Sir Frederick Snow Consulting

Sir Frederick Snow & Partners Ltd

SILSDEN PRIMARY SCHOOL
FLOOD RISK
ASSESSMENT REPORT

FS 4801

Rev	Date	Reason for Revision
R01	31 Oct 17	Issued for Review

Authorisation Record		Civil Engineer	Lead Civil/Structural Engineer	Project Engineer
		P Drobig	N. Hobson	P. Drobig
Rev	Date	Prepared by	Recommended by	Approved by

REVISION RECORD SHEET

Revision Number	Purpose	List of Updated/Modified Sections, if any
R01	Issued for Review	

HOLDS

HOLD No.	Section Ref.	Description of HOLD
1		
2		
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CONTENTS

1. SCOPE

This document has been prepared to provide a Flood risk assessment for the design of the permanent and construction works for Silsden Primary School.

2. DEFINITIONS

Throughout this specification, the following definitions shall apply:

COMPANY: Shall mean City of Bradford MDC, or their representative.

CONTRACTOR: Shall mean the CONTRACTOR appointed and for Works at Silsden Primary School in the CONTRACT with COMPANY, or their representative.

3. ABBREVIATIONS

CIRIA	Construction Industry Research and Information Association
EPA	Environment Protection Agency
RPC	Runoff Percentage Coefficient
SUDS	Sustainable Drainage Systems
SPS	Silsden Primary School

4. REFERENCE DOCUMENTS

This document should be in accordance with the reference documents including codes and standards listed below.

Unless otherwise stipulated in the CONTRACT, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of the Contract. References to superseded standards that may occur on technical documents will not over-write this clause.

Gov.UK	Flood risk assessment for planning applications
CIRIA C697	The SUDS Manual

5. FLOOD RISK ASSESSMENT FOR PLANNING APPLICATIONS

For a development complex such as this, Flood risk assessment for planning applications.GOV.uk requires consideration of the flood zone that the site is located in, to identify what level of review is required.

Input for this site at BD20 0JD shows it to be **Flood Zone 1**, being land and property with a low risk of flooding.

However as the site is greater than 1 Hectare a flood risk assessment is required for planning.

The Flood map for planning (screen shot in appendix 1) shows the site to be some 400m from the Leeds and Liverpool Canal and 300m from a feeder stream running through Brunthwaite.

It also shows an existing watercourse running down the south west site boundary where it appears to be culverted into some gardens and then into sewers. This would appear to emanate from the same 154m level that a couple of springs do to the east of the site as shown on the Proposed Landscaping drawing (appendix

2). From here it either drains into the Beck to the west or the canal to the south. The Beck runs southwards feeding into the river Aire some 1550m away from the site.

As such the sites high location means it is not at risk from flooding but the development must be undertaken so that it does not increase the risk downstream.

The site falls from 152m in the north to 132m on its southern boundary and will predominately drain downhill north to southwest (site contours appendix 3). The drainage strategy will be to contain run off from the buildings and impermeable areas created in swales and or storage and release it via Hydro brakes into the existing sewers and water courses at a permitted discharge rate, to match the existing conditions and so mitigate any flood risk.

6. ASSESSMENT OF RUNOFF

On this project the drainage network comprises surface water run off from a variety of areas including water storage, i.e. water retention pond; hard standings, i.e roads and paths; school ground and landscape areas whose impermeability and therefore run off percentages vary quite markedly. To allow for this variation in run off from the various areas the following run off percentage coefficients have been applied to the area groups:

Area Group	Run off Percentage Coefficient (RPC)	
Water Surfaces	0.95	(Allowing for evaporation loss)
Hardstanding Areas	0.90	(Allowing for evaporation + conveyance losses)
School Areas	0.25	(Mainly gravelled covered with some hardstandings)
Landscaped Areas	0.25	(Existing natural or cultivated land surface)

List of Land Area Draining To Swales

Catchments	Areas m2	RPC	RPCxArea	
School buildings	30,000	0.9	27,000	
Car Park	24,000	0.9	21,600	
Roads and pavements	40,000	0.9	36,000	
School Yards	38,000	0.25	9,500	
Landscaped	258,000	0.25	64,500	
total run off area	390,000		158,600	Vt= 2,379m3

When the above noted land areas are multiplied by their appropriate RPC and the resulting run off areas are taken cumulatively with the first flush run off depth of 15mm a basic Treatment Volume Vt figure of 2,379m^3 is generated.

