Archaeology South-East

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A Palaeoenvironmental Evaluation Along the Route of the Proposed Isle of Grain Transmission Pipeline (Stage 1)

(TQ 862755 - TQ 688730)

Report 2008001
Project No. 3068

By Martin Bates PhD
University of Wales, Lampeter

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ILLUSTRATIONS

1.0 BACKGROUND

Pleistocene sediments throughout the study area consist of material deposited by the River Medway (fluvial sands and gravels as well as estuarine sands and silts) and slope wash colluvium and solifluction. Today evidence for previous courses of the Medway exists as bands of sediments distributed along the spine and eastern side of the Hoo Peninsula across which the pipeline is to be constructed. Geological mapping and a substantial body of Quaternary research (e.g. Dines *et al*., 1954; Lake *et al.,* 1977; Bates *et al.,* 2002; Bridgland, 2003) have provided a basic understanding of the distribution of these deposits where increasing elevation of deposits usually suggests increasing age of deposits (i.e. those fluvial sands and gravels preserved at the highest elevations are the oldest). The Pleistocene deposits only exist within the region due to a combination of erosional downcutting and uplift of the earth's crust in southeast England. This has effectively meant that the river has flowed at progressively lower levels thereby preserving sand and gravel deposits as "terraces" high above the banks of the present river channel. On the Medway side of the Hoo Peninsula, a classic "staircase" of terrace deposits is preserved, with successively older deposits occurring higher up the valley sides. Both Bridgland (2003) and the British Geological Survey identify at least eight distinct terrace aggradations spanning the Middle to Late Pleistocene (Bridgland, 2003) (Table 1). However other investigations (Lake *et al*., 1977; Bates *et al*., 2007) have established that the area also contains deeply buried channels while Bates (1999) and Bates *et al*. (2002) have shown that these channels may contain fossiliferous material in places. Recent evidence suggests that these channels are likely to be former estuaries of the Medway and their geometry and altitudinal relationships to the terrace aggradations are difficult to ascertain.

2.0 METHODOLOGY

34 test pits were excavated by JCB to a maximum depth of 5.1m (PTP 1) or to a depth at which bedrock was attained. These test pits were excavated in controlled spits to minimise mixing between successive lithological units. Test pits were not entered below a depth of 1.2m. Recording of individual test pits was achieved by measuring from the top of the pit down to the appropriate boundary and recording of material was from samples taken from the machine bucket or spoil heap.

Summarised sequence information is presented in Appendix 1. Illustrations of schematic profiles are shown in Figures 1 – 6. Representative sequences are shown in Plates 1 – 8.

3.0 RESULTS

The lithological sequences recorded from the test pitting exercise fall into a number of basic geological categories (based on both lithological sequence and geomorphological position):

> **Colluvium** (reddish-brown sandy-silt with variable clast content; usually poorly or non-stratified)
>
> **Head Gravel** (red-brown flint gravel; usually matrix supported with sand-silt matrix; usually poorly or non-stratified)
>
> **Fluvial sand** (grey sandy-clay with occasional gravel clasts)
>
> **Sandy alluvium** (red-brown medium sand with occasional gravel clasts)
>
> **Fluvial gravels** (clast to matrix supported flint gravels with sand matrix; often stratified and bedded)
>
> **Weathered London Clay** (yellow-brown to blue-grey clay)

As a results of the field programme and the identification of the lithological sequences the test pits can be grouped into seven groups (based on the combination of their geomorphological and lithological properties):

Group 1. PTP 1-3

Group 2. PTP 4-6

Group 3. PTP 7-17

Group 4. PTP 18-22

Group 5. PTP 23-28

Group 6. PTP 29-30

Group 7. PTP 31-35

Group 1. PTP 1-3 (Figure 1; Plates 1-3)

These test pits lie on the east facing slope of the Medway valley running downslope towards the marsh surface. A range of sediment types are present in these pits. In all PTP's the Pleistocene sediments were not bottomed. The sequences present in PTP 1 consisted of thick sandy alluvium overlain by colluvium (Plate 1) lying below 6.34m O.D. Basal fluvial gravels and overlying sandy alluvium were present in PTP 2 with Head gravel capping the sequences (Plate 2) below 10.65m O.D. Finally in PTP 3 two fluvial gravels were present with an intervening sandy alluvium (Plate 3) below 14.9m O.D. In all cases fluvial sediments were present at depths less than 2m from ground surface. This evidence accords well with previous geophysical evidence for the area.

The height variation between deposits in these 3 pits suggests that a number of discrete episodes of deposition are recorded here, probably correlating with elements of the local stratigraphic system (Table 1). Sediments in PTP 1 may represent part of a buried Pleistocene channel previously recorded in the area (Bates *et al*., 2007) that may be of Middle Pleistocene age. Sediments in PTP 2 and 3 probably reflect different fluvial aggradations of probable later Middle Pleistocene data and may be correlated with Bridgland's (2003) Binney and Stoke Members (Table 1).

