Samson Flats
Inter-tidal Field Survey

Interim Report 2009

Kevin Camidge & Luke Randall

With contributions by
Phil Rees
Charlie Johns

CISMAS

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Finally we would like to express our gratitude to Doug Murphy of Opti-cal Survey Equipment Limited who supplied the RTK survey equipment for this project and took endless pains in instructing the authors in its use.

Kevin Camidge & Luke Randall

Contents

Abbreviations

ADS	Archaeology Data Service
BP	Before Present
CAU	Cornwall Archaeological Unit (now HE Projects)
CEP	Coastal Erosion Project
CISMAS	Cornwall and Isles of Scilly Maritime Archaeology Society
CSV	Comma Separated Values
DXF	Drawing eXchange Format
EDM	Electronic Measuring Device
EH	English Heritage
GPS	Global Positioning System
GPRS	General Packet Radio Service
GRS 1980	Geodetic Reference System 1980
HE Projects	Historic Environment Projects Cornwall Council
HER	Historic Environment Record
HES	Historic Environment Service (Cornwall)
IoS	Isles of Scilly
ISET	Isles of Scilly Environmental Trust (Isles of Scilly Wildlife Trust from 2001)
MSL	Mean Sea Level
OSGB	Ordnance Survey Great Britain
PDL	Position Data Link
PRN	Primary Record Number
RCZAS	Rapid Coastal Zone Assessment Survey
RTK	Real Time Kinematic
UKTM	United Kingdom Transverse Mercator

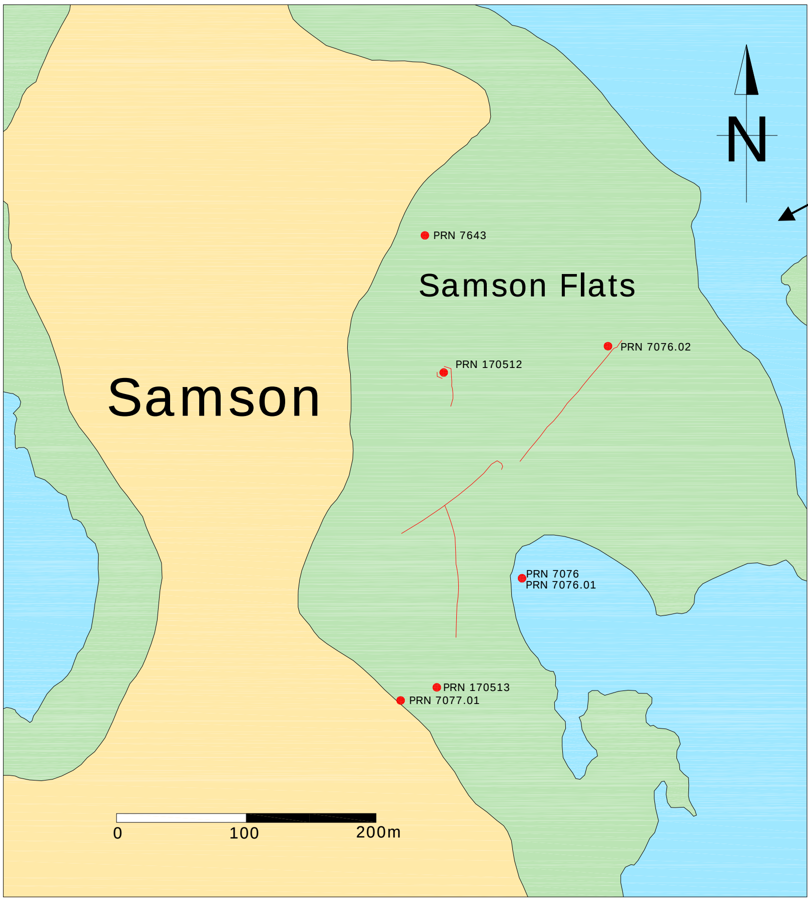
Project Name

Samson Flats Inter-tidal Field Survey

Summary Description

The *hedges and ruins* on Samson Flats in the Isles of Scilly were first noted by Dr William Borlase in the mid-eighteenth century. The location of these features within the inter-tidal zone was taken as evidence that they were part of an inundated landscape and possibly prehistoric. However, this interpretation of their function and date has sometimes been questioned. This project aims to produce an accurate survey of the features and the topography in the inter-tidal zone on Samson Flats. The survey of these features should allow a better determination of their function and date. The project will also seek to engage the local community through site open days and local presentations. Six days of fieldwork were undertaken by a team of nine CISMAS members between 21st and 26th June 2009. A further six days of fieldwork are scheduled for 2010.

Background



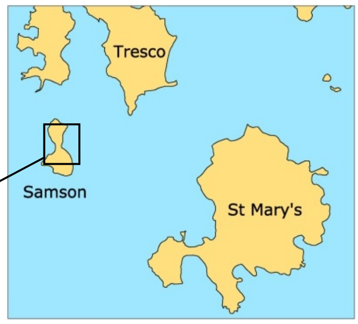


Fig 1

Location plan

Samson Flats is an expanse of littoral sand located to the east of Samson, Isles of Scilly. On a spring low tide, this area consists of about 0.15 km^2 of exposed ground. Within this area the Isles of Scilly Historic Environment Record (HER) lists seven features of archaeological importance (Fig 2). These form part of Scheduled Monument 15526 ‘Prehistoric to post-medieval funerary, field system and settlement remains etc, on and adjacent to Samson’.

Fig 2

HER records for Samson Flats

PRN	Description
7076	Hut Circle
7076.01	Field System
7076.02	Hut Circle/Settlement
7077.01	Field System
7643	Stone Working Site
170512	Hut Circle
170513	Hut Circle

Summary of the Geology of Samson (by Phil Rees)

The following observations were made of the land forms and deposits as part of the initial survey and recording of the ‘field’ wall systems on Samson Flats in June 2009. On the basis that no sediment samples were taken, it represents a preliminary evaluation of the land forms and deposits and their possible relationship to the character and dating of the ‘field’ wall systems.

The island of Samson is the largest of the uninhabited islands, and takes the form of two distinct hills connected by a sand bar isthmus. The twin hills effectively form the summits of two granitic ‘tors’ with the lower sides cloaked in a glacial derived ‘head’ material (known locally as ram) which can be seen in the exposed cliff faces up to 5 metres high on the east side of North Island facing onto the ‘sand flats’. The underlying geology of Samson is a ‘fine’ grained granite which has been subjected to deep weathering along the joint planes. The granite is exposed in a number of areas along the foreshore indicating that the indurated bedrock may lie at or close to the surface in the inter tidal areas. It should be noted that the sand levels may be subject to fluctuation in level depending on the nature of the recent storm and tidal stream action by direction.

At the time of the initial survey, it was noted that the sand spit on the north-east side of the island is subject to transitory movement and that the sand levels in the vicinity of the Black Ledge appeared to be relatively high. It is quite possible that during subsequent surveys there will be apparent fluctuations in sand levels particularly in the area of the spit.

The granite ‘tor’ on the North Island overlooking the flats on the east side has been preferentially eroded in the form of large blocks which have tumbled down the hillside to form a boulder field along a section of the foreshore. It is possible that this accumulation of boulders may overlie vestige wall features over this section of the foreshore.

The most relevant reference to the Pleistocene deposits of Samson from the literature is (Mitchell & Orme, 1967: 59-92). This reported the ‘head’ material as a basal granitic deposit (Lower Head) containing beach cobbles with occasional flints, overlain by a gritty and sandy deposit (Upper Head). These studies established that an ice sheet extended to the extreme northern margin of what are now known as the islands of Bryher, Tresco and St.Martins and that at this time the area of investigation on Samson Flats would have been subject to periglacial conditions. From more recent studies undertaken (Scourse et al, 2001 & 2004) at various sites on other the islands, there has been detailed evaluation of a number of Quaternary exposures and the inference of this work indicates that the ‘head’ deposit on Samson could well be of Devensian age.

In order to fully appraise the character and age of these ‘head’ deposits with any degree of certainty, further detailed recording and analysis of the deposits would be required. In this particular archaeological context, however, the true significance of this glacial deposit is not necessarily the age of its formation, but its disposition at the time that the ‘field’ walls were constructed. The most important aspect which needs to be considered is to determine the time when Samson was physically separated from the adjacent islands and became recognisable in its present form.

Prior to the time of submergence and physical separation from adjacent islands, this ‘head’ material would have almost certainly extended as a near continuous sequence across the flats and to have linked up across the channel with similar deposits on Tresco. Either the linear features were constructed above this head material or the head material had been eroded prior to their construction. It is proposed that a number of trial cores are taken at selected locations along the foreshore and inter tidal areas on Samson Flats in order to determine the disposition and thickness of head and/or beach deposits overlying the granite bedrock in the vicinity of the wall systems.

For the record, it was noted that the cobbles and boulders comprising the walls on Samson Flats are of fine-grained granite with the exception of the occasional chert/flint pebbles and three samples of angular shelly limestone cobbles. In accordance with the requirements of the survey, all specimens were left in situ and hence were not recorded in detail.

From (Hiemstra, 2006) it is considered that the most likely source of the limestone is from an area to the north west in the Celtic Sea where limestone exposures are thought to be present and that the material has been ice transported to the island at some time during the Devensian optimum.

Sea Level Rise

Since the Last Glacial Maximum, rising sea level has served to isolate the Isles of Scilly from the Cornish mainland and transform them into their present form (Johns *et al* 2004, 21). This process would have impacted significantly upon the islands' inhabitants. As areas once suitable for settlement gradually became inundated, the means by which islanders utilised a changing landscape would have altered accordingly (Johns *et al* 2004, 90-93). An early submergence model for the islands postulated by Thomas (1985) has more recently been questioned by Ratcliffe and Straker (1996) through the dating of inter-tidal peat deposits. The proposed Lyonesse project (Johns *et al* 2007) aims to build on previous work and resolve the question of sea level rise in Scilly.

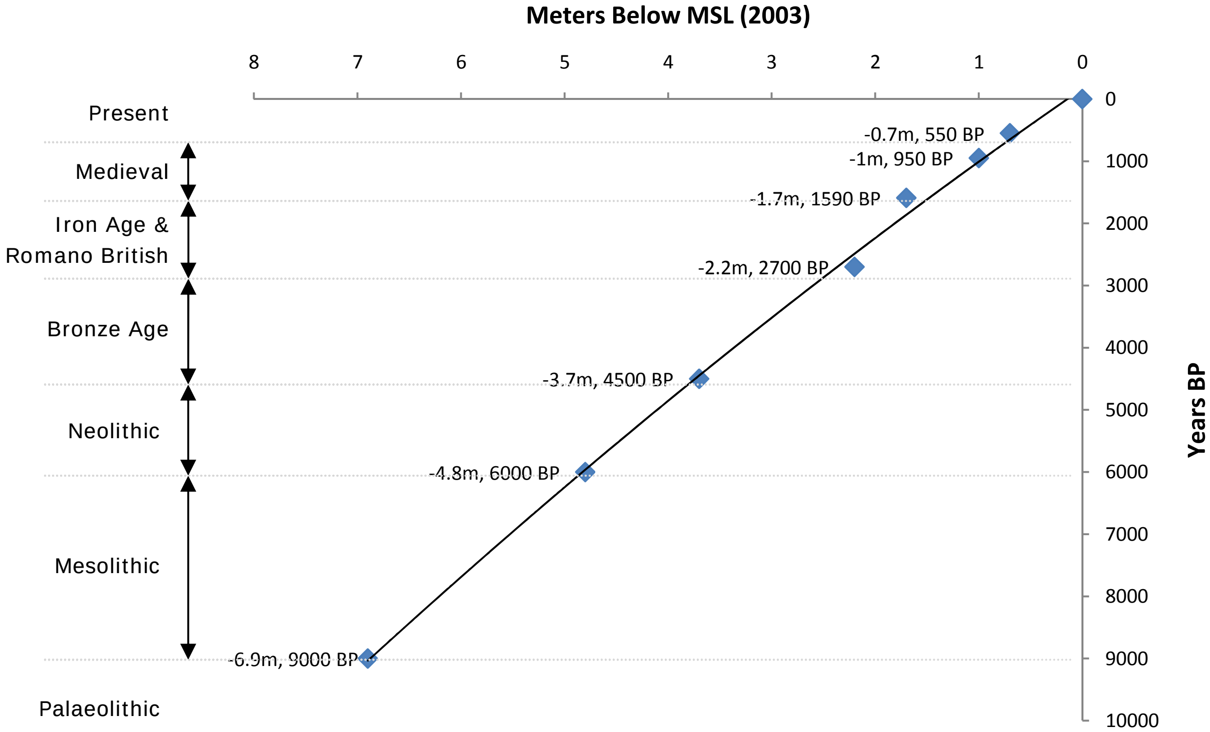


Fig 3 Graph of sea level rise in Scilly. After Johns et al (2004)

Previous Work

The ‘Hedges and Ruins’ on Samson Flats were first noted by Dr William Borlase in the mid-eighteenth century (Borlase 1756) and later discussed by OGS Crawford (1927). The location of these features within the inter-tidal zone was taken as evidence that they were part of an inundated landscape and possibly Bronze Age in date (eg Thomas 1985). However, the interpretation of these linear stone features as field boundaries by Borlase, Crawford and Thomas has sometimes been questioned.