SUDS Swales deal with normal surface water storm event run off by effectively providing attenuated storage above the previous runoff. The Silsden twin SUDS Swales are designed to provide the attenuation storage required for a 100year return period 60 minute duration storm using The Wallingford Procedure method to determine the appropriate run off flows.

The Wallingford Procedure's standard equation for post development flow relating to storm rainfall intensity and net impermeable area for an M100 - 60 storm event is 3.61CvAI, where:

- Cv or Runoff Percentage = varies from 0.25 (Landscaped Areas); 0.25 (Processed Areas); 0.9 (Road Areas) & 0.95 (Swale).
- Total A = 39 ha.
- Net A as revised by appropriate runoff percentages coefficients = 15.86 ha including the landscape areas and I varies with duration, as outlined in the table below, for M5-60 based on Wallingford Procedure a rainfall depth of 16.0 mm is taken for Silsden, as is the resultant attenuation volume required.

Post Development Flow is taken at 3.61 NetAI = 3.61.15.86.I = 57.25(I)

Limiting Greenfield Pre Flow is taken at 3.61CvAI = 3.61.0.2.39I = 28.16(I)

Duration Minutes	Z1 Factor	Z1.M5-60 mm	Z2 Factor	M100 Rainfall mm	Intensity I mm/hr	Inflow 3.61NetAI l/s	Limiting Outflow l/s	Net Flow To Storage l/s	Attenuation Volume Reqd. m^3
60	1.00	16.00	1.98	31.68	31.68	1814	892	922	3318

This M100 - 60 attenuation storage volume of 3318m^3 equates to a water depth of 2.07m taken over the twin pond potential surface areas of 1600m2.

As can be seen from the figures in the above table the inflow to the SUDS attenuation system as proposed is some 1800 l/s and the required limiting outflow relating to pre development natural Greenfield run off is some 900 l/s. Basically double the original runoff flow.

To achieve these values one option is to utilise twin retention pond arrangement which requires discharge flow control to be established in both retention ponds with the discharge invert set at the holding water level in each respective pond. The appropriate flow control on the discharge from the upper first retention pond to the lower second retention pond should be set at a maximum flow of approximately 1300 l/s and the flow control on the discharge from the lower second retention pond to the existing drainage system should be set at a maximum flow of 900 l/s to satisfy the limiting greenfield run off flow, as established above.

It is good practice to provide an emergency overflow from retention ponds to safely direct discharge flows in the event of a blockage to the discharge control/pipe or when the designed storm event is exceeded. In the SUDS Swale system, as proposed, emergency overflows in the form of the pond bank level at/near to the pond discharge outlet being lower locally over a short length of 5m to a level of 0.5m above the swale holding water level with an associated flow channel being formed in the external pond bank slopes.

