RECORD
2024/2

SEDIMENTOLOGICAL CORE LOGS OF THE DMP HARVEY 2, 3/3A AND 4 STRATIGRAPHIC WELLS IN THE SOUTHERN PERTH BASIN

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Cover image
One of the largest and most distinctive metagranitic units in the Gascoyne Province, the Davy Well Granite emerges from the water of the Yinnetharra Pool along the Gascoyne River. Photo by Angela Riganti

Contents

Appendices

Figures

Tables

Sedimentological core logs of the Harvey 2, 3/3A and 4 stratigraphic wells in the southern Perth Basin

L Collins

Abstract

Stratigraphic wells GSWA Harvey 1 and DMP Harvey 2, 3/3A and 4 were drilled as part of the South West Hub Carbon Capture and Storage research project. The wells intersected the stratigraphy of the Harvey Ridge, a structural high at the southern end of the Mandurah Terrace in the southern Perth Basin. Significant core was recovered through Triassic and Jurassic strata, including sections of the Wonnerup and Yalgorup Members of the Lesueur Sandstone and the Eneabba Formation. At the time of drilling, extensive core logging was undertaken on the GSWA Harvey 1 core, but not on the material from wells 2, 3/3A and 4. This Record presents logged sections and accompanying notes for the Harvey 2, 3/3A and 4 cored sections and presents a brief discussion of the accompanying observations on lithofacies and depositional setting.

KEYWORDS: Sedimentology, paleosols, floodplain, alluvial

Introduction

Stratigraphic wells GSWA Harvey 1 and DMP Harvey 2, 3/3A and 4 — hereafter referred to as Harvey 1–4 — were drilled in the Harvey area of southwest Western Australia (Fig.1) by the Department of Mines, Industry Regulation and Safety (DMIRS; previously DMP, the Department of Mines and Petroleum), as part of the South West Hub Carbon Capture and Storage research project (Department of Mines and Petroleum, 2012; Stalker and Whittaker, 2017).

The Triassic Lesueur Sandstone and Jurassic Eneabba Formation were the primary stratigraphic targets and were both recovered in core section (Tables 1 and 2). These lithostratigraphic units were originally defined in the northern Perth Basin, but have been translated to the southern Perth Basin by numerous workers (Martin, 2018), and are currently used as the standard stratigraphy in the region (Crostella and Backhouse, 2000). This translation is problematic in the southern part of the basin where lithostratigraphic assignation is not consistent with biostratigraphic data (Martin, 2018), resulting in inconsistencies between the northern and southern basin sections. As such, the position of stratigraphic boundaries in the Harvey 1–4 wells are questionable and correlation of units between wells is difficult. The uncertain position of the F10 fault (Fig. 1), a normal fault formed during Early Cretaceous rifting (C Thomas, 2021, written comm., 12 May), which offsets strata in the Harvey 2 well, adds additional uncertainty when assigning lithostratigraphic boundaries in this particular well.

Harvey 1 and 4 recovered numerous, small-cored intervals, whereas Harvey 2 and 3/3A recovered long, continuously cored sections (Table 1). The Harvey 1 core, as presented in Millar and Reeve (2014), was logged by H Olierook and its depositional setting was extensively evaluated by Delle Piane et al. (2013). Palynological samples were collected from Harvey 1, 2 and 3/3A. Samples from Harvey 1 and 2 were analysed by Backhouse (2014, 2020a) and the results are presented in Table 3; all samples from Harvey 3/3A were barren (Backhouse, 2020b).

This Record presents sedimentological logs and general descriptions for all cores from Harvey 2, 3/3A and 4. A complete facies analysis of the cored sections was beyond the scope of this study, but would be highly valuable and is recommended for any future work attempting to define and correlate stratigraphy across the Perth Basin.

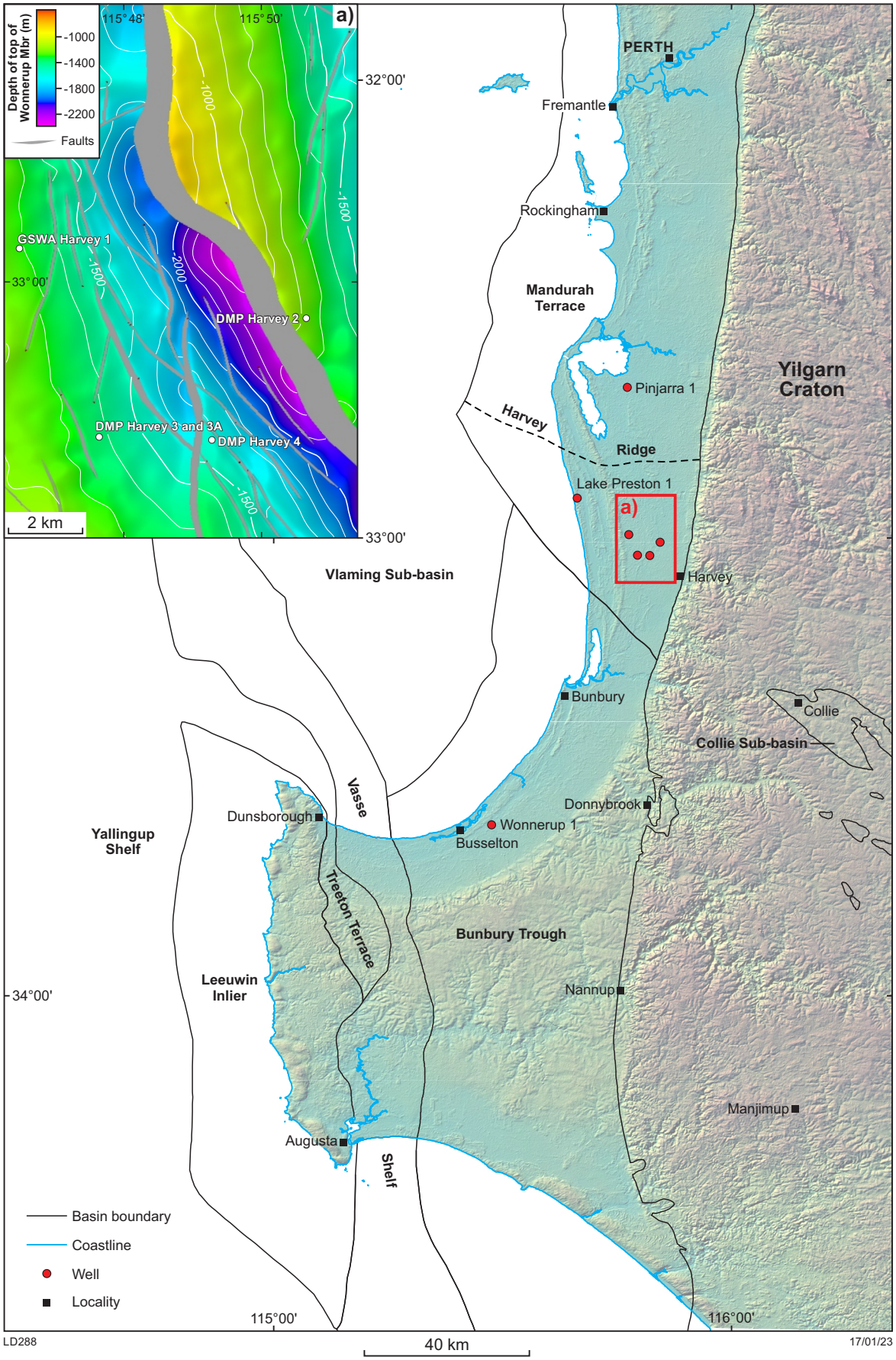

Figure 1. Structural subdivisions of the southern Perth Basin, showing the location of the Harvey 1–4 wells

Table 1. Summary of cored intervals recovered from wells Harvey 1–4. Cores are housed at the Perth Core Library

Well	*Core Number*	*Top depth (m)*	*Base depth (m)*	*Cored interval (m)*	*Logged*
Harvey 1	1	895.00	931.62	36.62	Olierook in Millar and Reeve (2014)
	2	1266.00	1319.20	53.20	Olierook in Millar and Reeve (2014)
	3	1320.00	1335.22	15.22	Olierook in Millar and Reeve (2014)
	4	1336.00	1343.76	7.76	Olierook in Millar and Reeve (2014)
	5	1896.00	1947.64	51.64	Olierook in Millar and Reeve (2014)
	6	2480.00	2532.59	52.59	Olierook in Millar and Reeve (2014)
Harvey 2	1	207.70	1351.20	1143.50	This report (Appendix 1)
Harvey 3	1	591.70	744.50	152.80	This report (Appendix 2)
Harvey 3A	1	668.40	1550.20	881.80	This report (Appendix 3)
Harvey 4	1 & 2	896.30	908.30	12.00	Not logged, rubble
	Misc.	1325.50	1326.60	1.10	This report (Appendix 4)
	3	1665.05	1666.65	1.60	This report (Appendix 4)
	4	1792.70	1802.55	9.85	This report (Appendix 4)

Table 2. Depth to top of stratigraphic units in Harvey 2–4 is represented as measured depth, based on Stelfox (2018, Table 21, P56.) These depths are sourced from seismic marker interpretations and picks from ODIN on the Harvey 3D seismic survey identified in Byrne (2016)

	Top depth (m) of stratigraphic units reported as measured depth								
Well	*Sabina Sandstone*	*Wonnerup Member*	*Yalgorup Member*	*Eneabba Formation 'basal shale'*	*Eneabba Formation*	*Leederville Formation*	*Undifferentiated Quaternary*	*Total well depth*	*Reference*
GSWA Harvey 1	2895	1378	700	624	249	53	5.38	2945	Millar and Reeve (2014)
DMP Harvey 2	–	1242	549	408	134	0	–	1350.2	Stelfox (2018)
DMP Harvey 3	–	1417	743	581	231	0	–	1550	Stelfox (2018)
DMP Harvey 4	–	1597	1014	872	162	0	–	1802.6	Stelfox (2018)

Table 3. Palynology samples and palynozones recovered from Harvey 1, 2 and 3/3A

Well	*Source material*	*Top depth (m)*	*Base depth (m)*	*Stratigraphic age (era)*	*Stratigraphic age (epoch)*	*Zone*	*Reference*
GSWA Harvey 1	Mud	795.00	825		?Early Jurassic or Late Triassic	?*Callialasporites turbatus/Corollina torosa*–?*Minutosaccus crenulatus* or older	(Backhouse 2014)
	Selected chips	795.00	825	Indeterminate		Indet.	(Backhouse 2014)
	Core	901.75		Triassic	Carnian–Ladinian	*S. speciosus* (?lower)	(Backhouse 2014)
	Core	903.60		Triassic	Carnian–Ladinian	*S. speciosus* (?lower)	(Backhouse 2014)
	Core	923.50		Indeterminate		Barren	(Backhouse 2014)
	Core	924.00		Indeterminate		Barren	(Backhouse 2014)
	Core	924.60		Indeterminate		Barren	(Backhouse 2014)
	Core	1268.80		Indeterminate		Barren	(Backhouse 2014)
	Core	1270.00		Indeterminate		Barren	(Backhouse 2014)
	Core	1302.50		Indeterminate		Barren	(Backhouse 2014)
	Core	1914.70		Indeterminate		Barren	(Backhouse 2014)
	Core	2510.90		Indeterminate		Barren	(Backhouse 2014)
	Core	2514.30		Indeterminate		Barren	(Backhouse 2014)
	Core	2514.40			Prob. Ladinian	*S. quadrifidus*, or slightly younger or older	(Backhouse 2014)
	Core	2414.55		Indeterminate		Barren	(Backhouse 2014)
	Core	2514.70		Indeterminate		Barren	(Backhouse 2014)
DMP Harvey 2	Core	213.90		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	219.30		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	248.95		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	283.10		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	344.75		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	377.00		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	450.90		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	552.20		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	610.95		Jurassic	Early Toarcian–Hettangian	*Corollina torosa*	(Backhouse 2015a)
	Core	644.90		Indeterminate		Barren	(Backhouse 2015a)
	Core	686.90		Indeterminate		Barren	(Backhouse 2015a)
	Core	732.50		?Triassic	?Rhaetian	?*Ashmoripollis reducta*	(Backhouse 2015a)
	Core	793.10		?Triassic	?Rhaetian	?*Ashmoripollis reducta*	(Backhouse 2015a)
	Core	821.20		Indeterminate		Indet contaminated	(Backhouse 2015a)
	Core	821.25		?Triassic	?Triassic	?Triassic indet.	(Backhouse 2015a)
	Core	908.25		Indeterminate		Indet. contaminated	(Backhouse 2015a)
	Core	908.26		?Triassic	?Triassic	?Triassic indet.	(Backhouse 2015a)
	Core	1006.95		Indeterminate		Barren	(Backhouse 2015a)
	Core	1111.90		Triassic	Carnian–Ladinian	?*lower S. speciosus – Staurosaccites quadrifidus*	(Backhouse 2015a)
	Core	1242.50		Triassic	Carnian–Ladinian	?*lower S. speciosus – Staurosaccites quadrifidus*	(Backhouse 2015a)
	Core	1315.70		Triassic	Carnian–Ladinian	?*lower S. speciosus – Staurosaccites quadrifidus*	(Backhouse 2015a)
	Core	1348.25		Triassic	Carnian–Ladinian	?*lower S. speciosus – Staurosaccites quadrifidus*	(Backhouse 2015a)
DMP Harvey 3/3A	Core	604.60		Indeterminate		Barren	(Backhouse 2015b)
	Core	665.75		Indeterminate		Barren	(Backhouse 2015b)
	Core	765.90		Indeterminate		Barren	(Backhouse 2015b)
	Core	888.40		Indeterminate		Barren	(Backhouse 2015b)
	Core	932.75		Indeterminate		Barren	(Backhouse 2015b)
	Core	968.90		Indeterminate		Barren	(Backhouse 2015b)
	Core	1186.45		Indeterminate		Barren	(Backhouse 2015b)
	Core	1229.40		Indeterminate		Barren	(Backhouse 2015b)
	Core	1252.40		Indeterminate		Barren	(Backhouse 2015b)
	Core	1281.85		Indeterminate		Barren	(Backhouse 2015b)
	Core	1316.15		Indeterminate		Barren	(Backhouse 2015b)
	Core	1385.80		Indeterminate		Barren	(Backhouse 2015b)
	Core	1410.65		Indeterminate		Barren	(Backhouse 2015b)
	Core	1424.60		Indeterminate		Barren	(Backhouse 2015b)

Geological setting and stratigraphy

All four Harvey wells were drilled on the southern end of the Mandurah Terrace, southern Perth Basin on an east–west to southeast–northwest-trending basement high known as the Harvey Ridge (Fig. 1). The current stratigraphic framework for the central and southern Perth Basin (Fig. 2) was developed by Crostella and Backhouse (2000), which draws from numerous works, including Playford et al. (1976), Mory and Iasky (1996) and Le Blanc Smith and Kristensen (1998). The following sections summarize the stratigraphic features pertinent to this Record, based on the work presented in Crostella and Backhouse (2000).

Permian–Triassic

Lower Permian strata within the southern Perth Basin unconformably overlie Yilgarn Craton basement in the subsurface of the Treeton Terrace and Vasse Shelf (Le Blanc Smith and Kristensen, 1998). The Permian–Cretaceous succession in the southern Perth Basin is entirely non-marine until the late Neocomian (Early Cretaceous) (Crostella and Backhouse, 2000), whereas age-equivalent strata in the northern Perth Basin contain several marine intervals.

Upper Permian – Lower Triassic deposition in the southern Perth Basin was seemingly continuous, although a small hiatus potentially exists at the top of the Permian Sue Group. A transition from quiet lacustrine conditions in the Upper Permian (Willespie Formation) to fluvial conditions in the Lower Triassic (Sabina Sandstone) are interpreted with coaly intervals also recorded from the Sabina Sandstone.

Conformably overlying the Sabina Sandstone is the fluvial Lesueur Sandstone (Triassic), constituting the Wonnerup and Yalgorup Members. The term Yalgorup Member replaces the now obsolete term 'Myalup Member'. The change was recommended by the Geological Survey of Western Australia to Geoscience Australia in 2012, and formally proposed by Millar and Reeve (2014) following the drilling of the Harvey 1 well.

The Wonnerup Member is described as a light grey to pale, coarse- to very coarse-grained, feldspathic, homogeneous sandstone, which is poorly sorted and generally poorly consolidated. The type section is located in Wonnerup 1 between 2640–3644 m. The conformably overlying Yalgorup Member is dominated by dark grey sandstone with subordinate interbeds of finer clastic material, such as siltstone in packages of up to 20 m thick. Crostella and Backhouse (2000) noted the similarity of this unit to younger Jurassic units. The type section of the Yalgorup Member is located in Lake Preston 1 between 1219–2045 m (Fig. 1). The boundary between the Wonnerup and Yalgorup members corresponds to a strong regional seismic marker (Thomas 2018).

Lower to Middle Jurassic

The Jurassic Eneabba Formation overlies the Yalgorup Member (Fig. 2). The Eneabba Formation was originally defined in the northern Perth Basin and is described there as a feldspathic, coarse to very coarse-grained sandstone interbedded with minor conglomerate locally, and multicoloured claystone and siltstone (Mory and Iasky 1996). These multicoloured beds are classically used to characterize the formation, due to the early informal name 'multicoloured member' used in petroleum exploration reports, interpreted as fluvial, overbank floodplain deposits (Crostella and Backhouse 2000). The apparent absence of multicoloured beds in the southern Perth Basin led Crostella and Backhouse (2000) to assign coeval strata in the Bunbury Trough to the overlying Cattamara Coal Measures (Fig. 2). Recent work, however, identified the Eneabba Member underlying the Cattamara Coal Measures (Martin, 2018), and multicoloured sediments are present in all four Harvey wells.

Identifying and defining the Eneabba Formation based on the presence of multicoloured units is problematic in Harvey 2 and 3/3A, as such units are observed directly overlying the Wonnerup Member up-section for over 800 m throughout both, the Yalgorup Member and Eneabba Formations. Seismic differentiation of the Triassic Yalgorup Member and Jurassic Eneabba Formation is also difficult in the Harvey area (Zhan, 2014), a problem previously noted for the wider southern Perth Basin by Crostella and Backhouse (2000).

The Eneabba Formation is typically considered Early Jurassic in age, based on the presence of *C. torosa* or younger palynozones (Fig. 2). Core samples from multicoloured strata in Harvey 2 have yielded not only Jurassic palynozones, but also Triassic palynomorphs of the ?*A. reducta* and ?lower *S. speciosus* to *S. quadrifidus* Zones in the lower sections of the core (Table 3). Martin (2018) suggested that individually, lithostratigraphy and palynology are insufficient for differentiating the Eneabba Formation and Cattamara Coal Measures as palynological zones *C. torosa* and *C. turbatus* do not define distinct lithologies and vice versa.

Differentiation difficulties are exacerbated by the limited core sections of the Yalgorup Member and Eneabba Formation in the southern Perth Basin, and the inherently high lithofacies variability that exists within fluvial–alluvial depositional settings.

Core logs

Previous work

Delle Piane et al. (2013) interpret the deposition of the Wonnerup Member in a fluvial channel system, describing predominantly high current energy fluvial facies, with subordinate moderate to low current energy fluvial deposits, and rare swampy overbank deposits. The depositional setting of the overlying Yalgorup Member is interpreted as floodplain, with paleosols and intercalated fluvial channel or barform facies identified in lower parts, changing up-section to braided fluvial environments (Delle Piane et al., 2013).

Delle Piane et al. (2013) identified nine lithofacies across the Wonnerup and Yalgorup Members in the core from Harvey 1. These lithofacies were based on a scheme developed by Timms et al. (2012) for other Perth Basin wells, viz.: Pinjarra 1, Cockburn 1 (Fig. 1), Gingin 1 and Gingin 2 (which lie north of Perth city). However, only Pinjarra 1 intersects the

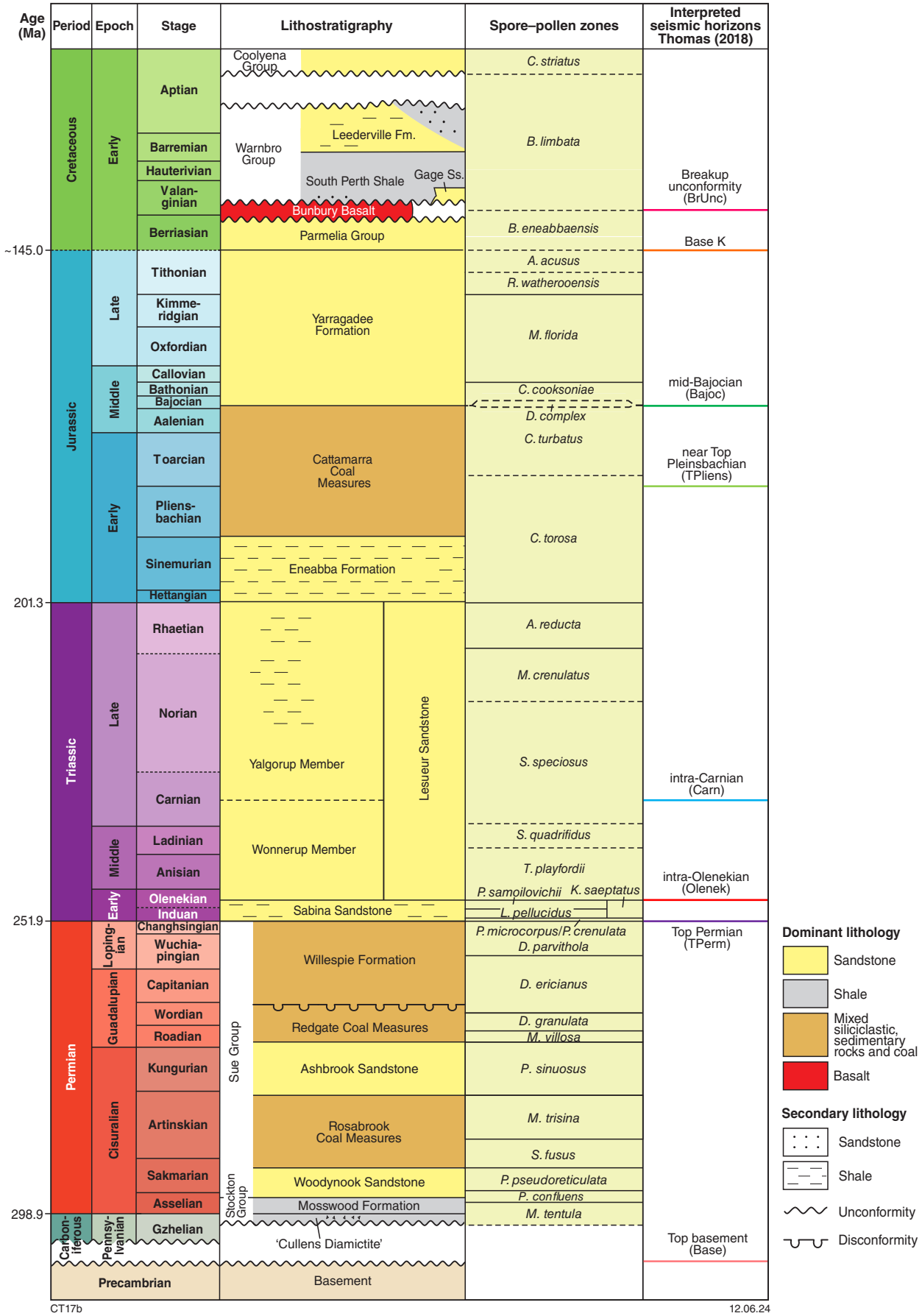

Figure 2. Stratigraphy of the southern Perth Basin with interpreted seismic horizons from Thomas (2018)

Table 4. Adjustment of lithofacies D (floodplain paleosoils) from original description by Timms et al. (2012) by Delle Piane et al. (2013)

Work	*Wells applied to*	*Facies D description*
Timms et al. (2012) and Timms et al. (2015)	Pinjarra 1, Cockburn 1, Gingin 1 and Gingin 2	Medium to pale grey, fine-to medium-grained, homogenized sands wIth rootlets, and 1–10 cm-thick black coal beds
Delle Piane et al. (2013)	GSWA Harvey 1	Floodplain paleosoils (often vertisoils), fine to medium homogenized sandstone with rootlets, dessication cracks and slickensides

Lesueur Sandstone and Eneabba Formation. Notably, Delle Piane et al. (2013) adjusted Facies D of Timms et al. (2012) to better represent the paleosols present in Harvey 1, which had a different appearance (Table 4).

Present study

This Record presents sedimentological logs for cored sections from Harvey 2, 3/3A and 4 (Appendices 1–4). Assignation of facies is beyond the scope of this work. A general overview of the members and formations intersected is given below.

Wonnerup Member

The top of the Wonnerup Member was intersected and recovered in all three wells. However, none of the wells intersected the member's basal contact. The Wonnerup Member is dominated by medium- to coarse-grained, cross-bedded sandstones. Sandstone compositions range from quartz arenite, subarkose and sublitharenite, and vary from moderate to well sorted. Sandstones are thinly to thickly bedded, arranged in sections that can reach over 10 m in thickness (e.g. Harvey 2: 1282–1292 m — Fig. 3a, Appendix 1). Subordinate massive and ripple cross-laminated sandstones are locally interbedded. Deposition likely took place in a moderate- to high-current energy fluvial channel system. A distinct, but conformable contact between the Wonnerup Member and the overlying Yalgorup Member is observed in core in both Harvey 2 and 3/3A.

Yalgorup Member

The Yalgorup Member was intersected and cored in all three wells. The core segment recovered from Harvey 4 was small with approximately 12 m of core recovered at three depth intervals, with depth of segments not accurately indicated (Appendix 4). Harvey 2 and 3/3a returned continuous core sections of the member (Tables 1 and 2). As a result, the following discussion pertains to the member as observed in Harvey 2 and 3/3a.

Multicoloured sandstones, muddy sandstones and siltstones are common throughout the Yalgorup Member. Sandstones compositions include quartz arenite, subarkose and sublitharenite, commonly moderately well to poorly sorted. Multicoloured lithologies are frequently mottled (Fig. 4c,e), predominantly red-green and commonly contain slickensides (Fig. 4.a,d), root traces (Fig. 4f,g), and large sand dykes (Fig. 4b). In thickly bedded sections, distinct horizons are discernible by colour change or frequency of features (Fig. 4). Multicoloured lithofacies are intercalated with massive and cross-bedded sandstone beds and sequences of stacked sandstones at variable frequency throughout the member. Sandstone beds range from thin- to thick-bedded and are commonly amalgamated into thick sequences. Ripple-cross laminated sandstones are observed infrequently, and normally-graded sandstone sequences are present in sections, often capped by multicoloured beds, e.g. Harvey 2 — 825–815 m and 784–776 m (Fig. 3b; Appendix 1) and Harvey 3 — 925–914 m (Appendix 2).

Multicoloured lithologies are likely to represent floodplain paleosols of varying levels of maturity. The dominance of green-hued paleosols in combination with red mottling suggests redoximorphic conditions and water table conditions that prevented drainage (Tabor et al., 2017). Slickensides and sand dykes are categorised as shrink–swell or vertic features (Tabor and Myers 2015). Based on the prevalence of these features, the paleosols in Harvey 2 and 3/3A are best categorized as vertisols, following the schemes of Tabor et al. (2017) and Mack et al. (1993).

Together, the sandstone and multicoloured sequences are likely to record deposition in an alluvial plain environment. Where the Yalgorup Member directly overlies the Wonnerup Member, the facies arrangements in both wells are characteristic of crevasse splay environments. These progress gradationally upwards into fluvial channel and point bar sequences, intercalated with paleosol sequences of varying thicknesses and most likely record alternating deposition between meandering fluvial channels and floodplain environments (e.g. Harvey 3/3A: 925–914 m; Appendix 1).

Eneabba Formation

The Eneabba Formation constitutes the same lithofacies as the underlying Yalgorup Member, leading to contention when assigning the formation boundary. Similar facies in the Yalgorup Member and overlying Jurassic units were also described by Crostella and Backhouse (2000) from the Yalgorup Member type section in Lake Preston 1, 17 km northwest of Harvey 3/3A (Fig. 1). Consequently, there is no consistent, well-defined seismic horizon between the two units, Thomas (2018) did not differentiate this boundary.

In Harvey 3/3A the Yalgorup Member — Eneabba Formation boundary was assigned at 743 m (Stelfox, 2018). This depth aligns with a clear transition in the depositional system from fluvial- to floodplain-dominated. In Harvey 2, the Yalgorup Member — Eneabba Formation boundary was originally placed at 549 m by Stelfox (2018), possibly influenced by the start of thick paleosol sequences at ~550 m.

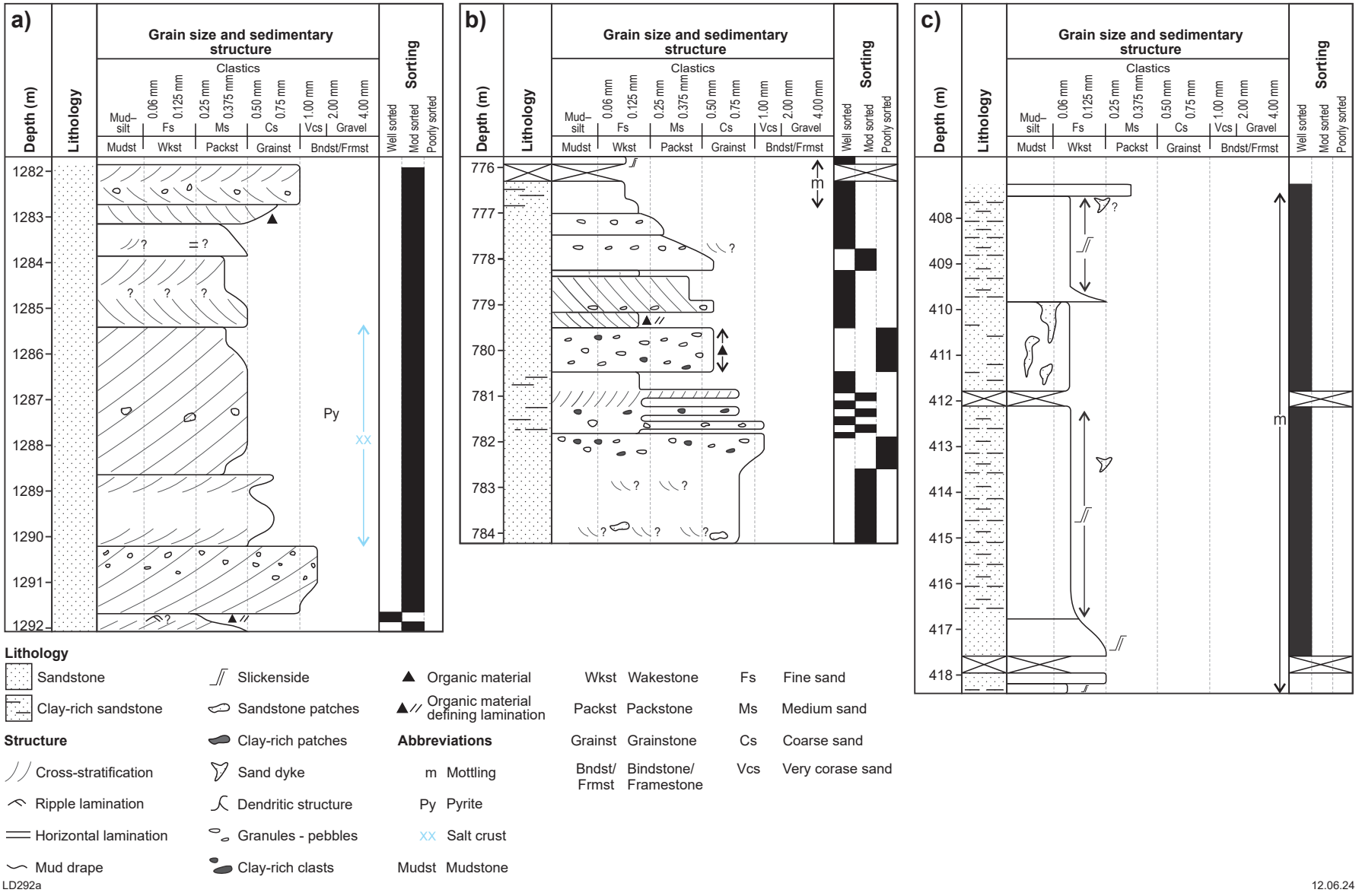

Figure 3. Harvey 2 lithological logs, showing typical lithofacies of: a) Wonnerup Member – thickly bedded medium- to coarse-grained, cross-bedded sandstones, arranged in thick sequences (1282–1292 m); b) Yalgorup Member – normal graded sandstone sequences with minor ripple-laminated facies and capped by multicoloured beds (776–784 m); c) Eneabba Formation – thick, clay-rich, multicoloured sandstones with common sand dykes (418–408 m)

Figure 4. Characteristics of Yalgorup Member paleosols in Harvey 3/3A: a) slickensides at 743.0 – 743.6 m, indicated by yellow arrows; b) large sand dyke with lining at ~1231 m; c) red mottling (reticulate style) at 1390.5 m; d) slickensides at ~1401 m; e) purple and ochre mottling at 1347.5 m; f) root trace at 1257.5 m, indicated with red arrow; g) root trace with fill from overlying bed at 1292.2 m, indicated with red arrow

However, this logging shows that at ~614 m there is a distinct change in depositional setting from channel-dominated to mixed channel–floodplain facies, making this a more logical position for the Yalgorup Member – Eneabba Formation boundary.

Above 743 m in Harvey 3/3A and above 614 m in Harvey 2 (the Jurassic Eneabba Formation), multicoloured lithologies dominate the succession (e.g. Harvey 2: 418–408 m; Fig. 3c; Appendix 1). Beds are commonly clay-rich, show distinct horizons, and are amalgamated into sequences reaching over 13 m in thickness. In Harvey 3/3A large desiccation cracks and sand dyke features are present above 743 m, particularly at the top of paleosol sequences (e.g. Harvey 3/3a: 714–684 m; Appendix 1) and fluvial facies are rare. These deposits grade into mixed fluvial–floodplain deposition up-section in both wells, with crevasse splay and point bar sequences re-appearing and increasing in frequency towards the top of the cored sections.

Yalgorup Member – Eneabba Formation boundary

More extensive and detailed work is required to properly resolve the exact position of the Yalgorup Member – Eneabba Formation boundary in these wells. As opposed to the sharp boundary at the base of the Yalgorup Member, the exact contact between the Yalgorup Member and the Eneabba Formation is unclear in both core and wireline logs. A tentative division between Triassic and Jurassic strata, as distinguished in the northern Perth Basin, may be made using the broad depositional setting as discussed above. The most significant change in the Harvey 2 and 3/3A cores is the transition from mixed fluvial–floodplain to floodplain-dominated deposition with well-developed paleosol profiles. The alternate boundary position proposed here in Harvey 2 at 614 m depth is consistent with a Jurassic age for the Eneabba Formation based on identification of the *C. torosa* Zone from a cored sample at 610.95 m. Typically, the base of the *C. torosa* Zone is equated to the base of the Jurassic (Helby et al., 1987; Partridge, 2006), which lies at or near the base of the Eneabba Formation in the northern Perth Basin (Mory and Iasky 1996; Martin, 2018). The next palynologically productive sample is located at 732.5 m (in the Yalgorup Member) and questionably assigned to the Triassic *A. reducta* Zone.

The position of the F10 fault in the Harvey 2 cored section remains uncertain. Original interpretations placed it at 594 m (Byrne, 2016). However, there is no change in the palynology across this depth, as may be expected if the displacement was significant. By comparison, Thomas (2018) placed the fault at ~650 m within a palynologically barren zone. Unfortunately, facies transitions around this depth appear gradational, making it difficult to pinpoint the position of the fault in the cored section. Further work determining the exact position of this fault would also assist in resolving the position of stratigraphic boundaries within the Harvey wells.

Little core material is available across the Yalgorup Member – Eneabba Formation boundary in the southern Perth Basin. This hinders extrapolating the depositional change identified in the Harvey 2 and 3/3A wells to a regional scale. The best nearby example of this formation boundary is in Pinjarra 1, where dominantly fluvial channel deposits in the Yalgorup Member change to predominantly crevasse splays and overbank deposits, and swampy/lagoonal/overbank deposits in the Eneabba Formation (Timms et al., 2015). Paleosols are identified in core from both units, but are more common in the Eneabba Formation (Timms et al., 2015). The paleosols in Pinjarra 1 differ in appearance from those in the Harvey wells (Table 4), most notably in lacking an oxidized appearance (i.e. red colouration). The abundance of paleosols in the Yalgorup Member is significantly greater in Harvey 1 than in Pinjarra 1 (Delle Piane et al., 2013). All three characteristics are consistent with the Harvey wells, representing a more proximal depositional position compared to Pinjarra 1, which is farther north.

Future work definition of the Triassic–Jurassic boundary

The prevalence of paleosols provides a potential opportunity to identify the Triassic–Jurassic boundary in the southern Perth Basin. A strong relationship has been established between precipitation and the chemical weathering of soils (Sheldon et al., 2002). This relationship has been more specifically applied to and refined for vertisols (Nordt and Driese, 2010) — the typical paleosol type in the Harvey cores. Recent studies have reported the successful estimation of climatic variation based on the relationship between precipitation and chemical alteration (Adams et al., 2011), particularly in Triassic (Norian) vertisols (Jewula et al., 2019). Furthermore, the change in palynoflora at the start of the Jurassic is often considered to reflect the change in climate to drier conditions at the start of the Jurassic (Martin, 2018). In the absence of robust biostratigraphic information, conducting geochemical studies, including quantitative XRD to assess the paleoclimate may provide better constraints for the identification of the Triassic–Jurassic boundary and assignation of the Yalgorup Member – Eneabba Formation contact. This additional data source would also improve the confidence of paleoclimate interpretations based on the palynoflora (Martin, 2018).

Conclusions

New logs of the core sections from Harvey 2, 3/3A and 4 are presented. The lithofacies observed suggest that the deposition of the Wonnerup Member is likely to have taken place in moderate- to high-energy fluvial settings and the deposition of the Yalgorup Member and Eneabba Formation probably took place in mixed fluvial channel–floodplain settings. A new Yalgorup Member – Eneabba Formation boundary position of 614 m is proposed in the Harvey 2 well, based on the transition from fluvial- to floodplain-dominated deposition at this depth. The cored sections of the paleosol horizons would benefit from in-depth geochemical analysis for any future work hoping to constrain the Triassic–Jurassic boundary.