The linear stone features on Samson Flats were recorded by Fowler and Thomas (1979) as part of a wider investigation ‘the early walls of Scilly’.

In 1988 the Cornwall Archaeological Unit (CAU – now HE Projects) was commissioned by EH to undertake an assessment of the archaeological resource on Scilly, including submerged remains and those in the inter-tidal zone. The resulting report (Ratcliffe 1989a) formed the archaeological input into an Integrated Management Plan by ISET. The hut circle/settlement and field system on Samson Flats was one of the sites prioritised for archaeological recording (Ratcliffe 1989b, 19). The Coastal Erosion Project (CEP) resulted in the publication of *The Early Environment of Scilly*, which similarly recommended further survey of inter-tidal remains (Ratcliffe and Straker 1996, 52).

In 2003 English Heritage commissioned the Cornwall County Council HES (now HE Projects) to conduct a Rapid Coastal Zone Assessment Survey (RCZAS) for the Isles of Scilly (Johns *et al* 2004). In this report the function and antiquity of certain inter-tidal and subtidal features listed in Scilly was debated:

> *It has been suggested recently that at least some of those submerged and inter-tidal stone remains, which have been interpreted since Dr Borlase’s time as old field walls, could in fact be fish traps, or possibly boundaries between kelp gathering territories. The kelp burning industry was introduced to Scilly in 1684; submerged ‘Hedges’ were noted by Dr Borlase 72 years later in 1756 and assumed to be prehistoric in date. Was Dr Borlase actually noting comparatively recent features associated with kelp burning? As a caveat to this hypothesis it is useful to note that Hooley (pers comm) has observed that the inter-tidal walls show a very poor correlation with areas of kelp growth and are not aligned in a suitable manner to function as fish-traps.* (Johns *et al* 2004, 94).

The ‘settlement and field system’ in the inter-tidal zone on Samson Flats was one of the sites prioritised for survey by the RCZAS (Johns *et al* 2004, 199-200).

Interpretation of the Features

The principal archaeological features visible on Samson Flats are linear stone features set into the sand of the inter-tidal zone. Several interpretations of these features have been voiced (Johns *et al* 2007, 94). These features could be associated with prehistoric settlements, fish-trapping or the kelp burning industry.

Submerged Prehistoric Settlement

There are seven HER records for Samson Flats. Of these, two are classified as 'Field Systems' and four as 'Hut Circles'. Thomas (1985, 241) suggests that the linear structures on Samson Flats might form part of a field system that extends over much of the island. It has been suggested that these features are Bronze Age in date (Thomas 1985; Robinson 2007) and present models for sea level rise in Scilly suggest that such a date is feasible (Ratcliffe & Straker 1996 cited in Johns *et al* 2004).

It has also been suggested that some of these structures may have a ritual rather than practical function:

> *Agriculture was undoubtedly practised on Scilly, but its expansion into a system of permanent land tenure may have been, at best, short-lived. If this is the case, then some of the so-called 'field systems' may be symbolic references to the problem of soil degradation (real or threatened?) rather than agricultural enclosures,* (Kirk, 2002).

Fish Traps

Although Crawford (1927) originally wrote in support of the submerged field boundary hypothesis he later suggests, in an editorial for *Antiquity* (Crawford 1946), that these features might instead be the remains of medieval fish traps (cf English Heritage 1996; Hooper 2001; Jones 1983). Bannerman and Jones (1999) state that seven types of fish trap can be identified, although variations upon these can be demonstrated (Dawson 2004; Hooper 2001). All types work on the same principle, acting to either isolate fish within a broad area or guide them towards a staked net during the ebbing tide.

Fig 4

Fish-trap types, after Bannerman and Jones (1999)

Type	Description
1	Natural feature adapted as a trap
2	Semi-permanent wattle and wood trap
3	Modified natural feature trap
4	Crescent – shaped trap
5	Rectilinear trap
6	The *V* or *Double V* – shaped trap
7	The S – shaped weir trap

The dating of stone-built fish-traps is often problematic. However, timber stakes found in association with stone-built traps at Strangford Lough, Co. Down, have been dated to the late medieval period (McErlean *et al* 2002 cited in Dawson 2004, 16). Historical sources have also been used to date a trap in Caernarfon, North Wales, to the 12th or 13th century (Momber 1991, 108) and fish-traps in Scotland are known to have been used well into the 19th century (Dawson 2004, 25).

Ashbee (1978, 55) and Hooley (cited in Johns *et al* 2004, 94) state that the alignment, position and construction of the linear features on Samson Flats all indicate they would function poorly as fish traps. High resolution survey of the features and surrounding topography should help resolve these issues.

Kelp Industry

The collection and burning of kelp for the extraction of sodium carbonate and iodine formed a seasonal industry in Scilly from the mid 17th to 19th century (Thomas 1985, 109). There are three types of archaeological feature associated with the kelp industry which are analogous with the inter-tidal remains on Samson Flats: drying walls, territorial boundaries and structures designed to encourage kelp growth.

Inter-tidal structures intended to increase yield – these are evidenced at Strangford Lough in Co. Down, Northern Ireland. They were shallow linear structures built within the inter-tidal zone in order to encourage the growth of kelp (McErlean *et al* 2002 cited in Forsythe 2006, 220).

Drying walls – structures intended to keep kelp off wet ground, thus allowing it to dry thoroughly in advance of burning. These are prevalent features in both Co. Donegal and Rathlin, Northern Ireland (Forsythe 2006, 221).

Territorial boundaries - Johns *et al* (2004, 94) suggests that the linear features on Samson Flats might represent boundaries between kelp territories. Thomas (1985, 110) cites historical accounts of disagreements in Scilly regarding kelp collection in certain areas.

Objectives

The project aims fall into three main categories:

Increasing Public Awareness and Community Involvement

- Involvement of the local community and schools in the project by means of guided site open days, school visits and presentations.
- Involvement of the community in the survey: CISMAS members will undertake the fieldwork and recording. All participants in the fieldwork will be volunteers.

Improved Site Management

- Determination as to the most efficient survey methods in the inter-tidal zone, yielding sufficient detail to facilitate the interpretation of function and monitoring the site deterioration processes.

Understanding the Monuments

There is a degree of uncertainty regarding the function of the archaeological features at Samson Flats. Early interpretations of these and other, similar features around Scilly are open to question and the lack of any detailed survey of these remains renders their reinterpretation difficult. The following methods will be used to address these issues:

- Completion of an accurate survey of feature positions and alignments using RTK GPS.

- Detailed recording of exposed features consisting of 1:20 planning frame drawings and 1:10 profiles. Such detailed recording may show any inter-relationships between features and lead to a relative dating sequence.

- Production of a high-resolution contour survey of site topography.

Fig 5 'Field walls' in the inter-tidal zone on Samson Flats. 17th September 2008

Methods

Site Access

The fieldwork took place during spring tides to allow access to the inter-tidal features. The field work took place between 21 and 26 June. The table below shows the predicted tides for that week. In practice the majority of Samson Flats was exposed for approximately two to two-and-a-half hours either side of low water, allowing a working day of four to five hours on most parts of the site.

Date (2009)	High Water		Low Water	
Sun 21 June	02:54	5.2m	09:19	1.2m
	15:18	5.4m	21:51	1.1m
Mon 22 June	03:46	5.5m	10:10	1.0m
	16:09	5.7m	22:43	0.9m
Tue 23 June	04:36	5.6m	11:01	0.9m
	16:58	5.8m	23:34	0.8m
Wed 24 June	05:26	5.7m	11:51	0.8m
	17:48	5.9m	-	-
Thu 25 June	06:16	5.6m	00:25	0.7m
	18:39	5.9m	12:40	0.9m
Fri 26 June	07:05	5.5m	01:15	0.8m
	19:29	5.6m	13:30	1.0m

Fig 6

Table of tidal heights above chart datum for St Mary's. Heights are in metres and times in GMT. The low tides when survey took place are highlighted in blue.

Seaweed

Most of the linear stone features in the inter-tidal zone on Samson Flats are covered in a thick growth of bladder wrack and other seaweeds. To record the form and structure of the features it was necessary to remove this weed in the areas where the characterisation drawings were made. The Isles of Scilly Wildlife Trust are keen that we minimise the amount of seaweed removed. The bladder wrack is removed by hand, with the aid of a knife to cut the holdfasts from the granite boulders to which they are attached.

Fig 7

Linear stone feature SF100, partly obscured by bladder wrack. Samson Flats September 2008

Real Time Kinematic GPS Survey

A Real Time Kinematic (RTK) Global Positioning System (GPS) was employed in the course of the 2009 survey. This system, which is capable of resolving real world positions with centimetric accuracy, was used to

- fix the control point network used for the drawn survey
- allow rapid collection of contour data for the area around the exposed features
- establish precise positions and alignments of the exposed features

The RTK GPS utilised consisted of two separate units, a Leica 1200 series SmartRover and a Leica 500 series reference station. The former of these two units is capable of working either as a stand-alone instrument or in conjunction with the reference station.

All positions were recorded as OSGB co-ordinates using the GRS 1980 ellipsoid and UKTM projection. Data were recorded in the proprietary Leica format and then converted within the instruments to DXF and CSV files.

Reference Control Points

Although the Leica SmartRover can be used as a standalone unit it is reliant upon the constant availability of a mobile phone signal in order for it to receive Leica SmartNet RTK corrections. It was thus decided to use it in conjunction with a Leica 500 series reference station, from which it could receive RTK corrections via a PDL radio. To facilitate the use of this system, it was necessary to accurately establish the location of at least one semi-permanent Control Point (CP) above which the reference station could be assembled at the start of each day's survey.

Fig 8
The Leica 1200 series SmartRover (right) and the Leica 500 series reference station (left).

Two such reference CPs (CP01 and CP02) were installed on the periphery of the survey area, outside of the inter-tidal zone, so as to provide a degree of redundancy should one be lost between the 2009 and 2010 survey seasons. These reference CPs consist of 0.5m lengths of 12mm steel reinforcing bar set into approximately 0.45m of concrete and labelled with survey tags. The positions of the reference CPs were established using the Leica 1200 series SmartRover, tripod mounted, receiving Leica SmartNet RTK corrections via a GPRS connection. One hundred and eighty observations were made and averaged for each CP. During this process the stated 2D (x,y) and 1D (z) accuracy did not exceed 15mm and 25mm respectively.

An opportunity for operator error existed as the antenna height of the reference station had to be measured and manually entered at the start of each day's survey. To test for any errors in measurement and/or transcription an observation was made of a recorded position (whichever of the two reference CPs was not in use), the two positions compared and any discrepancies noted.

Survey Control Points

In the course of the 2009 fieldwork 51 temporary CPs were installed within the project area to provide baselines for the planning frame and offset (profile) surveys. The position of these CPs were fixed using the SmartRover receiving RTK corrections from the reference station via a PDL radio. Stated 2D and 1D accuracy was typically 10mm and 20mm respectively.

The location of these CPs is recorded in appendix I. All temporary CPs were removed from the project area at the conclusion of the 2009 fieldwork.

Topographic Survey

A topographic survey of the project area was undertaken during the 2009 fieldwork, involving the collection of spot heights at approximately 5 metre intervals. This sample interval was achieved by navigating the GPS unit between two ranging poles and recording spot heights every five paces. At the conclusion of each line the ranging poles were offset 5 metres in the direction of survey.

All spot heights (z) and their positions (x,y) were recorded using the SmartRover receiving RTK corrections from the reference station via a PDL radio. Stated 2D and 1D accuracy was typically 10mm and 20mm respectively.

Feature Extents

Basic plans of each archaeological feature were completed using the RTK GPS (Fig 13). Although these lack the detail of the planning frame drawn characterisations, they successfully illustrate the visible extent and alignment of each feature. Similarly, basic 'profiles' of each feature were completed by recording positions and heights along their centre. Again, these are considerably cruder than the offset profiles drawn as feature characterisations. However they can be integrated with the topographic survey data to indicate the impact each feature has upon the topography of the project area.

