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07-0296

FLOOD RISK ASSESSMENT – REV B

FOR

ANAEROBIC DIGESTION PLANT, WESTWOOD

AT

BEDFORD ROAD, RUSHDEN

DECEMBER 2007

Registered No. 1547400
VAT No 336 2554 60

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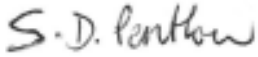
PROJECT NUMBER	**07-0269**
PROJECT	**ANAEROBIC DIGESTION PLANT, WESTWOOD**
CLIENT	The Bedfordia Group Milton Parc Milton Ernest MK44 1YU
CONSULTING ENGINEERS	Rolton Group Limited The Charles Parker Building Midland Road Higham Ferrers Northants NN10 8DN

REVISION & ISSUE RECORD

Revision	Date	Name	Qualifications	Signature
B	December 2007	Shaun Pentlow	Senior Project Engineer	
		Allan Rose	Managing Director	

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CONTENTS

PREFACE

a) This Risk Assessment and/or opinion has been prepared for the specific purpose stated therein.

b) The Risk Assessment has been prepared for the exclusive use by:-

The Bedfordia Group
Local Authority
Environment Agency

c) This document is issued only to the persons stated above and on the understanding that this Practice is not held responsible for the actions of others who obtain any unauthorised disclosure of its contents, or place reliance on any part of its findings, facts or opinions, be they specifically stated or implied.

d) This study is a risk based assessment of potential flooding issues at the study site and the information presented and the conclusions drawn are for guidance only and provide no guarantee against flooding.

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1.0 INTRODUCTION

This Flood Risk Assessment has been prepared on behalf of Bedfordia Group in support of their detailed planning Application and to assist the Environment Agency to assess the Flood Risk impact of the development on the surrounding area.

This report has been formatted in accordance with the requirements outlined in Planning Policy Statement 25 (PPS 25) and to assess the comments received in the pre-application advice (Your Ref AN/2007/102630/01-L01) and at the subsequent meeting. To further assist this checking process included in Appendix H is a copy of the EA guidance note checklist and its location within the report.

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2.0 SITE SUMMARY

The proposed site is situated to the South of Rushden off the A6 within Northamptonshire and is centred approximately on National Grid Reference SP 9889 6323. The site is located approximately 400m from the A6 and is approximately 4.3 ha in size within an area of arable farm land. An existing bridleway runs beyond the southern boundary hedge, generally in an east-west direction.

The site is bounded by existing hedge lines to the south and west and existing arable land to the north and east. The predominant soil type is clay and therefore the permeability will potentially be very low.

Location plans of the site are included in Appendix A.

3.0 SITE LEVELS – EXISTING AND PROPOSED

3.1 Existing Levels

The general topography of the site, prior to development consists of a shallow gradient falling from south to north at an approximate gradient of 1:160 with the site being generally flat from east to west. The proposed development appears to be at approximately the high point in the local topography.

Towards the Northwest of the site, as indicated on the location plan in Appendix B, there is a field boundary ditch running southwest to northeast.

Drawing INF02 in Appendix B indicates the pre-development levels.

3.2 Proposed Levels

During the development of the site the ground will be regraded to form a level plateau for the building footprint and appropriate gradients for areas of hard standing. Within the treatment areas the proposed levels will be such that the ground will slope approximately north east to a low point. The treatment area will have an earth bund surrounding it, primarily to prevent pollution incidents but also as a surface water storage feature.
The main tank process area is proposed to be located in a lowered area to allow segregation of run-off/spillages from this operational area which has a higher risk of leaks than the larger storage tank area.

The finished levels will be designed so that during inundation of the proposed drainage system, above ground water flow paths should be directed beyond entrances to the main site building and therefore reduce the risk of flooding.

Drawing INF01 in Appendix B indicates initial proposed levels based on the latest architect's layout.

All levels are based on the Ordnance Datum, provided by MK Surveys utilising the GPS network.

4.0 EXISTING SITE DRAINAGE SYSTEM

From a site inspection there does not appear to be any existing man made drainage system in place. The surface water run-off from the site would drain to the existing field ditches and drain off the site to the north. This combines with adjacent field drainage ditches through Melchbourne and Upper Dean and outfalls into the River Til in Lower Dean, approximately 6Km north east of the site.

5.0 HYDRAULIC INFLUENCES

The key features of the existing site drainage infrastructure, which influence the hydrology of the site are detailed below.

Photographs of these features are indicated in Appendix C.

5.1 Pond and field drainage ditches

From the survey and available OS data the location of a pond adjacent to the entrance to the site has been identified along with the field drainage ditches. From a site inspection the pond appears to be a naturally occurring field drainage pond which is fed by the local field ditch network. The ownership and maintenance, although not currently established, would be similar to the field boundary ditches in that riparian owners would have the maintenance responsibility. The ditch system flows to the north of the site and beyond. As the ditch drainage system will not generally be disturbed as part of this scheme, it should continue to function adequately. Section 8.4 details the potential flood plain of the ditch system and identifies that this has no impact on the development.

5.2 Ground Conditions

From BGS data sheet 186, the site is underlain by glacial deposits comprising, Oadby Till overlying Oxford Clay. This would potentially allow little permeability and the rainfall on the surface would flow to the field ditches. Therefore groundwater flooding is very unlikely.

5.3 Proposed Drainage

All flows from the proposed site will be restricted to Greenfield run-off.

The storage and private drainage system will be maintained by the on-site maintenance team.

Should the proposed drainage system become blocked or inundated, the proposed site levels should encourage the above ground flow of water beyond the main building to the North of the site. The current indicative levels design indicated in Appendix B identifies this provision and the detailed levels design should follow this principle.

6.0 IDENTIFICATION OF POTENTIAL FLOODING SOURCES

The River Til is located approximately 1.5km north of the site and the indicative flood plain map provided by the Environment Agency indicates that during an extreme storm event the extent of the River flooding should not reach the site boundary and is in fact still approximately 1.5km away from the site.

Appendix D indicates the Environment Agency's indicative flood plain map.

The field boundary ditches and pond adjacent to the site could act as conveyance for extreme rainfall and could therefore convey off site flows towards the development site. However as the proposed (and existing) levels of the site promote runoff in a northerly direction away from the site it is unlikely that this conveyed flow would cause flooding of the site. Also as indicated in further detail in section 8.4, the field boundary ditch adjacent to the site has significant capacity to convey additional flow compared with the potential Greenfield run-off rates of its current catchment area.

As the proposed development will be mostly impermeable the main potential flooding source would be the result of direct rainfall on the site. The proposed drainage and site levels will be designed specifically to reduce the risk of flood water entering the main building.

7.0 EXISTING FLOOD RISKS

The Environment Agency does not have any record of flooding on the site dating back to 1947. This includes the information gathered during the Easter floods of 1998, which was understood to be due to a 1 in 75 year probability rainfall event and a 1 in 150 year catchment event.

Included in Appendix D is the Environment Agency's indicative flood plain map, which identifies the site as being outside of the current area liable for flooding in an extreme storm event (1 in 1000 year, 0.1% probability).

The field boundary ditches and pond adjacent to the site could act as conveyance for extreme rainfall and could therefore convey off site flows towards the development site. However as the proposed (and existing) levels of the site promote runoff in a northerly direction away from the site it is unlikely that this conveyed flow would cause flooding of the site. Also as indicated in further detail in section 8.4, the field boundary ditch adjacent to the site has significant capacity to convey additional flow compared with the potential Greenfield run-off rates of its current catchment area.

8.0 ANALYSIS OF PROPOSED DEVELOPMENT AND SITE DRAINAGE SYSTEM

8.1 Proposed Development

The proposed development will consist of an anerobic digestion plant comprising buildings and tanks and an access road to take in and process 45,000 tonnes of food chain waste on a commercial basis and convert it into biogas to provide renewable heat and energy and bio-fertiliser (also known as digestate)

8.2 Surface Water Drainage

There are four elements to the proposed drainage system consisting of building roof drainage, car park and service yard drainage, treatment area drainage and the access road drainage. There are two storage areas proposed for the development and they are each identified in section 8.3 below, following the surface water drainage details. The drainage layout is indicated on INF03 which is contained within Appendix E. The proposed drainage system has been assessed using FEH rainfall and Microdrainage simulation software to determine the critical storm duration for each probability rainfall event analysed.

Building Roof Drainage

It is proposed that the building drainage is directed to two rainwater harvesting systems for re-use in the digestion plant. Overflow from these storage tanks will be directed to the balancing pond, the details of which are identified in the car park and service yard drainage below.

Car Park/ Service Yard Drainage

The parking area and service yard drainage is to be directed to the proposed balancing pond to the north of the site after passing through a petrol interceptor and catchpit to limit contamination as required by building regulations part H and PPG3. Due to the ground conditions on the site potentially being virtually impermeable and due to the potential contaminants on the site, soakaways and porous paving will not be a suitable means of surface water disposal. The simulation of a 1 in 30 year return period storm event, contained within Appendix G, identifies that the surface water can be conveyed to the balancing pond without pipe flooding. For storms in excess of the 1 in 30 year return period storm the system has the potential to be surpassed and water would flow onto the ground. The proposed ground levels are such that this overland flood flow would be directed towards the proposed interception swale which would convey this flow to the balancing pond.
The car park, service yard and excess roof water run-off will be directed to the proposed balancing pond as identified on INF03 which is contained within Appendix E. The details and calculations of the storage areas are discussed below in section 8.3.
A washdown area is proposed for the site which is intended to be a self contained unit with recycling of water and disposal of deleterious matter on a regular basis.

8.0 ANALYSIS OF PROPOSED DEVELOPMENT AND SITE DRAINAGE SYSTEM CONTINUED

An environmental wheel wash will also be provided on the site which will also be self contained and will recycle the chemicals within a bunded area. The wheel wash and washdown area will not discharge from the site and will therefore not form part of the discharge consent.

Bunded area drainage

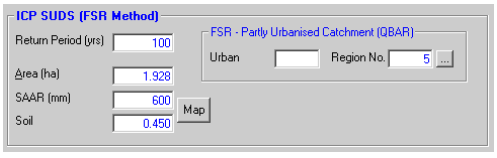
The treatment area will comprise of two areas for surface water storage purposes. The lowered area containing the process tanks will be used to store the more vulnerable surface water and the large treatment tanks with local hardstanding and the access road for maintenance will be outside of this lowered area. The whole bunded area will be underlain by impermeable material or an impermeable membrane and will slope towards the low point of the treatment areas. The lowered area will be concrete finish and the remaining area will contain a gravel finish to allow surface water to drain to the proposed sump. A regular inspection of the sumps will occur to check for contaminants and released (manually) into the attenuation pond or back into the anaerobic digestion process.

Access Road drainage

The access road into the development will be designed slightly above existing ground level and with a crossfall to ensure water is shed onto the adjacent fields. This will encourage the water to naturally dissipate into the ground and mimic the current site conditions.

8.3 Storage structures

The proposed site will be split into two storage areas, which will consist of the bunded area within the treatment zone and the balancing pond adjacent to the site entrance. The site has an approximate impermeable area directed towards the proposed drainage system of approximately 1.928Ha. Based on the existing impermeable soils on the site and utilising the Greenfield run-off calculations within the Microdrainage software for the IH 124 methodology, the equivalent Greenfield run-off rate from the development would be as follows,



Region	QBAR [l/s]	Q (100 yrs) [l/s]	Q (1 yrs) [l/s]	Q (30 yrs) [l/s]	Q (100 yrs) [l/s]
1	7.1	17.5	6.0	13.4	17.5
2	7.1	18.6	6.2	13.4	18.6
3	7.1	14.7	6.1	12.4	14.7
4	7.1	18.2	5.9	13.9	18.2
5	7.1	25.2	6.2	17.0	25.2
6/7	7.1	22.6	6.0	16.0	22.6
8	7.1	17.1	5.5	13.5	17.1
9	7.1	15.4	6.2	12.5	15.4
10	7.1	14.7	6.2	12.0	14.7
Ireland National	7.1	13.0	6.0	11.2	13.0
Ireland East	7.1	13.4	6.0	11.5	13.4
Ireland South	7.1	13.0	6.0	11.2	13.0
Ireland West	7.1	12.6	6.0	10.9	12.6
Greater Dublin	7.1	18.5	6.0	15.0	18.5

Thus the QBAR for the site would be 7.1 l/s, Q1 6.2 l/s, Q30 17.0 l/s and the Q100 would be 25.2 l/s.