The fine grained nature of the sequences suggests the possibility that some palaeoenvironmental material may occur in the sequences. The presence of sand in some abundance in all three pits suggests that dating using OSL dating would be possible. Archaeological potential is difficult to assess and will depend on the age of the sediments.

Group 2. PTP 4-6 (Figure 1)

These test pits lie beneath the terrace flat. A range of sediment types are present in these pits. In PTP 4 and 6 bedrock was attained while in PTP 5 bedrock remained beneath 4.2m depth. The sequences in PTP 4 consisted of colluvium directly above bedrock at a shallow depth. In PTP 5 Head gravel overlay sandy alluvium and fluvial sand beneath surface elevations of 16.7m O.D. while in PTP 6 colluvium overlay fluvial gravel. In the case of PTP 5/6 fluvial sediments were present at depths less than 2m from ground surface; fluvial sediments were absent from PTP 4.

The similarity in height of the sands and gravels in PTP 5 and 6 suggest they both belong to a similar aggradational unit (i.e. river terrace sequence). The absence of any fluvial sediments in PTP 4 suggests the edge of the terrace lies between PTP 4 and 5. This sequence of fluvial sediments probably belongs to a later Middle Pleistocene event, probably the Stoke Member (Bridgland, 2003). On the basis of the elevations it is likely that these deposits correlate with those present in PTP 3.

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. However the presence of sand (particularly in PTP 5) indicates a potential for OSL dating.

Archaeological potential is difficult to assess and will depend on the age of the sediments. However, the identification of the terrace edge between PTP 5 and 4 would indicate the presence of a feature considered as a target of high archaeological importance. It should also be noted that if the correlation of PTP 5/6 with 3 is correct a second edge of terrace situation
is present between PTP 3 and 4.

Group 3. PTP 7-15 (Figure 2, Plates 4-7).

These test pits lie beneath the terrace flat descending to an outer terrace edge near PTP 7/8. A range of sediment types are present in these pits. Only in PTP 9 was bedrock attained and consequently the thickness of the Pleistocene sequences here are considerable. These test pits lie below 18m O.D. Colluvium and/or Head gravel was present in all sequences. Fluvial gravels were present in all pits except PTP 15 where fluvial sand extended to the base of the pit and PTP 17 where colluvium depth exceeded 2.6m (base of excavated pit). Fluvial sand was present in PTP 7, 8A, 14 and 15. Where present fluvial sediments were typically less than 1.5m from surface (with the exception of PTP 15 and PTP 17 (where fluvial sediments were not proven).

The similarity in height of the sands and gravels in this sequence of pits suggest they all belong to a similar aggradational unit (i.e. river terrace sequence). The absence of any fluvial sediments in PTP 17, where colluvium thickness considerably increases suggests the edge of the terrace is being approached and lies beyond PTP 17 towards PTP 18. This sequence of fluvial sediments probably belongs to a later Middle Pleistocene event. On the basis of the elevations the sediments in Group 3 overlap those of PPT 3-6 although the deposits in Group 3 extend some 3m higher than the Group 1/2 sediments.

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. However the presence of sand (particularly in PTP 7/8A/14/15 indicates the potential for OSL dating. Archaeological potential is difficult to assess and will depend on the age of the sediments. However, the identification of the terrace edge possibly beyond PTP 17 would indicate the presence of a feature considered as a target of high archaeological importance.

Group 4. PTP 18-22 (Figure 3)

These test pits lie beneath valley side/marginal situations. A range of sediment types are present in these pits. Bedrock was attained in PTP 18-20 but not in 21/22. Colluvium and/or Head gravel was present in all sequences. There is no trace here of fluvial sediments and all deposits are likely to be reworked from sediments (bedrock or older Pleistocene deposits) lying at higher elevations in the landscape. The age of these deposits is difficult to ascertain.

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. The absence of sand suggests that the potential for OSL dating is low. Archaeological potential is low and most likely derived in context.

Group 5. PTP 23-28 (Figure 4, Plate 8)

These test pits lie beneath the terrace flat. A range of sediment types are present in these pits. In most cases bedrock was attained (exceptions being PTP 23 and ET 26 S/W). Colluvium or Head gravel was present in all sequences. The sequences lie at surface elevations in excess of 37m O.D. Fluvial gravels were present in all pits except PTP 28 (gravel was present but the precise nature of its depositional environment was difficult to ascertain) and ET 26 S/W where Head gravel extended to the base of the trench. No sand beds were present and noted. The depth to fluvial sediments varied from 1.0m to 2.2m depth.

The similarity in height of the sands and gravels in this sequence of pits suggest they all belong to a similar aggradational unit (i.e. river terrace sequence). This sequence of fluvial sediments probably belongs to a later Middle Pleistocene event. On the basis of the elevations it is likely that these deposits are the highest preserved terrace sequences in the route corridor. They may correlate with elements of Bridgland's Shakespeare Member (Table 1).