All positions recorded to this end were fixed using the SmartRover receiving RTK corrections from the reference station via a PDL radio. Stated 2D and 1D accuracy was typically 10mm and 20mm respectively.

Linear stone features

The position and outline of these features was established using the RTK GPS survey system. In addition to this outline several six-metre sections of each feature were drawn using planning frames at a scale of 1:20 in order to characterise the construction of each feature. These plans each covered an area of 6m x 4m, and included a longitudinal profile over the stones. The number of 1:20 plans for each feature varied; thirteen were made for SF100, three each for SF200, SF500 and SF600, four for SF300 and five for SF400. The plans have been incorporated into the overall site plan maintained in AutoCAD, which will allow easy export of the survey as DXF files to GIS systems.

Fig 9
Planning frame drawing. The planning frames were located using base lines which were positioned using the Leica SmartRover receiving RTK corrections from the reference station via a PDL radio.

Stone working

Two areas were located where there is evidence of stone working. These consist of large granite boulders which have been split using drilled holes with plug-and-feather splitting. These boulders were positioned and outlined using the RTK GPS system. Measured sketches were made and overhead digital photographs taken. The photographs were then fitted to the RTK points in AutoCAD to allow the finished drawings to be produced.

Photography

All contexts were photographed using digital compact and SLR cameras. All photographs are stored electronically in folders labelled by context number – these can be found on the CD ROM in appendix II of this report. In several instances overhead photographs were obtained by attaching a ball-and-socket head to the top of a telescopic 5m levelling staff. The auto focus camera was then fired using an infra red remote control. The framing of the photographs had to be established by trial and error – but the results were generally worth the effort entailed.

Fig 10 Camera mounted on telescopic levelling staff (left) and an example of an overhead view obtained using the system (right).

The survey team

The team were all members of CISMAS working as volunteers. Most members of the team have worked together on a number of underwater surveys including the wrecks of Colossus, Firebrand and the Mount's Bay Survey. The team consisted of:

Sharon Austin	Photographer
Kevin Camidge	Project Manager
Innes McCartney	Draughtsman
Charlie Johns	Volunteer and seaweed cutter extraordinaire
Maureen Murphy	Draughtsman
Luke Randall	RTK Survey and Site Supervisor
Phil Rees	Draughtsman and geologist
Janet Witheridge	Draughtsman
Robin Witheridge	Community liaison

Results

Community Involvement

During the 2009 season the project sought to engage members of the local community and visitors to the islands on the topic of cultural and environmental heritage. This was achieved through the organisation of site visits and a presentation to local students. A hand-out, which introduced the project and discussed the nature and location of other archaeological features on Samson, was prepared for all site visitors.

Fig 11

A site visit for students from The Five Islands School on Samson flats

A presentation was delivered to Key Stage 3 students of Carn Thomas Secondary (St. Mary's), Five Islands School, on Tuesday the 23rd of June. This presentation introduced the basic concepts of archaeological enquiry and discussed the project area and varied interpretations of the archaeological features in question. The topic of past and present sea-level rise and its implications were also considered.

A site visit for students from The Five Islands School was organised through liaison with teaching staff from Tesco Primary and Carn Thomas Secondary (St. Mary's). Both groups, totalling approximately forty students and ten teachers, were received on site on the morning of Thursday the 25th June. The students, aged between six and twelve years, were given a tour of the multi-period archaeology present on Samson's north hill, prior to visiting the exposed inter-tidal archaeology of Samson Flats. The students were introduced to the different survey methodologies being implemented during the project and were invited to discuss possible interpretations of the stone-built structures present on Samson Flats.

A public site open-day was organised for the afternoon of Thursday the 25th June. This was advertised through the local tourist information centre and an interview given by CISMAS to the local radio station on Tuesday the 23rd June. The public site open-day received approximately a dozen visitors, who were shown the exposed inter-tidal features of Samson Flats and the survey methodologies being used by the team.
The project area was visited daily by interested members of the public, in addition to those who attended the site open day, with whom CISMAS members discussed the project and site.

The theme of community outreach will be continued during the upcoming 2010 survey season with an additional public site open day. The opportunity for further involvement of students will also be offered to the Five Islands School.

Topographic survey

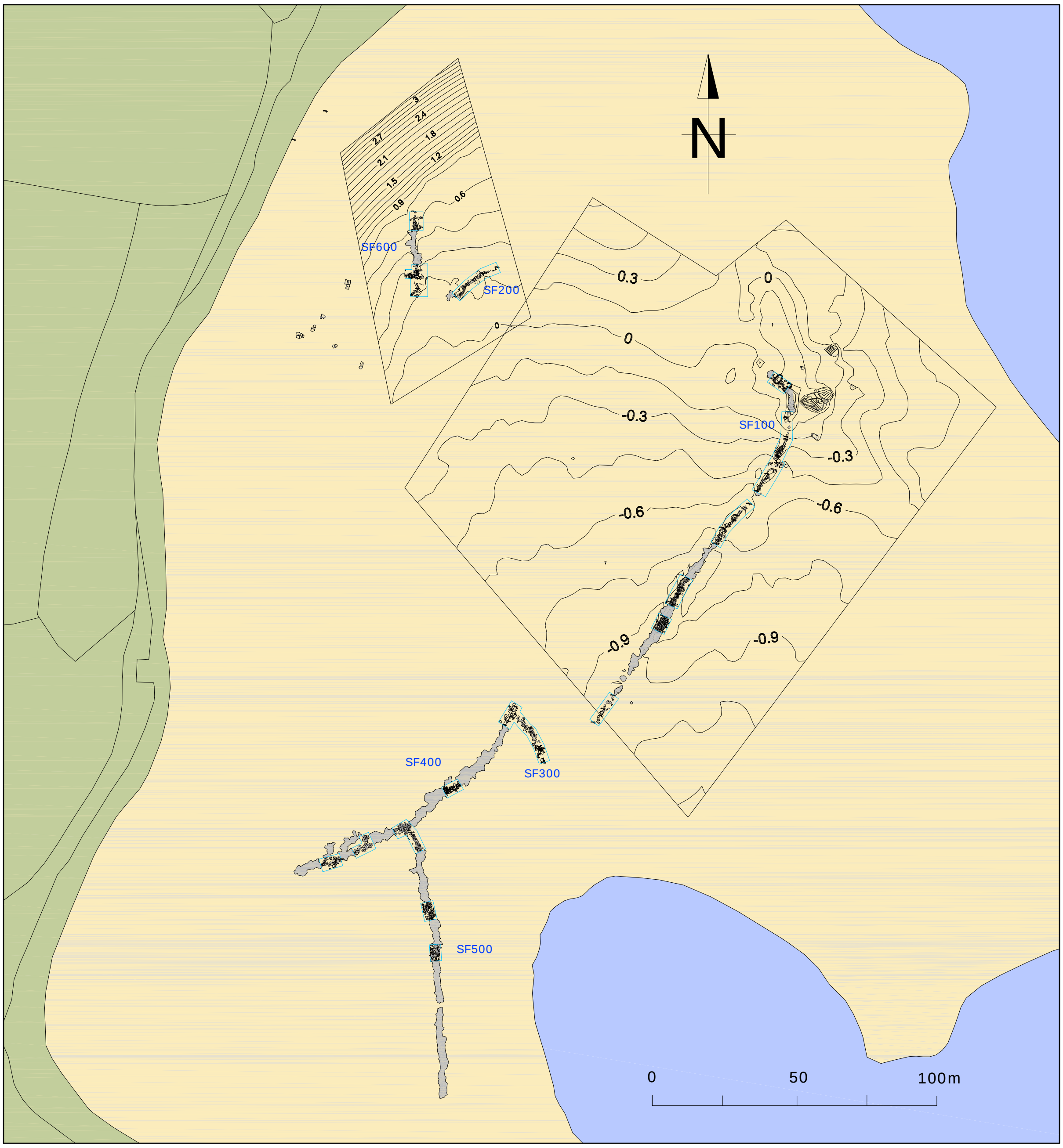


Fig 12

Topographic survey 2009 plotted as 0.15m contours, sampling interval 5m squares

The topographic data was collected as spot heights, with a corresponding horizontal position using the RTK GPS unit. Heights and position were taken at approximately every 5m. An area of over 30,000m^2 around SF100, SF200 and SF600 has so far been surveyed in this fashion. These have been plotted as contour maps at vertical intervals of 0.10m, 0.15m and 0.20m – Fig 12 shows the contours at 0.15m intervals. These contour plots should enable us to decide which, if any, of the linear stone features could function as tidal fish traps. Topographic data will be collected for the remainder of the area around the linear stone features in 2010.

Linear stone features

Six linear stone features were identified and recorded. A further four linear stone features were identified but not recorded; these will be recorded during the work scheduled for the 2010 season. The six features recorded this year were allocated context numbers SF100 to SF600, and details of each are summarised in Fig. 21 below. Details of the construction of these features could only be observed where the thick covering of seaweed was removed; each cleared section was recorded by 1:20 planning frame survey, longitudinal profile and photographs. It was not possible to draw the whole of the features due to time constraints and the desire of the Isles of Scilly Wildlife Trust that we remove as little weed from the features as possible.

These features were all constructed from undressed granite boulders. Broadly speaking, two different construction techniques were observed. Firstly, there were lines of medium sized granite boulders and slabs, with many of the stones set on end, and the feature only consisting of a single line of stones in places. SF100, SF200 and SF600 are of this type of construction. The second type of construction was more typical of normal stone wall construction, with stones laid flat side down in courses with the larger stones defining the edges of the wall. SF400 and SF500 were of this style of construction. SF300 exhibited elements of both types of construction, with the former predominating. For a more detailed description see Fig. 21 below. These two construction methods were also reported by Fowler and Thomas (1979).

Dating of these features is problematic and will probably only be established if limited intrusive investigation is undertaken at some time in the future (see objectives below). We know that at least some of the linear stone features were visible when Borlase visited the Islands in the middle of the 18th century. However, the presence of plug-and-feather cut granite recorded in two of these features (SF200 and SF300) would indicate that these at least may post date the introduction of plug-and-feather cutting sometime after 1800 (Herring, 2008). The different construction techniques observed in these linear stone features may indicate that they are of different dates. The possibility that submerged field walls have been utilised in later structures should at least be considered. Further speculation is perhaps best postponed until the features have all been identified and surveyed.

All the 1:20 plans, longitudinal profiles and photographs are reproduced on the CD ROM in appendix II. Examples from each context are reproduced below.

