out by Jersey Water. Existing water mains below ground serving the existing buildings will either be diverted, replaced or relocated as part of the phased construction programme.
Refer to existing Jersey Water site pipework distribution layout shown later in this technical note.

2.3.1.2 Incoming Mains Water Costs

Costs below for incoming mains water supply have been provided by Jersey Water.

Site Option C	Description of Works	Cost (£)
Existing General Hospital	There are no upgrade costs associated with this option. Jersey Water can re-use the existing mains water infrastructure	Jersey Water have confirmed that there are no costs associated with this option

2.3.2 Gas

2.3.2.1 Incoming Gas Supply

Natural Gas is currently supplied to the Pathology Laboratory and Kitchen only. However there is a large gas main located near the existing site routed along Gloucester St. (*refer to existing Jersey*

Gas site pipework distribution layout shown later in this technical note). A new incoming gas main to the site would be required with new gas meters (numbers and locations to be confirmed). New connection required to new meter location off Kensington Place. Possible modifications and connections required to the existing gas infrastructure located around the site perimeter. Works carried out on public highway by Jersey Gas, but trench work on site will be carried out by others.

2.3.2.2 Incoming Gas Main

Costs below for incoming mains gas supply have been provided by Jersey Gas.

Site Option C	Description of Works	Cost (£)
Existing General Hospital	Provision of suitably sized service to specified meter location off Kensington Place, St Helier	Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal.

2.3.2.3 Gas Usage

The p/kWh cost below is based on Jersey Gas tariff confirmed in via email on 11th February 2015.

Jersey Gas have confirmed that there are no standing orders.

Jersey Gas have confirmed that the tariff is exclusive GST.

Plant efficiency up to 95%.

Site Option C	Annual Gas Usage (kWh/year)	Average Gas Price (p/per kWh)	Total Annual Cost (£)
Existing General Hospital	7,875,277.95	6.25p	£492,204.87

2.3.3 Fuel Oil

Fuel oil tank serving oil fired boilers and generators required.

States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department which is for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Currently the 'average' fuel oil cost per litre supplied by PDJ Ltd is 52.72p per litre based on December 2014 price.

Plant efficiency up to 95%.

Site Option C	Annual Fuel Oil Usage (kWh/year)	Average Fuel Oil Cost (p/per litre)	Total Annual Cost (£)
Existing General Hospital	7,875,277.95	57.72p	£415,184.65

2.4 Option D

2.4.1 Water

2.4.1.1 Incoming Mains Water Supply

A new incoming mains water supply is required to the site and provided by Jersey Water. However at this stage Jersey Water have yet to confirm that the existing surrounding mains water infrastructure is sufficient for continuous supply. Booster sets and break tanks may be required to provide sufficient water pressure within the buildings. Consideration is to be given to possible existing supplies serving other buildings in the area located on the Waterfront site.

2.4.1.2 Incoming Mains Water Costs

Costs below for incoming mains water supply have been provided by Jersey Water.

Site Option D	Description of Works	Cost (£)
Waterfront Site	New supply connection to the Jersey Water network and bulk meter	£9,500.50 (excluding GST at 5%) for new connection and bulk meter (note that Jersey Water have stated that this is a budget cost). Above cost excludes excavation, backfilling and reinstatement of trenches. This work will not be carried out by Jersey Water or a contractor appointed by them, but to be carried out by the Main Contractor

2.4.2 Gas

2.4.2.1 Incoming Gas Supply

Natural Gas is not currently supplied to the existing site. However there is a gas main located near the existing site routed along La Route de la Liberation near to the site. If required, a new incoming mains gas supply would be provided by Jersey Gas with new gas meters (numbers and locations to be confirmed). Modifications and connections would be required to the existing gas infrastructure located around the site perimeter. Works carried out on public highway by Jersey Gas, but trench work on site will be carried out by others. Consideration is to be given to possible existing supplies serving other buildings in the area located on the Waterfront site with possible diversions required.

2.4.2.2 Incoming Gas Main

Costs below for incoming mains gas supply have been provided by Jersey Gas.

Site Option D	Description of Works	Cost (£)
Waterfront Site	Provision of gas to gas meter position. At this stage, costs assume all trench work on site will be carried out by others. Works carried out on public highway by Jersey Gas. Cost include meter rig, meters - suitable housing to be provided by others. No costs have been included for any outlet pipework	Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal.

2.4.2.3 Gas Usage

The p/kWh cost below is based on Jersey Gas tariff confirmed in via email on 11th February 2015.

Jersey Gas have confirmed that there are no standing orders.

Jersey Gas have confirmed that the tariff is exclusive GST.

Plant efficiency up to 95%.

Site Option D	Annual Gas Usage (kWh/year)	Average Gas Price (p/per kWh)	Total Annual Cost (£)
Waterfront Site	7,875,277.95	6.25p	£492,204.87

2.4.3 Fuel Oil

Fuel oil tank serving oil fired boilers and generators required.

States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department which is for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Currently the 'average' fuel oil cost per litre supplied by PDJ Ltd is 52.72p per litre based on December 2014 price.

Plant efficiency up to 95%.

Site Option D	Annual Fuel Oil Usage (kWh/year)	Average Fuel Oil Cost (p/per litre)	Total Annual Cost (£)
Waterfront Site	7,875,277.95	57.72p	£415,184.65

2.5 Option E

2.5.1 Water

2.5.1.1 Incoming Mains Water Supply

2no new 150mm separate incoming mains water supplies are required to the site and provided by Jersey Water. The connections will be taken from the existing water mains located at Westmount Road and St Aubins Road. Jersey Water confirm that the existing surrounding mains water infrastructure is sufficient for continuous supply. Sufficient pressure is available, but booster sets and break tanks may still be required to provide sufficient water pressure to the buildings. Diversions not envisaged at this stage, but if required will be carried out by Jersey Water. *Refer to existing Jersey Water site pipework distribution layout shown later in this technical note.*

2.5.1.2 Incoming Mains Water Costs

Costs below for incoming mains water supply have been provided by Jersey Water.

Site Option	Description of Works	Cost (£)
People's Park	2no. new 150mm separate supply connections to the Jersey Water network and bulk meter	£29,797.32 (excluding GST at 5%) for 2x 150mm connections and bulk meters (note that Jersey Water have stated that this is a budget cost). Above cost excludes excavation, backfilling and reinstatement of trenches. This work will not be carried out by Jersey Water or a contractor appointed by

		them, but to be carried out by the Main Contractor

2.5.2 Gas

2.5.2.1 Incoming Gas Supply

Natural Gas is not currently supplied to the existing site. A new 250mm PE incoming gas main supply is required to the site and provided by Jersey Gas. However Jersey Gas have confirmed that they could potentially insert a new 250mm medium pressure gas main up an old abandoned 12" main, *as shown on the Jersey Gas site pipework distribution layout shown later in this technical note*. This installation would require a limited amount of excavation work in the area, and to carry out the connections. There will also be on-site work to install the new gas main to the new proposed meter position.

The new 250mm incoming mains gas supply will be provided with a new gas meter (final location to be confirmed). As noted above, modifications and connections will be required to the existing gas infrastructure located around the site perimeter. Works carried out on public highway will be carried out by Jersey Gas, but trench work on site will be carried out by others.

2.5.2.2 Incoming Gas Main

Costs below for incoming mains gas supply have been provided by Jersey Gas.

Site Option	Description of Works	Cost (£)
People's Park	Provision of new 250mm PE gas main supply and gas meter from existing medium pressure gas main. At this stage, costs assume all trench work on site will be carried out by others. Works carried out on public highway by Jersey Gas. Cost include meter rig, meters - suitable housing to be provided by others. No costs have been included for any outlet pipework	£92,000.00 Jersey Gas have confirmed that this will be at no cost to the customer subject to full appraisal.

2.5.2.3 Gas Usage

The p/kWh cost below is based on Jersey Gas tariff confirmed in via email on 11th February 2015.

Jersey Gas have confirmed that there are no standing orders.

Jersey Gas have confirmed that the tariff is exclusive GST.

Plant efficiency up to 95%.

Site Option	Annual Gas Usage (kWh/year)	Average Gas Price (p/per kWh)	Total Annual Cost (£)
People's Park	7,875,277.95	6.25p	£492,204.87

2.5.3 Fuel Oil

Fuel oil tank serving oil fired boilers and generators required.

States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department which is for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Currently the 'average' fuel oil cost per litre supplied by PDJ Ltd is 52.72p per litre based on December 2014 price.

Plant efficiency up to 95%.

Site Option	Annual Fuel Oil Usage (kWh/year)	Average Fuel Oil Cost (p/per litre)	Total Annual Cost (£)
People's Park	7,875,277.95	57.72p	£415,184.65

3 Jersey Water Quotations

Copy of mains water supply costs from Jersey Water.

4 Jersey Gas Quotations

4.1 Incoming Gas Supply

Copy of incoming gas supply costs from Jersey Gas.

5 Fuel Oil Quotations

Copy of fuel oil prices provided by Graeme Le Sueur on 6th February 2015 on Gleeds Sharepoint.

Fuel Oil Prices Update

Wk No.	Week Commen
50	15/12/2

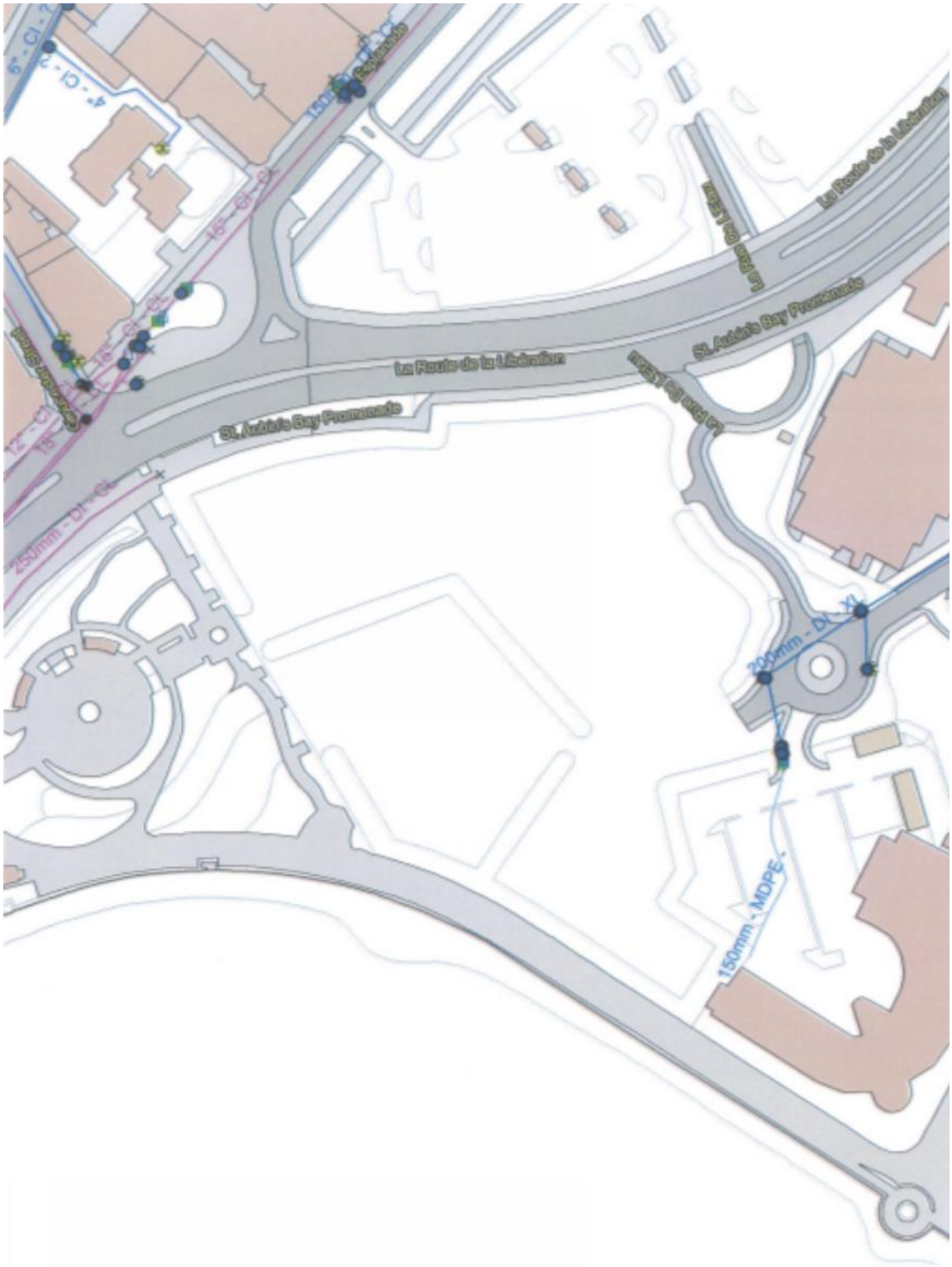
	LS Kero	Duty Free Diesel	Unleaded Petrol	Diesel
Current	**41.48**	**40.80**	**79.69**	**84.48**
Previous Week	43.57	43.12	82.45	86.80
Inc / Decrease	-2.09	-2.32	-2.76	-2.32
Inc / Decrease %	-5.04	-5.69	-3.46	-2.75
Avg Price	52.72	52.80	94.40	96.48

6 Jersey Water Layouts

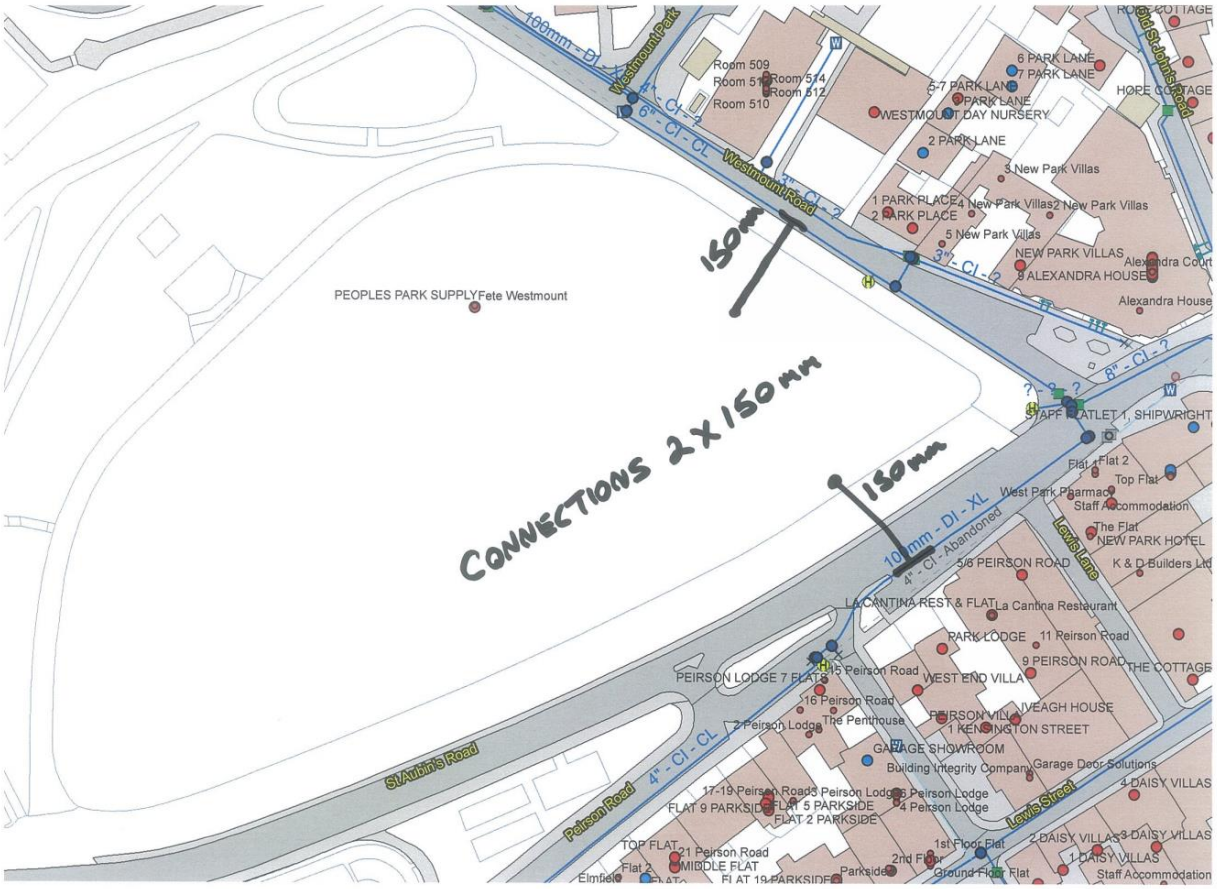
6.1 Overdale Hospital Mains Water Site Layout

6.2 Jersey General Hospital Mains Water Site Layout

6.3 Waterfront Site Mains Water Layout



6.4 People's Park Mains Water Site Layout



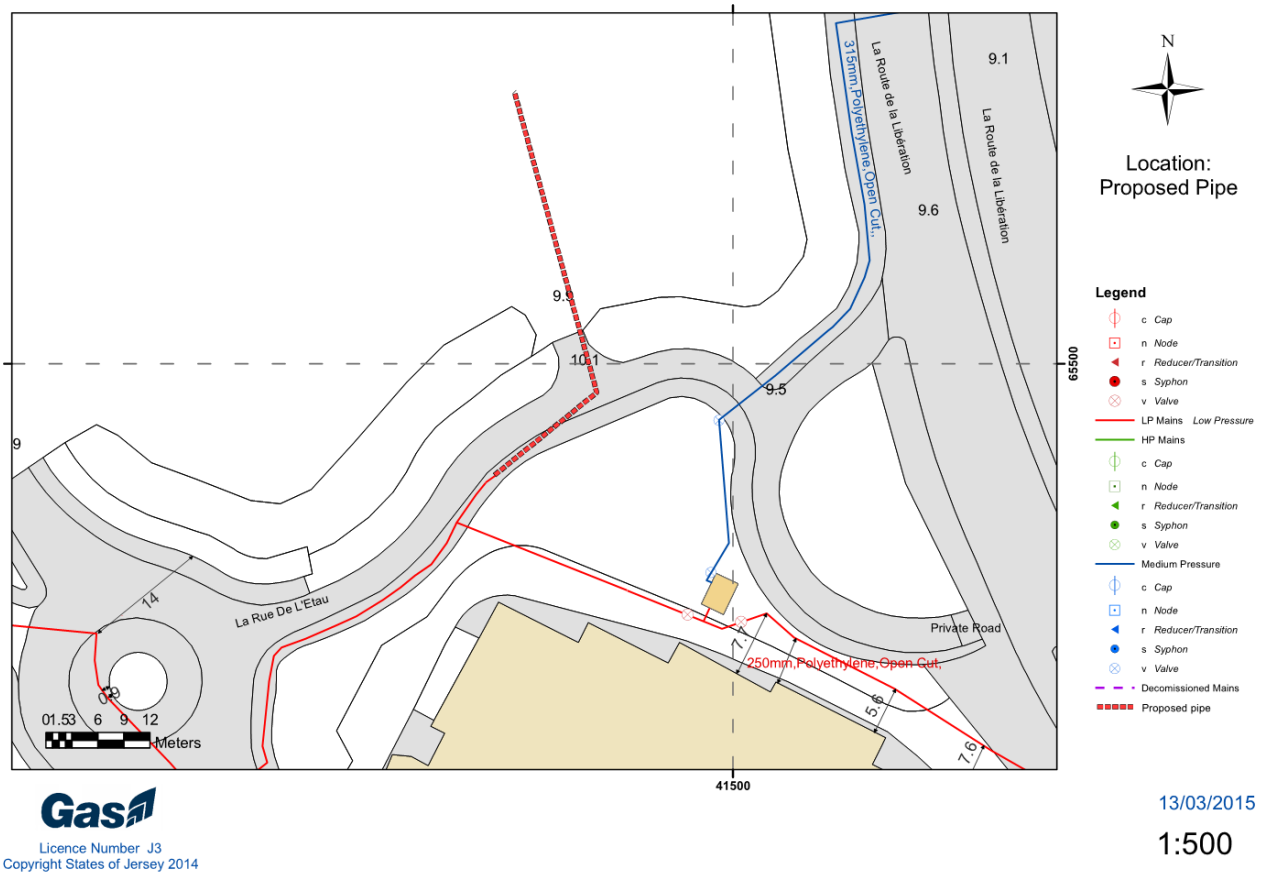
7 Jersey Gas Layouts

7.1 Jersey General Hospital Gas Main Layout

7.2 Overdale Hospital Gas Main Layout

Gas mains site layout and distribution information not available from Jersey Gas.

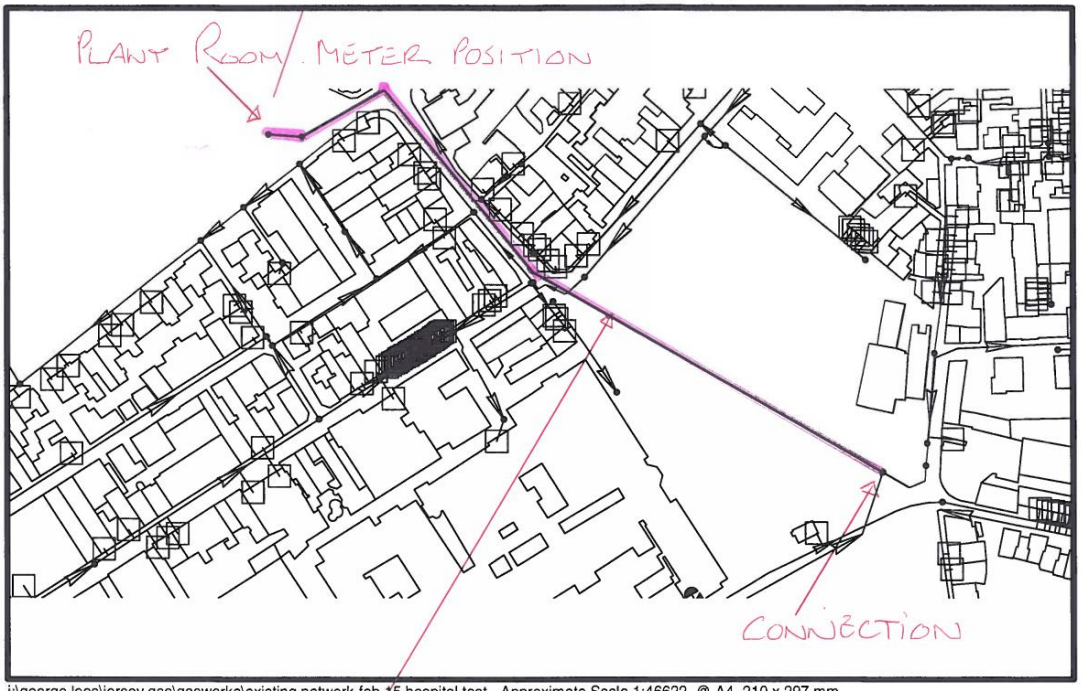
7.3 Waterfront Site Gas Main Layout



Gas

Licence Number J3

7.4 People's Park Gas Main Layout



j:\george lees\jersey gas\gasworks\existing network feb 15 hospital test - Approximate Scale 1:46622 @ A4, 210 x 297 mm

8 Risks/Opportunities

Jersey Gas have confirmed that given the information so far, they anticipate that the gas installation to site Options A, B, C, D and E would be at no cost to the developer (subject to a full appraisal).

Jersey Water have confirmed that given the information so far, they anticipate that the mains water installation to site Options A (existing hospital) and C would be at no cost.

As stated above, States of Jersey Fuel Oil contracts are tendered by the States of Jersey, Corporate Procurement Department for a three year period. The weekly prices per litre are adjusted and set against an agreed index. Future fuel costs may fluctuate depending on market conditions.

Gas and oil figures are based on a boiler efficiency of 95%. Should this reduce the incoming size capacity will change.

9 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-M-006 High Level Mechanical Services Description Technical Note Rev P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

This Technical Note has been prepared in conjunction with a separate Heating Options Appraisal report which is has been developed to ascertain the proposed heating fuel source and systems for the buildings.

This document therefore does not detail the specific systems and fuel sources used for heating and incoming services capacities are not defined at this time.

This document has been prepared as a general overview of systems to pre-feasibility level of detail and will be developed in subsequent design stages once the preferred option is established.

2 Commentary

2.1 Option A

2.1.1 Incoming Mains Water

An incoming mains domestic water supply will be provided to each of the hospital sites from the Jersey Water mains network. The current systems serving each hospital will require to be upgraded to accommodate the larger site supply capacities required.

2.1.2 Heating

The primary heating loads for each of the hospital sites will generally be generated via heating plant located in new energy centres. The total heating plant capacity for Overdale Hospital has been estimated as 1.6 MW and 5.6 MW for the Existing Hospital. For both hospital sites, the heating generated will be distributed around the hospital buildings via a number of dedicated heating circuits.

2.1.3 Ventilation

The ventilation strategy for each of the hospitals will include a variety of different systems specifically selected to meet clinical requirements and ensure an energy efficient solution.

Separate air systems will generally be provided to each of the departments requiring mechanical ventilation to minimise re-circulation between departments, limit disruption during maintenance or plant failure and simplify provision for operation on emergency power or upon receipt of a fire alarm. Some clinical departments such as operating theatres and isolation rooms located in the Existing Hospital will have dedicated air handling plant.

2.1.4 Cooling

Cooling plant located within external enclosures at roof level will be used for the provision of space cooling for each of the sites. The cooling circuits will be provided to serve the air handling plant for cooling and dehumidifying purposes.

Separate self-contained cooling systems will be provided to serve cooling units within the communications rooms, medical equipment as applicable and where required by the room data sheets such as operating theatres and isolation rooms, mainly located in the Existing Hospital.

2.1.5 Public Health

Boosted domestic water supplies will be provided from the storage tanks serving the whole of each hospital site. The domestic water supplies will be delivered at the point of discharge at a suitable pressure for the sanitary appliances or equipment.

From the domestic water booster pump sets, a boosted domestic cold feed will be run through each hospital site separate from the boosted domestic cold water mains, to feed the domestic hot water plate heat exchangers or calorifiers within the plantrooms located in the hospitals.

For both sites the domestic hot water will be generated by the use of plate heat exchangers or calorifiers. These units will be fed from the primary heating mains. The domestic hot water plant will be located in local plantrooms around each hospital. Each plantroom will provide hot water to predetermined areas within each of the hospitals.

2.1.6 Above Ground Drainage Systems

The buildings of each hospital will be provided with secondary ventilated stack soil and waste installation from the foul water under slab drainage system, to terminate above roof level. Generally the sanitary plumbing system will be routed throughout the buildings by gravity utilising a series of horizontal and vertical soil and vent pipes. Specialist drainage will be provided to departments such as labs and pharmacy and radiology

2.1.7 Medical Gases

The Existing Hospital will be provided with Medical Oxygen generated from a Pressure Swing Absorber (PSA) plant. The primary PSA plant will be located at one end of the hospital site, sized for the full oxygen demand. A secondary PSA plant will be located at the opposite end of the hospital site, sized for the full oxygen demand. A manifold and emergency supply manifold to be located at ground level in the centre of the hospital site. The primary and secondary plant will be connected to a ring main providing a secure supply of oxygen.

The Overdale Hospital site will also be provided with Medical Oxygen however due to the lower capacity required consideration will be given to either a smaller capacity Pressure Swing Absorber (PSA) plant or local bottled supply. The plant and distribution will be arranged to provide a secure supply of oxygen.

Medical Air at a nominal pressure of 4 bar will be provided from packaged medical compressor plant located in dedicated plantrooms for both the Existing Hospital and Overdale Hospital sites. The primary 4 bar Medical Air triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary 4 bar Medical Air triplex plant will be located at the opposite end of the hospital site, sized for the full demand. A manifold and emergency reserve manifold to be located at ground level in the centre of the hospital site. The primary and secondary plant will be connected to a ring main providing a secure supply of 4 bar medical air.

Surgical Air at a nominal pressure of 7 bar will be provided from packaged medical compressor plant located in dedicated plantrooms serving the Existing Hospital only. The primary 7 bar Surgical Air triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary 7 bar Surgical Air triplex plant will be located at the opposite end of the hospital site, sized for the full demand. A manifold and emergency reserve manifold to be located at ground level in the centre of the hospital site. The primary and secondary plant will be connected to a ring main providing a secure supply of 7 bar surgical air.

Medical Vacuum will be provided from packaged vacuum plant located in dedicated plantrooms both at the Existing Hospital and Overdale Hospital sites. The primary Vacuum triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary Vacuum triplex plant will be located at the opposite end of the hospital site, sized for the full demand. The primary and secondary plant will be connected to a ring main providing a secure Vacuum supply.

A piped nitrous oxide supply will be provided from an automatic cylinder manifold installation located within dedicated manifold rooms. It is anticipated that on the Existing Hospital will require this supply. Manifold room(s) with back up / emergency supply manifolds will be provided.

Where anaesthetic gases are required within a department such as operating theatre suites, and treatment suites, anaesthetic gas scavenging systems will be provided local to that department. The exhaust from the unit will discharge to a suitable safe location. Only the Existing Hospital will have an anaesthetic gas scavenging system.

Specialist gases such as compressed air and bottled gases associated with the laboratory, pharmacy and workshop areas will be provided from local plant and bottled supplies to suit the individual requirements. This will apply to both the Existing Hospital and Overdale Hospital sites.

The medical gases installation will be HTM 02-01 compliant.

2.1.8 Pneumatic Tube

A new pneumatic tube system will be provided to serve both the Existing Hospital and Overdale Hospital. A linear coupler server and exhausters will be located in a dedicated internal plantroom in the Existing Hospital. However it is expected that the plantroom at Overdale Hospital will only need to accommodate diverting stations and exhausters because of the smaller system required. Each plantroom will be strategically located within their respective hospitals based upon system capacity and departmental transport volume requirements and times.

2.1.9 Fire Systems

A fire main will be routed around each site to supply fire hydrants. The main will be fed directly from the local Jersey Water mains water network, subject to adequate flow rates being available. Fire hydrants will be provided in locations agreed with the fire officer to provide firefighting facilities.

The main hospital buildings will be provided with a Sprinkler system. Sprinkler pumps located in a dedicated plantroom will deliver water from large storage tanks to the sprinkler system.

2.2 Options B, C, D and E

2.2.1 Incoming Mains Water

A new duplicate incoming mains domestic water supply will be provided to the hospital from the Jersey Water mains network. For Options B and C, the current system will require to be upgraded to accommodate the larger site supply capacity required. For Option's D and Peoples Park, a new system will need to be provided to serve the hospital site.

2.2.2 Heating

The primary heating loads for each of the hospital sites will generally be generated via heating plant located in new energy centres. The total boiler capacity has been estimated as 7.8 MW. The heating generated will be distributed around the hospital buildings via a number of dedicated heating circuits.

2.2.3 Ventilation

The ventilation strategy for the hospital will include a variety of different systems specifically selected to meet clinical requirements and ensure an energy efficient solution.

Separate air systems will generally be provided to each of the departments requiring mechanical ventilation to minimise re-circulation between departments, limit disruption during maintenance or plant failure and simplify provision for operation on emergency power or upon receipt of a fire alarm. Some clinical departments such as operating theatres and isolation rooms will have dedicated air handling plant.

2.2.4 Cooling

Cooling plant located within external enclosures at roof level will be used for the provision of space cooling for the hospital. The cooling circuits will be provided to serve the air handling plant for cooling and dehumidifying purposes.

Separate self-contained cooling systems will be provided to serve cooling units within the communications rooms, medical equipment as applicable and where required by the room data sheets such as operating theatres and isolation rooms.

2.2.5 Public Health

Boosted domestic water supplies will be provided from the storage tanks serving the whole of the hospital. The domestic water supplies will be delivered at the point of discharge at a suitable pressure for the sanitary appliances or equipment.

From the domestic water booster pump sets, a boosted domestic cold feed will be run through the hospital separate from the boosted domestic cold water mains, to feed the domestic hot water plate heat exchangers or calorifiers within the plantrooms located in the hospital.

The domestic hot water will be generated by the use of plate heat exchangers or calorifiers. These units will be fed from the primary heating mains. The domestic hot water plant will be located in local plantrooms around the hospital. Each plantroom will provide hot water to predetermined areas within the hospital.

2.2.6 Above Ground Drainage Systems

The buildings will be provided with a secondary ventilated stack soil and waste installation from the foul water under slab drainage system, to terminate above roof level. Generally the sanitary plumbing system will be routed throughout the building by gravity utilising a series of horizontal and vertical soil and vent pipes. Specialist drainage will be provided to departments such as labs and pharmacy and radiology.

2.2.7 Medical Gases

Medical Oxygen will be generated from a Pressure Swing Absorber (PSA) plant. The primary PSA plant will be located at one end of the hospital site, sized for the full oxygen demand. A secondary PSA plant will be located at the opposite end of the hospital site, sized for the full oxygen demand. A manifold and emergency supply manifold to be located at ground level in the centre of the hospital site. The primary plant, secondary plant and manifolds will be connected to a ring main providing a secure supply of oxygen.

Medical Air at a nominal pressure of 4 bar will be provided from packaged medical compressor plant located in dedicated plantrooms. The primary 4 bar Medical Air triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary 4 bar Medical Air triplex plant will be located at the opposite end of the hospital site, sized for the full demand. A manifold and emergency reserve manifold to be located at ground level in the centre of the hospital site. The primary plant, secondary plant and manifolds will be connected to a ring main providing a secure supply of 4 bar medical air.

Surgical Air at a nominal pressure of 7 bar will be provided from packaged medical compressor plant located in dedicated plantrooms. The primary 7 bar Surgical Air triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary 7 bar Surgical Air triplex plant will be located at the opposite end of the hospital site, sized for the full demand. A manifold and emergency reserve manifold to be located at ground level in the centre of the hospital site. The primary plant, secondary plant and manifolds will be connected to a ring main providing a secure supply of 7 bar surgical air.

Medical Vacuum will be provided from packaged vacuum plant located in dedicated plantrooms. Each set of medical vacuum plant will supply the requirements of the various departments local to the plantroom.

Medical Vacuum will be provided from packaged vacuum plant located in dedicated plantrooms. . The primary Vacuum triplex plant will be located at one end of the hospital site, sized for the full demand. A secondary Vacuum triplex plant will be located at the opposite end of the hospital site, sized for the full demand. The primary and secondary plant will be connected to a ring main providing a secure Vacuum supply.