7. Conclusion

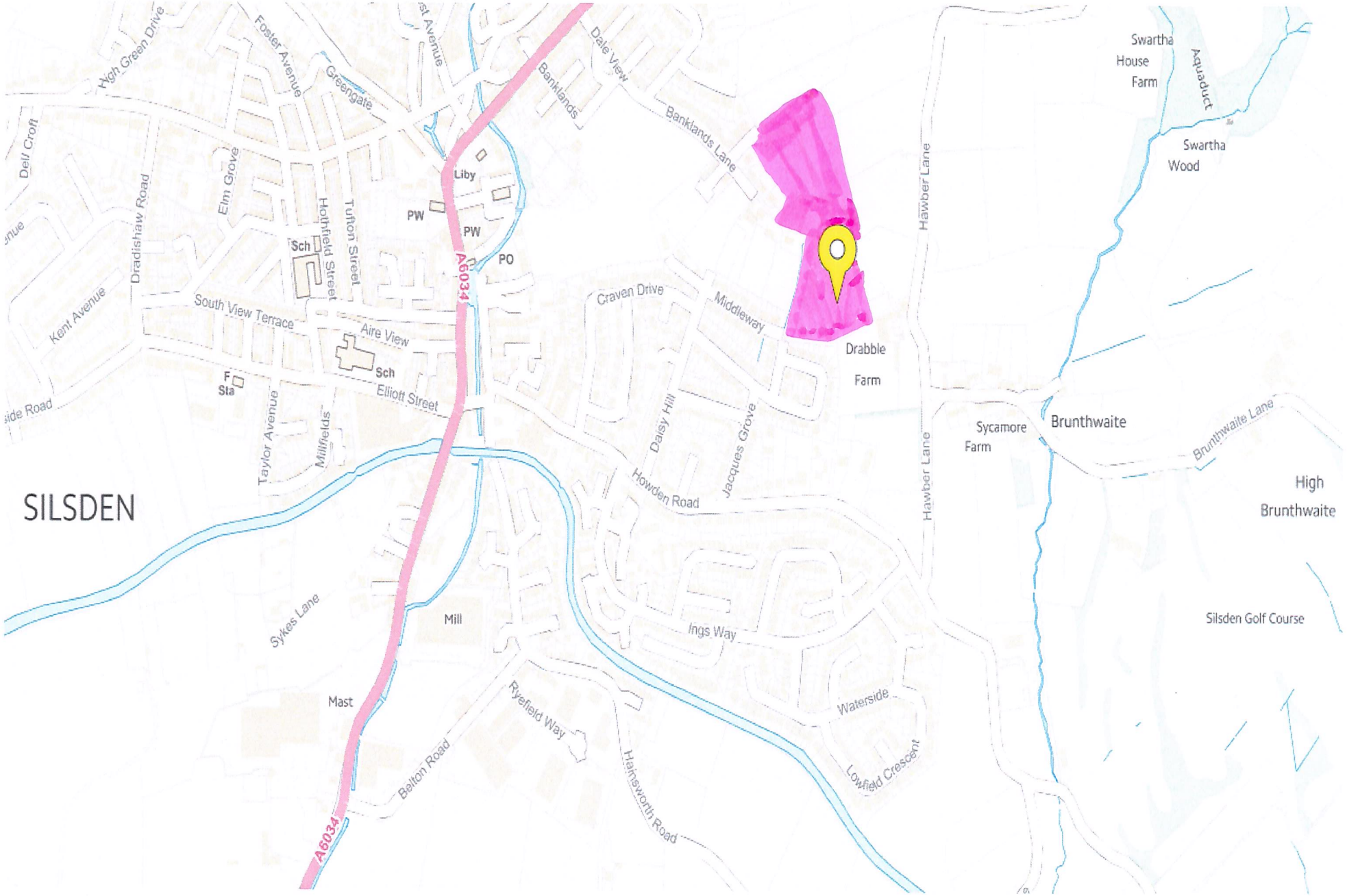
Based on the above assessment we conclude that the site is a Flood Zone 1 site not at risk from flooding from other sources.

It is however due to its size a potential risk to other existing developments and so must manage its surface runoff in accordance with SUDS.

With discussions with the Environment Agency it is hoped to agree discharge values for discharges adjacent to both swale/retention pond locations feeding into the existing water course along the south western boarder previously noted.

An alternative solution which will be explored would be a storage under the proposed football pitch.

Until full discussions can be held with the relevant authorities the final solution cannot be established.


SILSDEN
High Green Drive
Foster Avenue
Greengate
Banklands
Date View
Banklands Lane
Swartha House Farm
Aquaduct
Swartha Wood
Dell Croft
Dradishaw Road
Elm Grove
Hothfield Street
Tufton Street
Liby
PW
PW
PO
Sch
A6034
Hawber Lane
Craven Drive
Middleway
Drabble Farm
Kent Avenue
South View Terrace
Aire View
Sch
Elliott Street
F Sta
Taylor Avenue
Millfields
Daisy Hill
Jacques Grove
Howden Road
Sycamore Farm
Brunthwaite
Brunthwaite Lane
High Brunthwaite
Silsden Golf Course
Sykes Lane
Mill
Ings Way
Mast
Ryefield Way
Waterside
Belton Road
Hainsworth Road
Lowfield Crescent
A6034

Appendix 1

Appendix 2

1 **Site Plan Proposed - Landscape details**
1 : 500

NOTES:
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DO NOT SCALE FROM THIS DRAWING. Use figured dimensions only.

Notify Project Manager of any discrepancies.

This drawing is to be read in conjunction with all other contract documents and drawings.

This drawing is subject to confirmation by site survey.

All work to be in accordance with the current Building Regulations, current good practice & Construction, Design & Maintenance Regulations.