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Appendix 1

Core logs for DMP Harvey 2

Legend for Harvey 2 core logs

Lithology

- Sandstone
- Clay-rich sandstone
- Clay-rich siltstone
- Sandy claystone
- Cross-stratification
- Trough cross-stratification
- Ripple lamination
- Horizontal lamination
- Flaser bedding
- Wavy bedding
- Convolute bedding
- Slump
- Mud drape
- Slickenside
- Sandstone patches
- Clay-rich patches
- Sandstone lenses
- Sand dyke
- Dendritic structure
- Flame structure
- Granules - pebbles
- Clay-rich clasts
- Sandstone clasts
- Organic material

▲ //	Organic material defining lamination
m	Mottling
dm	Diffuse mottling
uc	Unconsolidated sediment
Py	Pyrite
Fe	Iron stain
xx	Salt crust

Grain size classification

Mudst	Mudstone
Wkst	Wackestone
Packst	Packstone
Grainst	Grainstone
Bndst/ Frmst	Bindstone/Framestone
Fs	Fine sand
Ms	Medium sand
Cs	Coarse sand
Vcs	Very coarse sand

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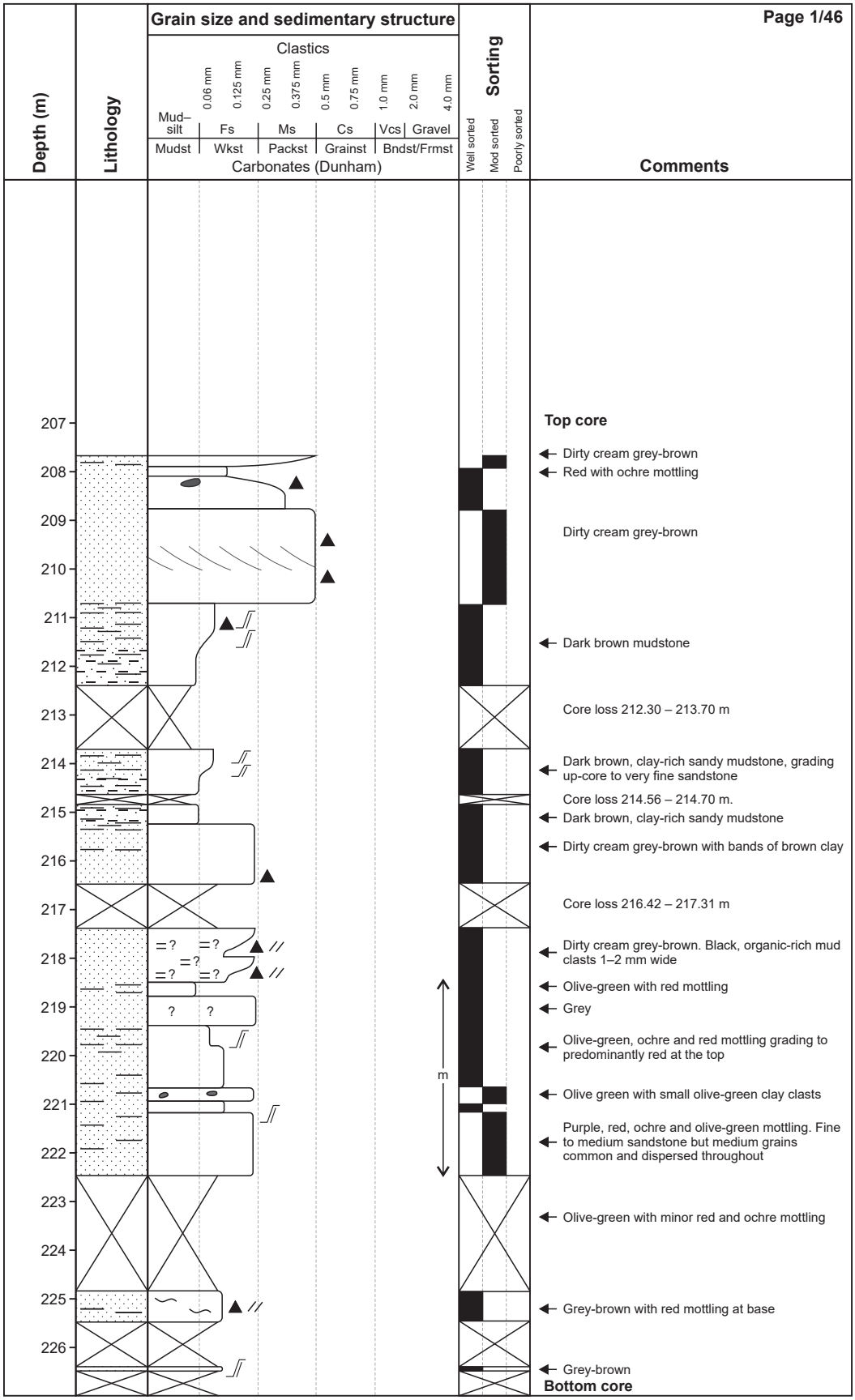
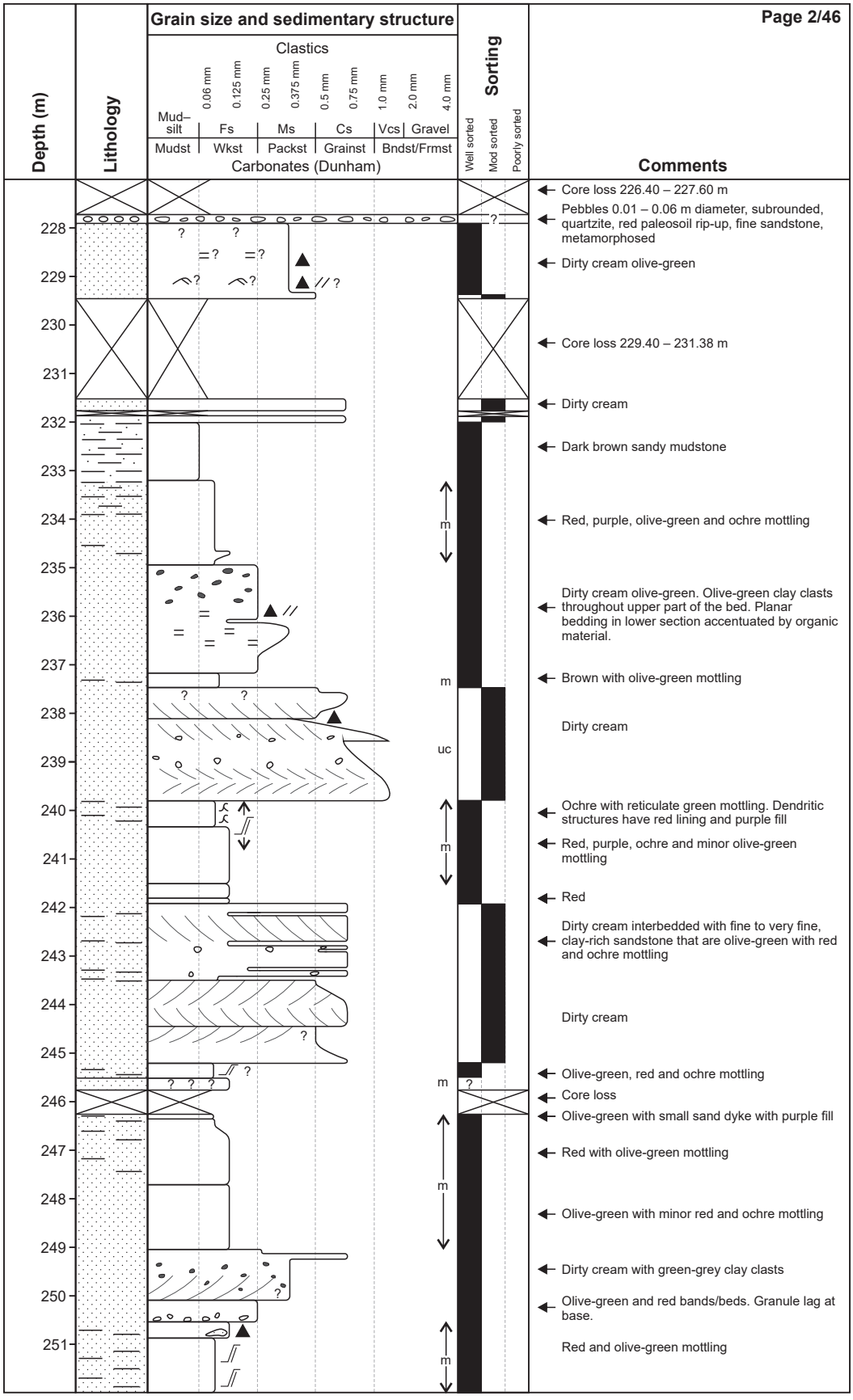

Page 1/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
m
Top core
Dirty cream grey-brown
Red with ochre mottling
Dirty cream grey-brown
Dark brown mudstone
Core loss 212.30 – 213.70 m
Dark brown, clay-rich sandy mudstone, grading up-core to very fine sandstone
Core loss 214.56 – 214.70 m.
Dark brown, clay-rich sandy mudstone
Dirty cream grey-brown with bands of brown clay
Core loss 216.42 – 217.31 m
Dirty cream grey-brown. Black, organic-rich mud clasts 1–2 mm wide
Olive-green with red mottling
Grey
Olive-green, ochre and red mottling grading to predominantly red at the top
Olive green with small olive-green clay clasts
Purple, red, ochre and olive-green mottling. Fine to medium sandstone but medium grains common and dispersed throughout
Olive-green with minor red and ochre mottling
Grey-brown with red mottling at base
Grey-brown
Bottom core


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 2/46
Comments
228
229
230
231
232
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235
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243
244
245
246
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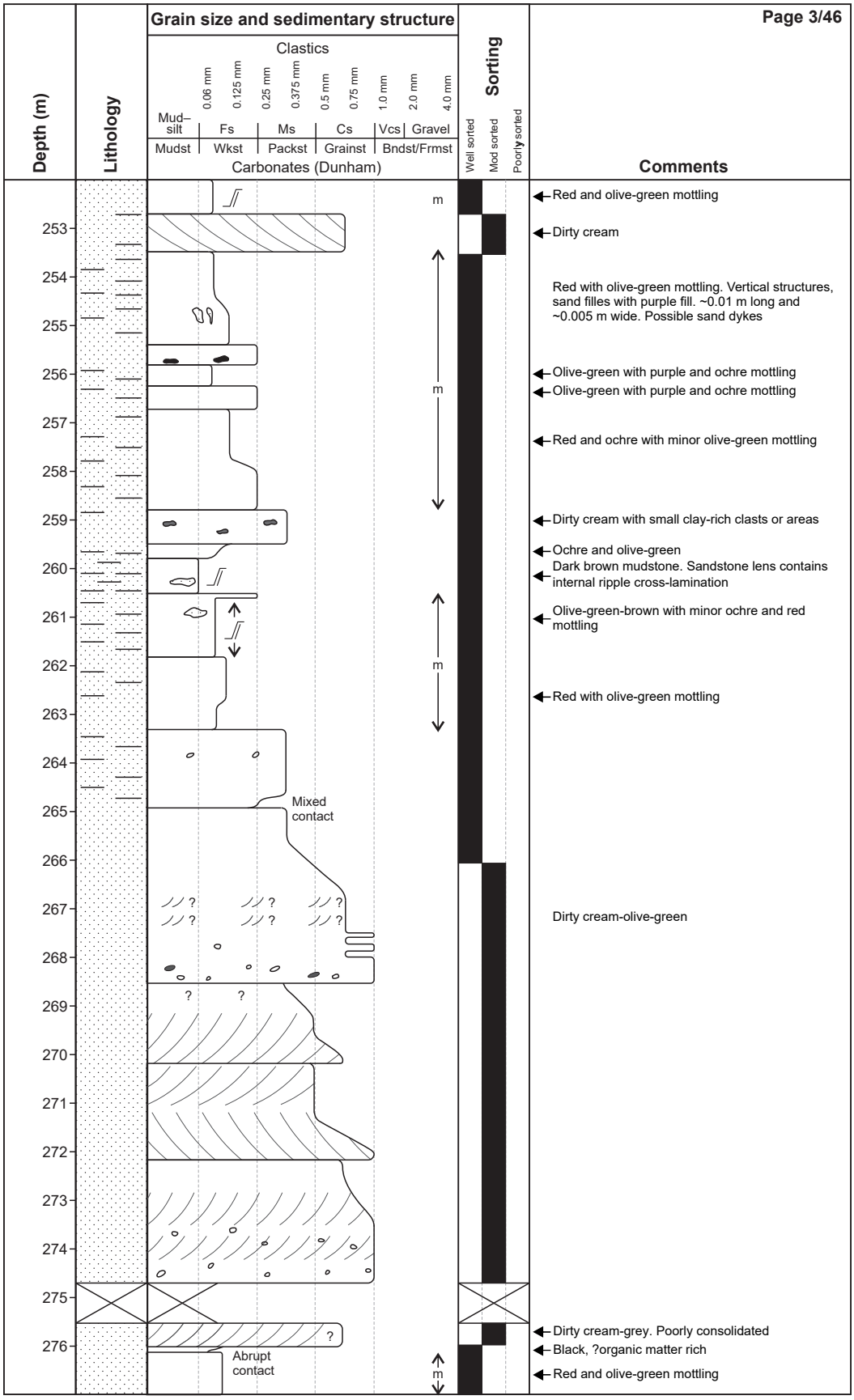
248
249
250
251
m
uc
Core loss 226.40 – 227.60 m
Pebbles 0.01 – 0.06 m diameter, subrounded, quartzite, red paleosoil rip-up, fine sandstone, metamorphosed
Dirty cream olive-green
Core loss 229.40 – 231.38 m
Dirty cream
Dark brown sandy mudstone
Red, purple, olive-green and ochre mottling
Dirty cream olive-green. Olive-green clay clasts throughout upper part of the bed. Planar bedding in lower section accentuated by organic material.
Brown with olive-green mottling
Dirty cream
Ochre with reticulate green mottling. Dendritic structures have red lining and purple fill
Red, purple, ochre and minor olive-green mottling
Red
Dirty cream interbedded with fine to very fine, clay-rich sandstone that are olive-green with red and ochre mottling
Dirty cream
Olive-green, red and ochre mottling
Core loss
Olive-green with small sand dyke with purple fill
Red with olive-green mottling
Olive-green with minor red and ochre mottling
Dirty cream with green-grey clay clasts
Olive-green and red bands/beds. Granule lag at base.
Red and olive-green mottling


Page 3/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
253
254
255
256
257
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268
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270
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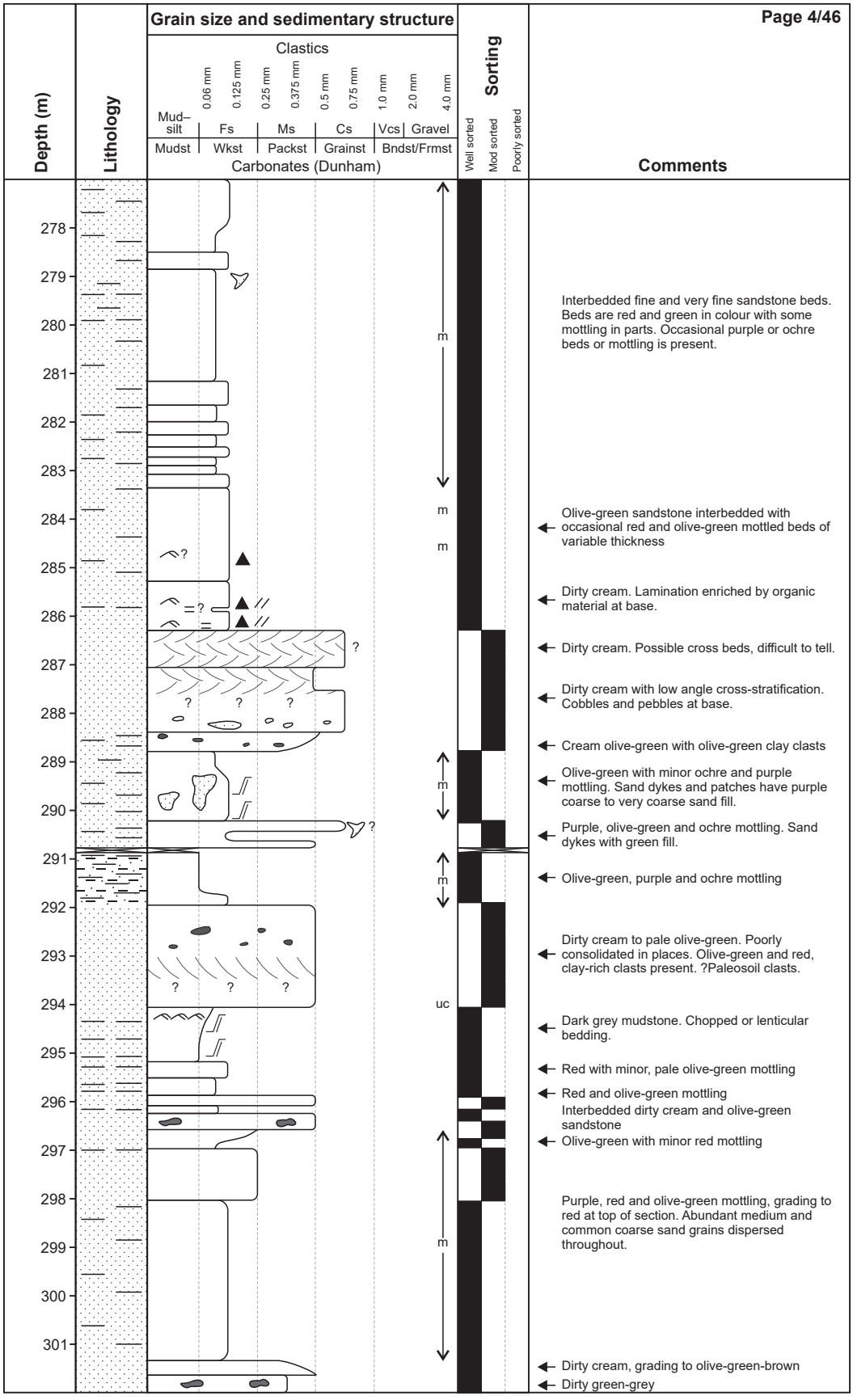
272
273
274
275
276
m
m
m
m
Mixed contact
Abrupt contact
Red and olive-green mottling
Dirty cream
Red with olive-green mottling. Vertical structures, sand filles with purple fill. ~0.01 m long and ~0.005 m wide. Possible sand dykes
Olive-green with purple and ochre mottling
Olive-green with purple and ochre mottling
Red and ochre with minor olive-green mottling
Dirty cream with small clay-rich clasts or areas
Ochre and olive-green
Dark brown mudstone. Sandstone lens contains internal ripple cross-lamination
Olive-green-brown with minor ochre and red mottling
Red with olive-green mottling
Dirty cream-olive-green
Dirty cream-grey. Poorly consolidated
Black, ?organic matter rich
Red and olive-green mottling


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 4/46
Comments
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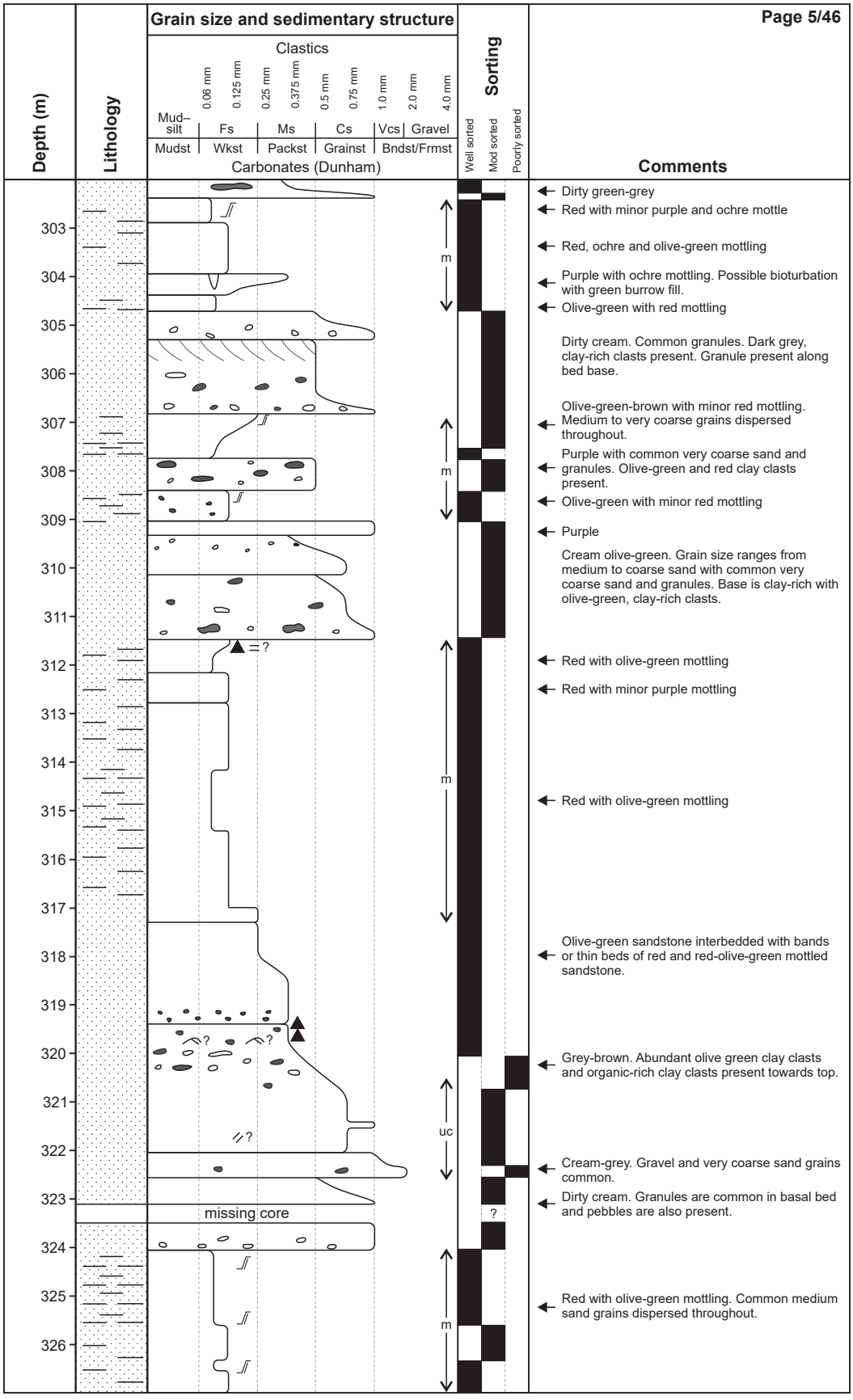
Interbedded fine and very fine sandstone beds. Beds are red and green in colour with some mottling in parts. Occasional purple or ochre beds or mottling is present.
Olive-green sandstone interbedded with occasional red and olive-green mottled beds of variable thickness
Dirty cream. Lamination enriched by organic material at base.
Dirty cream. Possible cross beds, difficult to tell.
Dirty cream with low angle cross-stratification. Cobbles and pebbles at base.
Cream olive-green with olive-green clay clasts
Olive-green with minor ochre and purple mottling. Sand dykes and patches have purple coarse to very coarse sand fill.
Purple, olive-green and ochre mottling. Sand dykes with green fill.
Olive-green, purple and ochre mottling
Dirty cream to pale olive-green. Poorly consolidated in places. Olive-green and red, clay-rich clasts present. ?Paleosoil clasts.
Dark grey mudstone. Chopped or lenticular bedding.
Red with minor, pale olive-green mottling
Red and olive-green mottling
Interbedded dirty cream and olive-green sandstone
Olive-green with minor red mottling
Purple, red and olive-green mottling, grading to red at top of section. Abundant medium and common coarse sand grains dispersed throughout.
Dirty cream, grading to olive-green-brown
Dirty green-grey


Page 5/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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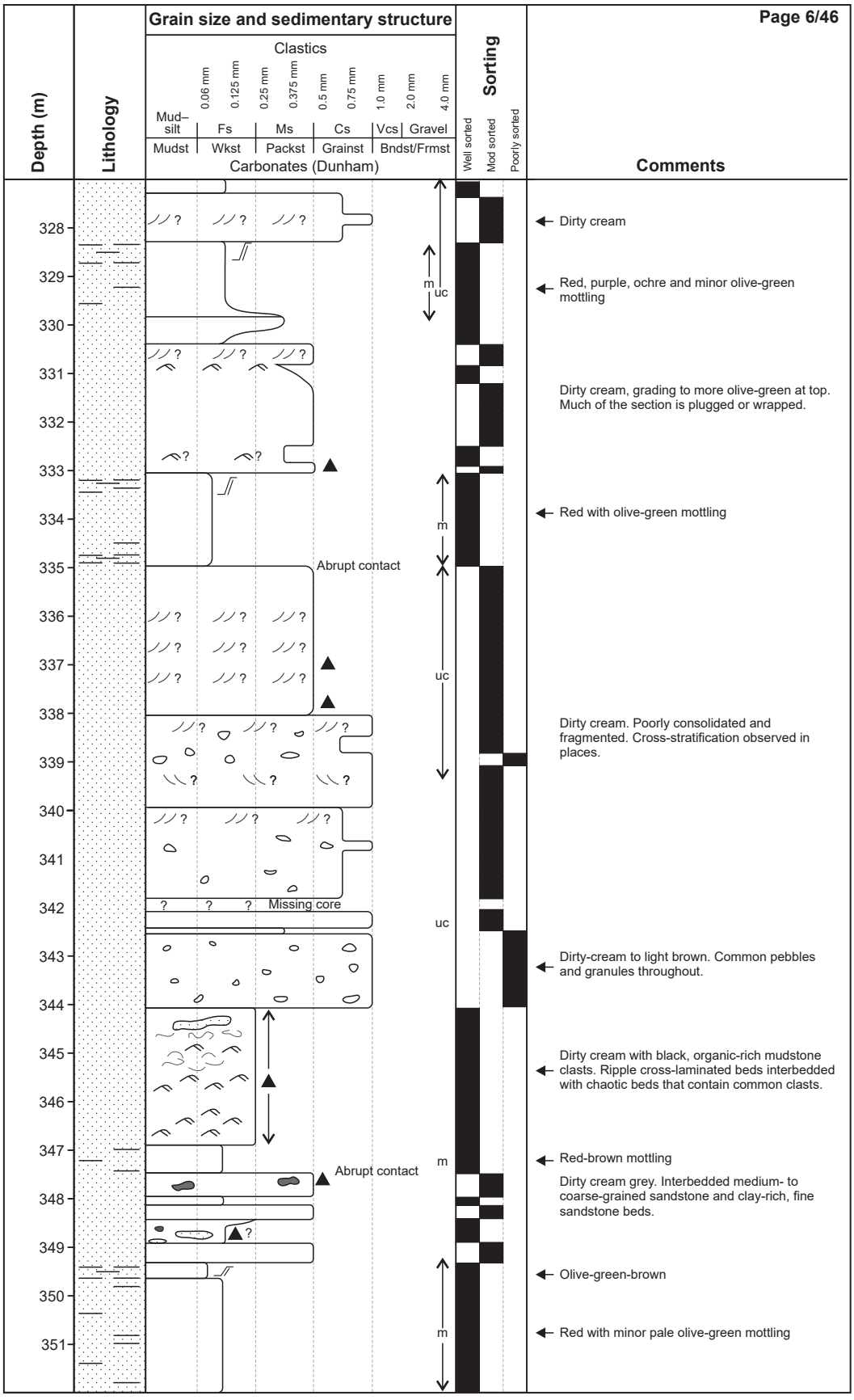
missing core
?
Dirty green-grey
Red with minor purple and ochre mottle
Red, ochre and olive-green mottling
Purple with ochre mottling. Possible bioturbation with green burrow fill.
Olive-green with red mottling
Dirty cream. Common granules. Dark grey, clay-rich clasts present. Granule present along bed base.
Olive-green-brown with minor red mottling. Medium to very coarse grains dispersed throughout.
Purple with common very coarse sand and granules. Olive-green and red clay clasts present.
Olive-green with minor red mottling
Purple
Cream olive-green. Grain size ranges from medium to coarse sand with common very coarse sand and granules. Base is clay-rich with olive-green, clay-rich clasts.
Red with olive-green mottling
Red with minor purple mottling
Red with olive-green mottling
Olive-green sandstone interbedded with bands or thin beds of red and red-olive-green mottled sandstone.
Grey-brown. Abundant olive green clay clasts and organic-rich clay clasts present towards top.
Cream-grey. Gravel and very coarse sand grains common.
Dirty cream. Granules are common in basal bed and pebbles are also present.
Red with olive-green mottling. Common medium sand grains dispersed throughout.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
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Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 6/46
Comments
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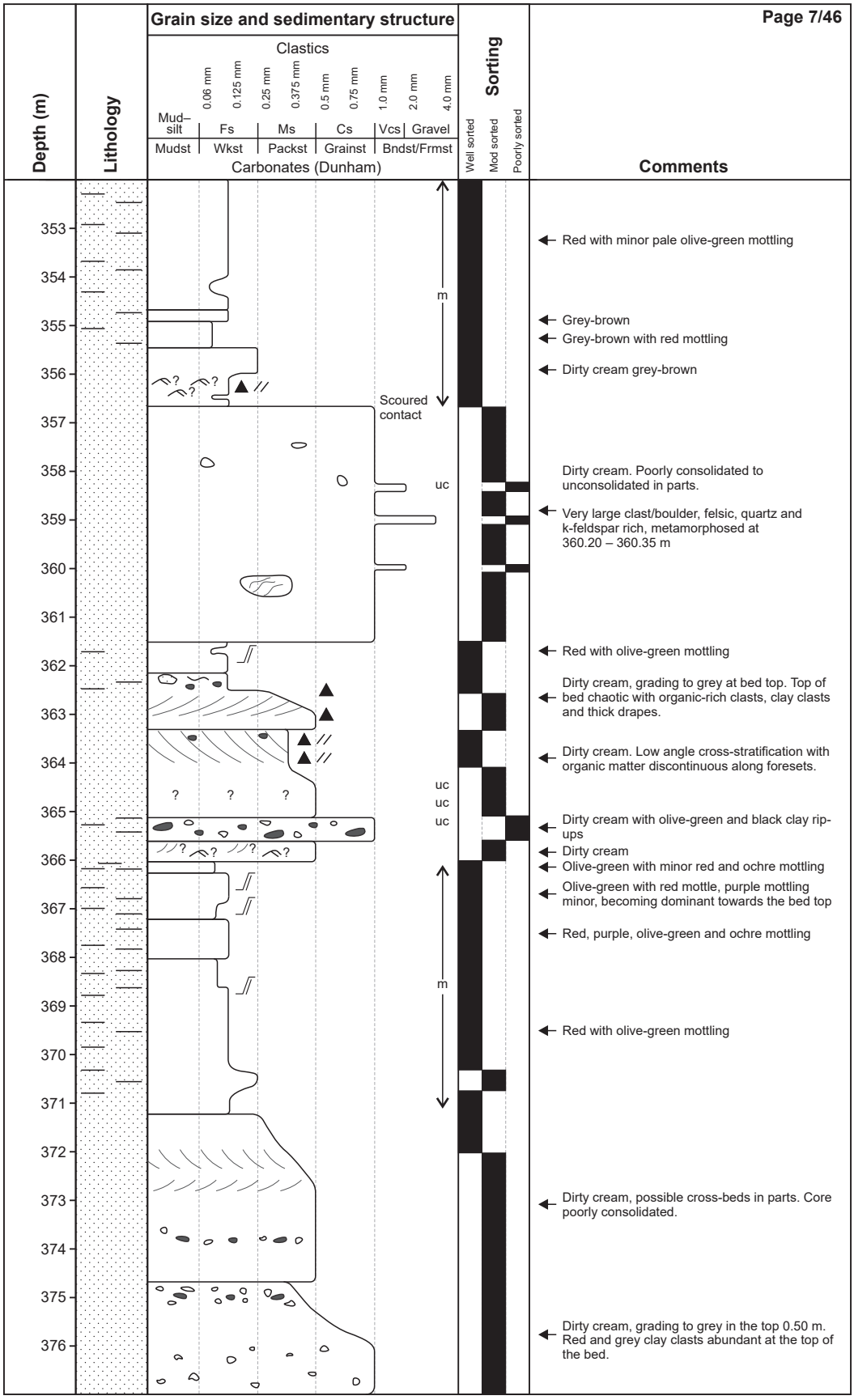
Abrupt contact
Abrupt contact
Missing core
Dirty cream
Red, purple, ochre and minor olive-green mottling
Dirty cream, grading to more olive-green at top. Much of the section is plugged or wrapped.
Red with olive-green mottling
Dirty cream. Poorly consolidated and fragmented. Cross-stratification observed in places.
Dirty-cream to light brown. Common pebbles and granules throughout.
Dirty cream with black, organic-rich mudstone clasts. Ripple cross-laminated beds interbedded with chaotic beds that contain common clasts.
Red-brown mottling
Dirty cream grey. Interbedded medium- to coarse-grained sandstone and clay-rich, fine sandstone beds.
Olive-green-brown
Red with minor pale olive-green mottling


Page 7/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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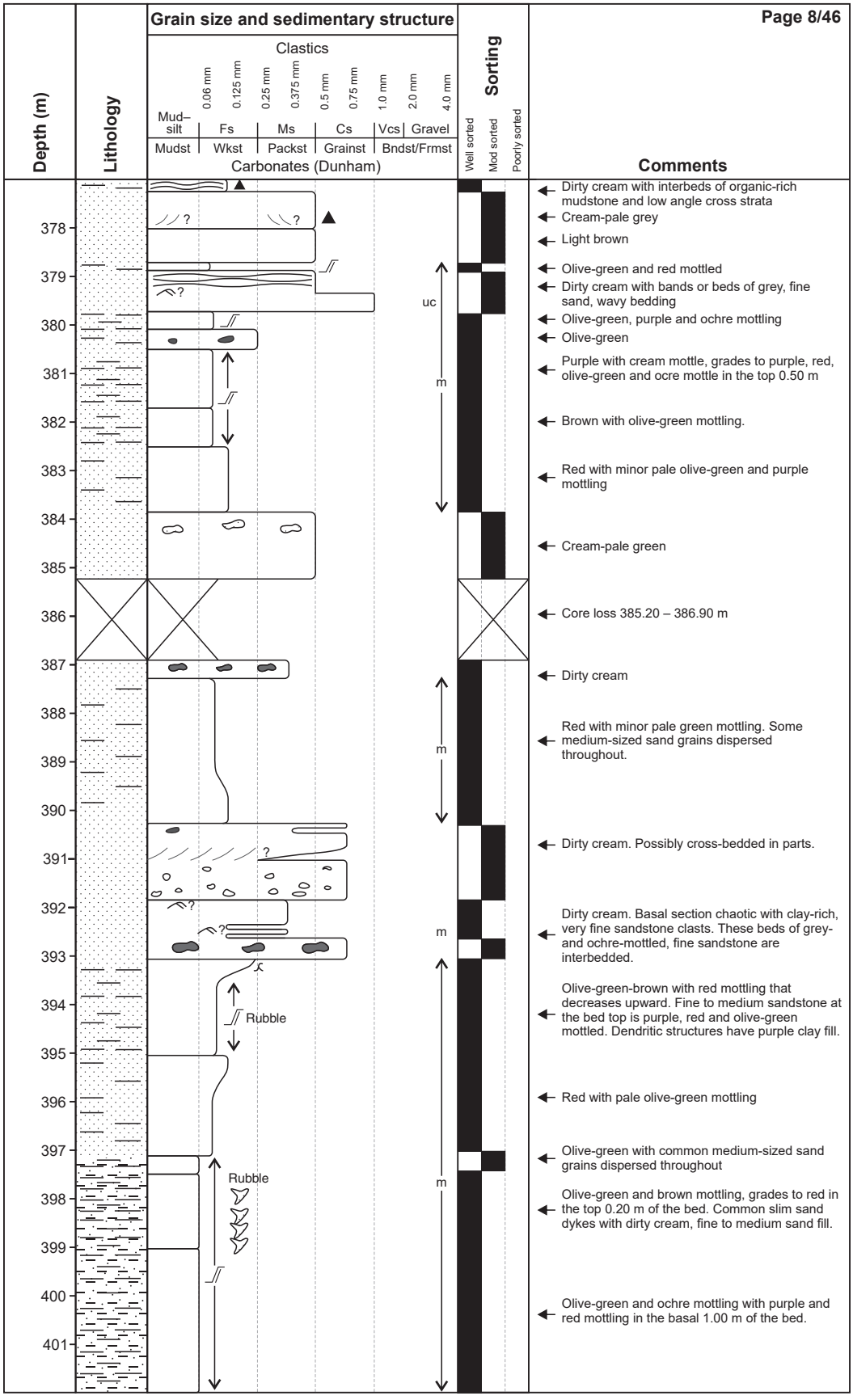
372
373
374
375
376
m
Scoured contact
uc
uc
uc
uc
m
Red with minor pale olive-green mottling
Grey-brown
Grey-brown with red mottling
Dirty cream grey-brown
Dirty cream. Poorly consolidated to unconsolidated in parts.
Very large clast/boulder, felsic, quartz and k-feldspar rich, metamorphosed at 360.20 – 360.35 m
Red with olive-green mottling
Dirty cream, grading to grey at bed top. Top of bed chaotic with organic-rich clasts, clay clasts and thick drapes.
Dirty cream. Low angle cross-stratification with organic matter discontinuous along foresets.
Dirty cream with olive-green and black clay rip-ups
Dirty cream
Olive-green with minor red and ochre mottling
Olive-green with red mottle, purple mottling minor, becoming dominant towards the bed top
Red, purple, olive-green and ochre mottling
Red with olive-green mottling
Dirty cream, possible cross-beds in parts. Core poorly consolidated.
Dirty cream, grading to grey in the top 0.50 m. Red and grey clay clasts abundant at the top of the bed.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 8/46
Comments
uc
m
m
m
m
Rubble
Rubble
378
379
380
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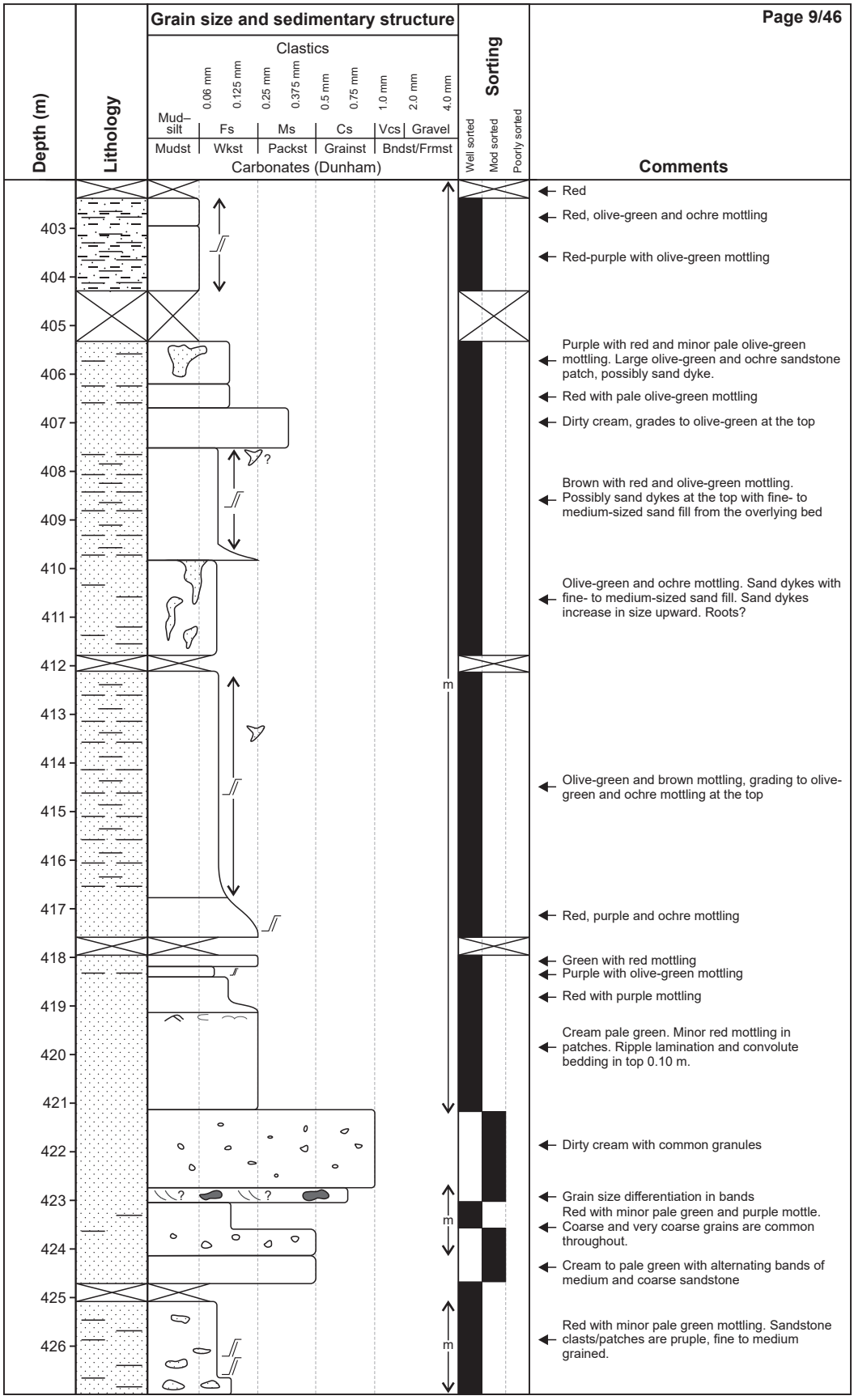
401
Dirty cream with interbeds of organic-rich mudstone and low angle cross strata
Cream-pale grey
Light brown
Olive-green and red mottled
Dirty cream with bands or beds of grey, fine sand, wavy bedding
Olive-green, purple and ochre mottling
Olive-green
Purple with cream mottle, grades to purple, red, olive-green and ocre mottle in the top 0.50 m
Brown with olive-green mottling.
Red with minor pale olive-green and purple mottling
Cream-pale green
Core loss 385.20 – 386.90 m
Dirty cream
Red with minor pale green mottling. Some medium-sized sand grains dispersed throughout.
Dirty cream. Possibly cross-bedded in parts.
Dirty cream. Basal section chaotic with clay-rich, very fine sandstone clasts. These beds of grey- and ochre-mottled, fine sandstone are interbedded.
Olive-green-brown with red mottling that decreases upward. Fine to medium sandstone at the bed top is purple, red and olive-green mottled. Dendritic structures have purple clay fill.
Red with pale olive-green mottling
Olive-green with common medium-sized sand grains dispersed throughout
Olive-green and brown mottling, grades to red in the top 0.20 m of the bed. Common slim sand dykes with dirty cream, fine to medium sand fill.
Olive-green and ochre mottling with purple and red mottling in the basal 1.00 m of the bed.