A piped nitrous oxide supply will be provided from an automatic cylinder manifold installation located within dedicated manifold rooms. Manifold room(s) with back up / emergency supply manifolds will be provided

Where anaesthetic gases are required within a department such as operating theatre suites, and treatment suites, anaesthetic gas scavenging systems will be provided local to that department. The exhaust from the unit will discharge to a suitable safe location.

Specialist gases such as compressed air and bottled gases associated with the laboratory, pharmacy and workshop areas will be provided from local plant and bottled gas manifolds to suit the individual requirements.

The medical gases installation will be HTM 02-01 compliant.

2.2.8 Pneumatic Tube

A new pneumatic tube system will be provided to serve the hospital. A linear coupler server and exhausters will be located in a dedicated internal plantroom. The plantroom will be strategically located within the hospital based upon system capacity and departmental transport volume requirements and times.

2.2.9 Fire Systems

A fire main will be routed around the site to supply fire hydrants. The main will be fed directly from the local Jersey Water mains water network, subject to adequate flow rates being available. Fire hydrants will be provided in locations agreed with the fire officer to provide firefighting facilities.

The main hospital buildings will be provided with a Sprinkler system. Sprinkler pumps located in a dedicated plantroom will deliver water from two large storage tanks to the sprinkler system.

3 Risks and Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-M-007 Technical Note – Energy Study (Mechanical) Rev P3. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

This document should be read in conjunction with the Energy Study (Electrical) document.

2 Commentary

This note documents the difference in spatial / equipment requirements for both an all-electric and connectional heating scheme.

2.1 Option A

2.1.1 All Electric – Overdale Site

The following mechanical heating plant (and electrical plant associated with an all-electric scheme) and equipment options have been considered for an all-electric hospital at Overdale:

2.1.1.1 Electric Hot Water Boiler

- Electric Hot Water Boilers located within Energy Centre with total load capacity of 1.6MW. (approx. 150m2).

2.1.1.2 Air Source Heat Pumps

- 1.6 MW air source heat pumps located at roof level. (Locations and areas to be confirmed).
- 180kW electric hot water heaters located in calorifier plantrooms.

2.1.1.3 Electric Panels / Electric Hot Water Boiler

- Electric ceiling panels with a total capacity of 650kW.
- Electric Hot Water Boilers located within Energy Centre with total load capacity of 950kW (approx. 150m2).

2.1.2 All Electric – Existing Site

The following mechanical heating plant and equipment options have been considered for an all-electric hospital at the existing site:

2.1.2.1 Electric Hot Water Boiler

- Electric Hot Water Boilers located within Energy Centre with total load capacity of 5.6MW. (approx. 300m2).

2.1.2.2 Air Source Heat Pumps

- 5.6 MW air source heat pumps located at roof level. (Locations and areas to be confirmed).
- 870kW electric hot water heaters located in calorifier plantrooms.

2.1.2.1 Electric Panels / Electric Hot Water Boiler

- Electric ceiling panels with a total capacity of 1.8MW.
- Electric Hot Water Boilers located within Energy Centre with total load capacity of 3.8 MW (approx. 300m2).

2.1.3 Conventional Heating – Overdale Site

The following mechanical heating plant and equipment options have been considered for a conventional heating system at Overdale:

2.1.3.1 Gas Fired Boilers

- Gas Fired Heating Boilers located within Energy Centre with total load capacity of 1.6MW. (approx. 150m2).
- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Incoming gas supply provided by Jersey Gas.

2.1.3.2 Oil Fired Boiler

- Oil Fired Heating Boilers located within Energy Centre with total load capacity of 1.6MW. (approx. 150m2).
- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Fuel oil storage tank.

2.1.4 Conventional Heating – Existing Site

The following mechanical heating plant and equipment options have been considered for a conventional heating system at the existing site:

2.1.4.1 Gas Fired Boilers

- Gas Fired Heating Boilers located within Energy Centre with total load capacity of 5.6MW. (approx. 300m2).
- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Incoming gas supply provided by Jersey Gas.

2.1.4.2 Oil Fired Boiler

- Oil Fired Heating Boilers located within Energy Centre with total load capacity of 5.6MW. (approx. 300m2).

- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Fuel oil storage tank.

2.2 Options B, C, D and E

2.2.1 All Electric

The following equipment would be required for an all-electric hospital at site options B, C, D and E:

2.2.1.1 Electric Hot Water Boiler

- Electric Hot Water Boilers located within Energy Centre with total load capacity of 7.8MW. (approx. 450m2).

2.2.1.2 Air Source Heat Pumps

- 6.5 MW air source heat pumps located at roof level. (Locations and areas to be confirmed).
- 870kW electric hot water heaters located in calorifier plantrooms.

2.2.1.1 Electric Panels / Electric Hot Water Boiler

- Electric ceiling panels with a total capacity of 2.6 MW
- Electric Hot Water Boilers located within Energy Centre with total load capacity of 5.2 MW (approx. 450m2).

2.2.2 Conventional Heating

The following mechanical heating plant and equipment options have been considered for a conventional heating system at site options B, C, D and E:

2.2.2.1 Gas Fired Boilers

- Gas Fired Heating Boilers located within Energy Centre with total load capacity of 7.8MW. (approx. 450m2).
- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Incoming gas supply provided by Jersey Gas.

2.2.2.2 Oil Fired Boiler

- Oil Fired Heating Boilers located within Energy Centre with total load capacity of 7.8MW. (approx. 450m2).
- Hot water generation plant located in calorifier plantrooms served by boiler plant.
- Fuel oil storage tank.

3 Risks/Opportunities

N/A

4 Derogations

N/A

JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Notes - Electricals

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

ARUP

Subject	Jersey Future Hospital – Site Validation TN-E-001 Technical Note – External CCTV Cameras Rev P3. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

Each site will be provided with a combination of building mounted and pole mounted CCTV cameras. These will generally be located to monitor the perimeter of the site, including building access / egress points, but will also be provided in areas where critical equipment is located e.g. loading bays, areas adjacent to the energy centre and external gas stores.

Examples of mounting arrangements are shown below.

Figure 1: Pole mounted CCTV arrangements

Figure 2 – Building mounted CCTV arrangements

2.1 Option A

2.1.1 Overdale

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads, service yard and new public car park. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Additional building mounted CCTV may be required for any existing buildings to remain (Westmount Centre).

Drawing SK-E-OPTA-010 had been prepared to show indicative areas which would be covered by the CCTV.

2.1.2 Existing Site

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads and service yard. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Additional building mounted CCTV may be required for any existing buildings to remain (Peter Crill).

Drawing SK-E-OPTA-012 had been prepared to show indicative areas which would be covered by the CCTV.

2.2 Option B

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads, service yard and new public car park. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Additional building mounted CCTV may be required for any existing buildings to remain (Westmount Centre).

Drawing SK-E-OPTB-001 had been prepared to show indicative areas which would be covered by the CCTV.

2.3 Option C

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads and service yard. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Additional building mounted CCTV may be required for any existing buildings to remain (Peter Crill).

Drawing SK-E-OPTC-001 had been prepared to show indicative areas which would be covered by the CCTV.

2.4 Option D

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads and service yard. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Drawing SK-E-OPTD-001 had been prepared to show indicative areas which would be covered by the CCTV.

2.5 Option E

Building mounted CCTV cameras will be used to monitor the building perimeter and access / egress routes. Penetrations through the building fabric will be required to allow for the connection of power / data to the CCTV equipment.

Pole mounted CCTV cameras will be installed for the new access roads and service yard. Where possible CCTV equipment will share poles with external lighting. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Ceiling mounted cameras will be utilised in the basement car park and other accommodation as appropriate.

Drawing SK-E-OPTE-001 had been prepared to show indicative areas which would be covered by the CCTV.

3 Risks/Opportunities

The car parking scheme for Option D will be developed to determine if external CCTV cameras are required. If a car park is located under the building in a basement arrangement, ceiling mounted cameras will be utilised.

4 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-E-002 Technical Note – External Lighting Rev P3. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

Each site will be provided with a combination of building mounted, pole mounted and bollard type LED external lighting. These will generally be located at all building entrances / exits as well as all access roads and external walkways.

Examples of external lighting types are shown below.

Figure 1: Pole mounted LED External Lighting

Figure 2 – Building mounted LED External Lighting

Figure 3 – Bollard Type LED External Lighting

External Lighting shall comply with the following parameters (taken from *Lighting Guide 2 (LG2): Hospitals and Health Care Buildings)*:

Table 2 General lighting schedule; external lighting

Area	Maintained average illuminance / lux	Maintained minimum illuminance / lux	Overall uniformity (not less than stated figure)	Threshold increment	Colour rendering (minimum), R_a	Environmental lighting class
CCTV:						
— monochrome	0	5	0.4	≥10%	≥60	—
— colour	—	15	0.4	≥10%	≥60	—
Roads	15	6	0.4		≥20	E1 and E2
	20	8	0.4		≥20	E3
	30	12	0.4		≥20	E4
General pedestrian areas	10	4	0.4		≥20	E1 and E2
	15	6	0.4		≥20	E3
	20	12	0.4		≥20	E4
Information and display signs	100 (vertical)					
Car park	15	6	0.4		≥20	E1 and E2
Vehicle drop-off points	10	5	0.4		≥20	E1 and E2
Steps or stairways	100	40	0.4		≥20	E1 and E2
General area lighting	20	12	0.4		≥20	
Hazardous open storage areas	50	20	0.4		≥20	

Figure 4: External Lighting Schedule

2.1 Option A

2.1.1 Overdale

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Pole mounted lighting will be provided to the new car park. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to the main entrance road (Westmount Road) may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Upgrades may also be required to the building mounted lighting associated with any existing buildings (Westmount Centre).

Drawing SK-E-OPTA-011 had been prepared to show indicative areas which would be covered by the external lighting.

2.1.2 Existing Site

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Pole mounted lighting will be provided to the new short stay parking / ambulance bay and amenity areas (South east corner of the site). In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to Newgate Street may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Drawing SK-E-OPTA-012 had been prepared to show indicative areas which would be covered by the external lighting.

2.2 Option B

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Pole mounted lighting will be provided to the new car park. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to the main entrance road (Westmount Road) may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Upgrades may also be required to the building mounted lighting associated with any existing buildings (Westmount Centre).

Drawing SK-E-OPTB-002 had been prepared to show indicative areas which would be covered by the external lighting.

2.3 Option C

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Pole mounted lighting will be provided to the new short stay parking / ambulance bay and amenity areas (southern section of site). In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to Newgate Street may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Drawing SK-E-OPTC-002 had been prepared to show indicative areas which would be covered by the external lighting.

2.4 Option D

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Pole mounted lighting will be provided to the new car park. In ground ducts will be required to supply power and data cabling to the pole mounted equipment.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to the main entrance road (The Esplanade) may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Drawing SK-E-OPTD-002 had been prepared to show indicative areas which would be covered by the external lighting.

2.5 Option E

Building mounted LED external luminaires will be provided at all building entrances / exits. Where possible, the building mounted lighting shall be utilised to illuminate the perimeter of the site. Where this is not possible, low level LED bollards and/or LED pole mounted luminaires will be required.

Enhanced lighting levels are required for service yard areas / any locations where service vehicles can access.

Additional road lighting to the main entrance roads (St Aubins Road, Westmount Road) may be required as part of the works to meet the requirements of LG2. A study will be required to determine the current lighting levels of all roads serving this site.

Drawing SK-E-OPTE-002 had been prepared to show indicative areas which would be covered by the external lighting.

3 Risks/Opportunities

It is suggested that provision be made for an additional level of façade lighting for Options D and E, due to the prominence of the sites.

Luminaire types to be developed as part of future stages.

Light pollution planning requirements to be considered as part of future stages.

4 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-E-003 Technical Note – Energy Study (Electrical) Rev P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

This document should be read in conjunction with the Energy Study (Mechanical) document.

2 Commentary

This note documents the difference in spatial / equipment requirements for both an all-electric and conventional oil or gas fuelled heating scheme.

An application was made to Jersey Electricity Company (JEC) on 28th January 2015 for the following supplies to each site, based on an all-electric scheme and a conventional heating scheme with a further application being made in August 2015 for the People's Park site:

Table 1: Maximum Demands Submitted to JEC

Site Option	A		B	C	D	E
	Overdale	Existing Site				
Max Demand (all electric) kVA	2,319	7,784	10,599	10,599	10,599	10,599
Max Demand (conventional oil / gas heating) kVA	919	3,084	4,199	4,199	4,199	4,199

The information below has been based on the above demands requested.

An N+1 arrangement will be provided for transformers and generators in all options with the exception of Option A.

See the following schematic drawings for indicative substation arrangements:

Title	Drawing Number
Option A - Overdale Proposed Electrical Equipment Locations	SK-E-OPTA-008
Option A - Existing Site Proposed Electrical Equipment Locations	SK-E-OPTA-009
Option B - Proposed Electrical Equipment Locations	SK-E-OPTB-003
Option C - Proposed Electrical Equipment Locations	SK-E-OPTC-003
Option D - Proposed Electrical Equipment Locations	SK-E-OPTD-003
Option E - Proposed Electrical Equipment Locations	SK-E-OPTE-003

2.1 Option A

It should be noted, that as part of the Option A development, the available plant space is lower than that required for a building of its size. As a result of this, the level of generator back up is lower than that provided for a single site Option. Option A is provided with N+1 generators which will be capable of backing up 50% of the electrical load for 200 hours. Load shedding / load management regimes will be implemented to ensure the life safety services are supported.

2.1.1 All Electric – Overdale

The following equipment would be required for an all-electric hospital at Overdale:

- 1 No. energy centre housing:
    - 1 No. JEC HV incomer (approx. 60m^2)

- 2 No. 1500kVA stand-by generators (approx. 180m^2 including fuel tank to supply 200 hours running at full load)

- 2 No. JFH substations housing 2 No. 1250kVA transformers in each (approx. 70m^2 each - locations as shown in drawings)

2.1.2 Conventional Heating – Overdale

The following equipment would be required for a conventionally heated hospital at the Overdale site:

- 1 No. energy centre housing:
  - 1 No. JEC HV incomer (approx. 60m^2)
  - 2 No. 550kVA stand-by generators (approx. 140m^2 – including fuel tank to supply 200 hours running at full load)
- 2 No. JFH substations housing 2 No. 550kVA transformers in each (approx. 60m^2 each - locations as shown in drawings)

2.1.3 All Electric – Existing Site

The following equipment would be required for an all-electric hospital at the existing site:

- 1 No. energy centre housing:
  - 1 No. JEC HV incomer (approx. 60m^2)
  - 3 No. 2000kVA stand-by generators (approx. 300m^2 – including fuel tank to supply 200 hours running at full load)
- 2 No. JFH substations housing 3 No. 2000kVA transformers in each (approx. 100m^2 each - locations as shown in drawings)

2.1.4 Conventional Heating – Existing Site

The following equipment would be required for a conventionally heated hospital at the existing site:

- 1 No. energy centre housing:
  - 1 No. JEC HV incomer (approx. 60m^2)
  - 2 No. 1500kVA stand-by generators (approx. 170m^2 – including fuel tank to supply 200 hours running at full load)
- 2 No. JFH substations housing 2 No. 1500kVA transformers in each (approx. 50m^2 each - locations as shown in drawings)

2.2 Options B/C/D/E

2.2.1 All Electric

The following equipment would be required for an all-electric hospital at site options B, C, D and E:

- 2 No. energy centres (in diverse locations) housing:
    - 2 No. JEC HV incomer (approx. 30m^2 located in each energy centre)
    - 6 No. 2500kVA stand-by generators (approx. 570m^2 located across energy centres 1 and 2 – including fuel tank to supply 200 hours running at full load)
- 3 No. JFH substations housing 3 No. 2000kVA transformers in each (approx. 130m^2 each - locations as shown in drawings)

2.2.2 Conventional Heating

The following equipment would be required for a conventionally heated hospital at site options B, C, D and E:

- 2 No. energy centres (in diverse locations) housing:
    - 2 No. JEC HV incomer (approx. 30m^2 located in each energy centre)
    - 3 No. 2500kVA stand-by generators (approx. 280m^2 located across energy centres 1 and 2 – including fuel tank to supply 200 hours running at full load)
- 2 No. JFH substations housing 2 No. 2500kVA transformers in each (approx. 100m^2 each - locations as shown in drawings)

3 Risks/Opportunities

Substation locations and numbers have been chosen to reduce long cable runs. However, the number of substations and arrangements will be reviewed as part of future design stages.

It should be noted that splitting the equipment across 2 energy centre sites (for Options B, C, D and E only) will result in a small uplift in overall plant space required. See TN-MEP-001 Technical Note – Energy Centres for further information.

4 Derogations

The amount of fuel storage on site(s) may be reduced, based on an agreed derogation by the hospital.

Subject	Jersey Future Hospital – Site Validation TN-E-004 Technical Note - Incoming Utilities & Diversions (Electrical Services) Rev P3. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital Site, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

2 Commentary

Applications for new electrical and communications supplies were made as follows (a copy of all correspondence has been included in Section 3 of this document):

- Jersey Electric Company (JEC) 28th January 2015 (Options A-D)
- JEC 7th August 2015 (Option E)
- Jersey Telecom (JT) 30th January 2015 (Options A-D)
- JT 7th August 2015 (Option E)

The impact of the new works on the existing in-ground services (e.g. diversion / re-routing / removal) has been reviewed as part of this document, based on information provided by:

- JEC – 3rd March 2015 (Options A-D)
- JEC – 10th August 2015 (Option E)
- JT – 27th February 2015 (Options A-D - information limited to a small section of each site)
- JT – 25th August 2015 (Option E)

See Utilities Diversions drawings for additional information.

5 Risks/Opportunities

Due to the early nature of this study, all costs received are high level approximations only and will be refined in further stages as more detail for the schemes is developed.

JEC have indicated that the retention / relocation / removal of existing JEC substations on the Overdale and Jersey General Hospital sites will be subject to further development and will not form part of their response to the request for new supplies (request dated 28th January).

The opportunity exists to negotiate further capital costs with JEC based on the understanding that the hospital will pursue an 'all-electric' scheme.

Once a final site option has been developed, additional requests will be submitted to JEC and JT to obtain more accurate costs.

6 Derogations

N/A

Subject	Jersey Future Hospital – Site Validation TN-E-005– Electrical Services High Level Technical Note Rev. P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to document the findings associated with the Electrical Systems to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital (JFH) Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

This Technical Note has been prepared in conjunction with a separate Heating Appraisal Document which is being developed to ascertain the proposed heating fuel source and systems for the buildings.

This document therefore does not detail the specific systems and fuel sources used for heating and incoming services capacities are not defined at this time.

This document has been prepared as a general overview of systems to pre-feasibility level of detail and will be developed in subsequent design stages once the preferred option is established.

This document should be read in conjunction with the supportive drawings.

2 Commentary

2.1 Option A

2.1.1 Incoming Services

The existing hospital site will be provided with 2 No. incoming HV supplies from the Jersey Electric Company (JEC) network. The 2 No. supplies will be provided from separate JEC primary substations. Requests have been made to JEC to obtain indicative costs associated with the works.

The Overdale site will be provided with 2 No. incoming HV supplies from the JEC network. The 2 No. supplies will be provided from separate JEC primary substations. Requests have been made to JEC to obtain indicative costs associated with the works.

The supplies will be terminated into 1 No. JEC owned HV switchboards at each site, within the 'HV Intake Room' located within the Energy Centre on each site. The intake rooms will be provided with a secure grille / screen to demark the boundary between the JEC and Hospital owned equipment. A space approximately 12 x 5m will be required in each of the energy centres to house the HV equipment. The intake room will require 24 hour access at ground level and requires good vehicular access for maintenance.

2 No. JFH HV supplies will be distributed from the JFH sections of the HV switchboard to form a 'HV ring' around each site. The two supplies will be distributed in diverse routes around the sites to enhance the resilience of the system. Each incoming supply will be rated to support the full load of the buildings.

2.1.2 JFH Substations

The existing hospital site will be provided with 2 No. substations housing JFH owned ring main units (RMUs) and HV/LV transformers.

The Overdale site will be provided with 2 No. substations housing JFH owned ring main units (RMUs) and HV/LV transformers.

In order to provide resilience across the sites, an N+1 arrangement for all transformers will be installed (as per HTM 06-01). Additional resilience will also be provided in the form of back-up generators and through the installation of a site wide HV ring.

The two substations (per site) will be linked to form a JFH HV ring network, i.e. each substation shall have 2 No. diversely routed points of supply. The locations of the substations will be selected in order to reduce long cable lengths.

Each substation will supply an LV switchboard which will provide supplies to sub-distribution boards / equipment throughout the site.

In order to enable access and maintenance of the equipment, the substations will be housed at ground level with good vehicular access.

2.1.3 Backup Generators

It is proposed that HV generators are provided. The back-up generators and associated fuel tanks will be located within the energy centre (for each site).

The number and size of generators will be selected to provide an N+1 level of resilience for half the building electrical loads (as per HTM 06-01). With this arrangement, it was agreed that load shedding would be utilised in this extreme scenario to ensure critical facilities could be maintained.

The generators will be connected to a separate generator switchboard located in a purpose made enclosure adjacent to the generator enclosures (within the sites energy centre). A connection will then be made from the generator switchboard to the JFH sides of the HV switchboard. This arrangement will reduce the requirement for running long lengths of cable / bus bar across the site.

Each generator will be housed in a separate fire rated compartment. Where possible, there should be separation between the HV incomers and the generators to prevent the loss of both services in the event of a catastrophic event in the energy centre.

The generators shall be located at ground level with vehicular access for maintenance.

Each generator will be provided with a day fuel tank which shall be no more than the greater of 750L or 10 hours full load running time.

Fuel storage tanks will be provided on each site with the capacity to store 200 hours' worth of fuel for the generators running at full load.

The fuel tank can be located at ground level or in a purpose made basement area of the energy centres.

Interlocks will be provided to prevent the mains supply and the generator being connected to the HV switchboards whilst the incoming supply is still active.

2.2 Options B/C/D

2.2.1 Incoming Services

The site will be provided with 2 No. incoming HV supplies from the Jersey Electric Company (JEC) network. The 2 No. supplies will be provided from separate JEC primary substations. Requests have been made to JEC to obtain indicative costs associated with the works associated with each site.

The supplies will be terminated into 2 No. separate JEC owned HV switchboards at the site, within the 'HV Intake Rooms' located within each of the Energy Centres (locations to be agreed with JEC and the architect). The intake rooms will be provided with a secure grille / screen to demark the boundary between the JEC and Hospital owned equipment. A space approximately 6 x 5m will be required in each of the energy centres to house the HV equipment. The intake room will require 24 hour access at ground level and requires good vehicular access for maintenance.

1 No. JFH HV supply will be distributed from the JFH section of each HV switchboard to form a 'HV ring' around the site. The two supplies will be distributed in diverse routes around the sites to enhance the resilience of the system. Each incoming supply will be rated to support the full load of the buildings.

2.2.2 JFH Substations

The site will be provided with 2/3 No. substations (number dependant on heating scheme) housing JFH owned ring main units RMUs and HV/LV transformers.

In order to provide resilience across the site, an 'N+1' arrangement for all transformers will be installed (as per HTM 06-01). Additional resilience will also be provided in the form of back-up generators and through the installation of a site wide HV ring.

The two / three substations will be linked to form a JFH HV ring network, i.e. each substation shall have 2 No. diversely routed points of supply. The locations of the substations will be selected in order to reduce long cable lengths.

Each substation will supply an LV switchboard which will provide supplies to sub-distribution boards / equipment throughout the site.

In order to enable access and maintenance of the equipment, the substations will be housed at ground level with good vehicular access.

2.2.3 Backup Generators

It is proposed that HV generators are provided. The back-up generators and associated fuel tanks will be located within the 2 No. energy centres.

It is proposed that the generators will be split across the sites energy centres. The number and size of generators will be selected to provide an 'N+1' level of resilience for the full building electrical loads (as per HTM 06-01). With this arrangement, should one of the generator locations be compromised, although the available supply will be less than the complete site, it was agreed that

load shedding would be utilised in this extreme scenario to ensure critical facilities could be maintained.

The generators will be connected to a separate generator switchboard located in a purpose made enclosure adjacent to the generator enclosures (within each of the energy centres). A connection will then be made from each of the generator switchboards to the JFH side of the HV switchboard. This arrangement will reduce the requirement for running long lengths of cable / bus bar across the site.

Each generator will be housed in a separate fire rated compartment.

The generators shall be located at ground level with vehicular access for maintenance.

Each generator will be provided with a day fuel tank which shall be no more than the greater of 750L or 10 hours full load running time.

Fuel storage tanks will be provided with the capacity to store 200 hours' worth of fuel for the generators running at full load.

The fuel tank can be located at ground level or in a purpose made basement area of the energy centres.

Interlocks will be provided to prevent the mains supply and the generator being connected to the HV switchboards whilst the incoming supply is still active.

2.3 Option E

2.3.1 Incoming Services

The site will be provided with 2 No. incoming HV supplies from the Jersey Electric Company (JEC) network. The 2 No. supplies will be provided from separate JEC primary substations. Requests have been made to JEC to obtain indicative costs associated with the works associated with each site.

The supplies will be terminated into 2 No. separate JEC owned HV switchboards at the site, within the 'HV Intake Rooms' located at ground floor (locations to be agreed with JEC and the architect). The intake rooms will be provided with a secure grille / screen to demark the boundary between the JEC and Hospital owned equipment. A space approximately 6 x 5m will be required in each intake rooms to house the HV equipment. The intake room will require 24 hour access at ground level and requires good vehicular access for maintenance.

1 No. JFH HV supply will be distributed from the JFH section of each HV switchboard to form a 'HV ring' around the site. The two supplies will be distributed in diverse routes around the sites to enhance the resilience of the system. Each incoming supply will be rated to support the full load of the building.

2.3.2 JFH Substations

The site will be provided with 2/3 No. substations (number dependant on heating scheme) housing JFH owned ring main units RMUs and HV/LV transformers.

In order to provide resilience across the site, an 'N+1' arrangement for all transformers will be installed (as per HTM 06-01). Additional resilience will also be provided in the form of back-up generators and through the installation of a site wide HV ring.

The two / three substations will be linked to form a JFH HV ring network, i.e. each substation shall have 2 No. diversely routed points of supply. The locations of the substations will be selected in order to reduce long cable lengths.

Each substation will supply an LV switchboard which will provide supplies to sub-distribution boards / equipment throughout the site.

In order to enable access and maintenance of the equipment, the substations will be housed at grade with good vehicular access.

2.3.3 Backup Generators

It is proposed that HV generators are provided. The back-up generators and associated fuel tanks will be located within the 2 No. energy centres.

It is proposed that the generators will be split across the site's energy centres. The number and size of generators will be selected to provide an 'N+1' level of resilience for the full building electrical loads (as per HTM 06-01). With this arrangement, should one of the generator locations be compromised, although the available supply will be less than the complete site, it was agreed that

load shedding would be utilised in this extreme scenario to ensure critical facilities could be maintained.

The generators will be connected to a separate generator switchboard located in a purpose made enclosure adjacent to the generator enclosures (within each of the energy centres). A connection will then be made from each of the generator switchboards to the JFH side of the HV switchboard. This arrangement will reduce the requirement for running long lengths of cable / bus bar across the site.

Each generator will be housed in a separate fire rated compartment.

The generators shall be located at grade with vehicular access for maintenance.

Each generator will be provided with a day fuel tank which shall be no more than the greater of 750L or 10 hours full load running time.

Fuel storage tanks will be provided with the capacity to store 200 hours' worth of fuel for the generators running at full load.

The fuel tank can be located at grade or in a purpose made basement area of the energy centres.

Interlocks will be provided to prevent the mains supply and the generator being connected to the HV switchboards whilst the incoming supply is still active.

2.4 Risks / Derogations

Site constraints associated with Option A have resulted in there being insufficient space to provide generator back up for 100% of the electrical load. In this instance generators and fuel storage will provide N+1 resilience with 200 hours run time for 50% of the electrical load.

A load shedding / load management regime will be developed to ensure that essential / life safety loads are prioritised in the event of a mains failure. It should be noted that additional resilience also will be provided in the form of two diverse HV incomers (from separate JEC substations) as well as a diversely routed site wide HV ring.

JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Note - MEP

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

Subject	Jersey Future Hospital – Site Validation TN-MEP-001 Technical Note - Energy Centres Rev P5. Date 18.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035-00

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - Peoples Park, 100% New Build Option

Energy Centre areas have been determined from:

Historical plant space information from similar sized healthcare projects.

- BSRIA Rules of Thumb – Guidelines for Building Services 5th Edition (BG9 / 2011).
- Calculations based on estimated system capacity loads.
- Manufacturer physical plant and equipment sizes.
- Plant and equipment space guidance information.
- Maintenance and access space required as advised by manufacturers.

2 Commentary

2.1 Option A

Existing General Hospital
Refurbished Energy Centre containing the following equipment:-

- Boilers
- Primary and Secondary Circulating Pumps
- Buffer Vessels
- Pressurisation Units
- Control Panels
- Generator
- Fuel Tank
- HV Incomer

Energy Centre floor areas are indicated in Section 2.3.

Existing General Hospital MEP plant will need remain operational throughout the phased construction work period with a minimal change over period.

Overdale Hospital
1 No. new Energy Centre containing the following equipment:-

- Boilers
- Primary and Secondary Circulating Pumps
- Buffer Vessels
- Pressurisation Units
- Control Panels
- Generators
- Fuel Tank
- HV Incomer

Energy Centre floor areas are indicated in Section 2.3.

2.2 Option B, C, D and E

2 No. Energy Centres have been provided for enhanced resilience. The Energy Centres will contain the following equipment:

- Boilers
- Primary and Secondary Circulating Pumps
- Buffer Vessels
- Pressurisation Units
- Control Panels
- Generators
- Fuel Tank
- HV Incomer

Energy Centre floor areas are indicated in Section 2.3.

It should be noted that due to the phased nature of the work at the existing site (Option C), the first energy centre constructed will need to be fully sized to accommodate 100% of the MEP services equipment. Half of the equipment will be relocated into the second energy centre following its construction.

2.3 Schedule of Areas

2.3.1 Total Energy Centre Spatial Requirements

	Conventional Heating			All Electric		
	Option A		Option B/C/D/E	Option A		Option B/C/D/E
	Overdale	Existing Site		Overdale	Existing Site	
HV Incomer (m2)	60	60	60	60	60	60
Generator + Fuel Tank (m2)	140	207	280	230	430	567
Boilers (m2)	150	300	450	150	300	450
Energy Centre Total (m2)	**350**	**567**	**790**	**440**	**790**	**1077**
Additional Energy Centre area required (m2)	**127**		**0**	**440**		**287**

Notes
1. 790m^2 energy centre originally requested for oil heated single site option
2. Note that single energy centre will not be considered for Options B, C, D and E. Areas provided are for information only.
* See Section 3

2.3.2 Spatial Requirements for Two Energy Centres

The client has requested that 2 No. separate energy centres be provided for Options B, C, D and E, to maximise the resilience of services. As a result, the areas of the energy centres will be:

	Conventional Heating			All Electric		
	Option A		Option B/C/D/E	Option A		Option B/C/D/E
	Overdale	Existing Site		Overdale	Existing Site	
HV Incomer (m2)	N/A	N/A	30	N/A	N/A	30
Generator + Fuel Tank (m2)	N/A	N/A	150	N/A	N/A	320
Boilers (m2)	N/A	N/A	250	N/A	N/A	250
Energy Centre 1 Total (m2)	**N/A**	**N/A**	**430**	**N/A**	**N/A**	**600***
HV Incomer (m2)	N/A	N/A	30	N/A	N/A	30
Generator + Fuel Tank (m2)	N/A	N/A	150	N/A	N/A	320
Boilers (m2)	N/A	N/A	250	N/A	N/A	250
Energy Centre 2 Total (m2)	**N/A**	**N/A**	**430**	**N/A**	**N/A**	**600***

*See Section 3

3 Risks/Opportunities

Demolition / refurbishment of existing energy centre on Options A and C will require correct phasing to ensure continuity of services throughout.

Asbestos issues in existing Overdale Hospital plant rooms.

* It should be noted that the Client has requested that the 2 No. energy centres be provided (for Options B, C, D and E only) to maximise the resiliency of services on site. Due to the phased nature of construction at the **existing general hospital site (Option C only),** the first Energy Centre built will need to be fully sized to accommodate 100% of MEP service equipment. When the second energy centre is constructed as part of a later phase, half of the equipment from the first energy centre will be re-located. The current phasing proposals for any works at the existing site do not permit this arrangement. In the event that the preferred site includes any work at the exiting general hospital site, an investigation will be undertaken to determine how this request can be incorporated into the design / phasing of any scheme.

Allowance has been made for a single Energy Centre for Option A. Resilience will be built into the MEP systems in the form of N+1 provisions of equipment and diverse routing of services.

JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Note - Civils

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

Subject	Jersey Future Hospital – Site Validation TN-CIV-001 Technical Note – Civil Engineering Rev P4. Date 24.09.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035

1 Introduction

This technical note has been prepared to document the findings associated with the below ground foul and surface water drainage options to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital (JFH) scheme.

The four options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, St.Helier

2 Option A – Dual Site Option

2.1 Foul Drainage

2.1.1 Existing Hospital Site

2.1.1.1 Existing Foul Drainage

The existing site is served by a 530mm sewer in The Parade, a 600mm diameter sewer in Gloucester Street and a 230mm diameter sewer in Newgate Street.

2.1.1.2 Proposed Foul Drainage

Under the dual site option, the Gloucester Street site will be partially developed as a 286 bed hospital. Many of the existing facilities (e.g. out- patients, pharmacy) will be transferred to Overdale. The existing services have capacity to cope with a proposed redevelopment. Existing connections to the main drains may be re-used where possible – subject to modelling and survey.

2.1.2 Overdale Site

2.1.2.1 Existing Drainage

The existing Overdale site is served by a 150mm diameter foul sewer to the south and a 150mm sewer to the north. Both sewers combine to the west into a 230mm diameter sewer to the east of King George V Homes. Some storm water from the existing hospital may be connected to the foul drainage – this will be confirmed by survey at a later date.

2.1.2.2 Proposed Drainage

Transport and Technical Services have confirmed the foul sewer to the east of King George V Homes has capacity to take the proposed development. However it is likely both sewer runs which connect to this will require to be re-routed round the development and upgraded. The existing buildings which it is believed discharges surface water to the foul sewers are to be demolished and hence the surface and foul water will be separated under the proposals.