8.0 ANALYSIS OF PROPOSED DEVELOPMENT AND SITE DRAINAGE SYSTEM CONTINUED

8.3 Storage structures continued

Bunded area storage

As indicated above, the bunded area will provide a large potential storage volume for regular surface water attenuation, whilst at the same time providing a contamination containment area in the event of a spillage or rupture of one of the treatment tanks. The whole area will be underlain by an impermeable material or membrane. The lowered area containing the process tanks is designed with a small upstand to ensure that surface water run-off from the outer bunded area is kept separate from the lower area up to a 1 in 30 year return period storm event.
The calculations indicated in Appendix F identify that for the impermeable area of 1.309Ha, with a zero discharge from the bunded area, the volume of storage for the critical storm event is 1888m^3. This is based on a 7 day duration, 1 in 100 year return period (+30%) storm for both bunded areas and during this time some of the water would be used within the process or discharged off site. This equates to a maximum storage depth of approximately 680mm in the main bunded area and 1120mm in the lowered bunded area which would then be discharged into the balancing pond and the ditch system via a restricted discharge of 2.5 l/s to ensure the balancing pond capacity was not breached. The maximum water level indicated in the calculation results of 97.18 for the man bunded area and 96.86 for the lowered bunded area does not take into account the granular/gravel fill around the tank area and thus the level is likely to be marginally lower than those identified.

It is anticipated that the plant and digestion process will require additional water and this is estimated as 3000m^3 annually or approximately 25% of the anticipated rainfall on the site. Therefore as the discharge is delayed or reduced from the bunded area, the pass on flow would be delayed or reduced which accords with the principals of the EA/DEFRA document W5-074/A/TR/1 'preliminary rainfall runoff management for new developments'. Also the requirement for long term storage discharge (2 l/s/Ha) identified in this document is satisfied by the proposed discharge from the balancing pond indicated below of 3.3 l/s.

Balancing pond storage

The proposed balancing pond, situated adjacent to the site entrance has an approximate maximum plan area of 1370m^2 and an approximate storage depth of 0.5m, which allows the storage of approximately 495m^3 of water. The balancing pond will receive water from the hardstanding area (once it has passed through the catchpit and interceptor) and the overflow from the rainwater recycling tanks. It will also receive flow from the bunded area following a contamination check by the site operative.
Surface water runoff from the maize storage area will be directed into the internal anaerobic digestion process and will therefore not contribute to the surface water discharge from the site.

8.0 ANALYSIS OF PROPOSED DEVELOPMENT AND SITE DRAINAGE SYSTEM CONTINUED

8.3 Storage structures continued

Balancing pond storage continued

The calculations indicated in Appendix G identify that the proposed pond size is capable of providing sufficient storage volume to accommodate the worst case 1 in 100 year (1% probability) return period storm, with a 20% global warming factor and 10% dilapidation taken into account.

The results indicate that the discharge can be limited to 3.3 l/s with an 80mm diameter Hydrobrake, which is considerably less than the Q100 greenfield run-off rate of 21.9 l/s and within 24hours the balancing pond can accommodate a 1 in 10 year (10% probability) rainfall event.
The discharge from the balancing pond will be restricted by a Hydrobrake or similar flow control device and will pass through a reed bed prior to discharging into the field boundary ditch. This reed bed will be designed during the detailed design stage and together with the outfall to the ditch will be subject to an Environment Agency land drainage consent (Structure/Quality).
Due to the length of the field ditch prior to discharge to the River Till, the flow from the site would be mixed with additional field run-off and potentially consumed by the vegetation alongside the ditch, prior to discharge to the river Til.

8.4 Development affect on field boundary ditch flood plain

The existing field boundary ditch adjacent to the site convey's surface water flows from the adjacent farmland. In order to identify its potential flooding extent during a 1 in 100 year return period storm, the Greenfield run-off figures indicated in section 8.3 above are utilised together with the FEH Cd Rom catchment area for the adjacent field ditch. This identifies the catchment area of the ditch to be 0.51km^2 approximately 500m downstream of the development site. This catchment area from the FEH cd ROM is identified in Appendix E.
The field ditch has been modelled in Microdrainage using a worst case cross section and roughness, 'n' value for each network element. It has also been modelled with 1117 l/s flow which equates to 21.9 l/s/ha, based on the 51 Ha catchment. (The Greenfield run-off flow is approximately 13 l/s/Ha) The field boundary ditch conveys the flows and the proposed and existing culverts provide the limited flow conveyance for the system. Therefore there is no out of banks flooding associated with the field boundary ditches and this therefore has no effect on the development proposals.
The calculations and cross section layout of the field boundary ditches are indicated in Appendix E.

8.0 ANALYSIS OF PROPOSED DEVELOPMENT AND SITE DRAINAGE SYSTEM CONTINUED

8.5 Global Warming and Dilapidation

Planning Policy Statement 25 (which sets out the government requirements for the management and reduction of flood risk in the land use planning process) requires the investigation of climate change on the proposed development and states that the storm intensity could be increased by up to 20% by 2085 (section B9).

The design life of the buildings is less than 80 years therefore the on-site drainage design will ensure climate change (up to 20%) is taken into account together with a 10% dilapidation factor of the infrastructure; by ensuring the design storage volume has an appropriate freeboard. This is identified in the calculations as a 30% global warming factor which is applied to the rainfall intensity.

9.0 ASSESSMENT, PROBABILITY AND RATE OF POTENTIAL FLOODING

The plant room associated with the bunded area has a FFL of approximately 96.875 and is protected by the flood gates and bund from containing flood water for the extreme rainfall identified in section 8. The lowered area containing the process tanks is designed with a small upstand to ensure that surface water run-off from the outer bunded area is kept separate from the lower area up to a 1 in 30 year return period storm event. Drawing INF04 included in Appendix F identifies the extent of the predicted 1 in 100 year (+30%) storm and includes a cross section illustration of the worst case duration storm. Should the floodgates not be shut correctly the levels are designed to encourage the flow of water away from the building towards the balancing pond.
The flow control device from the bunded area will need to be provided in an accessible area from the top of the bund in order that access is maintained following significant rainfall.

The site will be designed, as stated previously to a 1 in 100 year probability storm with global warming and dilapidation taken into account. During storms in excess of the design storm, there is the potential for the storage structures and drainage system to be overwhelmed by the volume of water, leading to flooding. The proposed site levels will be designed such that during these periods above ground water will be directed away from the main site building towards the balancing pond and boundary. In order to provide assistance to this over land flood path, it is proposed to provide a conveyance swale from the service yard low area towards the balancing pond.

Based on the PPS25 document (section D1) the site would be classified as being within a Category 1 flood zone – little or no risk. Due to the level of the site it is very unlikely the proposed buildings will be affected by river flooding in extreme storm events in excess of the 1 in 1000 year event identified on the Environment Agency's flood maps.

10.0 PROPOSED DEVELOPMENT IMPLICATIONS

Following the development of the site, the surface water from the site will be intercepted and stored as detailed in section 8. It is proposed that this stored water will be utilised within the plant process and operations wherever possible with the excess discharged to the local field ditch via a reed bed, by way of a final treatment process.

There will be a peak discharge of 3.3 l/s into the existing system from the proposed site which complies with EA guidelines, the calculations for Greenfield run-off and the long term storage discharge rate requirements.

10.1 Overall Flood Risk

During rainfall of up to a 1 in 100 year probability storm event the calculations indicate that there should be little or no risk of the main building flooding on the site.

Due to the reduction of infiltration water and overland flood flows on the site the potential flood risk to the surrounding area will also be reduced for storm events up to a 1 in 100 year return period. The bunded area has significant capacity to contain extreme event rainfall and as such would reduce the flooding downstream of the development during such events.

Therefore due to the provision of the infrastructure and storage areas, it is likely that the site would provide an overall reduction in flood risk to the surrounding area.

11.0 CONCLUSION

In conclusion, due to the location and gradient of the site the development should not be affected by the flooding of the River Till or adjacent field ditches.

It is proposed to utilise source control techniques to reduce the storm water discharge from the proposed development in order to minimise the impact of the development on the existing field ditch system and the surrounding area and to comply with EA guidelines.

The EA guidelines set out in the document 'preliminary rainfall runoff management for new developments' for surface water discharge and long term storage have been attained and the calculations provided to reinforce this statement.

The field boundary ditch adjacent to the site has significant capacity to convey additional flow compared with the potential Greenfield run-off rates of its current catchment area.

It is reasonably expected that the proposed infrastructure enables the overall flood risk of the site to be reduced following development.

12.0 REFERENCES

- "Flood Estimation Handbook" by The Institute of Hydrology.
- "Planning Policy Guidance 25, Development and Flood Risk" by Department for Transport, Local Government and the Regions.
- "Planning Policy Statement 25, Development and Flood Risk" by the Office of the Deputy Prime Minister.
- "Pollution prevention Guidance 3" by the Environment Agency.
- "C697 The SUDS manual" by CIRIA.
- Building Regulation part H.
- Drawing 12181 dated June 2007 by Milton Keynes Surveys.
- Drawing A/52052/11E dated 22nd June 2007 by Robinson & Hall.

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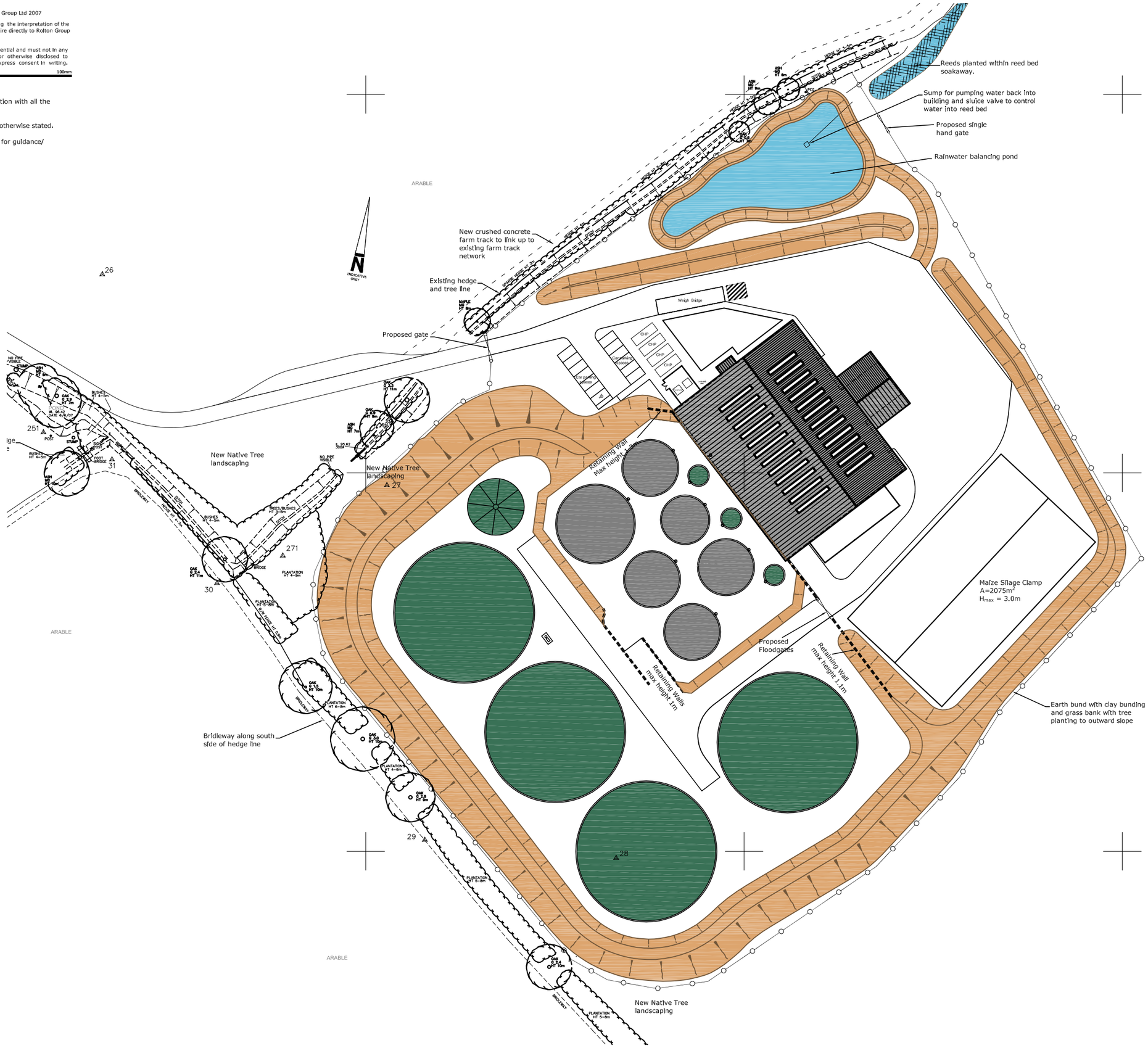
APPENDIX A

LOCATION PLAN

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.