Page 9/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
403
404
405
406
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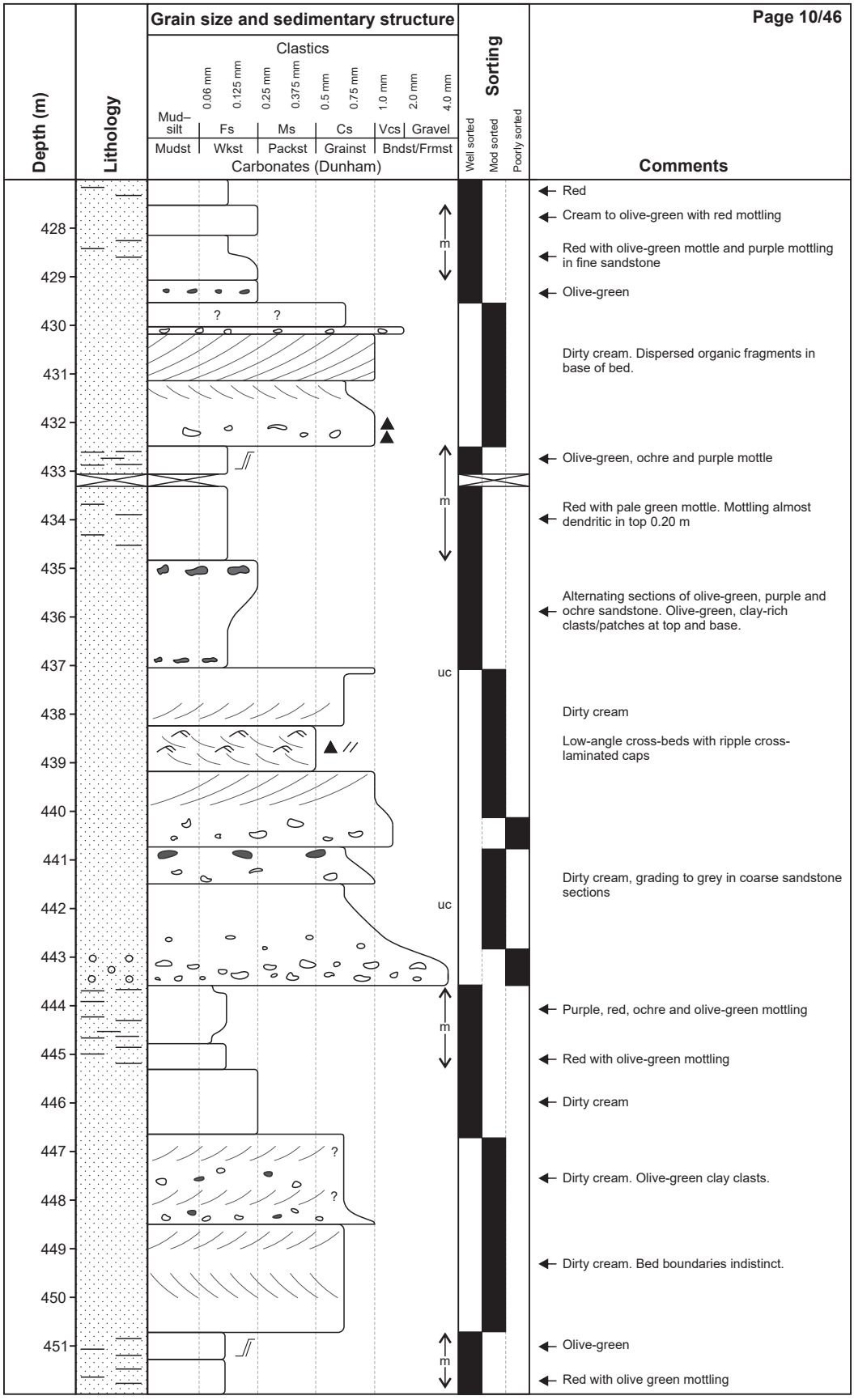
418
419
420
421
422
423
424
425
426
m
m
m
Red
Red, olive-green and ochre mottling
Red-purple with olive-green mottling
Purple with red and minor pale olive-green mottling. Large olive-green and ochre sandstone patch, possibly sand dyke.
Red with pale olive-green mottling
Dirty cream, grades to olive-green at the top
Brown with red and olive-green mottling. Possibly sand dykes at the top with fine- to medium-sized sand fill from the overlying bed
Olive-green and ochre mottling. Sand dykes with fine- to medium-sized sand fill. Sand dykes increase in size upward. Roots?
Olive-green and brown mottling, grading to olive-green and ochre mottling at the top
Red, purple and ochre mottling
Green with red mottling
Purple with olive-green mottling
Red with purple mottling
Cream pale green. Minor red mottling in patches. Ripple lamination and convolute bedding in top 0.10 m.
Dirty cream with common granules
Grain size differentiation in bands
Red with minor pale green and purple mottle.
Coarse and very coarse grains are common throughout.
Cream to pale green with alternating bands of medium and coarse sandstone
Red with minor pale green mottling. Sandstone clasts/patches are pruple, fine to medium grained.


Grain size and sedimentary structure
Page 10/46
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
428
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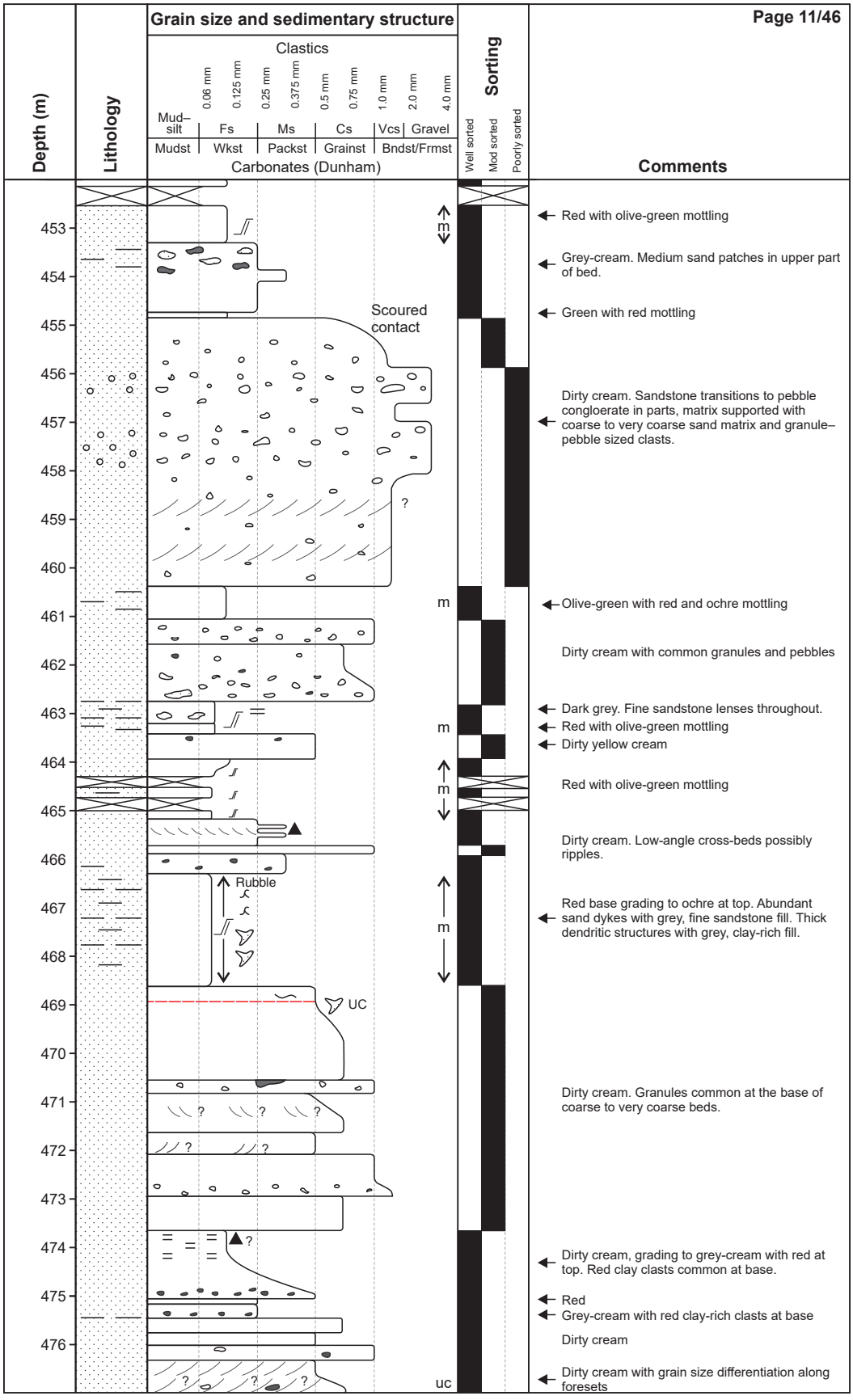
449
450
451
m
uc
Red
Cream to olive-green with red mottling
Red with olive-green mottle and purple mottling in fine sandstone
Olive-green
Dirty cream. Dispersed organic fragments in base of bed.
Olive-green, ochre and purple mottle
Red with pale green mottle. Mottling almost dendritic in top 0.20 m
Alternating sections of olive-green, purple and ochre sandstone. Olive-green, clay-rich clasts/patches at top and base.
Dirty cream
Low-angle cross-beds with ripple cross-laminated caps
Dirty cream, grading to grey in coarse sandstone sections
Purple, red, ochre and olive-green mottling
Red with olive-green mottling
Dirty cream
Dirty cream. Olive-green clay clasts.
Dirty cream. Bed boundaries indistinct.
Olive-green
Red with olive green mottling


Page 11/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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472
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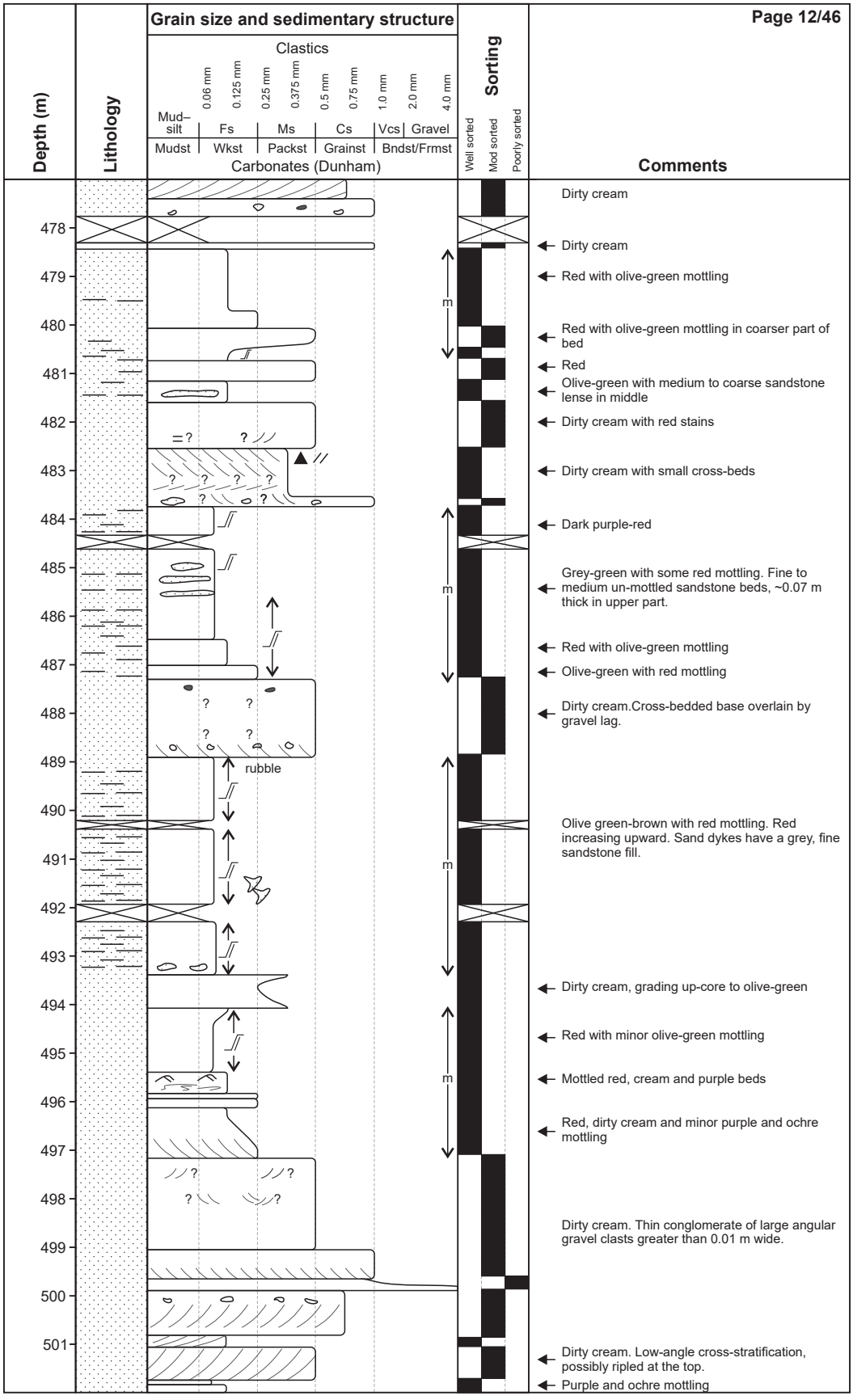
474
475
476
Scoured contact
Rubble
UC
m
m
m
m
uc
Red with olive-green mottling
Grey-cream. Medium sand patches in upper part of bed.
Green with red mottling
Dirty cream. Sandstone transitions to pebble congloerate in parts, matrix supported with coarse to very coarse sand matrix and granule–pebble sized clasts.
Olive-green with red and ochre mottling
Dirty cream with common granules and pebbles
Dark grey. Fine sandstone lenses throughout.
Red with olive-green mottling
Dirty yellow cream
Red with olive-green mottling
Dirty cream. Low-angle cross-beds possibly ripples.
Red base grading to ochre at top. Abundant sand dykes with grey, fine sandstone fill. Thick dendritic structures with grey, clay-rich fill.
Dirty cream. Granules common at the base of coarse to very coarse beds.
Dirty cream, grading to grey-cream with red at top. Red clay clasts common at base.
Red
Grey-cream with red clay-rich clasts at base
Dirty cream
Dirty cream with grain size differentiation along foresets


Grain size and sedimentary structure
Page 12/46
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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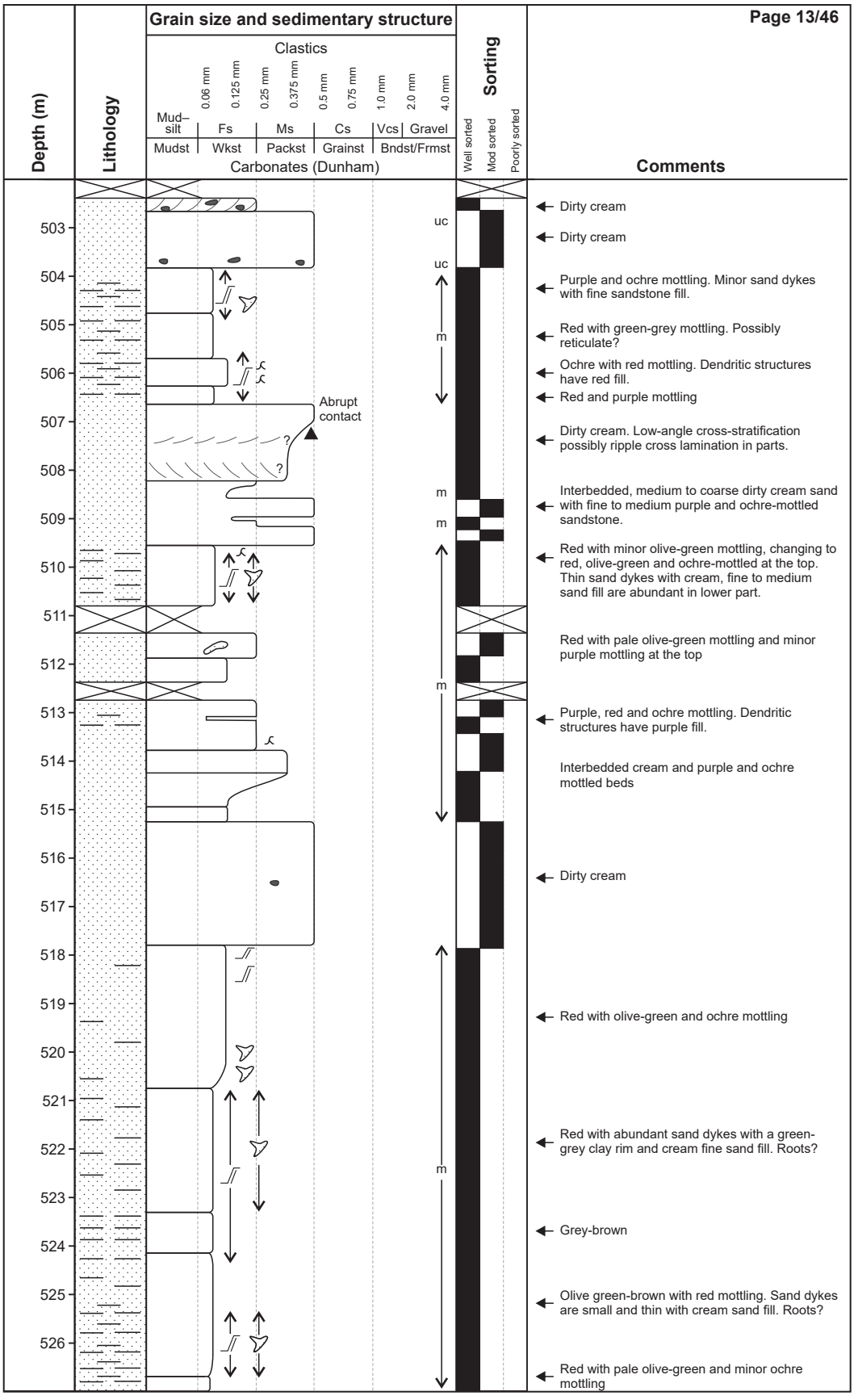
501
m
rubble
Dirty cream
Dirty cream
Red with olive-green mottling
Red with olive-green mottling in coarser part of bed
Red
Olive-green with medium to coarse sandstone lense in middle
Dirty cream with red stains
Dirty cream with small cross-beds
Dark purple-red
Grey-green with some red mottling. Fine to medium un-mottled sandstone beds, ~0.07 m thick in upper part.
Red with olive-green mottling
Olive-green with red mottling
Dirty cream.Cross-bedded base overlain by gravel lag.
Olive green-brown with red mottling. Red increasing upward. Sand dykes have a grey, fine sandstone fill.
Dirty cream, grading up-core to olive-green
Red with minor olive-green mottling
Mottled red, cream and purple beds
Red, dirty cream and minor purple and ochre mottling
Dirty cream. Thin conglomerate of large angular gravel clasts greater than 0.01 m wide.
Dirty cream. Low-angle cross-stratification, possibly ripled at the top.
Purple and ochre mottling


Page 13/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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Abrupt contact
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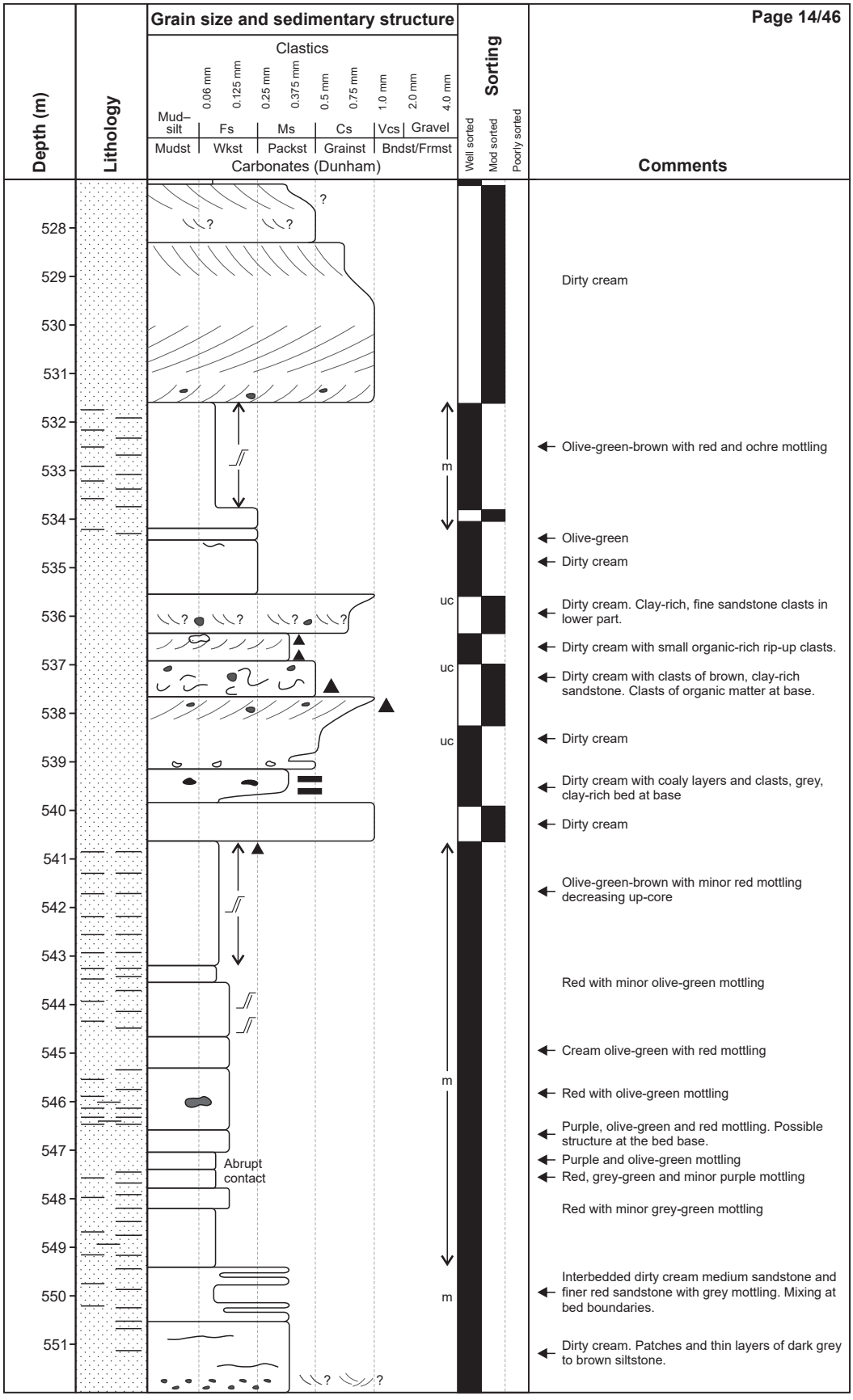
Dirty cream
Dirty cream
Purple and ochre mottling. Minor sand dykes with fine sandstone fill.
Red with green-grey mottling. Possibly reticulate?
Ochre with red mottling. Dendritic structures have red fill.
Red and purple mottling
Dirty cream. Low-angle cross-stratification possibly ripple cross lamination in parts.
Interbedded, medium to coarse dirty cream sand with fine to medium purple and ochre-mottled sandstone.
Red with minor olive-green mottling, changing to red, olive-green and ochre-mottled at the top. Thin sand dykes with cream, fine to medium sand fill are abundant in lower part.
Red with pale olive-green mottling and minor purple mottling at the top
Purple, red and ochre mottling. Dendritic structures have purple fill.
Interbedded cream and purple and ochre mottled beds
Dirty cream
Red with olive-green and ochre mottling
Red with abundant sand dykes with a green-grey clay rim and cream fine sand fill. Roots?
Grey-brown
Olive green-brown with red mottling. Sand dykes are small and thin with cream sand fill. Roots?
Red with pale olive-green and minor ochre mottling


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 14/46
Comments
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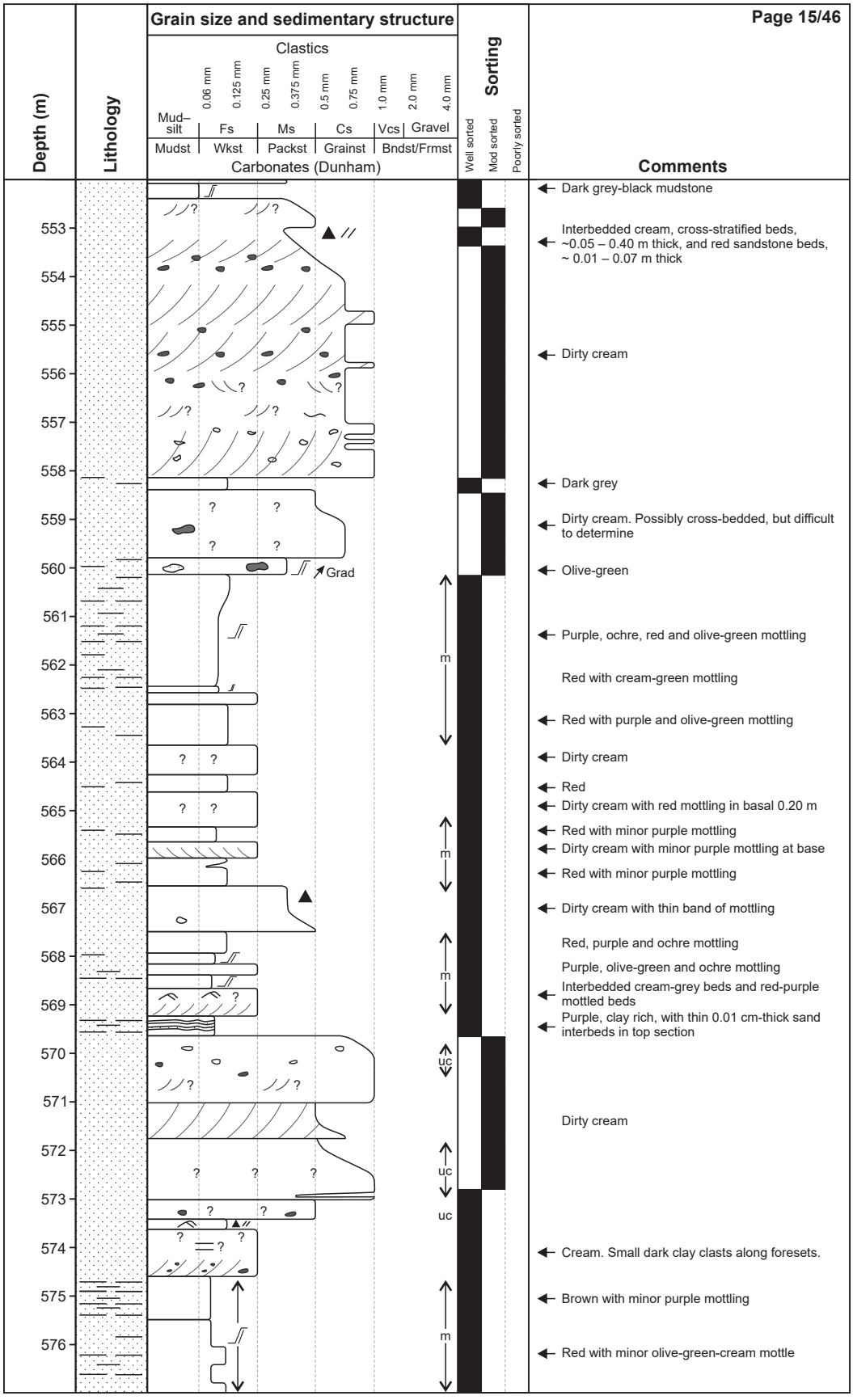
Abrupt contact
Dirty cream
Olive-green-brown with red and ochre mottling
Olive-green
Dirty cream
Dirty cream. Clay-rich, fine sandstone clasts in lower part.
Dirty cream with small organic-rich rip-up clasts.
Dirty cream with clasts of brown, clay-rich sandstone. Clasts of organic matter at base.
Dirty cream
Dirty cream with coaly layers and clasts, grey, clay-rich bed at base
Dirty cream
Olive-green-brown with minor red mottling decreasing up-core
Red with minor olive-green mottling
Cream olive-green with red mottling
Red with olive-green mottling
Purple, olive-green and red mottling. Possible structure at the bed base.
Purple and olive-green mottling
Red, grey-green and minor purple mottling
Red with minor grey-green mottling
Interbedded dirty cream medium sandstone and finer red sandstone with grey mottling. Mixing at bed boundaries.
Dirty cream. Patches and thin layers of dark grey to brown siltstone.


Page 15/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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Grad
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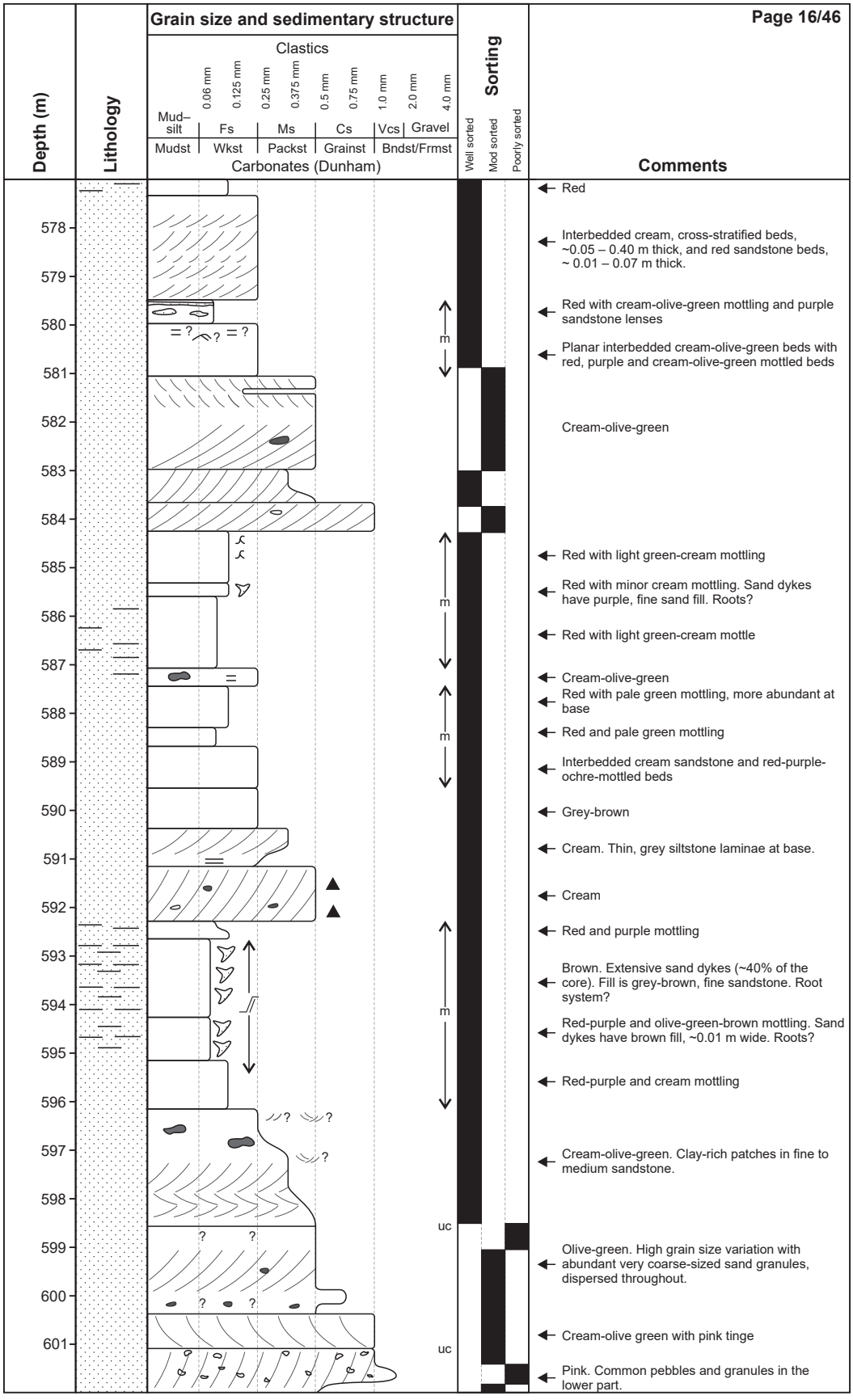
uc
m
Dark grey-black mudstone
Interbedded cream, cross-stratified beds, ~0.05 – 0.40 m thick, and red sandstone beds, ~ 0.01 – 0.07 m thick
Dirty cream
Dark grey
Dirty cream. Possibly cross-bedded, but difficult to determine
Olive-green
Purple, ochre, red and olive-green mottling
Red with cream-green mottling
Red with purple and olive-green mottling
Dirty cream
Red
Dirty cream with red mottling in basal 0.20 m
Red with minor purple mottling
Dirty cream with minor purple mottling at base
Red with minor purple mottling
Dirty cream with thin band of mottling
Red, purple and ochre mottling
Purple, olive-green and ochre mottling
Interbedded cream-grey beds and red-purple mottled beds
Purple, clay rich, with thin 0.01 cm-thick sand interbeds in top section
Dirty cream
Cream. Small dark clay clasts along foresets.
Brown with minor purple mottling
Red with minor olive-green-cream mottle


Grain size and sedimentary structure
Page 16/46
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
578
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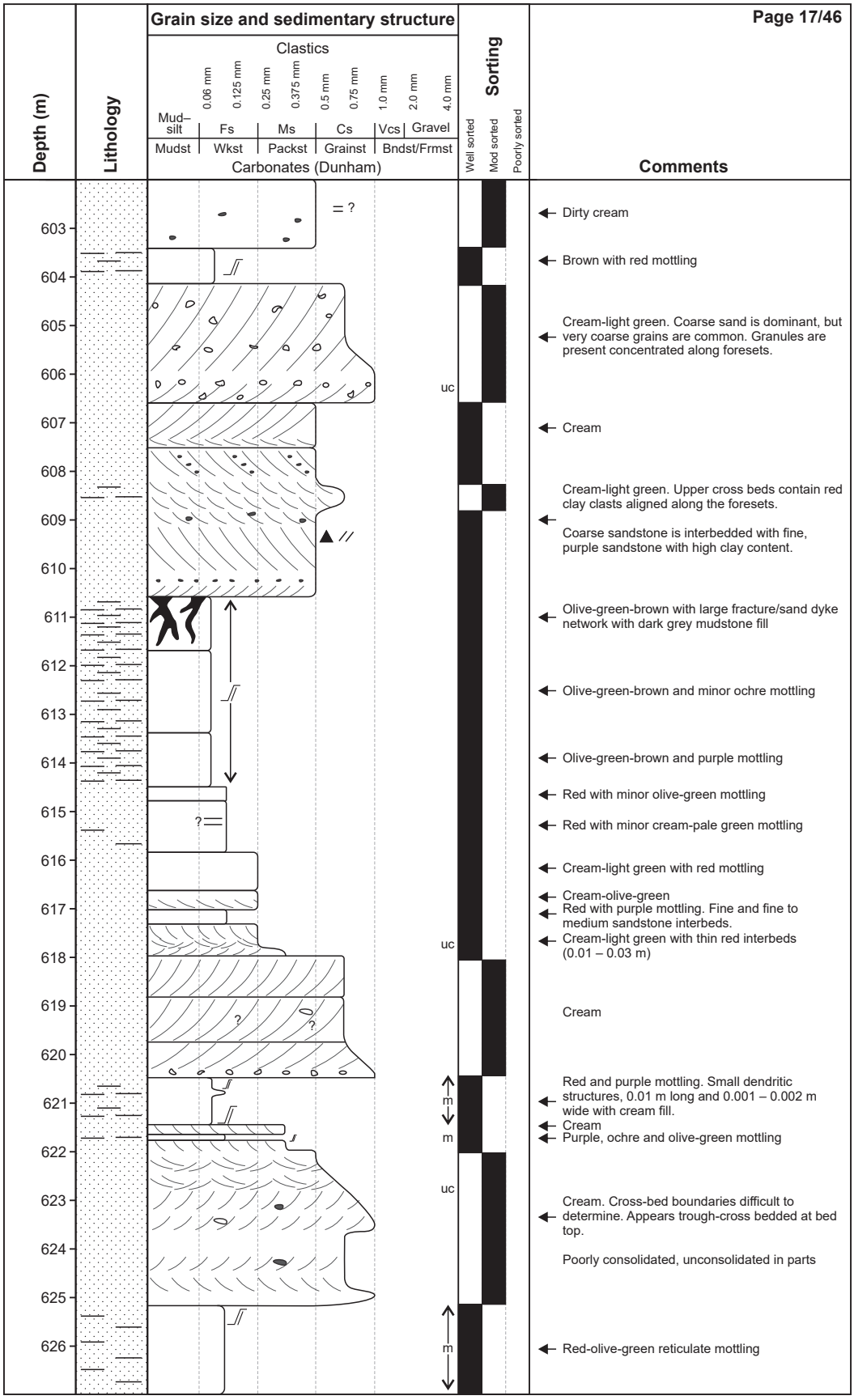
Red
Interbedded cream, cross-stratified beds, ~0.05 – 0.40 m thick, and red sandstone beds, ~ 0.01 – 0.07 m thick.
Red with cream-olive-green mottling and purple sandstone lenses
Planar interbedded cream-olive-green beds with red, purple and cream-olive-green mottled beds
Cream-olive-green
Red with light green-cream mottling
Red with minor cream mottling. Sand dykes have purple, fine sand fill. Roots?
Red with light green-cream mottle
Cream-olive-green
Red with pale green mottling, more abundant at base
Red and pale green mottling
Interbedded cream sandstone and red-purple-ochre-mottled beds
Grey-brown
Cream. Thin, grey siltstone laminae at base.
Cream
Red and purple mottling
Brown. Extensive sand dykes (~40% of the core). Fill is grey-brown, fine sandstone. Root system?
Red-purple and olive-green-brown mottling. Sand dykes have brown fill, ~0.01 m wide. Roots?
Red-purple and cream mottling
Cream-olive-green. Clay-rich patches in fine to medium sandstone.
Olive-green. High grain size variation with abundant very coarse-sized sand granules, dispersed throughout.
Cream-olive green with pink tinge
Pink. Common pebbles and granules in the lower part.


