9.
The St George's Down – The Plateau Gravel – a Preliminary Discussion

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Introduction

The British Geological Survey is currently completing a new survey of the whole of the Isle of Wight at the 1:10 000 scale. The team has been surveying in short sessions since the autumn of 2006 with a final session to be completed in April and May 2009. This survey will provide a modern appraisal of the Bedrock and Superficial Deposits and publish a new 1:50 000 scale geological map and supporting texts for this classic area of British Geology. Quite obviously the published interpretation of the Superficial Deposits on the island is at a very basic level (BGS, 1976; White, 1921 [1994]) reflecting the lack of study that most of the deposits have had since the original surveys. It is to be hoped that the current survey, and the melding of this data with the studies already undertaken in the wider community, will go a long way in unravelling the Quaternary history of the Island.

The visit to St George's Down [SZ 51 86] is to illuminate for discussion some of the complexities of the deposits present as an example of part of a long history of deposition and remobilisation that has affected all of the areas of Plateau Gravel depicted on the map. Some of the most pressing problems are to arrive at a reasonable interpretation for the Plateau Gravel, and its relationships to the mainland Solent River terrace succession and to the Marine Gravel of the north east of the island. St George's Down is unlikely to answer these questions entirely and a number of other related questions also derive from the investigations (Figure 9.1).

History of research

The first geological survey, at the one-inch scale by H W Bristow (British Geological Survey 1856) showed only the alluvium and blown sand depicted as superficial deposits. The Survey published a memoir on the Tertiary fluvio-marine formations of the Isle of Wight in that same year (Forbes, 1856) and this was followed by a memoir covering the whole of the island (Bristow, 1862). Both only make scant reference to the superficial deposits of the Chalk downs. The Geological Survey again visited the island to complete a six-inch-scale survey in 1886–87, by Clement Reid and Aubrey Strahan (1889) and it is on these maps that outcrops of Plateau Gravel and other superficial deposits were depicted. A