2.2 Surface Water Drainage

2.2.1 Existing Hospital Site

2.2.1.1 Existing Drainage

The existing hospital is served primarily by a 1525 diameter surface water sewer in Gloucester Street.

2.2.1.2 Proposed Surface Water

There is no increase in surface water run-off as the site is fully developed. Any new buildings on the campus should connect to the existing dedicated sewer in The Parade – via existing on-site drainage if possible. (Subject to survey).

2.2.2 Overdale Site

2.2.2.1 Existing Drainage

The Poplars building and the Rehabilitation Unit at Overdale currently discharge to soakaways. Drawings of the original hospital buildings show the site served by 6" sewers (probably combined) to the north.

There is a public 300mm surface water sewer to the west in Le Val Andre but this connects to a combined sewer La Route de St Aubin.

2.2.2.2 Proposed Drainage

The new hospital will result in an increase in surface water outflow from the site. New soakaways will be used, subject to satisfactory percolation testing and there being sufficient room around the perimeter to locate soakaways away from the buildings.

In addition if new buildings are located close to existing, the soakaways of those buildings may be affected. Consideration will also be given to the use of SUDS in car park areas.

Should soakaways not be viable any surplus surface water could be connected to the 300mm sewer in Le Val Andre, but may require attenuation (subject to town sewer modelling). The surface water will be required to be removed from the combined sewer in La Route de St Aubin and connected to a new outfall through the sea wall via a new main laid across the roads (refer to drawing 12578/D02 in Appendix B which shows a possible route).

3 Option B – Overdale Hospital Site New Build

3.1 Foul Drainage

3.1.1 Existing Drainage

The existing Overdale site is served by a 150mm diameter foul sewer to the south and a 150mm sewer to the north. Both sewers combine to the west into a 230mm diameter sewer to the east of King George V Homes. Some storm water from the existing hospital may be connected to the foul drainage – this will be confirmed by survey.

3.1.2 Proposed Drainage

Transport and Technical Services have confirmed the foul sewer to the east of King George V Homes has capacity to take the proposed development. However it is likely both sewer runs which connect to this will require to be re-routed round the development and upgraded. The existing building which discharge surface water to the foul sewers are to be demolished and hence the surface and foul water will be separate under the proposals.

The Transport and Technical Services email (Appendix A) refers to possible development in Field 1551 – to the east of Westmount Road. However this site would only be used for car parking and no foul drainage would be required.

3.2 Surface Water

3.2.1 Existing Drainage

The Poplars building and the Rehabilitation Unit currently discharge to soakaways. Drawings of the original hospital buildings show the site served by 6" sewers (probably combined) to the north.

There is a 300mm surface water sewer to the west in Le Val Andre but this connects to a combined sewer La Route de St Aubin.

Field 1551: This site is currently an agricultural field. It is proposed to utilise this for car parking. It is envisaged that drainage of this area would be to soakaways or using SUDS.

3.2.2 Proposed Drainage

The new hospital will result in an increase in surface water outflow from the site. New soakaways will be used, subject to satisfactory percolation testing and there being sufficient room around the perimeter to locate soakaways away from the buildings.

In addition if new buildings are located close to existing, the soakaways of those buildings may be affected. Consideration will also be given to the use of SUDS in car park areas.

Should soakaways not be viable any surplus surface water could be connected to the 300mm sewer in Le Val Andre, but may require attenuation (subject to town sewer modelling). The surface water

will be required to be removed from the combined sewer in La Route de St Aubin and connected to a new outfall through the sea wall via a new main laid across the roads (refer to drawing 12578/D02 in Appendix B which shows a possible route).

4 Option C – Existing General Hospital - New Build

4.1 Foul Drainage

4.1.1 Existing Drainage

The existing site is served by a 530mm sewer in The Parade, a 600mm diameter sewer in Gloucester Street and a 230mm diameter sewer in Newgate Street.

Properties fronting Kensington Place discharge into a (combined) lined brick sewer which runs north to south.

4.1.2 Proposed Foul Drainage

Transport and Technical services have confirmed the foul sewer network has capacity to take the proposed development. Existing connections to the public sewer are to be re-used wherever possible. (Subject to modelling and survey).

4.2 Surface Water Drainage

4.2.1 Existing Drainage

The existing hospital is served primarily by a 1525 diameter surface water sewer in Gloucester Street.

Surface water from the buildings fronting, Kensington Place connect to the combined sewer in Kensington Place.

4.2.2 Proposed Surface Water Drainage

The site is fully developed and hence there will be no net increase in surface water discharge. However the connections to the combined sewer in Kensington Place must be removed and re-routed.

There is likely to be little available space on the site for soakaways or SUDS.

Transport and Technical Services suggest (Appendix A), constructing a new branch sewer to manhole MH1 SW near the junction of The Parade and Saville Street. A possible route is shown on the marked up drawing in Appendix C

5 Option D – Waterfront Site New Build

5.1 Foul Drainage

5.1.1 Existing Foul Drains

There is an existing 300mm foul sewer which crosses the site (at a depth of 4 metres) and connecting to the sewer in the Esplanade.

5.1.2 Proposed Foul Drainage

Transport and Technical Services advise that the existing foul sewer has the capacity to take the proposed development of the site.

The foul sewer will need to be diverted around the proposed development but the branch connection from La Frigate Café (which crosses Jardin de La Mer) needs to be accommodated (and possibly re-routed). (See marked up drawing Appendix D)

New buildings should be located away from the diverted sewers to allow for future maintenance and to avoid surcharging. The normal easement width is 3 metres either side of the sewer.

5.2 Surface Water Drainage

5.2.1 Existing Drainage

There is 1.2 x 1.2 concrete box culvert to the north of the site at a depth of 8 metres which crosses between Jardin de La Mer and the new car park. There is also a 450mm surface water sewer at a depth of nearly four metres to the south in La Rue de L'Etau.

Part of the site has recently been resurfaced as a temporary car park and incorporates new surface water drains. These connect via a petrol interceptor to the 450mm public sewer.

5.2.2 Proposed Surface Water Drainage

Consideration may be given to the use of soakaways (subject to percolation tests and review of ground contamination) provided there is a suitable open space. However the ground water level in the area is known to be tidal and this may restrict the performance of the soakaways.

Transport and Technical Services advise that the box culvert has capacity to take run-off from the site. (Subject to modelling).

If the proposed development encompasses the adjacent Les Jardin de La Mer site then the scheme should incorporate an easement (approximately 5 metres either side of the culvert) for future maintenance. (See marked up drawing Appendix D).

5.3 Proposed Site Layout

A proposed site plan for the Waterfront Site has been produced. The building layout will impact on the stipulated exclusion zone for maintenance of the public sewers. Therefore both the foul sewer and surface water culvert will require diverting.

The suggested diversions are to the east and south of the site. The approximate routes are shown on 12578/SK150219 in Appendix E.

The existing foul sewer is approximately 4 metres below the existing ground level and has a fall of about 1 metre across the site. The diversion would be from MHF2 to the south to MH15 opposite Gloucester Street in the Esplanade.

The surface water diversion would be from MH52 in the Esplanade to a new SWMH on the existing culvert to the south and west of the site.

Transport and Technical Services have advised they have no objections to the diversion in principle but, due to the extra length and relatively shallow falls, they have recommended a feasibility study is undertaken at an early stage. This would determine the challenges, and likely associated costs. They have also requested the culvert is up-sized to take into account a future SW separation scheme upstream (Email S Bohea to John Woodward 23/02/2015 refers – also appendix E).

6 Option E – People's Park New Build

6.1 Foul Drainage

6.1.1 Existing Foul Drains

There is a 150mm diameter concrete foul sewer at 1.2 metres deep serving the south of the site which crosses St Aubin's Road and Peirson Road connecting to the foul sewer in Lewis Street.

There is a 915 x 710 deep brick culvert at a depth (to invert) of 2.57m which runs below Westmount Road to the north of the park. There is a shallow 150mm pipe-run crossing the road from the site which connects to this sewer via a backdrop column.

In addition, in Kensington Street, there is a 230mm diameter sewer at a depth of 2.0metres. This connects to the brick sewer in Lewis Street at a depth of 4 metres.

6.1.2 Proposed Foul Drainage

Transport and Technical Services (TTS) advise the main foul sewers in the vicinity will have capacity to take the proposed development with some local upsizing.
The 150mm concrete sewer connection to Lewis Street is probably at too shallow a depth to serve the new development in a significant capacity, although it may be useful connecting site services and local drains. This drain connects to the culvert in Lewis St which is an average of 4 metres down and it would be feasible to relay the pipe-run to the Park at a lower level. It is noted that some of this route is under private land and any work in that area will require Royal Court law notice to be served on the owners with their 'in principle' agreement in advance. This all falls under Article 10 of the Drainage Law and is not envisaged to be too problematic.

The brick sewer in Westmount Road at 2.57metres depth is suitably located for a connection by replacing the 150mm connection at a lower level which TTS advise through initial consultations could be deepened to an approximate depth of 2.4m below road level. However, the southernmost section of the site may have difficulty connecting to this by gravity.

The third option is to relay the 230 diameter sewer in Kensington Street from Lewis Street at a lower depth and extend to the People's Park.

The options are illustrated on the drawing in Appendix F1.

6.1.3 Basement Foul Drainage

Any foul drains required at basement level will need to be pumped to a higher level drainage to connect by gravity to the new main drainage runs.

6.2 Surface Water Drainage

6.2.1 Existing Drainage

There is no public surface water sewer available in the vicinity.

There is a private 300mm storm water sewer serving Westmount Quarry from west to east in Westmount Road at a depth of 1.8metres. A private attenuation tank and pump arrangement is located in People's Park to regulate flow to this sewer which connects to the public sewer in Cheapside at a restricted rate.

6.2.2 Proposed Surface Water Drainage

TTS advise that there is no public surface water sewer available for the proposed development to connect to. Options for surface water disposal include on-site through soakaways or via a dedicated sewer to a new beach outfall.

The dedicated sewer to a new beach outfall will involve tunnelling a section under Victoria Avenue by pipe-jacking. The position of the final outfall on the beach may have to be negotiated with appropriate parties as this area is quite well used during the summer season and discharge would be across one of the few sandy areas of beach in St Helier. TTS have advised that they would take advantage of any road crossing under Victoria Avenue to separate the combined public sewers in that area.

If the private attenuation tank cannot be accommodated into the landscaping of the development, the tank will need to be relocated if possible. Alternatively, the run-off from the Westmount Quarry site may be connected to the new surface water sewerage system which serves the hospital and discharges to the beach out fall.

A drawing illustrating the route of the new sewer run is shown in Appendix F2.

6.2.3 6.2.3 Land drains / Basement drained cavities

Any land drains required to relieve water pressure on basement walls or dewater drained cavities will be connected by gravity to basement level sumps and pumped to the higher level surface water drainage network.

Appendix A – TTS email and Enclosures 11/02/15

Appendix B – Arup Rothwell drawing 12578/D02 of Overdale showing proposed SW outlet

Appendix C – Existing Hospital Drainage showing line of possible new SW

Appendix D – Waterfront site marked up with exclusion zones and redirected foul.

Appendix E – Drawing 12578-SK150219: Waterfront Site marked up with suggested foul and surface water diversions

Appendix F – F1 People's Park Foul Drainage Options; F2 Line SW sewer

Appendix A – TTS email and Enclosures 11/02/15

DWG NO.

States of Jersey

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JERSEY GENERAL HOSPITAL OVERDALE & FIELD 1551 St HELIER	
DRAWN BY TTS RECORDS	DATE 11/02/2015
SCALE NTS	SHEET SIZE A1
DWG NO. -----	
SHEET NO. 1 of 1	REVISION RECORD

DWG NO.
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DRAINAGE (JERSEY) LAW, 2005 ARTICLE 17(1)(b) STIPULATES THAT NO NEW CABLE, CONDUIT MAIN OR PIPE SHALL BE CONSTRUCTED WITHIN ONE METRE OF A PUBLIC SEWER OR OUTFALL.

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DWG TITLE

JGH - EXISTING SITE
GLOUCESTER ST &THE PARADE
St HELIER

DRAWN BY	DATE
TTS RECORDS	11/02/2015
SCALE	SHEET SIZE
1:250	A1
DWG NO.	
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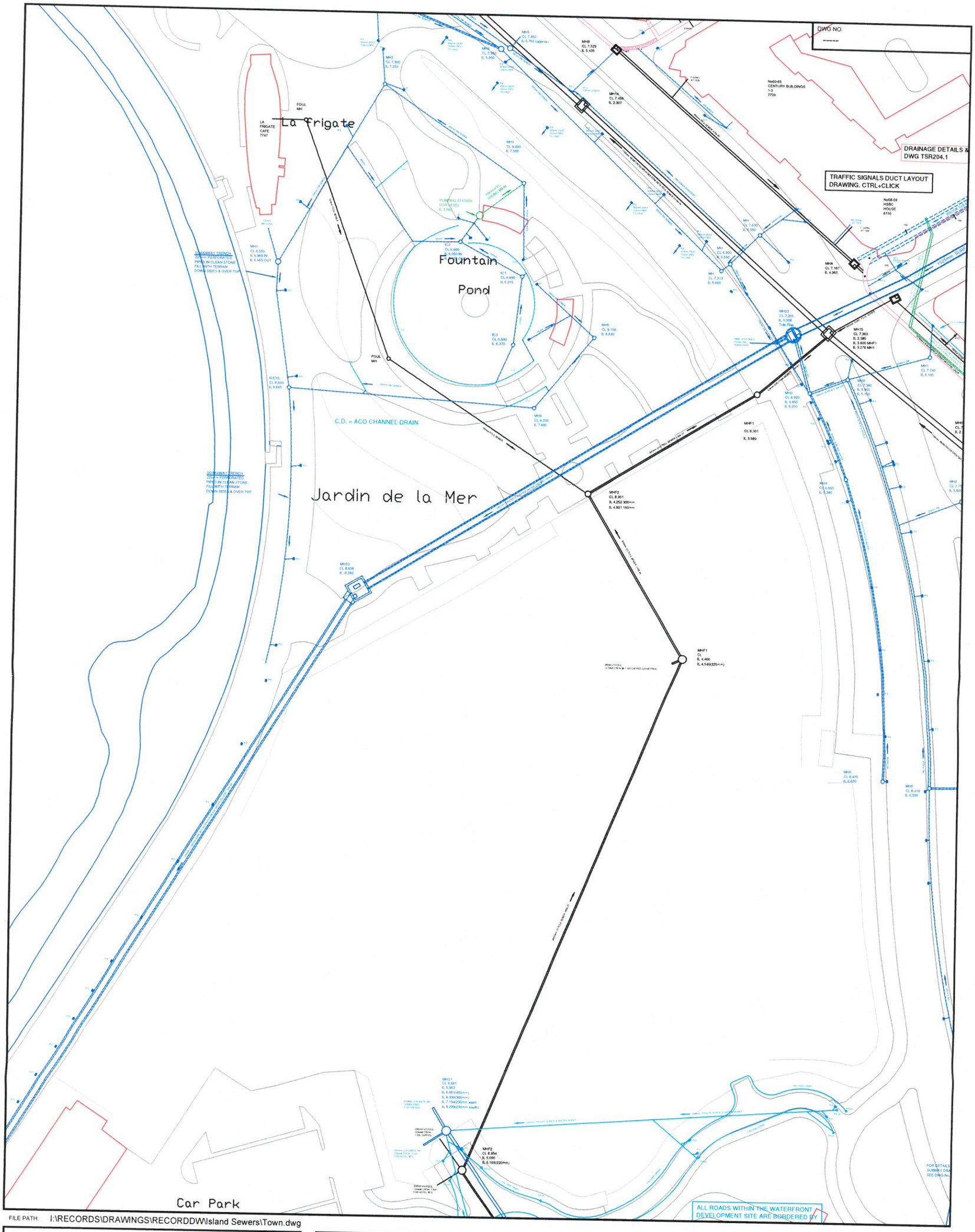
SHEET NO.	REVISION
1 of 1	RECORD



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DWG TITLE

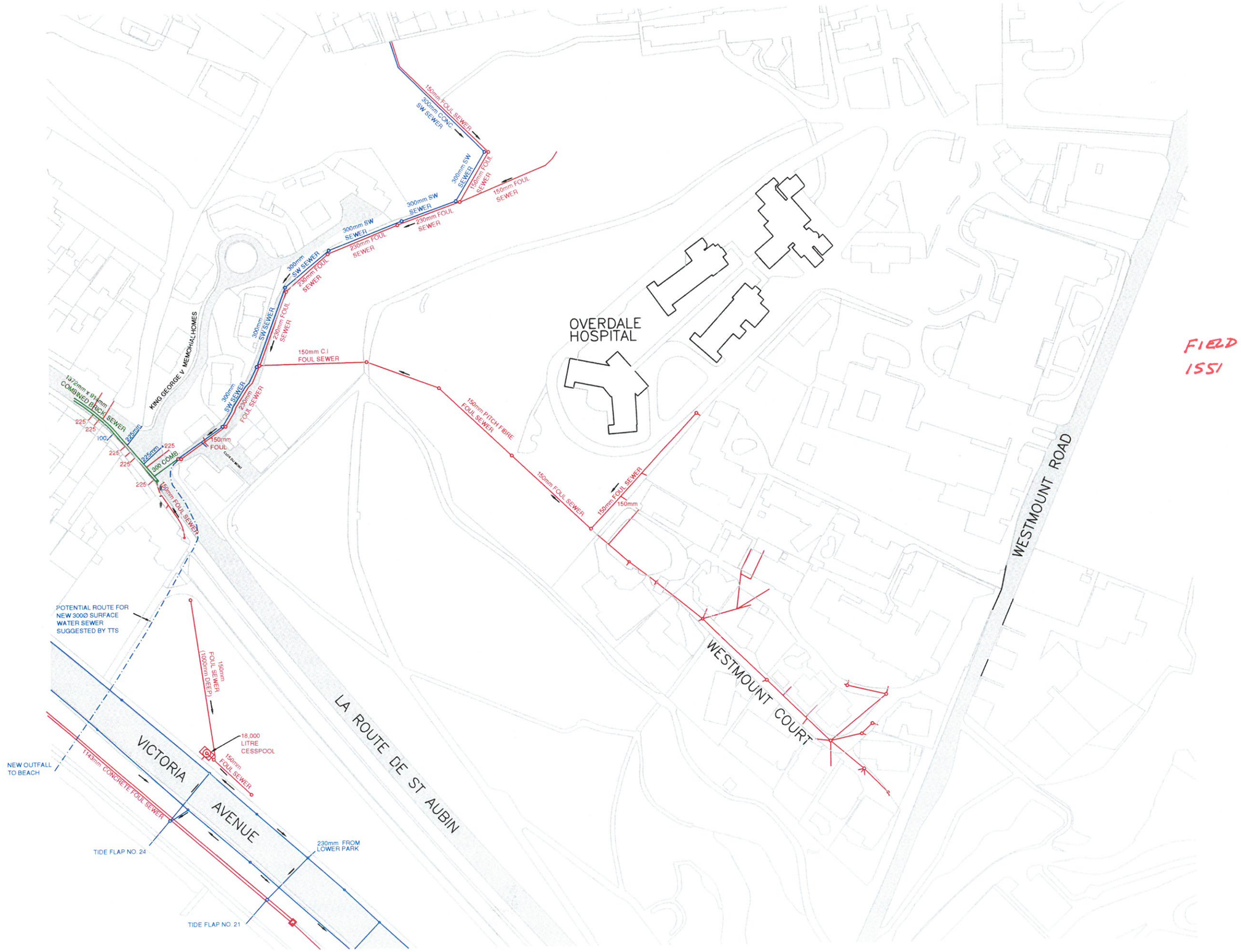
JERSEY GENERAL HOSPITAL
WATERFRONT & JARDIN DE LA MER
St HELIER

DRAWN BY	SCALE	SHEET SIZE
TTS RECORDS	NTS	A3
DWG NO.		

DATE	SHEET NO.	REVISION
11/02/2015	1 of 1	RECORD

Appendix B – Arup Rothwell drawing 12578/D02 of Overdale showing proposed SW outlet

A1



NOTES:

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS & OTHER CONSULTANTS DRAWINGS.

THIS DRAWING TO BE READ IN CONJUNCTION WITH ROTHWELL & PARTNERS GENERAL NOTES DRAWING (STRUCTURAL) 500.

ALL TEMPORARY WORKS TO BE THE RESPONSIBILITY OF THE MAIN CONTRACTOR.

LINTELS TO BE BY STRESSLINE (OR SIMILAR APPROVED). ALL LINTELS TO HAVE MIN. 150 END BEARING.

SETTING OUT DIMENSIONS TO BE VERIFIED ON SITE. DEVIATIONS FROM THE SHOWN DIMENSIONS TO BE CONFIRMED WITH ENGINEER

DPC, DPM, INSULATION, FIRE PROTECTION ETC. TO ARCHITECT'S DETAILS

IF IN DOUBT ASK

DO NOT SCALE

ALL BOLTS TO BE GRADE 8.8 UNLESS NOTED OTHERWISE.

ALL WELDS TO BE OF CONTINUOUS 6mm FILLET WELD UNLESS NOTED OTHERWISE.

FILED 1551

Rev.	Date	By	Description

Drawing Status
PRELIMINARY

APPENDIX B

Job Title
JGH
MASTERPLAN

Drawing Title
OVERDALE
DRAINAGE SITE PLAN
SHOWING LINE OF NEW S.W. OUTFALL

Rothwell & Partners Ltd.
17 La Motte Street, St. Helier, Jersey, JE2 4SY
Tel: (01534) 734585
Fax: (01534) 768609

Scales 1:400 @ A1 | Originator NN
Checked | Approved | Date SEPT 2014

Job No.	Drawing No.	Rev.
12578	D02	–

Appendix C – Existing Hospital Drainage showing line of possible new SW

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DRAINAGE (JERSEY) LAW, 2005 ARTICLE 17(1)(b) STIPULATES THAT NO NEW CABLE, CONDUIT MAIN OR PIPE SHALL BE CONSTRUCTED WITHIN ONE METRE OF A PLUS SEWER OR OUTFALL.

SHOWING LINE OF NEW S.W. SEWER

NEW S.W. DRAIN

NEW S.W. DRAIN

MH1SW

APPENDIX C

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ARUP ROTHWELL COMMENTS FEB 2015

DWG TITLE

JGH - EXISTING SITE
GLOUCESTER ST &THE PARADE
St HELIER

DRAWN BY	DATE
TTS RECORDS	11/02/2015
SCALE	SHEET SIZE
1:250	A1
DWG NO.	

SHEET NO.	REVISION
1 of 1	RECORD

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Appendix D – Waterfront site marked up with exclusion zones and redirected foul.

DWG NO.

DRAINAGE DETAILS & DWG TSR204.1

TRAFFIC SIGNALS DUCT LAYOUT DRAWING. CTRL+CLICK

La Frigate

Fountain Pond

RE ROUTE FOUL

C.D. = ACO CHANNEL DRAIN

Jardin de la Mer

300 DIA FOUL (Rerouted)

EXCLUSION ZONE TO ALLOW FOR REPAIR/REPLACENT OF DEEP SEWERS (5m either side of sewer)

300dia Foul Sewer redirected around development

EXCLUSION ZONE TO ALLOW FOR WORKS TO DEEP SEWERS

Car Park

APPENDIX D

ARUP ROTHWELL FEB 2015 WATERFRONT DRAINS SHOWING FOUL REROUTE & EXCLUSION ZONES

ALL ROADS WITHIN THE WATERFRONT DEVELOPMENT SITE ARE BORDERED BY

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States of Jersey

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TRANSPORT AND TECHNICAL SERVICES DEPARTMENT

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DWG TITLE

JERSEY GENERAL HOSPITAL
WATERFRONT & JARDIN DE LA MER
St HELIER

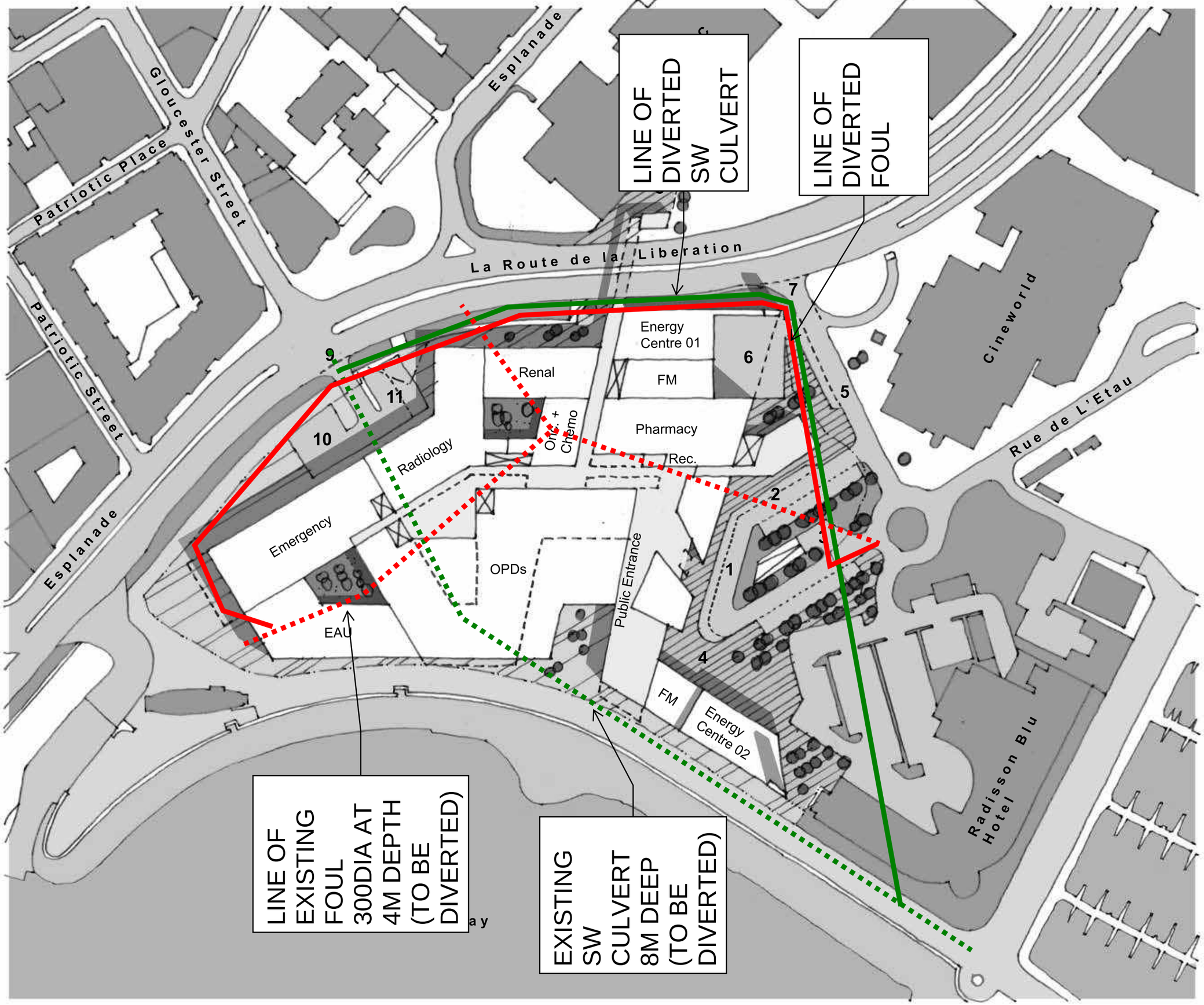
DRAWN BY	SCALE	SHEET SIZE
TTS RECORDS	NTS	A3

DWG NO.

DATE	SHEET NO.	REVISION
11/02/2015	1 of 1	RECORD

Appendix E– Drawing 12578-SK150219: Waterfront Site marked up with suggested foul and surface water diversions

Future Hospital
New hospital services for a healthier Jersey



1. Main public entrance and drop-off
2. Women's and Children's Entrance and drop-off
3. Ramp down to basement car park (optional)
4. Landscaped forecourt
5. Existing road re-aligned and widened
6. Service / delivery yard
7. Improved junction to Rue de la Liberation
8. Suggested pedestrian bridge link (with lifts and stair) across Ru de de la Liberation
9. Managed traffic control access for emergency
10. Ambulance drop-off
11. Short stay parking for emergency only

OPTION D

WATERFRONT SITE

100% SINGLE SITE OPTION

PROPOSED SITE PLAN

HASSELL

Appendix F - F1 People's Park Foul Drainage Options; F2 Line SW sewer

ARUP ROTHWELL - APPENDIX F1

OPTION E:
FOUL DRAINAGE OPTIONS

Option:
Relay connection at lower level omitting back-drop

Backdrop

Existing 150 Branch

Option: New 230 dia @ -4m approx Connect to sewer in Kensington Place. Pick up Existing connections

150 dia sewer at 1.2metres (Too shallow.?) or Relay at lower level to connect to Lewis St

Existing 230 sewer at 2m

Brick culvert at 4m

Green

Peoples Park

B 87 St. Aubin's Road

Monument

Victoria Park

Peirson Road

Kensington Street

Lewis Street

Pool

SEPT 2014

DWG NO. -----

States of Jersey

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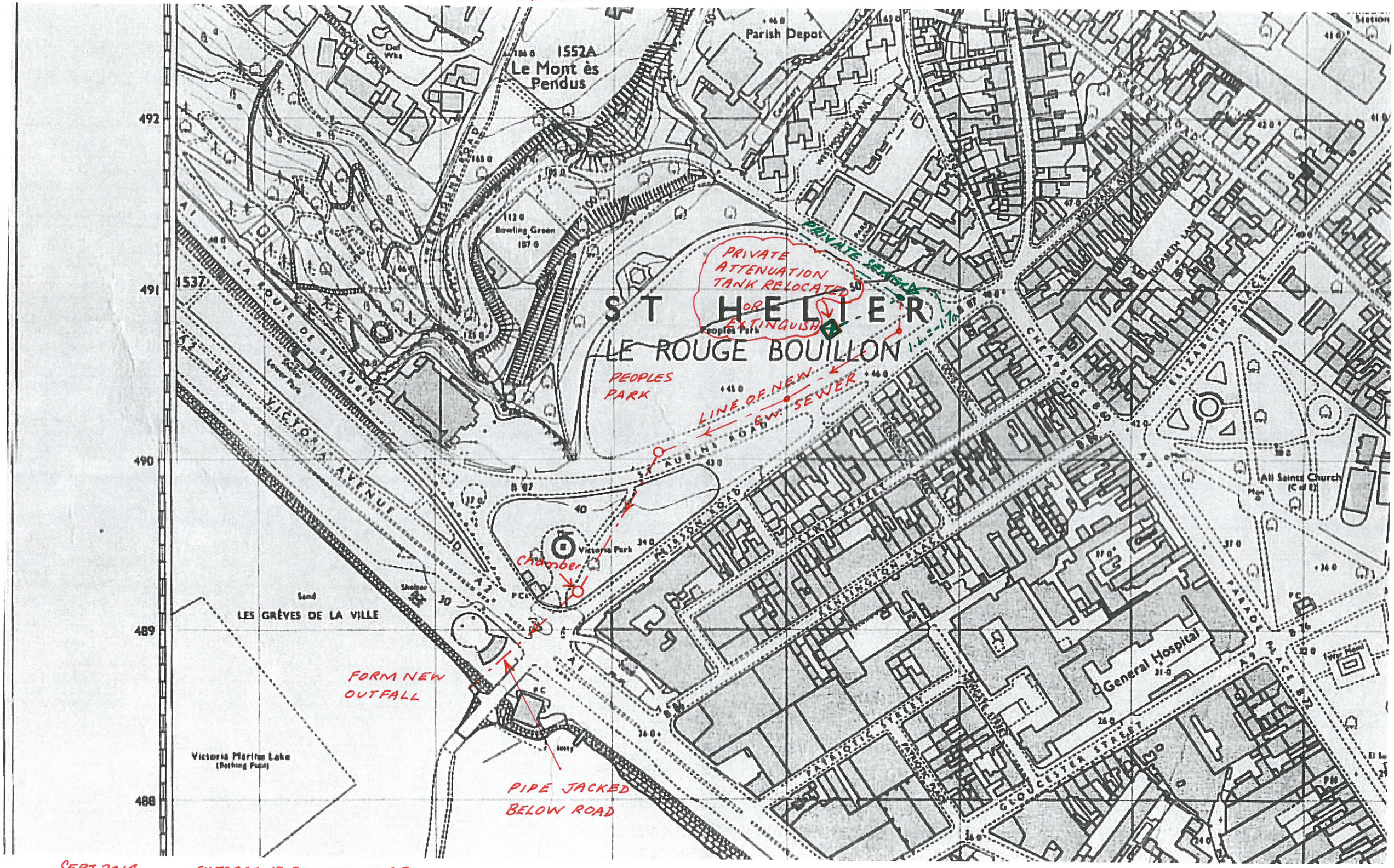
DWG TITLE	PEOPLE'S PARK St HELIER
DRAWN BY: TTS RECORDS	DATE: 03/08/2015
SCALE: nts	SHEET SIZE: A3
DWG NO.: -----	
SHEET NO.: 1 of 1	REVISION: RECORD

Appendix G

ARUP ROTHWELL - APPENDIX F2

OPTION E: LINE OF S.W. SEWER



SEPT 2014 EXTRACT 1981 OS MAP

JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Note - Geotechnics

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

Subject	Jersey Future Hospital – Site Validation TN-GEO-001 Technical Note – Geotechnics Rev P3. Date 29.09.2015. Final Preliminary Issue
Date	29 September 2015
Job No/Ref	237035

1 Introduction

This technical note has been prepared to document the findings associated with a geotechnical and geo-environmental desk top study to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The four options being reviewed are:

Option A - Dual Site Options (Options B and C below)

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

The purpose of this technical note is to identify geotechnical risks and opportunities for each of the four options to aid site selection.

The site boundary for each option is provided in the site location plan appended to this technical note.

2 Commentary

2.1 Option A

Refer to Option B and Option C below for full details. Additional headliners based on the dual site option are summarised below:

- Surplus arisings may be generated from the General Hospital and Overdale Hospital. It is unlikely that made ground could be reused as selected fill, however there is a potential that natural ground may be suitable for reuse, subject to appropriate testing and compliance with the regulators.
- If the hospital capacity requirements are spread across both hospital sites then there is potential for lower storey buildings which could potentially be founded on shallow foundations.
- In relation to existing foundations on both the Overdale and General Hospital site, the ground will have consolidated and strengthened under the old shallow foundation loads and will be subject to unload (due to demolition) and reload (new building), differing settlement characteristics will need to be carefully considered.