Page 17/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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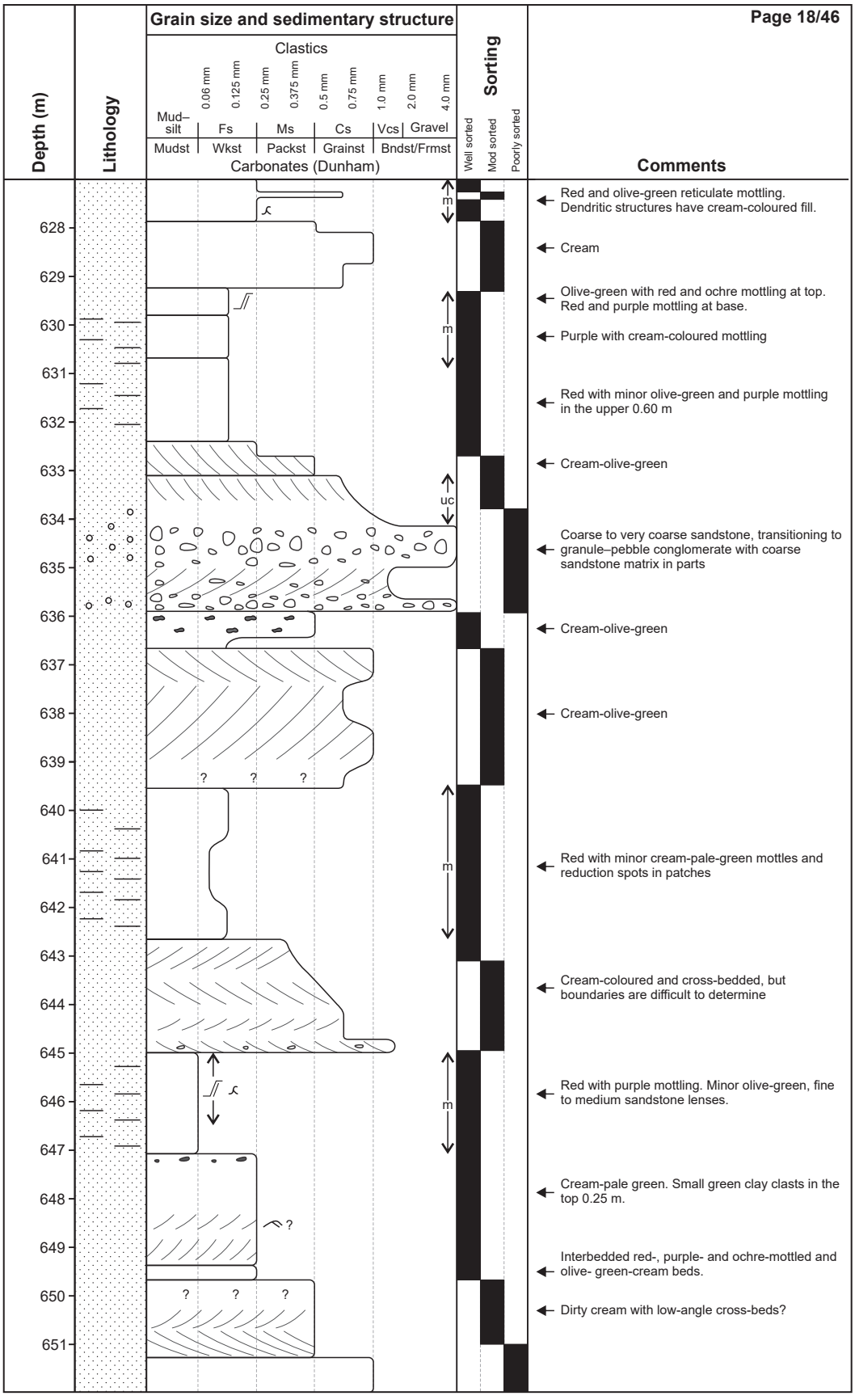
m
Dirty cream
Brown with red mottling
Cream-light green. Coarse sand is dominant, but very coarse grains are common. Granules are present concentrated along foresets.
Cream
Cream-light green. Upper cross beds contain red clay clasts aligned along the foresets.
Coarse sandstone is interbedded with fine, purple sandstone with high clay content.
Olive-green-brown with large fracture/sand dyke network with dark grey mudstone fill
Olive-green-brown and minor ochre mottling
Olive-green-brown and purple mottling
Red with minor olive-green mottling
Red with minor cream-pale green mottling
Cream-light green with red mottling
Cream-olive-green
Red with purple mottling. Fine and fine to medium sandstone interbeds.
Cream-light green with thin red interbeds (0.01 – 0.03 m)
Cream
Red and purple mottling. Small dendritic structures, 0.01 m long and 0.001 – 0.002 m wide with cream fill.
Cream
Purple, ochre and olive-green mottling
Cream. Cross-bed boundaries difficult to determine. Appears trough-cross bedded at bed top.
Poorly consolidated, unconsolidated in parts
Red-olive-green reticulate mottling


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 18/46
Comments
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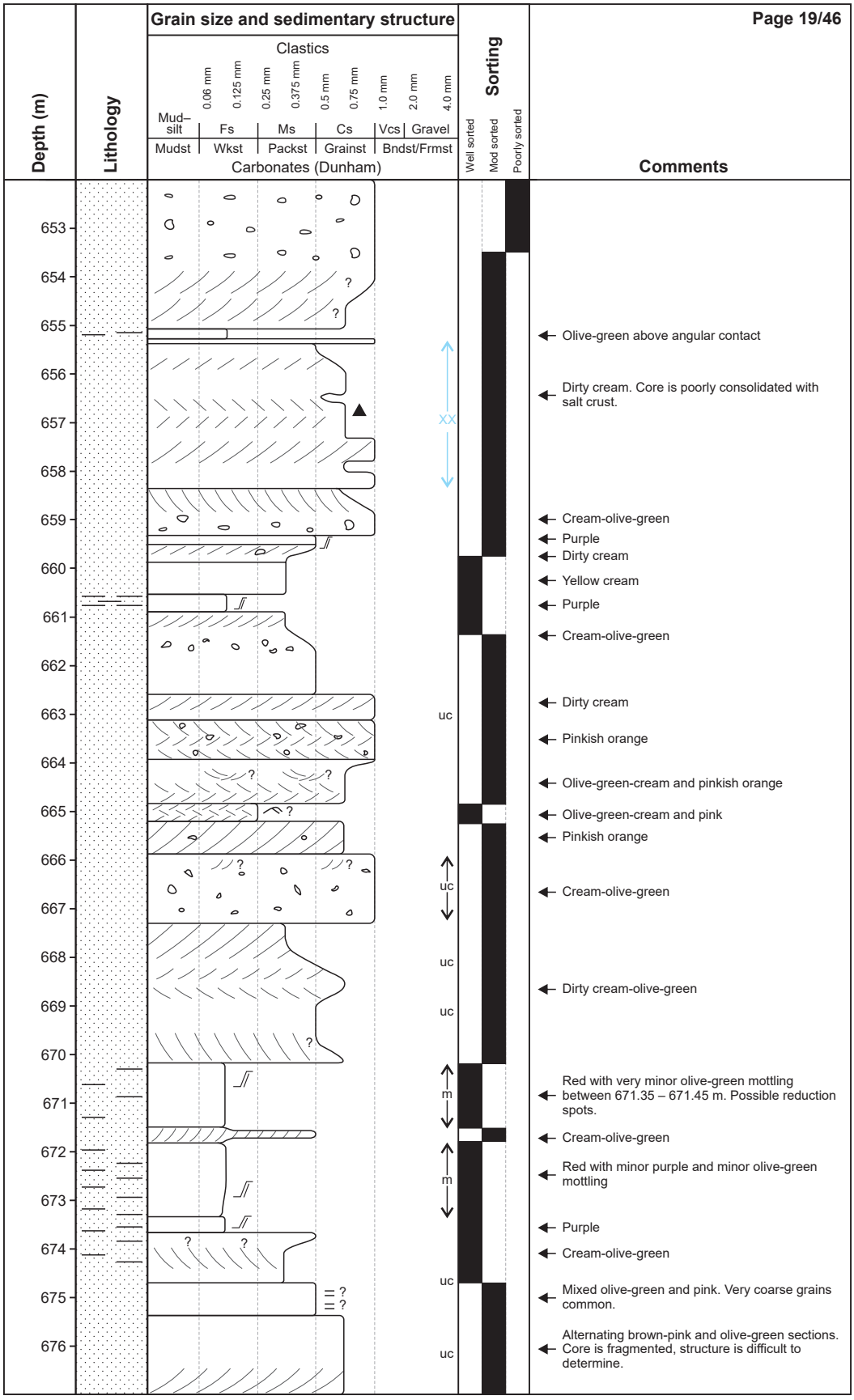
Red and olive-green reticulate mottling. Dendritic structures have cream-coloured fill.
Cream
Olive-green with red and ochre mottling at top. Red and purple mottling at base.
Purple with cream-coloured mottling
Red with minor olive-green and purple mottling in the upper 0.60 m
Cream-olive-green
Coarse to very coarse sandstone, transitioning to granule–pebble conglomerate with coarse sandstone matrix in parts
Cream-olive-green
Cream-olive-green
Red with minor cream-pale-green mottles and reduction spots in patches
Cream-coloured and cross-bedded, but boundaries are difficult to determine
Red with purple mottling. Minor olive-green, fine to medium sandstone lenses.
Cream-pale green. Small green clay clasts in the top 0.25 m.
Interbedded red-, purple- and ochre-mottled and olive- green-cream beds.
Dirty cream with low-angle cross-beds?


Page 19/46
Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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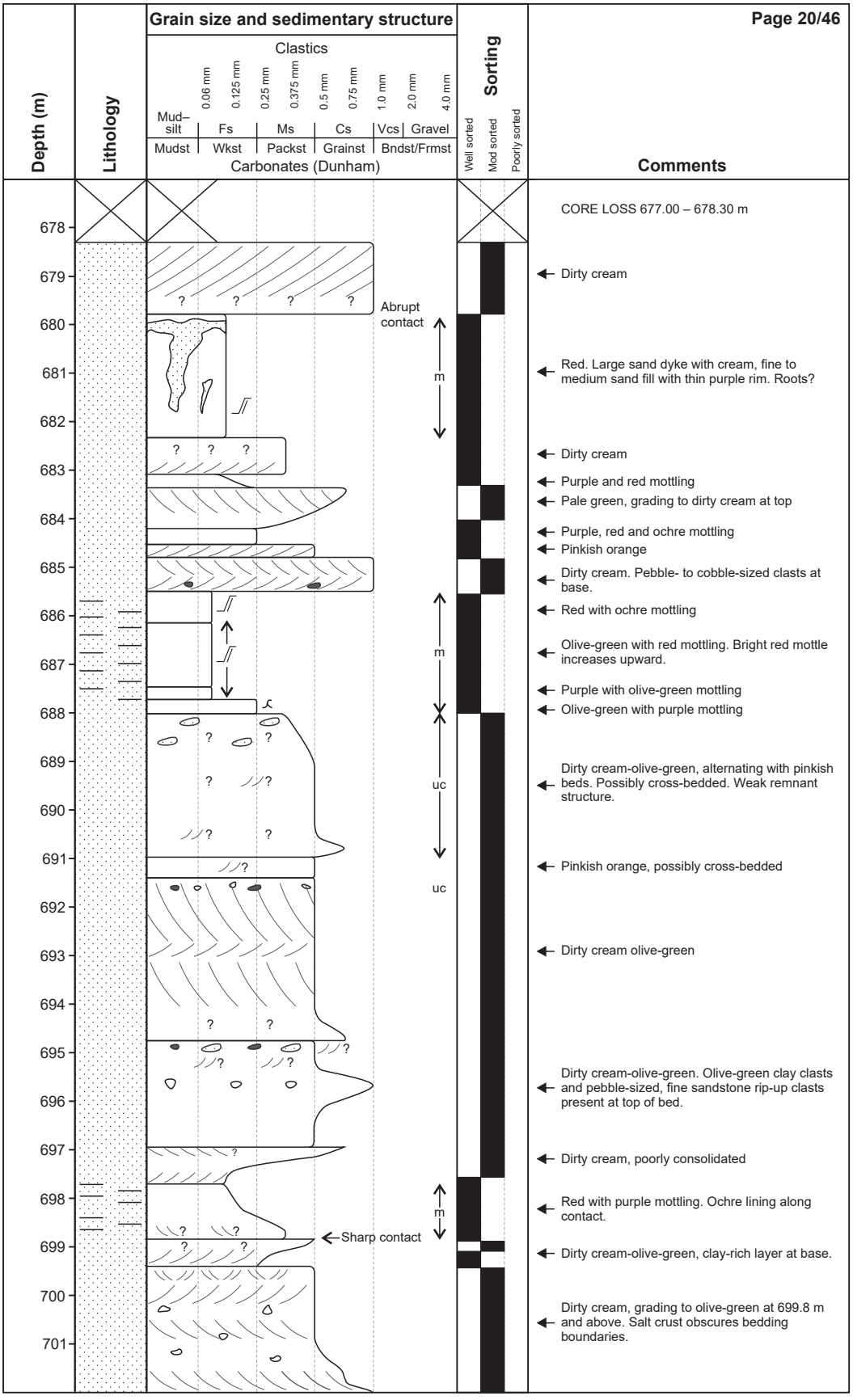
m
Olive-green above angular contact
Dirty cream. Core is poorly consolidated with salt crust.
Cream-olive-green
Purple
Dirty cream
Yellow cream
Purple
Cream-olive-green
Dirty cream
Pinkish orange
Olive-green-cream and pinkish orange
Olive-green-cream and pink
Pinkish orange
Cream-olive-green
Dirty cream-olive-green
Red with very minor olive-green mottling between 671.35 – 671.45 m. Possible reduction spots.
Cream-olive-green
Red with minor purple and minor olive-green mottling
Purple
Cream-olive-green
Mixed olive-green and pink. Very coarse grains common.
Alternating brown-pink and olive-green sections. Core is fragmented, structure is difficult to determine.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 20/46
Comments
CORE LOSS 677.00 – 678.30 m
Dirty cream
Abrupt contact
Red. Large sand dyke with cream, fine to medium sand fill with thin purple rim. Roots?
Dirty cream
Purple and red mottling
Pale green, grading to dirty cream at top
Purple, red and ochre mottling
Pinkish orange
Dirty cream. Pebble- to cobble-sized clasts at base.
Red with ochre mottling
Olive-green with red mottling. Bright red mottle increases upward.
Purple with olive-green mottling
Olive-green with purple mottling
Dirty cream-olive-green, alternating with pinkish beds. Possibly cross-bedded. Weak remnant structure.
Pinkish orange, possibly cross-bedded
Dirty cream olive-green
Dirty cream-olive-green. Olive-green clay clasts and pebble-sized, fine sandstone rip-up clasts present at top of bed.
Dirty cream, poorly consolidated
Red with purple mottling. Ochre lining along contact.
Sharp contact
Dirty cream-olive-green, clay-rich layer at base.
Dirty cream, grading to olive-green at 699.8 m and above. Salt crust obscures bedding boundaries.
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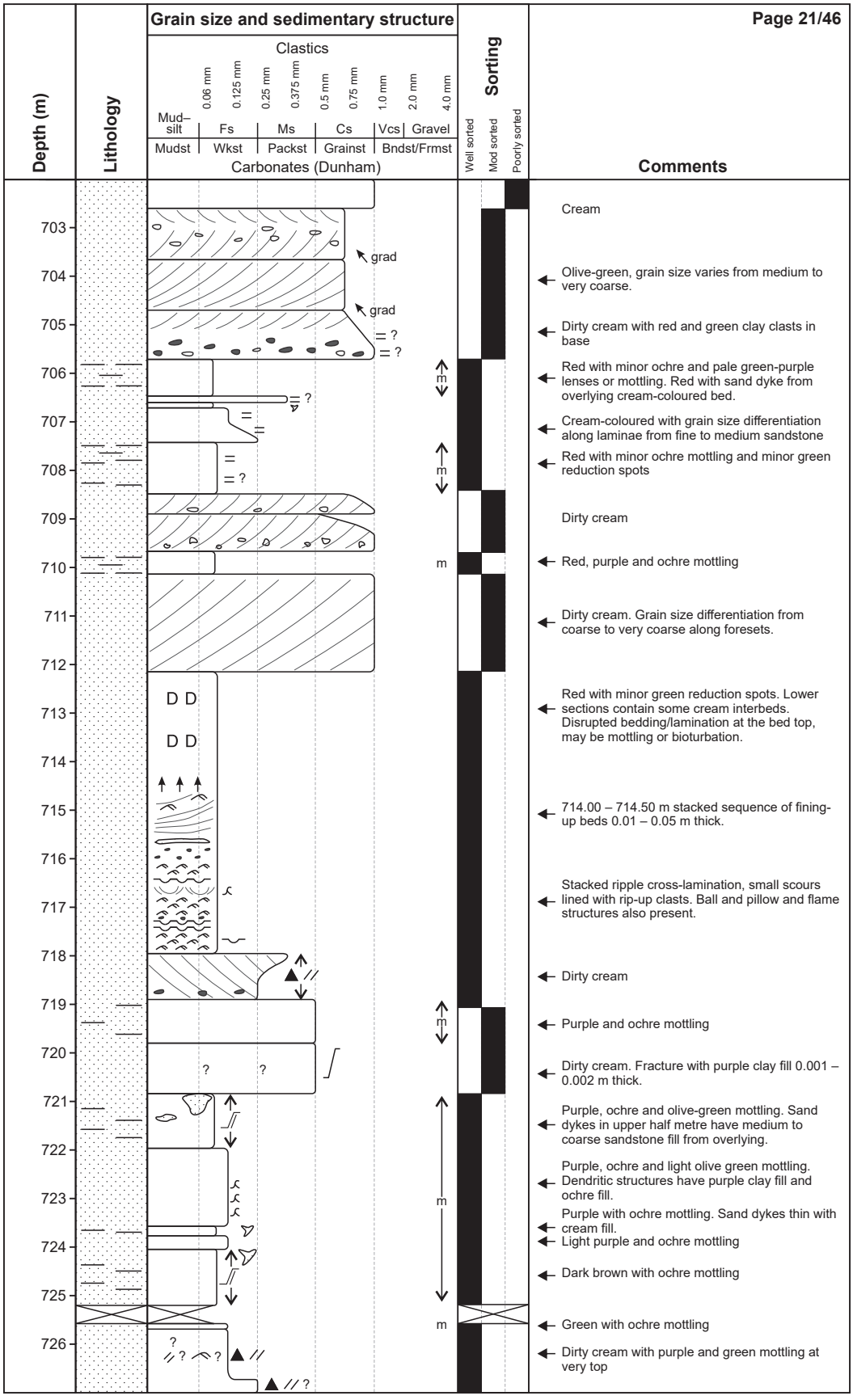
Depth (m)
Lithology
Grain size and sedimentary structure
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Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 21/46
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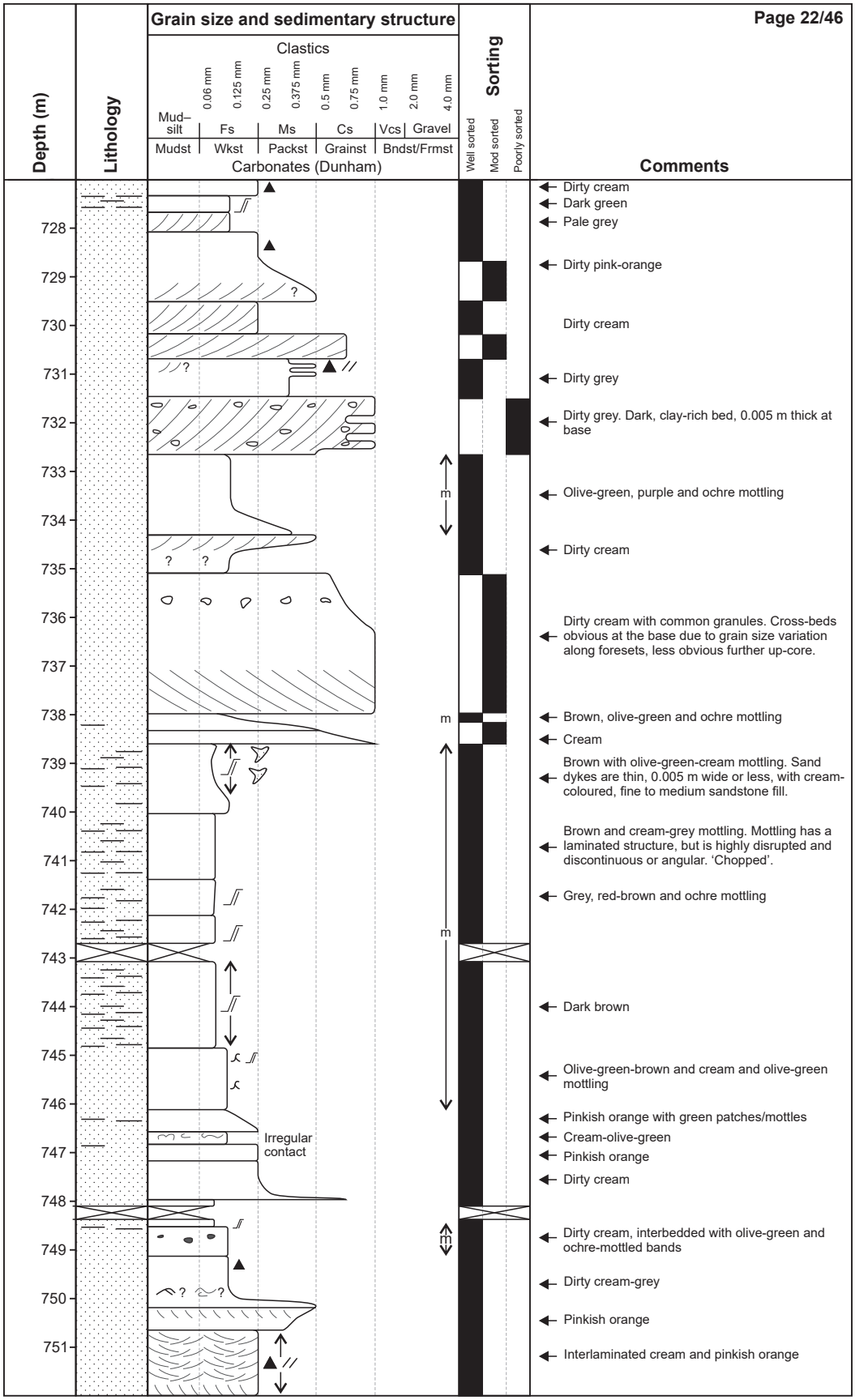
Cream
Olive-green, grain size varies from medium to very coarse.
Dirty cream with red and green clay clasts in base
Red with minor ochre and pale green-purple lenses or mottling. Red with sand dyke from overlying cream-coloured bed.
Cream-coloured with grain size differentiation along laminae from fine to medium sandstone
Red with minor ochre mottling and minor green reduction spots
Dirty cream
Red, purple and ochre mottling
Dirty cream. Grain size differentiation from coarse to very coarse along foresets.
Red with minor green reduction spots. Lower sections contain some cream interbeds. Disrupted bedding/lamination at the bed top, may be mottling or bioturbation.
714.00 – 714.50 m stacked sequence of fining-up beds 0.01 – 0.05 m thick.
Stacked ripple cross-lamination, small scours lined with rip-up clasts. Ball and pillow and flame structures also present.
Dirty cream
Purple and ochre mottling
Dirty cream. Fracture with purple clay fill 0.001 – 0.002 m thick.
Purple, ochre and olive-green mottling. Sand dykes in upper half metre have medium to coarse sandstone fill from overlying.
Purple, ochre and light olive green mottling. Dendritic structures have purple clay fill and ochre fill.
Purple with ochre mottling. Sand dykes thin with cream fill.
Light purple and ochre mottling
Dark brown with ochre mottling
Green with ochre mottling
Dirty cream with purple and green mottling at very top


Depth (m)
Lithology
Grain size and sedimentary structure
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Mud–silt
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Vcs
Gravel
Mudst
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Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 22/46
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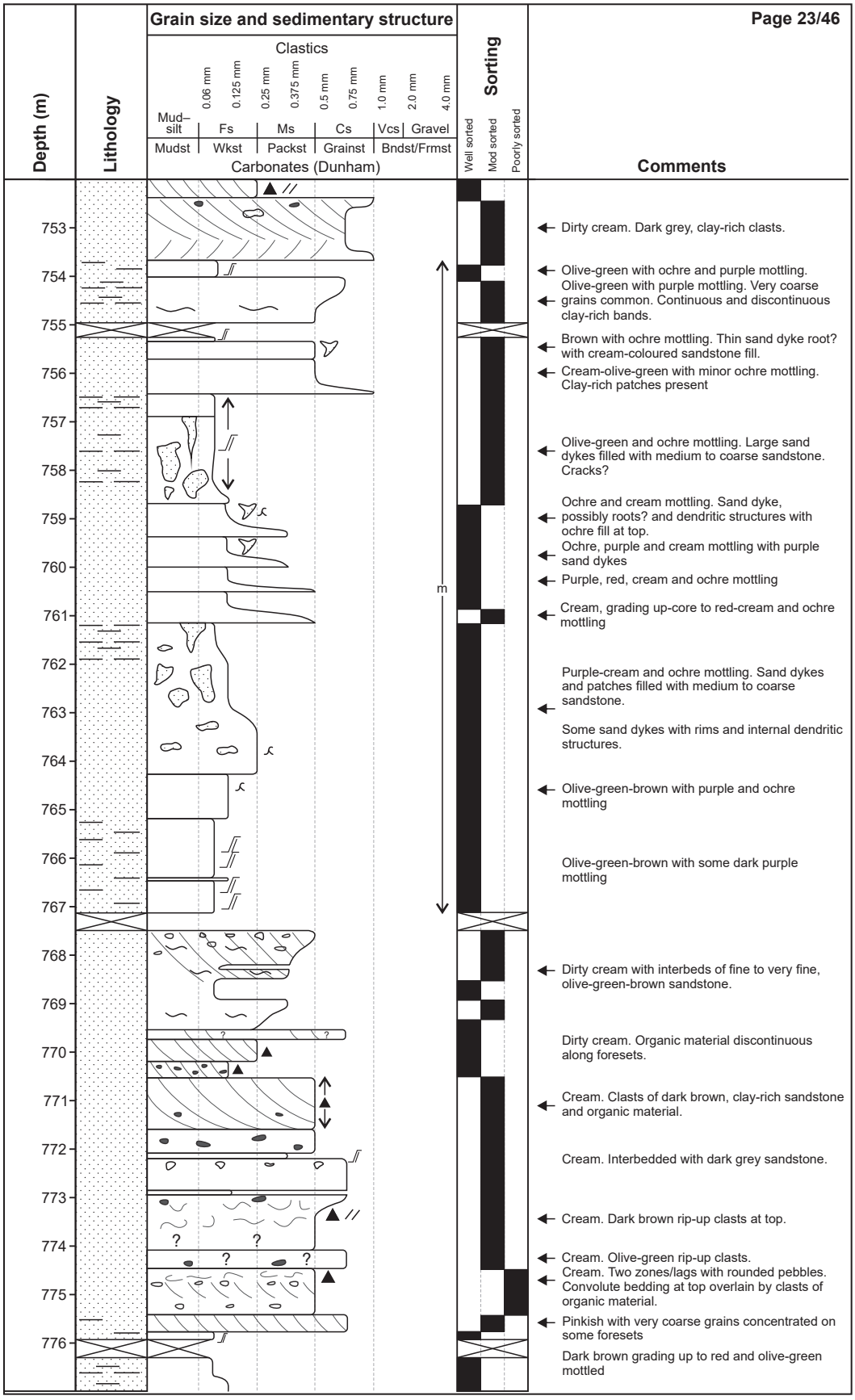
m
Irregular contact
Dirty cream
Dark green
Pale grey
Dirty pink-orange
Dirty cream
Dirty grey
Dirty grey. Dark, clay-rich bed, 0.005 m thick at base
Olive-green, purple and ochre mottling
Dirty cream
Dirty cream with common granules. Cross-beds obvious at the base due to grain size variation along foresets, less obvious further up-core.
Brown, olive-green and ochre mottling
Cream
Brown with olive-green-cream mottling. Sand dykes are thin, 0.005 m wide or less, with cream-coloured, fine to medium sandstone fill.
Brown and cream-grey mottling. Mottling has a laminated structure, but is highly disrupted and discontinuous or angular. ‘Chopped’.
Grey, red-brown and ochre mottling
Dark brown
Olive-green-brown and cream and olive-green mottling
Pinkish orange with green patches/mottles
Cream-olive-green
Pinkish orange
Dirty cream
Dirty cream, interbedded with olive-green and ochre-mottled bands
Dirty cream-grey
Pinkish orange
Interlaminated cream and pinkish orange


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
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Page 23/46
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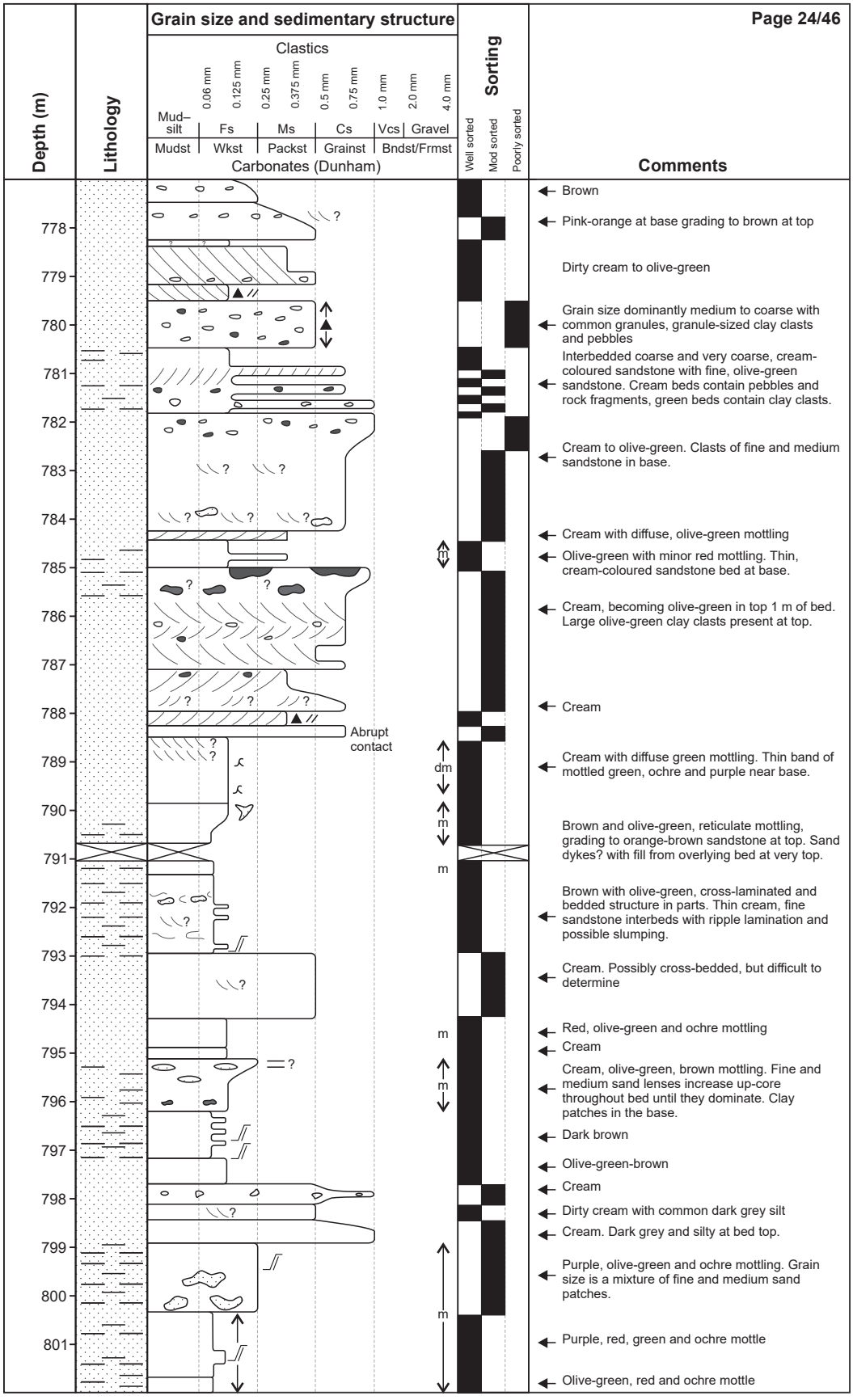
m
Dirty cream. Dark grey, clay-rich clasts.
Olive-green with ochre and purple mottling.
Olive-green with purple mottling. Very coarse grains common. Continuous and discontinuous clay-rich bands.
Brown with ochre mottling. Thin sand dyke root? with cream-coloured sandstone fill.
Cream-olive-green with minor ochre mottling. Clay-rich patches present
Olive-green and ochre mottling. Large sand dykes filled with medium to coarse sandstone. Cracks?
Ochre and cream mottling. Sand dyke, possibly roots? and dendritic structures with ochre fill at top.
Ochre, purple and cream mottling with purple sand dykes
Purple, red, cream and ochre mottling
Cream, grading up-core to red-cream and ochre mottling
Purple-cream and ochre mottling. Sand dykes and patches filled with medium to coarse sandstone.
Some sand dykes with rims and internal dendritic structures.
Olive-green-brown with purple and ochre mottling
Olive-green-brown with some dark purple mottling
Dirty cream with interbeds of fine to very fine, olive-green-brown sandstone.
Dirty cream. Organic material discontinuous along foresets.
Cream. Clasts of dark brown, clay-rich sandstone and organic material.
Cream. Interbedded with dark grey sandstone.
Cream. Dark brown rip-up clasts at top.
Cream. Olive-green rip-up clasts.
Cream. Two zones/lags with rounded pebbles. Convolute bedding at top overlain by clasts of organic material.
Pinkish with very coarse grains concentrated on some foresets
Dark brown grading up to red and olive-green mottled


Grain size and sedimentary structure
Page 24/46
Depth (m)
Lithology
Clastics
0.06 mm
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0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Vcs
Gravel
Mudst
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Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
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Poorly sorted
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Abrupt contact
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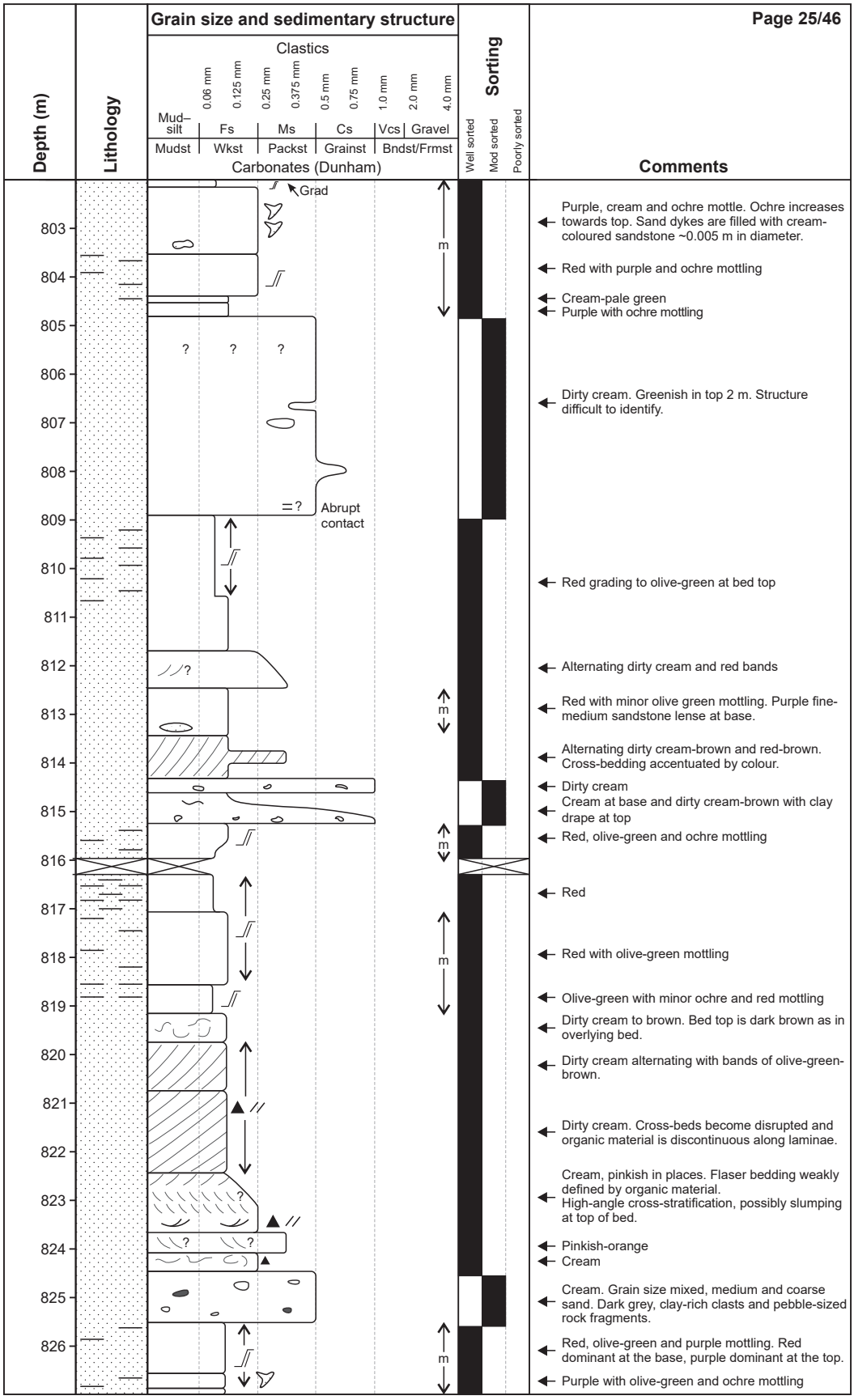
Brown
Pink-orange at base grading to brown at top
Dirty cream to olive-green
Grain size dominantly medium to coarse with common granules, granule-sized clay clasts and pebbles
Interbedded coarse and very coarse, cream-coloured sandstone with fine, olive-green sandstone. Cream beds contain pebbles and rock fragments, green beds contain clay clasts.
Cream to olive-green. Clasts of fine and medium sandstone in base.
Cream with diffuse, olive-green mottling
Olive-green with minor red mottling. Thin, cream-coloured sandstone bed at base.
Cream, becoming olive-green in top 1 m of bed. Large olive-green clay clasts present at top.
Cream
Cream with diffuse green mottling. Thin band of mottled green, ochre and purple near base.
Brown and olive-green, reticulate mottling, grading to orange-brown sandstone at top. Sand dykes? with fill from overlying bed at very top.
Brown with olive-green, cross-laminated and bedded structure in parts. Thin cream, fine sandstone interbeds with ripple lamination and possible slumping.
Cream. Possibly cross-bedded, but difficult to determine
Red, olive-green and ochre mottling
Cream
Cream, olive-green, brown mottling. Fine and medium sand lenses increase up-core throughout bed until they dominate. Clay patches in the base.
Dark brown
Olive-green-brown
Cream
Dirty cream with common dark grey silt
Cream. Dark grey and silty at bed top.
Purple, olive-green and ochre mottling. Grain size is a mixture of fine and medium sand patches.
Purple, red, green and ochre mottle
Olive-green, red and ochre mottle


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Mud–silt
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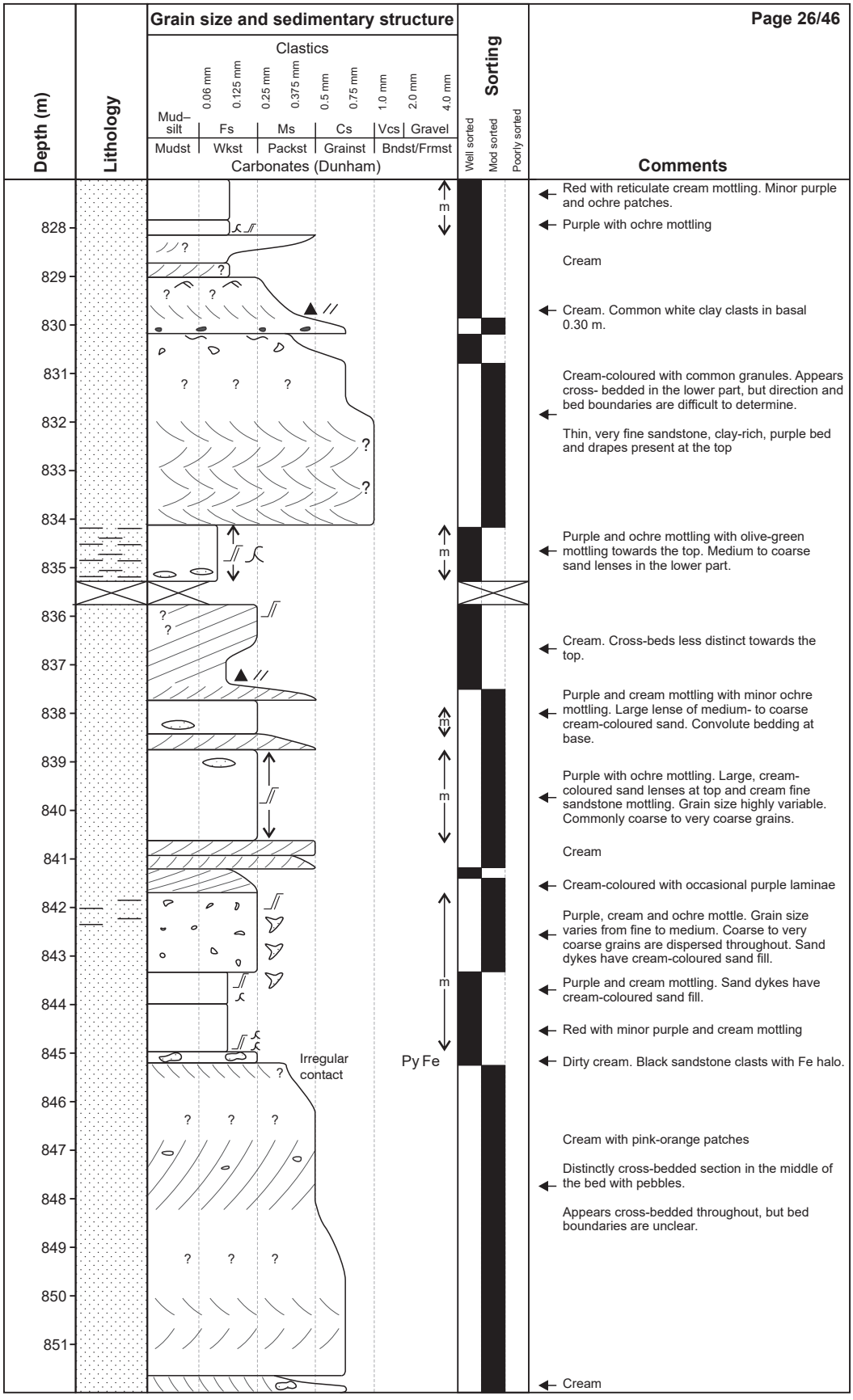
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 25/46
Comments
Grad
Abrupt contact
Purple, cream and ochre mottle. Ochre increases towards top. Sand dykes are filled with cream-coloured sandstone ~0.005 m in diameter.
Red with purple and ochre mottling
Cream-pale green
Purple with ochre mottling
Dirty cream. Greenish in top 2 m. Structure difficult to identify.
Red grading to olive-green at bed top
Alternating dirty cream and red bands
Red with minor olive green mottling. Purple fine-medium sandstone lense at base.
Alternating dirty cream-brown and red-brown. Cross-bedding accentuated by colour.
Dirty cream
Cream at base and dirty cream-brown with clay drape at top
Red, olive-green and ochre mottling
Red
Red with olive-green mottling
Olive-green with minor ochre and red mottling
Dirty cream to brown. Bed top is dark brown as in overlying bed.
Dirty cream alternating with bands of olive-green-brown.
Dirty cream. Cross-beds become disrupted and organic material is discontinuous along laminae.
Cream, pinkish in places. Flaser bedding weakly defined by organic material.
High-angle cross-stratification, possibly slumping at top of bed.
Pinkish-orange
Cream
Cream. Grain size mixed, medium and coarse sand. Dark grey, clay-rich clasts and pebble-sized rock fragments.
Red, olive-green and purple mottling. Red dominant at the base, purple dominant at the top.
Purple with olive-green and ochre mottling