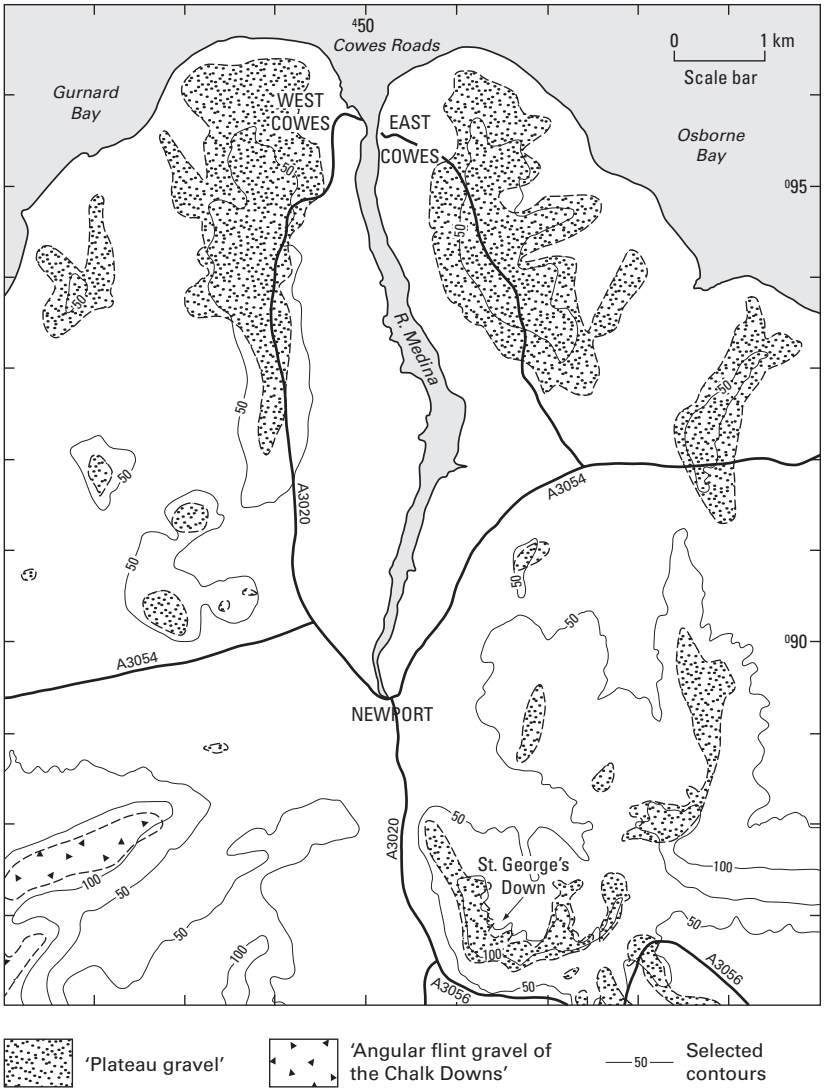


Figure 9.1 The St George's Down outcrop and its relationship to other outcrops of the Plateau Gravel in the north-central part of the Isle of Wight.

second edition of the memoir was published in 1889 (Reid and Strahan 1889) and the One-Inch scale map in 1888 (British Geological Survey, 1888). A short account of the geology of the Isle of White was published in 1921 (White, 1921)

to replace the out-of-print second edition. Four further impressions of this short account appeared up to 1994 with the 1990 version carrying a new bibliography. The 1994, fifth impression, became out-of-print in 2008 and will be replaced by a new publication shortly after the current survey is completed.

With some notable exceptions, reported in this and the previous QRA field guide (Barber, 1987), and in a limited number of papers, the Quaternary deposits of the island have received relatively scant scientific investigation from both the Geological Survey and the wider academic community since they were first depicted on the original six-inch surveys of Reid and Strahan. This is particularly true for the so-called Plateau Gravel where apart from the noted examples below, the numerous outcrops of the Isle of Wight Plateau Gravel have been included into the general Solent River story without specific study (see Allen and Gibbard, 1993 and references therein).

The Plateau Gravel – in general

The Plateau Gravel outcrops are shown widely spaced across the northern part of the island and in association with the Medina River and Eastern Yar. There is little specific information on the lithological characteristics of these spreads of gravel and only a quasi-correlation has been attempted in the past based essentially on the relative height of the deposits and their content (or not) of implements and fauna. Reid and Strahan (1889) state that the Plateau Gravels "do not seem to have belonged to one continuous sheet; for they occur at different levels" and it has been implicit in later works that this bald statement still holds true. Also, by implication from their distribution, the most northerly of the Plateau Gravels of the 'northern Palaeogene plateau' have been equated with the so called Marine Gravel spread over interfluves between Quarr Abbey and Bembridge. But is this association representative of a single depositional event or a number of such events?

The outcrop on St George's Down is topographically the highest within the Central Downs area, with only the gravels in the far west around Headon Hill and the 'angular flint gravel of the Chalk Downs' being higher. These latter named of course have for a long time being regarded as the product of the wasting of the Chalk and thin remnant of a Palaeogene cover; a history in itself of some complexity.

Forbes (1856) refers to the "Gravel and conglomerates along the line of Chalk Downs" but gives no description other than to identify them as 'superficial accumulations of later Tertiary age' and suggesting that as there are no deposits on the island that can be referred definitely to the Miocene or Pliocene, by

implication therefore, suggesting a Pleistocene age. He suggests that the 'higher gravel' (divided by him into three parts ie the gravels of the [1.] Chalk Downs, [2.] Headon Hill, and [3.] 'along the hill tops of the north coast') can be equated to the "higher gravel" of the River Stour in Dorset although it is uncertain to what Stour gravel unit he refers other than it is "at an elevation of 50 feet (15.24 m) above the Stour (perhaps then, the Seventh Terrace as in Figure 25, Bristow, *et al*., 1991). Because he also states that the Stour gravels contain a "fine collection of elephants teeth" he must be correlating, at the very least, the third part of his 'higher gravel' along the northern coast of the Isle of Wight rather than those at St George's Down that are not known to contain any fauna or implements. This correlation is likely to be erroneous, however, as Codrington (1870) clearly states that "neither shells nor bones have been found in this gravel (*the higher gravels of Forbes but undivided by Coddrington*), though the valley-gravels have afforded mammalian remains in abundance". There is of course, even in this early Forbes text, a clear implication that the Plateau Gravel deposits (at least in part) are remnants of Solent River terraces.