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. The absence of sand beds may also limit the potential for OSL dating. Archaeological potential is difficult to assess and will depend on the age of the sediments. The elevation of the sediments would suggest an older rather than younger age within the later Middle Pleistocene, a phase where human activity is more rather than less likely.

Group 6. PTP 29-30

These test pits lie beneath valley side/marginal situations. A range of sediment types are present in these pits. Bedrock was attained in PTP 29 but not 30. Colluvium and Head gravel was present in both sequences. There is no trace here of fluvial sediments and all deposits are likely to be reworked from sediments (bedrock or older Pleistocene deposits) lying at higher elevations in the landscape. The age of these deposits is difficult to ascertain.

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. The absence of sand suggests that the potential for OSL dating is low. Archaeological potential is low and most likely derived in context.

Group 7. PTP 31-35 (Figure 5, Plate 8)

These test pits lie beneath valley side/marginal situations and a small dry valley. A range of sediment types are present in these pits. Bedrock was attained in all pits. Colluvium was present in all pits and Head gravel was present in PTP 34/35. There is no trace here of fluvial sediments and all deposits are likely to be reworked from sediments (bedrock or older Pleistocene deposits) lying at higher elevations in the landscape. The age of these deposits is difficult to ascertain. The presence of the small dry valley is likely to have influenced sedimentation here.

On the basis of the visual appearance of the sequences it is thought unlikely that palaeoenvironmental material will be present in these sequences. The absence of sand suggests that the potential for OSL dating is low. Archaeological potential is low and most likely derived in context.

4.0 DISCUSSION

The results of the test pitting exercise confirm the previous expectations based on the geophysics and the interpretation of the geotechnical information for the route corridor. The present study has revealed the occurrence of extensive spreads of fluvial sediments belonging to a number of different river terraces across the study region (Groups 1, 2, 3 and 5). The remainder of the groups (4, 6 and 7) all contain sequences that are formed predominantly of slope deposits (colluvium/Head gravel). The height distributions of the sediments are shown in Figure 6.

The fluvial sequences are complex. For example sequences within the short transect from PTP 1-3 (Figure 1) are likely to contain 2 distinct river terrace sequences as well as elements of the major buried channel previously identified in the area. Evidence from groups 2 and 3 indicate the possibility that terrace edge situations are preserved (i.e. that part of the terrace adjacent to the rising ground of the former valley edge). These terrace edge situations are known elsewhere to be favoured locales in the landscape for hominid activity. Furthermore these terrace remnants show considerable internal structure and complexity suggesting local variation in sequence, as well as environments of deposition, may exist along the route corridor.

The presence of hominid activity within the sequences can be addressed but direct evidence for hominid tools has not been produced in the current work as the test pitting did not include sieving of gravels for artefacts. Suitable sediments for the recovery of reworked artefacts (gravels) and *in situ* artefacts (sands) (both contexts for which artefacts are known in the Medway) were located as well as contexts (terrace edges) known to be preferred niches of hominid activity.

The nature of the sequences is apparently, in most cases, decalcified. This would indicate that the potential for the preservation of faunal palaeoenvironmental material is low (the exception to this might be the lower slopes of the area around PTP 1 where preservation of molluscs and ostracods has previously been demonstrated at Allhallows (Bates *et al*., 2002). Suitability for dating of many of the sequences is high however. The presence of sand beds or distinct sand units in many cases has been noted and would be ideal substrate for dating using the OSL technique.