Grain size and sedimentary structure
Page 26/46
Depth (m)
Lithology
Clastics
0.06 mm
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Mud–silt
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Gravel
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Carbonates (Dunham)
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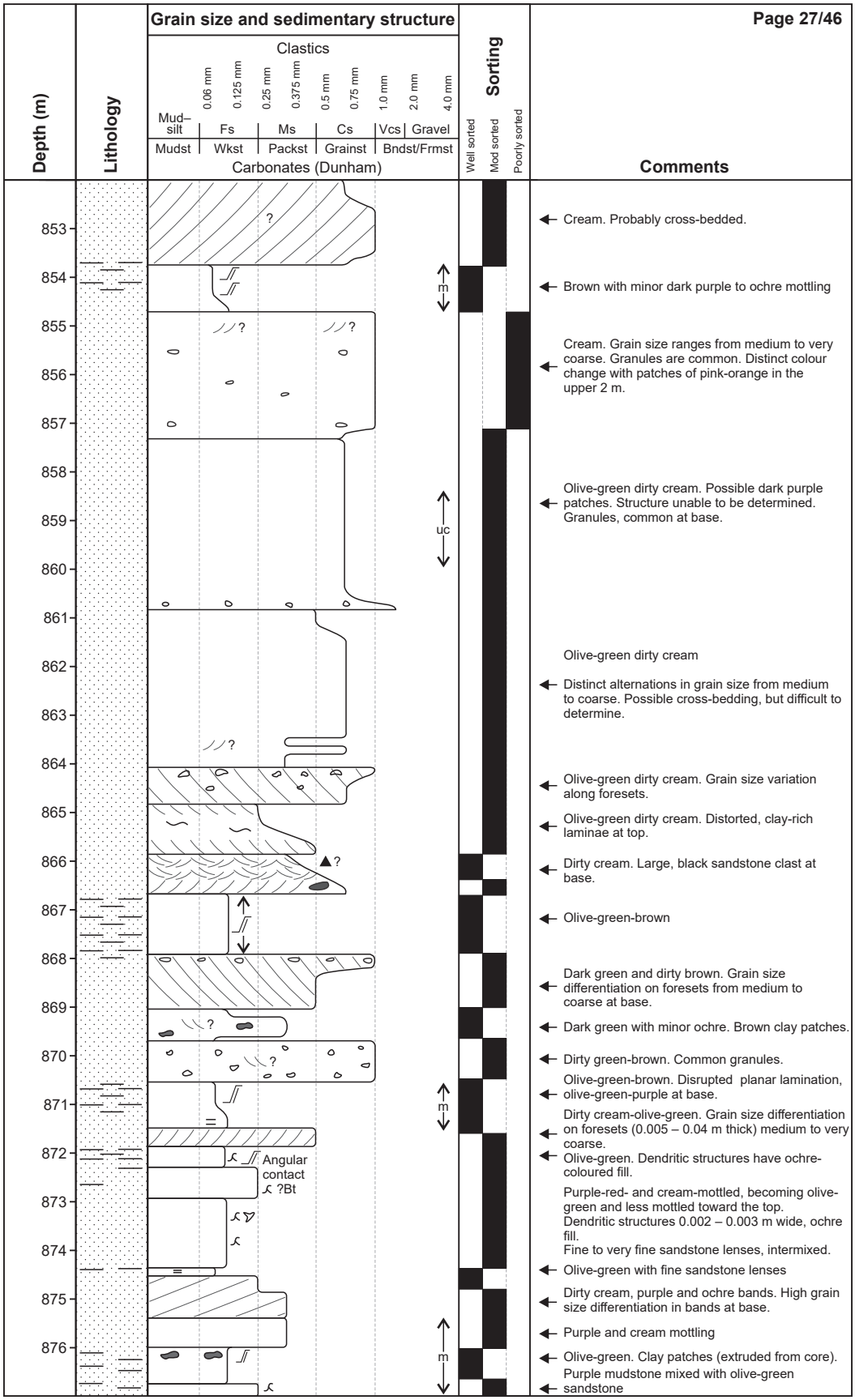
Irregular contact
Py Fe
Red with reticulate cream mottling. Minor purple and ochre patches.
Purple with ochre mottling
Cream
Cream. Common white clay clasts in basal 0.30 m.
Cream-coloured with common granules. Appears cross- bedded in the lower part, but direction and bed boundaries are difficult to determine.
Thin, very fine sandstone, clay-rich, purple bed and drapes present at the top
Purple and ochre mottling with olive-green mottling towards the top. Medium to coarse sand lenses in the lower part.
Cream. Cross-beds less distinct towards the top.
Purple and cream mottling with minor ochre mottling. Large lense of medium- to coarse cream-coloured sand. Convolute bedding at base.
Purple with ochre mottling. Large, cream-coloured sand lenses at top and cream fine sandstone mottling. Grain size highly variable. Commonly coarse to very coarse grains.
Cream
Cream-coloured with occasional purple laminae
Purple, cream and ochre mottle. Grain size varies from fine to medium. Coarse to very coarse grains are dispersed throughout. Sand dykes have cream-coloured sand fill.
Purple and cream mottling. Sand dykes have cream-coloured sand fill.
Red with minor purple and cream mottling
Dirty cream. Black sandstone clasts with Fe halo.
Cream with pink-orange patches
Distinctly cross-bedded section in the middle of the bed with pebbles.
Appears cross-bedded throughout, but bed boundaries are unclear.
Cream


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
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Page 27/46
Comments
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Angular contact
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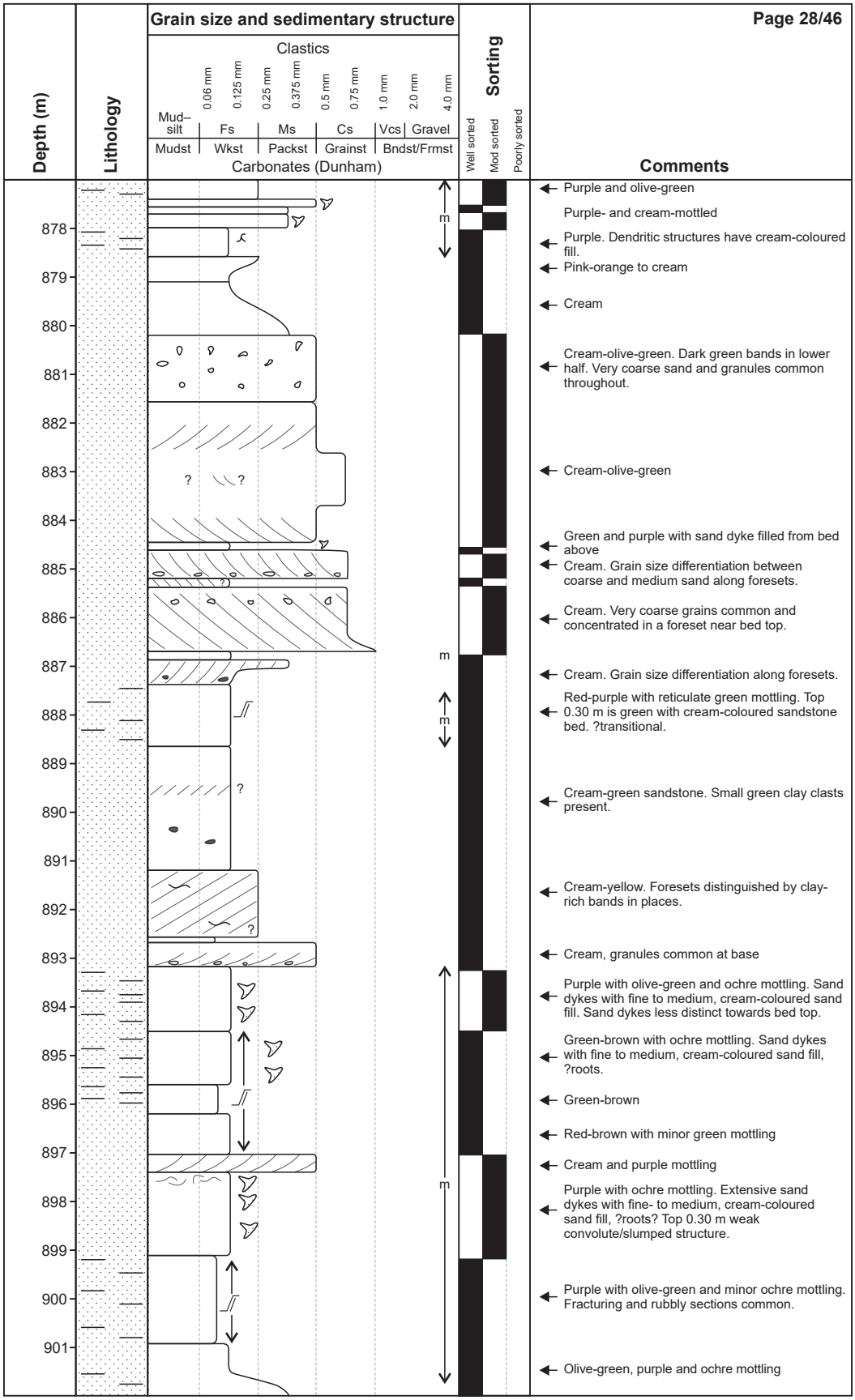
Cream. Probably cross-bedded.
Brown with minor dark purple to ochre mottling
Cream. Grain size ranges from medium to very coarse. Granules are common. Distinct colour change with patches of pink-orange in the upper 2 m.
Olive-green dirty cream. Possible dark purple patches. Structure unable to be determined. Granules, common at base.
Olive-green dirty cream
Distinct alternations in grain size from medium to coarse. Possible cross-bedding, but difficult to determine.
Olive-green dirty cream. Grain size variation along foresets.
Olive-green dirty cream. Distorted, clay-rich laminae at top.
Dirty cream. Large, black sandstone clast at base.
Olive-green-brown
Dark green and dirty brown. Grain size differentiation on foresets from medium to coarse at base.
Dark green with minor ochre. Brown clay patches.
Dirty green-brown. Common granules.
Olive-green-brown. Disrupted planar lamination, olive-green-purple at base.
Dirty cream-olive-green. Grain size differentiation on foresets (0.005 – 0.04 m thick) medium to very coarse.
Olive-green. Dendritic structures have ochre-coloured fill.
Purple-red- and cream-mottled, becoming olive-green and less mottled toward the top.
Dendritic structures 0.002 – 0.003 m wide, ochre fill.
Fine to very fine sandstone lenses, intermixed.
Olive-green with fine sandstone lenses
Dirty cream, purple and ochre bands. High grain size differentiation in bands at base.
Purple and cream mottling
Olive-green. Clay patches (extruded from core).
Purple mudstone mixed with olive-green sandstone


Grain size and sedimentary structure
Page 28/46
Depth (m)
Lithology
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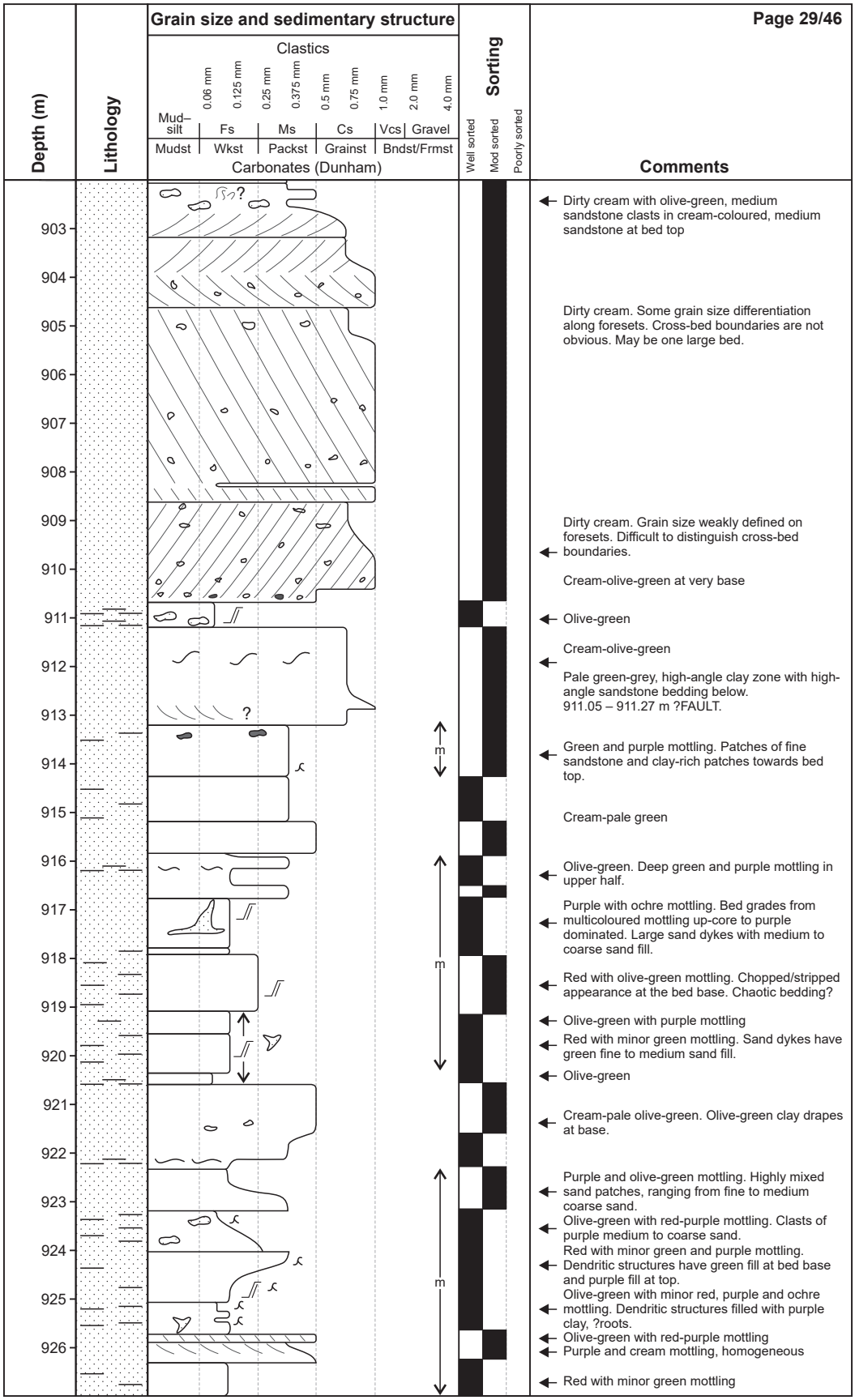
Purple and olive-green
Purple- and cream-mottled
Purple. Dendritic structures have cream-coloured fill.
Pink-orange to cream
Cream
Cream-olive-green. Dark green bands in lower half. Very coarse sand and granules common throughout.
Cream-olive-green
Green and purple with sand dyke filled from bed above
Cream. Grain size differentiation between coarse and medium sand along foresets.
Cream. Very coarse grains common and concentrated in a foreset near bed top.
Cream. Grain size differentiation along foresets.
Red-purple with reticulate green mottling. Top 0.30 m is green with cream-coloured sandstone bed. ?transitional.
Cream-green sandstone. Small green clay clasts present.
Cream-yellow. Foresets distinguished by clay-rich bands in places.
Cream, granules common at base
Purple with olive-green and ochre mottling. Sand dykes with fine to medium, cream-coloured sand fill. Sand dykes less distinct towards bed top.
Green-brown with ochre mottling. Sand dykes with fine to medium, cream-coloured sand fill, ?roots.
Green-brown
Red-brown with minor green mottling
Cream and purple mottling
Purple with ochre mottling. Extensive sand dykes with fine- to medium, cream-coloured sand fill, ?roots? Top 0.30 m weak convolute/slumped structure.
Purple with olive-green and minor ochre mottling. Fracturing and rubbly sections common.
Olive-green, purple and ochre mottling


Depth (m)
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Vcs
Gravel
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Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
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Page 29/46
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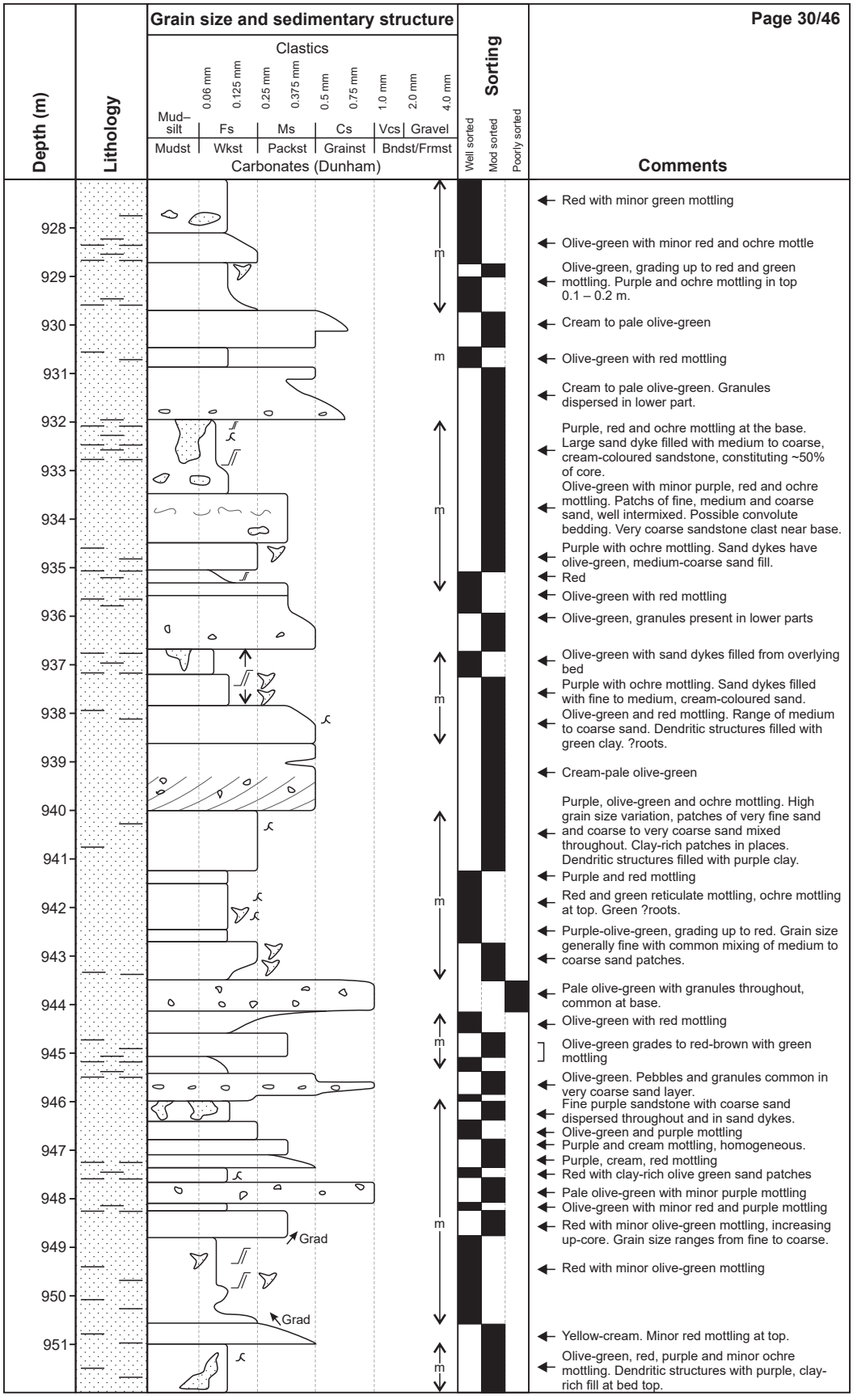
Dirty cream with olive-green, medium sandstone clasts in cream-coloured, medium sandstone at bed top
Dirty cream. Some grain size differentiation along foresets. Cross-bed boundaries are not obvious. May be one large bed.
Dirty cream. Grain size weakly defined on foresets. Difficult to distinguish cross-bed boundaries.
Cream-olive-green at very base
Olive-green
Cream-olive-green
Pale green-grey, high-angle clay zone with high-angle sandstone bedding below.
911.05 – 911.27 m ?FAULT.
Green and purple mottling. Patches of fine sandstone and clay-rich patches towards bed top.
Cream-pale green
Olive-green. Deep green and purple mottling in upper half.
Purple with ochre mottling. Bed grades from multicoloured mottling up-core to purple dominated. Large sand dykes with medium to coarse sand fill.
Red with olive-green mottling. Chopped/stripped appearance at the bed base. Chaotic bedding?
Olive-green with purple mottling
Red with minor green mottling. Sand dykes have green fine to medium sand fill.
Olive-green
Cream-pale olive-green. Olive-green clay drapes at base.
Purple and olive-green mottling. Highly mixed sand patches, ranging from fine to medium coarse sand.
Olive-green with red-purple mottling. Clasts of purple medium to coarse sand.
Red with minor green and purple mottling.
Dendritic structures have green fill at bed base and purple fill at top.
Olive-green with minor red, purple and ochre mottling. Dendritic structures filled with purple clay, ?roots.
Olive-green with red-purple mottling
Purple and cream mottling, homogeneous
Red with minor green mottling


Grain size and sedimentary structure
Page 30/46
Depth (m)
Lithology
Clastics
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Carbonates (Dunham)
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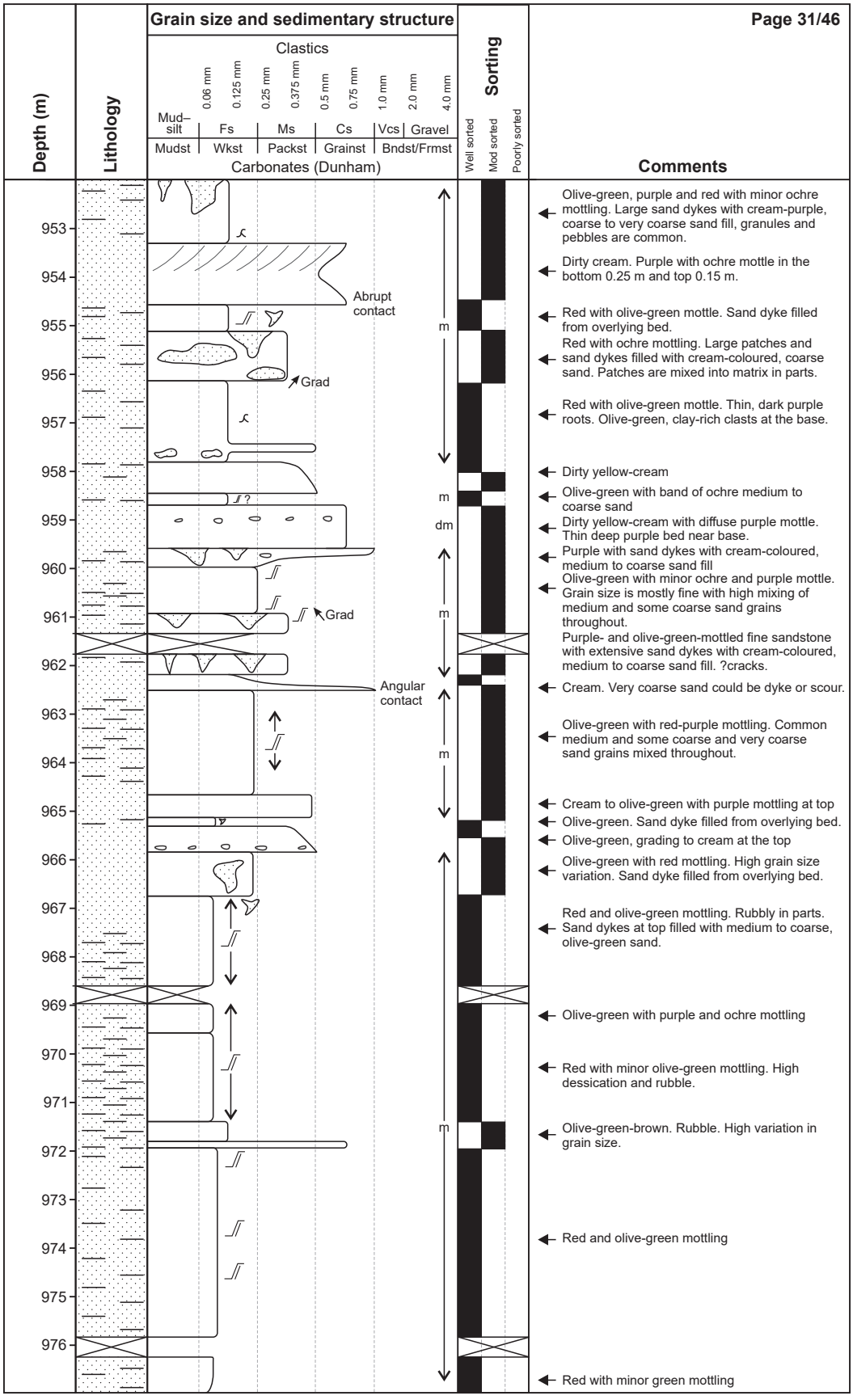
Red with minor green mottling
Olive-green with minor red and ochre mottle
Olive-green, grading up to red and green mottling. Purple and ochre mottling in top 0.1 – 0.2 m.
Cream to pale olive-green
Olive-green with red mottling
Cream to pale olive-green. Granules dispersed in lower part.
Purple, red and ochre mottling at the base. Large sand dyke filled with medium to coarse, cream-coloured sandstone, constituting ~50% of core.
Olive-green with minor purple, red and ochre mottling. Patchs of fine, medium and coarse sand, well intermixed. Possible convolute bedding. Very coarse sandstone clast near base.
Purple with ochre mottling. Sand dykes have olive-green, medium-coarse sand fill.
Red
Olive-green with red mottling
Olive-green, granules present in lower parts
Olive-green with sand dykes filled from overlying bed
Purple with ochre mottling. Sand dykes filled with fine to medium, cream-coloured sand.
Olive-green and red mottling. Range of medium to coarse sand. Dendritic structures filled with green clay. ?roots.
Cream-pale olive-green
Purple, olive-green and ochre mottling. High grain size variation, patches of very fine sand and coarse to very coarse sand mixed throughout. Clay-rich patches in places. Dendritic structures filled with purple clay.
Purple and red mottling
Red and green reticulate mottling, ochre mottling at top. Green ?roots.
Purple-olive-green, grading up to red. Grain size generally fine with common mixing of medium to coarse sand patches.
Pale olive-green with granules throughout, common at base.
Olive-green with red mottling
Olive-green grades to red-brown with green mottling
Olive-green. Pebbles and granules common in very coarse sand layer.
Fine purple sandstone with coarse sand dispersed throughout and in sand dykes.
Olive-green and purple mottling
Purple and cream mottling, homogeneous.
Purple, cream, red mottling
Red with clay-rich olive green sand patches
Pale olive-green with minor purple mottling
Olive-green with minor red and purple mottling
Red with minor olive-green mottling, increasing up-core. Grain size ranges from fine to coarse.
Red with minor olive-green mottling
Yellow-cream. Minor red mottling at top.
Olive-green, red, purple and minor ochre mottling. Dendritic structures with purple, clay-rich fill at bed top.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Mud–silt
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Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 31/46
Comments
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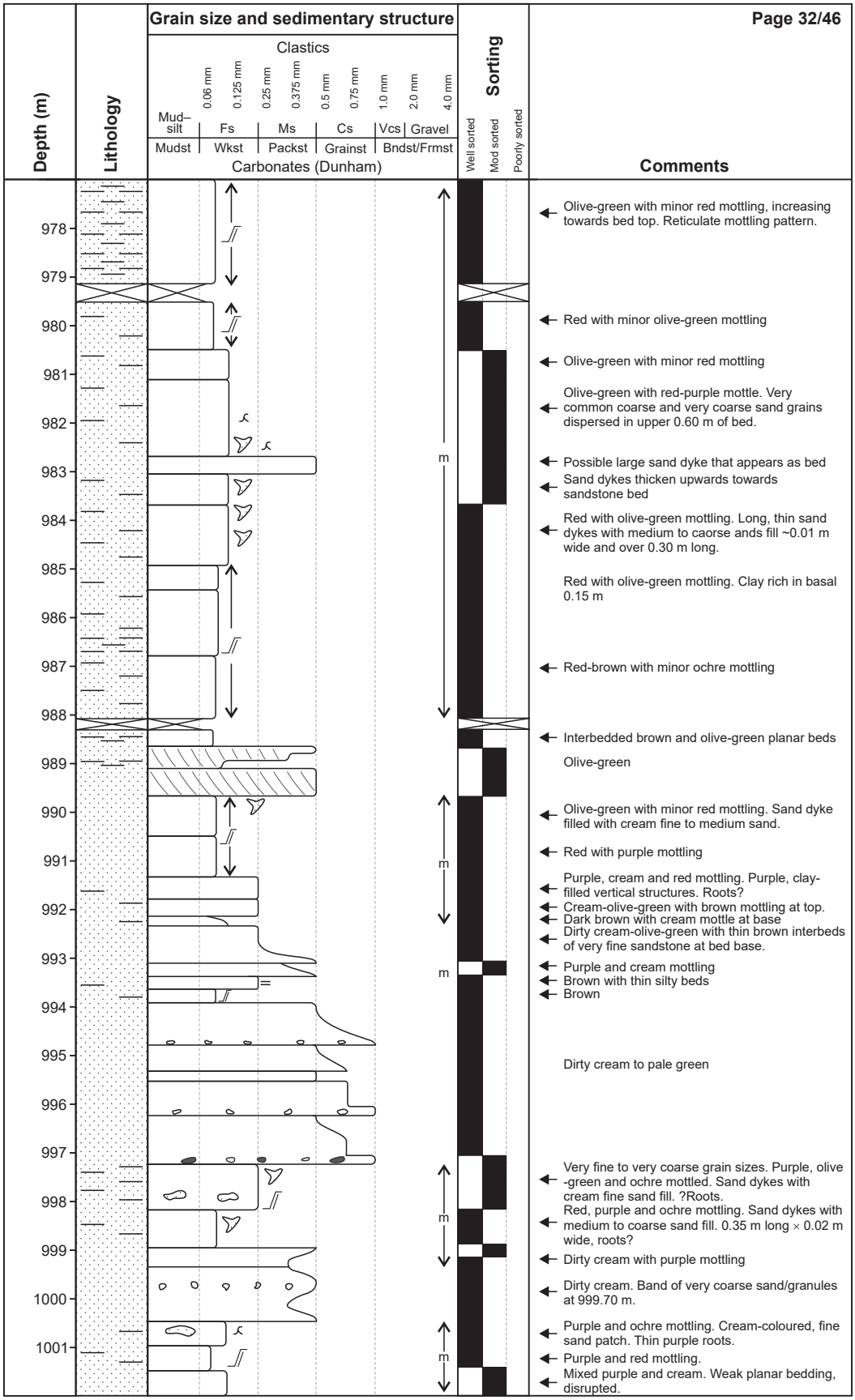
Olive-green, purple and red with minor ochre mottling. Large sand dykes with cream-purple, coarse to very coarse sand fill, granules and pebbles are common.
Dirty cream. Purple with ochre mottle in the bottom 0.25 m and top 0.15 m.
Red with olive-green mottle. Sand dyke filled from overlying bed.
Red with ochre mottling. Large patches and sand dykes filled with cream-coloured, coarse sand. Patches are mixed into matrix in parts.
Red with olive-green mottle. Thin, dark purple roots. Olive-green, clay-rich clasts at the base.
Dirty yellow-cream
Olive-green with band of ochre medium to coarse sand
Dirty yellow-cream with diffuse purple mottle. Thin deep purple bed near base.
Purple with sand dykes with cream-coloured, medium to coarse sand fill
Olive-green with minor ochre and purple mottle. Grain size is mostly fine with high mixing of medium and some coarse sand grains throughout.
Purple- and olive-green-mottled fine sandstone with extensive sand dykes with cream-coloured, medium to coarse sand fill. ?cracks.
Cream. Very coarse sand could be dyke or scour.
Olive-green with red-purple mottling. Common medium and some coarse and very coarse sand grains mixed throughout.
Cream to olive-green with purple mottling at top
Olive-green. Sand dyke filled from overlying bed.
Olive-green, grading to cream at the top
Olive-green with red mottling. High grain size variation. Sand dyke filled from overlying bed.
Red and olive-green mottling. Rubbly in parts. Sand dykes at top filled with medium to coarse, olive-green sand.
Olive-green with purple and ochre mottling
Red with minor olive-green mottling. High dessication and rubble.
Olive-green-brown. Rubble. High variation in grain size.
Red and olive-green mottling
Red with minor green mottling


Depth (m)
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Grain size and sedimentary structure
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Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 32/46
Comments
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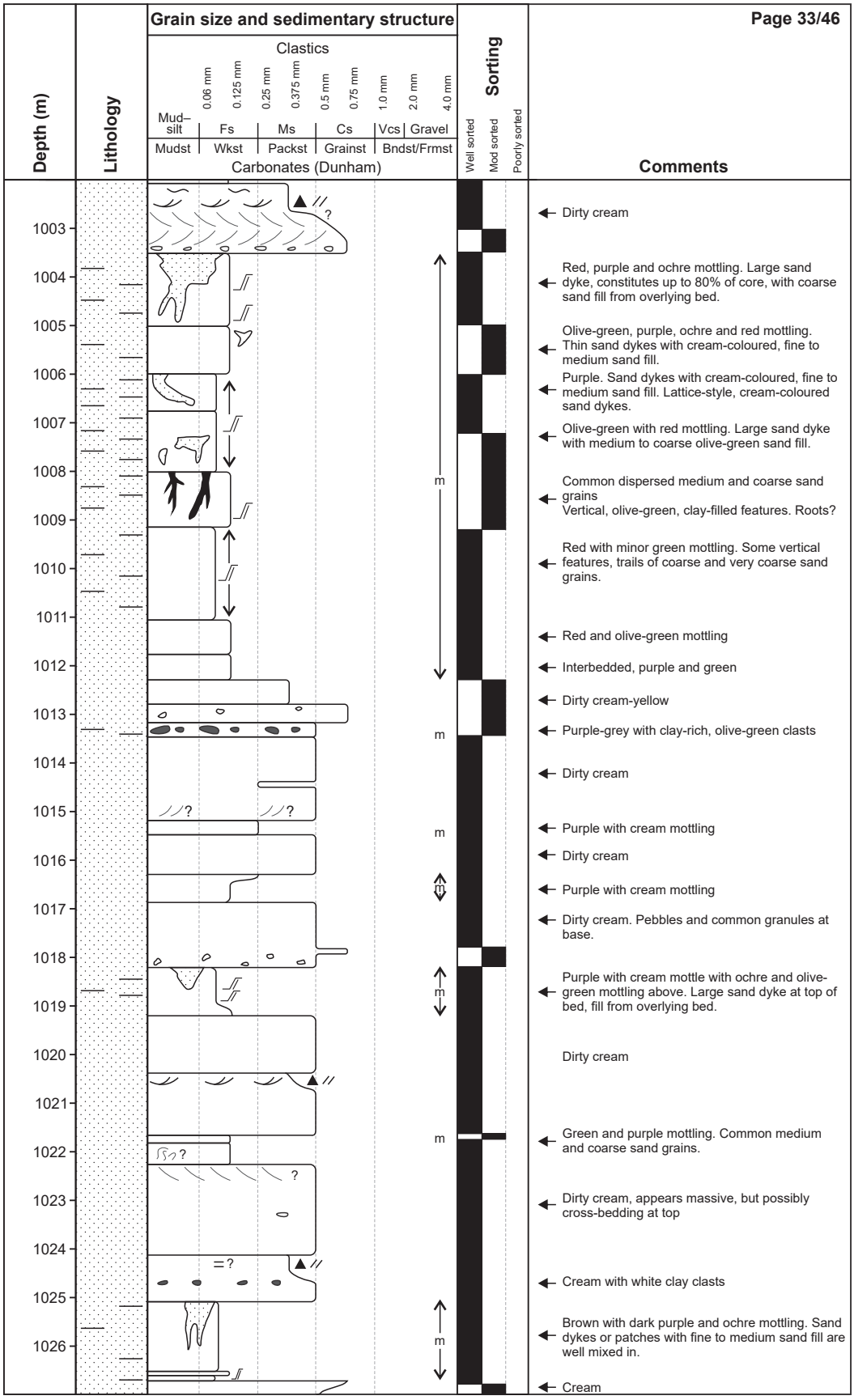
Olive-green with minor red mottling, increasing towards bed top. Reticulate mottling pattern.
Red with minor olive-green mottling
Olive-green with minor red mottling
Olive-green with red-purple mottle. Very common coarse and very coarse sand grains dispersed in upper 0.60 m of bed.
Possible large sand dyke that appears as bed
Sand dykes thicken upwards towards sandstone bed
Red with olive-green mottling. Long, thin sand dykes with medium to caorse ands fill ~0.01 m wide and over 0.30 m long.
Red with olive-green mottling. Clay rich in basal 0.15 m
Red-brown with minor ochre mottling
Interbedded brown and olive-green planar beds
Olive-green
Olive-green with minor red mottling. Sand dyke filled with cream fine to medium sand.
Red with purple mottling
Purple, cream and red mottling. Purple, clay-filled vertical structures. Roots?
Cream-olive-green with brown mottling at top.
Dark brown with cream mottle at base
Dirty cream-olive-green with thin brown interbeds of very fine sandstone at bed base.
Purple and cream mottling
Brown with thin silty beds
Brown
Dirty cream to pale green
Very fine to very coarse grain sizes. Purple, olive-green and ochre mottled. Sand dykes with cream fine sand fill. ?Roots.
Red, purple and ochre mottling. Sand dykes with medium to coarse sand fill. 0.35 m long × 0.02 m wide, roots?
Dirty cream with purple mottling
Dirty cream. Band of very coarse sand/granules at 999.70 m.
Purple and ochre mottling. Cream-coloured, fine sand patch. Thin purple roots.
Purple and red mottling.
Mixed purple and cream. Weak planar bedding, disrupted.