The first edition of the memoir for the whole island (Bristow, 1862) maintains the tripartite division of the 'high level gravel' and gives only the following limited description of the St George's Down outcrop. "The heath-land of St. George's Down to the westward of Arreton, is situated on a considerable thickness of round and ordinary flint gravel, resting on the ferruginous sandy beds of the Lower Greensand. The gravel itself is of a brown colour, from the presence of iron, which frequently cements the fragments of flints together, and causes them to become consolidated into a hard flinty conglomerate." Incidentally neither the Bristow memoir nor that of Forbes (1856), mention the deposits at Bleak Down (or Blakedown of Coddrington, 1870; and Reid and Strahan, 1889).

Coddrington (1870), writing before the six-inch scale geological survey, divides the Quaternary deposits of the island into five parts. From the descriptions his divisions 'a' (north of the island) and, 'b' (in part, those deposits south of the chalk ridge), equate with those deposits later shown as Plateau Gravel on Survey maps. Division 'a' he equates with those on the mainland and envisages "a once continuous gravel-covered tableland" with a uniform slope to the north (as exemplified in his section 10 from St Georges's Down to Norris Castle [SZ 5148 9619], north of East Cowes). In his summary these gravel spreads are the product of "gradual unheaval" and "the spreading out of the gravel, and the levelling of the tablelands, probably was effected within an inlet of the sea … opening to the eastward"; thus seemingly implying that the gravels are all marine in origin. He does for the first time give a broad indication of the composition of the northern gravels as principally of "chalk-flints and tertiary pebbles, Upper Greensand

cherts and materials from the Lower-Greensand beds". He does identify an exotic of a liver-coloured pebble of the "New Red Conglomerate beds" in the lowest part of the Plateau Gravel at Egypt [SZ 485966] in West Cowes and from this scant evidence regards this as evidence of a connection with the "country far to the westward". Division 'b', "south of the chalk range" is not regarded as part of the same 'tableland cover' but rather high-level gravels related to the drainage of the south-eastern part of the island; streams that flowed northward through the Chalk ridge (although he does not state which route this drainage took). Only part of the deposits described under his division 'b', principally those of Blakedown [SZ 512 822] and Whitcomb were considered as Plateau Gravel in the six-inch scale survey of 1886/87.

Reid and Strahan (1889) classified the Quaternary deposits of the island within four groups (I to IV) with II being their "deposits formed before the present valleys existed (Plateau Gravels)" and capping flat-topped hills. They disagree with Coddrington (1870) and considered that these Plateau Gravels "do not seem to have belonged to one continuous sheet; for they occur at different levels", but also at the same time stating that they were the product of the excavation of the Solent Valley that "was in progress during the deposition of the Plateau Gravels". By implication they therefore see the deposition of the Plateau Gravel as a series of stages. The description of the St George's Down outcrop (Figure 9.2) and deposits to the coast at Cowes concentrates heavily on their northward gradient and carries little description from the exposures themselves. The gravel is considered to rest on a plain at about 320 feet (97.5m). The gravel found in the quarries on the down is described as upwards of 30 feet (9.1m) of rough stratified gravel composed almost entirely of flint (including a notable amount of rolled flints) with a few fragments of chert and ironstone. They note that the abundance of cemented blocks is greatest along the southern margin of the deposit.

Hull (1912) uses the same evidence to agree to a marine origin for the Plateau Gravel but not in a confined sea inlet (Coddrington, 1870) but rather by whole-scale submergence (by 400 feet [122m]) and subsequent "re-elevation into present condition of land and sea" and the creation of "formation of low terraces, with works of art (presumably flint artefacts) and extinct animals". He does suggest that the authors of the Geological Survey Memoir (Reid and Strahan, 1889) "do not appear to have arrived at any clear view regarding their origin" a quite disingenuous interpretation of the statement "product of the excavation of the Solent Valley" in the second edition of the memoir.

Additional descriptive detail appears in the Short Account (White, 1921) although much of the text is a re-write of the second edition of the memoir. The