5.0 REFERENCES

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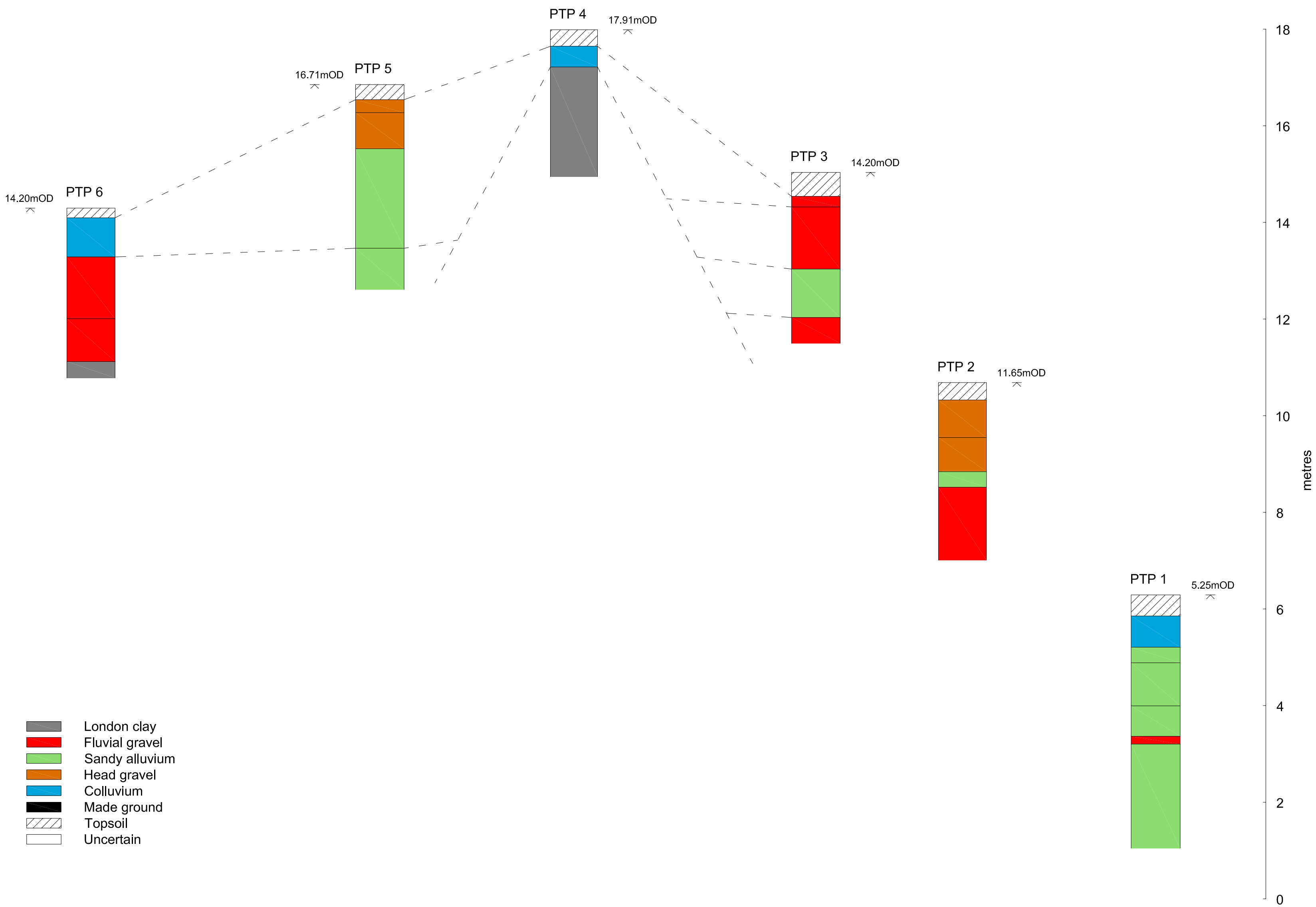
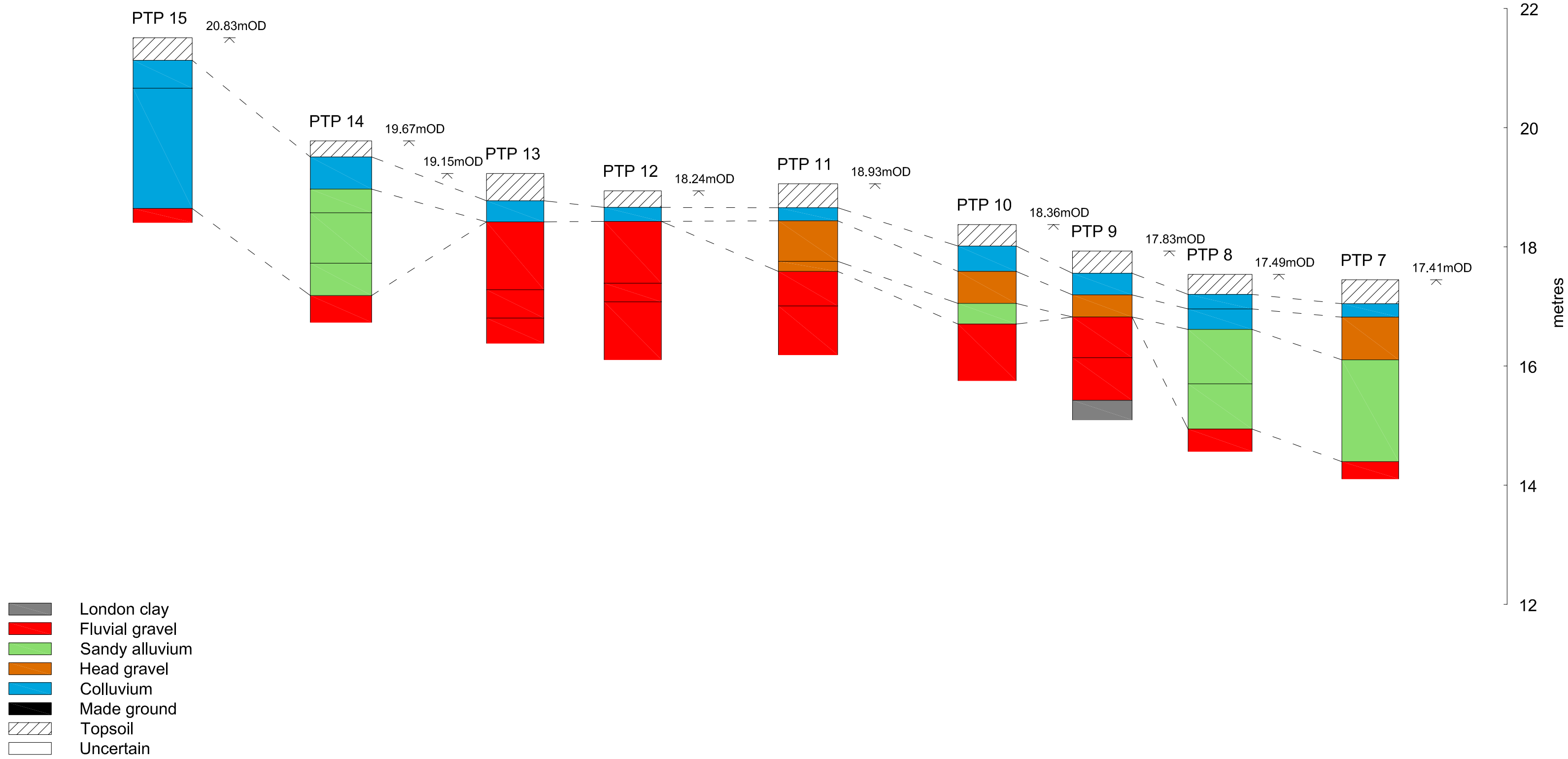
Terrace formation: Medway	Interglacial deposits (channels)	Terrace formation: Thames	Members: Lower Thames	Age	Climate	MI Stage
Tilbury		Tilbury	Tilbury	Holocene	warm	1
Halling		Shepperton	Shepperton	late Devensian	cold	late 2
Aylesford Upper			East Tilbury Marshes Upper	Devensian	cold	5d-2
	?Kingsnorth deposits	East Tilbury Marshes	Trafalgar Square deposits	Ipswichian	warm	5e
Aylesford Lower			East Tilbury Marshes Lower	intra-Saalian	cold	late 6
Binney Upper			Mucking Upper	intra-Saalian	cold	6
	?Allhallows deposits	Mucking	Aveley Silts and sands	intra-Saalian	warm	7
Binney Lower			Mucking Lower	intra-Saalian	cold	late 8
			Botany	intra-Saalian	cold	8
Stoke (Grain Gravel*)	?Allhallows deposits	Corbets Tey (Grain Gravel)	Purfleet deposits	intra-Saalian	warm	9
			Little Thurrock	intra-Saalian	cold	late 10
			Orsett Heath Upper	intra-Saalian	cold	10
Shakespeare		Orsett Heath	Swanscombe interglacial deposits	Hoxnian	warm	11
			Orsett Hearth Lower	late Anglian	cold	late 12
Newhall?		Black Park		Anglian	cold	12
Dagenham Farm/Chalkwell/Caidge		Winter Hill	St.Osyth	Anglian	cold	12
Clinch Street/Canewdon/St. Lawrence			Wivenhoe	pre-Anglian	c/w/c	14-12?
High Halstow/Belfairs/Mayland			Ardleigh	Cromerian complex	c/w/c	?