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NO 16 NAPIER COURT
BARLBOROUGH LINKS
DERBYSHIRE S43 4PZ

BIOGEN

Rev.	Date	Description of Issue	Chkd
PL1	04.12.07	Issued for Planning	TAI
P3	28.11.07	Amended to suit clients comments	TAI
P2	26.11.07	Amended to suit clients comments	TAI
P1	24.10.07	Issed for comment	

Revisions

Issue Purpose:
PLANNING ISSUE

Project
BIOGEN UK LTD
WESTWOOD PLANT
NORTHANTS

Drawing Title:
PROPOSED SITE GA

Designer's Risk Assessment Reference:
TBA

Specification Reference:

Drawn By: NT
Checked By: TAI

Scales: 500@A1 1000@A3
Date: 19.10.07

Drawing No. 07-0296/A/01 Rev. PL1

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

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3. Drawings marked Preliminary are for guidance/ approval only.

N

W E

S

Based upon the Ordnance Survey sheet no. SP 9763 - 9864

TP10

Public Footpath

New crushed concrete hardcore farm track

Existing kissing gate to be resited along line of path

A6

BEDFORD ROAD

Bridleway

BW21

West Wood

Bencroft Grange

Bagleyfield Farm

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BIOGEN

Rev.	Date	Description of Issue	Chkd
PL1	05.12.07	Issed for Planning	

Revisions

Issue Purpose:
PLANNING ISSUE

Project
BIOGEN UK LTD
WESTWOOD PLANT
NORTHANTS

Drawing Title:
PROPOSED SITE LOCATION PLAN (1:2500)

Designer's Risk Assessment Reference:
TBA

Specification Reference:

Drawn By: NT
Checked By: TAI

Scales: 1:2500@A1, 1:5000@A3
Date: 03.12.07

Drawing No. 07-0296/A/02PL1
Rev.

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

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N

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Based upon the Ordnance Survey sheet no. SP 9763 - 9864

Higham Park

A6
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Knotting Green

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Rev.	Date	Description of Issue	Chkd
PL1	05.12.07	Issed for Planning	

Revisions

Issue Purpose:
PLANNING ISSUE

Project
BIOGEN UK LTD
WESTWOOD PLANT
NORTHANTS

Drawing Title:
PROPOSED SITE LOCATION PLAN (1:5000)

Designer's Risk Assessment Reference:
TBA

Specification Reference:

Drawn By: NT
Checked By: TAI

Scales: 1:5000@A1, 1:10000@A3
Date: 03.12.07

Drawing No. 07-0296/A/03PL1
Rev.

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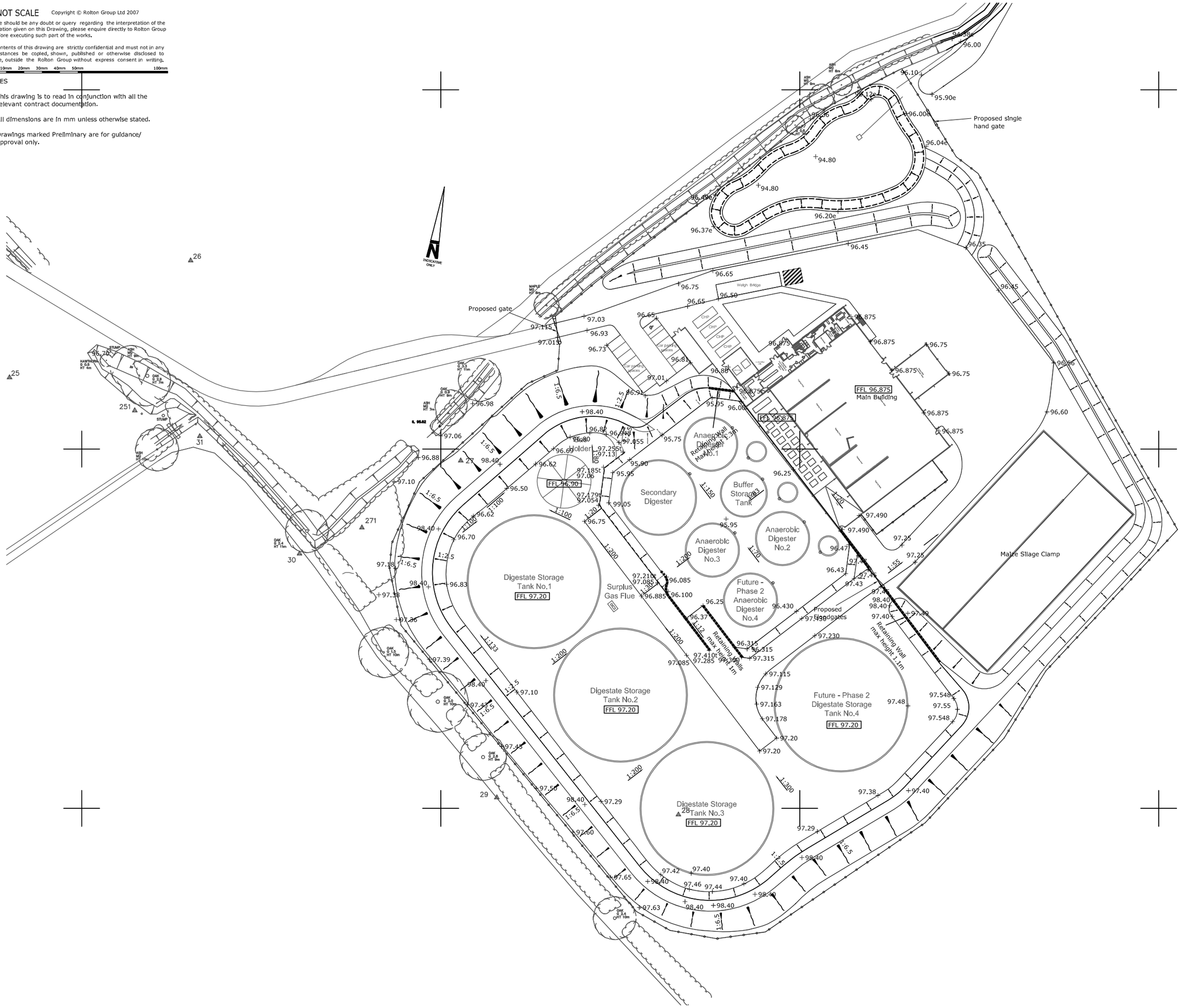
APPENDIX B

SITE LEVELS – PRIOR TO AND AFTER DEVELOPMENT

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.



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THE CHARLES PARKER BUILDING
MIDLAND ROAD, HIGHAM FERRERS
NORTHANTS NN10 8DN

NO 1 MINERVA BUSINESS PARK
LYNCH WOOD
PETERBOROUGH PE2 6FT

NO 6 THE COURTYARD
WARWICK ROAD, SOLIHULL
WEST MIDLANDS B91 3DA

NO 16 NAPIER COURT
BARLBOROUGH LINKS
DERBYSHIRE S43 4PZ

BIOGEN

Key:

FFL 97.30	Proposed finished floor level
+97.15e	Existing finishes levels
+97.30	Proposed finishes levels
+97.43t	Top of kerb levels
1:50	Proposed gradient
	Proposed fence
	Proposed gate

Rev.	Date	Description of Issue	Chkd
P4	13.12.07	Revised architects layout added. Levels revised.	SDP
P3	07.12.07	Proposed levels revised in accordance with new Architect's layout	SDP
P2	09.11.07	General amendments in accordance with new Architect's layout	SDP
P1	26.09.07	Preliminary issue	SDP

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Proposed Finishes Levels

Designer's Risk Assessment Reference:
TBA

Specification Reference:
N/A

Drawn By: AJM
Checked By: SDP

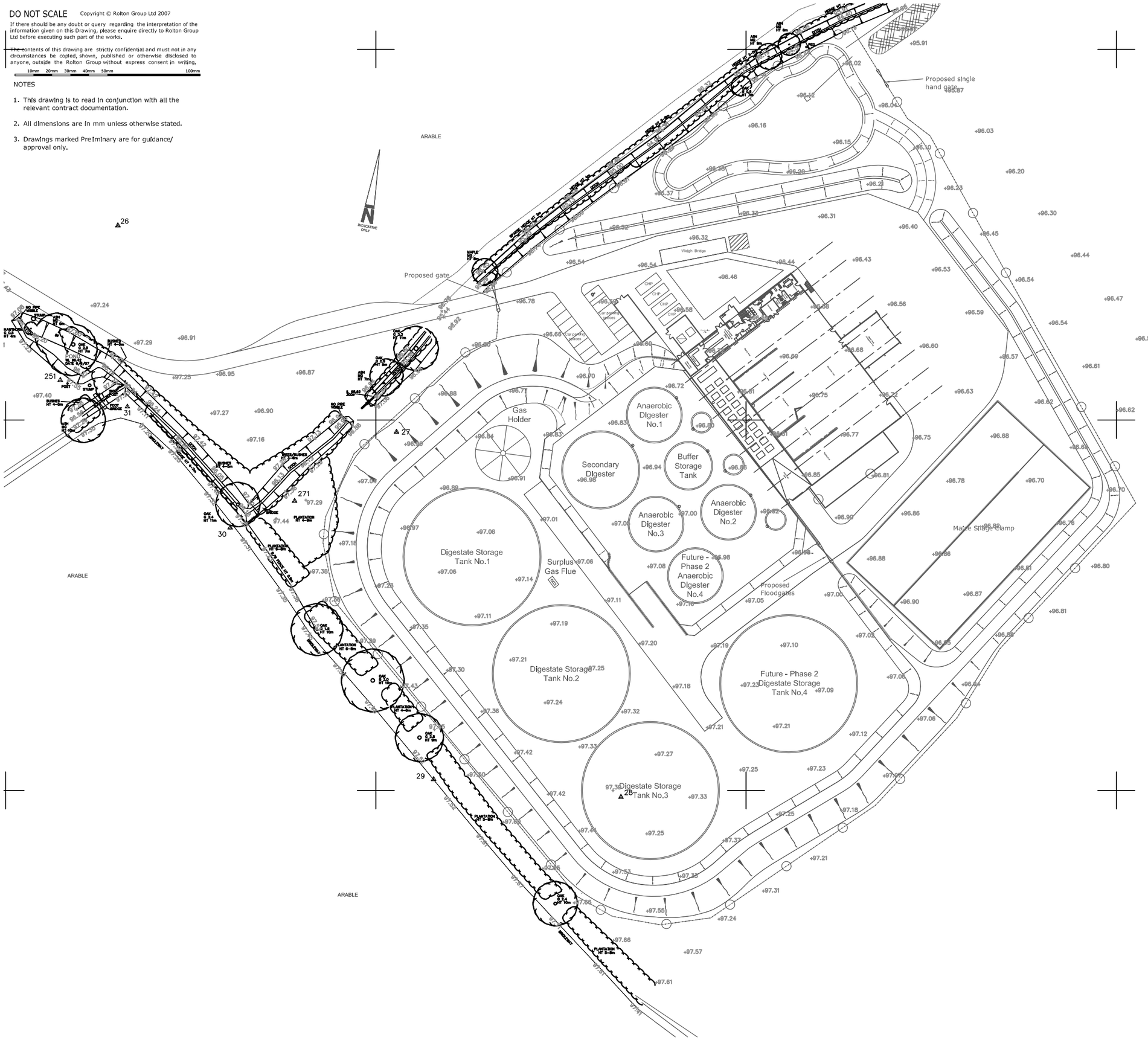
Scales: 1:500@A1, 1:1000@A3
Date: 26.09.07

Drawing No. 07-0296/INF/01 P4

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.



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BARLBOROUGH LINKS
DERBYSHIRE S43 4PZ

BIOGEN

Rev.	Date	Description of Issue	Chkd
P3	13.12.07	Revised architects layout added	SDP
P2	07.12.07	Architect's layout in the background changed	SDP
P1	20.09.07	Preliminary Issue	SDP

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Existing Levels

Designer's Risk Assessment Reference:
TBA

Specification Reference:
N/A

Drawn By: BEP
Checked By: SDP

Scales: 1:500@A1 1:1000@A3
Date: 24.09.07

Drawing No. 07-0296/INF/02 P3
Rev.