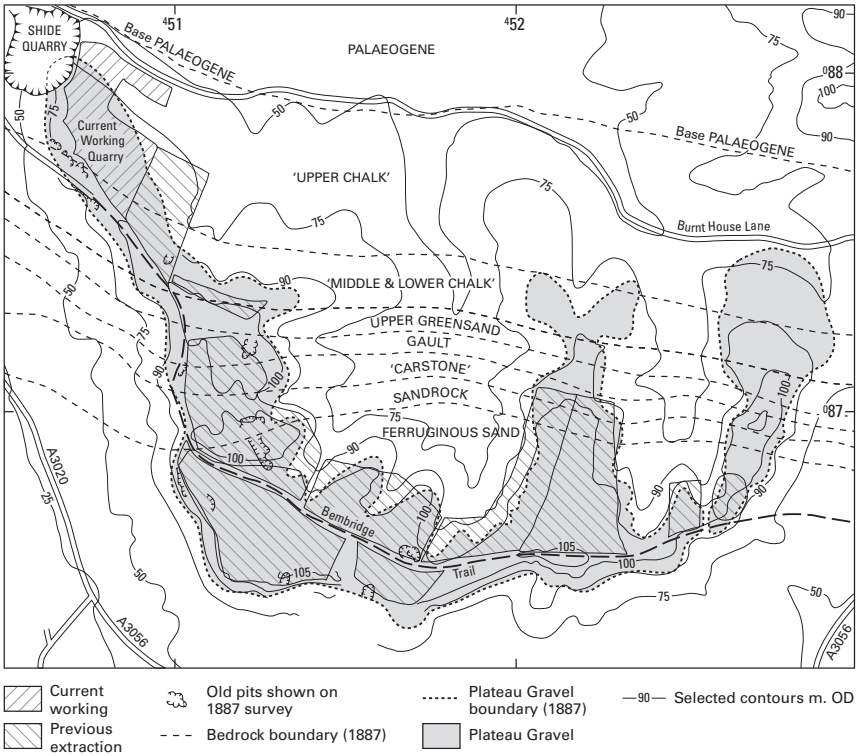


Figure 9.2 The St. George's Down Outcrop.

area is described as having the character of a dissected terrace and standing about 300feet (91.44m) above the level of the Medina (modern contours place the base of the main mass of the deposit at about 95m OD with the highest part of the down around 105m OD). For the first time there is a description of a succession of beds with an upper 8 feet (2.44m) or so of structureless or confusedly banded gravel overlying the well-stratified and current-bedded sand and gravel with lenses and seams of grey stony 'loam'; this lower unit becoming more ferruginous downwards and fully cemented in the basal layers. The nature of the deposit and the northwards slope of the mapped base led White to conclude a fluvial origin of a 'proto-Medina' of a 'St George's Stage'; presumably, but not stated, as a right bank tributary of a Solent River. The account also describes the gravel flat of the Shide Golf Course (that was in the area occupied by the quarry visited today) as being some 50 feet (15.24 m) below the main mass of the down and considered as a later stage of this proto-Medina river.

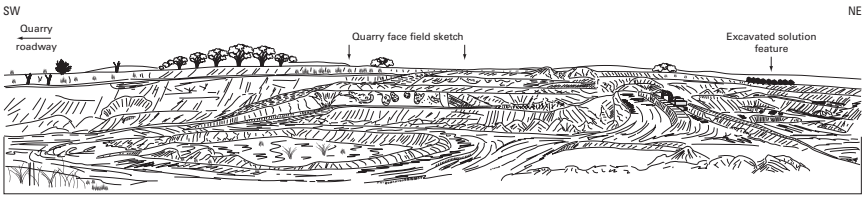


Figure 9.3 General field sketch of the lower level of the Plateau Gravel on St. George's Down.

The account further states that the "deposits between St George's Down and the Solent do not call for particular description and White only notes the fall in height northward of the outcrops and the fact that nearer the coast the gravel is more water worn and better stratified. The 'brickearth' associated with the Plateau Gravel at Downend is described as "with chips of flint" and it is tempting to suggest that this is merely a surface representation of the grey stony loam described within the deposit on St George's Down and therefore may not carry an aeolian depositional association.

Everard (1954) mentions the Shide Golf Course spur and the spur to the east that he attributes to his "300-ft Stage" (i.e. between 300 and 285 feet [91.4 to 86.9m]). Both spurs are covered by three feet of sub-angular gravel with pieces of chert and cherty sandstone.

The Solent River story and the arguments for the development of the proto-Solent are well exercised in Allen and Gibbard (1993) and continue to be the subject of debate for example in Preece *et al*., (1990), Velegrakis *et al*. (1999) and reviewed in Fookes (2008). Much of what is written illuminates the deposits on the mainland and makes presumptions that the Plateau Gravels on the Isle of Wight fall into that pattern. The purpose of this visit is to show that there is a considerable story to be determined for St George's Down and the Isle of Wight Plateau Gravel deposits in general and that the results of that investigation may add to the Solent River story.