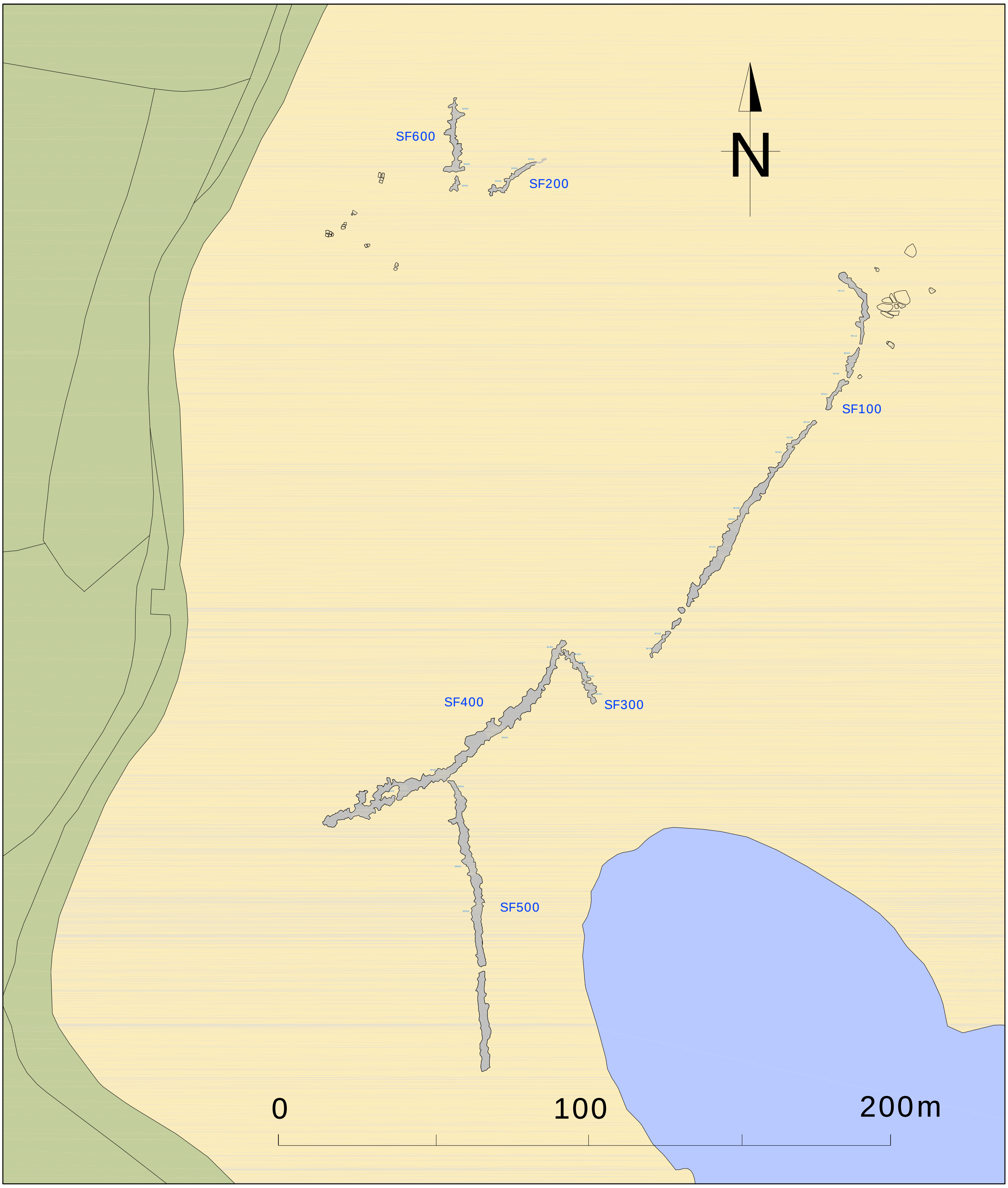


Fig 13
Outline plan of linear stone features recorded on Samson Flats in June 2009.

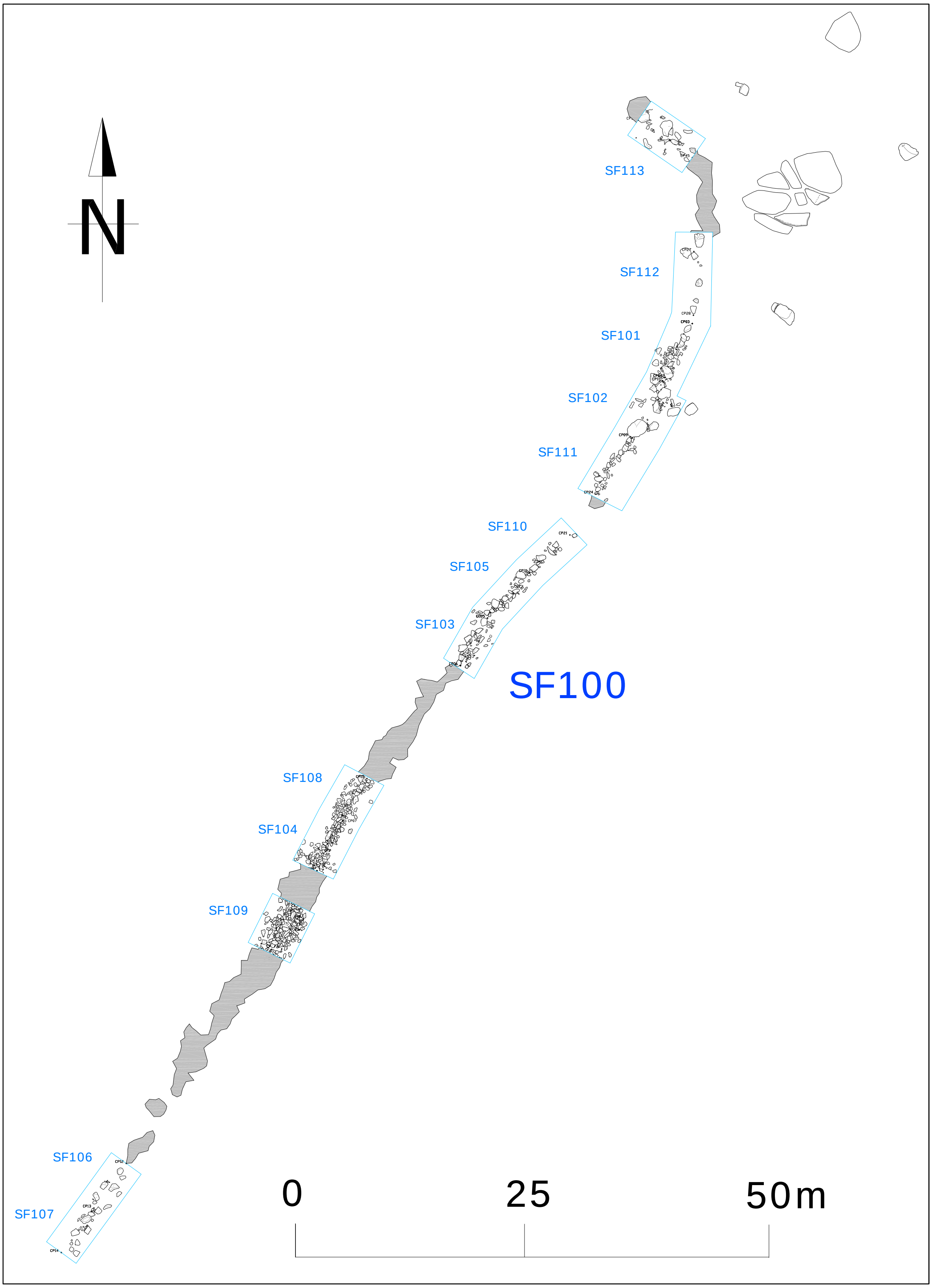


Fig 14 – Linear stone feature SF100, showing the location of the drawn segments SF101 to SF113

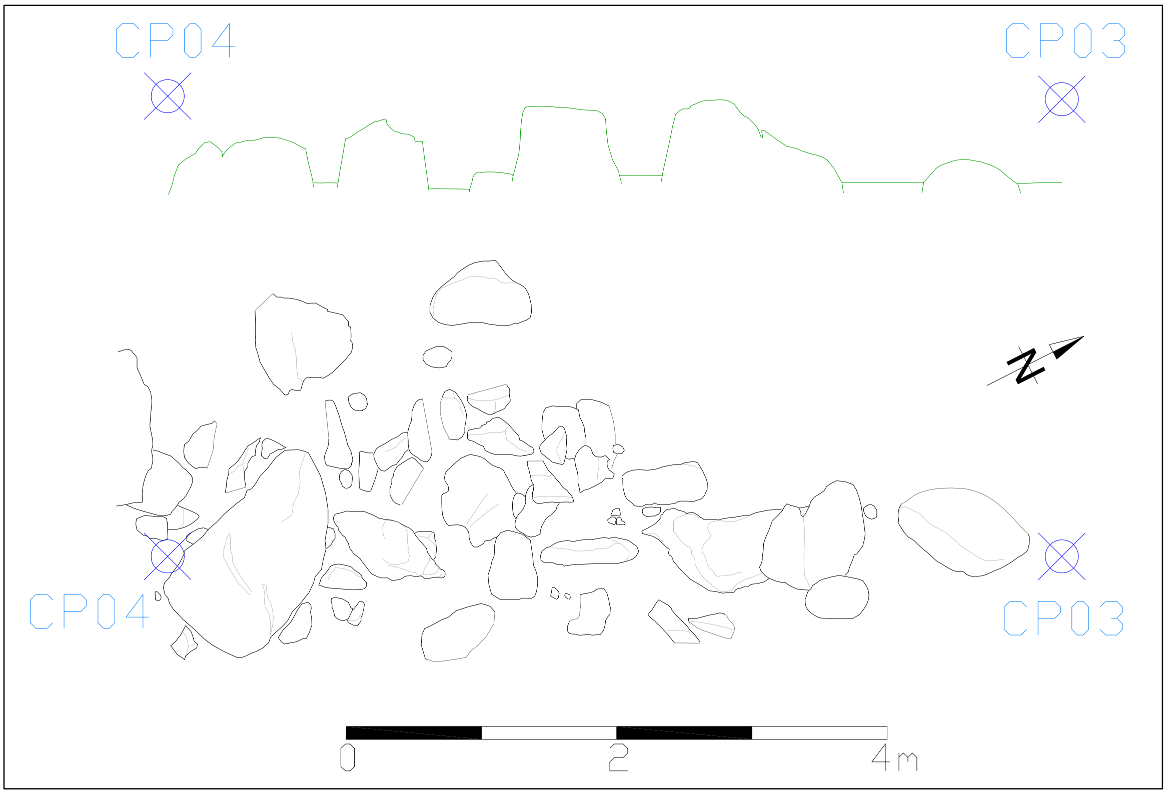


Fig 15
An example of one of the drawn segments of SF100. Shown here is SF101.

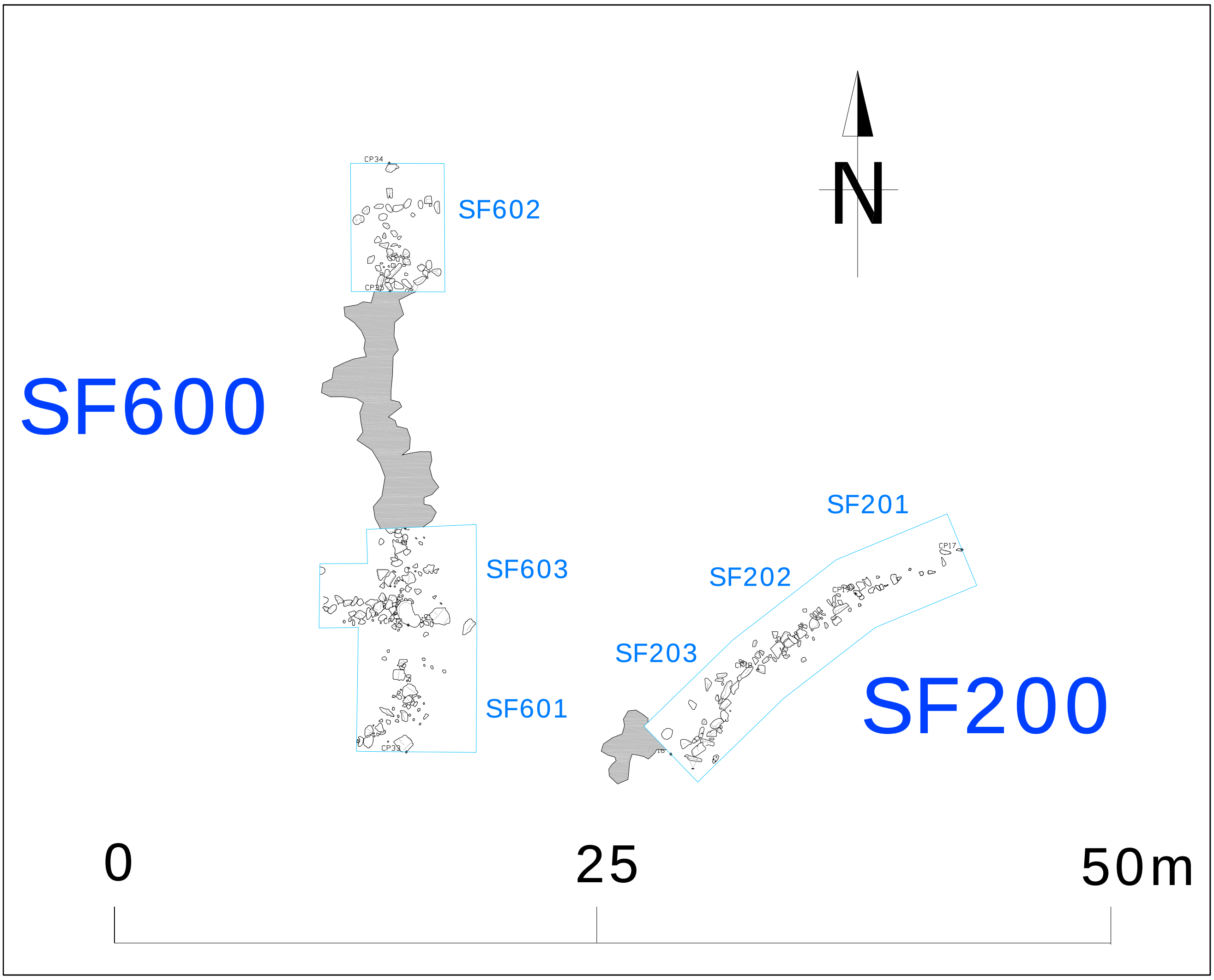


Fig 16
Linear stone features SF200 and SF600, showing the location of the characterisation drawn segments.