* The Grain Gravel (present on the Isle of Grain) is a Thames not Medway deposit and is equivalent to the Corbets Tey Terrace of the Lower Thames

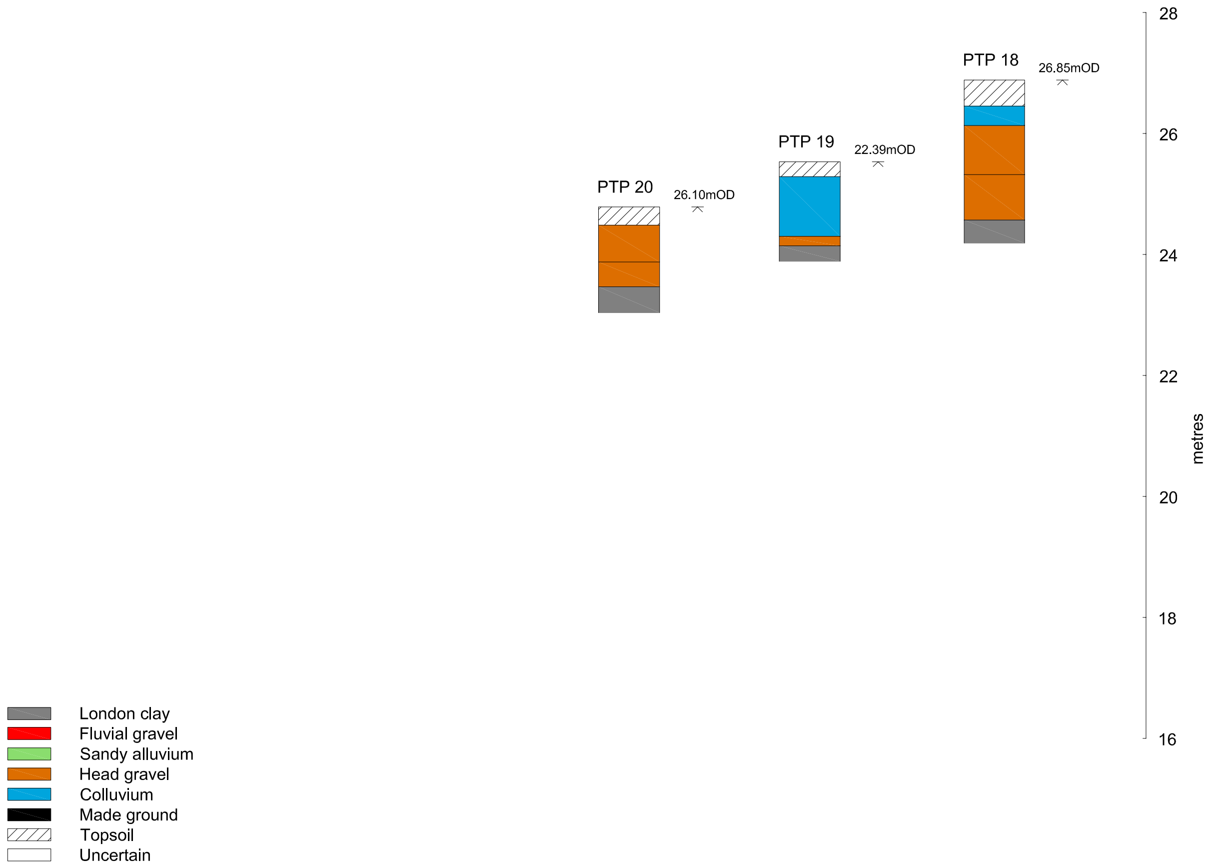
Table 1. The Quaternary sequence in the lower reaches of the Medway showing lithostratigraphic sequence and suggested correlations with Thames formations and with chronostratigraphic, climatic and marine isotope (MI) stages (modified from Bridgland, 2003).



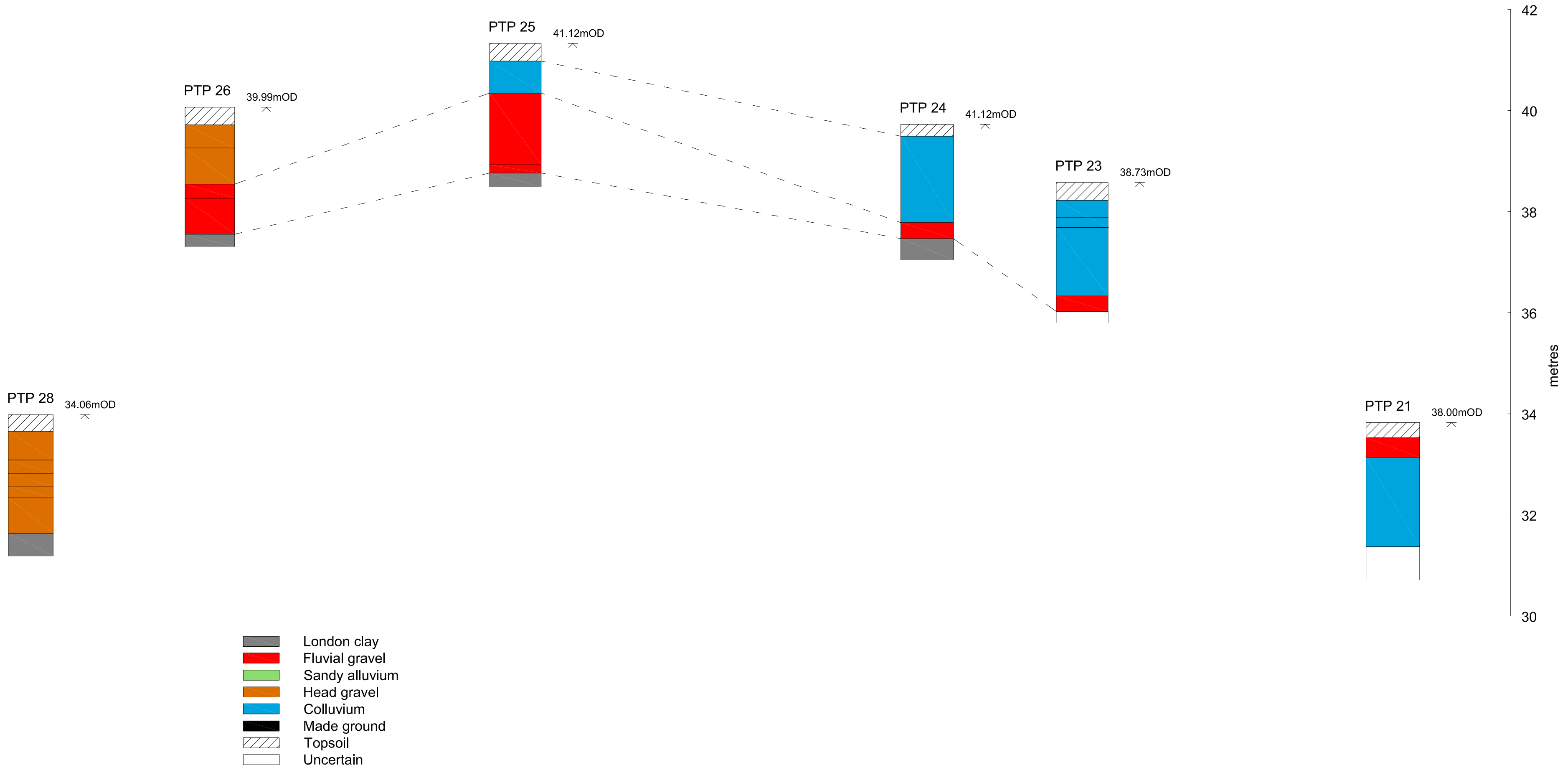
© Archaeology South-East		Isle of Grain Gas Pipeline	Fig. 1
Project Ref: 3068	Jan 2008	Test Pits 1-6	
Report Ref: 2008001	Drawn by: JR/SM		