The St George's Down Plateau Gravel – exposure

The quarry visited today (Figure 9.3) underlies the old Shide Golf Course and as such therefore falls within the lower platform described in White (1921, p.157) (the new Newport Golf Course was built as a replacement on reclaimed quarry workings to the east). The information presented here represents the earliest stages of the investigation of this and the other spreads of the Plateau Gravel indicated on the currently available geological map.

Figure 9.4 One of the few remaining crags of the cemented gravel seen on the southern margin of the St George's Down plateau. [SZ 5100 8683]. Auger, 1.3m for scale. P 692170, 10/10/07, ARF/NERC.

There is very little of the higher level of the deposits of St George's Down available for study as much of it has been quarried away. Exposures of the cemented gravel are still visible along the southern side of the highest part of the down (Figure 9.4) and blocks of this material can be found within the reclaimed areas (Figure 9.5). Figure 9.6 shows an example of the stratified gravel described by White (1921).

The relationship between these higher level 'stratified and cemented deposits' of the high down and the lower platform has not been investigated to date although

Figure 9.5 An example of the blocks of cemented gravel strewn across the higher part of St George's Down near to Arreton Cross. [SZ 526 867]. Hammer 30cm. 21/04/08, ARF/NERC.

the described nature of the higher level deposit clearly suggests a fluviatile origin. White (1921) however indicates that the upper 8 feet (2.44 m) of the high down deposit is structureless. This has not been clearly observed during the present survey but the relationship of this upper unit to the material on the lower platform needs to be determined.

The material currently available for study quite obviously represents a succession of soliflucted material incorporating at least one and probably two horizons of cryoturbation and representatives of a soil horizon that itself has been involved in solifluction. A general view and two principal localities are illustrated in the 'field' sketches (Figure 9.3, 9.8a and 9.8b) presented here and date from the survey in May 2008. No further exhaustive studies have yet been undertaken on this part of the plateau nor within the stratified and cemented deposits that underlie the higher part of the St George's plateau to the east, other than surveying to delimit the extent of the gravely material.

Within the lowest exposed part the current excavation the tops of solution features into the near vertical chalk bedrock are exposed (Figure 9.7). They contain material that can be attributed to the clay-with-flints (the so called