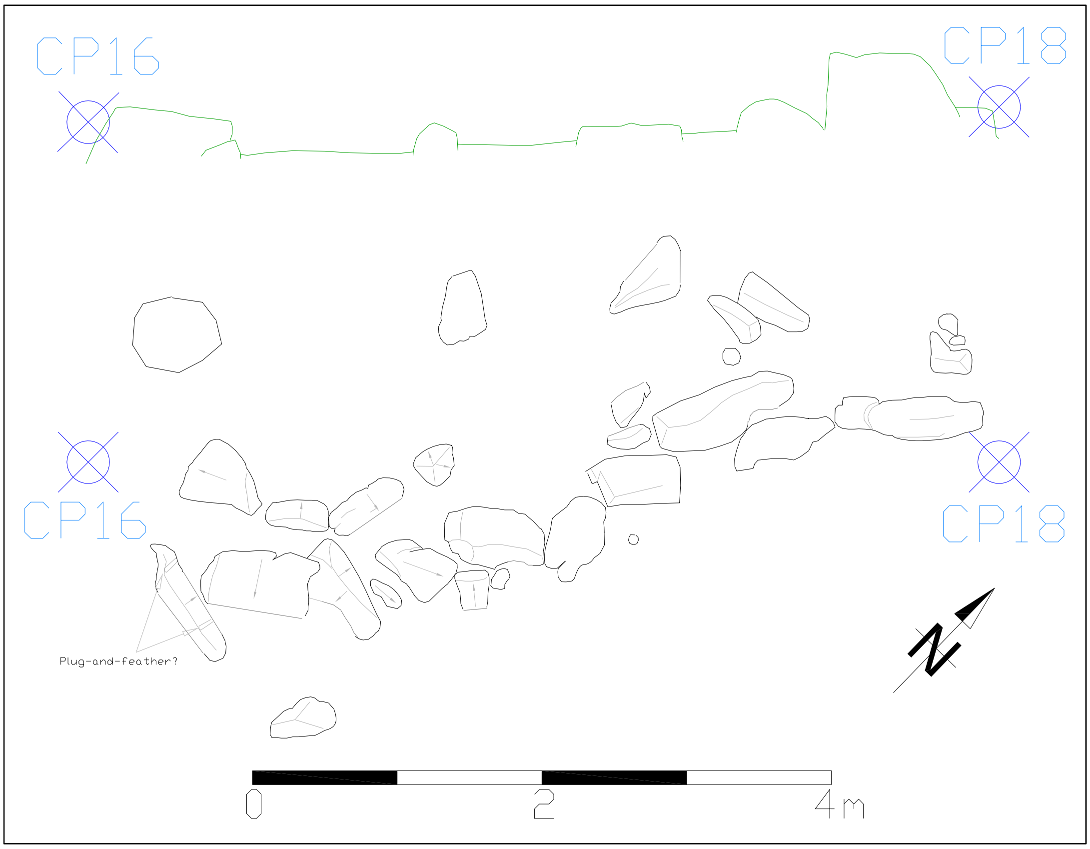


Fig 17 . An example of one of the drawn segments of SF200. Shown here is SF203, plan and profile (above) and photograph looking NW (below)

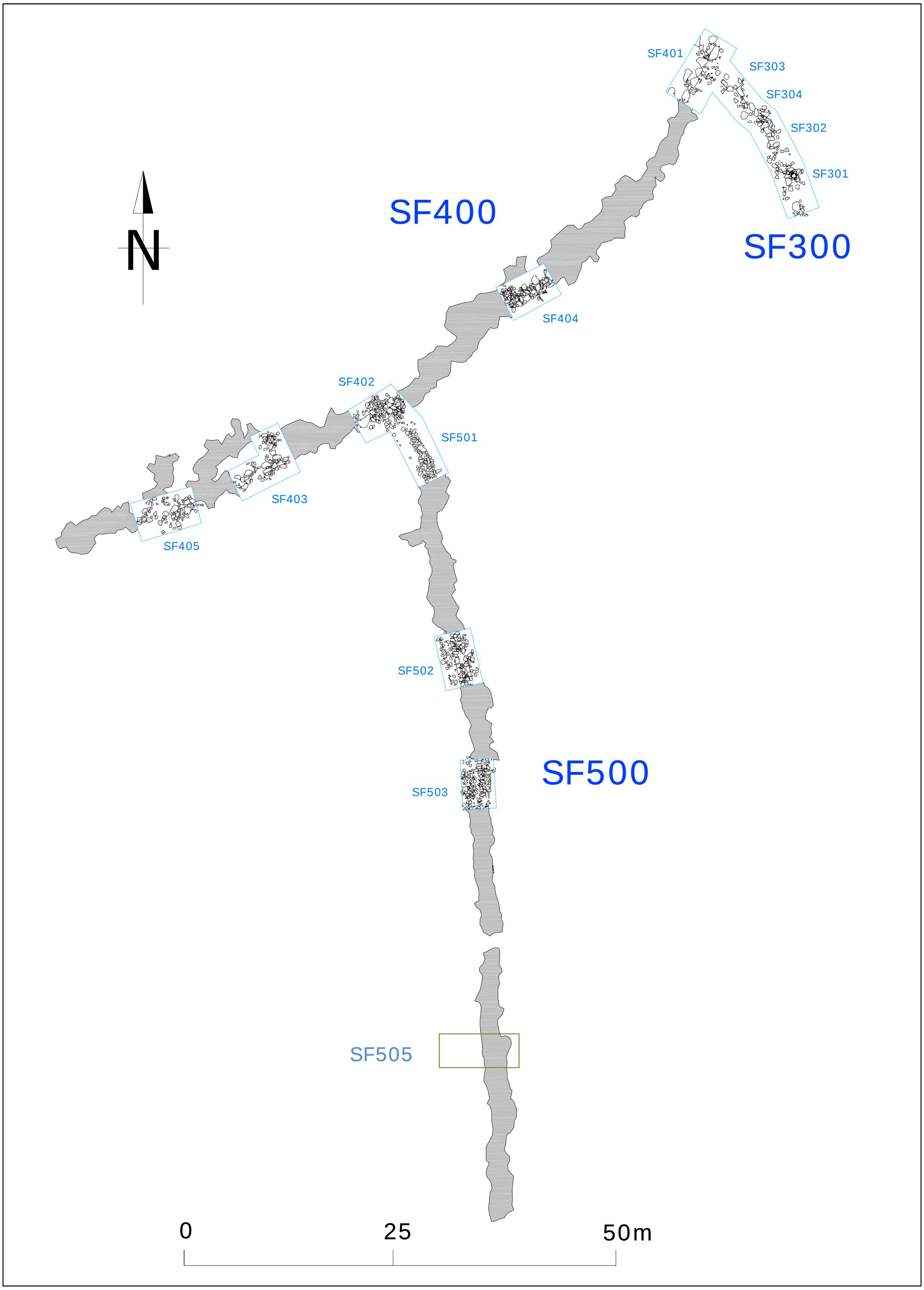
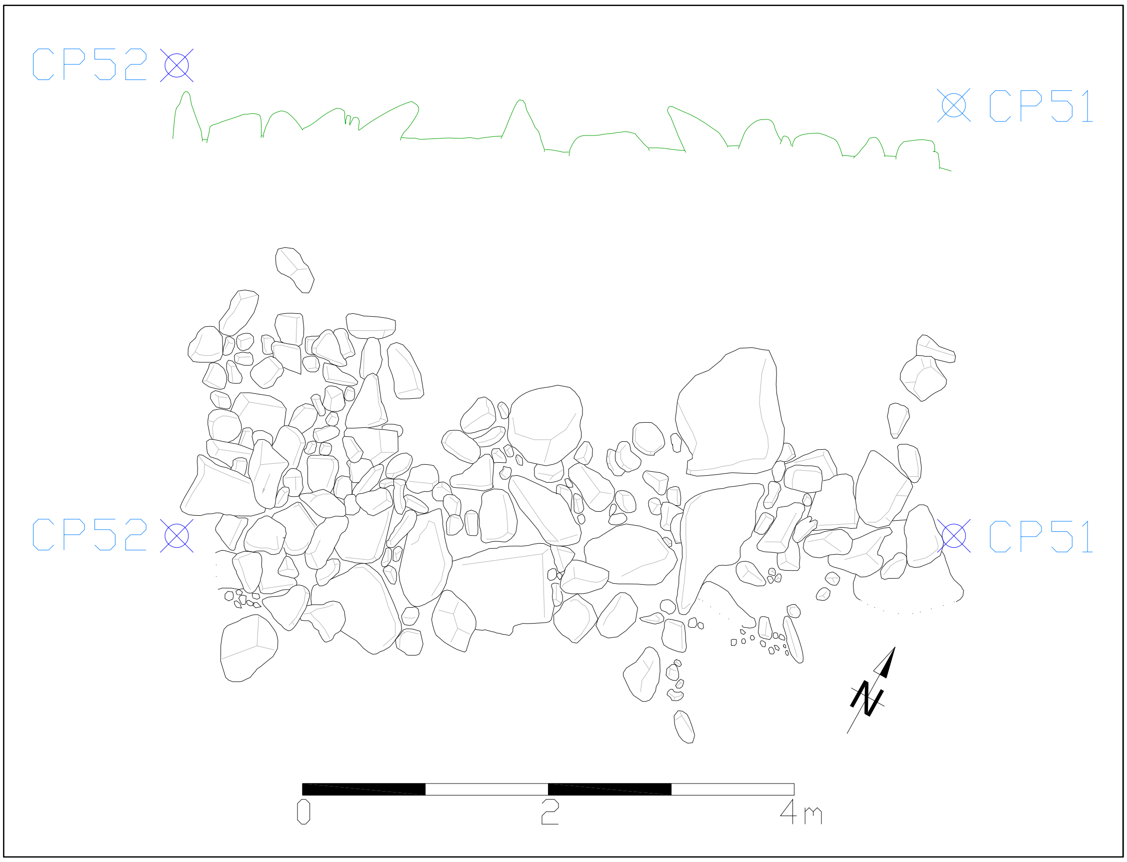


Fig 18
Linear stone features SF300, SF400 and SF500, showing the location of the characterisation drawn segments.



