Report Title	# Drainage Report
Property Address	Proposed Warehouse Joe McBain Ave Moresby Parks Whitehaven CA28 8EA
Client	O'Connor Fencing Ltd
Our Reference	22-485r002
Date	December 2022
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Introduction

The purpose of this report is to provide support for a planning application associated with the proposed development on land adjacent at Joe McBain Ave, Moresby Parks, Whitehaven, CA28 8EA.

Research has been undertaken on the site and observations made regarding the existing site and the drainage servicing the site.

Calculations associated with the drainage have been performed by software packages from a recognised resource. Where appropriate copies of calculations are provided in the Appendices of this report.

The Site

Historic Usage

The area of the proposed development has historically been undeveloped and is part of a larger site developed in the 1990's by the North West Development Agency for industrial use. Infrastructure and some limited developments took place during the intervening years, and the site proposed for development has remained fallow with limited maintenance being undertaken on the site.

Existing Foul Network

A private sewer system is located on the site servicing the properties which discharges to the United Utilities foul drainage system located on the site boundary.

Existing Site Drainage

The site has no natural drainage and all surface water is collected and managed via a site wide surface water drainage system which leaves the site and discharges to a watercourse on the site boundary. The drainage system installed as part of the development during the 1990's has no flow controls or attenuation and the condition is to be inspected as part of this development to ensure that it is suitable for future demands on the site.

Geology

The superficial geology indicates that the site is overlain by the Diamicton Till generally consisting of clays, and silts.

The solid geology of the site is Coal Measures.

A copy of the geological mapping is appended to this report.

Drainage Strategy

Foul Drainage

It is proposed that the development shall have a connection to the adjacent foul drainage network present on the site boundary.

Surface Water Drainage

Outline Strategy

It is proposed to discharge the surface water from the development to the existing surface water drainage present on the site boundary.

At present, drainage located on the site discharges any surface water from the area of the development into the surface water system unattenuated. It would be proposed to attenuate via a small pond and release the surface water discharge at greenfield runoff rates.

Hydraulic Design

Surface Water Drainage

Principally the surface water drainage has been calculated on the impermeable areas of the development.

Modelling has been conducted on the following rainfall events:

- 1 in 10 years
- 1 in 30 years
- 1 in 100 years plus 40 % increase due to climate change over a 6 hour period

An assessment of the proposed network has been undertaken to identify the requirements of each property and requirements for the attenuation of water on the site to ensure that runoff from the

site does not exceed the limits of Qbar (approx 1 in 2 year rainfall event).

The following parameters were adopted in the analysis. These were obtained from UK SUDS based on the site location and data held by HR Wallingford.

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	0.0
M5-60 (mm)	20.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	10 year (l/s)	17.9
Summer CV	0.750	30 year (l/s)	22.0
Winter CV	0.840	100 year (l/s)	26.9
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	x	100 year +40% 360 minute (m³)	1004

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	0	0	0
30	0	0	0
100	40	0	0

The following rates and volumes have been calculated for the predevelopment discharge and volumes from the site.

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)	1.876	Betterment (%)	0
SAAR (mm)	950	QBar	13.0
Soil Index	4	Q 1 year (l/s)	
SPR	0.47	Q 30 year (l/s)	
Region	10	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	40
Positively Drained Area (ha)	1.876	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	0.547
CWI	124.875	Runoff Volume (m^3)	1004

Detailed Engineering

The detailed model presented in this report adopts the following engineering aspects specific to the site.

Attenuation

Attenuation in the form of an attenuation pond downstream of the site shall accommodate all peak flows from the development and , prevent flooding occuring within and outside the site.

Node 12 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	30.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	124.750	Main Channel Slope (1:X)	1000.0
Safety Factor	1.0	Time to half empty (mins)	45	Main Channel n	0.030

Flow Control

A hydrobrake is to be installed downstream of the attenuation pond and shall control flows from the site to the existing drainage network. The following summary is presented for the flow control device.