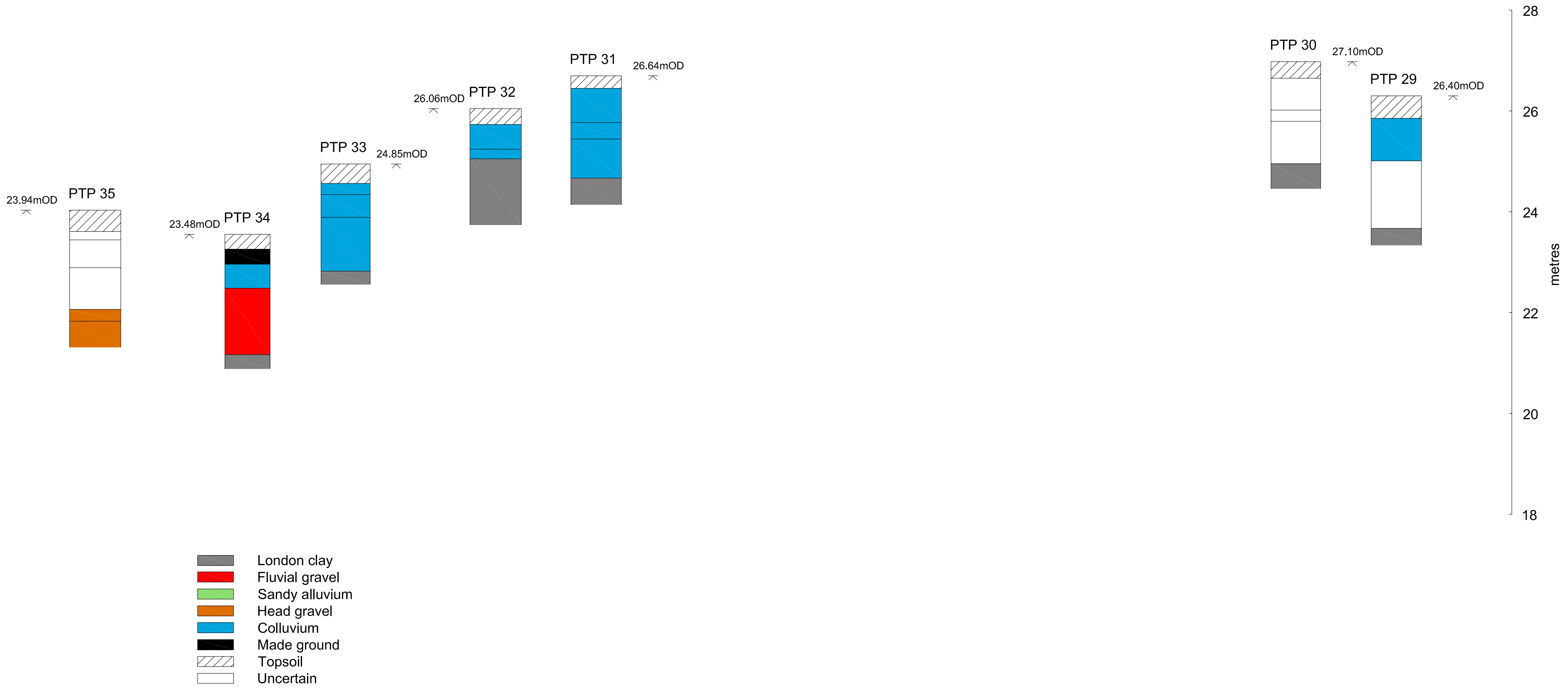
© Archaeology South-East		Isle of Grain Gas Pipeline	Fig. 2
Project Ref: 3068	Jan 2008	Test Pits 7-15	
Report Ref: 2008001	Drawn by: JR/SM		