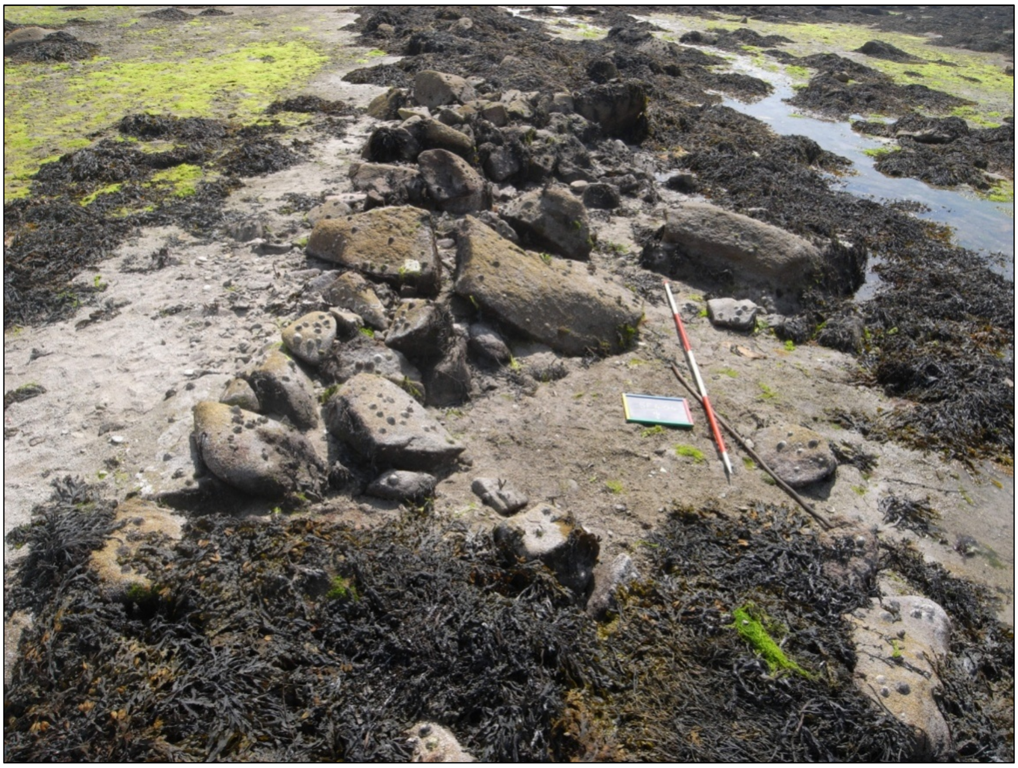
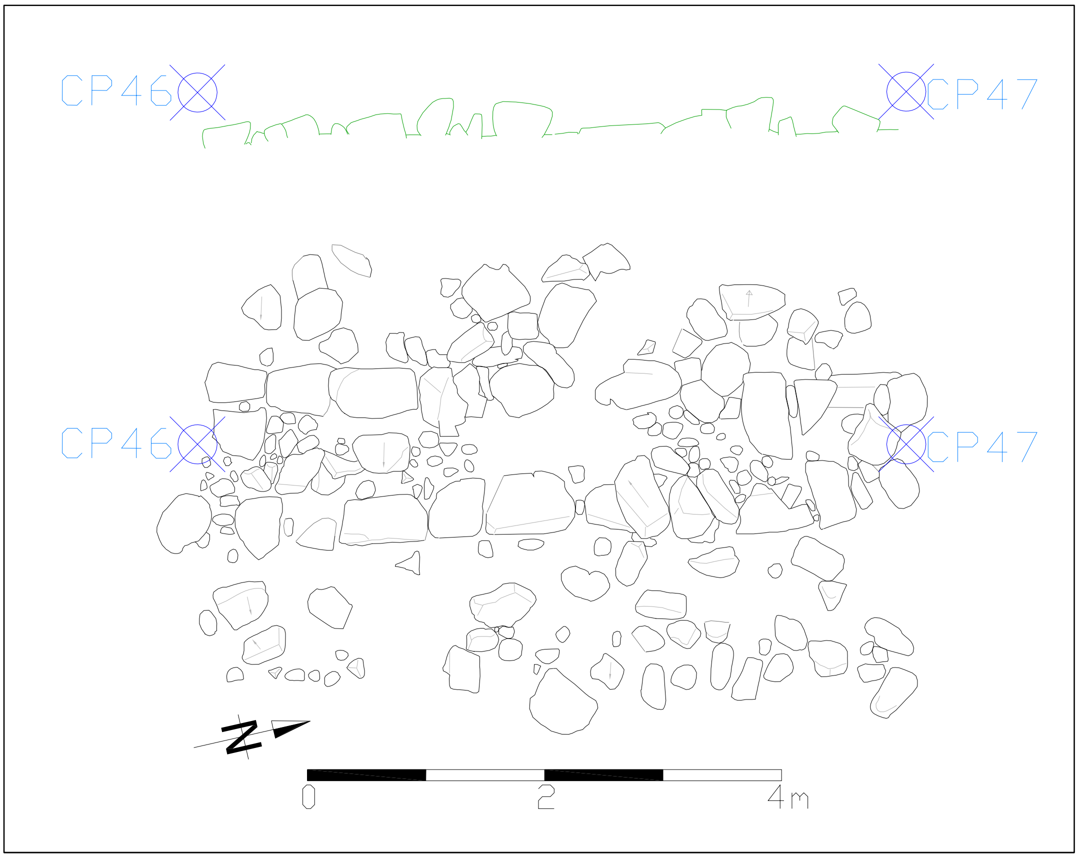


Fig 19 . An example of one of the drawn segments of SF400. Shown here is SF404, plan and profile (above) and photograph looking SW (below)



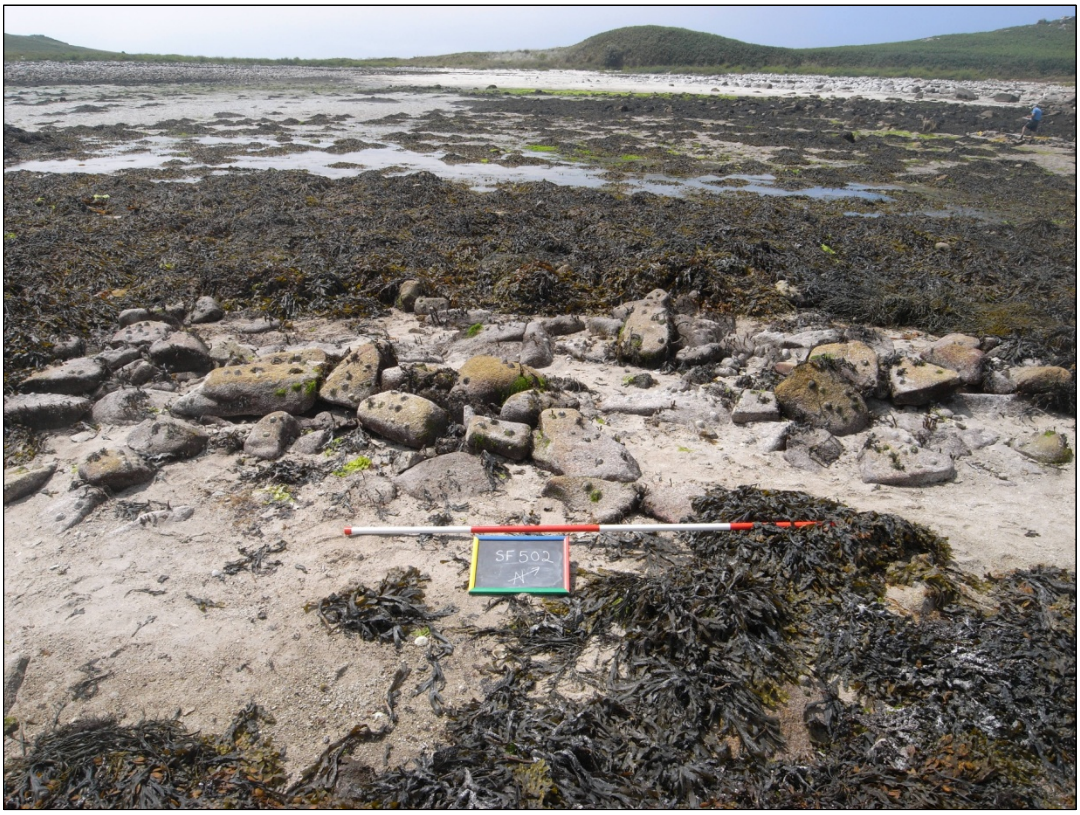


Fig 20 . An example of one of the drawn segments of SF500. Shown here is SF502, plan and profile (above) and photograph looking NW (below)

Samson Flats linear stone structures (all dimensions in metres)					
Context	Dimensions	Position	Alignment	Drawings	Description
SF100	L : 141.00m W : 1.10-3.00m	N end 88074.5E 13015.7N S end 88012.4E 12891.4N Centre 88054.2E 12954.6N	NE-SW	101-113	Linear stone feature formed from granite boulders and stones set into coarse grey sand. The northern end bends round to the west, almost at right angles to the line of the main feature (see plan). Variable construction, larger boulders at the north smaller stones to the south. In places the feature consists of only a single line of granite stones set on end. Gap in the feature may represent a deliberate opening?
SF200	L : 21.70m W : 0.85-1.00m	NE end 87977.3E 13053.9N SW end 87959.2E 13042.4N Centre 87968.3E 13049.3W	NE-SW	201-203	Slightly curved linear stone feature consisting of medium to small granite boulders. Some of the boulders have been set on end in the coarse grey sand prevalent in this part of Samson Flats. The feature often consists of little more than a single line of stones. The construction of this feature is similar to that of SF100, but with smaller, sparser stones. Of note is a granite stone at the N end of this structure (SF203) which shows evidence of having been drilled and split using plug-and-feather. If this stone is part of the original structure it must post-date 1800 when this technique started in this country.
SF300	L : 19.00m W : 1.20-2.00m	NW end 87984.4E 12892.6N SE end 87993.5E 12876.9N Centre 87990.1E 12885.9N	NW-SE	301-304	Linear feature composed of medium sized granite boulders, some of which are set on end into the coarse grey sand with some small granite chippings. The granite stones are tightly packed in places and have a distinct ‘built ‘appearance. Of note is a granite stone at the NW end of this structure which shows evidence of having been drilled and split using plug-and-feather. If this stone is part of the original structure it must post-date 1800 when this technique started in this country. This feature joins SF400, roughly at right angle (see plan).
SF400	L : 99.50m W : 1.70-2.20m	E end 87983.4E 12897.3N W end 87904.8E 12837.1N Centre 87953.6E 12861.9N	Roughly E-W	401-405	Slightly curved linear stone feature. Consisting of medium sized granite stones generally laid flat with the larger stones defining the edges, much as typical stone wall construction. This feature is joined by SF300 and SF500

Samson Flats linear stone structures (all dimensions in metres)					
Context	Dimensions	Position	Alignment	Drawings	Description
SF500	L : 96.00m W : 1.20-1.50m	N end 87946.5E 12851.4N S end 87957.8E 12756.6N Centre 87955.1E 12805.5N	N-S	501-503	Very slightly curved linear stone feature. Formed from medium sized granite stones and boulders. The structure is set into the light brown coarse sand with many small granite chippings. The edges of the feature are often lined with larger stones, sometimes with reasonable faces. Some stones are laid on top of other stones – up to three courses deep have been observed (SF503). Has a gap, which may represent a deliberate opening (see plan). At the southern end, clearing of weed to the west of the feature revealed a possible stone surface and other linear features (SF505 not yet surveyed).
SF600	L : 30.50m W : 1.00-1.50m	N end 87947.8E 13073.7N S end 87948.4E 13043.9N Centre 87947.8E 13059.4N	N-S	501-503	Similar to SF200 but has more small stones, some of which appear to be displaced. May be associated with SF200

Fig 21
Table of the linear stone features recorded in the 2009 season. The drawing numbers indicate how many six metre characterisation sections were drawn – these appear on the main site plan.

SF505 - Structures associated with SF500

Late on the last day of survey a short section of linear stone feature SF500 was cleared of weed to reveal a number of possibly associated structures. These seemed to consist of a stone surface, 5-6m wide (marked *Surface?* On Fig 22), another possible linear feature joining SF500 at an angle (shown as a dotted line on Fig 22) and a possible kerb to the stone surface. We did not have time to survey these features before the tide covered them over again. These features will need to be cleared of weed and recorded in 2010.

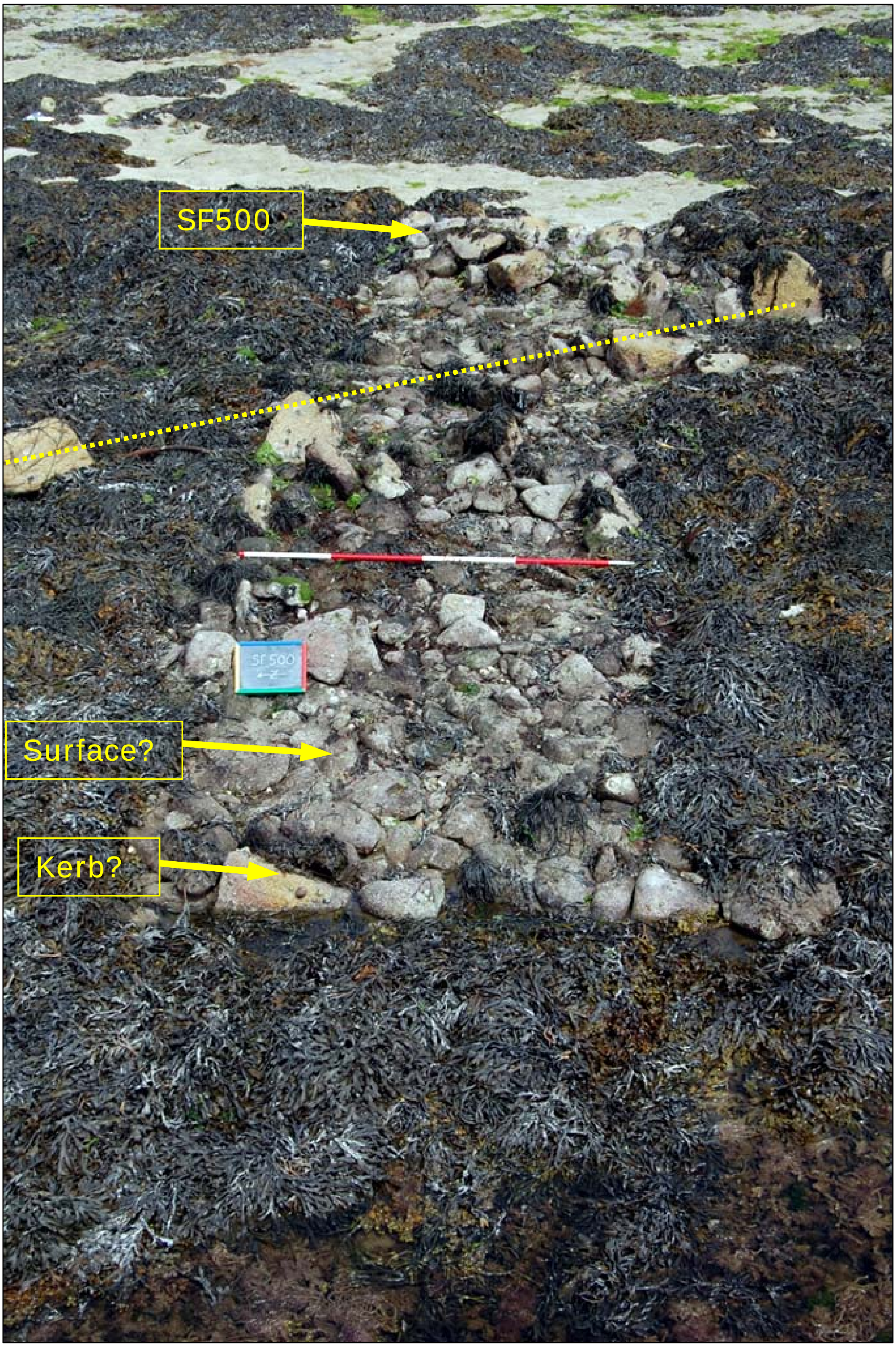


Fig 22
SF505 - Structures to the west of SF500 (for location see Fig 18)