2.2 Option B

Background

- Overdale Hospital is situated on high ground to the north-west of the town of St Helier. The Site consists of existing hospital buildings and a valley feature. Ground investigation records available for the existing hospital buildings in the east of the site indicate shallow bedrock is anticipated to be encountered. When the building proposal details are known (including loads and dimensions) a ground investigation and laboratory testing is required to fully assess the ground and groundwater conditions beneath the site, as a minimum to inform the following:
    - Foundation design options
    - The aggressively of the ground to concrete and steel (such as low pH and high sulphates)
    - Swelling potential which may be associated with the shale (Jersey Shale Formation) present beneath much of the site
    - Variability in strength and fracturing of bedrock.

Shallow bedrock anticipated

- Should bedrock be encountered near surface then there is a potential for surplus bedrock arisings to be generated during construction. There is a potential opportunity for reuse as selected fill, subject to appropriate testing of material suitability and regulatory compliance.

Foundations

- Shallow bedrock is anticipated beneath the site based on desk study (to be confirmed by a ground investigation). If shallow bedrock is present then shallow foundations are a potential foundation solution. However, foundation design options will be dependent on suitability of the ground from the ground investigation information. Ground investigation will also allow development of foundation design parameters, ripability of bedrock, and understand potential foundation movements.

Basements

- If a basement is required then the basement construction would involve excavating out bedrock. Ripability / excavatability of bedrock could be an issue if the rock strength is high and had few fractures, this could slow down excavation progress. Bedrock joints / fracturing could impacting stability of the rock face and support measures will need careful consideration during basement design, which may even require a basement wall.

Topsoil surplus anticipated

- Topsoil is anticipated to be present beneath the site and is likely to be stripped as part of the construction works. There is a potential opportunity for topsoil reuse, subject to testing for suitability and compliance with regulators. Ground investigation is required to confirm the extent, volume and chemical suitability.

Ground contamination potential

- When the proposed development details are confirmed, further desk study and development of a conceptual site model will be required to inform the design of a targeted ground investigation. Subsequent to this it will be possible to identify constraints related to ground conditions and potential ground contamination. Depending on the level of contamination encountered detailed risk assessments may be required, which will be subject to regulatory approval, to confirm the suitability of the site for the proposed development and the requirement for any remediation.
- A localised area of potential fill at the head of the valley slope was identified in the desk study report prepared by Arup in October 2014. The chemical composition, extent and volume of fill is unknown. The fill has the potential to contain contaminants of concern. There is a requirement for targeted ground investigation to determine the nature and composition of the fill. It is anticipated the States of Jersey (SOJ) will require a material management plan for such materials, such as off-site disposal / remediation and / or treatment.
- Consideration of planning conditions, in relation to contaminated ground, that may be imposed on the development should also be taken in to account.

Invasive plants

- A localised area of Japanese Knotweed (JK) was identified within the area of fill at the head of the valley slope and reported in the desk study prepared by Arup in October 2014. In accordance with the JK Code of Practice (CoP), there is a requirement for a JK survey and assessment to be carried out by a specialist, to confirm the locations and extent of JK, and management / treatment of the invasive plant with potential associated costs.

UXO potential

- There is a risk associated with the potential for historic storage of UXOs (unexploded bombs) as well as bombs potentially deployed from aircrafts during WWII. Therefore, it is recommended that a detailed UXO assessment is undertaken ahead of any ground investigation excavations at the site.

Green Backdrop Zone

- Trees on the site are within the SOJ 'Green Backdrop Zone' and require a tree survey associated with tree root protection zones / tree preservation and protection. The trees are predominantly situated along the southern limb of the valley, Le Val Andre. The survey findings may impact on the proposed ground investigation locations and proposed building layout and location.

Groundwater control measures

- Groundwater conditions are currently unknown. However, there is potential for groundwater flow through bedrock fractures and joints.
- Ground investigation is required to provide information on the groundwater conditions in order to develop a hydrogeological conceptual model and to prescribe appropriate groundwater control methods.

- Should groundwater be encountered, groundwater control measures during temporary excavations and construction will provide a dry and stable working area.
- Determination of appropriate groundwater control measures such as pumping or cut off wall will depend upon factors such as groundwater flow rates, building proposals, construction programme and working space available.

Surface water management – soakaway potential

- There is a requirement for soakaway or SuDs as part of proposed development of the site. Infiltration testing will be required as part of the ground investigation works to fully assess the ground suitability for potential soakaways or SuDs. It should be noted that the nature of bedrock and the degree of fracturing will heavily influence the infiltration and it could be quite variable.

2.3 Option C

Background

- The General Hospital site is densely developed with existing buildings constructed at differing periods of time and are typically five storeys high. It is understood that the hospital buildings are piled, with the exception of the two Granite listed buildings, the foundation of which are unknown. The existing building foundations (including hotels) in the northern part of the site boundary (and north of the hospital buildings) are currently unknown.
- When the building proposal details are known (including loads and dimensions) a ground investigation and laboratory testing is required to fully assess the ground and groundwater conditions beneath the site, as a minimum to inform the following:
    - Foundation design options
    - The aggressively of the ground to concrete and steel (such as low pH and high sulphates)

New foundations

- Due to the limited site footprint and the upgrading capacity requirements for the hospital, tall buildings are anticipated which are likely to require deep foundations, such as, piles socketed into bedrock.
- Potential issues associated with piling may include the following:
    - Selection of appropriate piling methods to control vibration, noise and dust.
        - Potential issue for existing sensitive clinical services and equipment at the hospital (assuming a phased approach)
        - Potential impact on site neighbours, adjacent utilities, foundations, structures, basements and adjacent buildings
    - Potential obstructions, which may require the pile layout to be designed around existing foundations that cannot be easily removed

Potential reuse of existing foundations

- Potential issues associated with reuse of existing piles include the following:
    - Piles may not have the load carrying capacity and pile vertical load testing is required to validate this
    - Assessment of the durability / residual design life of the old foundations will be required, including assessment of the corrosion of steel and sulphate attack on concrete, which can be a relatively complex assessment
    - Piles may be off-set from the new building column grid, and therefore require larger pile caps to cantilever the loads
- It should be noted that pile investigation works for potential reuse are likely to cause delays to the programme, and may not even prove that the piles can be reused

Buried obstructions

- Buried obstructions are anticipated to exist which may present issues during demolition and construction; such as buried old foundations, utilities, tanks and storage facilities associated with hospital services.

Basements

- Potential expansion to existing basements should be carefully considered in the context of the following:
    - Existing buildings and foundations on site
    - Proposed building layout and proportions and foundations
    - Larger walls may be required to restrict movement
    - Adjacent buildings and foundations
    - Restriction of basement depths
    - Impact on ground movement
    - Potential for groundwater control measures and long term impact on groundwater
- Construction sequencing for any widening of existing basements will require careful consideration.

Groundwater control measures

- Groundwater conditions are currently unknown, however previous desk study indicates groundwater may be at depth. Ground investigation is required to provide information on the groundwater conditions in order to develop a hydrogeological conceptual model and to prescribe appropriate groundwater control methods, if necessary.
- Should groundwater be encountered, groundwater control measures during temporary excavations and construction may be required to provide a dry and stable working area.
- Determination of appropriate groundwater control measures such as pumping or cut off wall will depend upon factors such as groundwater flow rates, building proposals, construction programme and working space available. However, given deep groundwater levels are anticipated this is considered to be unlikely.

Ground contamination potential

- When the proposed development details are confirmed, further desk study and development of a conceptual site model will be required to inform the design of a targeted ground investigation. Subsequent to this it will be possible to identify constraints related to ground conditions and potential ground contamination. Depending on the level of contamination encountered detailed risk assessments may be required, which will be subject to regulatory approval, to confirm the suitability of the site for the proposed development and the requirement for any remediation.
- It is likely, considering the nature of the ground and the proposed foundations solution, that the following will be required by the regulatory authorities:

- Foundation works risk assessment
- Ground gas assessment
- Soil risk assessment
- Groundwater risk assessment

- Consideration of planning conditions, in relation to contaminated ground, that may be imposed on the development should also be taken in to account.
- Soil arisings may be generated from piling, excavations for new basement construction, foundation excavations, utility trenches, and other excavations on the site. It is unlikely that made ground could be reused as selected fill, however there is a potential that natural ground may be suitable for reuse, subject to appropriate testing and compliance with the regulators. Made ground materials may be acceptable for re use in areas of open landscaping, however this will need to be confirmed by appropriate risk assessments. There is a requirement for targeted ground investigation to determine the nature and composition of the ground to be excavated. It is anticipated the States of Jersey (SOJ) will require a material management plan for such materials, such as off-site disposal / remediation and / or treatment.

2.4 Option D

Background

- The Waterfront site is an undeveloped brownfield site. A temporary car park is currently being constructed across the site (January/February 2015). Historical investigations undertaken on an adjacent site during the 1990's indicate the ground in the vicinity of the site to comprise around 10m thick of uncontrolled fill (associated with West Albert land reclamation), underlain by soft clay of beach deposits, underlain by variably weathered and fractured bedrock igneous, granite, diorite and andesite.
- When the building proposal details are known (including loads and dimensions) a ground investigation is required to fully assess the ground and groundwater conditions (including whether groundwater is tidally influenced) beneath the site to inform foundation design options, potential ground contamination and inform assessments such as the aggressively of the ground to concrete and steel (such as low pH and high sulphates).

Foundations

- The available information indicates an uncontrolled variable fill thickness of around 10m beneath the site, therefore it's anticipated a building development will be supported on piled foundations through the fill and socketed in to the bedrock.
- Potential issues associated with piling, depending on the piling methods adopted, may include:
    - Vibration, noise and dust;
        - Potential impact on site neighbours and adjacent utilities, foundations, structures, basements and adjacent buildings.
- Material descriptions of the fill from the trial pitting investigation at the site indicate the fill to be soft/ loose, which will therefore require a robust temporary platform to support construction plant, piling operations and equipment.
- Buried inclusions within the uncontrolled fill are anticipated to present obstruction or impact excavations, and piling works. The limited 2014 ground investigation within the top 2m encountered brick, concrete, glass, iron, plastic, timber, metal and cobble and boulder sized fragments of concrete and granite.

Basements

- If a basement / partial basement is constructed as part of the development the following issues are anticipated:
    - Surplus arisings (which based on limited information indicates typically comprise uncontrolled variable fill) will require a materials management plan in accordance with the SOJ (as described above)
    - A cut/ fill balance is anticipated to be unlikely due to the relatively flat site
    - Potential for significant costs associated with material management such as off-site disposal, remediation and / or treatment

- Consideration of temporary and permanent groundwater control measures if groundwater is high

Groundwater control measures

- Groundwater conditions are currently unknown. Ground investigation is required to provide information on the groundwater conditions in order to develop a hydrogeological conceptual model and to prescribe appropriate groundwater control methods.
- Groundwater control measures are likely to be required during temporary excavations and construction may be required to provide a dry and stable working area.
- Determination of appropriate groundwater control measures such as pumping or cut off wall will depend upon factors such as groundwater flow rates, building proposals, construction programme and working space available.

Ground contamination potential

- The Waterfront site comprises reclaimed land and forms part of uncontrolled fill (West of Albert land reclamation) which is understood to be uncontrolled. The landfill is therefore likely to contain contaminants of concern.
- A limited ground investigation undertaken in February 2014 investigated the top 2m layer for drainage works associated with construction of a proposed temporary car park. The encountered fill comprised dark brown grey silty gravel / clayey gravel / silt / clay / sandy / gravelly ash with inclusions of fragments of brick, concrete, glass, iron, plastic, timber, metal and cobble and boulder sized fragments of concrete and granite. The base of the fill was not proven. The logs relating to the 2014 investigation indicates heterogeneous / mixed waste within the top 2m to be present across the site based on the limited spacing of excavations across the site.
- Waste characterisation assessment of the limited available chemical data pertaining to materials within the top 2m of the ground surface (prior to construction of the temporary car park) has been undertaken. A technical note presenting the results of this waste characterisation assessment should be read in conjunction with this note.
- When the proposed development details are confirmed, further desk study and development of a conceptual site model will be required to inform the design of a targeted ground investigation. Subsequent to this it will be possible to identify constraints related to ground conditions and potential ground contamination. Depending on the level of contamination encountered detailed risk assessments may be required, which will be subject to regulatory approval, to confirm the suitability of the site for the proposed development and the requirement for any remediation.
- It is likely, considering the nature of the ground and the proposed foundations solution, that the following will be required by the regulatory authorities:
  - Foundation works risk assessment
  - Ground gas assessment
  - Soil risk assessment

- Groundwater risk assessment

- Consideration of planning conditions, in relation to contaminated ground, that may be imposed on the development should also be taken in to account.
- Based on findings of limited ground investigation, fragments of Asbestos Containing Materials (ACM) were identified within the upper 2m of the landfill. The client will need to rely on the services of an asbestos specialist for appropriate surveys and management of asbestos, including appropriate disposal (this is not within Arup's scope of works).
- Should peripheral landscaped area be incorporated in to the development design, it is anticipated importation of topsoil will be required to facilitate an appropriate growing medium and a potential regulatory requirement for topsoil importation validation.

UXO potential

- The anticipated soft clay associated with the beach deposits present beneath the fill is anticipated to have been exposed at surface/ at the shore during WWII and would have the potential for bombs to sink within the soft beach deposit. Initial, historical searches indicate Jersey was not heavily bombed during WWII and that parts of the Island were used to store UXOs. The potential presence of UXOs should not be ruled out and a detailed assessment is recommended, prior to any ground investigation works / excavations at the site.

2.5 Option E

Background

- The site is a grassed public open space called 'People's Park', with trees along the south, south-eastern and north –western boundaries. The site is located to the west of the town centre of St Helier and is approximately 120m to the north of the sea front. The site is bounded by St Aubin's Road / Peirson Road in the south and east and a bowling green and Westmount Road to the west and north-west.

  The majority of the site is relatively flat with an elevation of around 13m AOD in the east to around 15m AOD in the west over a distance of around 80m, giving a very gentle gradient of around 1 in 40. Ground elevations within the western part of the site rise from around 20mOD to around 30mOD over a distance of around 30m, approximately equating to a 1 in 3 slope.

  When the building proposal details are known (including loads and dimensions) a ground investigation and laboratory testing is required to fully assess the ground (depth to bedrock) and groundwater conditions (and if tidally induced) and potential contaminants beneath the site, as a minimum to inform the following:

  - Foundation design options
  - The aggressively of the ground to concrete and steel (such as low pH and high sulphates)
  - Variability in strength and fracturing of bedrock

Bedrock

- No ground investigation records are available for the site. Nearest available historical ground investigation records 100m east of the eastern site boundary, located at Kensington Place encountered bedrock at around 9m bgl.
- Due to the lack of available geotechnical information, the presence of rock and the level of any rockhead cannot be determined with confidence. The rockhead level may also potentially vary across the site.

Foundations

- Given the uncertainty of the rockhead depth below the site, three rockhead depth scenarios have been considered.

  - Scenario 1: **Intermediate rockhead** – 4m to 6m below ground level

    Should rockhead be encountered at intermediate depth, it's anticipated building development may be supported on piled foundations socketed in to the bedrock, potentially a suspended ground floor slab or potentially pads / raft within the Head deposit.

  - Scenario 2: **Shallow rockhead** – 1m to 2m below ground level

Should rockhead be encountered at shallow depth, overlain by head deposits it's anticipated this scenario provides the potential for a ground bearing slab, raft or piled raft possibly within the head deposit or bedrock.

There is also a potential for surplus bedrock arisings to be generated during construction. There may be a potential opportunity for reuse as selected fill, subject to appropriate testing of material suitability and regulatory compliance.

- Scenario 3: **Deep rockhead** – > 10m below ground level

  Should rockhead be encountered at depth it's anticipated this scenario provides the potential for a pile foundation solution socketed in to bedrock.

Foundation design options will be dependent on suitability of the ground from the ground investigation information. Ground investigation will also allow development of foundation design parameters, ripability of bedrock, and understand potential foundation movements.

Excavatability

- Based on the rock descriptions from an adjacent site, rock excavatability is anticipated as follows:
  - Weathered bedrock: mainly hard dig to easy ripping, but locally hard dig
  - Intact / un-weathered bedrock: hard ripping to hydraulic breaker
- This requires confirmation through ground investigation and geotechnical testing.

Basements

- Initial proposals indicate a 5m clear headroom should be provided in the basement to allow for HGV traffic in the service-yard areas. If a basement is constructed as part of the development the following issues are anticipated:
  - Surplus arisings (which based on limited information indicates Head deposit and possibly Andesite bedrock in the intermediate and shallow rockhead scenarios)
  - basement construction in the intermediate and shallow rockhead scenarios would involve excavating out bedrock. Anticipated ripability / excavatability of bedrock is provided above. However, ripability could be an issue if the rock strength is higher than anticipated and had few fractures, this could slow down excavation progress and alternative solution to remove bedrock may be required, such as blasting.
  - Bedrock joints / fracturing could impact stability of the rock face and support measures will need careful consideration during basement design, which may require a basement wall / secant wall.
  - A cut/ fill balance is anticipated to be unlikely due to the relatively flat site
  - Consideration of temporary and permanent groundwater control measures if groundwater is high and consideration of tidally induced groundwater

Groundwater control measures

- Groundwater conditions are currently unknown, however previous ground investigation undertaken on an adjacent site indicates groundwater may be at depth. Ground investigation is required to provide information on the groundwater conditions in order to develop a hydrogeological conceptual model and to prescribe appropriate groundwater control methods, if necessary.
- Should groundwater be encountered, groundwater control measures during temporary excavations and construction may be required to provide a dry and stable working area.
- Determination of appropriate groundwater control measures such as pumping or cut off wall will depend upon factors such as groundwater flow rates, building proposals, construction programme and working space available, tidal influence on groundwater levels and flooding from the sea.

Topsoil surplus anticipated

- Topsoil is anticipated to be present beneath the site and is likely to be stripped as part of the construction works. There is a potential opportunity for topsoil reuse, subject to testing for suitability and compliance with regulators. Ground investigation is required to confirm the extent, volume and chemical suitability.

Ground contamination potential

- When the proposed development details are confirmed, further desk study and development of a conceptual site model will be required to inform the design of the ground investigation. Subsequent to this it will be possible to identify constraints related to ground conditions and potential ground contamination. Depending on the level of contamination encountered detailed risk assessments may be required, which will be subject to regulatory approval, to confirm the suitability of the site for the proposed development and the requirement for any remediation.
- Consideration of planning conditions, in relation to any potentially contaminated ground, that may be imposed on the development should also be taken in to account.

UXO potential

- There is a potential risk associated with UXOs (unexploded bombs) potentially deployed from aircrafts during WWII. Therefore, it is recommended that a detailed UXO assessment is undertaken ahead of any ground investigation excavations at the site.

Historic copper mines

- An old copper mine at West Mount, opposite the bowling green (higher ground in the western part of the site). The exact location is unknown. The entrance to the Westmount Copper mine is recorded opposite the bowling green. The adit (near horizontal mine entry) was used as an air raid shelter during WWII and sealed again after its use. Further review of this feature is required to understand the risk it presents, if any, to any future development of the People's Park site.

Archaeological

- Given the undeveloped history of the site an archeological study of the site may be required.

3 Risks/Opportunities

The key risks and opportunities are as follows:

Consideration and assessment of all of the above is anticipated in relation to each Option with regards to sustainability, programme, costs, buildability, temporary and permanent works considerations, costs of removal of waste and minimising removal of waste, health and safety risks, impacts on human health and soil and groundwater, the environment (including both land and marine), potential reuse of materials and consideration to site neighbours and future site users, to inform the assessment of uncertainty and risks and opportunities. In order to address each of these considerations a robust desk study, ground investigation and geotechnical and geo-environmental interpretative reporting is required to be undertaken for the selected site when the proposed building details are known.

DOCUMENT CHECKING

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Name	Katherine Iles	Kyla Nunn / Charlie Martin / Aled	Kyla Nunn / Aled
Signature			

A3

Legend

Site Locations

P1	2015-09-29	JM	KI	PT
P0	2014-10-23	JM	KI	PT
Issue	Date	By	Chkd	Appd

Metres
0 100 200 400

23/10/2014 17:33:59

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Client

States of Jersey

Job Title

Jersey Future Hospitals

Figure 1 - Site Location Plan

Scale at A3

1:7,500

Job No	Drawing Status
237035-00	**Preliminary**

Drawing No	Issue
001	P1

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JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Note – Tidal Impact

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

States of Jersey

Jersey Future Hospital

Preliminary Tidal Impact Study

TN-TI-001

P4 | 16 September 2015

Job number 237035

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Document Verification

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		Name	Kambiz Ayoubkhani	Peter Thomas	Nick Ashby
		Signature			
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Contents

Figures

Appendices

Appendix A

Drawings of Sea Walls

Appendix B

Overtopping Analysis

1 Introduction

This technical note has been prepared to support the preparation of the Site Validation Exercise as part of the Jersey Future Hospital Scheme.

The five options being reviewed as below:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

These five options are associated with four sites as detailed in Figure 1 below.

Figure 1 Site Locations

The risk of flooding is primarily from extreme tidal events causing wave overtopping of the sea defences and flood water collecting in the lower areas of St Helier.

The Overdale site is located at high ground and there will be no risk of flooding from wave overtopping. Therefore for the purposes of this report, the Overdale site has not been considered further.

This report provides the findings as the outcome of a review of the available information. It also recommends further work that is recommended to be undertaken as part of the next design stages. This will inform the next stages' design progression including completion of a comprehensive Flood Risk Assessment should one of options A, C, D or E be considered as the preferred option.

2 Scope of Study

This report is based on previous flooding assessments Arup have undertaken in 2011 for commercial developments in this area of St Helier. In addition, a Digital Terrain Map (DTM) of the area has been supplied by the States which has been used to create a 2D surface and plot contours.

The report does not review the risk of flooding from:

- Sewer Flooding
- Overland pluvial flooding
- Groundwater flooding
- Flood risk to basements
- Fluvial Flooding

It should be noted that the Overdale Hospital site will need to be assessed for the above mentioned flood risks.

3 Wave overtopping

Drawings of the coastal wall structures were obtained from TTS in 2011(Appendix A) which were used to analyse the wave overtopping.

The EurOtop, "Wave Overtopping of Sea Defences and Related Structures: Assessment Manual" was used to derive wave overtopping volumes. This is standard industry guidance for predicting the magnitude of wave overtopping and provides methods for determining the overtopping discharges for given met-ocean conditions on standard wall structure types.

The assessment considers the probability of an extreme tide and wind generated wave occurring simultaneously.

Four structures were considered to be vulnerable to wave overtopping that could reach the sites:

- Vertical sea wall running along Victoria Avenue (Type 1)
- Slipway to the south of Victoria Park (Type 2)
- Concrete terrace sea wall adjacent to Les Jardins de la Mer (Type 3)
- Rock armour revetment to the south of the terraced wall section. (Type 4)

The location of these different wall types is shown in the figure 2 below. This figure also shows the wave direction that was considered within this analysis. A wave direction of approximately 230° allows waves to enter St Aubin's Bay and reach Victoria Avenue without obstruction, resulting in the maximum wave overtopping potential.

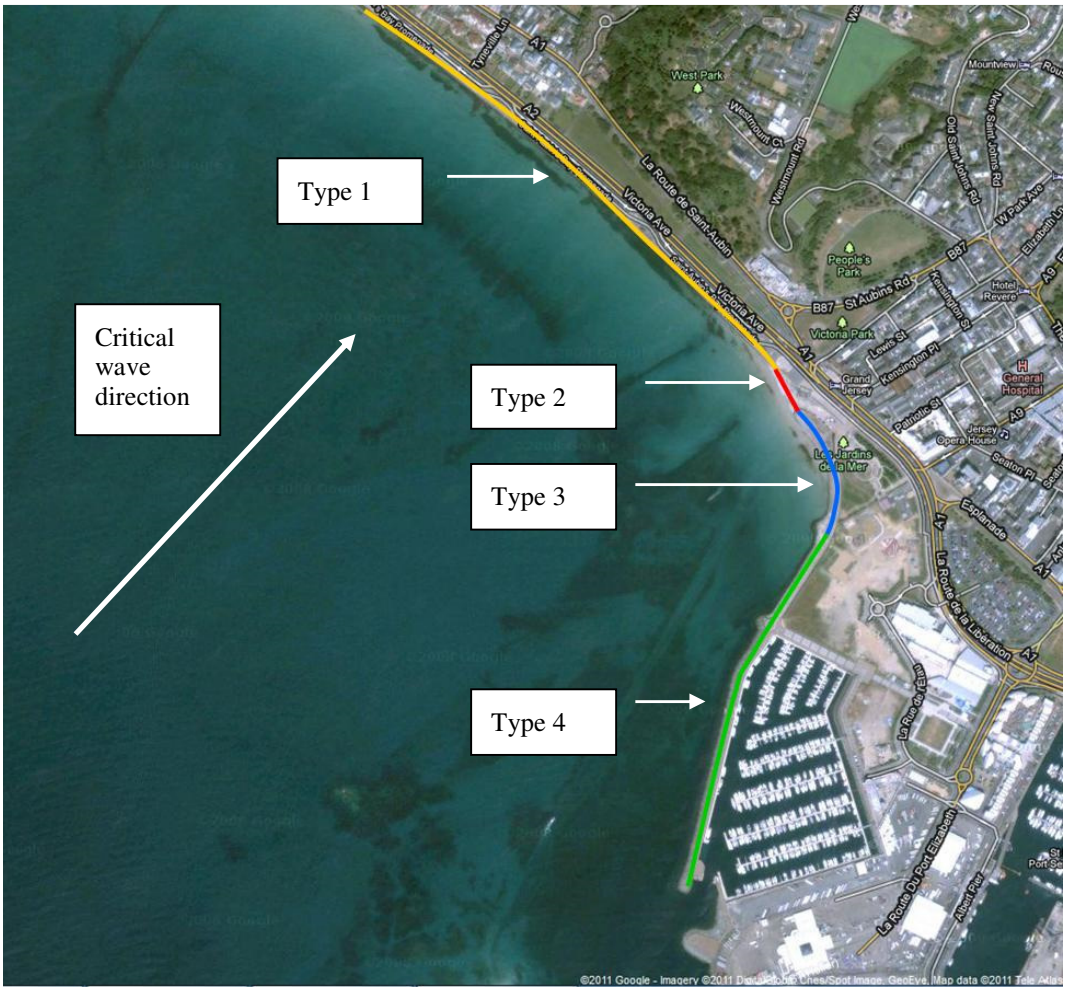


Figure 2 - Wall section locations

3.1 Victoria Avenue (Type 1)

The Victoria Avenue wall, reproduced in Appendix A, is a steeply sloped masonry structure with a curved lower section. Along some sections there is a stepped toe. Figure 3 below is a photograph of this wall type.

Figure 3 - Wall Type 1 photograph

The wall geometry was taken from the drawing provided by TTS with the crest of the wall at +9.1mOD and the toe at +2.0mOD.

Figure 4 below is an image from the BBC Jersey news website taken during the March 2008 floods showing the wave overtopped volume discharging into Victoria Avenue.

Figure 4 - Overtopped discharge down Victoria Avenue (BBC Jersey)

Figure 5 below shows the partial collapse of the flood defences following the 2014 storms.

Figure 5 – Partial collapse of defences in 2014 storms

3.2 Slipway (Type 2)

Figure 6 below shows a photograph of the slipway, wall Type 2.

Figure 6 - Wall Type 2 - slipway

The slipway has a width of 10m, a maximum slope angle of approximately 5% and a crest height of +8.0mOD. The surface is made up of blocks, resulting in a reduction factor to account for the increased surface roughness.

3.3 Terrace Revetment (Type 3)

Drawings of this wall section were received from TTS, reproduced within Appendix A. This wall structure is made up of a sloped revetment of terraced blocks placed on a rock filter layer and central rubble core. The toe of the wall is supported on a line of sheet piles driven to rock level. A photograph of this section of wall is shown in the figure 7 below.

Figure 7 - Wall Type 3

From the drawings provided by TTS the crest level and slope angle were determined to be 9.7mOD and 1:2 respectively.

3.4 Rock Armour Revetment (Type 4)

Drawings of this section of wall was received from TTS and are reproduced in Appendix A. This section of wall is a rock revetment type structure with a double layer of 2 to 3 tonne rock armour placed on a stone rubble core. A photograph of the structure is shown in Figure 8 below.

Figure 8 - Wall Type 4

From the drawings provided by TTS the crest level and slope angle were determined to be 9.7mOD and 1:2 respectively.

4 Wave Overtopping Discharges

The overtopping assessment is included in Appendix B. The critical section of wall for wave overtopping is the vertical wall along Victoria Avenue. This vertical wall geometry produces the largest overtopping volumes compared to the more sloped sections of the other wall types. The vertical wall along Victoria Avenue is also the only wall type subject to perpendicular head-on wave impact which significantly increases the overtopping volumes.

4.1 Boundary Assessment

To determine the overtopping volumes across three scenario bounds the following assumptions have been varied. This is to allow a range of values to be presented. It is worth noting that the empirical formulae used to determine wave overtopping volumes can never accurately model the complex wave, structure interactions that take place during an overtopping event for a given set of met-ocean conditions. As such they are intended as a guide to the order of magnitude.

For the lower bound approach the current day water levels have been used. This acts to increase the free-board at the wall structure reducing the overtopping volume. A probabilistic approach has also been adopted which uses a lower confidence factor to assess the resulting discharge volumes.

For the upper bound approach the predicted future water levels and a deterministic approach were adopted. The increased water levels will act to reduce the free-board of the wall structures increasing overtopping. Using a deterministic approach applied a higher confidence factor within the discharge volume determination, increasing the resulting volumes by almost a factor of 2.

The middle bound overtopping volumes were calculated as an average of the upper and lower bounds.

The overtopping volumes from the calculations in Appendix B seem to be high given that reported flooding is less frequent than the figures would suggest. This is especially the case for the middle and upper bound figures. It should be noted that the HR Wallingford Study (Jersey Coastal Management Study 1991) produced even higher figures for a similar section of sea wall further to the West along Victoria Avenue.

This apparent anomaly can possibly be explained by:-

- Localised flooding from wave overtopping at Victoria Avenue is unreported because it is short lived and no sensitive structures are affected.
- Part of the overtopped water usually flows into the local storm drainage network and where possible back into the sea
- Historic overtopping would have been less frequent because sea levels are rising.

5 Flood routes and levels assessment

Figure 9 below illustrates the principal flow routes from the overtopping source. The key points to note are as follows:-

- There is a 'flood hump' in the region of the Gloucester Street and Esplanade junction. This is at a level of +7.4mOD and as such will act to block surface water from travelling down Esplanade and Gloucester Street until it is overtopped. This hump will cause the backing up of water behind it during a flood event.
- Once flood waters overcome the above flood hump, water will pass down Gloucester Street, Seaton Place and the Esplanade. The area is relatively low lying so the flood water will pond in this area and begin to spread over a wider area.
- Flood water will then continue up Castle Street and Commercial Street to the North East and South East respectively.
- At the junction of Esplanade and Castle Street flood flows will not pass this point until overtopping a ridge in the road at approximately +7.25m OD. Beyond this level, water will pass down towards the marina and the southern entrance to the underpass of the La Route de la Liberation.

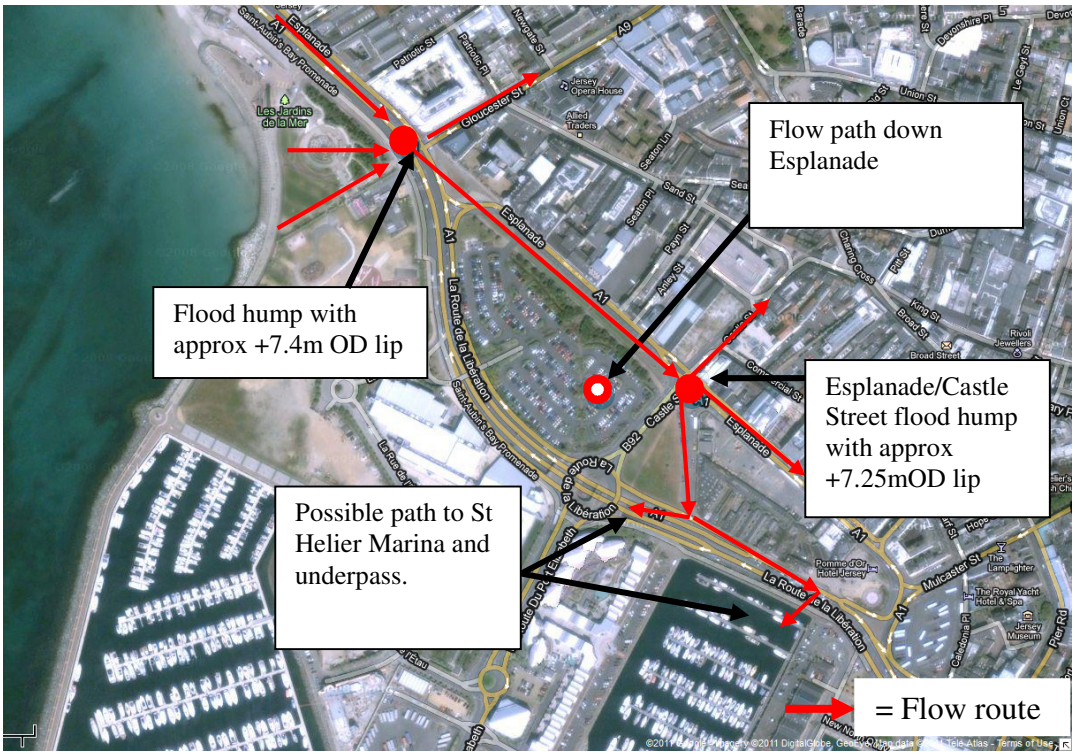


Figure 9 – Principal Flow Routes and Key Levels

Appendix B summarises the conclusions of the wave overtopping assessment.

The following variables were altered to determine lower and upper bound overtopping volume rates across the different wall types. The middle bound was the average of the upper and lower bounds.

Lower bound

- Current day water levels were used (i.e. no allowance for climate change)
- A 10% reduction in wave height was allowed for wave transformation inshore
- A reduced correlation between maximum extreme water levels and wave heights was used (approximately 0.5). Ie. an extreme wave event of return period 50 years was combined with an extreme water level with return period 25 years.