Project Ref: 3068	Jan 2008	Isle of Grain Gas Pipeline	Fig. 3
Report Ref: 2008001	Drawn by: JR/SM	Test Pits 18-20	



© Archaeology South-East		Isle of Grain Gas Pipeline	Fig. 4
Project Ref: 3068	Jan 2008	Test Pits 21-28	
Report Ref: 2008001	Drawn by: JR/SM		



© Archaeology South-East		Isle of Grain Gas Pipeline	Fig. 5
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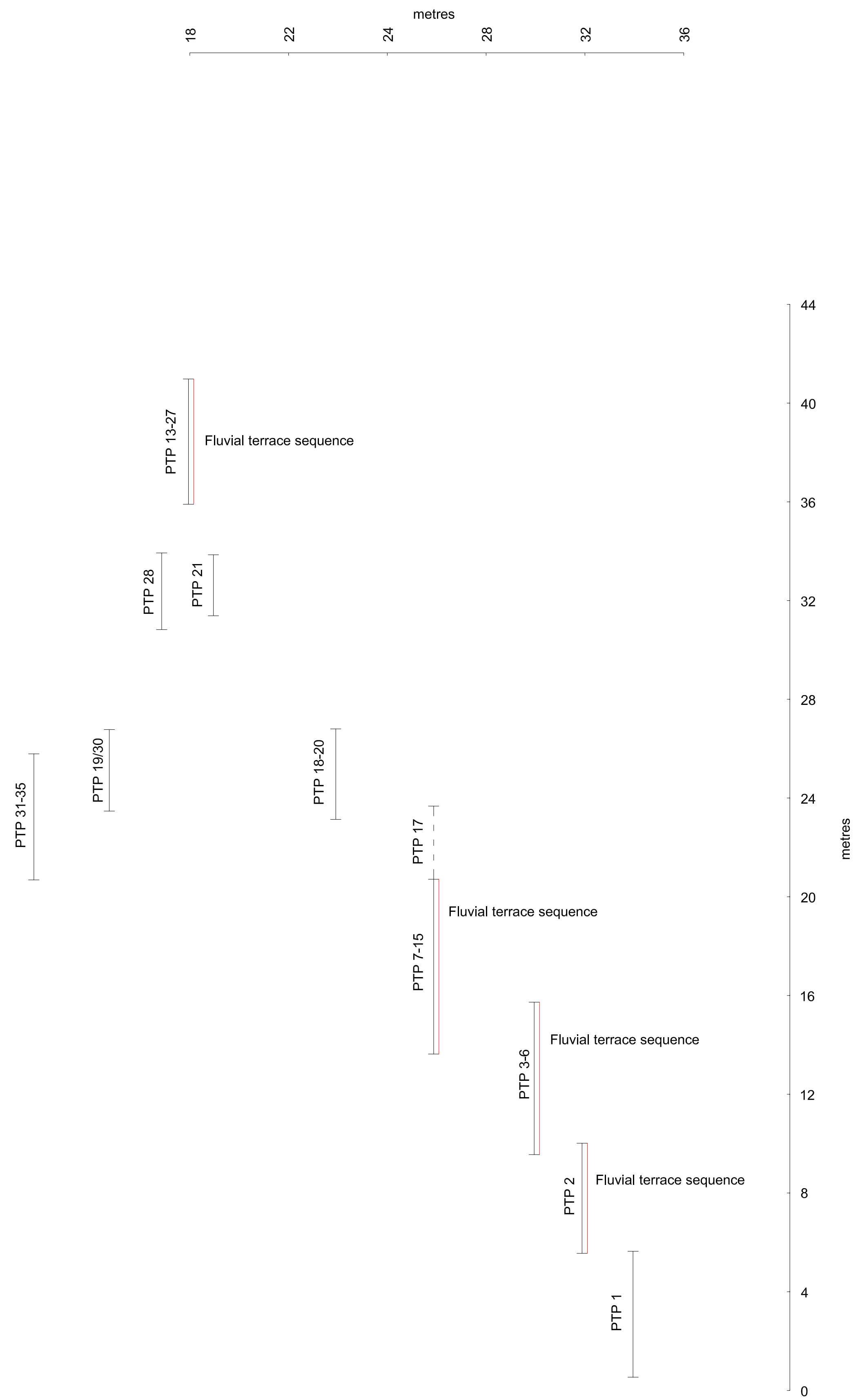
Report Ref: 2008001	Drawn by: JR/SM		



© **Archaeology South-East**		Isle of Grain Gas Pipeline	Fig. 6
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