Stone Working

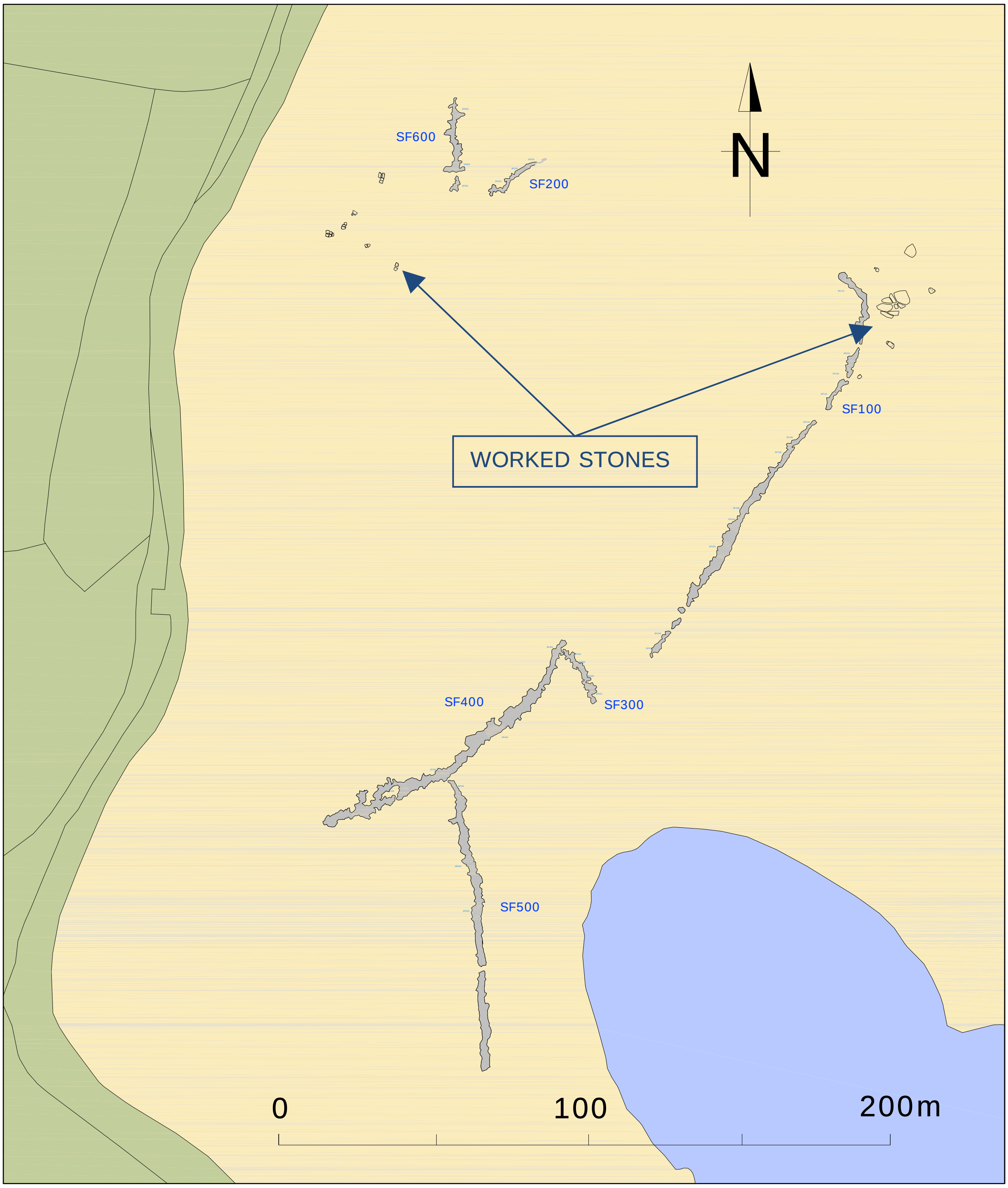


Fig 23
The location of the two clusters of worked granite boulders on Samson Flats

Five worked stones are recorded on Samson Flats in the Cornwall Historic Environment Record (HER), four on East Porth and one on Black Ledge (an area of raised ground with large natural granite boulders at the north end of SF100). Six worked stones were observed at East Porth and a further five at Black Ledge. These stones were drawn, photographed and recorded – see Fig. 24 below. There may be more of these worked stones as there was not time during the work this season to undertake a systematic search.

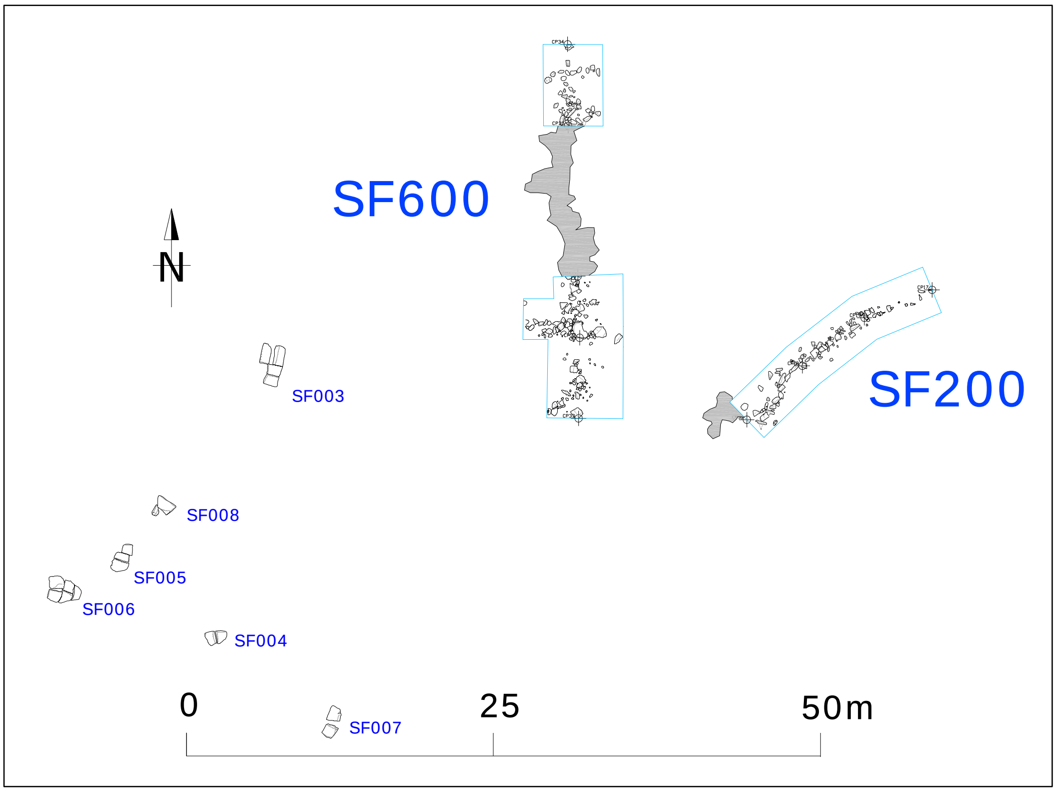
The evidence for this stone working is easy to see, consisting of split granite boulders with the lines of drill holes used to effect the split still clearly visible (if somewhat eroded by the sea). The technique of splitting granite using plug-and-feather is described by Herring (2008:87-88) in Vol 2 of the Bodmin Moor Archaeological Survey:

> *A line of holes 0.075-0.10m deep and 0.10 to 0.15 apart was drilled along the intended cleavage line by giving hand-held stone borers or chisels part-turns between blows... Holes drilled in the first half of the 19th century tended to have larger diameters (0.028 – 0.035m) than more recent ones (0.015m)... Iron 'plugs', (short chisels), were placed between pairs of iron feathers reaching the bottoms of the holes. The plugs were struck in turn by a sledgehammer* (thus splitting the stone).

The technique was apparently introduced to Cornwall around 1800, probably from America (Herring, 2008).

Interestingly, all the worked stones observed to date are situated below the high water mark – (Black Ledge is roughly 0.10m above OD, East Porth 0.80m above OD). Given that many apparently similar granite boulders exist above the high water mark this must have been deliberate on the part of those splitting the stones. Possible reasons for this are that either the blocks were for use on Samson Flats or that the intention was to transport the stones by water. Only two stones worked in this manner (using plug-and-feather) were found in the linear stone features recorded to date. These were a single stone incorporated into each of SF200 and SF300 (see fig 21 for details). If these stones were deliberately incorporated into these features then that incorporation must have been at some time after 1800, when plug-and-feather splitting of granite started in Cornwall.

In most cases the blocks split from the granite boulder are still in place on site. Of the eleven worked stones recorded to date, only two show evidence of split blocks having been removed (SF001 and SF009). The possibility that whole boulders have been split and removed cannot be discounted, but the surviving evidence is that at least nine boulders were worked, but no blocks were removed. Time will be allocated in the 2010 season for a more systematic search for further evidence of stone working on the site.



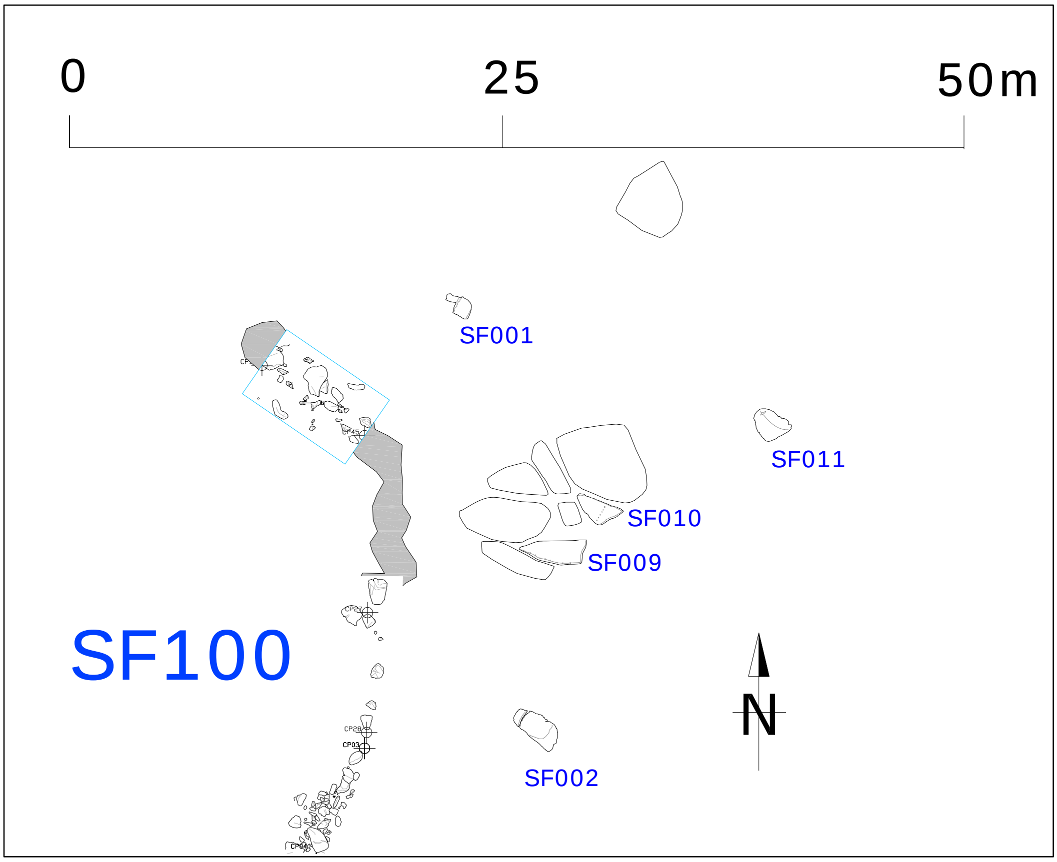


Fig 24 Plans showing the two clusters of worked granite boulders (SF001 to SF011) - those at East Porth (above) and those at Black Ledge (below).