X:\07-0129\Design Docs (deliverables)\Drawings and Sketches\Working Drawings\Civil\07-0296 INF 02 Existing Levels.dwg, 13/12/2007 15:24:57

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APPENDIX C

PHOTOGRAPHS OF KEY FEATURES

1. Existing field boundary pond looking north west

2. Existing field boundary ditch looking south east

3. Proposed site view looking north west

4. Existing field ditch – proposed outfall location

10mm 20mm 30mm 40mm 50mm 100mm

N

W E

S

Based upon the Ordnance Survey
sheet no. SP 9763 - 9864

Key

5 Photograph locations

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BIOGEN

Rev.	Date	Description of Issue	Chkd
PL1	05.12.07	Issed for Planning	

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Photograph
Location Plan

Designer's Risk Assessment Reference:
TBA

Specification Reference:

Drawn By: BEP
Checked By: SDP

Scales: 1:2500@A1
1:5000@A3
Date: 24.09.07

Drawing No. 07-0296 SK 03
Rev. P1

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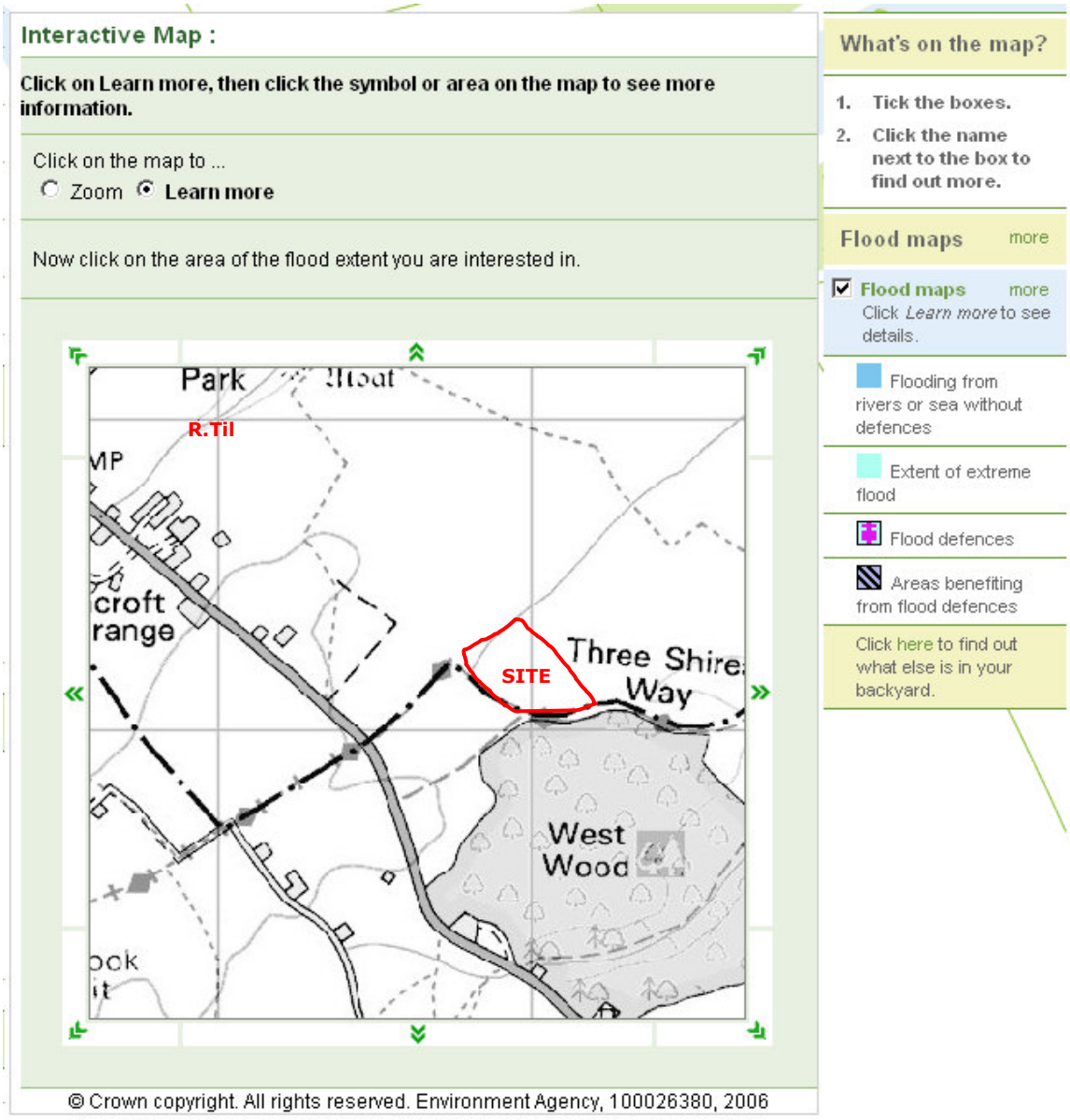
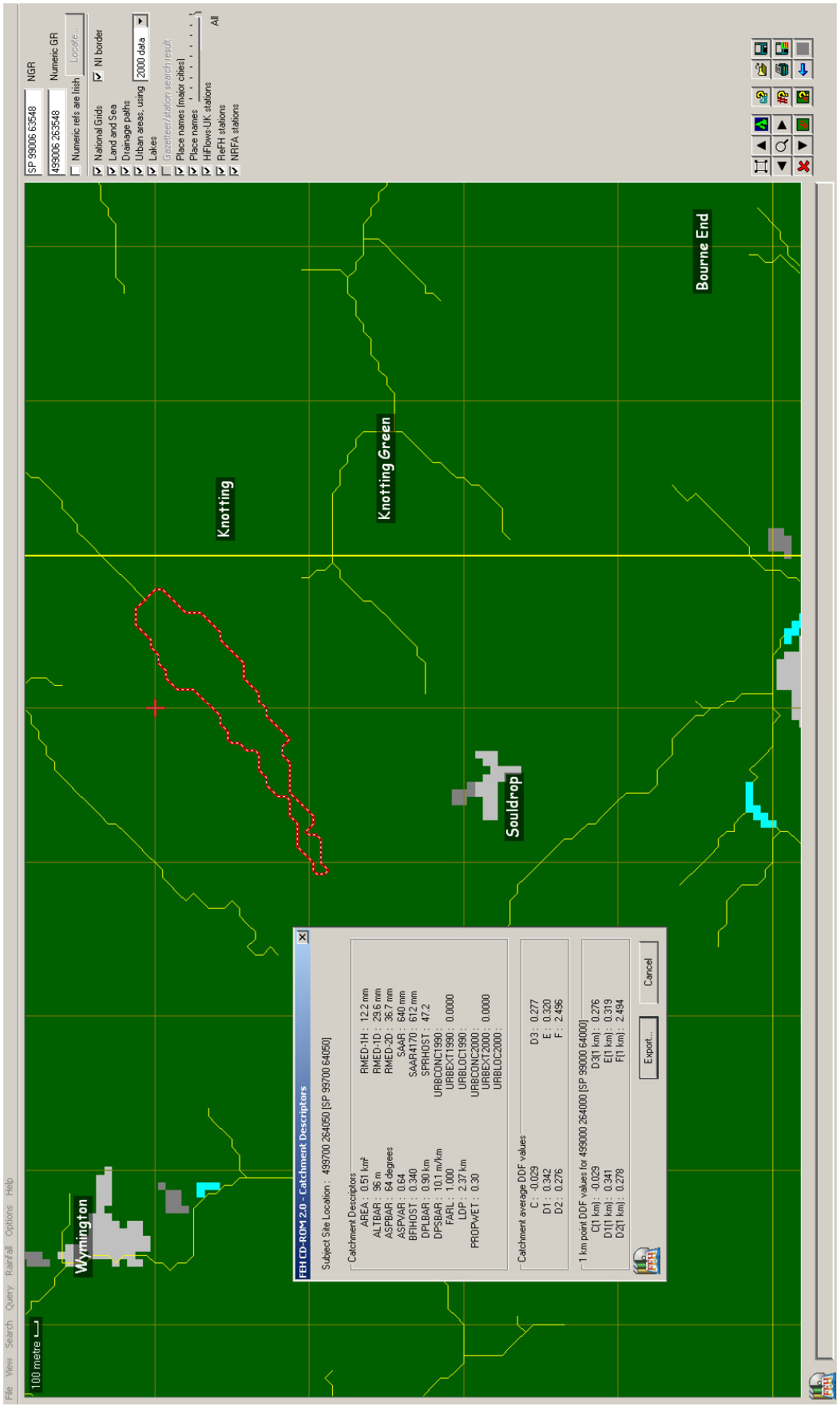
APPENDIX D

ENVIRONMENT AGENCY'S INDICATIVE FLOOD PLAIN MAP AND FIELD BOUNDARY DITCH CALCULATIONS





Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations.sws	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File c:\WinDes\STANDARD.PIP Manhole Size File c:\WinDes\STANDARD.MHS

FEH Rainfall Model

Return Period (years)	100
Site Location	500300 264600 TL 00300 64600
C (1km)	-0.029
D1 (1km)	0.348
D2 (1km)	0.278
D3 (1km)	0.272
E (1km)	0.320
F (1km)	2.492
Maximum Rainfall (mm/hr)	50
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Infiltration %	0
Minimum Backdrop Height (m)	0.000
Depth from Soffit to G.L. (m)	1.200
Min Vel. (m/s - Auto Design Only)	0.75
Min Slope (1:X - Optimisation)	500
Minimum Outfall Invert (m)	94.700
Ground Level at Outfall (m)	96.250
Outfall Manhole Name	ditch
Outfall Manhole Dia/Length (mm)	3000
Outfall Manhole Width (mm)	0

Designed with Level Inverts

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	n	HYD SECT	DIA (mm)
1.000	46.00	0.160	287.5	0.000	4.00	999.0	0.035	\/	-1
1.001	37.00	0.220	168.2	0.000	0.00	118.0	0.035	\/	-4
1.002	10.40	0.320	32.5	0.000	0.00	0.0	0.012	o	600
1.003	18.60	0.110	169.1	0.000	0.00	0.0	0.035	\/	-6
1.004	24.00	0.240	100.0	0.000	0.00	0.0	0.012	o	750
1.005	35.50	0.200	177.5	0.000	0.00	0.0	0.035	\/	-7
1.006	55.40	0.390	142.1	0.000	0.00	0.0	0.035	\/	-10

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.7	96.340	0.000	999	0	0	1.03	1914	999
1.001	50.0	5.2	96.180	0.000	1117	0	0	1.30	2354	1117
1.002	50.0	5.3	95.960	0.000	1117	0	0	4.13	1167	1117
1.003	50.0	5.5	95.640	0.000	1117	0	0	1.50	4051	1117
1.004	50.0	5.6	95.530	0.000	1117	0	0	2.73	1206	1117
1.005	50.0	6.1	95.290	0.000	1117	0	0	1.33	2341	1117
1.006	50.0	6.6	95.090	0.000	1117	0	0	1.61	3706	1117

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations.sws	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
1.000	\/	-1	1	97.230	96.340	0.090	2000
1.001	\/	-4	2	97.300	96.180	0.320	2000
1.002	o	600	3	96.760	95.960	0.200	2000
1.003	\/	-6	4	96.940	95.640	0.500	2000
1.004	o	750	5	96.790	95.530	0.510	2000
1.005	\/	-7	6	96.430	95.290	0.340	2000
1.006	\/	-10	7	96.440	95.090	0.550	2000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
1.000	46.00	287.5	2	97.300	96.180	0.320	2000
1.001	37.00	168.2	3	96.760	95.960	0.000	2000
1.002	10.40	32.5	4	96.940	95.640	0.700	2000
1.003	18.60	169.1	5	96.790	95.530	0.460	2000
1.004	24.00	100.0	6	96.430	95.290	0.390	2000
1.005	35.50	177.5	7	96.440	95.090	0.550	2000
1.006	55.40	142.1	ditch	96.250	94.700	0.750	3000

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations.sws	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
1	97.230	0.890	2000	1.000	96.340	-1			
2	97.300	1.120	2000	1.001	96.180	-4	1.000	96.180	-1
3	96.760	0.800	2000	1.002	95.960	600	1.001	95.960	-4
4	96.940	1.300	2000	1.003	95.640	-6	1.002	95.640	600
5	96.790	1.260	2000	1.004	95.530	750	1.003	95.530	-6
6	96.430	1.140	2000	1.005	95.290	-7	1.004	95.290	750
7	96.440	1.350	2000	1.006	95.090	-10	1.005	95.090	-7
ditch	96.250	1.550	3000		OUTFALL		1.006	94.700	-10

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations SIM 100y 15min ...	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Global Variables

Region	FEH Rainfall Model
Return Period (yrs)	100
Site Location	500300 264600 TL 00300 64600
C(1km)	-0.029
D1(1km)	0.348
D2(1km)	0.278
D3(1km)	0.272
E(1km)	0.320
F(1km)	2.492
Volumetric Runoff Coef	0.840
Profile Type	Winter
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.006	ditch	96.250	94.700	3000	0

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations SIM 100y 15min ...	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	n	Hyd Sect	Dia (mm)
1.000	46.00	0.160	287.5	0.000	4.00	1	0.035	\/	-1
1.001	37.00	0.220	168.2	0.000	0.00	1	0.035	\/	-4
1.002	10.40	0.320	32.5	0.000	0.00	1	0.012	o	900
1.003	18.60	0.110	169.1	0.000	0.00	1	0.035	\/	-6
1.004	24.00	0.240	100.0	0.000	0.00	1	0.012	o	900
1.005	35.50	0.200	177.5	0.000	0.00	1	0.035	\/	-7
1.006	55.40	0.390	142.1	0.000	0.00	1	0.035	\/	-10