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
Sorting
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Page 33/46
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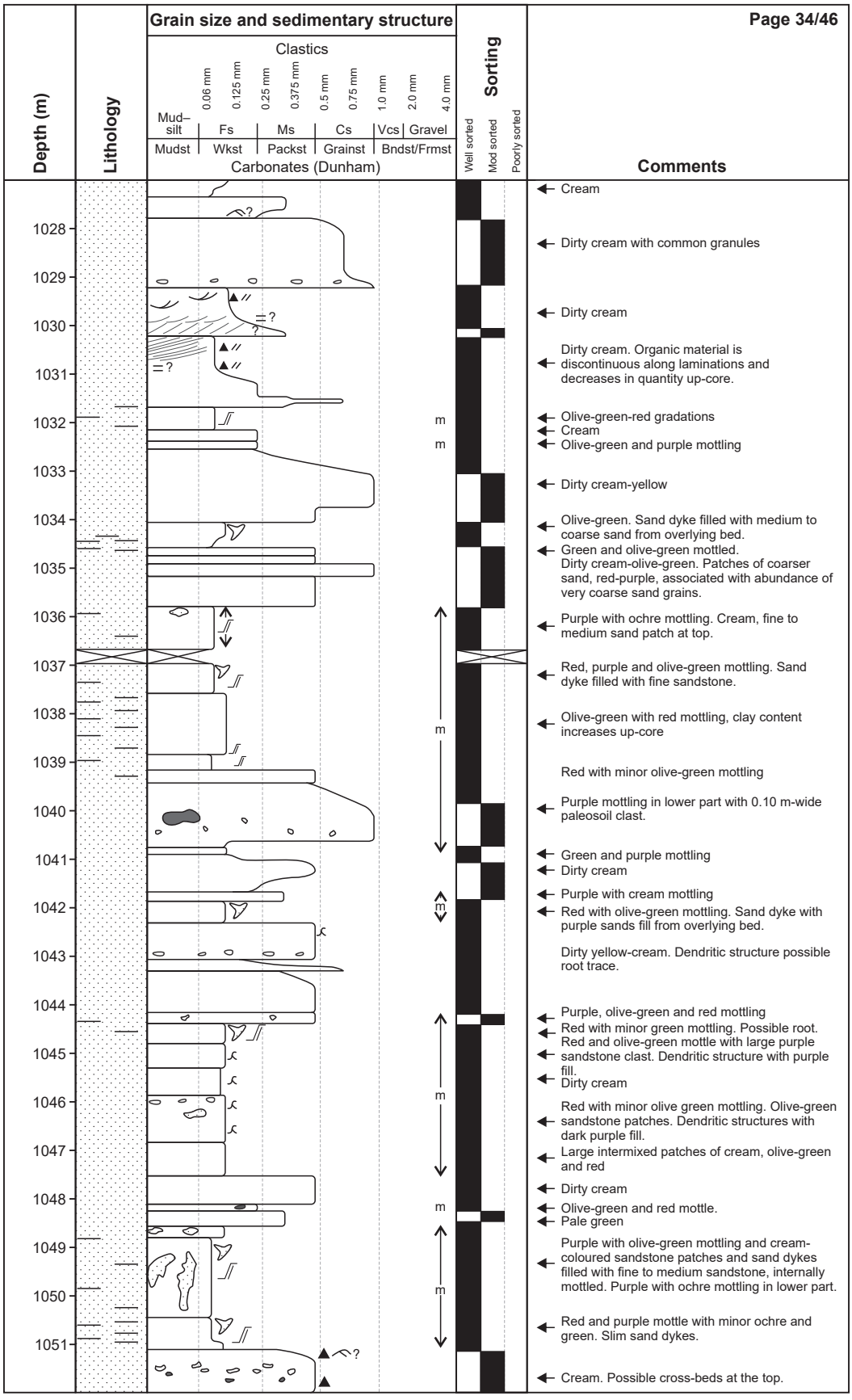
Dirty cream
Red, purple and ochre mottling. Large sand dyke, constitutes up to 80% of core, with coarse sand fill from overlying bed.
Olive-green, purple, ochre and red mottling. Thin sand dykes with cream-coloured, fine to medium sand fill.
Purple. Sand dykes with cream-coloured, fine to medium sand fill. Lattice-style, cream-coloured sand dykes.
Olive-green with red mottling. Large sand dyke with medium to coarse olive-green sand fill.
Common dispersed medium and coarse sand grains
Vertical, olive-green, clay-filled features. Roots?
Red with minor green mottling. Some vertical features, trails of coarse and very coarse sand grains.
Red and olive-green mottling
Interbedded, purple and green
Dirty cream-yellow
Purple-grey with clay-rich, olive-green clasts
Dirty cream
Purple with cream mottling
Dirty cream
Purple with cream mottling
Dirty cream. Pebbles and common granules at base.
Purple with cream mottle with ochre and olive-green mottling above. Large sand dyke at top of bed, fill from overlying bed.
Dirty cream
Green and purple mottling. Common medium and coarse sand grains.
Dirty cream, appears massive, but possibly cross-bedding at top
Cream with white clay clasts
Brown with dark purple and ochre mottling. Sand dykes or patches with fine to medium sand fill are well mixed in.
Cream


Grain size and sedimentary structure
Page 34/46
Depth (m)
Lithology
Clastics
0.06 mm
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0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Mudst
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Carbonates (Dunham)
Sorting
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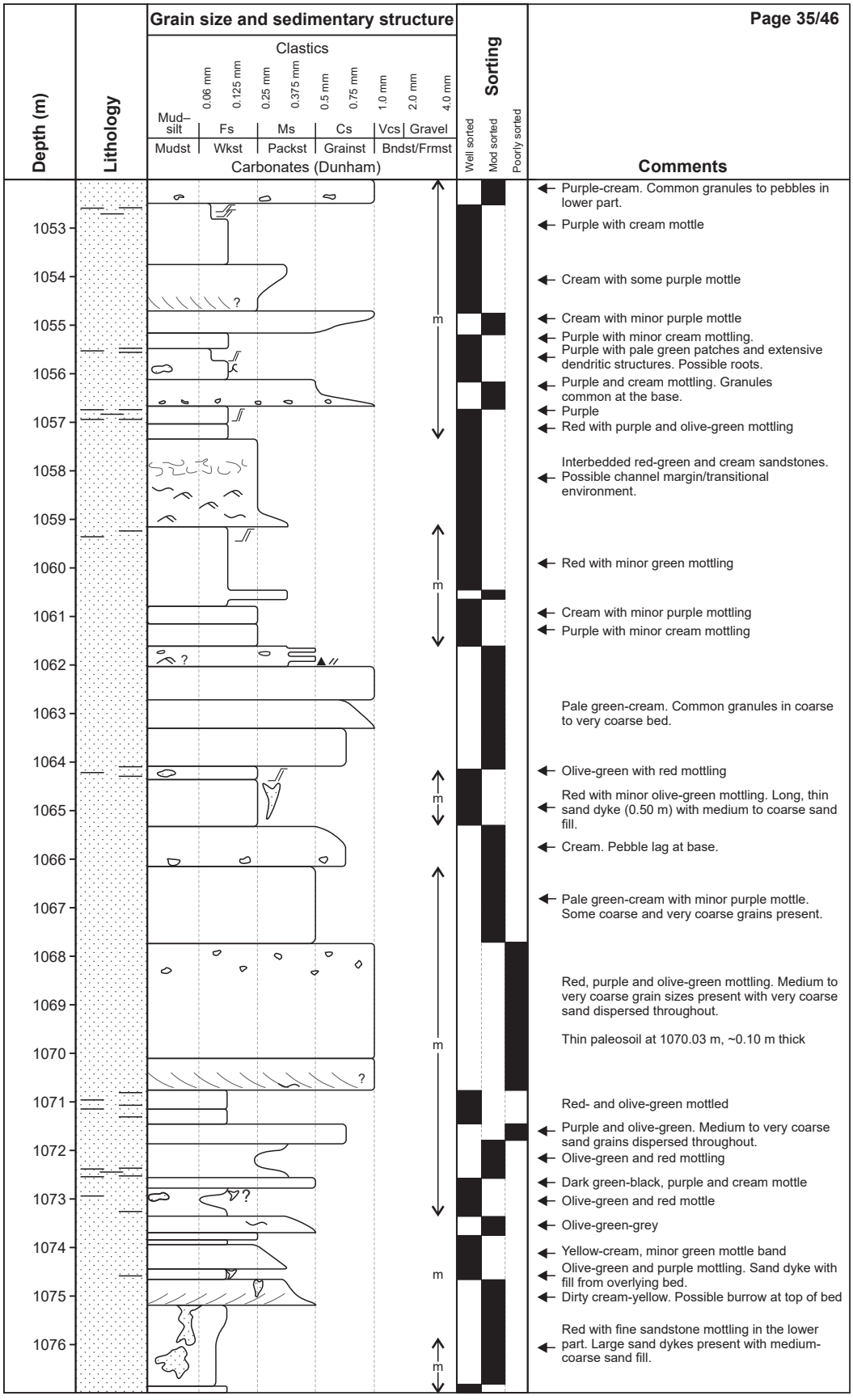
m
Cream
Dirty cream with common granules
Dirty cream
Dirty cream. Organic material is discontinuous along laminations and decreases in quantity up-core.
Olive-green-red gradations
Cream
Olive-green and purple mottling
Dirty cream-yellow
Olive-green. Sand dyke filled with medium to coarse sand from overlying bed.
Green and olive-green mottled. Dirty cream-olive-green. Patches of coarser sand, red-purple, associated with abundance of very coarse sand grains.
Purple with ochre mottling. Cream, fine to medium sand patch at top.
Red, purple and olive-green mottling. Sand dyke filled with fine sandstone.
Olive-green with red mottling, clay content increases up-core
Red with minor olive-green mottling
Purple mottling in lower part with 0.10 m-wide paleosoil clast.
Green and purple mottling
Dirty cream
Purple with cream mottling
Red with olive-green mottling. Sand dyke with purple sands fill from overlying bed.
Dirty yellow-cream. Dendritic structure possible root trace.
Purple, olive-green and red mottling
Red with minor green mottling. Possible root.
Red and olive-green mottle with large purple sandstone clast. Dendritic structure with purple fill.
Dirty cream
Red with minor olive green mottling. Olive-green sandstone patches. Dendritic structures with dark purple fill.
Large intermixed patches of cream, olive-green and red
Dirty cream
Olive-green and red mottle.
Pale green
Purple with olive-green mottling and cream-coloured sandstone patches and sand dykes filled with fine to medium sandstone, internally mottled. Purple with ochre mottling in lower part.
Red and purple mottle with minor ochre and green. Slim sand dykes.
Cream. Possible cross-beds at the top.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Gravel
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Carbonates (Dunham)
Sorting
Well sorted
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Page 35/46
Comments
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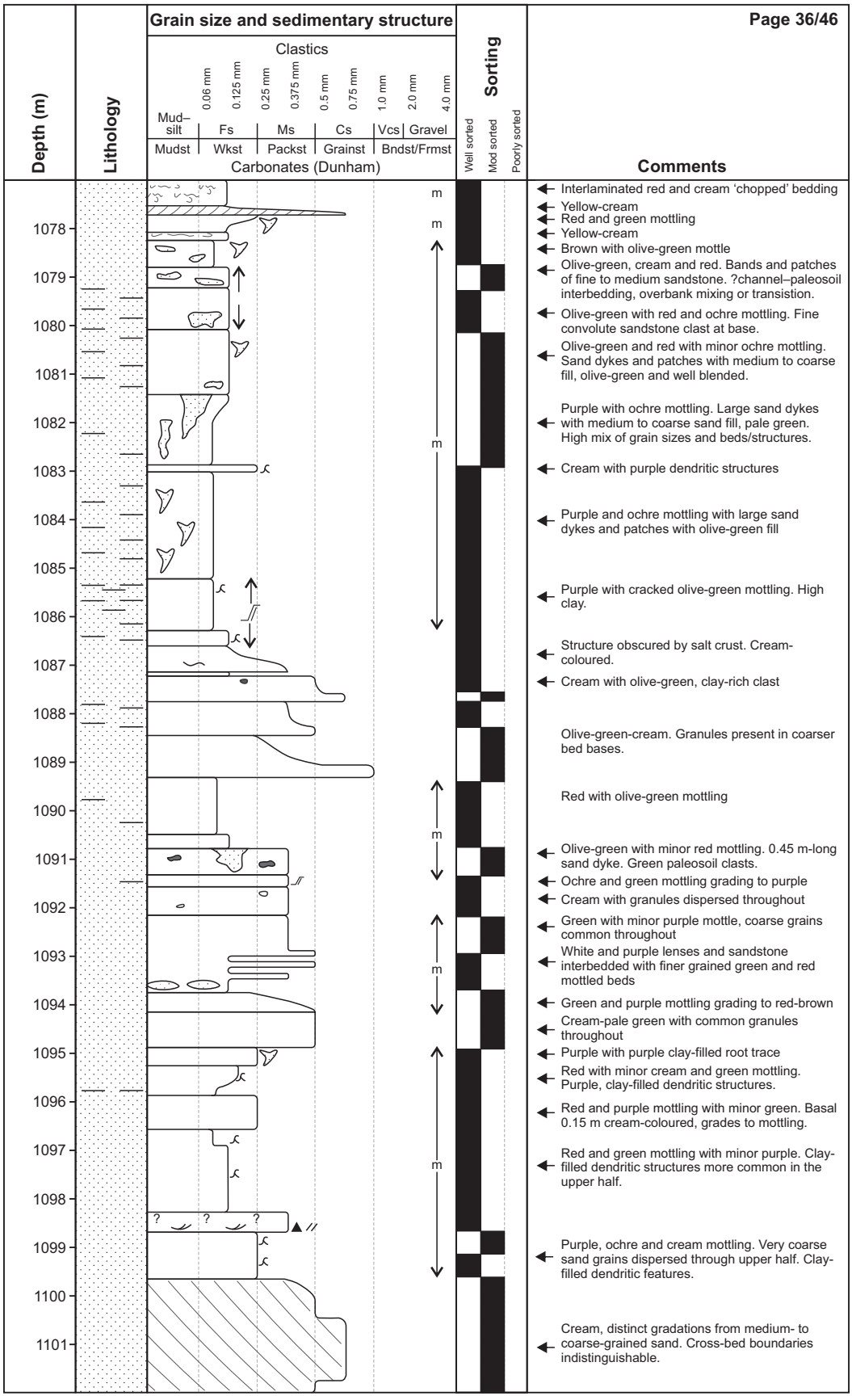
m
Purple-cream. Common granules to pebbles in lower part.
Purple with cream mottle
Cream with some purple mottle
Cream with minor purple mottle
Purple with minor cream mottling.
Purple with pale green patches and extensive dendritic structures. Possible roots.
Purple and cream mottling. Granules common at the base.
Purple
Red with purple and olive-green mottling
Interbedded red-green and cream sandstones. Possible channel margin/transitional environment.
Red with minor green mottling
Cream with minor purple mottling
Purple with minor cream mottling
Pale green-cream. Common granules in coarse to very coarse bed.
Olive-green with red mottling
Red with minor olive-green mottling. Long, thin sand dyke (0.50 m) with medium to coarse sand fill.
Cream. Pebble lag at base.
Pale green-cream with minor purple mottle. Some coarse and very coarse grains present.
Red, purple and olive-green mottling. Medium to very coarse grain sizes present with very coarse sand dispersed throughout.
Thin paleosoil at 1070.03 m, ~0.10 m thick
Red- and olive-green mottled
Purple and olive-green. Medium to very coarse sand grains dispersed throughout.
Olive-green and red mottling
Dark green-black, purple and cream mottle
Olive-green and red mottle
Olive-green-grey
Yellow-cream, minor green mottle band
Olive-green and purple mottling. Sand dyke with fill from overlying bed.
Dirty cream-yellow. Possible burrow at top of bed
Red with fine sandstone mottling in the lower part. Large sand dykes present with medium-coarse sand fill.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Carbonates (Dunham)
Sorting
Well sorted
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Page 36/46
Comments
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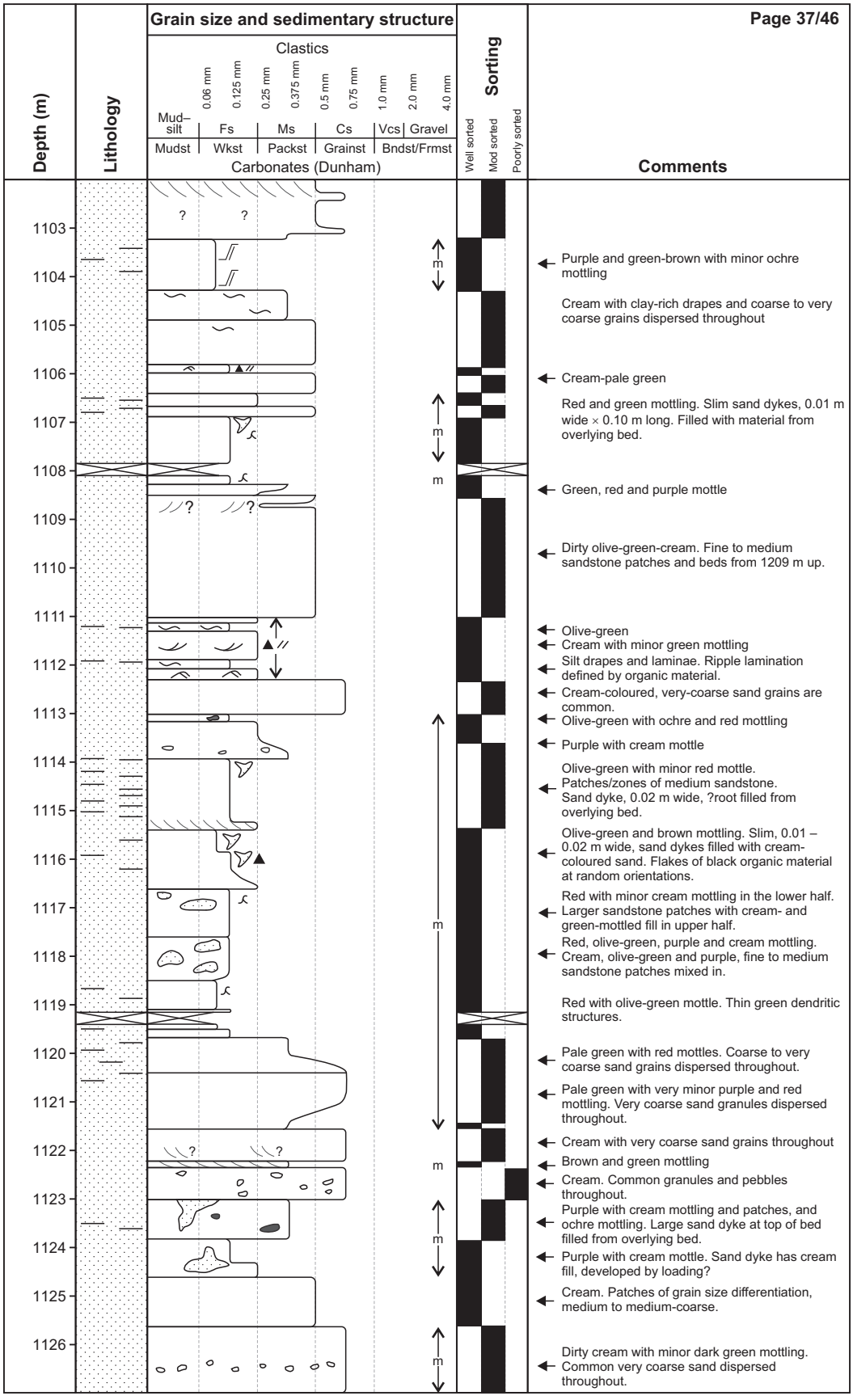
m
Interlaminated red and cream 'chopped' bedding
Yellow-cream
Red and green mottling
Yellow-cream
Brown with olive-green mottle
Olive-green, cream and red. Bands and patches of fine to medium sandstone. ?channel–paleosoil interbedding, overbank mixing or transistion.
Olive-green with red and ochre mottling. Fine convolute sandstone clast at base.
Olive-green and red with minor ochre mottling. Sand dykes and patches with medium to coarse fill, olive-green and well blended.
Purple with ochre mottling. Large sand dykes with medium to coarse sand fill, pale green. High mix of grain sizes and beds/structures.
Cream with purple dendritic structures
Purple and ochre mottling with large sand dykes and patches with olive-green fill
Purple with cracked olive-green mottling. High clay.
Structure obscured by salt crust. Cream-coloured.
Cream with olive-green, clay-rich clast
Olive-green-cream. Granules present in coarser bed bases.
Red with olive-green mottling
Olive-green with minor red mottling. 0.45 m-long sand dyke. Green paleosoil clasts.
Ochre and green mottling grading to purple
Cream with granules dispersed throughout
Green with minor purple mottle, coarse grains common throughout
White and purple lenses and sandstone interbedded with finer grained green and red mottled beds
Green and purple mottling grading to red-brown
Cream-pale green with common granules throughout
Purple with purple clay-filled root trace
Red with minor cream and green mottling. Purple, clay-filled dendritic structures.
Red and purple mottling with minor green. Basal 0.15 m cream-coloured, grades to mottling.
Red and green mottling with minor purple. Clay-filled dendritic structures more common in the upper half.
Purple, ochre and cream mottling. Very coarse sand grains dispersed through upper half. Clay-filled dendritic features.
Cream, distinct gradations from medium- to coarse-grained sand. Cross-bed boundaries indistinguishable.


Depth (m)
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Clastics
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Packst
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Carbonates (Dunham)
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Page 37/46
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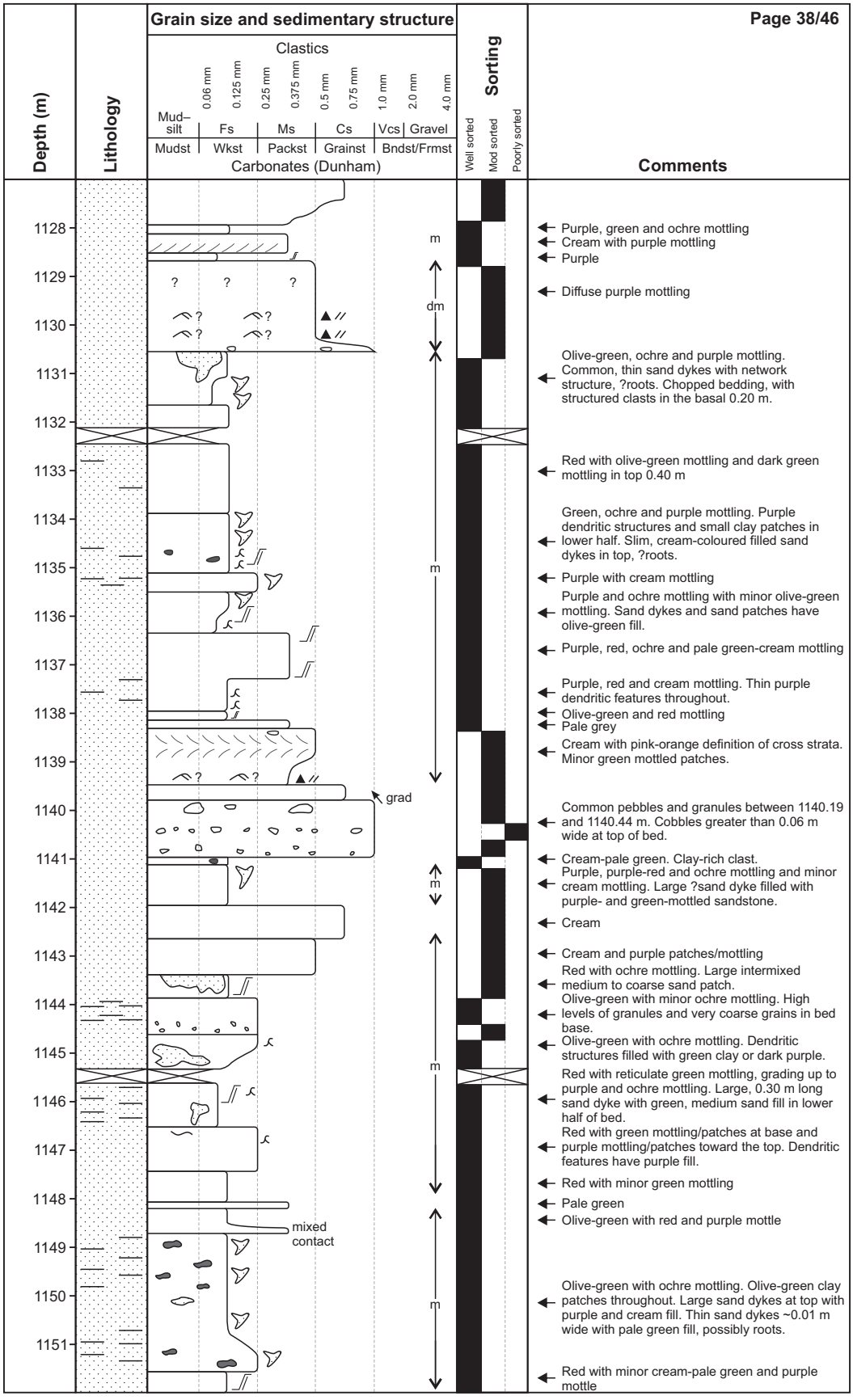
m
Purple and green-brown with minor ochre mottling
Cream with clay-rich drapes and coarse to very coarse grains dispersed throughout
Cream-pale green
Red and green mottling. Slim sand dykes, 0.01 m wide × 0.10 m long. Filled with material from overlying bed.
Green, red and purple mottle
Dirty olive-green-cream. Fine to medium sandstone patches and beds from 1209 m up.
Olive-green
Cream with minor green mottling
Silt drapes and laminae. Ripple lamination defined by organic material.
Cream-coloured, very-coarse sand grains are common.
Olive-green with ochre and red mottling
Purple with cream mottle
Olive-green with minor red mottle. Patches/zones of medium sandstone. Sand dyke, 0.02 m wide, ?root filled from overlying bed.
Olive-green and brown mottling. Slim, 0.01 – 0.02 m wide, sand dykes filled with cream-coloured sand. Flakes of black organic material at random orientations.
Red with minor cream mottling in the lower half. Larger sandstone patches with cream- and green-mottled fill in upper half.
Red, olive-green, purple and cream mottling. Cream, olive-green and purple, fine to medium sandstone patches mixed in.
Red with olive-green mottle. Thin green dendritic structures.
Pale green with red mottles. Coarse to very coarse sand grains dispersed throughout.
Pale green with very minor purple and red mottling. Very coarse sand granules dispersed throughout.
Cream with very coarse sand grains throughout
Brown and green mottling
Cream. Common granules and pebbles throughout.
Purple with cream mottling and patches, and ochre mottling. Large sand dyke at top of bed filled from overlying bed.
Purple with cream mottle. Sand dyke has cream fill, developed by loading?
Cream. Patches of grain size differentiation, medium to medium-coarse.
Dirty cream with minor dark green mottling. Common very coarse sand dispersed throughout.


Depth (m)
Lithology
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Mud–silt
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Gravel
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Bndst/Frmst
Carbonates (Dunham)
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Well sorted
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Page 38/46
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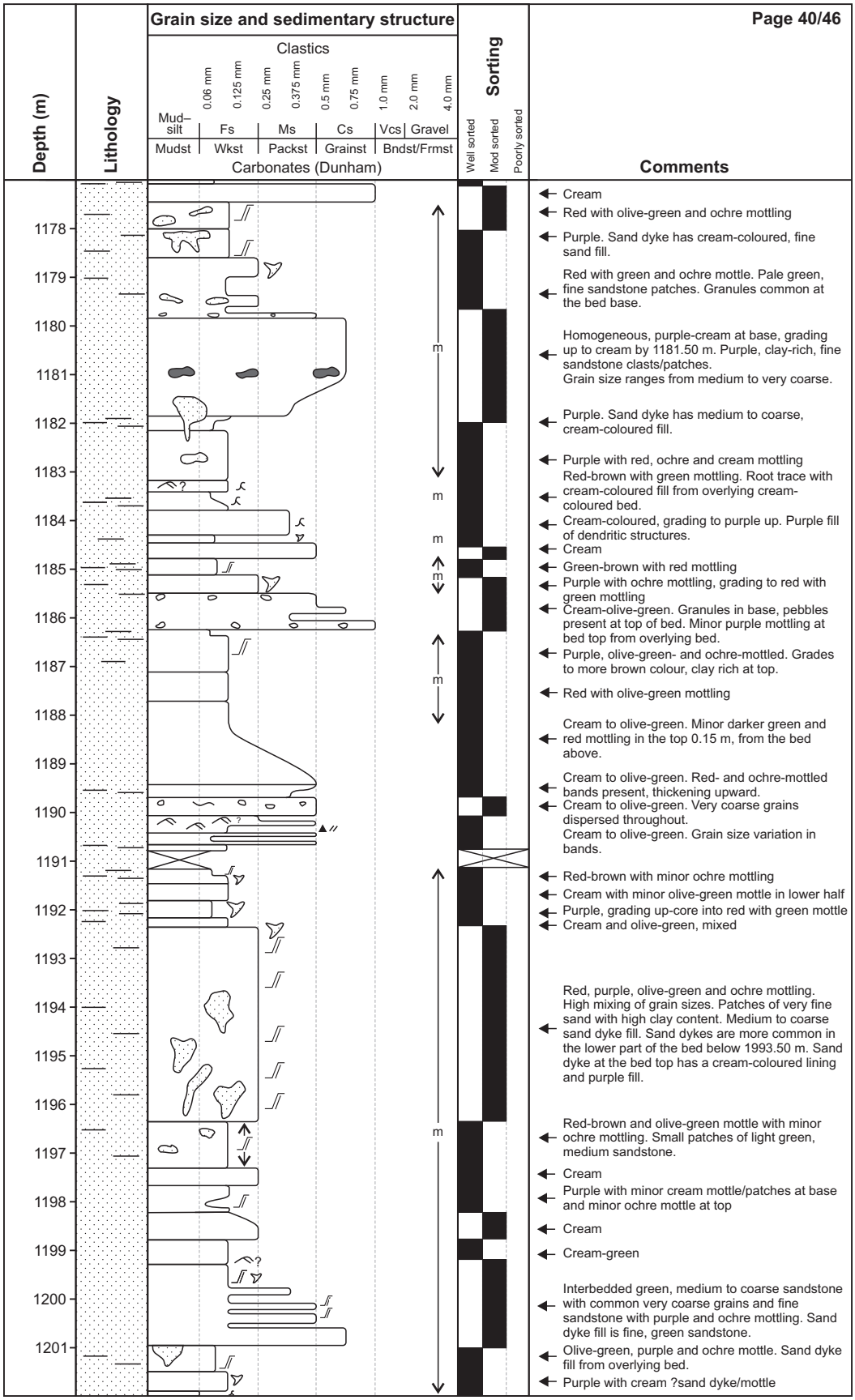
Purple, green and ochre mottling
Cream with purple mottling
Purple
Diffuse purple mottling
Olive-green, ochre and purple mottling. Common, thin sand dykes with network structure, ?roots. Chopped bedding, with structured clasts in the basal 0.20 m.
Red with olive-green mottling and dark green mottling in top 0.40 m
Green, ochre and purple mottling. Purple dendritic structures and small clay patches in lower half. Slim, cream-coloured filled sand dykes in top, ?roots.
Purple with cream mottling
Purple and ochre mottling with minor olive-green mottling. Sand dykes and sand patches have olive-green fill.
Purple, red, ochre and pale green-cream mottling
Purple, red and cream mottling. Thin purple dendritic features throughout.
Olive-green and red mottling
Pale grey
Cream with pink-orange definition of cross strata. Minor green mottled patches.
Common pebbles and granules between 1140.19 and 1140.44 m. Cobbles greater than 0.06 m wide at top of bed.
Cream-pale green. Clay-rich clast.
Purple, purple-red and ochre mottling and minor cream mottling. Large ?sand dyke filled with purple- and green-mottled sandstone.
Cream
Cream and purple patches/mottling
Red with ochre mottling. Large intermixed medium to coarse sand patch.
Olive-green with minor ochre mottling. High levels of granules and very coarse grains in bed base.
Olive-green with ochre mottling. Dendritic structures filled with green clay or dark purple.
Red with reticulate green mottling, grading up to purple and ochre mottling. Large, 0.30 m long sand dyke with green, medium sand fill in lower half of bed.
Red with green mottling/patches at base and purple mottling/patches toward the top. Dendritic features have purple fill.
Red with minor green mottling
Pale green
Olive-green with red and purple mottle
Olive-green with ochre mottling. Olive-green clay patches throughout. Large sand dykes at top with purple and cream fill. Thin sand dykes ~0.01 m wide with pale green fill, possibly roots.
Red with minor cream-pale green and purple mottle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Poorly sorted
Page 40/46
Comments
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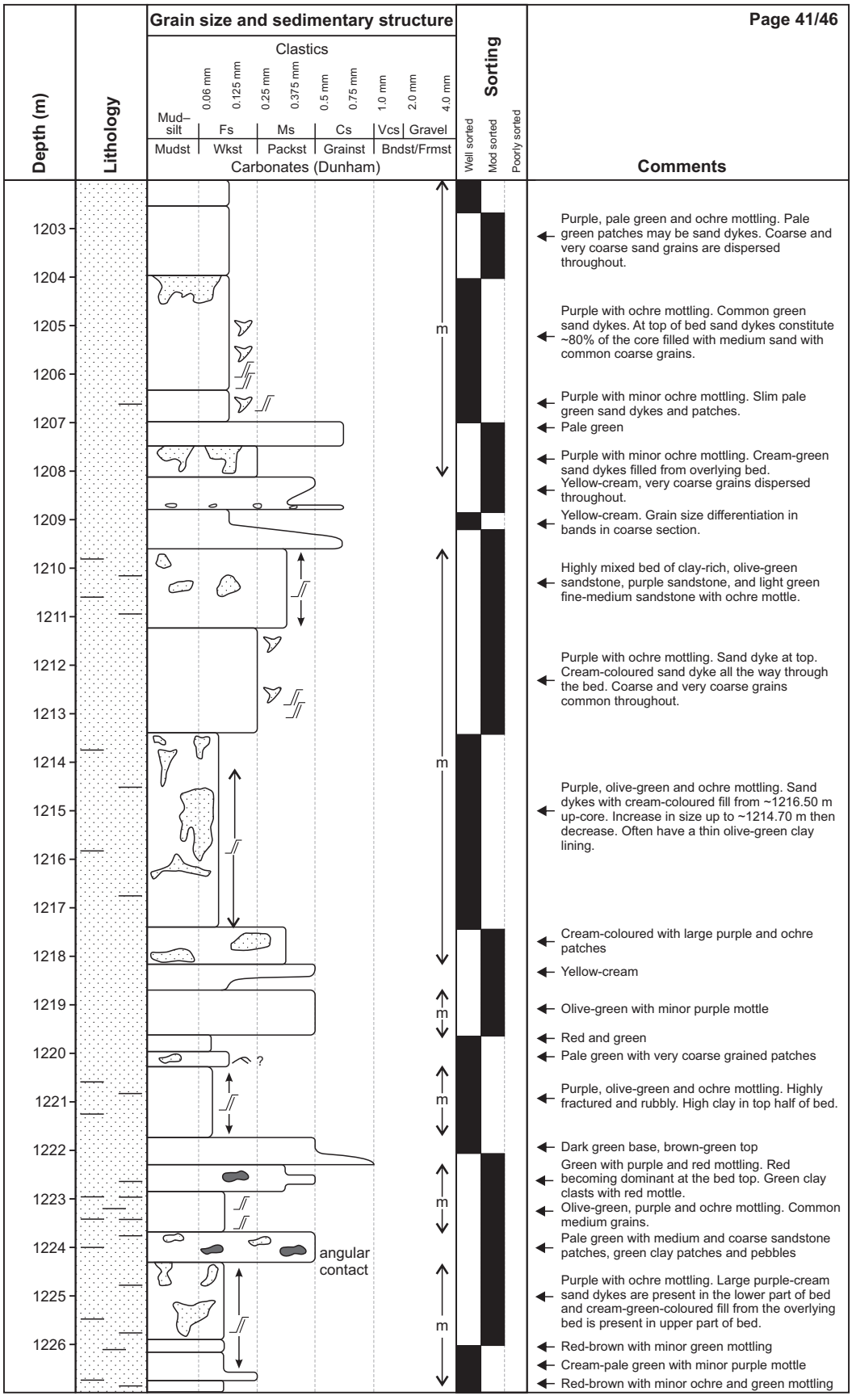
Cream
Red with olive-green and ochre mottling
Purple. Sand dyke has cream-coloured, fine sand fill.
Red with green and ochre mottle. Pale green, fine sandstone patches. Granules common at the bed base.
Homogeneous, purple-cream at base, grading up to cream by 1181.50 m. Purple, clay-rich, fine sandstone clasts/patches.
Grain size ranges from medium to very coarse.
Purple. Sand dyke has medium to coarse, cream-coloured fill.
Purple with red, ochre and cream mottling
Red-brown with green mottling. Root trace with cream-coloured fill from overlying cream-coloured bed.
Cream-coloured, grading to purple up. Purple fill of dendritic structures.
Cream
Green-brown with red mottling
Purple with ochre mottling, grading to red with green mottling
Cream-olive-green. Granules in base, pebbles present at top of bed. Minor purple mottling at bed top from overlying bed.
Purple, olive-green- and ochre-mottled. Grades to more brown colour, clay rich at top.
Red with olive-green mottling
Cream to olive-green. Minor darker green and red mottling in the top 0.15 m, from the bed above.
Cream to olive-green. Red- and ochre-mottled bands present, thickening upward.
Cream to olive-green. Very coarse grains dispersed throughout.
Cream to olive-green. Grain size variation in bands.
Red-brown with minor ochre mottling
Cream with minor olive-green mottle in lower half
Purple, grading up-core into red with green mottle
Cream and olive-green, mixed
Red, purple, olive-green and ochre mottling. High mixing of grain sizes. Patches of very fine sand with high clay content. Medium to coarse sand dyke fill. Sand dykes are more common in the lower part of the bed below 1993.50 m. Sand dyke at the bed top has a cream-coloured lining and purple fill.
Red-brown and olive-green mottle with minor ochre mottling. Small patches of light green, medium sandstone.
Cream
Purple with minor cream mottle/patches at base and minor ochre mottle at top
Cream
Cream-green
Interbedded green, medium to coarse sandstone with common very coarse grains and fine sandstone with purple and ochre mottling. Sand dyke fill is fine, green sandstone.
Olive-green, purple and ochre mottle. Sand dyke fill from overlying bed.
Purple with cream ?sand dyke/mottle