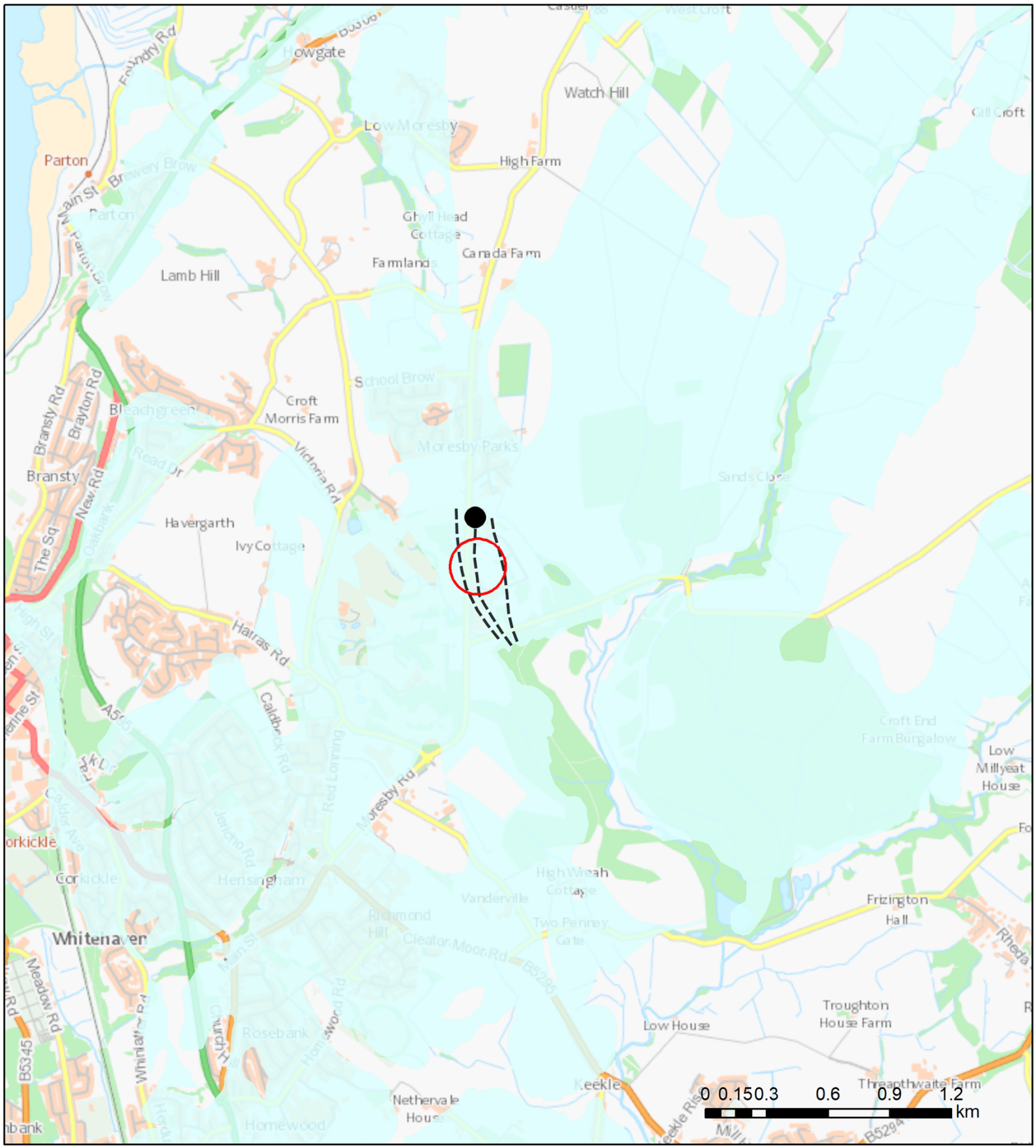
Node 13 Online ACO Q-Brake Control

Flap Valve	x	Design Depth (m)	1.400	Min Node Diameter (mm)	1050
Replaces Downstream Link	✓	Design Flow (l/s)	13.0	Orifice Diameter (mm)	0.145
Invert Level (m)	124.614	Min Outlet Diameter (m)	0.145		

Appendices

BGS Geological Records

Superficial Deposits



Map Key

Superficial deposits 1:50,000 scale

- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- TILL, DEVENSIAN - DIAMICTON
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- RAISED MARINE DEPOSITS - CLAY AND SILT
- RIVER TERRACE DEPOSITS, 1 - CLAY, SAND AND GRAVEL
- ALLUVIAL FAN DEPOSITS - SAND AND GRAVEL
- MARINE BEACH DEPOSITS - SAND AND GRAVEL
- PEAT - PEAT
- SUPERFICIAL THEME NOT MAPPED [FOR DIGITAL MAP USE ONLY] - UNKNOWN/UNCLASSIFIED ENTRY