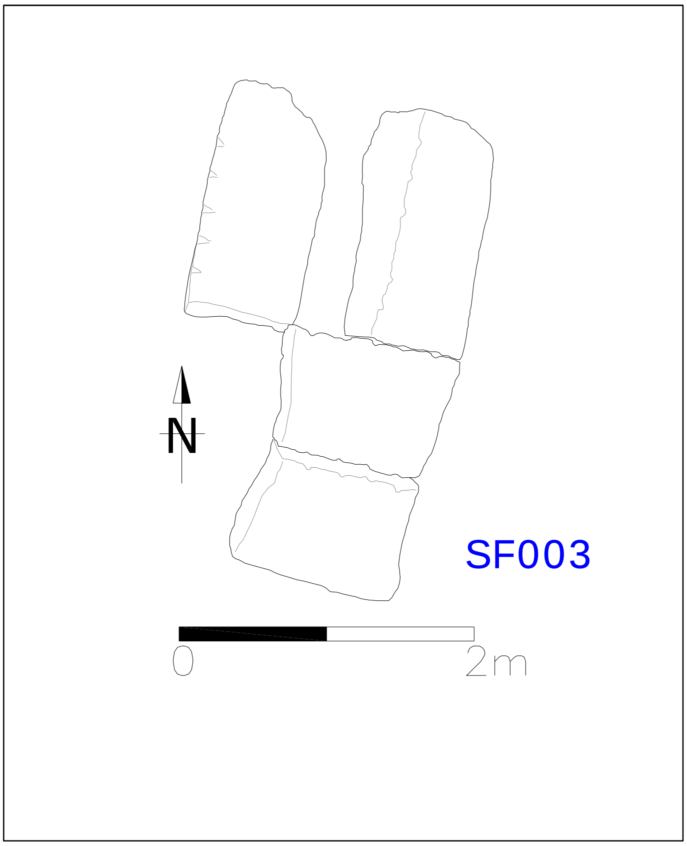


Fig 25

Example of one of the worked stones SF003. The granite boulder has been split into four blocks using drilled holes and plug-and-feather technique as evidenced by the surviving drill holes. None of the cut blocks have been removed. The scale in the photograph is 0.50m long.

Samson Flats worked stones (all dimensions in metres)								
Context	Position	Dimensions		Drill holes				Description
		Overall	Components	No	Diametre	Depth	Spacing	
SF001	88085E 13017N	1.55m 1.05m 1.10m	0.70x0.85x0.85m	5	0.03m	0.10m	0.18m	Granite boulder split using drilled holes and plug-and-feather technique. Split block has been removed.
SF002	88090E 12993N	2.75m 1.30m 1.00m	0.90x0.40x0.80m 2.00x1.30x0.80m	5	0.035m	0.12m	0.20m	Granite boulder split into two blocks using drilled holes and plug-and-feather technique. Split block is still in place c. 0.15m from original position.
SF003	87923.5E 13047.7N	3.30m 1.00m 0.50m	0.70x0.90x0.50m 0.70x0.90x0.48m 0.70x1.45x0.37m 0.56x1.45x0.60m	15	0.04m	0.05 – 0.08m	0.20m	Granite boulder split into four blocks using drilled holes and plug-and-feather technique. All four blocks are still in position.
SF004	87919E 13025.8N	1.50m 0.95m 0.60m	0.80x0.77x0.80m 0.73x0.65x0.70m	5	0.04m	0.05 – 0.09m	c.0.17m	Granite boulder split into two blocks using drilled holes and plug-and-feather technique. Both blocks are still in position.
SF005	87911.3E 13032.2N	2.3m 1.25m 0.45m	1.25x1.10x0.40m 1.18x0.65x0.50m 0.90x0.95x0.40m	7	0.04m	0.08m	0.21m	Granite boulder split into three blocks using drilled holes and plug-and-feather technique. All three blocks are still in position.
SF006	87906.9E 13029.5N	2.60m 1.75m 0.50m	1.10x0.90x0.45m 1.10x0.90x0.45m 1.10x0.80x0.50m 0.90x0.80x0.50m 1.10x0.70x0.60m	15	0.04m	0.18m	c.0.18m	Granite boulder split into five blocks using drilled holes and plug-and-feather technique. All five blocks are still in position.
SF007	87928E 13018N	2.45m 1.00m 0.35m	1.00x0.90x0.35m 1.30x1.00x0.50m	5	0.04m	0.17m	?	Granite boulder split into two blocks using drilled holes and plug-and-feather technique. Both blocks are still in position.
SF008	87914.7E 13036.5N	1.50m 1.00m 0.65m	1.50x0.80x0.65m 0.80x0.50x0.50m	5	0.04m	?	0.17m	Granite boulder split into two blocks using drilled holes and plug-and-feather technique. Both blocks are still in position. Drill holes are very eroded.
SF009	88091.5E 13003.7N	3.80m 1.30m 0.95m	-	9	0.04m	0.07 – 0.09m	0.25m	Granite boulder split using drilled holes and plug-and-feather technique. The split off block could not be located.
SF010	88093.8E 13006.1N	2.70m 1.25m 0.30m	-	6	0.035m	?	0.20m	Triangular granite boulder with a line of six drill holes on the upper surface. The stone was not split.
SF011	88103.6E 13010.9N	2.10m 1.40m 1.05m	-	3	0.035m	?	0.18m	Irregular granite boulder with a line of three drill holes on a vertical face. The stone was not split.

Fig 26
Table of worked stones observed on Samson Flats 2009.

Discussion

What is clear after the first season's survey on Samson Flats is that the extent and complexity of the exposed archaeological features is greater than was originally envisaged. It would seem that the linear stone features, Borlase's *hedges and ruins*, exhibit different construction techniques and may in fact be of different date and function. The possibility that prehistoric walls may have been reused as part of later structures (for example fish traps) cannot at this stage be discounted.

Dating of the linear stone features is problematic; a number of strategies could be employed to shed more light on this matter. The present project has close links (and common team members) with the forthcoming Lyonesse project. To this end the Lyonesse team hope to take several core samples on Samson Flats this year – this will help to establish the nature and depth of the sediments around the linear stone features, which could shed some light on possible dating. Ultimately, limited small scale excavation will probably be necessary to establish depth and possible presence of buried soils (and possible dating) which falls outside the scope of the current project. However, once the survey has been completed and we know the full extent and nature of the exposed remains, it may be possible to consider this as a variation to the current project.

Establishing whether any of the linear stone features could function as fish traps will not be possible until the completion of the topographic survey in 2010. Even then it is more likely that we will be able to assert that they could not function as such rather than be certain that they were. At this stage this is speculation only, but it is possible that the features are of differing date and function rather than all of a single function.

Objectives for 2010

- Systematic search and survey of stone working
- Completion of the recording and survey of observed linear stone features
- Completion of the contour survey around the linear stone features
- Appraisal and recording of SF505

In addition, consideration should be given to obtaining core samples to establish the nature and depth of sediment on Samson Flats. Once the present project has been completed in 2010, consideration should be given to the possibility of small scale, limited excavation down the side of several of the linear features to establish their depth and to identify and sample any buried soils or other organic deposits.

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Appendix I – Control point positions

Control Point ID	Easting	Northing	Hieght OD	Type	Correction
CP01	87904.798m	13099.609m	5.109m	Reference	SmartNet
CP02	87916.057m	13109.894m	5.010m	Reference	SmartNet
CP03	88080.323m	12992.302m	0.449m	Temporary	PDL
CP04	88077.312m	12986.414m	0.466m	Temporary	PDL
CP05	88058.005m	12960.161m	-0.267m	Temporary	PDL
CP06	88055.057m	12954.965m	-0.339m	Temporary	PDL
CP07	88042.226m	12938.052m	-0.216m	Temporary	PDL
CP08	88039.418m	12932.586m	-0.248m	Temporary	PDL
CP09	88073.575m	12979.955m	0.325m	Temporary	PDL
CP10	88062.596m	12965.134m	-0.085m	Temporary	PDL
CP11	88077.078m	12986.053m	-0.366m	Temporary	PDL
CP12	88018.637m	12900.631m	-0.717m	Temporary	PDL
CP13	88015.107m	12895.764m	-0.671m	Temporary	PDL
CP14	88011.556m	12890.906m	-0.695m	Temporary	PDL
CP15	88044.865m	12942.648m	-0.454m	Temporary	PDL
CP16	87962.230m	13043.440m	0.382m	Temporary	PDL
CP17	87977.306m	13053.993m	0.401m	Temporary	PDL
CP18	87966.747m	13047.820m	0.489m	Temporary	PDL
CP19	87971.798m	13051.726m	0.523m	Temporary	PDL
CP20	NOT USED				
CP21	88066.980m	12969.234m	-0.370m	Temporary	PDL
CP22	88037.374m	12928.767m	-0.326m	Temporary	PDL
CP23	88034.701m	12923.401m	-0.316m	Temporary	PDL
CP24	88069.819m	12973.703m	0.148m	Temporary	PDL
CP25	87993.805m	12876.677m	-0.662m	Temporary	PDL
CP26	87991.834m	12882.267m	-0.561m	Temporary	PDL
CP27	88080.497m	13000.170m	0.788m	Temporary	PDL
CP28	88080.441m	12993.222m	0.523m	Temporary	PDL
CP29	87989.021m	12887.582m	-0.344m	Temporary	PDL
CP30	87987.115m	12889.245m	-0.428m	Temporary	PDL
CP31	87983.292m	12893.857m	-0.304m	Temporary	PDL
CP32	87948.627m	13050.103m	0.558m	Temporary	PDL
CP33	87948.532m	13043.551m	0.479m	Temporary	PDL
CP34	87947.646m	13073.941m	1.136m	Temporary	PDL
CP35	87947.681m	13067.319m	1.091m	Temporary	PDL
CP36	87983.747m	12896.619m	-0.082m	Temporary	PDL
CP37	87980.014m	12889.967m	0.039m	Temporary	PDL
CP38	87945.993m	12854.182m	0.145m	Temporary	PDL
CP39	87940.901m	12851.125m	0.068m	Temporary	PDL
CP40	87946.462m	12851.404m	-0.159m	Temporary	PDL
CP41	87949.486m	12845.062m	-0.198m	Temporary	PDL

Control Point ID	Easting	Northing	Hieght OD	Type	Correction
CP42	87926.362m	12844.334m	0.186m	Temporary	PDL
CP43	87931.614m	12846.978m	0.331m	Temporary	PDL
CP44	87948.468m	13055.100m	0.752m	Temporary	PDL
CP45	88080.329m	13010.431m	0.483m	Temporary	PDL
CP46	87953.678m	12820.646m	-0.167m	Temporary	PDL
CP47	87952.099m	12826.412m	-0.168m	Temporary	PDL
CP48	87920.962m	12841.783m	0.107m	Temporary	PDL
CP49	87914.181m	12839.852m	0.060m	Temporary	PDL
CP50	88074.407m	13014.513m	0.452m	Temporary	PDL
CP51	87963.796m	12868.657m	0.030m	Temporary	PDL
CP52	87958.245m	12865.638m	0.408m	Temporary	PDL
CP53	NOT USED				
CP54	NOT USED				
CP55	NOT USED				
CP56	NOT USED				
CP57	87955.184m	12805.484m	-0.175m	Temporary	PDL
CP58	87954.816m	12811.445m	-0.241m	Temporary	PDL

Appendix II – CD ROM