A probabilistic assessment was used. This relates the fit of the empirical wave overtopping model to the recorded data. Using the probabilistic tools 50% of the recorded data points exceed the model prediction and 50% fall below the predicted values.

Upper bound

- Future (50 year) water levels were used.
- No wave height reduction was allowed for – to allow for possible wave concentration.
- A correlation of 1.0 between extreme water levels and wave heights was assumed. Such that the combination of events with the same return period was considered, i.e. a 50 year return period wave event was combined with a 50 year water level event.

Table 1 below reproduced from Appendix B, indicates the volumes of flood water likely to be overtopped for varying return periods and lower to upper bound conditions.

Return Period	**1 year**	**10 year**	**20 year**	**50 year**	**100 year**
	Volume	**Volume**	**Volume**	**Volume**	**Volume**
Bound	**[m³]**	**[m³]**	**[m³]**	**[m³]**	**[m³]**
Lower	3,850	21,500	33,500	56,000	135,000
Middle	11,425	62,250	96,250	155,500	257,000
Upper	19,000	103,000	159,000	255,00	379,000

Table 1 – Wave overtopping volumes

SK-TI-001 shows the depth contours obtained from the Digital Terrain Model at 0.5m intervals ranging from 6m OD to 8.50m OD.

A 3D surface of the contours has been created and draped over the DTM surface to calculate the storage volume contained below each contour interval. Table 2 below indicates the calculated storage volumes available.

Depth Interval m	**Storage Volume m3**
6.00 – 7.0	3,540
6.00 – 7.50	74,130
6.00 – 8.0	177,740
6.00 – 8.50	392,330
6.00 – 9.00	638,960

Table 2 – Storage volumes available

Comparison of predicted flood volumes in table 1 with the available storage volumes in table 2 indicates that based on the simplified assumption that all flood water will be evenly stored within the low lying areas, the flood levels are unlikely to rise above 8.50m OD.

6 Conclusions

The available information, which is some 4 years old, indicates that in extreme tidal and wave events, the sea defences are likely to be overtopped and flood parts of St Helier. In the absence of comprehensive hydraulic modelling and calculations to latest data sets which will be undertaken at subsequent design stages, the significant difference in volumes, for a 1 in 100 return period in the upper bound, between the depth intervals 6.00-8.50m and 6.00-9.00m provides reassurance that the 8.50m OD flood levels remain appropriate.

Minor flooding is likely to occur in a 1 year event.

If flood levels were to reach 8.50m OD, the impact on the proposed sites can be assessed as follows:

6.1 Waterfront Site

The Waterfront site would be flood free as it is at or above 9.00m OD. However. The means of access/egress would be flooded to a maximum depth of some 2.5m.

Options have been considered to provide a flood free access to the site. For the purposes of this study a proposal of the following has been allowed for at this early stage:

- a strengthening and raising of the sea wall.
- relocation of the tidal protection hump further to the north west to prevent potential flooding and enable a new at-grade junction arrangement to be provided.

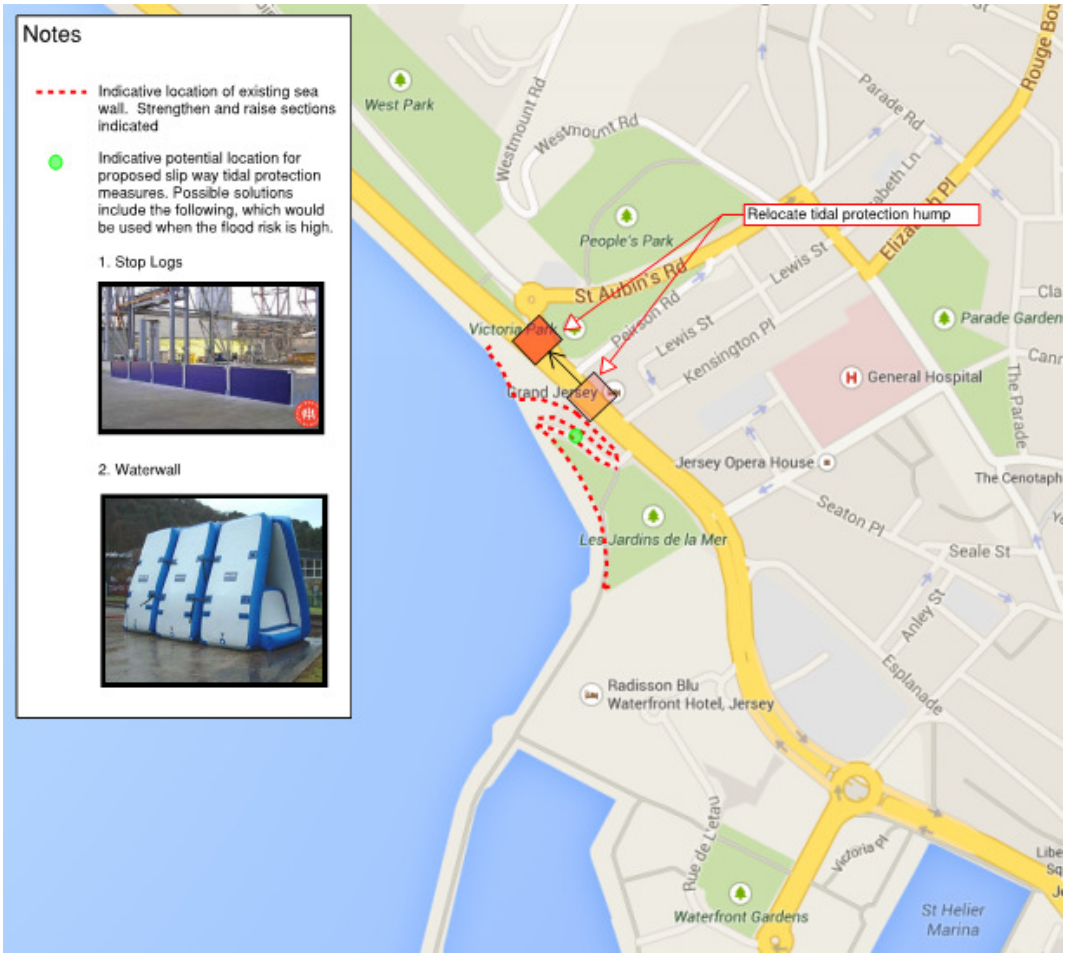


Figure 10 – Waterfront Access Initial Proposals

6.2 Existing General Hospital

The existing hospital site would generally remain flood free, although there is a risk that some basements could be flooded. However, with careful management of the proposed basement thresholds and the provision of flood gates, the hospital can remain flood free and operational.

Access/egress to the site will be available from the higher ground to the north and east but the south western routes onto Gloucester Street and Newgate Street may be inundated.

6.3 People's Park

Site levels vary from 12.0m OD to 20.0m OD. The initial findings from our review of the available flooding data indicate that levels above 8.5m OD are unlikely to flood and it is therefore unlikely that the site will be affected by tidal waters. Given the basement provision and proximity of the site to the sea, further work to ensure this risk is given full consideration will be undertaken in future design stages.

The A1 and A2 roads have historically flooded and these form principal access routes from the east and potentially the west. Access from the north of the site and other routes from the east and west are available.

7 Proposed Further Work

To provide a more robust assessment of flood risk for the proposed hospital sites, it is recommended that the additional information is collated and the study extended as described below:

1. Update the overtopping assessment model to incorporate the latest requirements and recommendations on climate change.
2. Undertake Lidar survey of the low lying areas below 10.0m OD contour with a 2.0m grid and accuracy of +- 150mm and extend to include the lower site boundary of the respective site
3. Undertake topographical survey to complement the Lidar survey and accurately determine the level of flood defences, kerb lines and any obstructions to flood routes.
4. Undertake 2D hydraulic modelling using Tuflow or MIKEFLOOD software package to determine flood plain extent and depth and velocity of flood water.
5. Assess impact of sewers, including the flood tunnels on the surface flooding.
6. Assess impact of flooding from other sources such as pluvial, fluvial and groundwater.

Figures

Appendix A

Drawings of Sea Walls

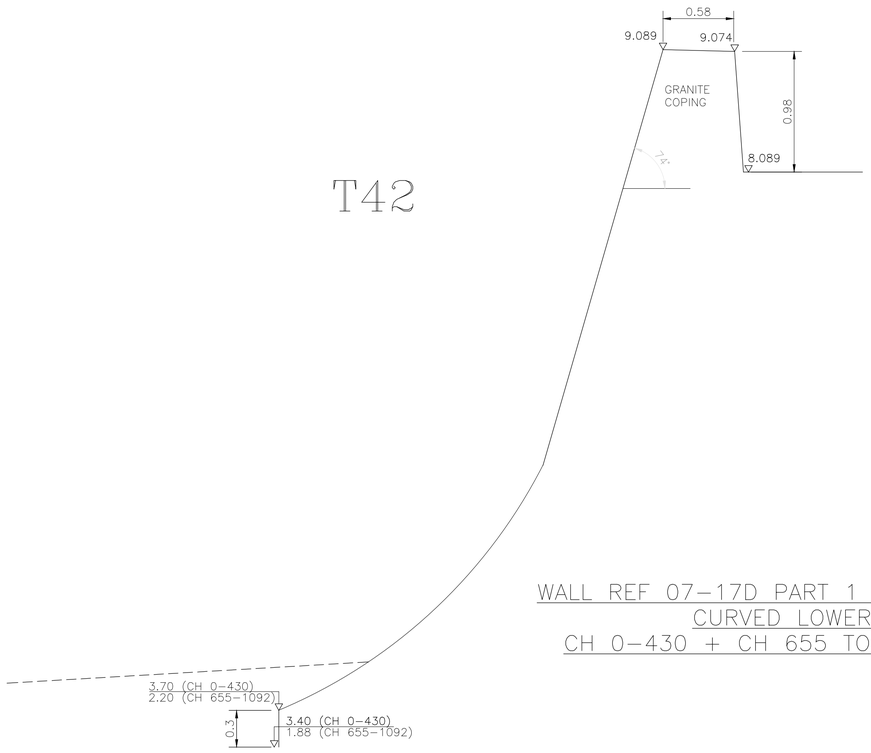
Drg. No. 07-17D-01

NOTES

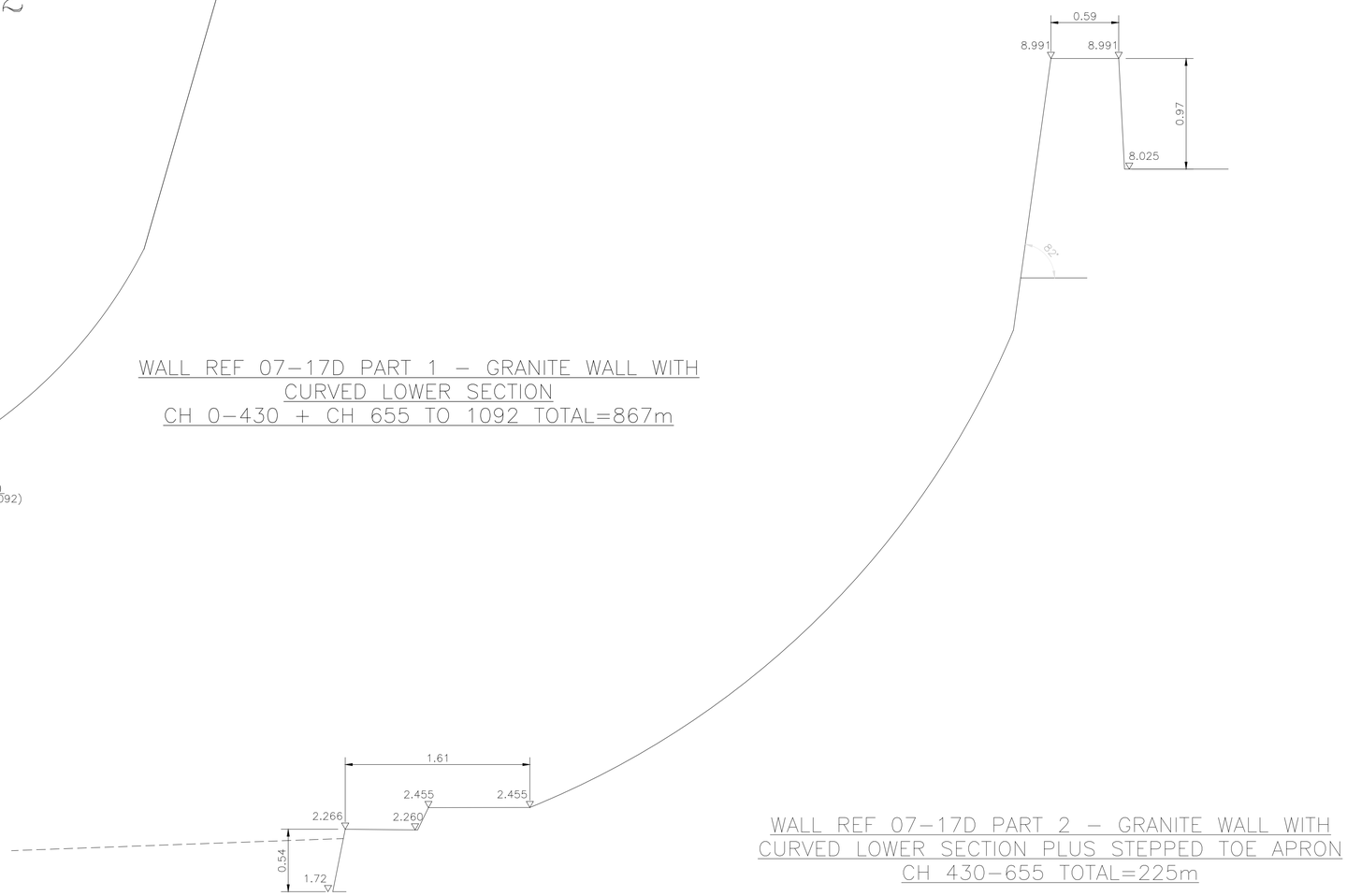
NOTE
CH 75–427 AND 470–653 – TOE PROTECTED BY ROCK ARMOUR, PREVENTING EXCAVATION

ALL LEVELS SHOWN ARE m AOD. FOR ADMIRALTY LEVELS ADD 5.892m

T42



WALL REF 07–17D PART 1 – GRANITE WALL WITH CURVED LOWER SECTION
CH 0–430 + CH 655 TO 1092 TOTAL=867m



WALL REF 07–17D PART 2 – GRANITE WALL WITH CURVED LOWER SECTION PLUS STEPPED TOE APRON
CH 430–655 TOTAL=225m

Rev	Date	Init	Details

STATES OF JERSEY

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Fax – 01534 68950

PUBLIC SERVICES DEPARTMENT

Project
COASTAL DEFENCE STRATEGY

Title
WALL REFERENCE 07–17D CONSTRUCTION DETAILS

Drawn by : SCS	Project Engineer : CS
Designed by :	
Checked by :	Date : JUNE 2002

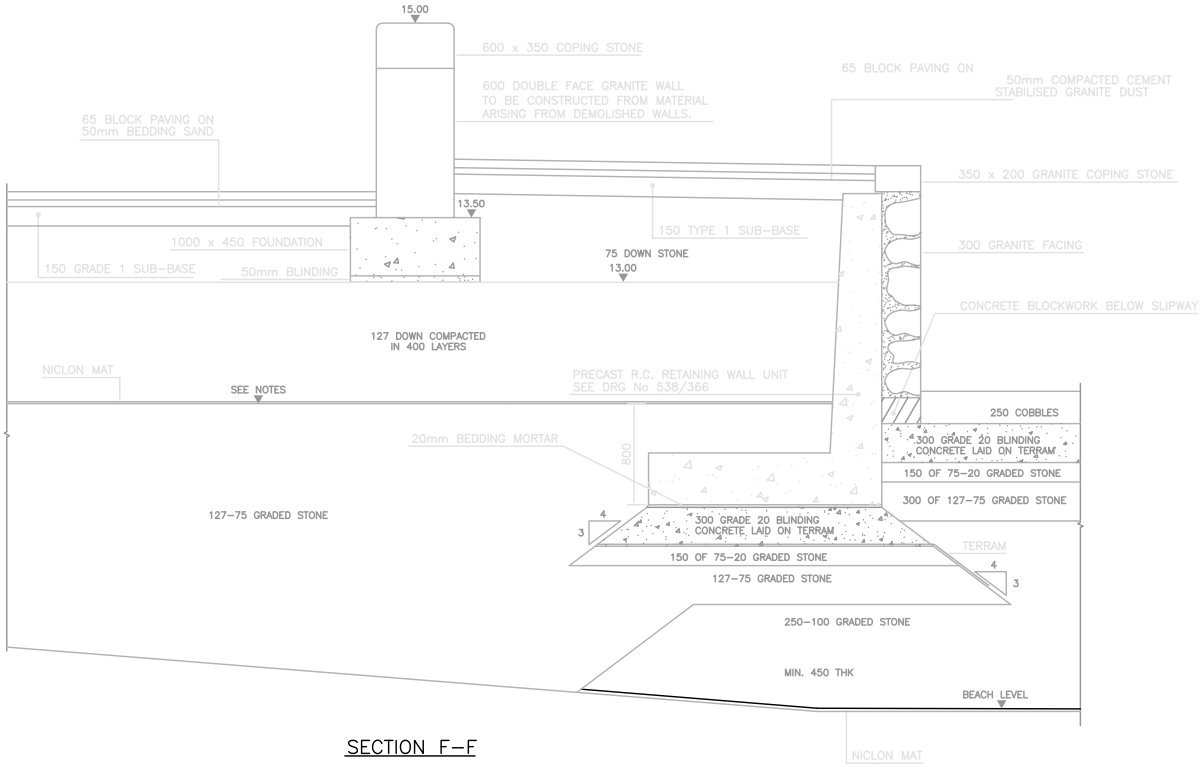
Scales 1:25

Drg. No. 07-17D-01

Drg. No. 538/543 (E)

NOTES

1. FOR SECTIONS D–D & E–E SEE DRG No 538/542
2. FOR SECTION LOCATIONS SEE DRG. No. 538/541
3. FOR G.A. & REINFORCEMENT DETAILS OF PRECAST UNITS SEE DRG. No. 538/366
4. BACKFILLING BEHIND THE PRECAST RETAINING WALL SHALL BE LIMITED TO ONE THIRD OF THEIR HEIGHT UNTIL THE SLIPWAY BLINDING CONCRETE LAYER IS IN PLACE.
5. FOR PAVING DETAILS SEE DRG. No. 538/601



SECTION F–F

AS BUILT

E	05–06–98	SCS	AS BUILT
D	03–01–94	BEL	MOVED FOUNDATION LEVEL AS SHOWN & CHANGED BLOCK PAVING DEPTH
C	16–09–93	BEL	CHANGED FILL MATERIALS AS SHOWN
B	11–06–93	BEL	ISSUED FOR TENDER
A	02–04–93	BEL	ISSUED FOR TENDER
Rev	Date	Init	Details

STATES OF JERSEY
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PUBLIC SERVICES DEPARTMENT

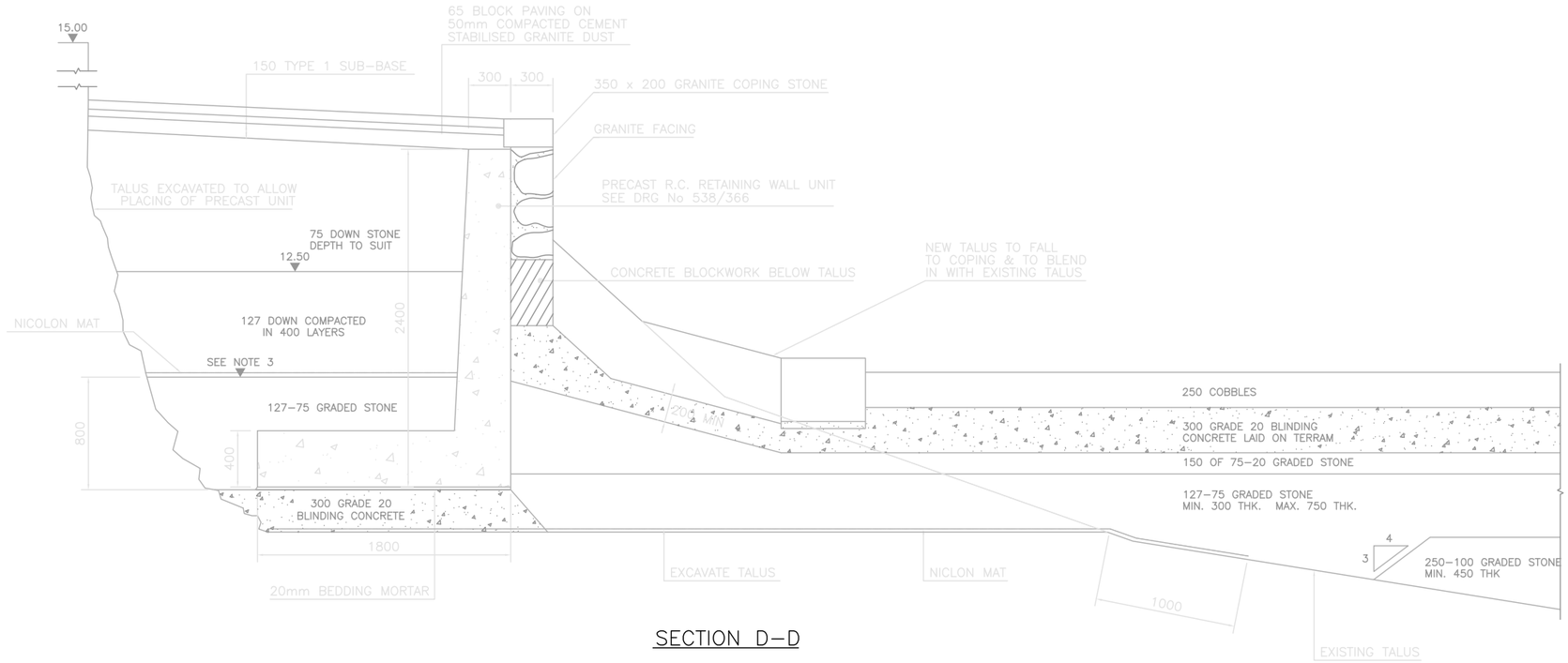
Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
SLIPWAY
DUKW AREA
CROSS–SECTION
SHEET 2

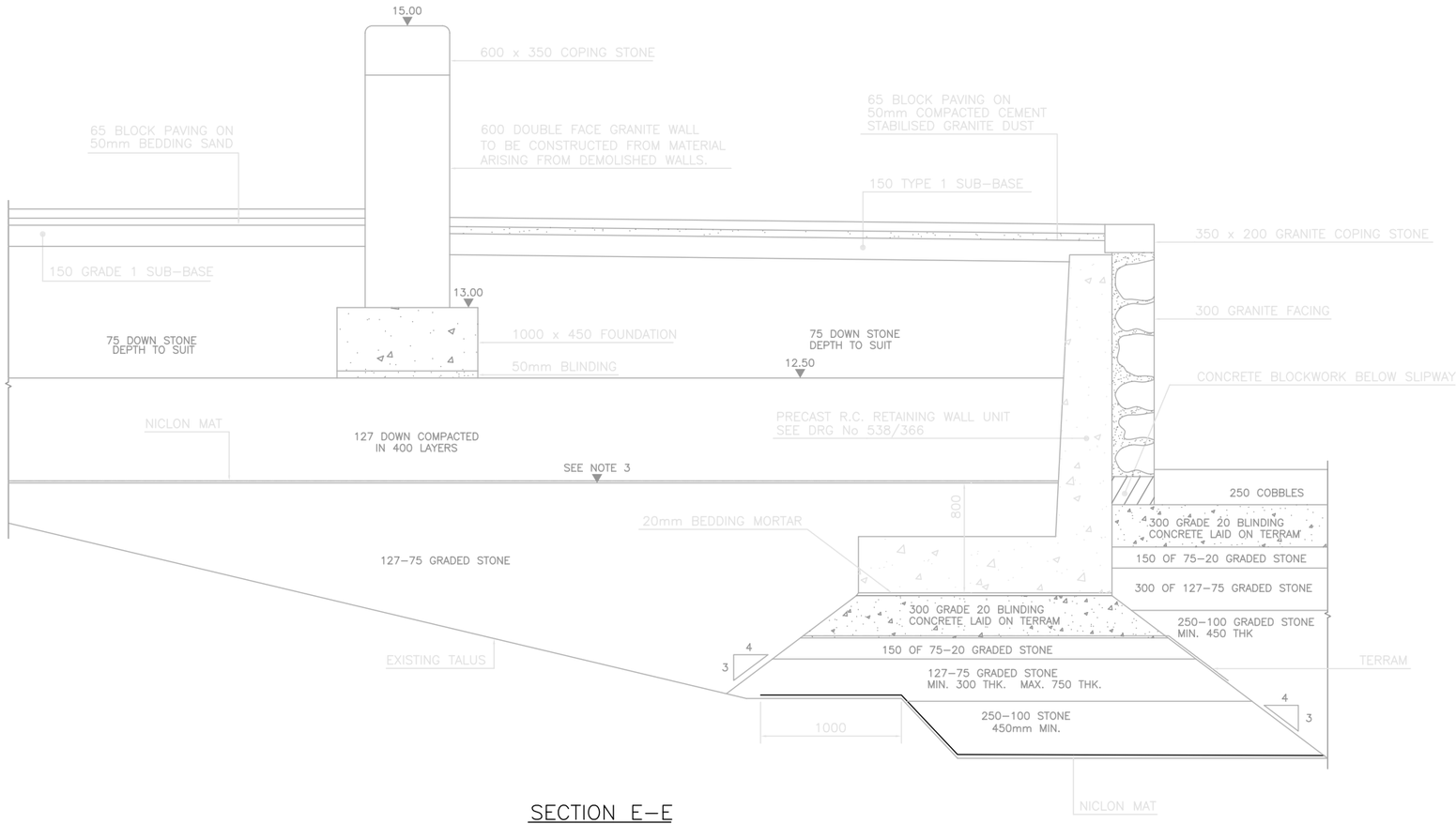
Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : G.M.M
Checked by : BEL	Date : MARCH 93

Scales 1:20

Drg. No. 538/543 (E)



SECTION D-D



SECTION E-E

Drg. No. 538/542 (E)

NOTES

1. FOR SECTION LOCATIONS SEE DRG. No. 538/541
2. FOR G.A. & REINFORCEMENT DETAILS OF PRECAST UNITS SEE DRG. No. 538/366
3. BACKFILLING BEHIND THE PRECAST RETAINING WALL SHALL BE LIMITED TO ONE THIRD OF THEIR HEIGHT UNTIL THE SLIPWAY BLINDING CONCRETE LAYER IS IN PLACE.
4. FOR PAVING DETAILS SEE DRG. No. 538/601

AS BUILT

Rev	Date	Init	Details
E	04-06-98	SCS	AS BUILT
D	03-01-94	BEL	CHANGED BLOCK PAVING DEPTH & ADDED DIMS TO SECTION E-E
C	16-09-93	BEL	CHANGED FILL MATERIALS AS SHOWN
B	11-06-93	BEL	ISSUED FOR CONSTRUCTION
A	11-06-93	BEL	ISSUED FOR TENDER

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Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
SLIPWAY
DUKW AREA
CROSS-SECTION
SHEET 1

Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : G.M.M
Checked by : BEL	Date : MARCH 93

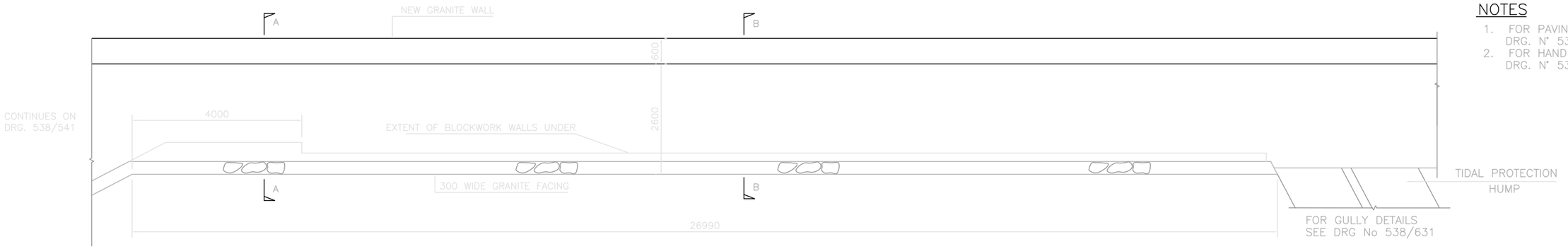
Scales 1:20

Drg. No. 538/542 (E)

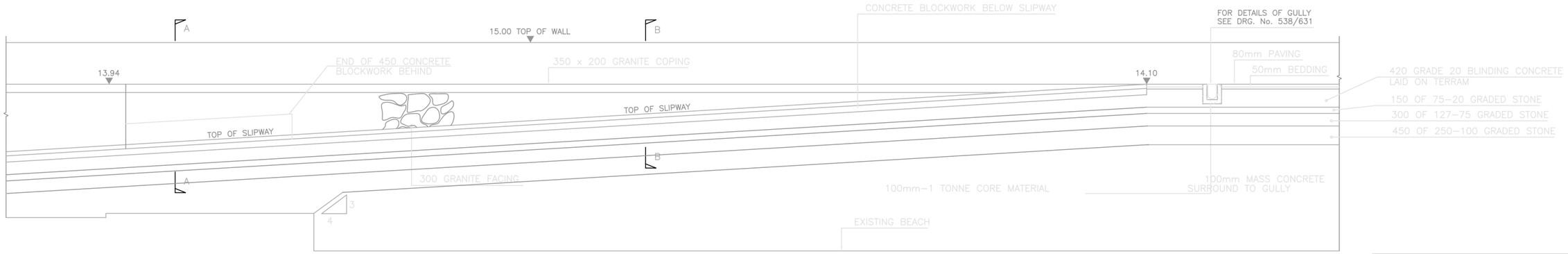
Drg. No. 538/532 (E)

NOTES

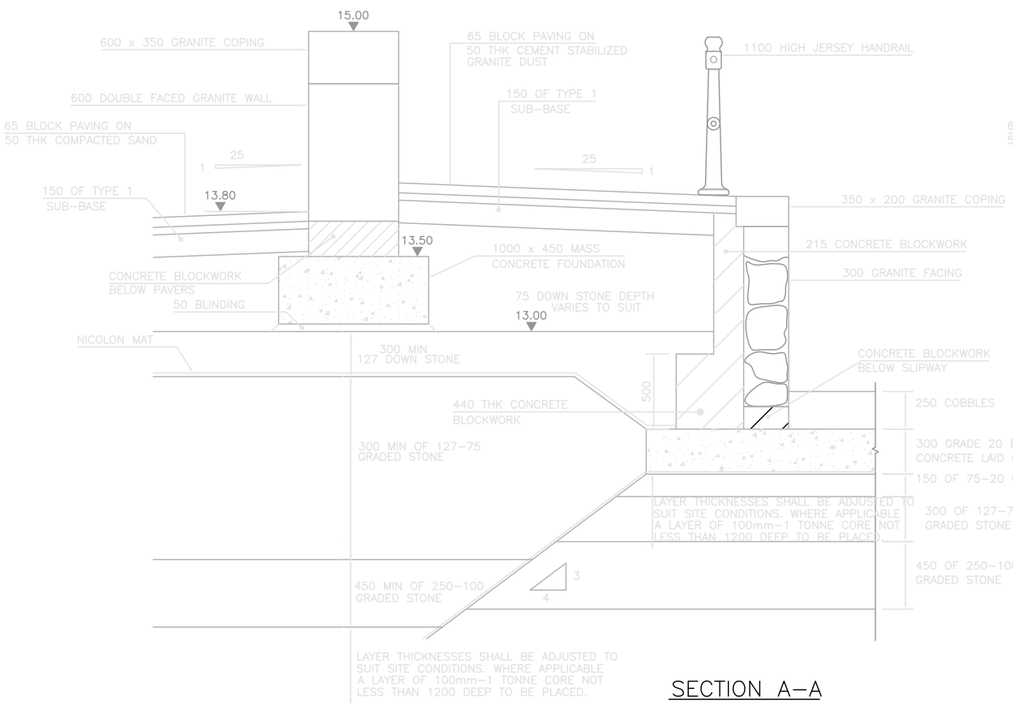
1. FOR PAVING DETAILS SEE DRG. N° 538/601
2. FOR HAND RAIL DETAILS SEE DRG. N° 538/621



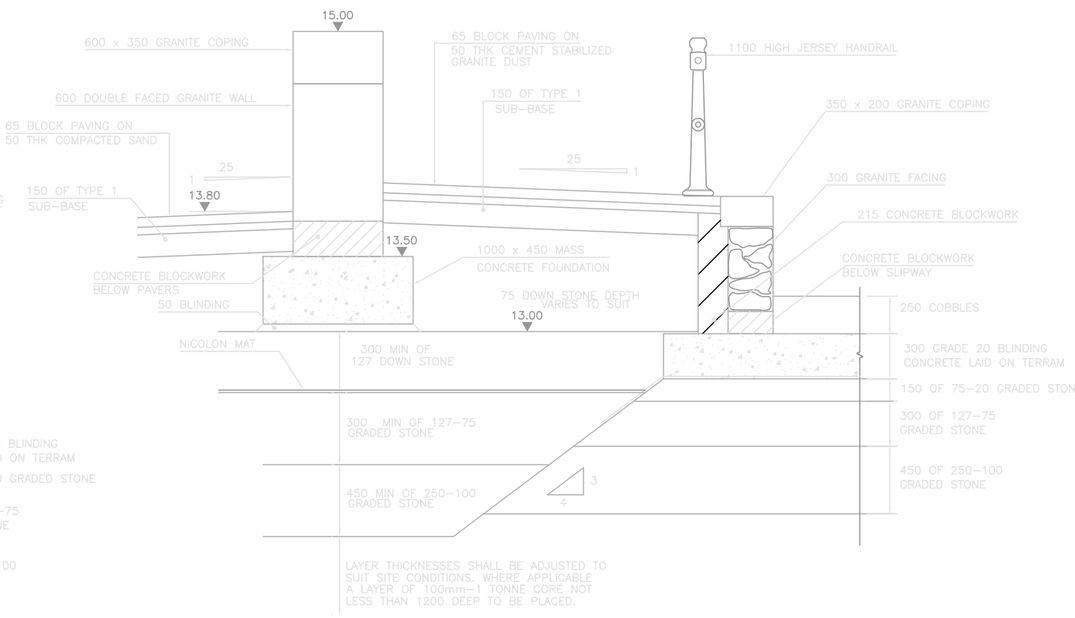
PLAN ON WALKWAY



ELEVATION OF WALKWAY



SECTION A-A
1:20



SECTION B-B
1:20

AS BUILT

Rev	Date	Init	Details
E	04-06-98	SCS	AS BUILT
D	03-01-94	BEL	ADDED NOTES TO A-A & B-B
C	16-09-93	BEL	CHANGED UPPER MATERIALS AS SHOWN
B	11-06-93	BEL	ISSUED FOR CONSTRUCTION
A	02-04-93	BEL	ISSUED FOR TENDER