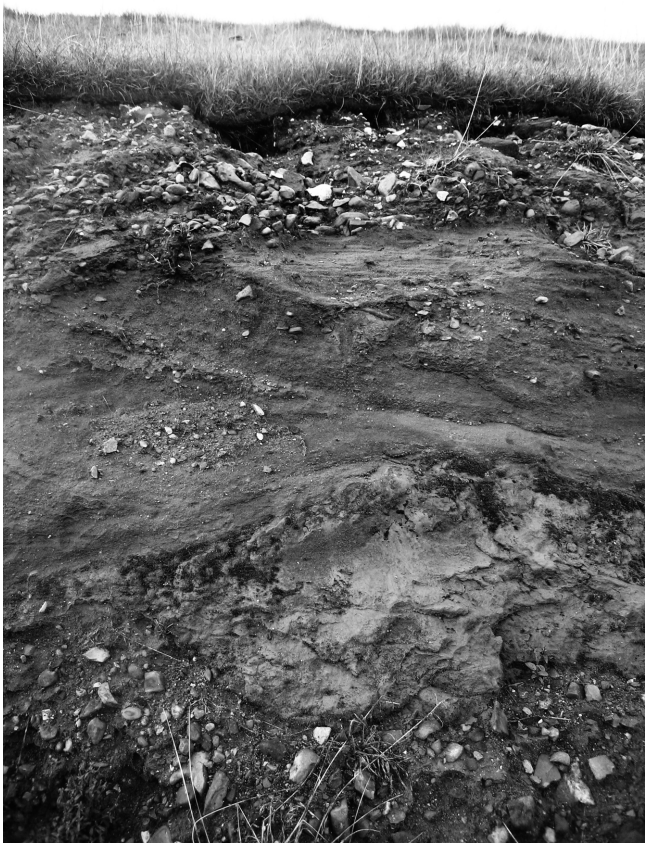


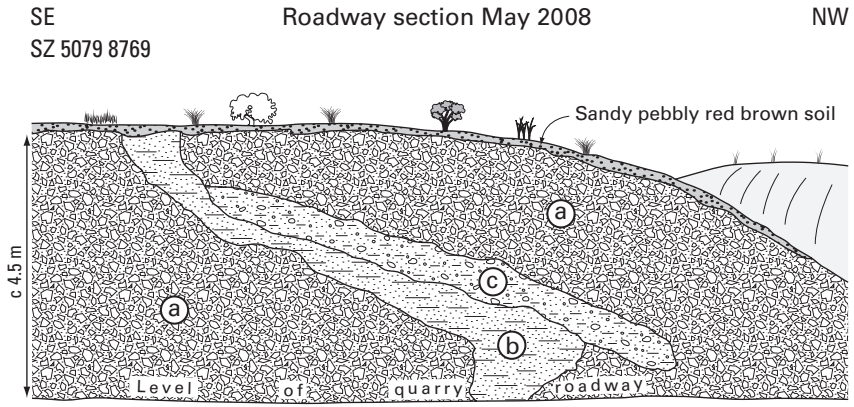
Figure 9.6 Small exposure in Golf Course bunker showing cross-bedded, ferruginous, fluvial Plateau Gravel of the higher level resting on bedrock. Base of photo in talus. [SZ5118 8724] P692164, 09/10/07, ARF/NERC.

angular flint gravel of the Chalk Downs) and clearly predates the bulk of the deposit being excavated. Reserve investigation maps show that the overlying soliflucted material fills broad hollows within the bedrock and does not represent a consistent depositional sheet.

The depth of the material is very variable and ranges from a few metres of gravely soil, which does not form an aggregate resource, up to 15 metres or more of material with a distinct succession of gravely units (emphasising again that the whole succession may not be the product of a single solifluction event).

Figure 9.7 View of a solution feature in the steeply dipping Seaford Chalk Formation [SZ 5080 8785]. 22/04/08, ARF/NERC.

The exposure within the lower level of the Plateau Gravel outcrop is illustrated in Figures 8a and b. The deposit here, unlike the deposits on the 'higher level' plateau, is clearly not a fluviatile succession and demonstrates levels of solifluction and cryoturbation with interposed laminated silty clays and superposed grey and red mottled clays with possible rootlet traces. These clay bodies have themselves been disrupted and indicate the destruction of a land surface with possible shallow ponds as part of a general solifluction event. At the least their presence in the succession indicates a time gap between successive solifluction events.

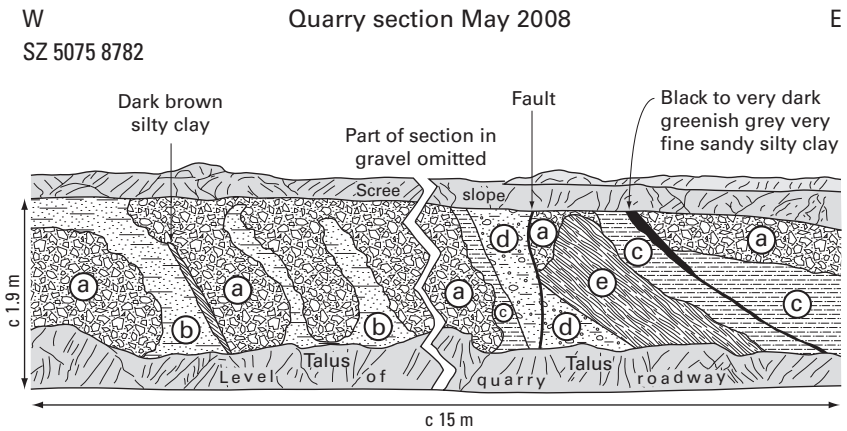


a	Coarse with cobble and fine angular to subangular flint / with chert gravel set in a matrix of very silty / clayey fine- to medium-grained with coarse sand. No discernable bedding. Gravel: predominantly flint and chert with some sandstone and rare fine quartz and ironstone. Sand: mainly fine- to medium-grained quartz with medium- to coarse-grained flint.
b	Pale grey mottled orange very fine-grained sandy silty clay
c	Fine with some coarse flint gravel in an orange fine- to medium-with some coarse-grained clayey sand matrix

Figure 9.8a Sketch section of the roadway exposure within the current workings.