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	1	97.231	96.340	0.001	97.300	96.180	0.230		2000
1.001	2	97.300	96.180	0.200	96.861	95.960	-0.019		2000
1.002	3	96.861	95.960	0.001	96.940	95.640	0.400		2000
1.003	4	96.940	95.640	0.080	96.790	95.530	0.040		2000
1.004	5	96.790	95.530	0.360	96.431	95.290	0.241		2000
1.005	6	96.431	95.290	0.001	96.641	95.090	0.411		2000
1.006	7	96.641	95.090	0.001	96.250	94.700	0.000		2000

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	BIOMASS POWER STATION BEDFORD ROAD RUSHDEN DITCH CALCULATION	Micro Drainage
Date 24.10.2007 File Ditch calculations SIM 100y 15min ...	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Summary of Results

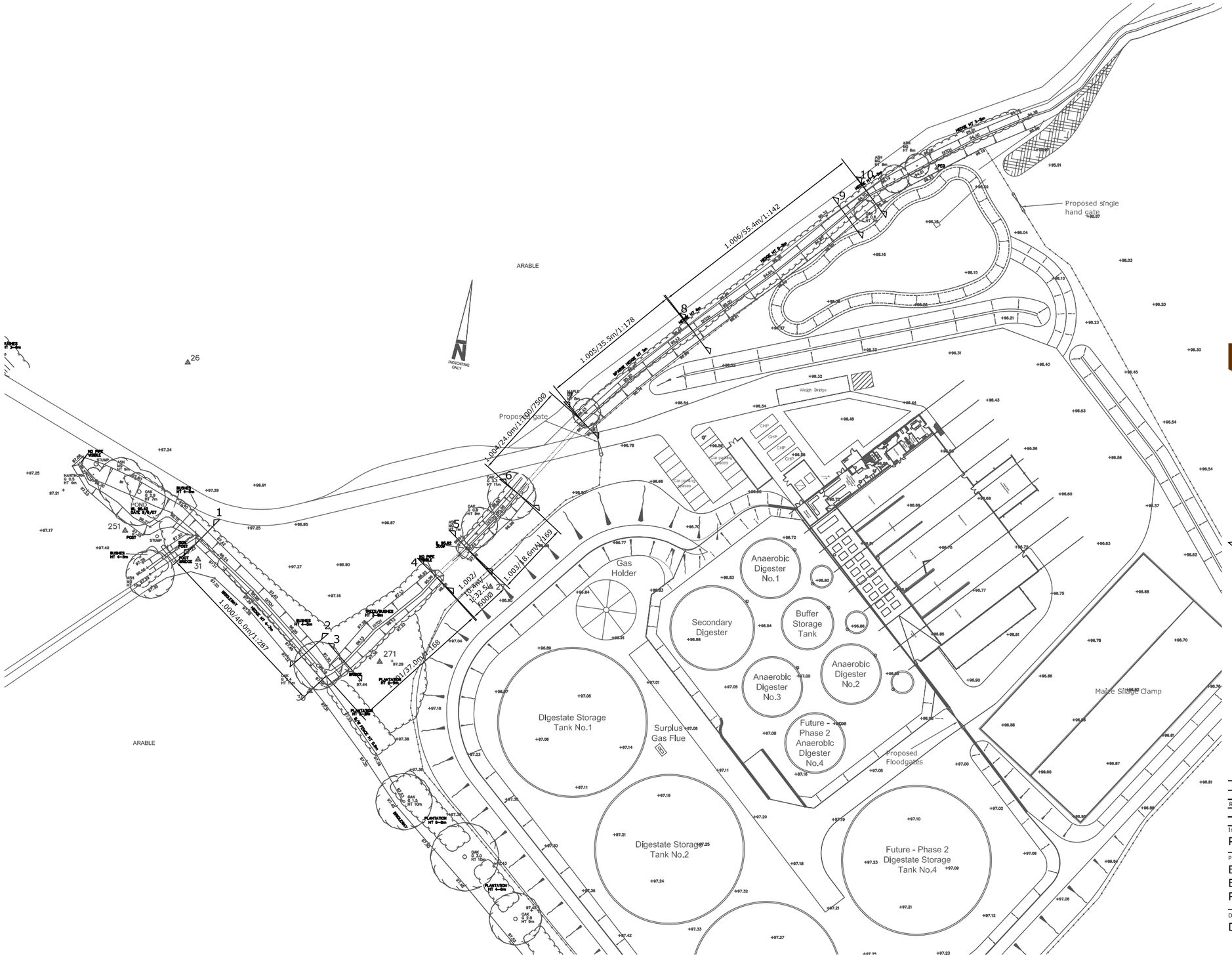
Return Period (years)	100	Analysis Time Step	Fine
Storm Duration (mins)	15	DVD Status	OFF
Profile Type	Winter	Inertia Status	OFF
Margin for Flood Risk warning (mm)	450		

PN	Water Lev. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	97.011	-0.219	0.000	0.56	0	999	FLD RISK
1.001	96.860	-0.240	0.000	0.52	0	1117	FLD RISK
1.002	96.714	-0.146	0.000	0.88	0	1117	FLD RISK
1.003	96.469	-0.391	0.000	0.34	0	1117	O K
1.004	96.430	0.000	0.000	1.01	0	1117	FLD RISK
1.005	96.128	-0.302	0.000	0.53	0	1117	FLD RISK
1.006	95.997	-0.643	0.000	0.33	0	1117	O K

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.



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BIOGEN

Rev.	Date	Description of Issue	Chkd
P2	13.12.07	Revised architects layout added.	SDP
P1	24.10.07	Preliminary issue	SDP

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Ditch Sections

Designer's Risk Assessment Reference:
TBA

Specification Reference:
N/A

Drawn By: AJM
Checked By: SDP

Scales: 1:500@A1 1:1000@A3
Date: 24.10.07

Drawing No. 07-0296/INF/05 P2
Rev.

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APPENDIX E

PROPOSED DRAINAGE LAYOUT

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.

S14
Hydrobrake MH
(CL 96.00)
(IL 94.95)
Flow Restricted to 3.3 l/s
for 0.54m head,
hydrobrake type MD5.

Pond
Pond Dims =
Area = 832 m² (bottom)
1370 m² (top).
Based on an Impermeable Area of
0.62ha and a Restricted Discharge of
3.3l/s.
Subject to Approval by the EA

Reed bed
Area = 180m²

Outlet
(IL 95.00)

Proposed single hand gate

Pond
(IL 94.80)-bottom

Inlet
(IL 95.00)

Oil Interceptor
S8812
(CL 96.55)
(IL 95.437)375Ø-in.
(IL 95.337)375Ø-out

S8
(CL 96.50)
(IL 95.634)

3.001/225Ø/
5.5m/1:166

2.001/375Ø/
4.5m/1:321

S6-Catchpit
(CL 96.85)
(IL 96.601)225Ø
(IL 96.526)300Ø
(IL 96.451)375Ø

S11-catchpit
(CL 96.78)
(IL 95.417)100Ø
(IL 95.067)450Ø

1.000/450Ø/
25.0m/1:273

2.002/375Ø/
5.5m/1:321

Weigh Bridge

3.000/225Ø/
61.5m/1:108

1.003/300Ø/
5.5m/1:181

1.004/375Ø/
40.0m/1:320

S9
(CL 96.55)
(IL 95.395)300Ø
(IL 95.320)375Ø

RWP

S4
(CL 96.70)
(IL 95.536)

2.000/300Ø/
33.5m/1:240

1.002/300Ø/
18.5m/1:240

S5
(CL 96.65)
(IL 95.661)

S3
(CL 96.70)
(IL 95.613)

1.001/300Ø/
24.5m/1:240

S16
(CL 97.76)
(IL 97.00)

S2
(CL 96.93)
(IL 95.790)225Ø
(IL 95.715)300Ø

1.000/225Ø/
35.3m/1:168

1500/47.5m/1:100

Maize Silage Clamp

S15
pump station
(CL 97.30)
(IL 96.525)

S1
(CL 97.41)
(IL 96.00)

Proposed gate

Rising main 225Ø/100Ø

S13
Pump station
flow 2.5l/s
(CL 96.80)
(IL 94.755)

S7
(CL 97.00)
(IL 96.00)

S10
(CL 96.94)
(IL 95.195)375Ø
(IL 95.120)450Ø

S12
valve chamber
(CL 96.90)
(IL 94.795)

2250/45.0m/1:100

Channel Drain

Gas Holder

Anaerobic Digester No.1

Rising main 150Ø/100Ø

Sump
(IL 95.500)

Secondary Digester

Buffer Storage Tank

Anaerobic Digester No.3

Anaerobic Digester No.2

Future - Phase 2 Anaerobic Digester No.4

Digestate Storage Tank No.1

Surplus Gas Flue

Digestate Storage Tank No.2

Digestate Storage Tank No.3

Future - Phase 2 Digestate Storage Tank No.4

Proposed Floodgates

Retaining Walls max height 1m

Retaining Wall max height 1.1m

25 26 27 28 29 30 31 251 271

Private Drainage Key

S3
(CL 96.75)
(IL 95.707)
Private storm drainage with PPIC inspection chamber/PCC manhole

SRM Storm Water Rising Main

PCC Road Gully

RWP Rain water pipe with connection

By-pass Interceptor

1.003/150Ø/4.12m/1:40

MicroDrainage pipe reference (where applicable)
Pipe diameter
Pipe length
Pipe gradient

PRIVATE DRAINAGE BELOW GROUND

Pipes to be 100mm dia. UPVC to BS4660 laid on class S granular bed and surround and backfilled in accordance with detail on drawing unless otherwise shown. Pipes with less than 0.6m cover in un-trafficked areas or 0.9m cover in trafficked areas to have min. of 100mm concrete surround class Z.

Pipes running under buildings to have a min. of 100mm granular surround.

INSPECTION CHAMBERS AND MANHOLES

Brickwork Class B engineering to BS 3921, pre-cast concrete sections to BS 5911 plastic relevant BBA certificate.

RODDING EYES AND ACCESS FITTINGS

To be in accordance with BS 4660 and relevant BBA certificate.

Inspection chambers and manholes to have removable non-ventilating covers to a load class as indicated on the manhole schedule.

NOTE:

1. All the above specifications and installations are to comply with Building Regulations 2000 (April 2002 edition) approved documents (part H), relevant BS and manufacturers recommendations.
2. All connections below the slab to be at an approximate minimum gradient of 1:40.
3. 3. This drawing is to be read in conjunction with all the relevant contract documentation.
4. All dimensions are in mm unless otherwise stated.

ROLTON GROUP
ENGINEERING THE FUTURE

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THE CHARLES PARKER BUILDING
MIDLAND ROAD, HIGHAM FERRERS
NORTHANTS NN10 8DN

NO 1 MINERVA BUSINESS PARK
LYNCH WOOD
PETERBOROUGH PE2 6FT

NO 6 THE COURTYARD
WARWICK ROAD, SOLIHULL
WEST MIDLANDS B91 3DA

NO 16 NAPIER COURT
BARLBOROUGH LINKS
DERBYSHIRE S43 4PZ

BIOGEN

Rev.	Date	Description of Issue	Chkd
P4	13.12.07	Revised architects layout added. Drainage revised.	SDP
P3	07.12.07	Drainage revised in accordance with new Architect's layout	SDP
P2	05.11.07	General drainage revision in accordance with new Architect's layout	SDP
P1	26.09.07	Preliminary issue	SDP

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Storm Water
Drainage Layout

Designer's Risk Assessment Reference:
TBA

Specification Reference:
N/A

Drawn By: AJM
Checked By: SDP

Scales: 1:500@A1
1:1000@A3
Date: 26.09.07

Drawing No. 07-0296/INF/03 P4

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage system-network calculatio...	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File c:\WinDes\STANDARD.PIP Manhole Size File c:\WinDes\STANDARD.MHS