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 41/46
Comments
1203
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1224
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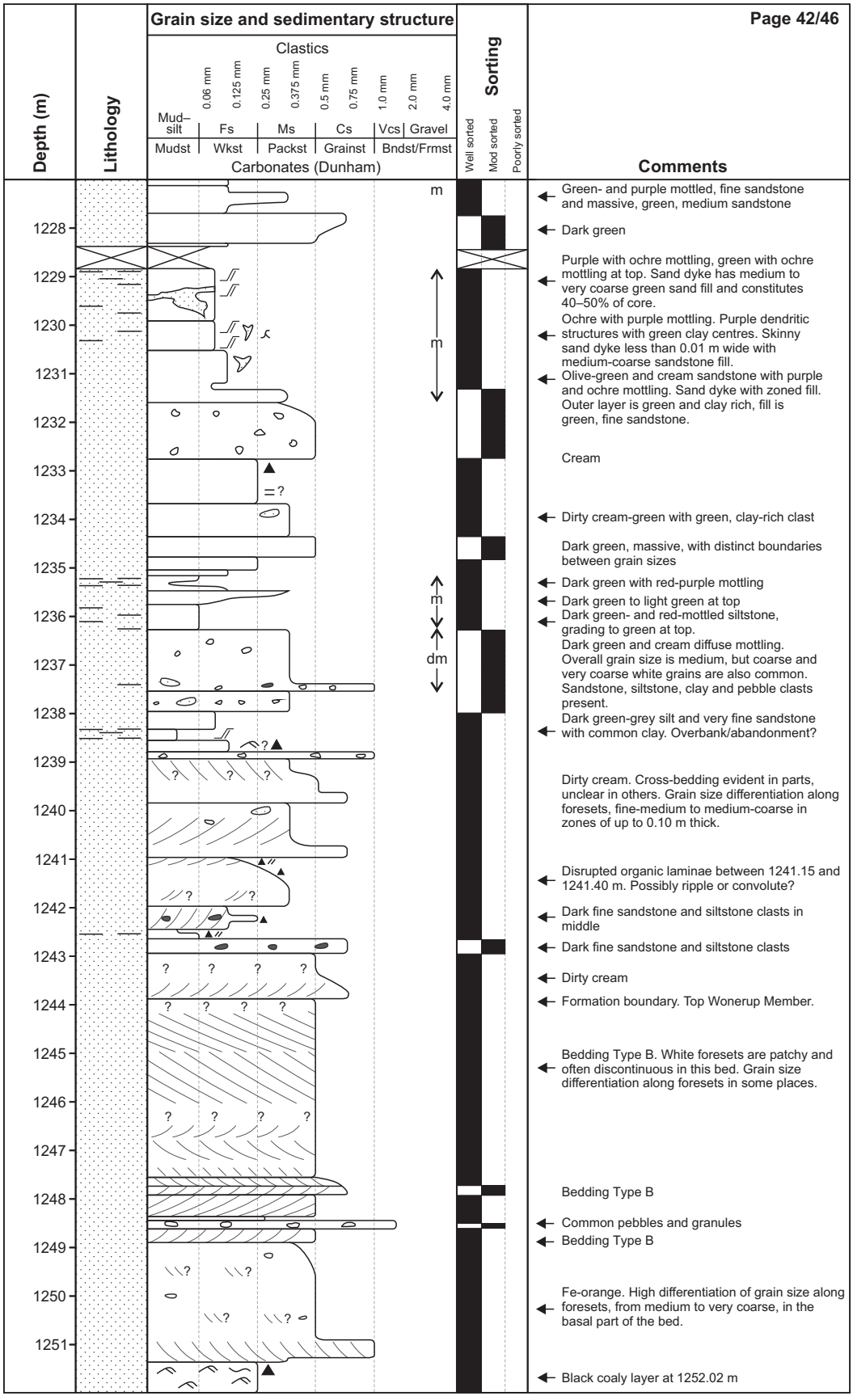
m
m
?
angular contact
Purple, pale green and ochre mottling. Pale green patches may be sand dykes. Coarse and very coarse sand grains are dispersed throughout.
Purple with ochre mottling. Common green sand dykes. At top of bed sand dykes constitute ~80% of the core filled with medium sand with common coarse grains.
Purple with minor ochre mottling. Slim pale green sand dykes and patches.
Pale green
Purple with minor ochre mottling. Cream-green sand dykes filled from overlying bed.
Yellow-cream, very coarse grains dispersed throughout.
Yellow-cream. Grain size differentiation in bands in coarse section.
Highly mixed bed of clay-rich, olive-green sandstone, purple sandstone, and light green fine-medium sandstone with ochre mottle.
Purple with ochre mottling. Sand dyke at top. Cream-coloured sand dyke all the way through the bed. Coarse and very coarse grains common throughout.
Purple, olive-green and ochre mottling. Sand dykes with cream-coloured fill from ~1216.50 m up-core. Increase in size up to ~1214.70 m then decrease. Often have a thin olive-green clay lining.
Cream-coloured with large purple and ochre patches
Yellow-cream
Olive-green with minor purple mottle
Red and green
Pale green with very coarse grained patches
Purple, olive-green and ochre mottling. Highly fractured and rubbly. High clay in top half of bed.
Dark green base, brown-green top
Green with purple and red mottling. Red becoming dominant at the bed top. Green clay clasts with red mottle.
Olive-green, purple and ochre mottling. Common medium grains.
Pale green with medium and coarse sandstone patches, green clay patches and pebbles
Purple with ochre mottling. Large purple-cream sand dykes are present in the lower part of bed and cream-green-coloured fill from the overlying bed is present in upper part of bed.
Red-brown with minor green mottling
Cream-pale green with minor purple mottle
Red-brown with minor ochre and green mottling


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 42/46
Comments
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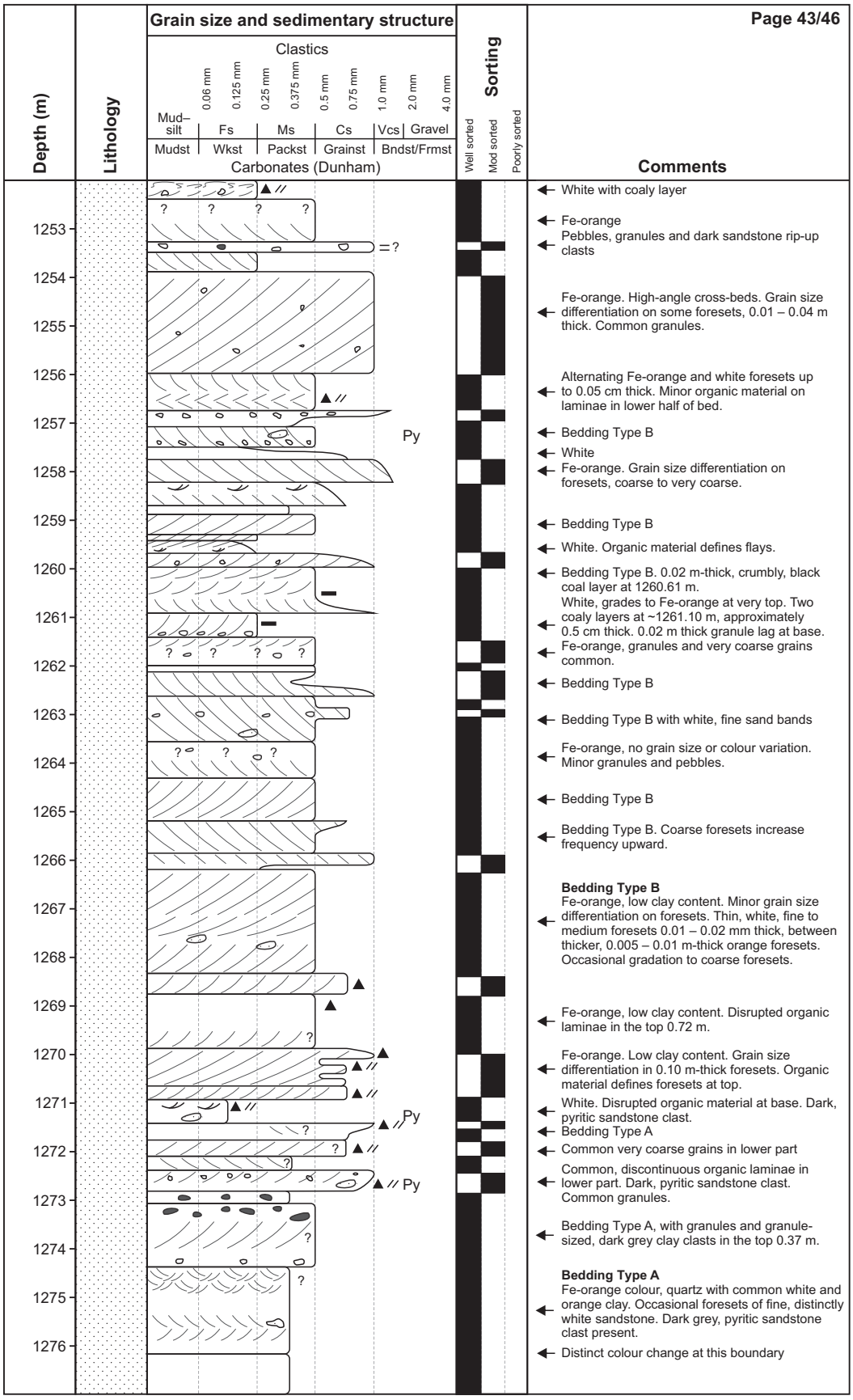
1250
1251
m
m
m
dm
Green- and purple mottled, fine sandstone and massive, green, medium sandstone
Dark green
Purple with ochre mottling, green with ochre mottling at top. Sand dyke has medium to very coarse green sand fill and constitutes 40–50% of core.
Ochre with purple mottling. Purple dendritic structures with green clay centres. Skinny sand dyke less than 0.01 m wide with medium-coarse sandstone fill.
Olive-green and cream sandstone with purple and ochre mottling. Sand dyke with zoned fill. Outer layer is green and clay rich, fill is green, fine sandstone.
Cream
Dirty cream-green with green, clay-rich clast
Dark green, massive, with distinct boundaries between grain sizes
Dark green with red-purple mottling
Dark green to light green at top
Dark green- and red-mottled siltstone, grading to green at top.
Dark green and cream diffuse mottling. Overall grain size is medium, but coarse and very coarse white grains are also common. Sandstone, siltstone, clay and pebble clasts present.
Dark green-grey silt and very fine sandstone with common clay. Overbank/abandonment?
Dirty cream. Cross-bedding evident in parts, unclear in others. Grain size differentiation along foresets, fine-medium to medium-coarse in zones of up to 0.10 m thick.
Disrupted organic laminae between 1241.15 and 1241.40 m. Possibly ripple or convolute?
Dark fine sandstone and siltstone clasts in middle
Dark fine sandstone and siltstone clasts
Dirty cream
Formation boundary. Top Wonerup Member.
Bedding Type B. White foresets are patchy and often discontinuous in this bed. Grain size differentiation along foresets in some places.
Bedding Type B
Common pebbles and granules
Bedding Type B
Fe-orange. High differentiation of grain size along foresets, from medium to very coarse, in the basal part of the bed.
Black coaly layer at 1252.02 m


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 43/46
Comments
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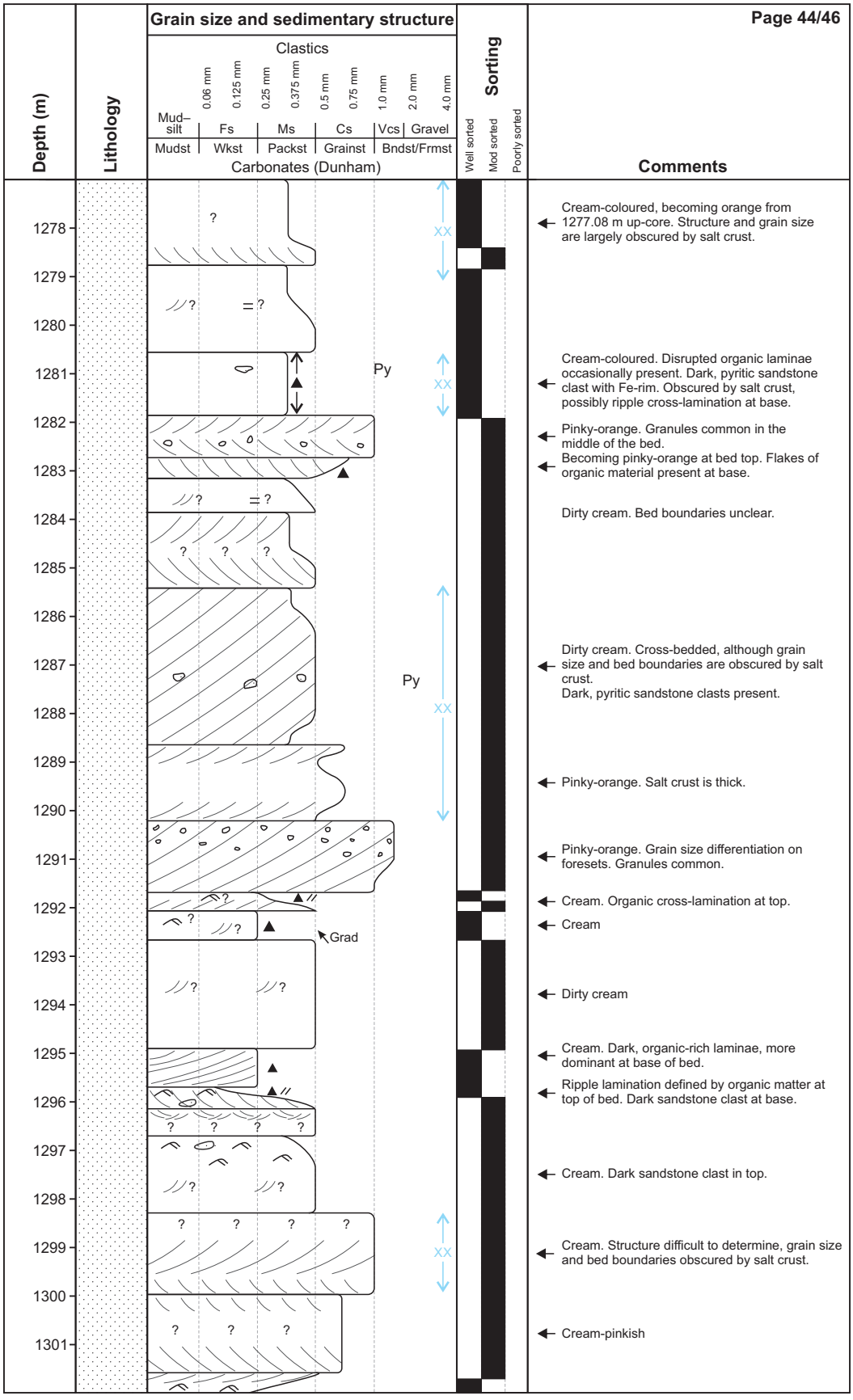
Py
White with coaly layer
Fe-orange
Pebbles, granules and dark sandstone rip-up clasts
Fe-orange. High-angle cross-beds. Grain size differentiation on some foresets, 0.01 – 0.04 m thick. Common granules.
Alternating Fe-orange and white foresets up to 0.05 cm thick. Minor organic material on laminae in lower half of bed.
Bedding Type B
White
Fe-orange. Grain size differentiation on foresets, coarse to very coarse.
Bedding Type B
White. Organic material defines flays.
Bedding Type B. 0.02 m-thick, crumbly, black coal layer at 1260.61 m.
White, grades to Fe-orange at very top. Two coaly layers at ~1261.10 m, approximately 0.5 cm thick. 0.02 m thick granule lag at base.
Fe-orange, granules and very coarse grains common.
Bedding Type B
Bedding Type B with white, fine sand bands
Fe-orange, no grain size or colour variation. Minor granules and pebbles.
Bedding Type B
Bedding Type B. Coarse foresets increase frequency upward.
Bedding Type B
Fe-orange, low clay content. Minor grain size differentiation on foresets. Thin, white, fine to medium foresets 0.01 – 0.02 mm thick, between thicker, 0.005 – 0.01 m-thick orange foresets. Occasional gradation to coarse foresets.
Fe-orange, low clay content. Disrupted organic laminae in the top 0.72 m.
Fe-orange. Low clay content. Grain size differentiation in 0.10 m-thick foresets. Organic material defines foresets at top.
White. Disrupted organic material at base. Dark, pyritic sandstone clast.
Bedding Type A
Common very coarse grains in lower part
Common, discontinuous organic laminae in lower part. Dark, pyritic sandstone clast. Common granules.
Bedding Type A, with granules and granule-sized, dark grey clay clasts in the top 0.37 m.
Bedding Type A
Fe-orange colour, quartz with common white and orange clay. Occasional foresets of fine, distinctly white sandstone. Dark grey, pyritic sandstone clast present.
Distinct colour change at this boundary


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 44/46
Comments
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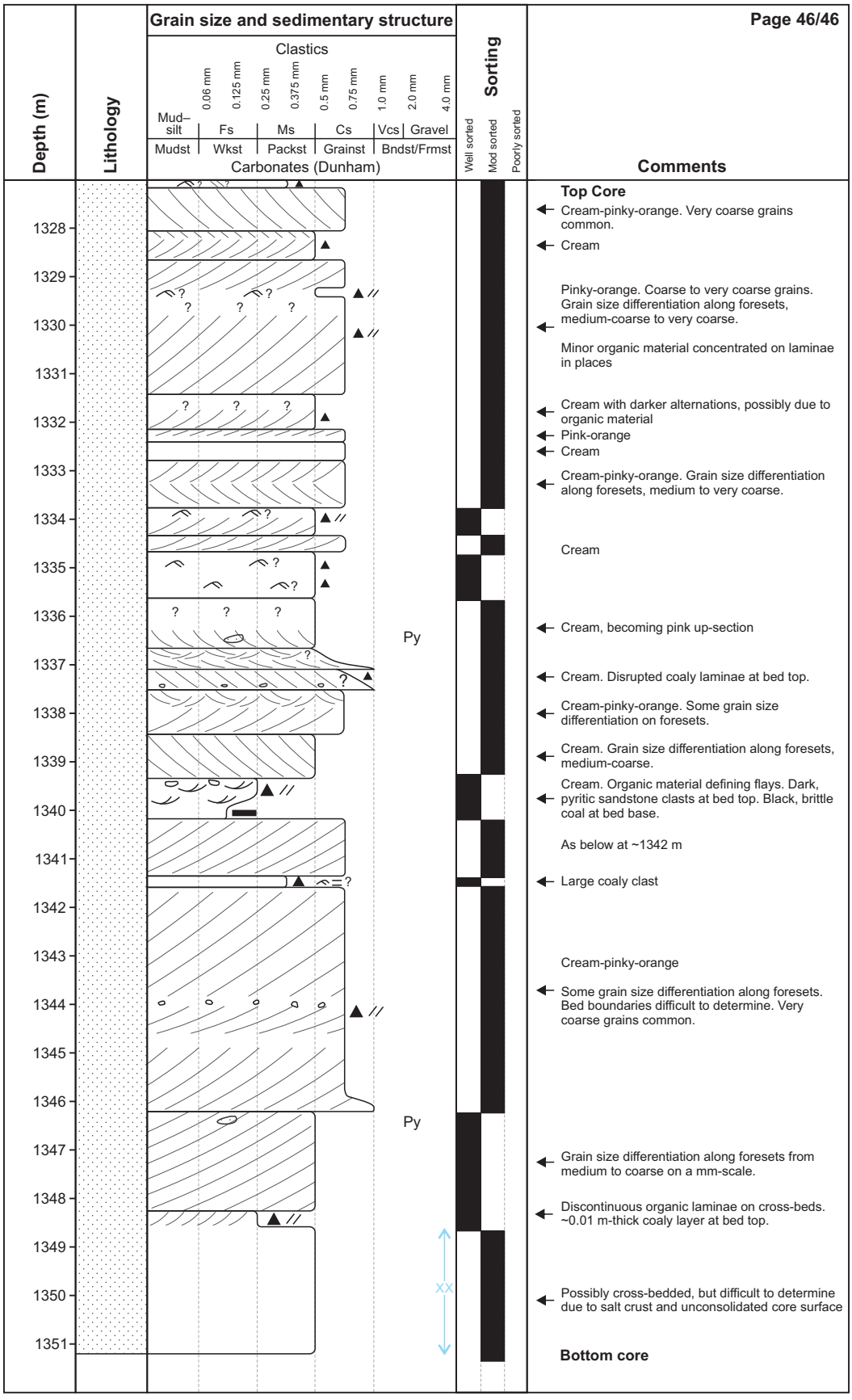
1300
1301
Py
Py
Grad
Cream-coloured, becoming orange from 1277.08 m up-core. Structure and grain size are largely obscured by salt crust.
Cream-coloured. Disrupted organic laminae occasionally present. Dark, pyritic sandstone clast with Fe-rim. Obscured by salt crust, possibly ripple cross-lamination at base.
Pinky-orange. Granules common in the middle of the bed.
Becoming pinky-orange at bed top. Flakes of organic material present at base.
Dirty cream. Bed boundaries unclear.
Dirty cream. Cross-bedded, although grain size and bed boundaries are obscured by salt crust.
Dark, pyritic sandstone clasts present.
Pinky-orange. Salt crust is thick.
Pinky-orange. Grain size differentiation on foresets. Granules common.
Cream. Organic cross-lamination at top.
Cream
Dirty cream
Cream. Dark, organic-rich laminae, more dominant at base of bed.
Ripple lamination defined by organic matter at top of bed. Dark sandstone clast at base.
Cream. Dark sandstone clast in top.
Cream. Structure difficult to determine, grain size and bed boundaries obscured by salt crust.
Cream-pinkish


Grain size and sedimentary structure
Page 46/46
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
Top Core
Cream-pinky-orange. Very coarse grains common.
Cream
Pinky-orange. Coarse to very coarse grains. Grain size differentiation along foresets, medium-coarse to very coarse.
Minor organic material concentrated on laminae in places
Cream with darker alternations, possibly due to organic material
Pink-orange
Cream
Cream-pinky-orange. Grain size differentiation along foresets, medium to very coarse.
Cream
Cream, becoming pink up-section
Cream. Disrupted coaly laminae at bed top.
Cream-pinky-orange. Some grain size differentiation on foresets.
Cream. Grain size differentiation along foresets, medium-coarse.
Cream. Organic material defining flays. Dark, pyritic sandstone clasts at bed top. Black, brittle coal at bed base.
As below at ~1342 m
Large coaly clast
Cream-pinky-orange
Some grain size differentiation along foresets. Bed boundaries difficult to determine. Very coarse grains common.
Grain size differentiation along foresets from medium to coarse on a mm-scale.
Discontinuous organic laminae on cross-beds. ~0.01 m-thick coaly layer at bed top.
Possibly cross-bedded, but difficult to determine due to salt crust and unconsolidated core surface
Bottom core
Py
Py
XX
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Appendix 2

Core logs for DMP Harvey 3/3A

Legend for Harvey 3/3A core logs

Lithology

- Sandstone
- Clay-rich sandstone
- Clay-rich siltstone
- Sandy claystone
- Cross-stratification
- Trough cross-stratification
- Ripple lamination
- Horizontal lamination
- Flaser bedding
- Wavy bedding
- Convolute bedding
- Slump
- Mud drape
- Slickenside
- Sandstone patches
- Clay-rich patches
- Sandstone lenses
- Sand dyke
- Dendritic structure
- Flame structure
- Granules - pebbles
- Clay-rich clasts
- Sandstone clasts
- Organic material

▲ //	Organic material defining lamination
m	Mottling
dm	Diffuse mottling
uc	Unconsolidated sediment
Py	Pyrite
Fe	Iron stain
xx	Salt crust

Grain size classification

Mudst	Mudstone
Wkst	Wackestone
Packst	Packstone
Grainst	Grainstone
Bndst/ Frmst	Bindstone/Framestone
Fs	Fine sand
Ms	Medium sand
Cs	Coarse sand
Vcs	Very coarse sand

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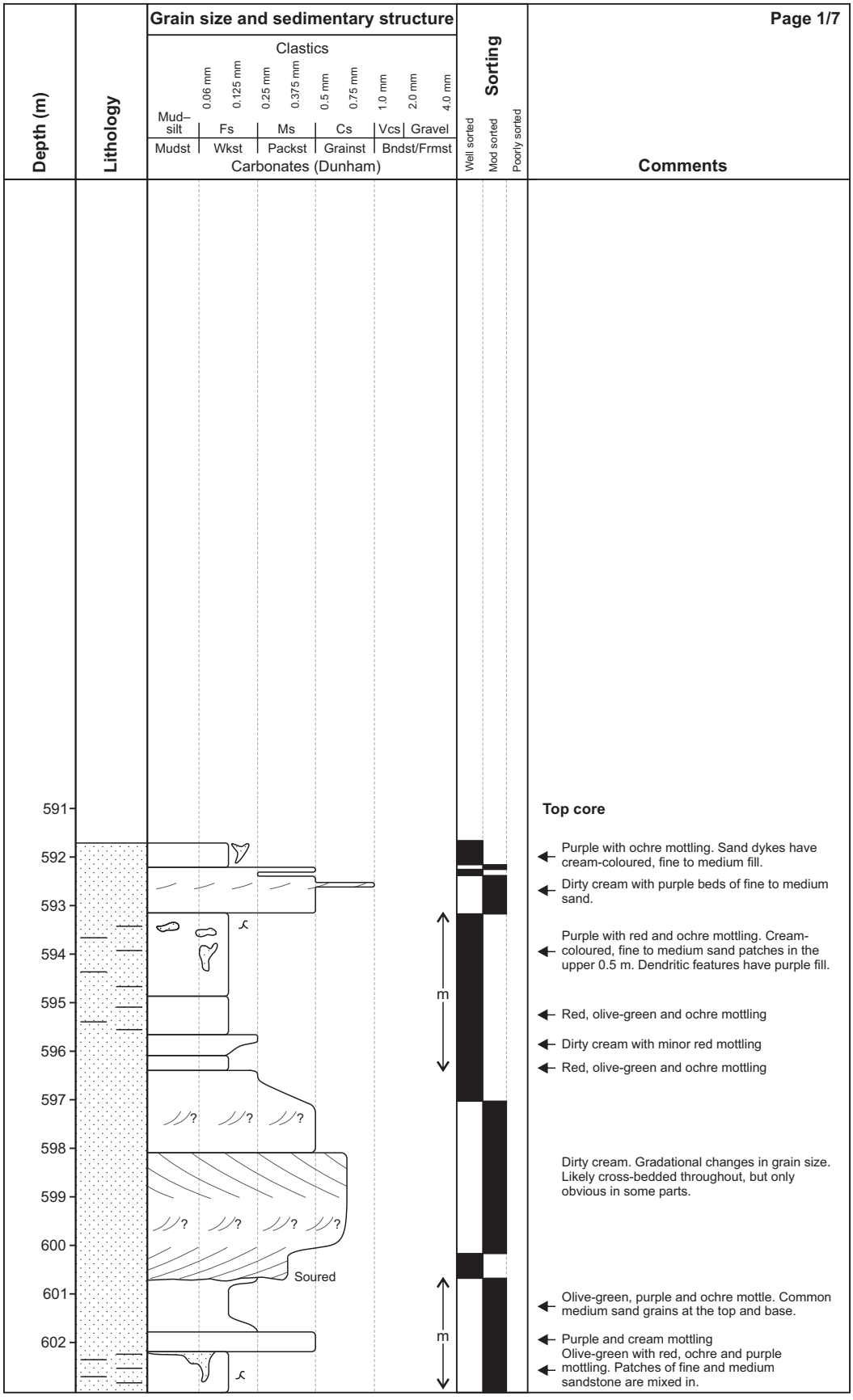
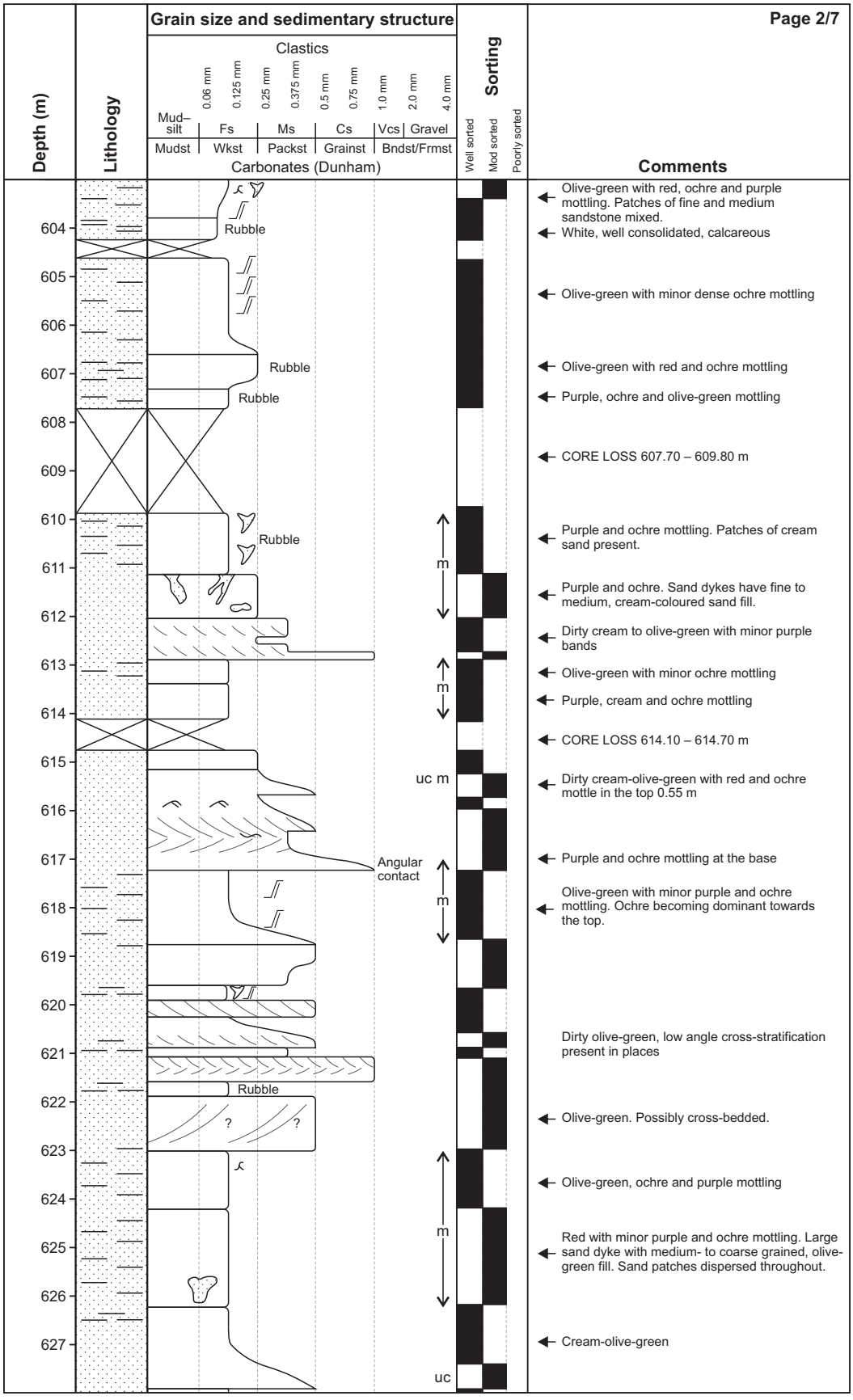
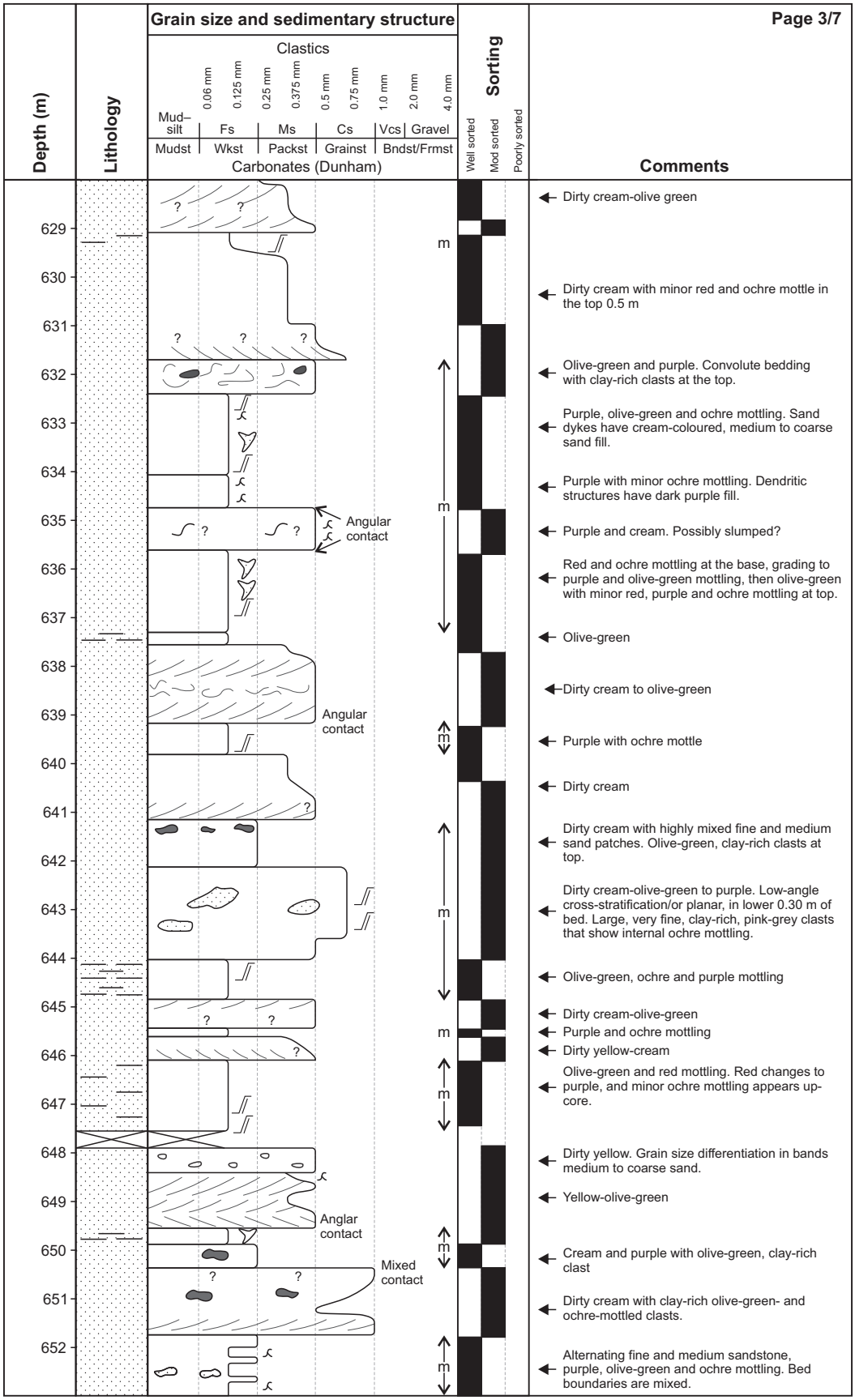

Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 1/7
Comments
591
592
593
594
595
596
597
598
599
600
601
602
m
m
Soured
Top core
Purple with ochre mottling. Sand dykes have cream-coloured, fine to medium fill.
Dirty cream with purple beds of fine to medium sand.
Purple with red and ochre mottling. Cream-coloured, fine to medium sand patches in the upper 0.5 m. Dendritic features have purple fill.
Red, olive-green and ochre mottling
Dirty cream with minor red mottling
Red, olive-green and ochre mottling
Dirty cream. Gradational changes in grain size. Likely cross-bedded throughout, but only obvious in some parts.
Olive-green, purple and ochre mottle. Common medium sand grains at the top and base.
Purple and cream mottling
Olive-green with red, ochre and purple mottling. Patches of fine and medium sandstone are mixed in.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 2/7
Comments
Rubble
Angular contact
m
uc m
uc
?
Olive-green with red, ochre and purple mottling. Patches of fine and medium sandstone mixed.
White, well consolidated, calcareous
Olive-green with minor dense ochre mottling
Olive-green with red and ochre mottling
Purple, ochre and olive-green mottling
CORE LOSS 607.70 – 609.80 m
Purple and ochre mottling. Patches of cream sand present.
Purple and ochre. Sand dykes have fine to medium, cream-coloured sand fill.
Dirty cream to olive-green with minor purple bands
Olive-green with minor ochre mottling
Purple, cream and ochre mottling
CORE LOSS 614.10 – 614.70 m
Dirty cream-olive-green with red and ochre mottle in the top 0.55 m
Purple and ochre mottling at the base
Olive-green with minor purple and ochre mottling. Ochre becoming dominant towards the top.
Dirty olive-green, low angle cross-stratification present in places
Olive-green. Possibly cross-bedded.
Olive-green, ochre and purple mottling
Red with minor purple and ochre mottling. Large sand dyke with medium- to coarse grained, olive-green fill. Sand patches dispersed throughout.
Cream-olive-green


Grain size and sedimentary structure
Page 3/7
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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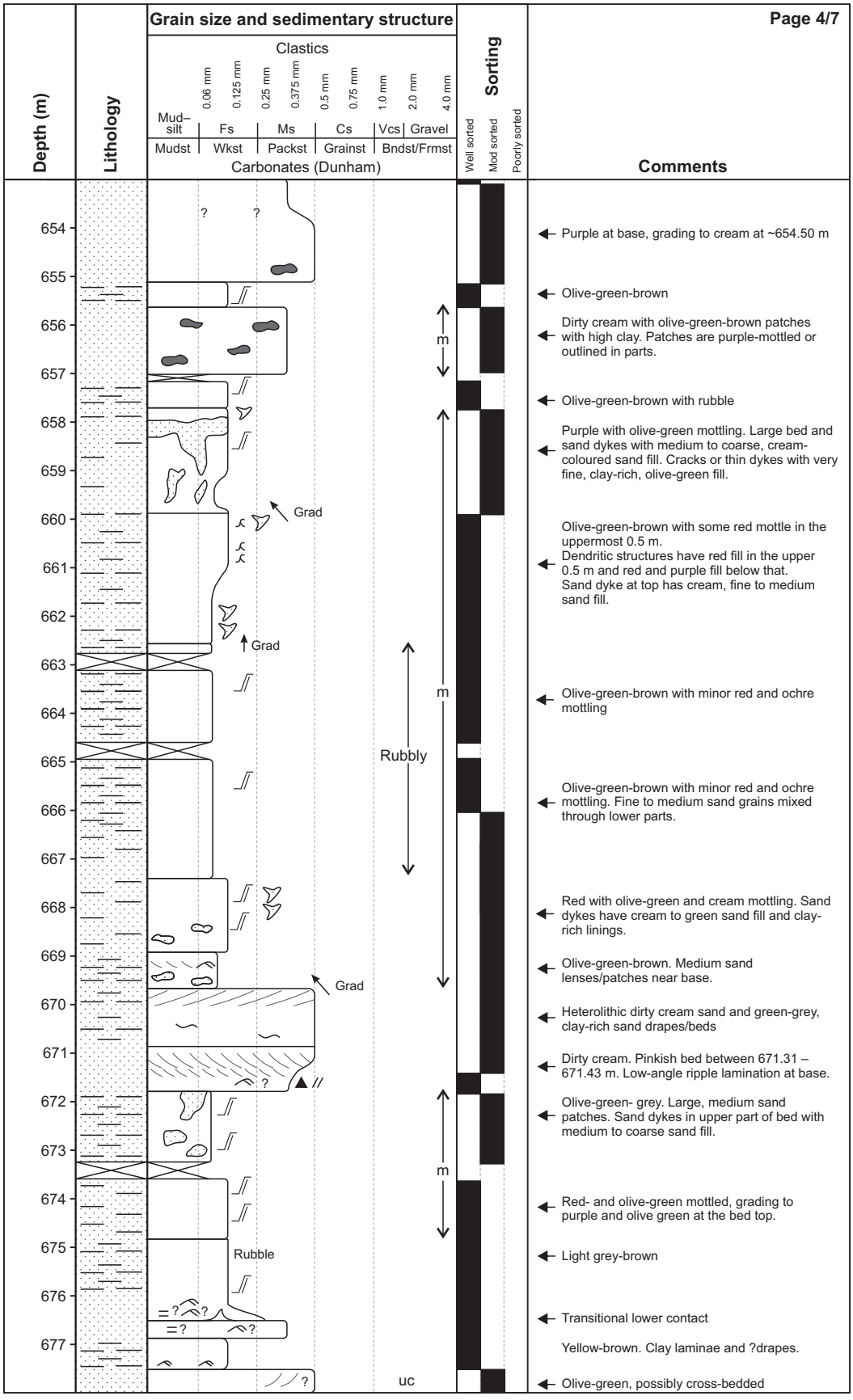
m
Angular contact
Angular contact
Anglar contact
Mixed contact
Dirty cream-olive green
Dirty cream with minor red and ochre mottle in the top 0.5 m
Olive-green and purple. Convolute bedding with clay-rich clasts at the top.
Purple, olive-green and ochre mottling. Sand dykes have cream-coloured, medium to coarse sand fill.
Purple with minor ochre mottling. Dendritic structures have dark purple fill.
Purple and cream. Possibly slumped?
Red and ochre mottling at the base, grading to purple and olive-green mottling, then olive-green with minor red, purple and ochre mottling at top.
Olive-green
Dirty cream to olive-green
Purple with ochre mottle
Dirty cream
Dirty cream with highly mixed fine and medium sand patches. Olive-green, clay-rich clasts at top.
Dirty cream-olive-green to purple. Low-angle cross-stratification/or planar, in lower 0.30 m of bed. Large, very fine, clay-rich, pink-grey clasts that show internal ochre mottling.
Olive-green, ochre and purple mottling
Dirty cream-olive-green
Purple and ochre mottling
Dirty yellow-cream
Olive-green and red mottling. Red changes to purple, and minor ochre mottling appears up-core.
Dirty yellow. Grain size differentiation in bands medium to coarse sand.
Yellow-olive-green
Cream and purple with olive-green, clay-rich clast
Dirty cream with clay-rich olive-green- and ochre-mottled clasts.
Alternating fine and medium sandstone, purple, olive-green and ochre mottling. Bed boundaries are mixed.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 4/7
Comments
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Grad
Grad
Grad
Rubbly
Rubble
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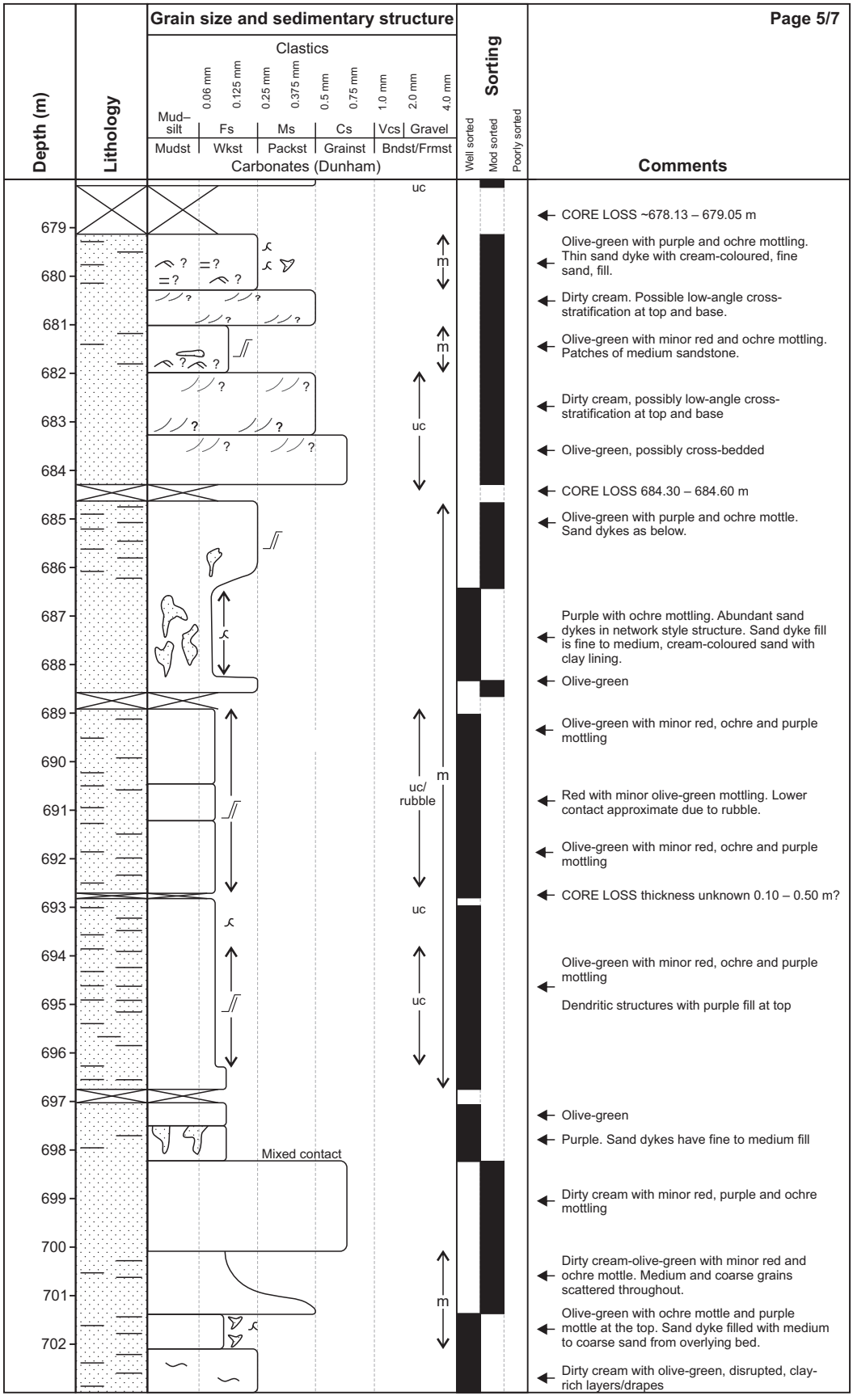
uc
Purple at base, grading to cream at ~654.50 m
Olive-green-brown
Dirty cream with olive-green-brown patches with high clay. Patches are purple-mottled or outlined in parts.
Olive-green-brown with rubble
Purple with olive-green mottling. Large bed and sand dykes with medium to coarse, cream-coloured sand fill. Cracks or thin dykes with very fine, clay-rich, olive-green fill.
Olive-green-brown with some red mottle in the uppermost 0.5 m.
Dendritic structures have red fill in the upper 0.5 m and red and purple fill below that.
Sand dyke at top has cream, fine to medium sand fill.
Olive-green-brown with minor red and ochre mottling
Olive-green-brown with minor red and ochre mottling. Fine to medium sand grains mixed through lower parts.
Red with olive-green and cream mottling. Sand dykes have cream to green sand fill and clay-rich linings.
Olive-green-brown. Medium sand lenses/patches near base.
Heterolithic dirty cream sand and green-grey, clay-rich sand drapes/beds
Dirty cream. Pinkish bed between 671.31 – 671.43 m. Low-angle ripple lamination at base.
Olive-green- grey. Large, medium sand patches. Sand dykes in upper part of bed with medium to coarse sand fill.
Red- and olive-green mottled, grading to purple and olive green at the bed top.
Light grey-brown
Transitional lower contact
Yellow-brown. Clay laminae and ?drapes.
Olive-green, possibly cross-bedded