STATES OF JERSEY
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Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
SLIPWAY
TYPICAL SECTION THROUGH
ACCESSS WALKWAY

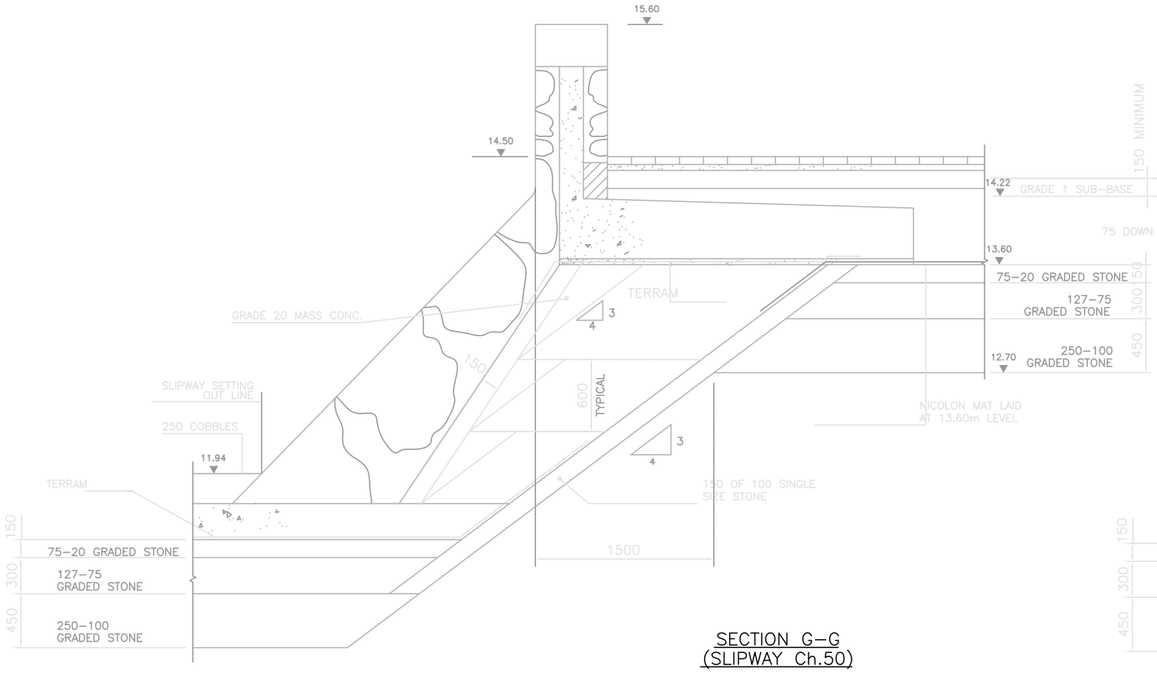
Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : G.M.M
Checked by : BEL	Date : MAR. 1993

Scales 1:50

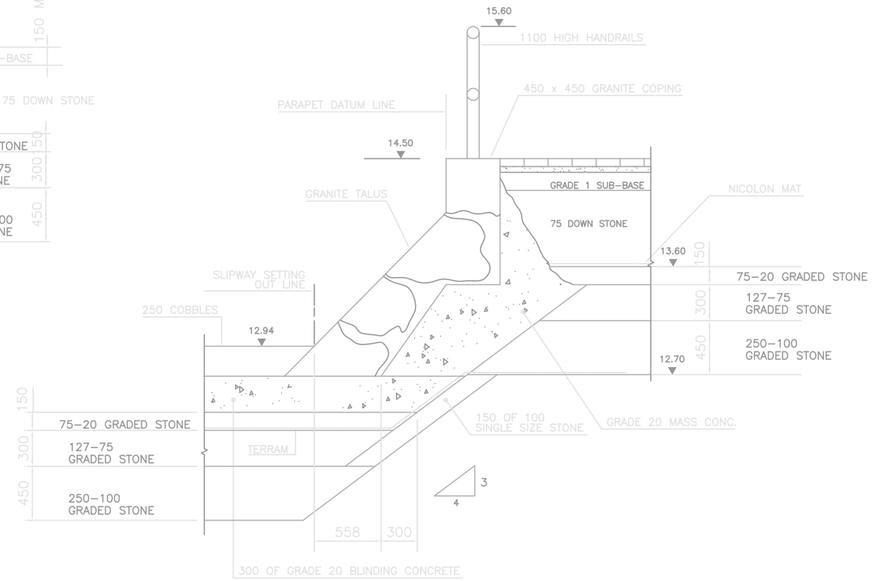
Drg. No. 538/532 (E)

Drg. No. 538/522 (C)

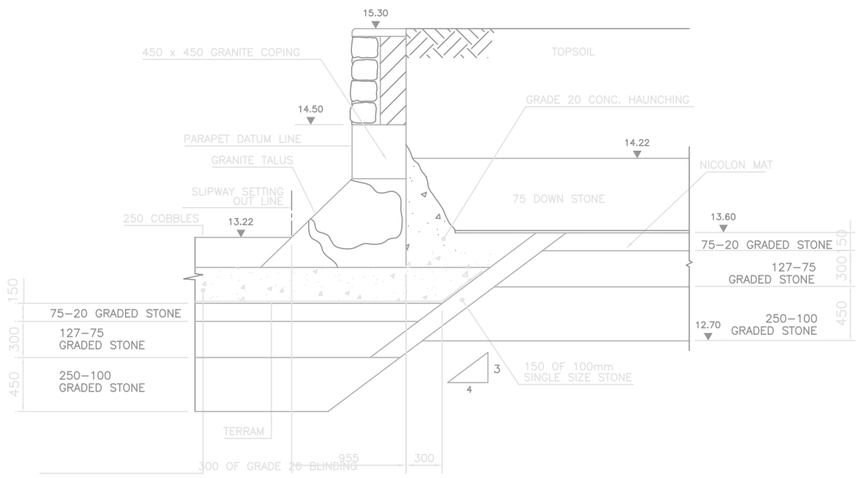
NOTES



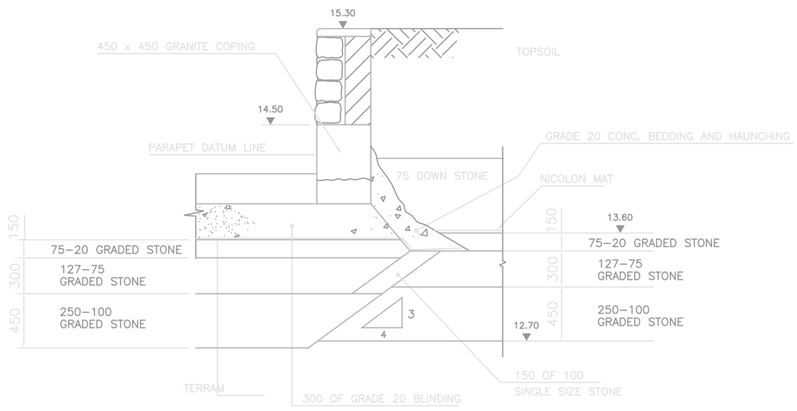
SECTION G-G
(SLIPWAY Ch.50)



SECTION J-J
(SLIPWAY Ch.70)



SECTION K-K
(SLIPWAY Ch.80)



SECTION L-L
(SLIPWAY Ch. 87.5)

AS BUILT

Rev	Date	Init	Details
C	02-06-98	SCS	AS BUILT
B	11-06-93	BEL	ISSUED FOR CONSTRUCTION
A	02-04-93	BEL	ISSUED FOR TENDER

STATES OF JERSEY
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Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
SLIPWAY
LANDWARD TOE DETAILS OF
GRANITE TALUS

Contract No. 538	Sheet No.
Designed by : BEL	Drawn by : G.M.M
Checked by : BEL	Date : MAR. 1993

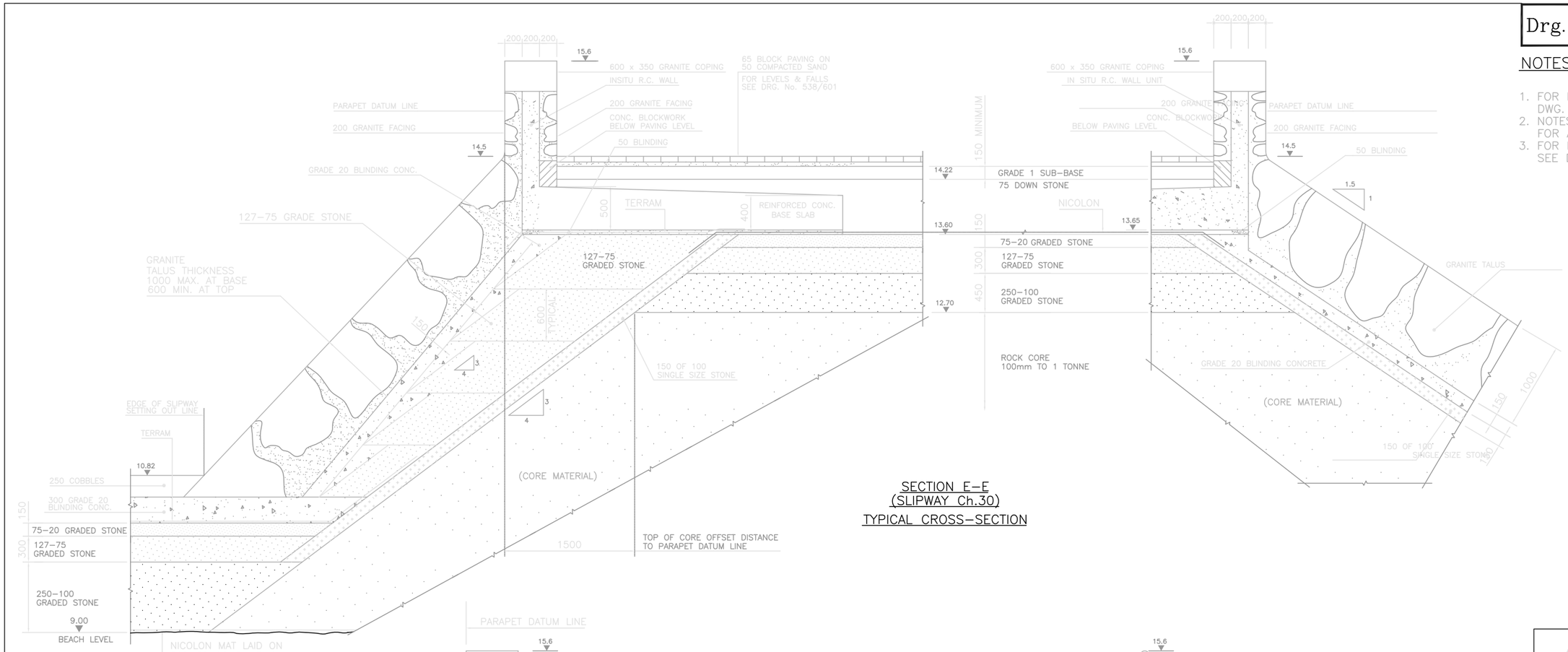
Scales 1:25

Drg. No. 538/522 (C)

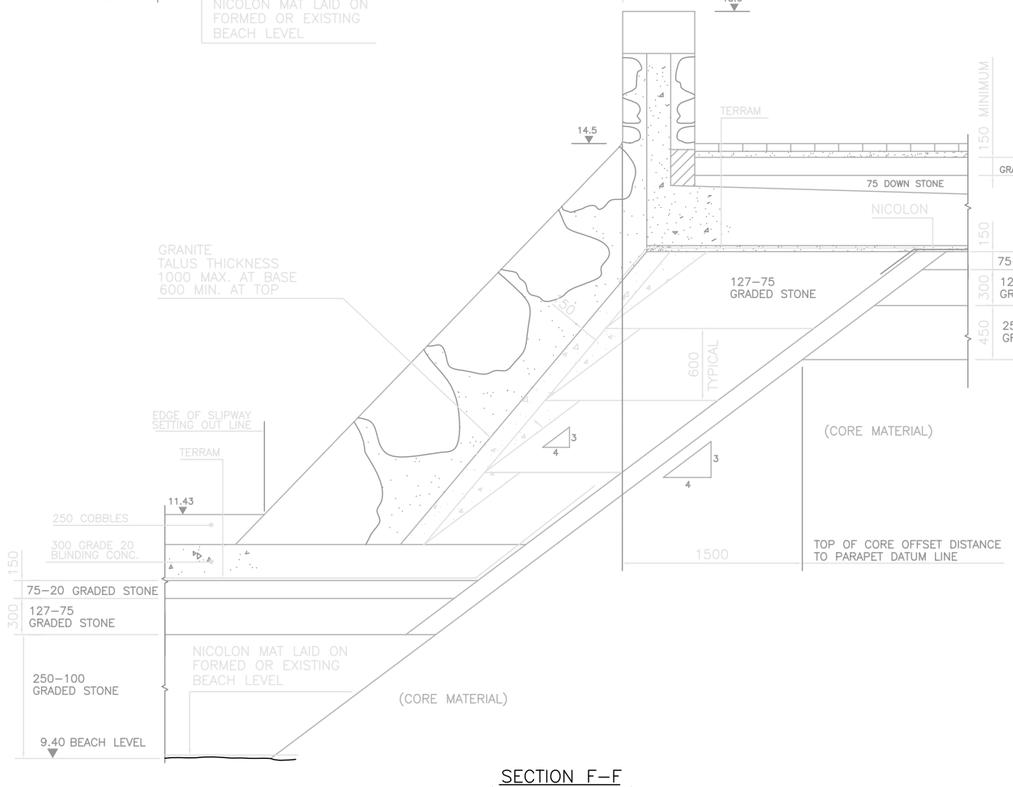
Drg. No. 538/511 (C)

NOTES

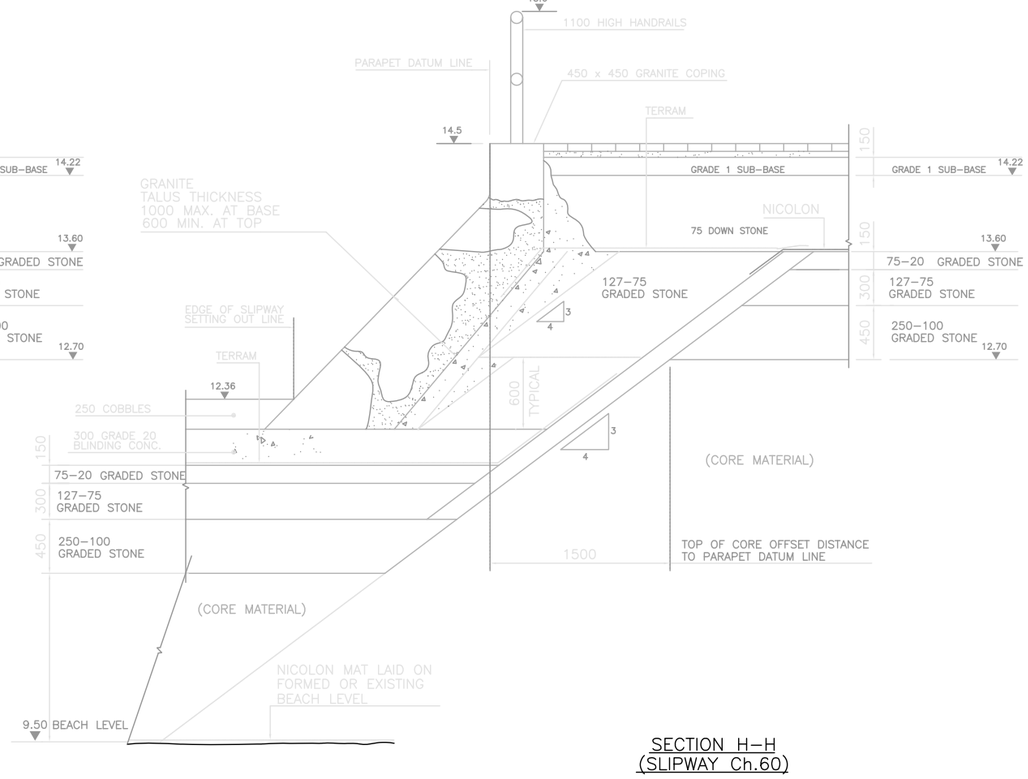
1. FOR LOCATION OF SECTIONS SEE DWG. No. 538/524
2. NOTES TO SECTION E–E TYPICAL FOR ALL SECTIONS.
3. FOR DETAILS OF R.C. SLAB & WALL SEE DRG. No's 538/551 & 538/552



SECTION E–E
(SLIPWAY Ch.30)
TYPICAL CROSS–SECTION



SECTION F–F
(SLIPWAY Ch.40)



SECTION H–H
(SLIPWAY Ch.60)

AS BUILT

Rev	Date	Init	Details
C	02–06–98	SCS	AS BUILT
B	11–06–93	BEL	ISSUED FOR CONSTRUCTION
A	02–04–93	BEL	ISSUED FOR TENDER

STATES OF JERSEY
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Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
SLIPWAY
TALUS
TYPICAL CROSS–SECTION & DETAILS

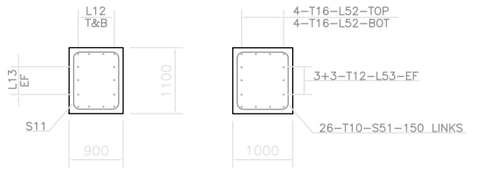
Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : G.M.M
Checked by : BEL	Date : MARCH 93

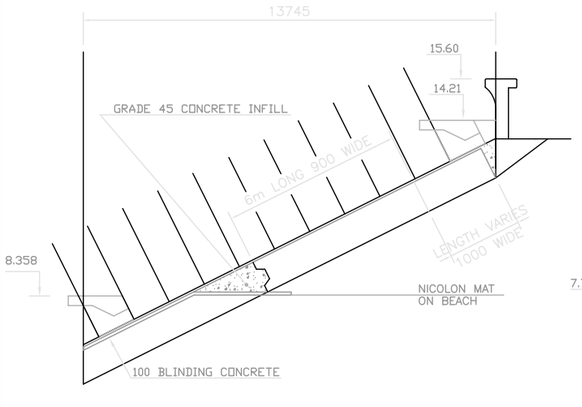
Scales 1:25

Drg. No. 538/511 (C)

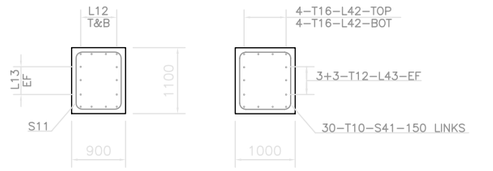
Drg. No. 538/254 (B)

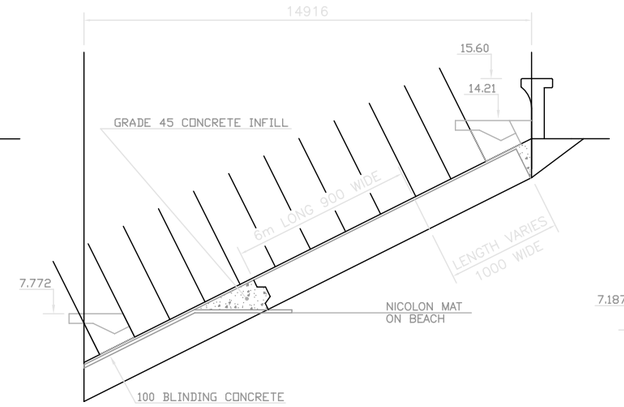
NOTES



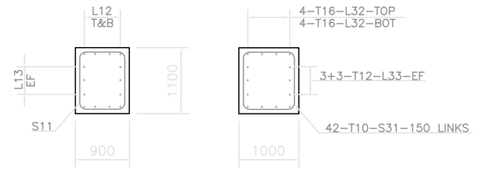


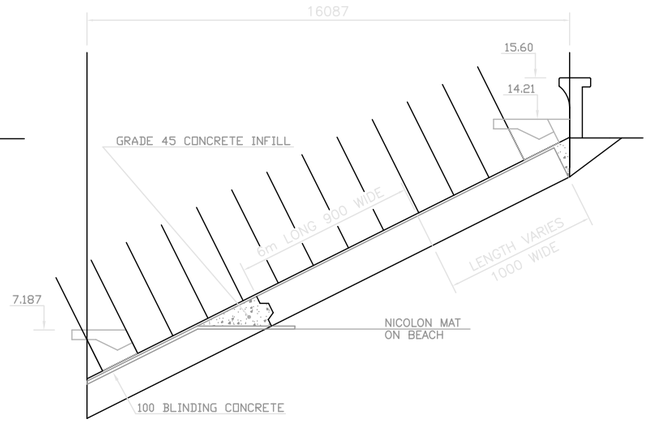
11 BLOCK SECTION
(20 GROUND BEAMS THUS)



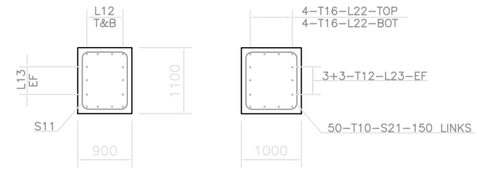


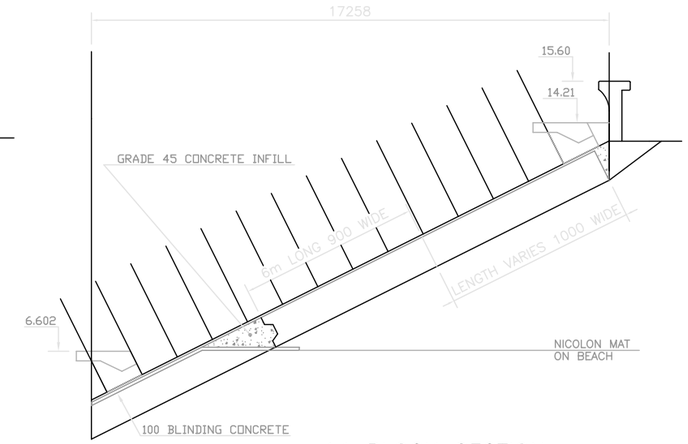
12 BLOCK SECTION
(14 GROUND BEAMS THUS)



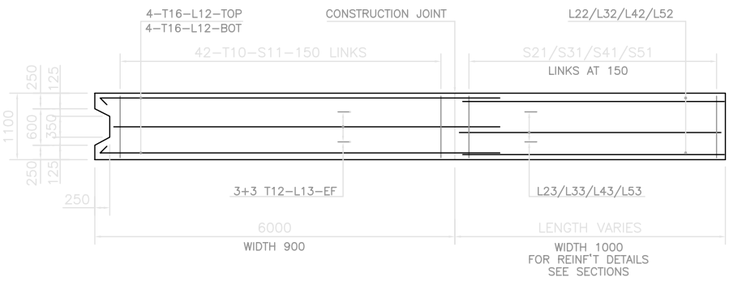


13 BLOCK SECTION
(9 GROUND BEAMS THUS)





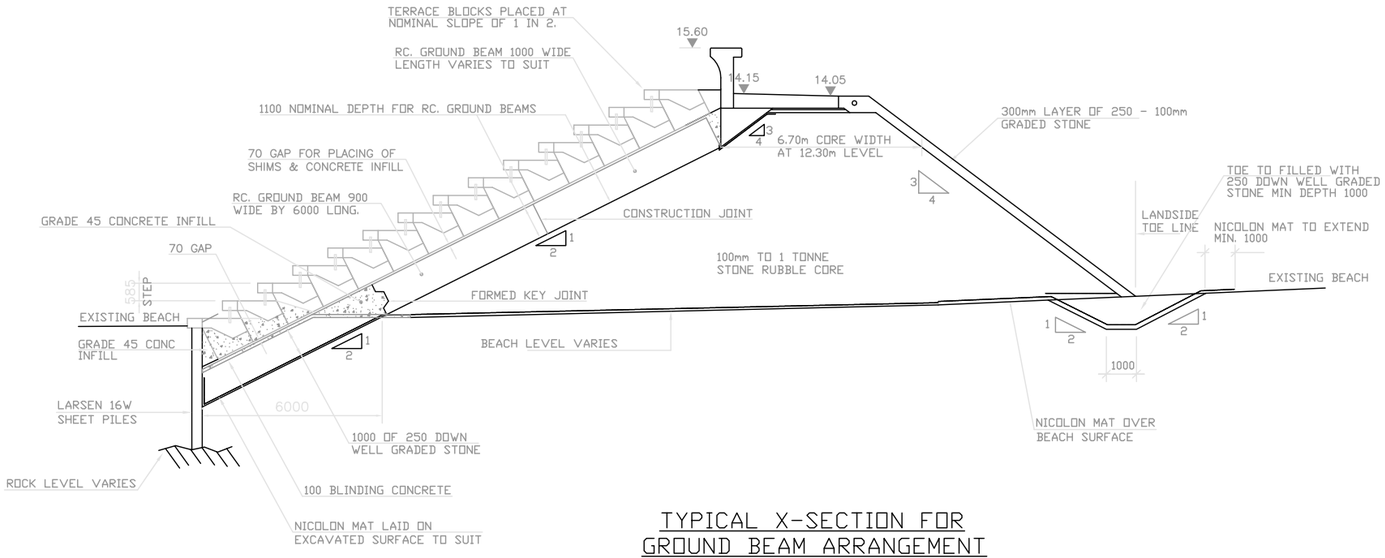
14 BLOCK SECTION
(9 GROUND BEAMS THUS)



GROUND BEAM REINFORCEMENT DETAILS
(1:50)

NOTES :

1. FOR ASSEMBLY TOLERANCES REFER TO THE SPECIFICATION.



TYPICAL X-SECTION FOR
GROUND BEAM ARRANGEMENT

AS BUILT

Rev	Date	Init	Details
B	22–05–98	SCS	AS BUILT
A	14–01–94	BEL	ISSUED FOR CONSTRUCTION

STATES OF JERSEY
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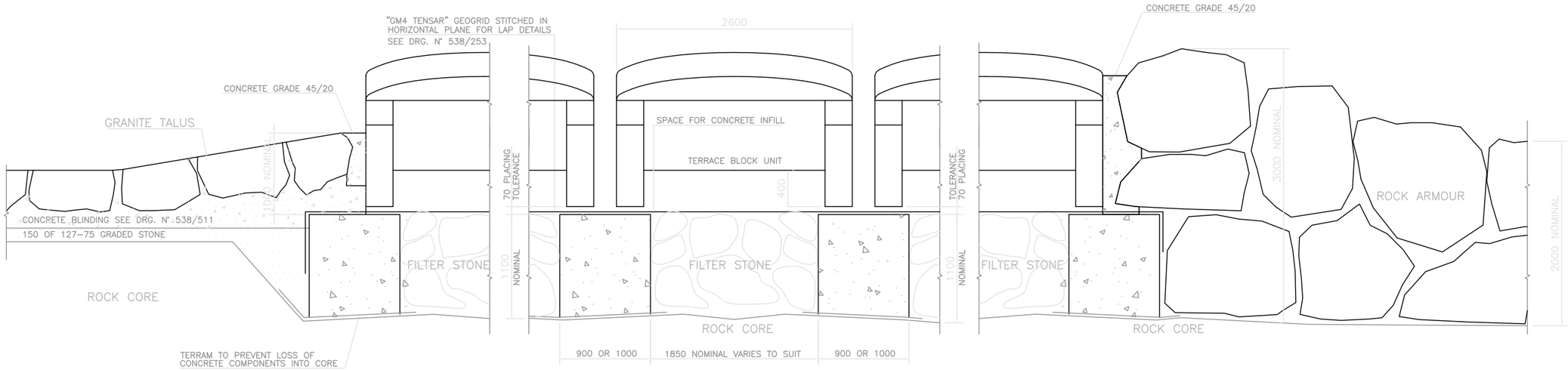
Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
TERRACE BLOCKS
TYPICAL GROUND BEAMS
G.A. AND REINFORCEMENT

Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : CS/GM
Checked by : BEL	Date : MARCH 93

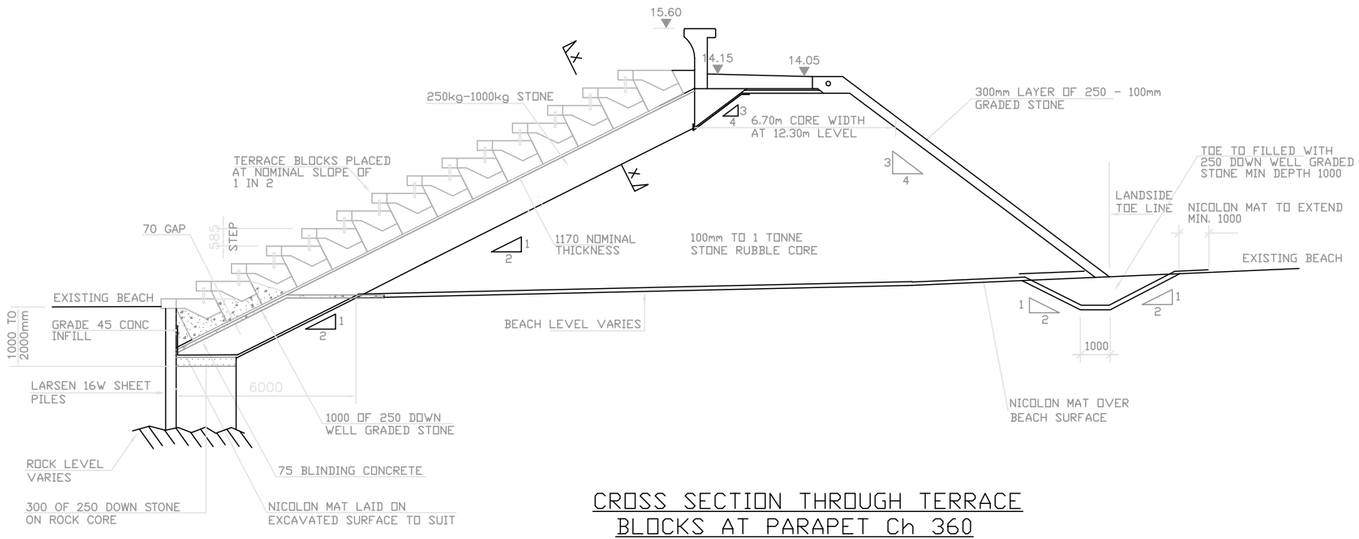
Scales 1:100

Drg. No. 538/254 (B)

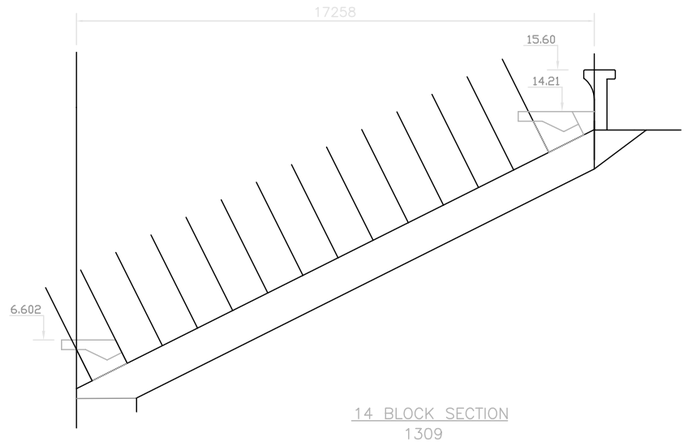


SECTION X-X

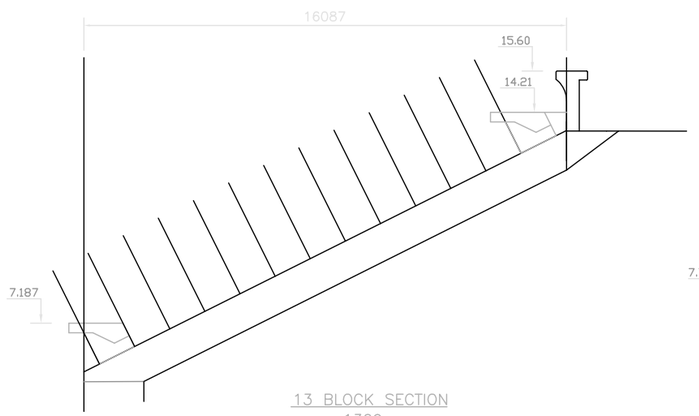
(1:25)



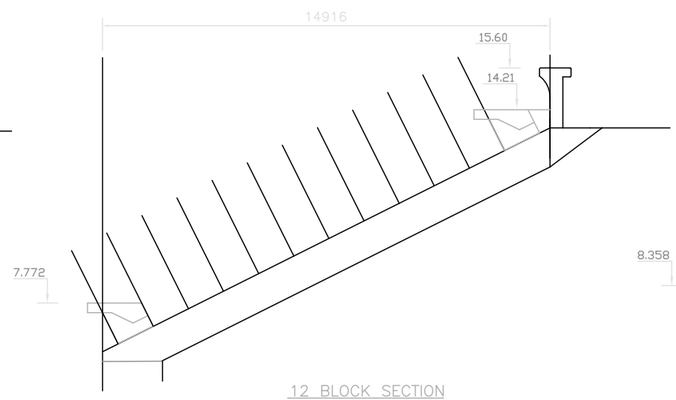
CROSS SECTION THROUGH TERRACE BLOCKS AT PARAPET Ch 360



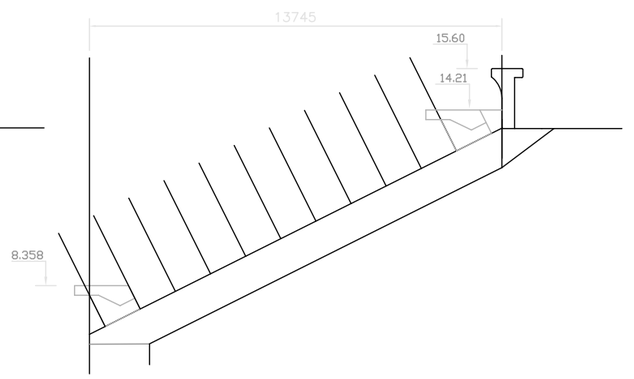
14 BLOCK SECTION
1309



13 BLOCK SECTION
1309



12 BLOCK SECTION
1309



11 BLOCK SECTION
1309

Drg. No. 538/252 (D)