FEH Rainfall Model

Return Period (years)	1
Site Location	500300 264600 TL 00300 64600
C (1km)	-0.029
D1 (1km)	0.348
D2 (1km)	0.278
D3 (1km)	0.272
E (1km)	0.320
F (1km)	2.492
Maximum Rainfall (mm/hr)	150
Foul Sewage (l/s/ha)	0.00
O'flow Setting (*Foul only)	0
Volumetric Runoff Coeff.	0.75
Infiltration %	0
Minimum Backdrop Height (m)	0.000
Depth from Soffit to G.L. (m)	1.200
Min Vel. (m/s - Auto Design Only)	1.00
Min Slope (1:X - Optimisation)	500
Minimum Outfall Invert (m)	95.000
Ground Level at Outfall (m)	96.120
Outfall Manhole Name	pond
Outfall Manhole Dia/Length (mm)	1800
Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	35.30	0.210	168.1	0.052	4.00	0.0	0.600	o	225
1.001	24.50	0.102	240.2	0.036	0.00	0.0	0.600	o	300
1.002	18.50	0.077	240.3	0.010	0.00	0.0	0.600	o	300
1.003	25.50	0.141	180.9	0.010	0.00	0.0	0.600	o	300
2.000	32.50	0.135	240.7	0.268	4.00	0.0	0.600	o	300
3.000	61.50	0.366	168.0	0.125	4.00	0.0	0.600	o	225
3.001	5.50	0.033	166.7	0.000	0.00	0.0	0.600	o	225
2.001	4.50	0.014	321.4	0.000	0.00	0.0	0.600	o	375
2.002	5.50	0.017	323.5	0.000	0.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	64.6	4.6	96.000	0.052	0	0	0	1.01	40	9
1.001	61.2	5.0	95.715	0.088	0	0	0	1.01	71	15
1.002	58.8	5.3	95.613	0.098	0	0	0	1.01	71	16
1.003	56.3	5.7	95.536	0.108	0	0	0	1.17	82	16
2.000	65.1	4.5	95.661	0.268	0	0	0	1.01	71	47
3.000	60.9	5.0	96.000	0.125	0	0	0	1.01	40	21
3.001	60.2	5.1	95.634	0.125	0	0	0	1.01	40	21
2.001	59.7	5.2	95.451	0.393	0	0	0	1.01	111	63
2.002	59.0	5.3	95.337	0.393	0	0	0	1.00	111	63

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage system-network calculatio...	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.004	40.00	0.125	320.0	0.046	0.00	0.0	0.600	o	375
1.005	21.00	0.053	396.2	0.072	0.00	0.0	0.600	o	450
1.006	25.00	0.067	373.1	0.000	0.00	2.5	0.600	o	450

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Infil. (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.004	52.4	6.3	95.320	0.547	0	0	0	1.01	111	78
1.005	50.6	6.7	95.120	0.619	0	0	0	1.02	161	85
1.006	48.8	7.1	95.067	0.619	3	0	0	1.05	166	85

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage system-network calculatio...	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
1.000	o	225	S1	97.410	96.000	1.185	1200
1.001	o	300	S2	96.930	95.715	0.915	1200
1.002	o	300	S3	96.700	95.613	0.787	1500
1.003	o	300	S4	96.700	95.536	0.864	1500
2.000	o	300	S5	96.650	95.661	0.689	1200
3.000	o	225	S6	97.000	96.000	0.775	1200
3.001	o	225	S7	96.500	95.634	0.641	1200
2.001	o	375	S8	96.550	95.451	0.724	1500
2.002	o	375	INT	96.550	95.337	0.838	1500
1.004	o	375	S9	96.550	95.320	0.855	1500
1.005	o	450	S10	96.940	95.120	1.370	1800
1.006	o	450	S11	96.780	95.067	1.263	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH No.	C.Level (m)	I.Level (m)	Depth (m)	MH DIAM., L*W (mm)
1.000	35.30	168.1	S2	96.930	95.790	0.915	1200
1.001	24.50	240.2	S3	96.700	95.613	0.787	1500
1.002	18.50	240.3	S4	96.700	95.536	0.864	1500
1.003	25.50	180.9	S9	96.550	95.395	0.855	1500
2.000	32.50	240.7	S8	96.550	95.526	0.724	1500
3.000	61.50	168.0	S7	96.500	95.634	0.641	1200
3.001	5.50	166.7	S8	96.550	95.601	0.724	1500
2.001	4.50	321.4	INT	96.550	95.437	0.738	1500
2.002	5.50	323.5	S9	96.550	95.320	0.855	1500
1.004	40.00	320.0	S10	96.940	95.195	1.370	1800
1.005	21.00	396.2	S11	96.780	95.067	1.263	1800
1.006	25.00	373.1	pond	96.120	95.000	0.670	1800

Rolton Group		Page 4
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage system-network calculatio...	Designed By AJM Checked By	
Micro Drainage	System1 W.10.4	

MANHOLE SCHEDULES

M/Hole Number	Cover Level (m)	M/Hole Depth (m)	M/Hole Diam.,L*W (mm)	Pipes Out PN	Pipes Out IL.(m)	Pipes Out D (mm)	Pipes In PN	Pipes In IL.(m)	Pipes In D (mm)
S1	97.410	1.410	1200	1.000	96.000	225			
S2	96.930	1.215	1200	1.001	95.715	300	1.000	95.790	225
S3	96.700	1.087	1500	1.002	95.613	300	1.001	95.613	300
S4	96.700	1.164	1500	1.003	95.536	300	1.002	95.536	300
S5	96.650	0.989	1200	2.000	95.661	300			
S6	97.000	1.000	1200	3.000	96.000	225			
S7	96.500	0.866	1200	3.001	95.634	225	3.000	95.634	225
S8	96.550	1.099	1500	2.001	95.451	375	2.000 3.001	95.526 95.601	300 225
INT	96.550	1.213	1500	2.002	95.337	375	2.001	95.437	375
S9	96.550	1.230	1500	1.004	95.320	375	1.003 2.002	95.395 95.320	300 375
S10	96.940	1.820	1800	1.005	95.120	450	1.004	95.195	375
S11	96.780	1.713	1800	1.006	95.067	450	1.005	95.067	450
pond	96.120	1.120	1800		OUTFALL		1.006	95.000	450

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage System-simulation.SUM	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Global Variables

Region	FEH Rainfall Model
Return Period (yrs)	30
Site Location	500300 264600 TL 00300 64600
C(1km)	-0.029
D1(1km)	0.348
D2(1km)	0.278
D3(1km)	0.272
E(1km)	0.320
F(1km)	2.492
Volumetric Runoff Coef	0.840
Profile Type	Winter
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	0

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.006	pond	96.120	95.000	1800	0

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	
Date 07.12.2007 File Drainage System-simulation.SUM	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	35.30	0.210	168.1	0.052	4.00	1	0.600	o	225
1.001	24.50	0.102	240.2	0.036	0.00	1	0.600	o	300
1.002	18.50	0.077	240.3	0.010	0.00	1	0.600	o	300
1.003	25.50	0.141	180.8	0.010	0.00	1	0.600	o	300
2.000	32.50	0.135	240.7	0.268	4.00	1	0.600	o	300
3.000	61.50	0.366	168.0	0.125	4.00	1	0.600	o	225
3.001	5.50	0.033	166.7	0.000	0.00	1	0.600	o	225
2.001	4.50	0.014	321.4	0.000	0.00	1	0.600	o	375
2.002	5.50	0.017	323.6	0.000	0.00	1	0.600	o	375
1.004	40.00	0.125	320.0	0.046	0.00	1	0.600	o	375
1.005	21.00	0.053	396.2	0.072	0.00	1	0.600	o	450
1.006	25.00	0.067	373.1	0.000	0.00	1	0.600	o	450

PN	USMH No.	US/CL (m)	US/IL (m)	US/Dep (m)	DS/CL (m)	DS/IL (m)	DS/Dep (m)	Ctrl No.	US/MH (mm)
1.000	S1	97.410	96.000	1.185	96.930	95.790	0.915		1200
1.001	S2	96.930	95.715	0.915	96.700	95.613	0.787		1200
1.002	S3	96.700	95.613	0.787	96.700	95.536	0.864		1500
1.003	S4	96.700	95.536	0.864	96.550	95.395	0.855		1500
2.000	S5	96.650	95.661	0.689	96.550	95.526	0.724		1200
3.000	S6	97.000	96.000	0.775	96.500	95.634	0.641		1200
3.001	S7	96.500	95.634	0.641	96.550	95.601	0.724		1200
2.001	S8	96.550	95.451	0.724	96.550	95.437	0.738		1500
2.002	INT	96.550	95.337	0.838	96.550	95.320	0.855		1500
1.004	S9	96.550	95.320	0.855	96.940	95.195	1.370		1500
1.005	S10	96.940	95.120	1.370	96.780	95.067	1.263		1800
1.006	S11	96.780	95.067	1.263	96.120	95.000	0.670		1800

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Network Calculation	Micro Drainage
Date 07.12.2007 File Drainage System-simulation.SUM	Designed By AJM Checked By	
Micro Drainage	Simulation W.10.4	

Summary Wizard of 15 Winter 30 years return period
Results for Design Storms

Margin for Flood Risk warning (mm) 450 Inertia Status OFF
DVD Status OFF Analysis Time Step Fine

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 5, 10, 20, 30, 50, 100
Climate Change (%) 0, 0, 0, 0, 0, 0, 0, 0

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Winter	30	0%	7	50/15 Summer			
1.001	15 Winter	30	0%	7	20/15 Winter			
1.002	15 Winter	30	0%	7	20/15 Summer			
1.003	15 Winter	30	0%	7	20/15 Summer			
2.000	15 Winter	30	0%	7	10/15 Summer	50/15 Winter		
3.000	15 Winter	30	0%	7	10/15 Summer	50/15 Summer		
3.001	15 Winter	30	0%	7	10/15 Summer			
2.001	15 Winter	30	0%	7	10/15 Summer			
2.002	15 Winter	30	0%	7	5/15 Winter			
1.004	15 Winter	30	0%	7	10/15 Summer			
1.005	15 Winter	30	0%	7	20/15 Summer			
1.006	15 Winter	30	0%	7	20/15 Summer			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	96.207	-0.018	0.000	0.66	0	25	O K
	1.001	96.166	0.151	0.000	0.55	0	35	SURCH'ED
	1.002	96.137	0.224	0.000	0.48	0	30	SURCH'ED
	1.003	96.109	0.273	0.000	0.45	0	33	SURCH'ED
5	2.000	96.598	0.637	0.000	1.61	0	105	FLD RISK
6	3.000	96.850	0.625	0.000	1.16	0	45	FLD RISK
	3.001	96.399	0.540	0.000	1.44	0	43	FLD RISK
	2.001	96.307	0.481	0.000	1.78	0	139	FLD RISK
	2.002	96.192	0.480	0.000	1.84	0	139	FLD RISK
	1.004	96.074	0.379	0.000	1.75	0	177	SURCH'ED
	1.005	95.680	0.110	0.000	1.47	0	193	SURCH'ED
	1.006	95.558	0.041	0.000	1.39	0	193	SURCH'ED

ROLTON GROUP
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APPENDIX F

BUNDED AREA STORAGE CALCULATIONS

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Large Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Summary of Results for large bund 100y 30%climate.src

Upstream Structures	Outflow To	Overflow To
(None)	(None)	mini bund 100y 30%climate.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	0.0	0.0	0.0	97.0478	0.5478	0.0	375.7	O K
30 Summer	0.0	0.0	0.0	97.0788	0.5788	0.0	435.9	O K
60 Summer	0.0	0.0	0.0	97.1108	0.6108	0.0	505.8	O K
120 Summer	0.0	0.0	0.0	97.1438	0.6438	0.0	587.0	O K
180 Summer	0.0	0.0	0.0	97.1633	0.6633	0.0	640.3	O K
240 Summer	0.0	12.5	12.5	97.1768	0.6768	15.9	677.1	O K
360 Summer	0.0	18.2	18.2	97.1773	0.6773	76.8	678.7	O K
480 Summer	0.0	18.2	18.2	97.1773	0.6773	123.1	678.8	O K
600 Summer	0.0	24.6	24.6	97.1778	0.6778	161.4	680.2	O K
720 Summer	0.0	24.6	24.6	97.1778	0.6778	193.4	680.6	O K
960 Summer	0.0	24.6	24.6	97.1778	0.6778	228.9	680.9	O K
1440 Summer	0.0	24.6	24.6	97.1778	0.6778	282.1	680.2	O K
2160 Summer	0.0	18.2	18.2	97.1773	0.6773	342.6	680.1	O K
2880 Summer	0.0	18.2	18.2	97.1773	0.6773	383.3	679.0	O K
4320 Summer	0.0	12.5	12.5	97.1768	0.6768	442.2	678.2	O K
5760 Summer	0.0	12.5	12.5	97.1768	0.6768	495.2	677.6	O K
7200 Summer	0.0	12.5	12.5	97.1768	0.6768	529.2	677.6	O K
8640 Summer	0.0	12.5	12.5	97.1768	0.6768	557.7	677.7	O K
10080 Summer	0.0	7.5	7.5	97.1763	0.6763	581.4	677.0	O K
15 Winter	0.0	0.0	0.0	97.0713	0.5713	0.0	420.7	O K
30 Winter	0.0	0.0	0.0	97.1028	0.6028	0.0	488.2	O K
60 Winter	0.0	0.0	0.0	97.1358	0.6358	0.0	566.5	O K
120 Winter	0.0	0.0	0.0	97.1698	0.6698	0.0	657.4	O K
180 Winter	0.0	31.6	31.6	97.1783	0.6783	52.1	681.6	O K
240 Winter	0.0	31.6	31.6	97.1783	0.6783	97.1	681.6	O K
360 Winter	0.0	39.2	39.2	97.1788	0.6788	165.5	683.9	O K
480 Winter	0.0	47.2	47.2	97.1793	0.6793	218.0	684.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	156.47	19
30 Summer	90.78	34
60 Summer	52.67	64
120 Summer	30.56	124
180 Summer	22.22	184
240 Summer	17.73	240
360 Summer	12.89	322
480 Summer	10.29	338
600 Summer	8.63	394
720 Summer	7.48	452
960 Summer	5.85	578
1440 Summer	4.13	830
2160 Summer	2.92	1212
2880 Summer	2.29	1572
4320 Summer	1.61	2332
5760 Summer	1.26	3096
7200 Summer	1.04	3784
8640 Summer	0.89	4504
10080 Summer	0.78	5232
15 Winter	156.47	19
30 Winter	90.78	34
60 Winter	52.67	64
120 Winter	30.56	124
180 Winter	22.22	168
240 Winter	17.73	194
360 Winter	12.89	250
480 Winter	10.29	310