Revisions			
Rev	Issued by	Description	Date
A	TR	Draft issue prior to Planning Application	05/05/17
B	MJH	Issue to Planning	17/10/17

Preliminary - RIBA Stage 02

City of BRADFORD METROPOLITAN DISTRICT COUNCIL

CLIENT:
CBMDC Education Client Services

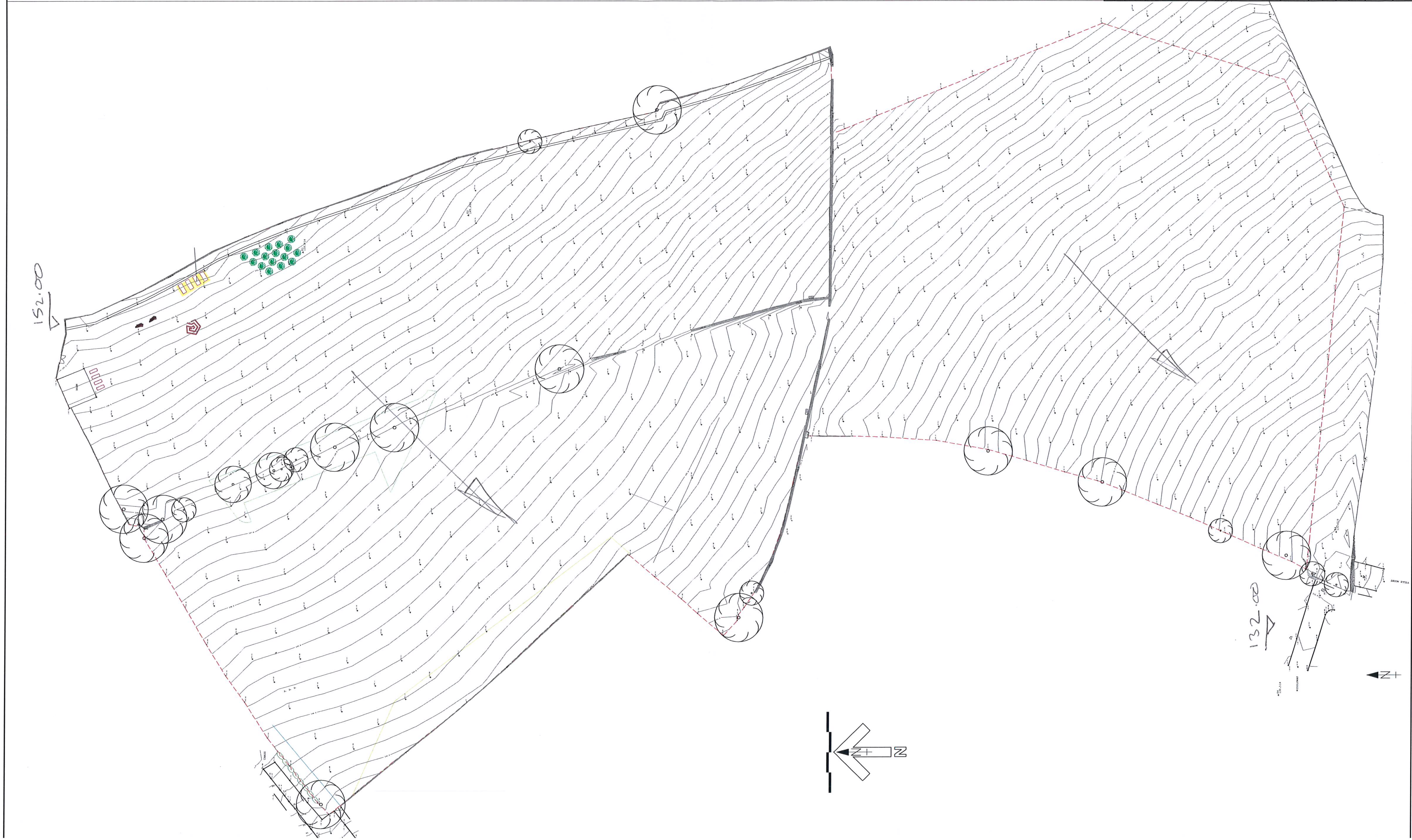
PROJECT:
Proposed Silsden Primary School

DRAWING:
RIBA Stage 02 - Site Plan
Proposed Landscaping

Architect/Lead Designer:		OS Ref:	
MJH			
Drawn By:	Date:	Approved By:	Scale: @A0
TR/MJH	Oct 2017	BB	1 : 500

Drawing No. AR00404A118 A0 Rev A

Appendix 3



Revision	Inits	Date
A Original	TR	Sept 2017

Department of Place

Design Office
Landscape, Design and Conservation
4th Floor
Britannia House
Hall Ings
Bradford
BD1 1HX

Project
SILSDEN NEW PRIMARY SCHOOL

Client

Engineer to Contract

Design	Drawn	Checked	Released
TR	TR		

Scale(s) @ A0	Approved	Date
1:300		Sept 2017

Drawing Title
LANDSCAPE PROPOSALS

Drawing No.
L/103856/CDH/1A