NOTES

1. FOR ASSEMBLY TOLERANCES REFER TO THE SPECIFICATION OR AS DIRECTED BY THE ENGINEER.

AS BUILT

D	22-05-98	SCS	AS BUILT
C	24-01-94	BEL	AMENDED TOE DETAIL AND ADDED
			SECTION DETAIL
B	11-06-93	BEL	ISSUED FOR CONSTRUCTION
A	02-04-93	BEL	ISSUED FOR TENDER
Rev	Date	Init	Details

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PUBLIC SERVICES DEPARTMENT

Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
TERRACE BLOCKS
TYPICAL X-SECTION
LAYOUT

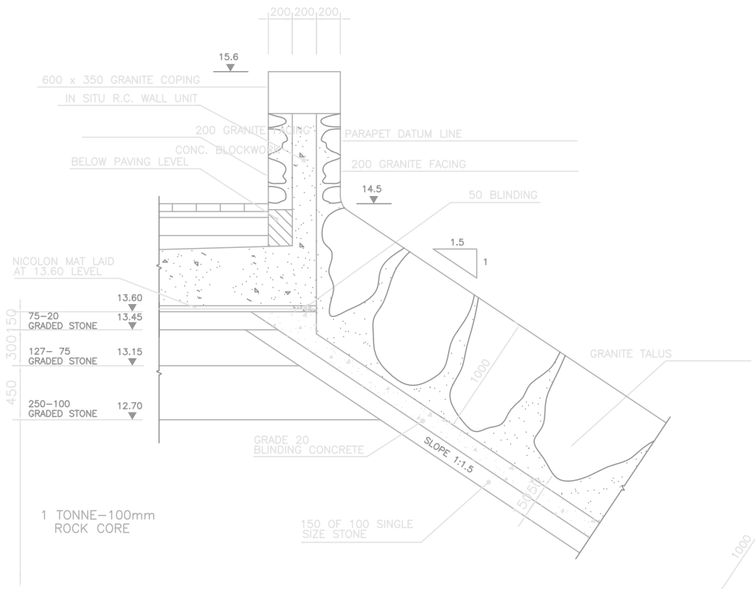
Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : CS/GM
Checked by : BEL	Date : MARCH 93

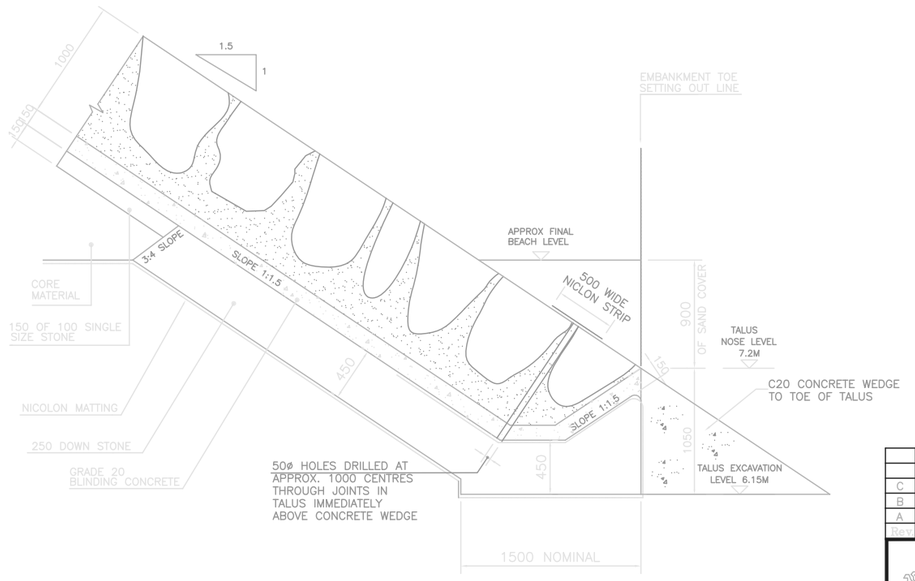
Scales 1:100

Drg. No. 538/252 (D)

Drg. No. 538/203 C

NOTES

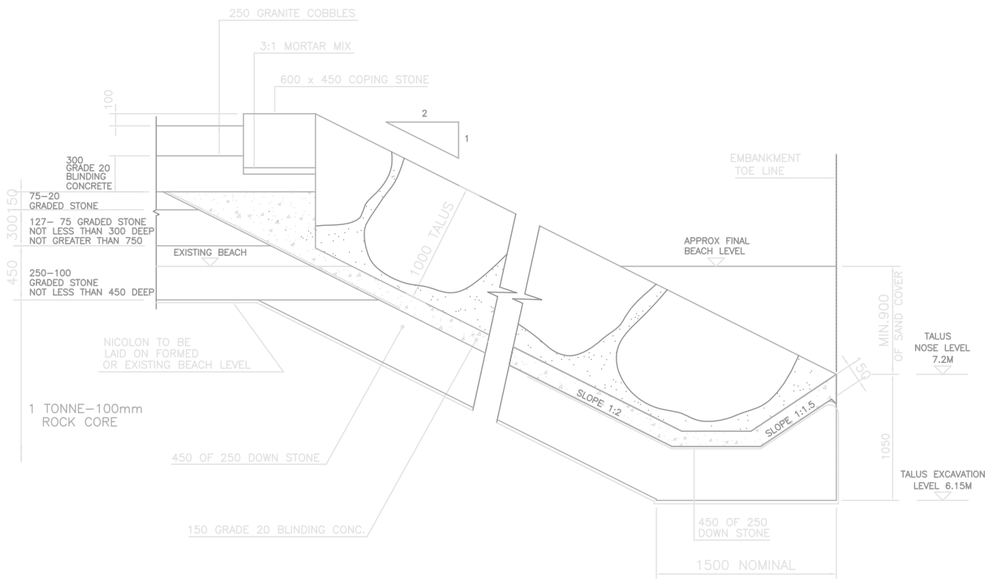




TYPICAL SECTION THROUGH TALUS

AS BUILT

Rev	Date	Init	Details
C	22–05–98	SCS	AS BUILT
B	11–06–93	BEL	ISSUED FOR CONSTRUCTION
A	02–04–93	BEL	ISSUED FOR TENDER



NOTE
1. LAYER THICKNESSES SHALL BE ADJUSTED TO SUIT EXISTING BEACH LEVELS. MINIMUM LAYER CONSTRUCTION BENEATH BLINDING CONCRETE SHALL BE 600mm.
2. DEPTH TO EXISTING BEACH VARIES

SLIPWAY SECTION D–D
REFER TO DRG. No. 538/524

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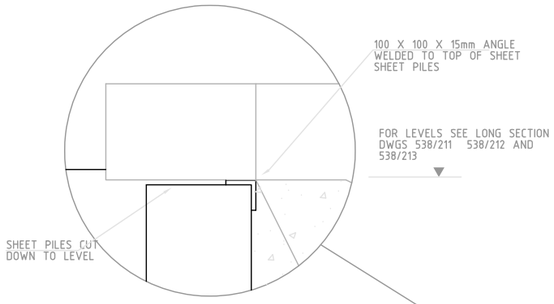
Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
EMBANKMENT
TYPICAL CROSS–SECTION
OF GRANITE TALUS

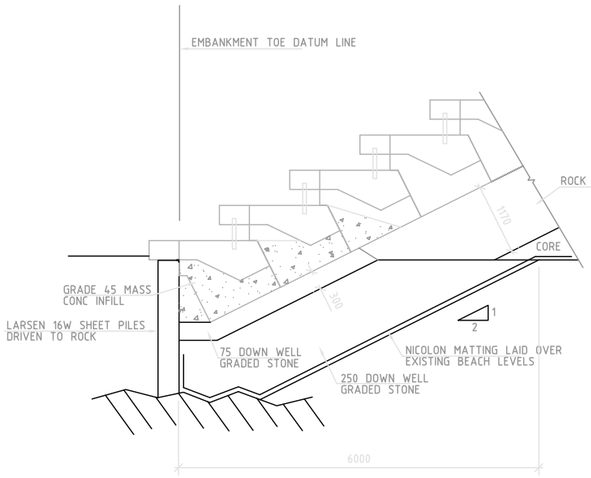
Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : G.M.M
Checked by : BEL	Date : MARCH 93

Scales 1:25

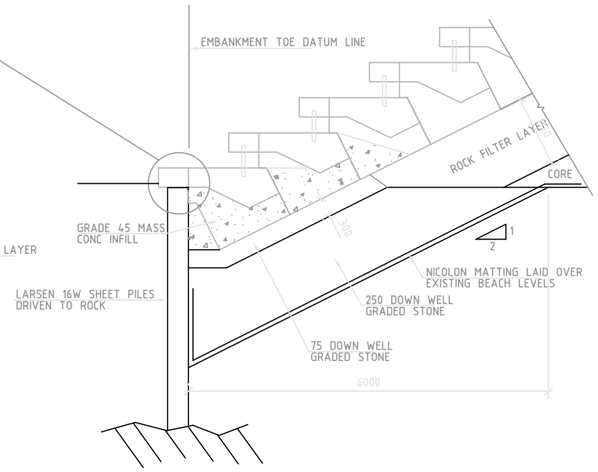
Drg. No. 538/203 C



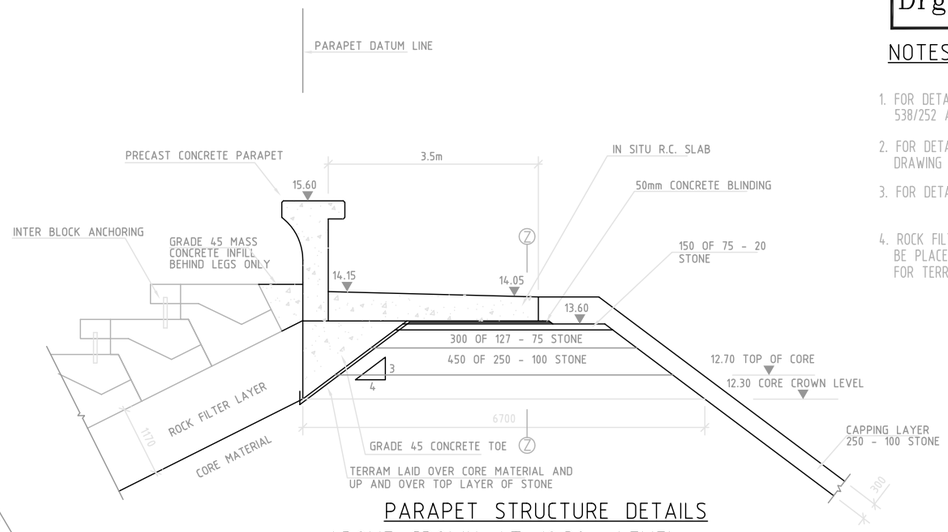
TERRACE BLOCK NOSE SUPPORT DETAIL



TOE DETAIL WHERE ROCK HEAD IS HIGHER THAN TYPICAL TOE DETAIL



TYPICAL TOE DETAIL



PARAPET STRUCTURE DETAILS ABOVE CROWN AT 12.30m LEVEL

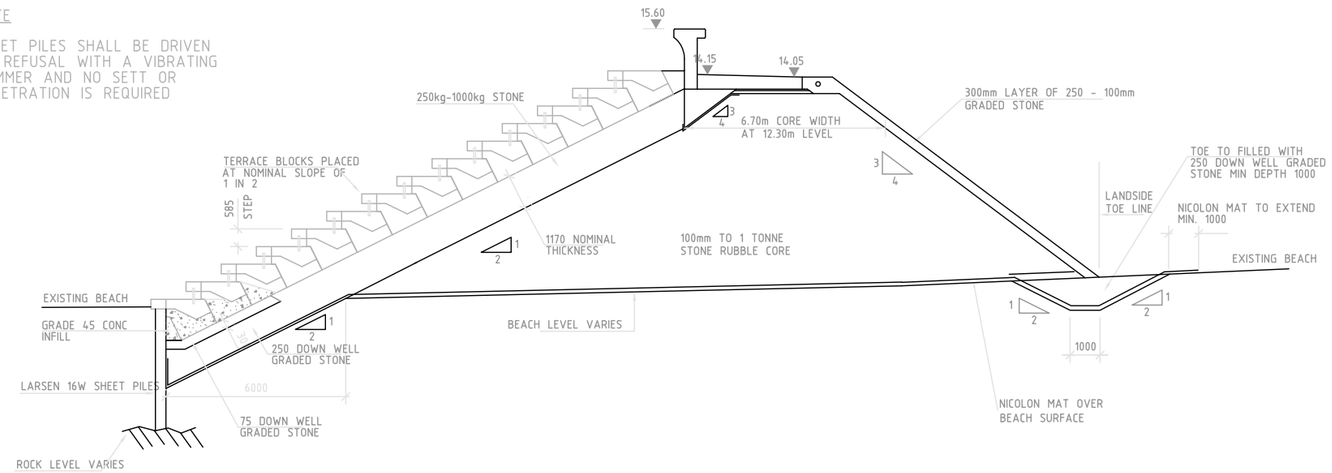
NOTES

1. FOR DETAILS OF TERRACE BLOCKS SEE DRAWINGS 538/252 AND 538/261
2. FOR DETAILS OF BLOCK TO BLOCK ANCHOR DETAILS SEE DRAWING 538/263
3. FOR DETAILS OF TERRACE BLOCK LEVELS SEE DRWG
4. ROCK FILTER LAYER MATERIAL 250kg TO 1000kg TO BE PLACED WITH CARE TO FORM A SOUND FOUNDATION FOR TERRACE BLOCKS

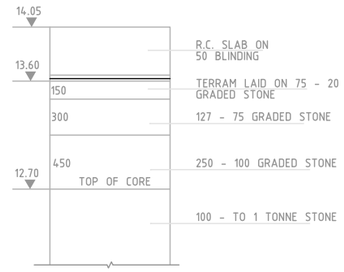
AS BUILT

NOTE

SHEET PILES SHALL BE DRIVEN TO REFUSAL WITH A VIBRATING HAMMER AND NO SETT OR PENETRATION IS REQUIRED



CROSS SECTION THROUGH TERRACE BLOCKS AT PARAPET Ch 360



SECTION Z - Z (1 : 25)
GRADED STONE LAYER STRUCTURE

Rev	Date	Init	Details
C	22-05-98	SCS	AS BUILT
B	11-06-93	BEL	ISSUED FOR CONSTRUCTION
A	02-04-93	BEL	ISSUED FOR TENDER

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PUBLIC SERVICES DEPARTMENT

Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

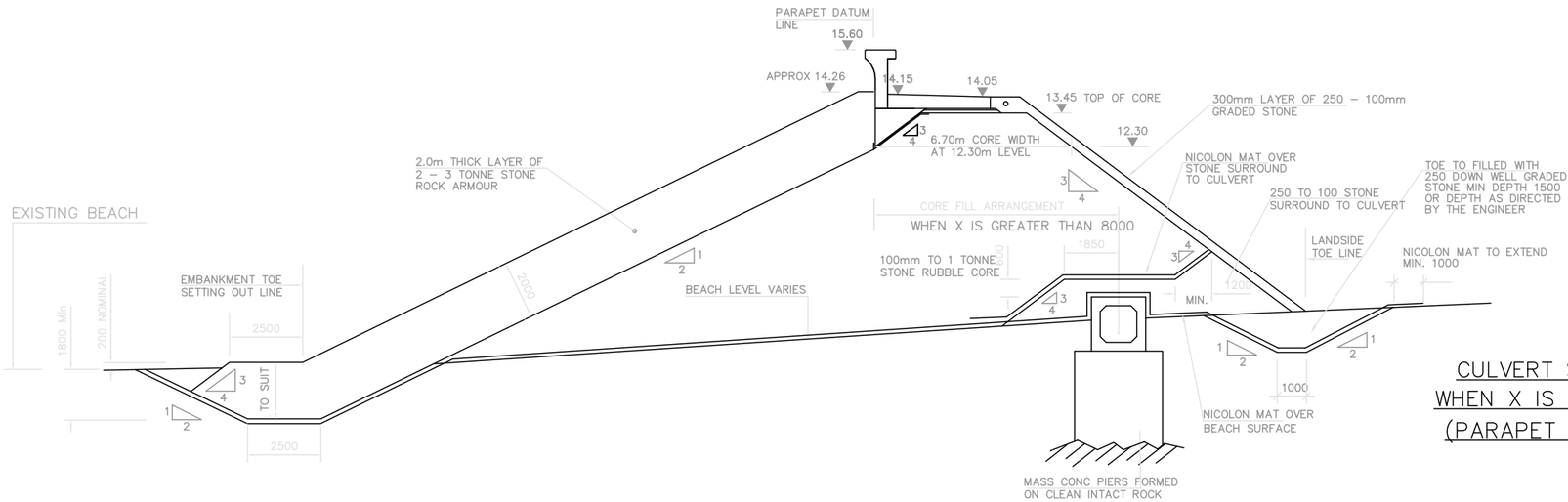
Title
EMBANKMENT
TYPICAL CROSS SECTIONS
WITH TERRACE BLOCKS

Contract No. 538	Sheet No.
Designed by : BEL	Drawn by : CS
Checked by : BEL	Date : MAR.1993

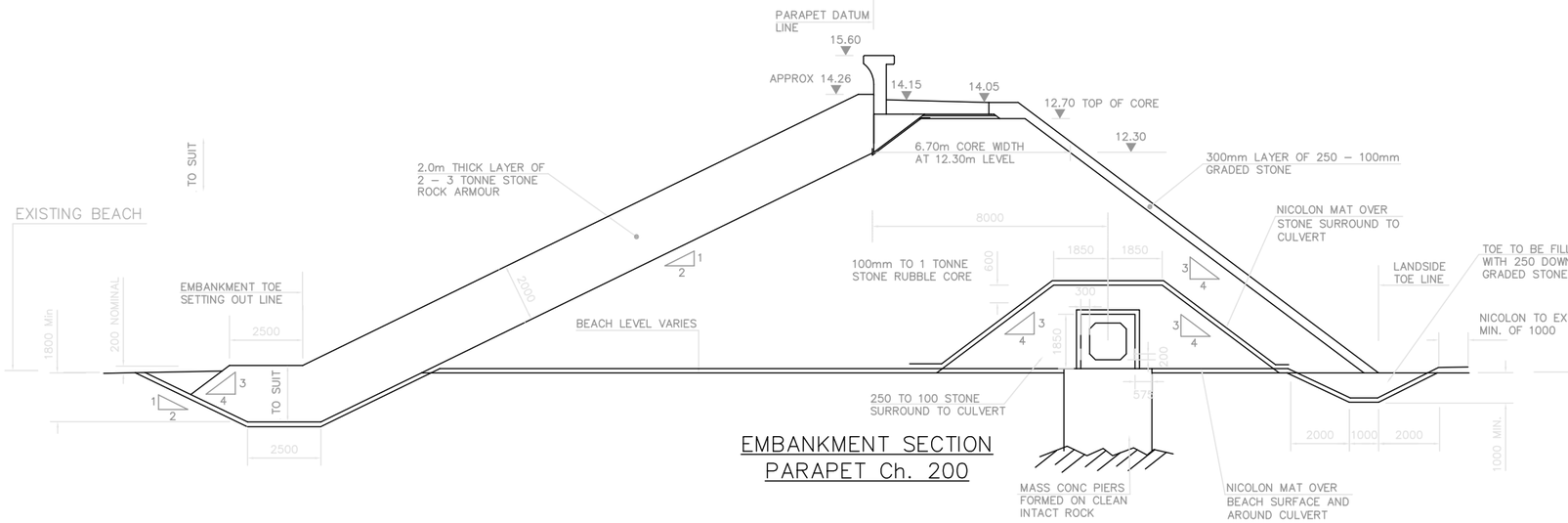
Scales 1:100 1:50

Drg. No. 538/202 C

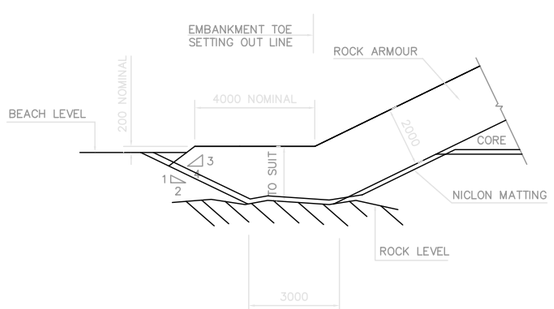
Drg. No. 538/201 (C)



CULVERT SURROUND DETAIL WHEN X IS GREATER THAN 8000 (PARAPET Ch 315 ONWARDS)

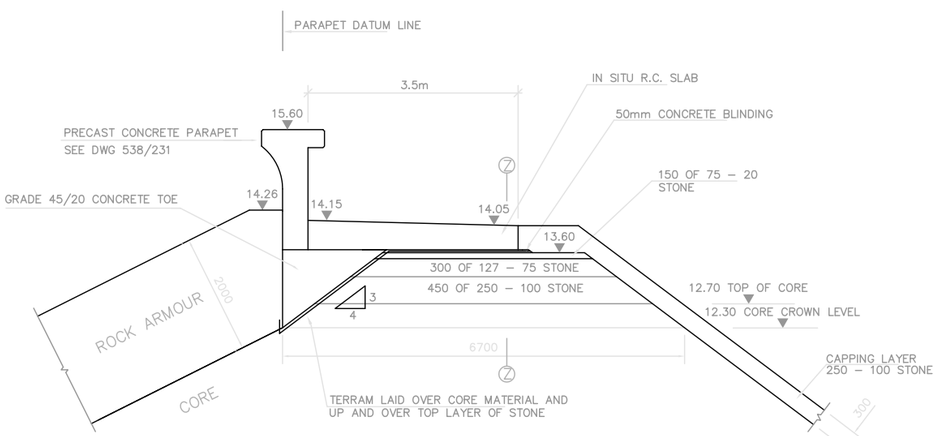


EMBANKMENT SECTION PARAPET Ch. 200

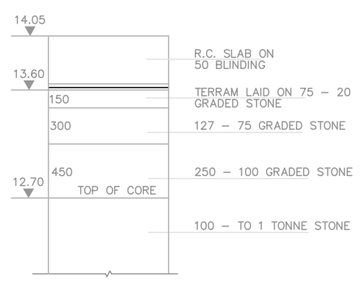


ALTERNATIVE TOE DETAIL

(WHEN ROCK ENCOUNTERED AT LESS THAN 1.8m BELOW EXTG BEACH LEVEL)



PARAPET STRUCTURE DETAILS ABOVE CROWN AT 12.30m LEVEL



SECTION Z – Z (1 : 25) GRADED STONE LAYER STRUCTURE

NOTES

1. STONE SURROUND TO CULVERT STRUCTURE SHALL BE AS SHOWN EXCEPT FOR :–
   (a) SMALL REDUCTIONS IN COVER AT THE OUTFALL SEE DWG 538/421
   (b) CHANGES IN SECTION AS CULVERT EMERGES FROM CORE SURROUND SEE DWG 538/202
2. FOR GRADES OF NICOLON AND TERRAM SEE SPECIFICATION

AS BUILT

Ref	Date	Init	Details
C	22–05–98	SCS	AS BUILT
B	11–06–93	BEL	ISSUED FOR CONSTRUCTION
A	02–04–93	BEL	ISSUED FOR TENDER

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Project
WEST OF ALBERT
PHASE II
LAND RECLAMATION

Title
EMBANKMENT
TYPICAL CROSS SECTIONS
WITH ROCK ARMOUR

Contract No. 538	Sheet No.
Designed by : BEL/CS	Drawn by : CS
Checked by : BEL	Date : MAR.1993

Scales 1:100

Drg. No. 538/201 (C)

A1 Drawings of Sea Walls

Appendix B

Overtopping Analysis

B1 Overtopping Analysis

D1 Overtopping Parameters

D1.1 Victoria Avenue

The figure shows the standard vertical wall type from EurOtop has been assumed to be representative of this section of wall.

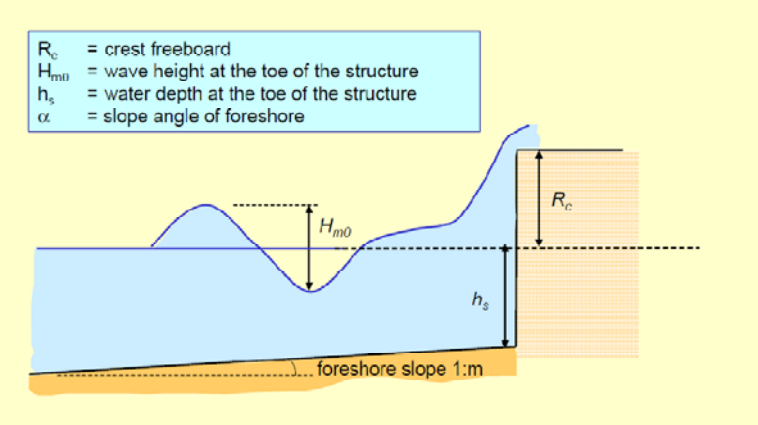


Figure D1 - Representation of Wall Type 1

It has been assumed that the toe, if present, will have a relatively small effect on the wave overtopping regime along this section of wall. We have witnessed physical model testing of a similar shaped wall which demonstrated that this is a robust assumption.

Considering the wave direction shown in Figure 1 in the main report, the waves have been assumed to hit this stretch of wall head on so no obliquity has been considered. Based on an assessment of the levels along Victoria Avenue a wall length of 100m of Wall Type 1 has been considered to drain to the east towards the site.

D1.2 Slipway

The slipway has been modelled as a standard simple slope structure from EurOtop to determine the wave overtopping volume as show in the figure below.

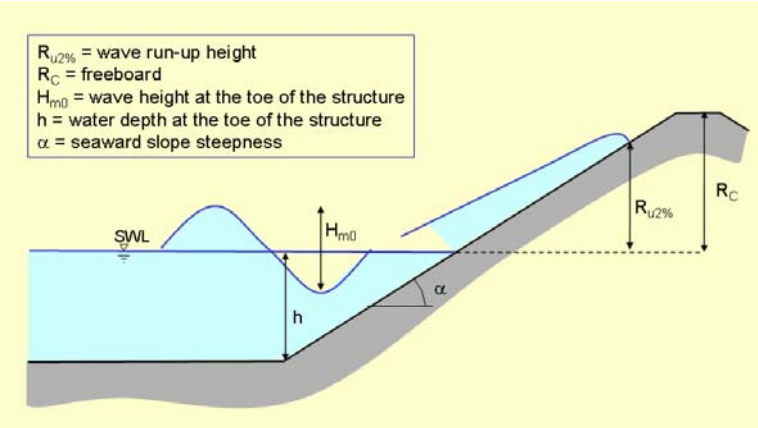


Figure D2 - Representation of Wall Type 2

For this section of wall an incident wave obliquity of 45° has been considered. Given the relatively shallow slope of the slipway and narrow extent, it does not contribute significantly to the total overtopping discharge along the complete length of defences being considered.

D1.3 Terrace Revetment

This is an uncommon form of wall construction and as such is not represented directly within the EurOtop manual. However a reasonable estimation of the expected levels of overtopping discharge can be made by applying the outline geometry of this wall section to a standardised typical wall section from EurOtop.

The standard section show below has been used to represent wall Type 3.

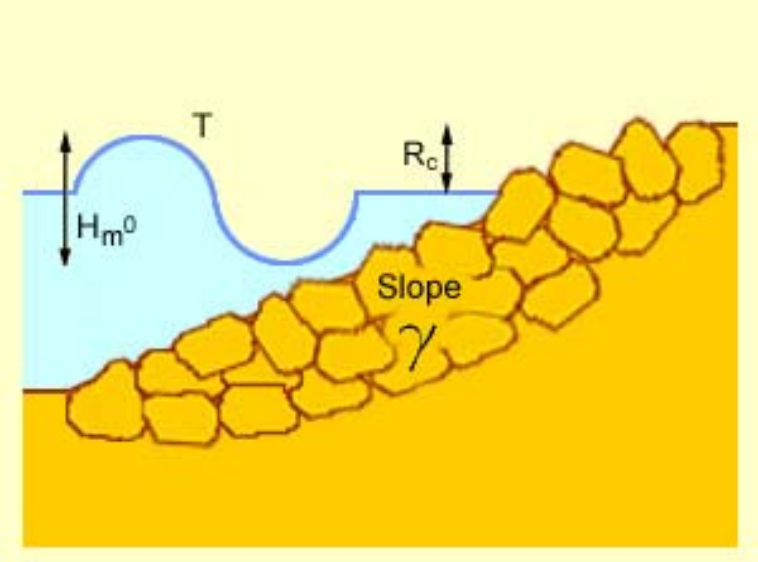


Figure D3 – Representation of Wall Type 3

The use of this standard wall type gave us the flexibility to manipulate the slope material properties to represent the terraced steps that would be expected to cause significant wave breaking, reduce wave run-up and therefore limit wave overtopping.

The slope material reduction factor has been set to a relatively low level of 0.45 which provides a representation of the degree to which the wave energy will be disrupted by the terraced blocks.

This wall section has been determined to be 140m in length and an incident wave obliquity of 45° has been assumed.

D1.4 Rock Armour Revetment

This is a common wall construction type and geometry, and the representative section below has been used to assess its wave overtopping volume potential.

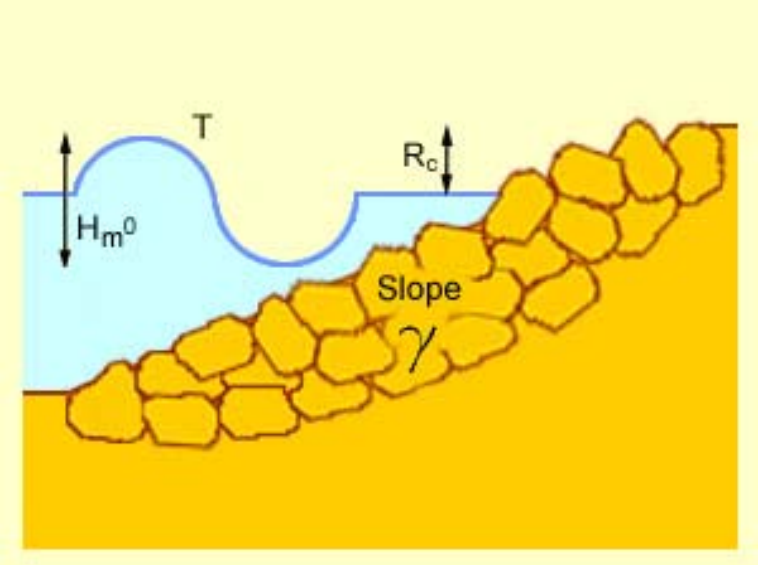


Figure D4 - Representation of Wall Type 4

The slope material reduction factor has been set to a value of 0.55, based on a standard reduction coefficient value for two layer rock armour structures.

Whilst this wall section extends to the tip of Elizabeth Harbour, a length of 50m has been considered where overtopped water is likely to drain towards Esplanade. An incident wave obliquity of 45° has been assumed.

D2 Met-Ocean Conditions

The met-ocean conditions for the site have been derived from existing reports completed by HR Wallingford (HRW).

The wave conditions were extracted from HRW Report EX5964 (2009) for a point offshore of the site. HRW computed the near-shore wave height within St Aubins Bay which showed a reduction in the wave height in the order of 10%. However the nearshore location HRW considered was away from the more complex geometry to the eastern end of the bay around the slipway which could act to concentrate wave activity, increasing the wave heights.

HRW have derived a relationship between the mean wave period, Tm, and offshore wave height, Hs, in their report HRW EX4020 (2001). This relationship was determined for wind generated waves propagating in a similar direction to those that will affect our site and has been used to determine wave periods for this analysis.

It was determined that for spectral waves the effect of wave transformation inshore considering wave shoaling, white capping and bed friction would possibly result in an increase in low frequency wave energy, resulting in an increase in wave period. As such a change in the wave period has not been used for the wave overtopping assessment.

The water levels derived within HRW Report EX5255 (2006) have been updated to give current day (2011) and future (2059) water levels, considering climate change. The combination of extreme water level and wave height event has been considered as discussed in Section D3.

D3 Overtopping Output

Three confidence bounds (upper, middle and lower) for the wave overtopping volume were calculated to take into account the uncertainties involved within wave overtopping discharge determination.

The following variables were altered to determine lower and upper bound overtopping volume rates across the different wall types. The middle bound was the average of the upper and lower bounds.

Lower bound

- Current day water levels were used (i.e. no allowance for climate change)
- A 10% reduction in wave height was allowed for wave transformation inshore
- A reduced correlation between maximum extreme water levels and wave heights was used (approximately 0.5). i.e. an extreme wave event of return period 50 years was combined with an extreme water level with return period 25 years.
- A probabilistic assessment was used. This relates the fit of the empirical wave overtopping model to the recorded data. Using the probabilistic tools 50% of the recorded data points exceed the model prediction and 50% fall below the predicted values.

Upper bound

- Future (50 year) water levels were used.
- No wave height reduction was allowed for – to allow for possible wave concentration.
- A correlation of 1.0 between extreme water levels and wave heights was assumed. Such that the combination of events with the same return period was considered, i.e. a 50 year return period wave event was combined with a 50 year water level event.
- A deterministic assessment was used. Using the deterministic design tools returns values as the mean value plus one standard deviation, allowing for model uncertainty.

The following table has the results of the wave overtopping analysis for return periods up to 100 years at the different bounds.

Return Period	**1 year**	**10 year**	**20 year**	**50 year**	**100 year**
	Volume	**Volume**	**Volume**	**Volume**	**Volume**
Bound	**[m³]**	**[m³]**	**[m³]**	**[m³]**	**[m³]**
Lower	3,850	21,500	33,500	56,000	135,000
Middle	11,425	62,250	96,250	155,500	257,000

Upper	19,000	103,000	159,000	255,00	379,000

Table D1 - Wave overtopping volumes

Wave overtopping volumes for event return periods exceeding 100 years were calculated but they have not been included because of the significant wave overtopping volumes that resulted at lower return periods.

As discussed in the main body of the report the resulting wave overtopping volumes have been assessed with respect to various drainage and water loss mechanisms to determine the final resulting wave overtopping volumes that could be expected at the site.