Linear features 1:50,000 scale

- Coal_seam_Inf
- Glacial_meltwater_channel_Centre_Undiff
- Marine_band

Selection Results

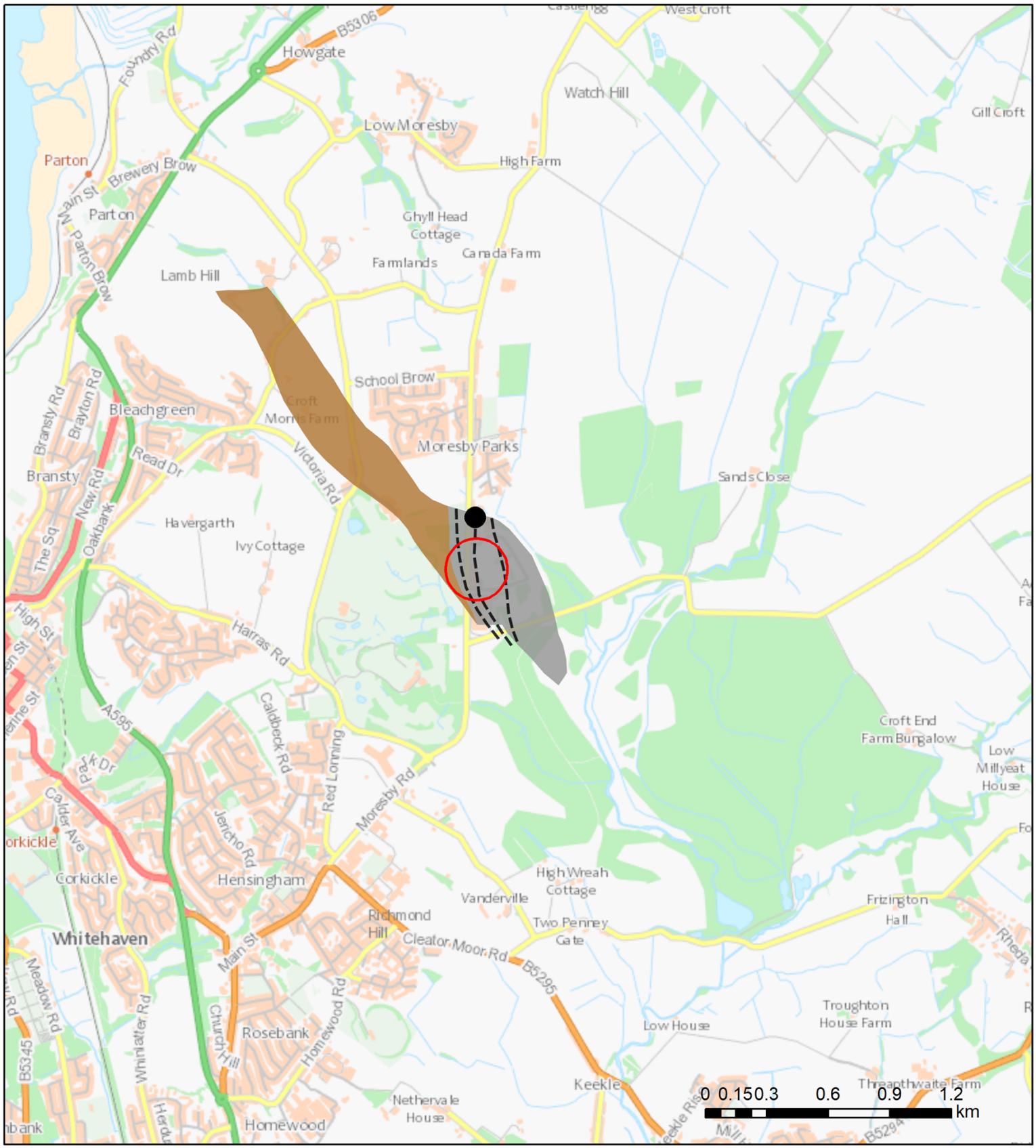
Linear features 1:50,000 scale

Feature
Coal seam, inferred
Coal seam, inferred
Coal seam, inferred

Superficial deposits 1:50,000 scale

Description	Details
TILL, DEVENSIAN - DIAMICTON	More Information

Solid Geology



Map Key

Bedrock geology 1:50,000 scale

- FIRST SHALE MEMBER - SANDSTONE, SILTSTONE AND MUDSTONE
- PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- FIRST LIMESTONE (CUMBRIA) - LIMESTONE
- MILLYEAT MEMBER - MUDSTONE, SANDSTONE AND LIMESTONE
- BUTTERMERE FORMATION - MUDSTONE AND SANDSTONE
- PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- STAINMORE FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE
- ST BEES SANDSTONE MEMBER - SANDSTONE
- OREBANK SANDSTONE - SANDSTONE
- ST BEES SHALE FORMATION - SILTSTONE AND MUDSTONE, INTERBEDDED
- PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE
- PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE
- WHITEHAVEN SANDSTONE FORMATION - SANDSTONE
- ST BEES EVAPORITE FORMATION - DOLOMITIC LIMESTONE, MUDSTONE AND ANHYDRITE-STONE
- HENSINGHAM GRIT - SANDSTONE
- BROCKRAM - BRECCIA

Linear features 1:50,000 scale

- Coal_seam_Inf
- Glacial_meltwater_channel_Centre_Undiff
- Marine_band

Selection Results

Linear features 1:50,000 scale

Feature
Coal seam, inferred
Coal seam, inferred
Coal seam, inferred

Bedrock geology 1:50,000 scale

Description	Details
PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE	More Information
WHITEHAVEN SANDSTONE FORMATION - SANDSTONE	More Information