Aggregate testing done by the company indicates that all of the material sampled falls within the categories clayey (+10% passing 63 microns) or very clayey (+20% passing) and contains a proportionally high gravel content relative to the sand. A summary of grading results (Table 9.1), using industry standards of the day, represent samples from various boreholes (and horizons within) and illustrates the coarseness and variability of the material.

A single small sample from the current workings within the roadway section (Figure 9.8a) has been taken and the following (Table 9.2) represents the clast analysis within the 8–16mm range. A more comprehensive study of the various units is called for but these crude results clearly show an overwhelming Upper Cretaceous (or possibly, in part, Palaeogene origin, although no rounded Palaeogene pebble material has been identified). The chert and cherty sandstone have a direct local source of the Upper Greensand whilst the sandstone could be derived from either the Upper or Lower Greensands. These are all locally sourced materials and indicate that the deposit contains no ‘foreign’ materials derived from a distant upstream Solent River source.



a	Fine and coarse with cobble gravel, angular to sub-rounded flint with rare sandstone, ironstone and fine-grade quartz, set in a yellow- to orange-brown fine- to medium- with coarse-grained quartz and flint, silty and clayey sand. Rare chalk grains.
b	Silty clayey sand to very sandy clayey silt. Generally fine- with medium-grained quartz sand and some rare coarse-grained angular flint and rounded quartz.
c	Very fine-grained sandy silt with rare flint clasts. Reddish to pink with pale grey rootlets (?) traces perpendicular to surfaces.
d	Red / pink and grey - streaked clay with granule and fine gravel grade angular flints. Sandy and silty throughout.
e	Finely bedded to laminated grey very fine sandy clayey silt with thin red laminae.

Figure 9.8b Sketch section of the major exposure within the current workings.

The coarse gravel (>16mm) from the sample is not representative due to low numbers but indicates a higher proportion of flint relative to other clast species. The sand fraction, by observation, is overwhelmingly of flint chips within the +250 micron range with only significant proportions of sub-rounded and rounded quartz below that size.

There are a number of questions still to be answered as the survey progresses at this and other outcrops of the Plateau Gravel, as well as broader questions on the relationship of the outcrops to the regional picture. These can be summarised as follows:-

- In terms of surveying, will it be possible to differentiate in situ fluviatile materials from the soliflucted materials derived from them?

Table 9.1 Example sieve analyses from the operators records for the gravel deposits within the lower level of the St. George's Down Plateau Gravel outcrop.

Borehole	Depth range	% passing					
		20mm	10mm	5mm	2mm	600 µ	63µ
4	0.4–2.8m	92	70	58	48	41	27
4	3.0–7.0m	77	63	54	48	43	31
4	9.0–10.5m	73	55	43	36	29	19
5	0.0–3.0m	69	48	38	30	22	15
5	3.0–6.0m	78	58	45	30	25	17
5	9.0–12.0m	59	50	43	39	34	23
5	12.0–15.0m	79	60	46	35	28	18
6	0.0–3.5m	70	50	39	30	24	16
6	3.5–5.6m	84	64	51	43	34	15
7	1.8–6.0m	85	70	58	47	38	25
7	9.0–11.5m	90	66	49	37	29	18
7	11.5–12.5m	100	95	91	88	85	17*

* likely to incorporate bedrock sand

Table 9.2 Single sample clast lithological analysis from the St. George's Down site.

	Flint (angular to subangular)	Sandstone	Cherty Sandstone	Chert	Others
Number	383	25	15	11	2
%	88	6	3	3	trace

- Are the high-level St. George's Down deposits part of a proto-Medina story as a tributary of a Solent River?
- What is the relationship between the structureless gravel overlying the high level fluviatile deposits and that found at the lower level in the St. George's Down outcrop?
- How many solifluction and cryoturbation events are represented in the low level deposits and is there a significant time gap between them?
- What is the relationship of the laminated clays and clays with rootlet traces to the depositional events within the low level deposits?

In a wider context:-

- Are the events seen at St George's Down represented within other Plateau Gravel outcrops?
- Are other outcrops composites of fluviatile and solifluction materials and if so, does this disguise a more extensive topographically differentiated 'staircase' of deposits?
- At which level do 'exotic' clast species, indicating a Solent River derivation become evident in the Plateau Gravel?
- What is the lateral relationship of the lower level Plateau Gravels to the Marine Gravel depicted on the IoW Special Sheet?

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