D4 Robustness

The EurOtop Manual is the most current and commonly used industry standard guidance for the derivation of wave overtopping discharges. The overtopping rates are calculated from empirically derived equations and should be regarded as being within, at best, a factor of 1 – 3 of the actual overtopping rate.

JERSEY FUTURE HOSPITAL

CO021 – SITE OPTION REPORT

APPENDIX 6 TECHNICAL APPRAISAL – Technical Note - Structural

QUALITY ASSURANCE

Sign off: Peter Thomas

Position: Senior Engineer

September 2015

Subject	Jersey Future Hospital – Change Order 21 – Site Validation TN-STR-001 Technical Note – Structural Considerations Rev P1. Date 02.04.2015. Final Preliminary Issue
Date	18 September 2015
Job No/Ref	237035

1 Introduction

This technical note has been prepared to document the findings associated with structural and related geotechnical input to support the preparation of the Site Validation Exercise that forms Change Request Nr. 21 as part of the Jersey Future Hospital Scheme.

The five options being reviewed are:

Option A - Dual Site Options

Option B - Overdale Hospital Site, 100% New Build Option

Option C - Existing General Hospital, 100% New Build Option

Option D - Waterfront Site, 100% New Build Option

Option E - People's Park, 100% New Build Option

In general, the focus of this section of the report has been to look at the key structural and related geotechnical issues that are relevant to the site selection process and has not focussed on or developed any specific structural designs for the above ground structures at this stage. Either steelwork or concrete frames may be suitable once design stages are commenced, but for the purposes of this note, it is assumed a concrete frame will be used.

Detailed ground investigations will be required to inform appropriate detailed design stratigraphy and parameters for the proposed developments.

2 Commentary

2.1 Option A

This option provides for:

- 100% new build at Overdale (albeit for a smaller building than option B)
- A mixture of new build and refurbished buildings at the existing general hospital site

Rather than repeat the data unduly, the geotechnical parameters available and assessed for each site are shown in the following Option B and Option C sections respectively.

2.1.1 Overdale

For geotechnical parameters refer to Option B

The proposed building is generally one to two storeys in height with no basement.

Given the existing ground conditions, it is likely that a ground bearing slab may be suitable. It is also considered unlikely that gas protection measures will be required given the shallow bedrock, although this would need to be confirmed following a full ground investigation.

2.1.2 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 2500kN.

Based on the available geotechnical information, and assuming a 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 3-5m in depth with a 2m deep rock socket. This suggests that there will be approximately 1 pile per 10-15m^2.

Given the proposed architectural layout, it is likely that the structure will be split into two independent blocks with movement joints between each block.

The site slopes generally from East to West and the main entrance is likely to be at or around the existing site level. Therefore, the ground slab of the building will have to be elevated above ground level by approximately 3m at the West edge of the building. This could either be achieved through a retaining wall and compacted fill, or as a suspended slab on columns with cladding to create an undercroft.

To the west edge of the site, the ground falls away steeply into Le Val Andre. Depending on the relative location of the building foundations, it may be necessary to carry out a slope stability

assessment. The outcome of this assessment may require some slope stability works prior to construction of the new building.

It should be noted that, with bedrock close to the existing ground surface, the costs of excavation on the site for foundations and drainage can be expected to be higher than normal. There is insufficient ground investigation data available to make an assessment of the rock strength and 'ripability' and its likely impact on excavation and costs/programme.

2.1.3 Jersey General Hospital

For geotechnical parameters refer to Option C.

The new buildings vary in height from two to five storeys generally with a taller tower to the East of seven storeys. There is no new basement proposed, but the existing basement is assumed to be retained (at least in part).

There is an element of refurbishment required in the original listed building. It is assumed that there will not be any significant structural works required in this element, although this will need further definition during the design stage of the project.

Given the existing ground conditions, it will be necessary to provide piled foundations and potentially a suspended ground floor slab. It is also possible that gas protection measures may be required subject to a detailed ground gas risk assessment.

2.1.4 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 4250kN in the main body of the new build blocks and approximately 5900kN in the taller block.

Based on the available geotechnical information, and assuming a 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 15-20m in depth with a 4-5m deep rock socket. The taller block is likely to require 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 15-20m in depth with a 6-7m deep rock socket.

This suggests that there will be approximately 1 pile per 10-15m^2.

Given the proposed architectural layout and potential construction phasing, it is likely that the structure will be split into three independent blocks with movement joints between each block. Where structures are adjacent to existing buildings care will need to be taken to avoid damage or affecting their stability during the works.

It is known that some of the existing buildings on the site are piled and as such these will present a constraint to the foundation design of the new buildings such that new piles may not be able to be

placed in the most advantageous positions with a subsequent requirement for a more complex substructure. There is the potential to consider re-use of the existing piles, but this would require detailed investigations after demolition of the buildings. Given the programme requirements, it may not be possible to assess this option and incorporate it into the new build design and maintain programme.

There is a partial, one storey basement on the site and the new design will need to co-ordinate with this element which may complicate the substructure design locally.

It should be noted that groundwater is relatively shallow and may be confined and under pressure. Also, there is a potential risk of running sands on the site. This may affect the methods of excavation and should be noted as a site abnormal.

2.2 Option B

This option provides a 100% new build structure that varies in height between three and four storeys. The building does not require a basement.

Given the existing ground conditions, it is likely that a ground bearing slab may be suitable. It is also unlikely that gas protection measures will be required given the shallow bedrock, although this would need to be confirmed following a full ground investigation.

The geotechnical aspects of the site of relevance to the structural works & foundations are as follows.

2.2.1 Available ground investigation information

2.2.1.1 Stratigraphy

No ground investigation has been undertaken on site. Historical ground investigations were undertaken in 1997 and 2001 (TP1 to TP12) on land to the east of the site.

The assumed stratigraphy is provided in Table 1 below:

Table 1: Assume stratigraphy for initial foundation assessment

Depth	Geology	Summary of log description
GL to 1m	Superficial	Silt, fine sand with gravel.
3m to 6m	Weathered bedrock	Sandy silt with gravel
6m +	Bedrock (mudstone / lavas, tuffs, pyroclastic deposits (blocky) NW - Jersey shale Central - St John's Road Andesite SE - St John's Road Agglomerate	Mudstone / Andesite

2.2.1.2 Groundwater

No groundwater was recorded in the trial pits undertaken to 4.5mbgl, to the east of the site. The site is situated on high ground.

Conservatively, for this initial foundation assessment groundwater is assumed at 3mbgl (interface between superficials and weathered bedrock).

2.2.1.3 Soil parameters

The soils parameters are based on limited ground investigation to the east of the site, (soils are assumed to be predominantly granular) and derived using guidance fromBS8002:1994. The assumed soil parameters for this assessment are provided in Table 2 below.

Table 2: Assumed soil parameters

Stratigraphy	Design parameters
Superficials	Φ = 35° γ = 21 kN/m^2 C' = 0
Weathered bedrock	Φ = 35° γ = 22 kN/m^2 C' = 5
Bedrock	Φ = 35° γ = 22 kN/m^2 C' = 10

A detailed ground investigation will be required to inform appropriate detailed design stratigraphy and parameters for the proposed development.

2.2.2 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 4250kN.

Based on the available geotechnical information, and assuming a 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 5-10m in depth with a 4-5m deep rock socket. This suggests that there will be approximately 1 pile per 10-15m^2.

Given the proposed architectural layout, it is likely that the structure will be split into two independent blocks with movement joints between each block.

The site slopes generally from East to West and the main entrance is likely to be at or around the existing site level. Therefore, the ground slab of the building will have to be elevated above ground level by approximately 3m at the West edge of the building. This could either be achieved through a retaining wall and compacted fill, or as a suspended slab on columns with cladding to create an undercroft.

To the west edge of the site, the ground falls away steeply into Le Val Andre. Depending on the relative location of the building foundations, it may be necessary to carry out a slope stability assessment. The outcome of this may assessment may require some slope stability works prior to construction of the new building.

It should be noted that, with bedrock close to the existing ground surface, the costs of excavation on the site for foundations and drainage can be expected to be higher than normal. There is insufficient ground investigation data available to make an assessment of the rock strength and 'ripability' and its likely impact on excavation and costs/programme.

2.3 Option C

This option provides a 100% new build structure that varies in height between five and six storeys. There is no new basement proposed, but the existing basement is assumed to be retained (at least in part).

There is an element of refurbishment required in the original listed building. It is assumed that there will not be any significant structural works required in this element, although this will need further definition during the design stage of the project.

Given the existing ground conditions, it will be necessary to provide piled foundations and potentially a suspended ground floor slab. It is also possible that gas protection measures may be required subject to a detailed ground gas risk assessment.

The geotechnical aspects of the site of relevance to the structural works and foundations are as follows.

2.3.1 Available ground investigation information

2.3.1.1 Stratigraphy

Historically, ground investigations were undertaken in 1973 (BH1, BH2 and BH3), 1979 (BH1, BH2 and BH3) and 2014 (BH1). Logs are available for 7 No. boreholes and have been reviewed.

The assumed stratigraphy is provided in Table 3 below:

Table 3: Assume stratigraphy for initial foundation assessment

Depth (elevation)	Geology	Summary of log description
GL (13mOD) to 1.5m (11.5mOD)	made ground	made ground – gravelly sand
1.5 (11.5mOD) to 4m (9mOD)	Blown Sand	Fine and medium silty sand.
4m (9mOD) to 10m (3mOD)	Alluvium	Sands and gravels, with laminated silt
10m (3mOD) to 18m (-5mOD)	**North-west corner of site**: Weathered John's Road Andesite Formation	Andesite
	South & south-east part of the site: Weathered Jersey Shale Formation	Mudstone, siltstone, grit

2.3.1.2 Groundwater

Groundwater strikes were typically encountered at 4mbgl, with little or no rise, with the exception of BH1_2014 where groundwater was stuck at 4mbgl and rose to surface.

Consequently, for this initial foundation assessment groundwater is assumed at ground level.

2.3.1.3 Soil Parameters

The soils parameters are based on limited ground investigation, (assumed to be predominantly granular) and derived using guidance from BS8002:1994. The assumed soil parameters for this assessment are provided in Table 4 below.

Table 4: Assumed soil parameters

Stratigraphy	Design parameters
Made ground	$\Phi = 35°$ $\gamma = 18$ kN/m^2 C' = 0
Blown Sand	$\Phi = 35°$ $\gamma = 18$ kN/m^2 C' = 0
Alluvium	$\Phi = 35°$ $\gamma = 19$ kN/m^2 C' = 0
North-west corner of site: Weathered John's Road Andesite Formation	$\Phi = 35°$ $\gamma = 22$ kN/m^2 C' = 5 kPa
South & south-east part of the site: Weathered Jersey Shale Formation	

2.3.2 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 5900kN.

Based on the available geotechnical information, and assuming a 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 15-20m in depth with a 6-7m deep rock socket. This suggests that there will be approximately 1 pile per 10-15m^2.

Given the proposed architectural layout and potential construction phasing, it is likely that the structure will be split into four or five independent blocks with movement joints between each block. Where structures are adjacent to existing buildings care will need to be taken to avoid damage or affecting their stability during the works.

It is known that some of the existing buildings on the site are piled and as such these will present a constraint to the foundation design of the new buildings such that new piles may not be able to be placed in the most advantageous positions with a subsequent requirement for a more complex substructure. There is the potential to consider re-use of the existing piles, but this would require detailed investigations after demolition of the buildings. Given the programme requirements, this it may not be possible to assess this and incorporate into the new build design in any case.

There is a partial, one storey basement on the site and the new design will need to co-ordinate with this element which may complicate the substructure design locally.

It should be noted that groundwater is relatively shallow and may be confined and under pressure. Also, there is a potential risk of running sands on the site. This may affect the methods of excavation and should be noted as a site abnormal.

2.4 Option D

This option provides a 100% new build structure that varies in height between three and four storeys. The building does not require a basement.

Given the existing ground conditions, it will be necessary to provide piled foundations and a suspended ground floor slab. It is also possible that gas protection measures will be required given the material underlying the site subject to a detailed ground gas risk assessment.

The geotechnical aspects of the site of relevance to the structural works & foundations are as follows.

2.4.1 Available ground investigation information

2.4.1.1 Stratigraphy

Limited ground investigation has been undertaken on site. Trial pits were undertaken as part of drainage construction works in 2014. Ground investigations were undertaken on land to the east of the site at Marina Car Park in 1997. 10 No. boreholes were advanced to up to 16m bgl.

The assumed stratigraphy is provided in Table 5 below:

Table 5: Assume stratigraphy for initial foundation assessment

Depth	Geology	Summary of log description
GL to 10m	Made ground – landfill	Silty clay, with sand and gravel
10m to 13m	Beach deposit	Soft to firm clay, silt and sand
13m +	Bedrock	Granophyre granite / lamprophyre and dolerite / St Saviours Andesite Formation

2.4.1.2 Groundwater

In boreholes to the east of the site, groundwater was typically encountered at 7m to 8m below ground level.

Consequently, for this initial foundation assessment groundwater is assumed at 5mbgl (within the landfill materials).

2.4.1.3 Soil Parameters

The soils parameters are based on limited ground investigation to the east of the site, (soils are assumed to be predominantly granular) and derived using guidance from on BS8002:1994. The assumed soil parameters for this assessment are provided in Table 6 below.

Table 6: Assumed soil parameters

Stratigraphy	Design parameters
Made ground – landfill	$\Phi = 28°$ $\gamma = 18$ kN/m^2 C' = 0
Beach deposit	$\Phi = 35°$ $\gamma = 19$ kN/m^2 C' = 5
Bedrock	$\Phi = 35°$ $\gamma = 22$ kN/m^2 C' = 5

A detailed ground investigation will be required to inform appropriate detailed design stratigraphy and parameters for the proposed development.

2.4.2 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 5900kN.

Based on the available geotechnical information, and assuming a 750mm diameter CFA pile, a typical column is likely to be supported on 4 pile groups of around 15-20m in depth with a 3-4m deep rock socket. This suggests that there will be approximately 1 pile per 10-15m^2.

Given the proposed architectural layout, it is likely that the structure will be split into three independent blocks with movement joints between each block.

Given the site location, the structure will need to be designed to deal with an aggressive, marine environment.

2.5 Option E

This option provides a 100% new build structure that varies in height between five and six storeys. The building requires a basement of ~6,000m^2 on plan and will be located towards the front of the site.

Given the uncertainty of the rockhead depth below the site, three rockhead depth scenarios have been considered to inform initial foundation options:

- Scenario 1: **Intermediate rockhead**:- This scenario provides the potential for piled foundations and potentially a suspended ground floor slab.
- Scenario 2: **Shallow rockhead**:- This scenario provides the potential for a ground bearing slab, raft or piled raft. It is also unlikely that gas protection measures will be required given the shallow bedrock although this would need to be confirmed following a full ground investigation.
- Scenario 3: **Deep rockhead**:- This scenario provides the potential for piled foundations.

The geotechnical aspects of the site of relevance to the structural works & foundations are as follows.

2.5.1 Available ground investigation information

2.5.1.1 Stratigraphy

No ground investigation records are available for the site. Desk top researches indicate shallow excavations were undertaken within the north-eastern part of the site for the construction of the attenuation tank. No excavation records are available, any available excavation records will need to be requested from Dandara.

The nearest available historical ground investigation records are 100m east of the eastern site boundary, located at Kensington Place.

The assumed stratigraphy provided in Table 7 below, is based upon three rockhead depth scenarios:

Table 7: Assume stratigraphy for initial foundation assessment

Scenario 1: Intermediate	Scenario 2: Shallow	Scenario 3: Deep	Geology	Summary of log description [Note 1]
m below ground level				
GL - 4 to 6m	GL – 1 to 2m	GL – 10-12m	Head deposit	Dense grey and brown clayey very sandy fine to coarse GRAVEL, with occasional cobbles.
4 to 6m +	1 to 2m +	10m +	Bedrock - Andesite	Moderately strong slight grey slightly Andesite, iron stained planar discontinuities.

Note 1: Based on borehole log BH3 Kensington Place situated 100m east of the eastern site boundary.

2.5.1.2 Groundwater

No ground investigation has been undertaken beneath the site. Based on historical borehole records a groundwater depth of between 2 to 3m bgl has been assumed beneath the site. There is a potential for groundwater to be tidally induced, this is currently unknown. Groundwater conditions beneath the site require investigation and monitoring.

Consequently, for this initial foundation assessment groundwater is assumed at 2-3mbgl.

2.5.1.3 Soil Parameters

The soils parameters are based on limited ground investigation to the east of the site, (soils are assumed to be predominantly granular) and derived using guidance from on BS8002:1994. The assumed soil parameters for this assessment are provided in Table 8 below.

Table 8: Assumed soil parameters

Stratigraphy	Design parameters
Head deposit	$\Phi = 36°$ $\gamma = 19$ kN/m^2 C' = 0
Bedrock - Andesite	$\Phi = 35°$ $\gamma = 22$ kN/m^2 C' = 5

A detailed ground investigation will be required to inform appropriate detailed design stratigraphy and parameters for the proposed development.

2.5.2 Structural assumptions & assessment

We have made an assessment of the likely structural loadings on the site. We have based them on a concrete framed, flat slab structure which is typical for modern healthcare facilities and a typical grid of 7.5 x 7.5m. This gives likely floor loadings of:

- 10kN/m^2 dead load
- 5kN/m^2 imposed load

This leads to typical column working loads of approximately 5900kN.

Given the proposed architectural layout, it is likely that the super-structure will be split into two or three independent blocks with movement joints between each block.

Given the site location, the structure will need to be designed to deal with an aggressive, marine environment.

The presence of a basement will require substantial substructures to be constructed on the site. The likely requirements of this element are as follows:

- Given the limited plan size of the available site and the adjacency of St Aubin's Road to the South and Westmount Road to the North East, it is assumed that construction in an open cut with a traditional reinforced concrete retaining wall would not be possible on this site.
- Given the above, it would be necessary to provide a piled or sheet piled wall to facilitate the excavation and retain the adjacent roads. Given the anticipated ground conditions and potential rockhead levels, it is unlikely that sheet piles will be suitable in this case.
- Given the risk of shallow groundwater, it should be assumed that the retaining wall to the basement should surround the excavation on all sides and that a secant piled wall will be necessary to provide a cofferdam structure to enable dewatering of the excavation during construction. The secant piles will need to be socketed into the rock to provide a cut off to ground water flows.
- No information about ground gas risk is available and as such, it should be assumed that ground gas protection measures should be provided, until proven otherwise.
- Based on the available geotechnical information, and assuming 750mm diameter piles, a typical column is likely to be supported on 4 pile groups with a 5-6m deep rock socket. The length of piles will varying depending on the level of rock head (see below for details). This suggests that there will be approximately 1 pile per 10-15m^2.
- Piles are likely to be either CFA or Rotary bored. The final decision on pile type will be determined by the strength and hardness of the rock and the depth required for any rock sockets. At this stage it is considered that bored piles are likely to be required.
- For the purposes of pricing, it has been agreed that a 5m clear headroom should be provided in the basement to allow for HGV traffic in the service-yard areas. If transfer beams are required to provide sufficiently large, column free areas for HGV manoeuvring, the overall level of excavation required could increase accordingly.

As explained in the geotechnical section, due to the lack of available geotechnical information, the presence of rock and the level of any rockhead cannot be determined with confidence. The rockhead level will also potentially vary across the site. Therefore, three potential scenarios have been reviewed with regards to the substructures for the proposed building:

1. Intermediate Rockhead
2. Shallow Rockhead
3. Deep Rockhead

Sketch SK-STR-OPTE-001 shows an indicative section of the substructures for each scenarios and should be read in conjunction with this note. The key aspects of each scenario are as follows:

2.5.2.1 Scenario 1 - Intermediate Rockhead

The following key features of this scenario are:

1. In this scenario, the secant piled wall is likely to require ~12-15m long piles, socketed 5-6m into rock.

2. It is anticipated that dewatering will be required during excavation and construction of the basement.
3. The basement slab will almost certainly need to be tanked and a drained cavity provided to the walls with sumps. Provision of Grade 2 space is likely to be sufficient for serviceyard and car park areas subject to client approval. The basement slab is likely to be ~350-450mm thick (due to uplift from water) and will need to be secured to the secant wall and detailed to provide a watertight joint.
4. It is anticipated that piles will be installed from basement level after excavation which will are likely to be to the order of 5-8m long.
5. Piles to the rear of the building, outside the basement area, are likely to be in the order of 10-12m in length.
6. A retaining wall to the rear of the building will be necessary due to the rising ground levels to the North of the site. However, depending on the rock's local properties and slope stability, it may be possible to leave a cut rock slope and only utilise a liner wall in lieu of a retaining wall.

2.5.2.2 Scenario 2 - Shallow Rockhead

The key features of this scenario are as for scenario 1 except as follows:

1. It is anticipated that there would be significantly more rock to excavate, and to a greater depth. The effort required to excavate the rock is likely to increase with depth into the rock.
2. This scenario provides the potential option for a raft, or piled raft foundation to be utilised in both the basement and/or to the rear of the site. This option will depend on the rock strength at the base of the excavation and also any uplift considerations due to buoyancy of the basement. The raft slab is likely to be ~1200-1500mm thick depending on the final column loads and spacings. The raft slab would need to be secured to the secant piled wall and detailed to provide a watertight joint.
3. In this scenario, the secant piled wall are likely to be in the order of ~10-12m in length and socketed 5-6m in to the rock.

2.5.2.3 Scenario 3 - Deep Rockhead

The key features of this scenario are as for scenario 1 except as follows:

1. It is anticipated there would be no rock excavation required.
2. In this scenario, the secant piled wall is likely to be approximately 17-20m deep socketed 5-6m in to the rock.
3. Piles in the basement area are likely to be in the order of 12-15m long.
4. Piles to the rear of the site would vary with rockhead depth, but is likely to be between 10-20m in length.

5. The retaining wall to the rear will be required in this option. A rock slope is not likely to be available due to the depth of the rockhead.

3 Risks/Opportunities

The key risks and opportunities are as follows:

3.1 Overdale site

The key risks are:

- Ground contamination – no data available, but a risk remains given previous uses
- Lack of ground investigation leading to longer/larger pile size and/or greater numbers
- Shallow rock affecting excavations
- Adjacent to steep slope of Le Val Andre – may require slope stabilisation works
- Work on a live hospital site

The key opportunities are:

- Potential for use of shallow foundations subject to detailed ground investigation and assessment of rock strength

3.2 Existing general hospital site

The key risks are:

- Ground contamination – no data available, but a risk remains given previous uses
- Lack of detailed ground investigation leading to longer/larger pile size and/or greater numbers
- Relatively shallow ground water under pressure and potential for running sands affecting excavations and pile methods.
- Existing basement providing a constraint to new building
- Existing piled foundations providing a constraint to new substructure design
- Work adjacent to existing buildings and on a live hospital site.
- The level of structural work required for refurbishment areas cannot be assessed at present.

The key opportunities are:

- Potential for re-use of piles at the existing general hospital subject to detailed investigations

3.3 Waterfront site

The key risks are:

- Ground contamination (refer to geo-environmental report)
- Lack of detailed ground investigation leading to longer/larger pile size and/or greater numbers
- Exposed, marine site with potential impact from storm events

The key opportunities are:

- Can be constructed in a single phase and provide a shorter overall programme

3.4 People's Park site

The key risk are:

- Rockhead levels cannot be determined with confidence due to the limited amount of available GI data. This will directly affect the substructure design and costs.
- Ground water levels cannot be determined with confidence given the limited amount of available data.
- The rock hardness will directly affect the cost and time required for excavation. There is no direct GI data to confirm this variable. There is only anecdotal evidence from historical records of nearby quarries to suggest the methods required to excavate the rock.

The key opportunities are:

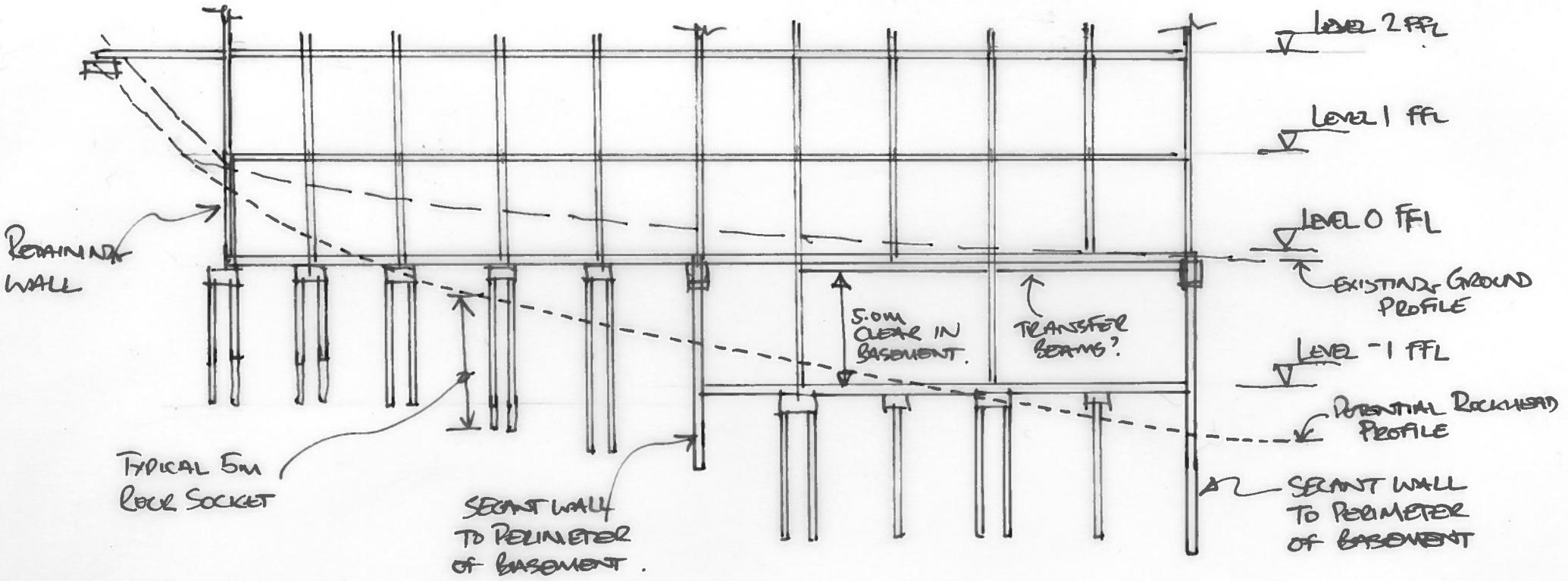
- Should groundwater be determined not to be within the depth of excavation, or that the water is a perched water layer rather than the main aquifer, it may be possible to limit the plan extent of the piled wall (potentially utilising open cut to the North of the site) and/or use a contiguous piled wall in lieu of the secant wall as this would not need to be watertight. The need for dewatering during construction could also be reduced or potentially eliminated.

4 Derogations

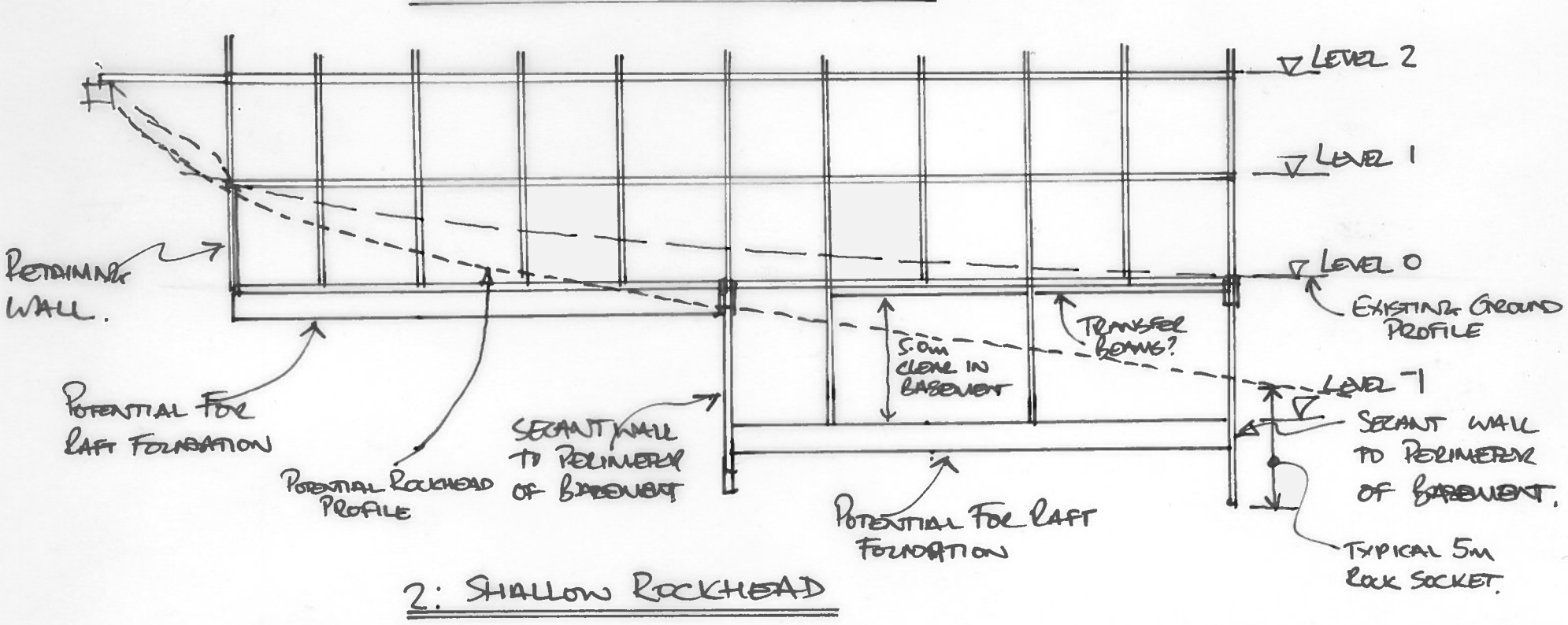
It is assumed that HTM 08.01 will be applied to the structural design, in particular floor vibration limits, to suit the use of specific areas of the hospital which will influence the final slab thickness and method of construction.

There are no identified derogations at this time.

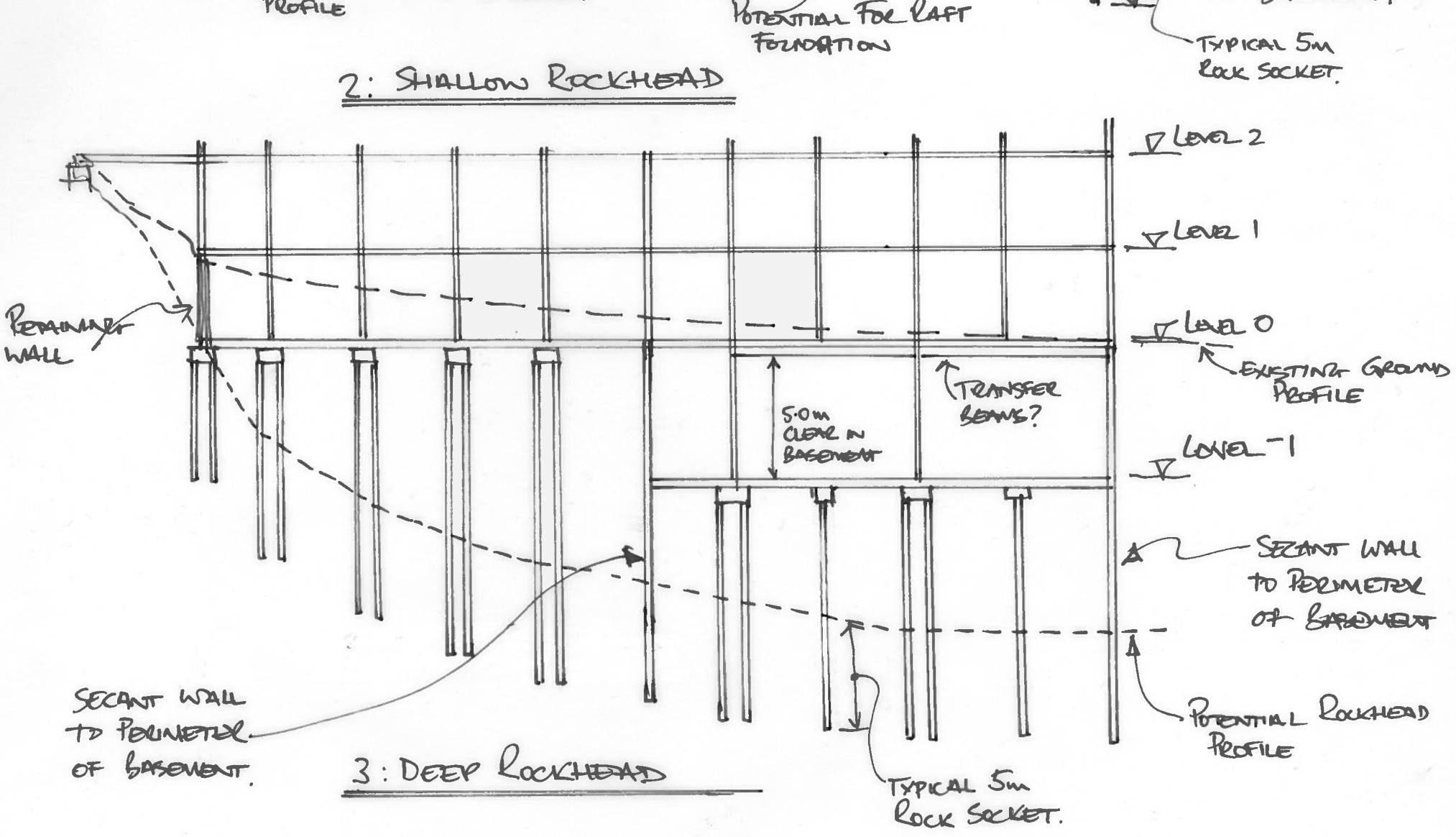
INDICATIVE SUBSTRUCTURE SCENARIOS.



1: INTERMEDIATE ROCKHEAD



2: SHALLOW ROCKHEAD



3: DEEP ROCKHEAD

NOTES:
- VERTICAL SCALE IS EXAGGERATED. (TWICE HORIZONTAL).
- IF TRANSFER BEAMS ARE REQUIRED OVER BASEMENT THE EXCAVATION DEPTH WILL INCREASE
- TO BE READ IN CONJUNCTION WITH NOTE TN-STR-001

N.T.S

SK-STR-OPTE-001

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