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Large Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Summary of Results for large bund 100y 30%climate.src

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
600 Winter	0.0	47.2	47.2	97.1793	0.6793	260.3	684.3	O K
720 Winter	0.0	39.2	39.2	97.1788	0.6788	297.0	683.7	O K
960 Winter	0.0	39.2	39.2	97.1788	0.6788	337.2	683.0	O K
1440 Winter	0.0	31.6	31.6	97.1783	0.6783	396.1	681.6	O K
2160 Winter	0.0	24.6	24.6	97.1778	0.6778	465.7	680.3	O K
2880 Winter	0.0	18.2	18.2	97.1773	0.6773	509.9	678.9	O K
4320 Winter	0.0	12.5	12.5	97.1768	0.6768	576.1	677.7	O K
5760 Winter	0.0	12.5	12.5	97.1768	0.6768	634.5	677.6	O K
7200 Winter	0.0	12.5	12.5	97.1768	0.6768	671.7	677.7	O K
8640 Winter	0.0	7.5	7.5	97.1763	0.6763	703.8	676.6	O K
10080 Winter	0.0	7.6	7.6	97.1763	0.6763	732.4	676.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	8.63	374
720 Winter	7.48	440
960 Winter	5.85	578
1440 Winter	4.13	814
2160 Winter	2.92	1180
2880 Winter	2.29	1620
4320 Winter	1.61	2272
5760 Winter	1.26	3288
7200 Winter	1.04	3800
8640 Winter	0.89	4320
10080 Winter	0.78	5112

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Large Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Rainfall Details for large bund 100y 30%climate.src

Region	FEH Rainfall Model
Return Period (years)	100
Site Location	500300 264600 TL 00300 64600
C (1km)	-0.029
D1 (1km)	0.348
D2 (1km)	0.278
D3 (1km)	0.272
E (1km)	0.320
F (1km)	2.492
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Summer Storms	Yes
Winter Storms	Yes
Climate Change %	+30

Time / Area Diagram

Total Area (ha) = 0.985

Time from:	(mins) to:	Area (ha)
0	4	0.985

Rolton Group		Page 4
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Large Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Storage Controls for large bund 100y 30%climate.src

Tank/Pond Details

Invert Level (m) 96.500 Ground Level (m) 98.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	0.0	0.50	1456.0	1.00	6492.0	1.50	6593.0	2.00	6593.0	2.50	6593.0
0.10	74.0	0.60	2228.0	1.10	6593.0	1.60	6593.0	2.10	6593.0		
0.20	382.0	0.70	3074.0	1.20	6593.0	1.70	6593.0	2.20	6593.0		
0.30	687.0	0.80	5717.0	1.30	6593.0	1.80	6593.0	2.30	6593.0		
0.40	1106.0	0.90	6285.0	1.40	6593.0	1.90	6593.0	2.40	6593.0		

Pump Outflow Control

Invert Level of Control 95.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	0.0	0.60	0.0	1.60	0.0	2.60	0.0	5.00	0.0	7.50	0.0
0.20	0.0	0.80	0.0	1.80	0.0	3.00	0.0	5.50	0.0	8.00	1.0
0.30	0.0	1.00	0.0	2.00	0.0	3.50	0.0	6.00	0.0	8.50	1.0
0.40	0.0	1.20	0.0	2.20	0.0	4.00	0.0	6.50	0.0	9.00	1.0
0.50	0.0	1.40	0.0	2.40	0.0	4.50	0.0	7.00	0.0	9.50	1.0

Weir / Flume Overflow Control

Discharge Coef 0.544 Width (m) 100.000 Crest Level (m) 97.175

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Mini Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Summary of Results for mini bund 100y 30%climate.src

Upstream Structures	Outflow To	Overflow To
large bund 100y 30%climate.src	(None)	(None)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	0.0	0.0	96.1378	0.3877	123.6	O K
30 Summer	0.0	0.0	96.1633	0.4132	143.4	O K
60 Summer	0.0	0.0	96.1903	0.4402	166.4	O K
120 Summer	0.0	0.0	96.2193	0.4692	193.1	O K
180 Summer	0.0	0.0	96.2372	0.4872	210.6	O K
240 Summer	0.0	0.0	96.2653	0.5153	240.0	O K
360 Summer	0.0	0.0	96.3333	0.5833	321.2	O K
480 Summer	0.0	0.0	96.3778	0.6278	383.1	O K
600 Summer	0.0	0.0	96.4128	0.6628	434.1	O K
720 Summer	0.0	0.0	96.4403	0.6903	477.0	O K
960 Summer	0.0	0.0	96.4698	0.7198	524.6	O K
1440 Summer	0.0	0.0	96.5138	0.7638	595.6	O K
2160 Summer	0.0	0.0	96.5618	0.8118	675.0	O K
2880 Summer	0.0	0.0	96.5948	0.8448	729.8	O K
4320 Summer	0.0	0.0	96.6413	0.8913	808.8	O K
5760 Summer	0.0	0.0	96.6813	0.9313	876.7	O K
7200 Summer	0.0	0.0	96.7083	0.9583	922.6	O K
8640 Summer	0.0	0.0	96.7303	0.9803	961.2	O K
10080 Summer	0.0	0.0	96.7488	0.9988	993.6	O K
15 Winter	0.0	0.0	96.1568	0.4067	138.4	O K
30 Winter	0.0	0.0	96.1838	0.4337	160.6	O K
60 Winter	0.0	0.0	96.2122	0.4622	186.4	O K
120 Winter	0.0	0.0	96.2427	0.4927	216.2	O K
180 Winter	0.0	0.0	96.3068	0.5568	288.0	O K
240 Winter	0.0	0.0	96.3528	0.6028	348.0	O K
360 Winter	0.0	0.0	96.4158	0.6658	439.3	O K
480 Winter	0.0	0.0	96.4603	0.7103	509.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	156.47	19
30 Summer	90.78	34
60 Summer	52.67	64
120 Summer	30.56	124
180 Summer	22.22	184
240 Summer	17.73	2880
360 Summer	12.89	2880
480 Summer	10.29	2880
600 Summer	8.63	2880
720 Summer	7.48	2880
960 Summer	5.85	2880
1440 Summer	4.13	2880
2160 Summer	2.92	5760
2880 Summer	2.29	5760
4320 Summer	1.61	5760
5760 Summer	1.26	11520
7200 Summer	1.04	11520
8640 Summer	0.89	11520
10080 Summer	0.78	11520
15 Winter	156.47	19
30 Winter	90.78	34
60 Winter	52.67	64
120 Winter	30.56	124
180 Winter	22.22	2880
240 Winter	17.73	2880
360 Winter	12.89	2880
480 Winter	10.29	2880

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Mini Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Summary of Results for mini bund 100y 30%climate.src

Storm Duration (mins)		Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
600	Winter	0.0	0.0	96.4953	0.7453	565.8	O K
720	Winter	0.0	0.0	96.5253	0.7753	614.7	O K
960	Winter	0.0	0.0	96.5578	0.8078	668.3	O K
1440	Winter	0.0	0.0	96.6048	0.8548	747.2	O K
2160	Winter	0.0	0.0	96.6588	0.9088	838.1	O K
2880	Winter	0.0	0.0	96.6938	0.9438	898.1	O K
4320	Winter	0.0	0.0	96.7448	0.9948	986.6	O K
5760	Winter	0.0	0.0	96.7883	1.0383	1061.8	O K
7200	Winter	0.0	0.0	96.8168	1.0668	1112.4	O K
8640	Winter	0.0	0.0	96.8413	1.0913	1155.7	O K
10080	Winter	0.0	0.0	96.8628	1.1128	1194.1	O K

Storm Duration (mins)		Rain (mm/hr)	Time-Peak (mins)
600	Winter	8.63	2880
720	Winter	7.48	2880
960	Winter	5.85	2880
1440	Winter	4.13	2880
2160	Winter	2.92	5760
2880	Winter	2.29	5760
4320	Winter	1.61	5760
5760	Winter	1.26	11520
7200	Winter	1.04	11520
8640	Winter	0.89	11520
10080	Winter	0.78	11520

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Mini Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Rainfall Details for mini bund 100y 30%climate.src

Region	FEH Rainfall Model
Return Period (years)	100
Site Location	500300 264600 TL 00300 64600
C (1km)	-0.029
D1 (1km)	0.348
D2 (1km)	0.278
D3 (1km)	0.272
E (1km)	0.320
F (1km)	2.492
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Summer Storms	Yes
Winter Storms	Yes
Climate Change %	+30

Time / Area Diagram

Total Area (ha) = 0.324

Time (mins) from:	to:	Area (ha)
0	4	0.324

Rolton Group		Page 4
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Mini Bund1in100rain+30%	Micro Drainage
Date 07.12.07 File Whole Bund 100y 30%climate casc...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Cascade Storage Controls for mini bund 100y 30%climate.src

Tank/Pond Details

Invert Level (m) 95.750 Ground Level (m) 97.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	0.0	0.50	1037.0	1.00	1741.0	1.50	1905.0	2.00	1918.0	2.50	1918.0
0.10	98.0	0.60	1368.0	1.10	1781.0	1.60	1918.0	2.10	1918.0		
0.20	280.0	0.70	1604.0	1.20	1819.0	1.70	1918.0	2.20	1918.0		
0.30	565.0	0.80	1657.0	1.30	1855.0	1.80	1918.0	2.30	1918.0		
0.40	774.0	0.90	1699.0	1.40	1882.0	1.90	1918.0	2.40	1918.0		

Pump Outflow Control

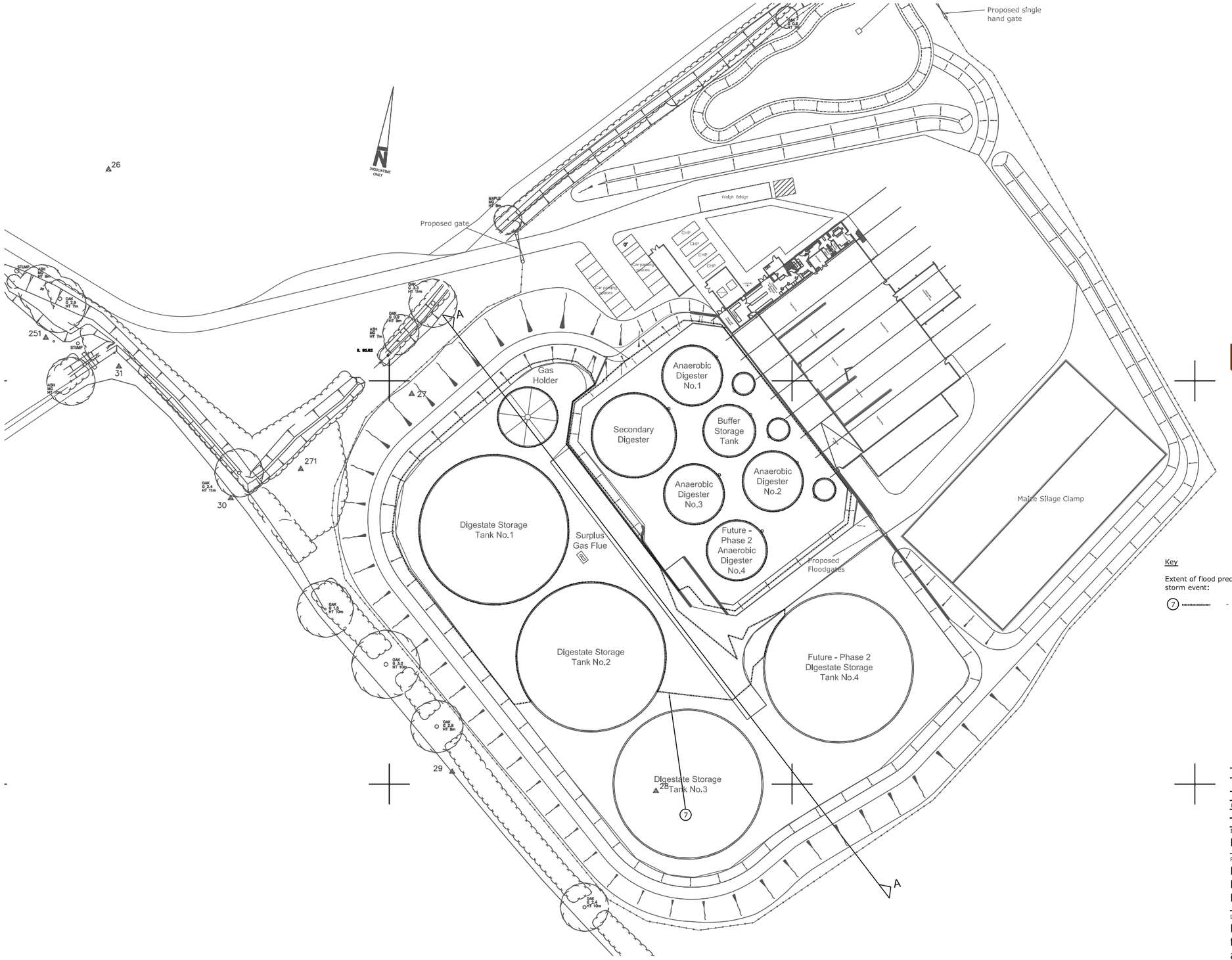
Invert Level of Control 95.000

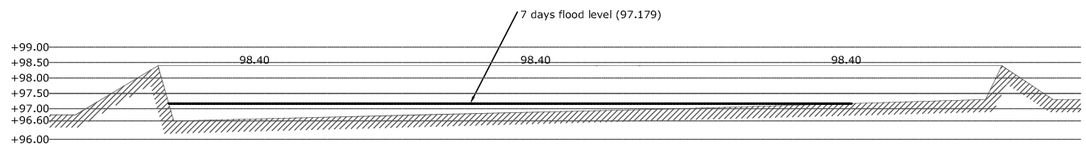
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	0.0	0.60	0.0	1.60	0.0	2.60	0.0	5.00	0.0	7.50	0.0
0.20	0.0	0.80	0.0	1.80	0.0	3.00	0.0	5.50	0.0	8.00	1.0
0.30	0.0	1.00	0.0	2.00	0.0	3.50	0.0	6.00	0.0	8.50	1.0
0.40	0.0	1.20	0.0	2.20	0.0	4.00	0.0	6.50	0.0	9.00	1.0
0.50	0.0	1.40	0.0	2.40	0.0	4.50	0.0	7.00	0.0	9.50	1.0

10mm 20mm 30mm 40mm 50mm 100mm

NOTES

1. This drawing is to read in conjunction with all the relevant contract documentation.
2. All dimensions are in mm unless otherwise stated.
3. Drawings marked Preliminary are for guidance/ approval only.





Section A - A
scale 1:500 (horizontal)
1:100 (vertical)

Key

Extent of flood predicted 1 in 100 year (+30%) storm event:

(7) ---------- - 7 day duration

ROLTON GROUP
ENGINEERING THE FUTURE

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THE CHARLES PARKER BUILDING
MIDLAND ROAD, HIGHAM FERRERS
NORTHANTS NN10 8DN

NO 1 MINERVA BUSINESS PARK
LYNCH WOOD
PETERBOROUGH PE2 6FT

NO 6 THE COURTYARD
WARWICK ROAD, SOLIHULL
WEST MIDLANDS B91 3DA

NO 16 NAPIER COURT
BARLBOROUGH LINKS
DERBYSHIRE S43 4PZ

BIOGEN

Rev.	Date	Description of Issue	Chkd
P3	13.12.07	Revised architects layout added.	SDP
P2	07.12.07	Revised in accordance with new Architect's layout	SDP
P1	26.09.07	Preliminary issue	SDP

Revisions

Issue Purpose:
Preliminary

Project
Biomass Power Stations
Bedford Road
Rushden

Drawing Title:
Flood Level
for Bund Storage
and Cross Section

Designer's Risk Assessment Reference:
TBA

Specification Reference:
N/A

Drawn By: AJM
Checked By: SDP

Scales: 1:500@A1
1:1000@A3
Date: 26.09.07

Drawing No. 07-0296/INF/04 P3
Rev.

ROLTON GROUP
ENGINEERING THE FUTURE

APPENDIX G

BALANCING POND STORAGE CALCULATIONS

Rolton Group		Page 1
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Balancing Pond1in100+30%	Micro Drainage
Date 07.12.2007 File Balancing Pond 100y 30%climate.S...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	2.8	2.8	95.2408	0.2407	233.0	O K
30 Summer	2.8	2.8	95.2753	0.2752	268.8	O K
60 Summer	2.9	2.9	95.3133	0.3132	308.4	O K
120 Summer	3.0	3.0	95.3528	0.3527	350.5	O K
180 Summer	3.0	3.0	95.3758	0.3757	375.0	O K
240 Summer	3.1	3.1	95.3908	0.3907	391.4	O K
360 Summer	3.1	3.1	95.4097	0.4097	411.8	O K
480 Summer	3.2	3.2	95.4198	0.4197	423.0	O K
600 Summer	3.2	3.2	95.4252	0.4252	428.9	O K
720 Summer	3.2	3.2	95.4272	0.4272	431.3	O K
960 Summer	3.1	3.1	95.4162	0.4162	419.0	O K
1440 Summer	3.1	3.1	95.3927	0.3927	393.4	O K
2160 Summer	3.0	3.0	95.3632	0.3632	361.4	O K
2880 Summer	2.9	2.9	95.3368	0.3367	333.3	O K
4320 Summer	2.8	2.8	95.2908	0.2907	284.6	O K
5760 Summer	2.8	2.8	95.2513	0.2512	244.0	O K
7200 Summer	2.8	2.8	95.2163	0.2162	208.1	O K
8640 Summer	2.8	2.8	95.1848	0.1847	176.9	O K
10080 Summer	2.8	2.8	95.1588	0.1588	150.8	O K
15 Winter	2.8	2.8	95.2683	0.2682	261.3	O K
30 Winter	2.9	2.9	95.3068	0.3067	301.6	O K
60 Winter	3.0	3.0	95.3492	0.3492	346.5	O K
120 Winter	3.1	3.1	95.3938	0.3937	394.6	O K
180 Winter	3.2	3.2	95.4198	0.4197	422.9	O K
240 Winter	3.2	3.2	95.4373	0.4372	442.3	O K
360 Winter	3.3	3.3	95.4592	0.4592	467.1	O K
480 Winter	3.3	3.3	95.4722	0.4722	481.6	O K
600 Winter	3.3	3.3	95.4797	0.4797	490.1	O K
720 Winter	3.3	3.3	95.4842	0.4842	494.8	O K
960 Winter	3.3	3.3	95.4752	0.4752	485.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	156.47	23
30 Summer	90.78	38
60 Summer	52.67	68
120 Summer	30.56	126
180 Summer	22.22	186
240 Summer	17.73	246
360 Summer	12.89	364
480 Summer	10.29	484
600 Summer	8.63	602
720 Summer	7.48	722
960 Summer	5.85	958
1440 Summer	4.13	1170
2160 Summer	2.92	1544
2880 Summer	2.29	1960
4320 Summer	1.61	2768
5760 Summer	1.26	3576
7200 Summer	1.04	4328
8640 Summer	0.89	5096
10080 Summer	0.78	5752
15 Winter	156.47	23
30 Winter	90.78	37
60 Winter	52.67	66
120 Winter	30.56	124
180 Winter	22.22	184
240 Winter	17.73	242
360 Winter	12.89	358
480 Winter	10.29	474
600 Winter	8.63	590
720 Winter	7.48	702
960 Winter	5.85	926

Rolton Group		Page 2
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Balancing Pond1in100+30%	Micro Drainage
Date 07.12.2007 File Balancing Pond 100y 30%climate.S...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
1440 Winter	3.2	3.2	95.4497	0.4497	456.3	O K
2160 Winter	3.1	3.1	95.4147	0.4147	417.6	O K
2880 Winter	3.1	3.1	95.3822	0.3822	381.9	O K
4320 Winter	2.9	2.9	95.3192	0.3192	314.6	O K
5760 Winter	2.8	2.8	95.2632	0.2632	256.3	O K
7200 Winter	2.8	2.8	95.2123	0.2122	204.4	O K
8640 Winter	2.8	2.8	95.1688	0.1688	160.9	O K
10080 Winter	2.7	2.7	95.1363	0.1363	128.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
1440 Winter	4.13	1332
2160 Winter	2.92	1648
2880 Winter	2.29	2108
4320 Winter	1.61	2988
5760 Winter	1.26	3856
7200 Winter	1.04	4616
8640 Winter	0.89	5352
10080 Winter	0.78	6048

Rolton Group		Page 3
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Balancing Pond1in100+30%	Micro Drainage
Date 07.12.2007 File Balancing Pond 100y 30%climate.S...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Rainfall Details

Region	FEH Rainfall Model
Return Period (years)	100
Site Location	500300 264600 TL 00300 64600
C (1km)	-0.029
D1 (1km)	0.348
D2 (1km)	0.278
D3 (1km)	0.272
E (1km)	0.320
F (1km)	2.492
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Summer Storms	Yes
Winter Storms	Yes
Climate Change %	+30

Time / Area Diagram

Total Area (ha) = 0.619

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.293	4	8	0.326

Rolton Group		Page 4
The Charles Parker Building Midland Road Northants NN10 8DN	Biomass Power Stations Bedford Road Rushden Balancing Pond1in100+30%	Micro Drainage
Date 07.12.2007 File Balancing Pond 100y 30%climate.S...	Designed By AJM Checked By	
Micro Drainage	Source Control W.10.4	

Tank/Pond Details

Invert Level (m) 95.000 Ground Level (m) 96.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.00	916.0	0.50	1136.0	1.00	1369.0	1.50	1369.0	2.00	1369.0	2.50	1369.0
0.10	960.0	0.60	1182.0	1.10	1369.0	1.60	1369.0	2.10	1369.0		
0.20	1003.0	0.70	1228.0	1.20	1369.0	1.70	1369.0	2.20	1369.0		
0.30	1047.0	0.80	1275.0	1.30	1369.0	1.80	1369.0	2.30	1369.0		
0.40	1092.0	0.90	1322.0	1.40	1369.0	1.90	1369.0	2.40	1369.0		

Hydro-Brake Outflow Control

Design Head (m) 0.540 Hydro-Brake Type MD5 Invert Level (m) 94.950
Design Flow (l/s) 3.3 Diameter (mm) 87

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	2.3	0.60	3.5	1.60	5.7	2.60	7.3	5.00	10.2	7.50	12.4
0.20	2.8	0.80	4.1	1.80	6.1	3.00	7.9	5.50	10.7	8.00	12.8
0.30	2.8	1.00	4.5	2.00	6.4	3.50	8.5	6.00	11.1	8.50	13.2
0.40	3.0	1.20	5.0	2.20	6.7	4.00	9.1	6.50	11.6	9.00	13.6
0.50	3.2	1.40	5.4	2.40	7.0	4.50	9.6	7.00	12.0	9.50	14.0

ROLTON GROUP
ENGINEERING THE FUTURE

APPENDIX H

FRA GUIDANCE NOTE 1 : LOCATION WITHIN THE REPORT

FRA Guidance Note 1: Development Greater Than 1 Hectare in Flood Zone 1 Environment Agency guidance on requirements for undertaking a Flood Risk Assessment (FRA) for planning applications. March 2007	
	LOCATION WITHIN THE REPORT
Plans	
A location plan that includes geographical features, street names and identifies the catchment, watercourses or other bodies of water in the vicinity.	Appendix A and D
A plan of the site showing:	
• existing site	Appendix B
• development proposals	Appendix B and E
• identification of any structures, which may influence local flood flow overland or in any watercourses present on the site	Appendix C
Surveys	
Site levels related to Ordnance Datum, both existing and proposed.	Appendix B
Assessments	
The Applicant should submit:	
Information about the surface water disposal measures already in place and their state of maintenance	Section 5
An assessment of the volume of surface water run-off likely to be generated from the proposed development	Section 8
Proposals for surface water management according to sustainable drainage principles, with the aim of not increasing, and where practicable reducing, the rate of runoff from the site as a result of the development.	Section 8
Allowance in design for how climate change will affect the probability and intensity of events in the future.	Section 8.4
□ Information about any other potential sources of flooding that may affect the site – streams, surface water run-off, sewers, groundwater, reservoirs, canals and other artificial sources or any combination of these.	Section 5 and 7
□ Information on how these sources of flooding will be managed safely within the development proposal.	Section 5 and 7
Consideration of the proposal relative to any existing Strategic Flood Risk Assessment carried out by the local authority.	Section 7
Confirmation as to whether Environment Agency consent is needed for any aspect of the work, and whether this has been applied for or not.	Section 8.3