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 5/7
Comments
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uc
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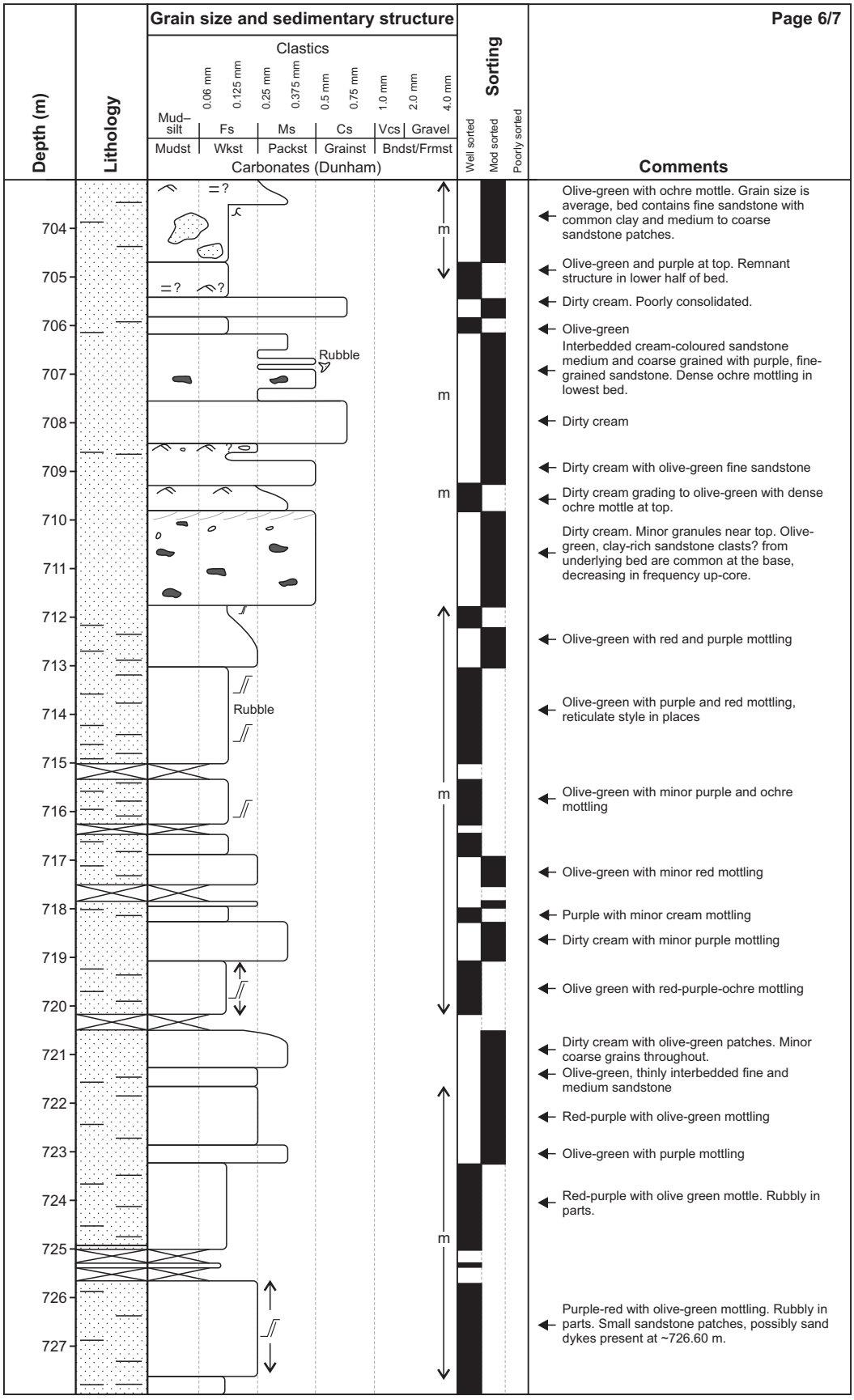
rubble
uc
uc
m
Mixed contact
CORE LOSS ~678.13 – 679.05 m
Olive-green with purple and ochre mottling. Thin sand dyke with cream-coloured, fine sand, fill.
Dirty cream. Possible low-angle cross-stratification at top and base.
Olive-green with minor red and ochre mottling. Patches of medium sandstone.
Dirty cream, possibly low-angle cross-stratification at top and base
Olive-green, possibly cross-bedded
CORE LOSS 684.30 – 684.60 m
Olive-green with purple and ochre mottle. Sand dykes as below.
Purple with ochre mottling. Abundant sand dykes in network style structure. Sand dyke fill is fine to medium, cream-coloured sand with clay lining.
Olive-green
Olive-green with minor red, ochre and purple mottling
Red with minor olive-green mottling. Lower contact approximate due to rubble.
Olive-green with minor red, ochre and purple mottling
CORE LOSS thickness unknown 0.10 – 0.50 m?
Olive-green with minor red, ochre and purple mottling
Dendritic structures with purple fill at top
Olive-green
Purple. Sand dykes have fine to medium fill
Dirty cream with minor red, purple and ochre mottling
Dirty cream-olive-green with minor red and ochre mottle. Medium and coarse grains scattered throughout.
Olive-green with ochre mottle and purple mottle at the top. Sand dyke filled with medium to coarse sand from overlying bed.
Dirty cream with olive-green, disrupted, clay-rich layers/drapes


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 6/7
Comments
Rubble
Rubble
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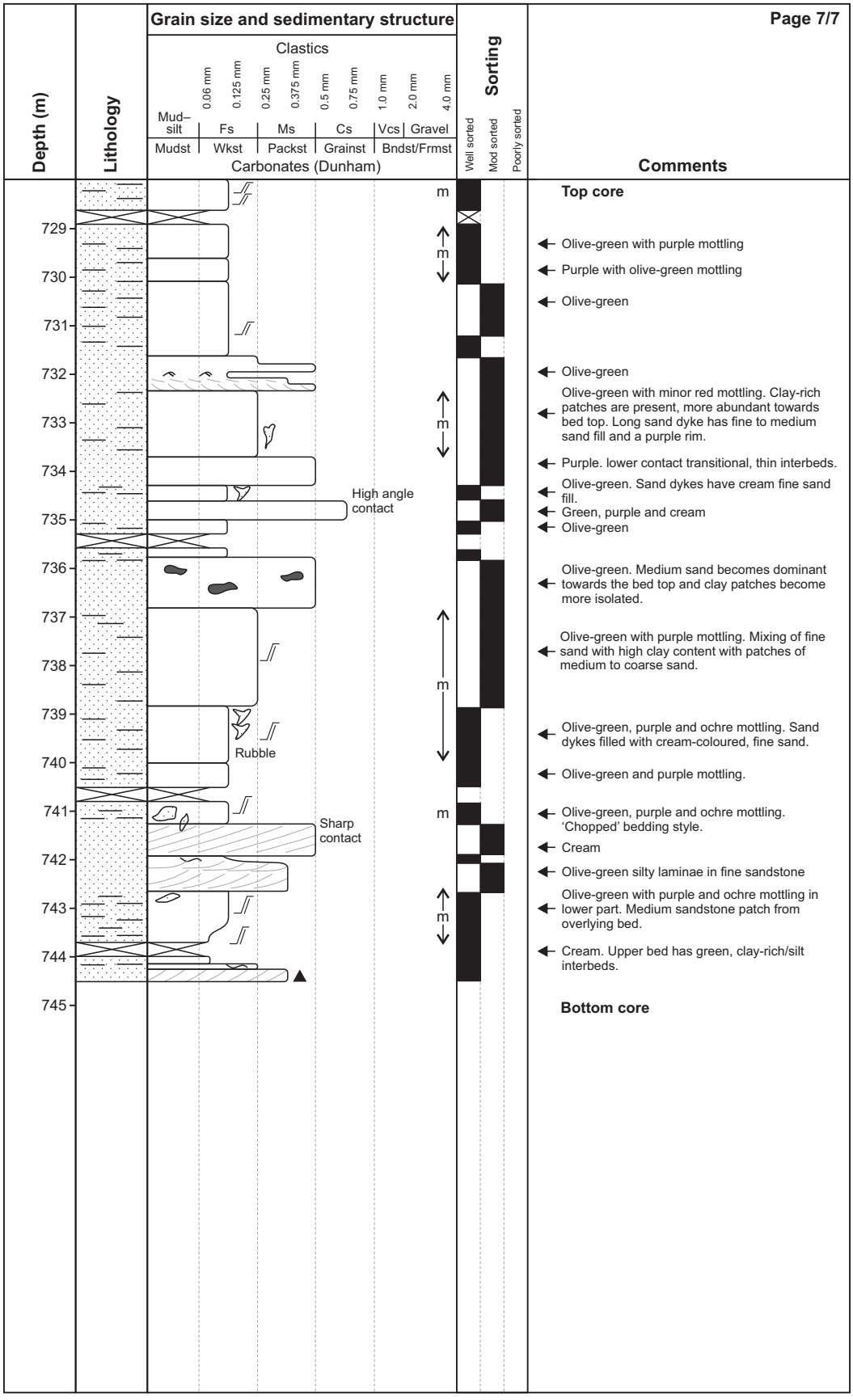
Olive-green with ochre mottle. Grain size is average, bed contains fine sandstone with common clay and medium to coarse sandstone patches.
Olive-green and purple at top. Remnant structure in lower half of bed.
Dirty cream. Poorly consolidated.
Olive-green
Interbedded cream-coloured sandstone medium and coarse grained with purple, fine-grained sandstone. Dense ochre mottling in lowest bed.
Dirty cream
Dirty cream with olive-green fine sandstone
Dirty cream grading to olive-green with dense ochre mottle at top.
Dirty cream. Minor granules near top. Olive-green, clay-rich sandstone clasts? from underlying bed are common at the base, decreasing in frequency up-core.
Olive-green with red and purple mottling
Olive-green with purple and red mottling, reticulate style in places
Olive-green with minor purple and ochre mottling
Olive-green with minor red mottling
Purple with minor cream mottling
Dirty cream with minor purple mottling
Olive green with red-purple-ochre mottling
Dirty cream with olive-green patches. Minor coarse grains throughout.
Olive-green, thinly interbedded fine and medium sandstone
Red-purple with olive-green mottling
Olive-green with purple mottling
Red-purple with olive green mottle. Rubbly in parts.
Purple-red with olive-green mottling. Rubbly in parts. Small sandstone patches, possibly sand dykes present at ~726.60 m.


Grain size and sedimentary structure
Page 7/7
Depth (m)
Lithology
Clastics
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0.25 mm
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2.0 mm
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Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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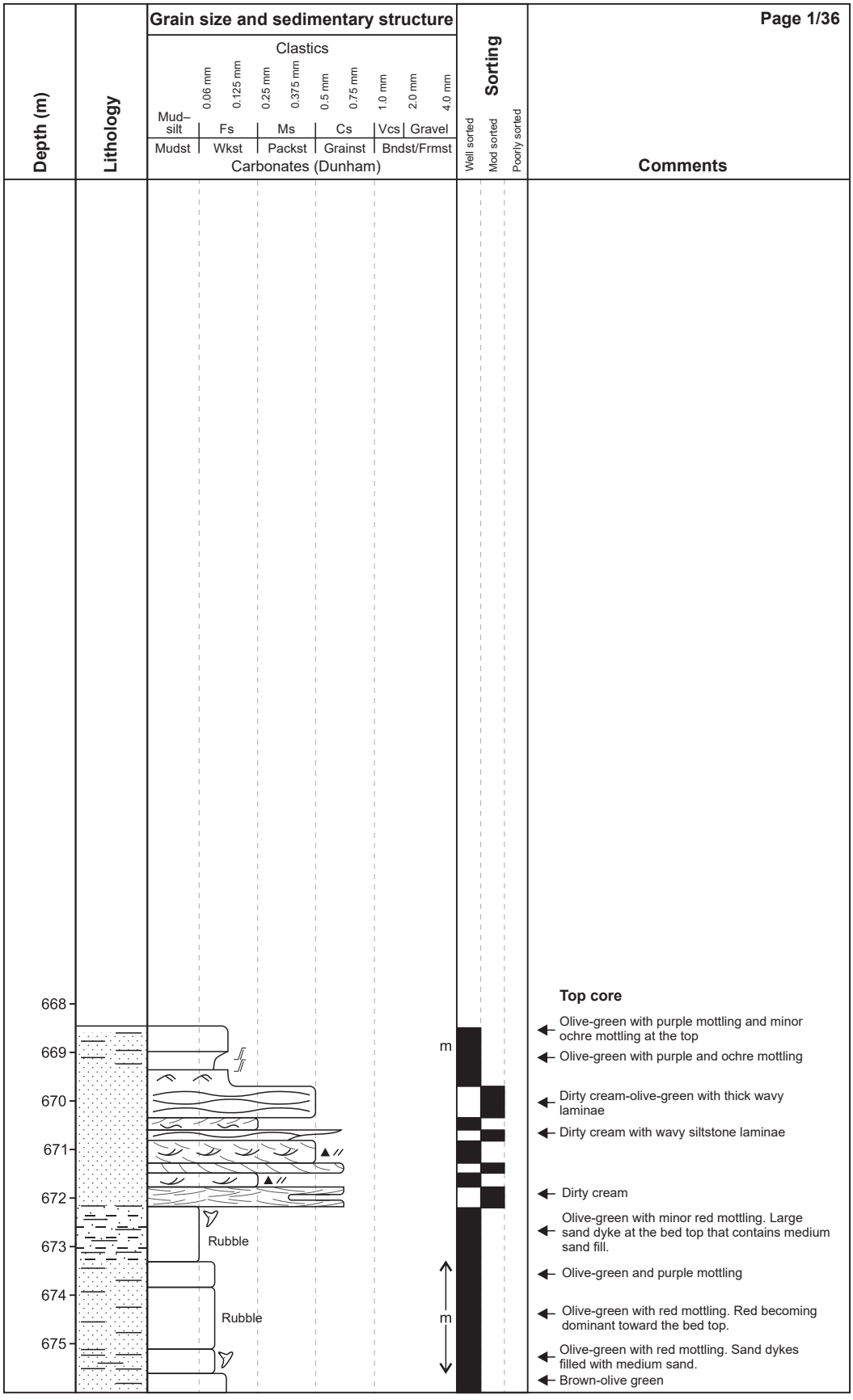
743
744
745
m
High angle contact
Rubble
Sharp contact
Top core
Olive-green with purple mottling
Purple with olive-green mottling
Olive-green
Olive-green
Olive-green with minor red mottling. Clay-rich patches are present, more abundant towards bed top. Long sand dyke has fine to medium sand fill and a purple rim.
Purple. lower contact transitional, thin interbeds.
Olive-green. Sand dykes have cream fine sand fill.
Green, purple and cream
Olive-green
Olive-green. Medium sand becomes dominant towards the bed top and clay patches become more isolated.
Olive-green with purple mottling. Mixing of fine sand with high clay content with patches of medium to coarse sand.
Olive-green, purple and ochre mottling. Sand dykes filled with cream-coloured, fine sand.
Olive-green and purple mottling.
Olive-green, purple and ochre mottling. ‘Chopped’ bedding style.
Cream
Olive-green silty laminae in fine sandstone
Olive-green with purple and ochre mottling in lower part. Medium sandstone patch from overlying bed.
Cream. Upper bed has green, clay-rich/silt interbeds.
Bottom core


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 1/36
Comments
668
669
670
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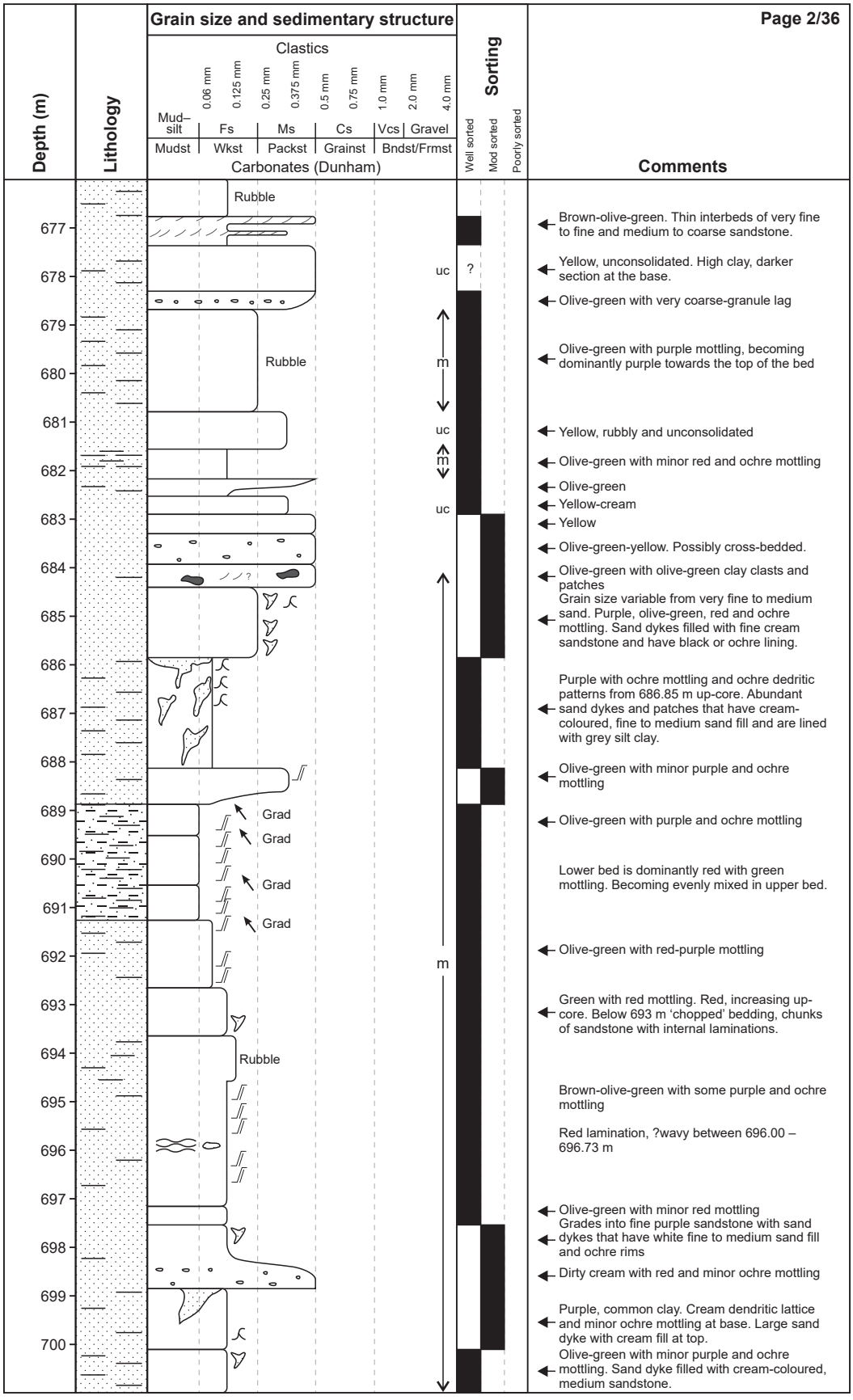
672
673
674
675
Rubble
Rubble
m
m
Top core
Olive-green with purple mottling and minor ochre mottling at the top
Olive-green with purple and ochre mottling
Dirty cream-olive-green with thick wavy laminae
Dirty cream with wavy siltstone laminae
Dirty cream
Olive-green with minor red mottling. Large sand dyke at the bed top that contains medium sand fill.
Olive-green and purple mottling
Olive-green with red mottling. Red becoming dominant toward the bed top.
Olive-green with red mottling. Sand dykes filled with medium sand.
Brown-olive green


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 2/36
Comments
Rubble
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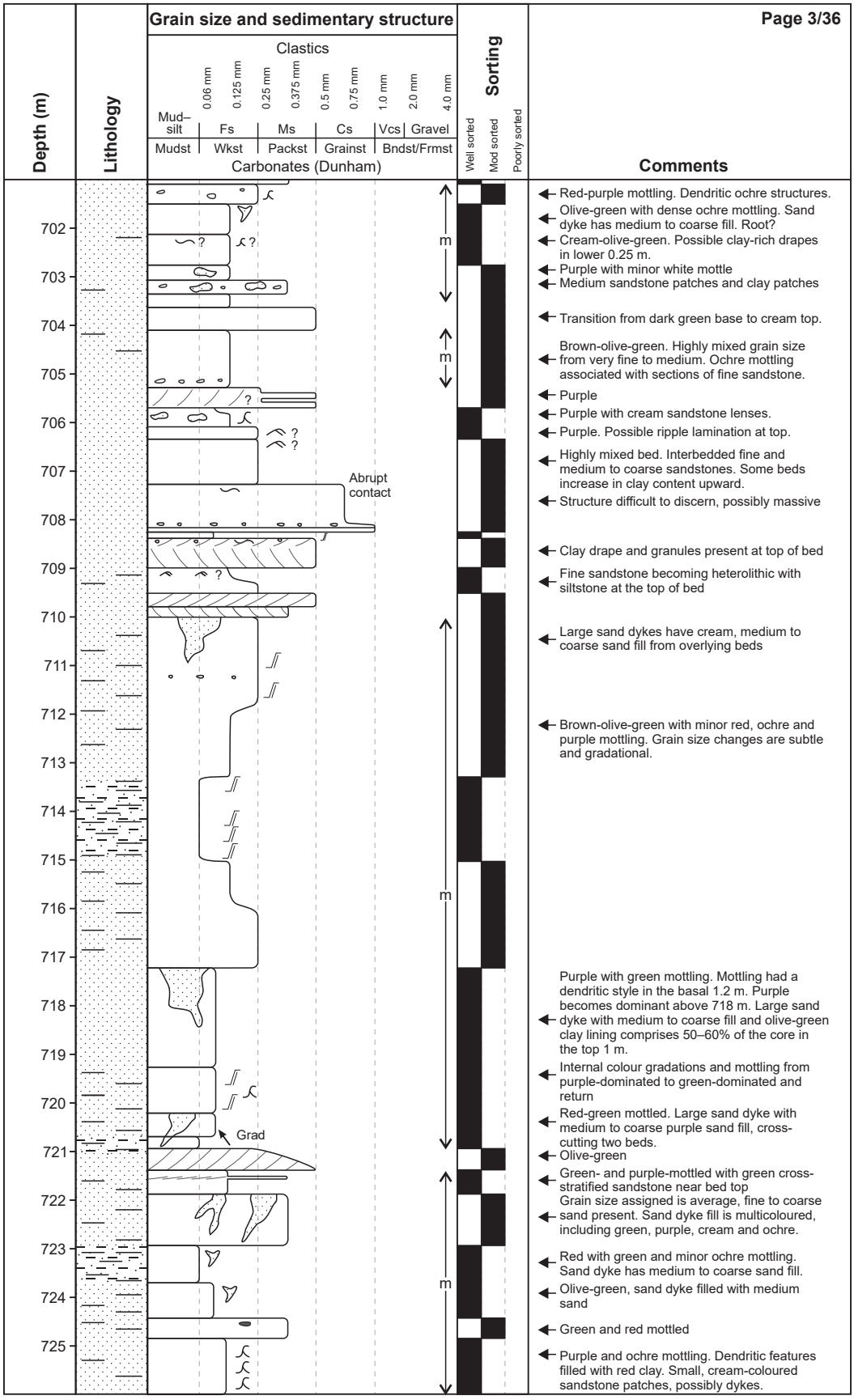
Brown-olive-green. Thin interbeds of very fine to fine and medium to coarse sandstone.
Yellow, unconsolidated. High clay, darker section at the base.
Olive-green with very coarse-granule lag
Olive-green with purple mottling, becoming dominantly purple towards the top of the bed
Yellow, rubbly and unconsolidated
Olive-green with minor red and ochre mottling
Olive-green
Yellow-cream
Yellow
Olive-green-yellow. Possibly cross-bedded.
Olive-green with olive-green clay clasts and patches
Grain size variable from very fine to medium sand. Purple, olive-green, red and ochre mottling. Sand dykes filled with fine cream sandstone and have black or ochre lining.
Purple with ochre mottling and ochre dedritic patterns from 686.85 m up-core. Abundant sand dykes and patches that have cream-coloured, fine to medium sand fill and are lined with grey silt clay.
Olive-green with minor purple and ochre mottling
Olive-green with purple and ochre mottling
Lower bed is dominantly red with green mottling. Becoming evenly mixed in upper bed.
Olive-green with red-purple mottling
Green with red mottling. Red, increasing up-core. Below 693 m ‘chopped’ bedding, chunks of sandstone with internal laminations.
Brown-olive-green with some purple and ochre mottling
Red lamination, ?wavy between 696.00 – 696.73 m
Olive-green with minor red mottling
Grades into fine purple sandstone with sand dykes that have white fine to medium sand fill and ochre rims
Dirty cream with red and minor ochre mottling
Purple, common clay. Cream dendritic lattice and minor ochre mottling at base. Large sand dyke with cream fill at top.
Olive-green with minor purple and ochre mottling. Sand dyke filled with cream-coloured, medium sandstone.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 3/36
Comments
Abrupt contact
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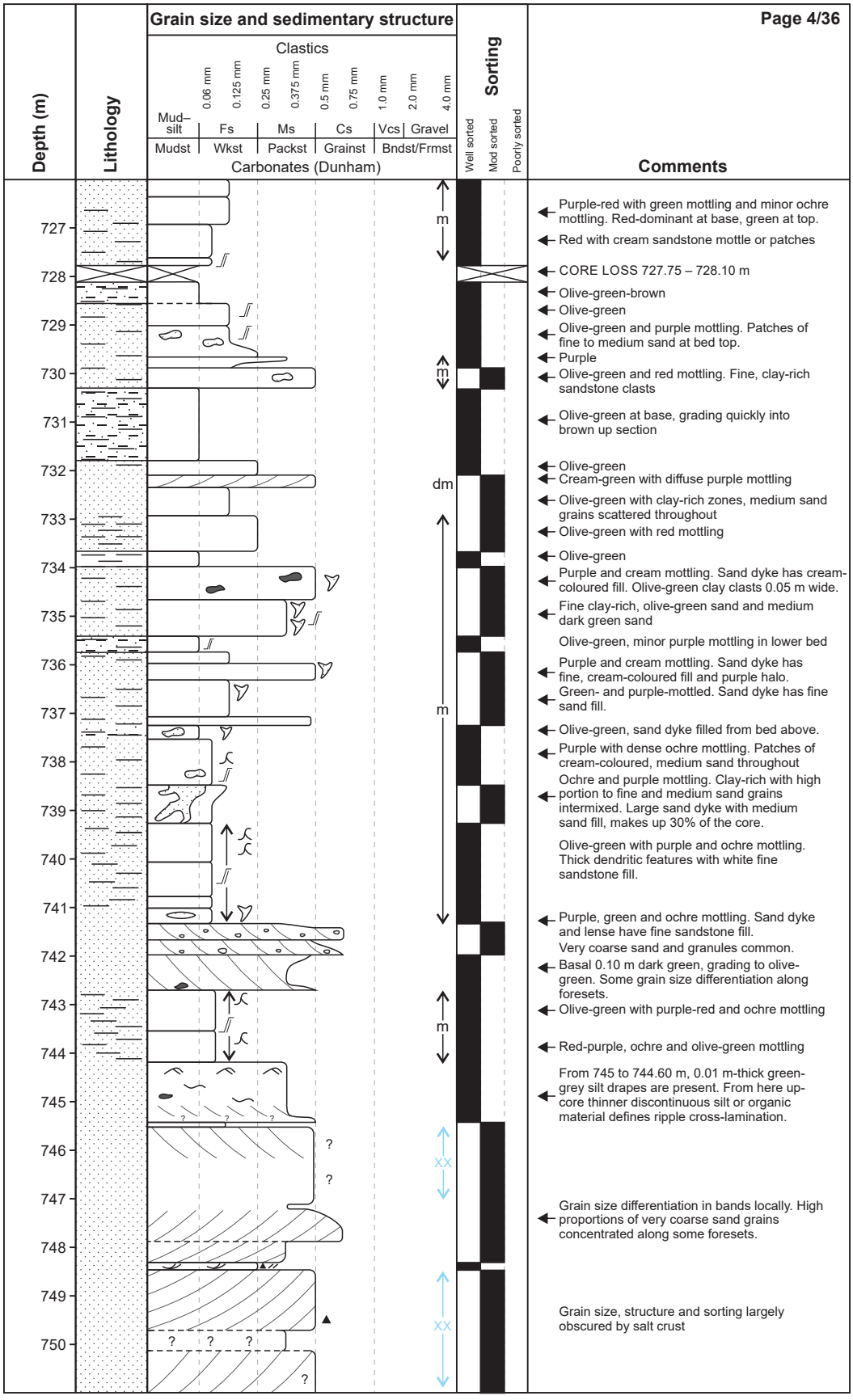
Red-purple mottling. Dendritic ochre structures.
Olive-green with dense ochre mottling. Sand dyke has medium to coarse fill. Root?
Cream-olive-green. Possible clay-rich drapes in lower 0.25 m.
Purple with minor white mottle
Medium sandstone patches and clay patches
Transition from dark green base to cream top.
Brown-olive-green. Highly mixed grain size from very fine to medium. Ochre mottling associated with sections of fine sandstone.
Purple
Purple with cream sandstone lenses.
Purple. Possible ripple lamination at top.
Highly mixed bed. Interbedded fine and medium to coarse sandstones. Some beds increase in clay content upward.
Structure difficult to discern, possibly massive
Clay drape and granules present at top of bed
Fine sandstone becoming heterolithic with siltstone at the top of bed
Large sand dykes have cream, medium to coarse sand fill from overlying beds
Brown-olive-green with minor red, ochre and purple mottling. Grain size changes are subtle and gradational.
Purple with green mottling. Mottling had a dendritic style in the basal 1.2 m. Purple becomes dominant above 718 m. Large sand dyke with medium to coarse fill and olive-green clay lining comprises 50–60% of the core in the top 1 m.
Internal colour gradations and mottling from purple-dominated to green-dominated and return
Red-green mottled. Large sand dyke with medium to coarse purple sand fill, cross-cutting two beds.
Olive-green
Green- and purple-mottled with green cross-stratified sandstone near bed top
Grain size assigned is average, fine to coarse sand present. Sand dyke fill is multicoloured, including green, purple, cream and ochre.
Red with green and minor ochre mottling. Sand dyke has medium to coarse sand fill.
Olive-green, sand dyke filled with medium sand
Green and red mottled
Purple and ochre mottling. Dendritic features filled with red clay. Small, cream-coloured sandstone patches, possibly dykes.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
Ms
Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 4/36
Comments
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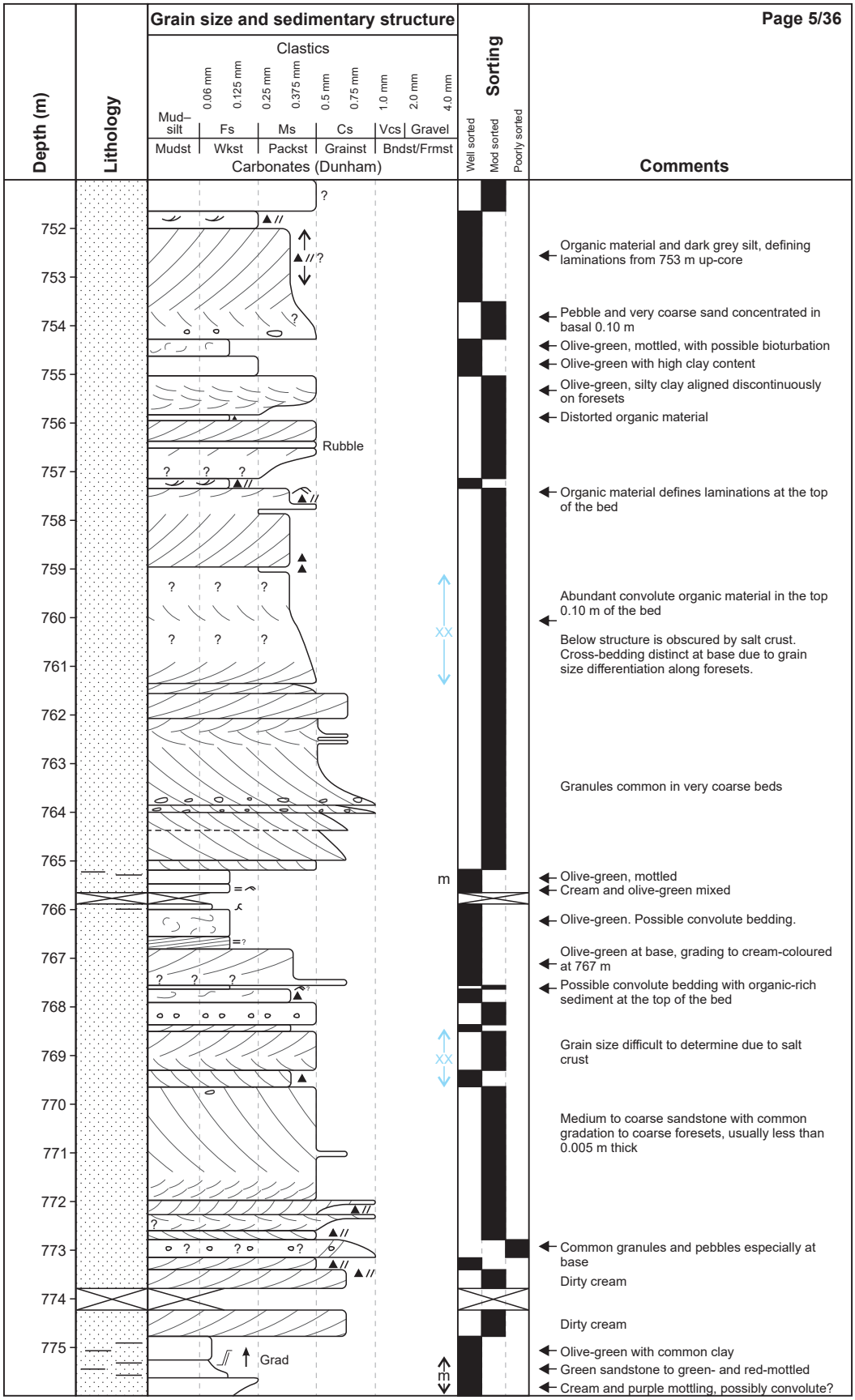
Purple-red with green mottling and minor ochre mottling. Red-dominant at base, green at top.
Red with cream sandstone mottle or patches
CORE LOSS 727.75 – 728.10 m
Olive-green-brown
Olive-green
Olive-green and purple mottling. Patches of fine to medium sand at bed top.
Purple
Olive-green and red mottling. Fine, clay-rich sandstone clasts
Olive-green at base, grading quickly into brown up section
Olive-green
Cream-green with diffuse purple mottling
Olive-green with clay-rich zones, medium sand grains scattered throughout
Olive-green with red mottling
Olive-green
Purple and cream mottling. Sand dyke has cream-coloured fill. Olive-green clay clasts 0.05 m wide.
Fine clay-rich, olive-green sand and medium dark green sand
Olive-green, minor purple mottling in lower bed
Purple and cream mottling. Sand dyke has fine, cream-coloured fill and purple halo.
Green- and purple-mottled. Sand dyke has fine sand fill.
Olive-green, sand dyke filled from bed above.
Purple with dense ochre mottling. Patches of cream-coloured, medium sand throughout
Ochre and purple mottling. Clay-rich with high portion to fine and medium sand grains intermixed. Large sand dyke with medium sand fill, makes up 30% of the core.
Olive-green with purple and ochre mottling. Thick dendritic features with white fine sandstone fill.
Purple, green and ochre mottling. Sand dyke and lense have fine sandstone fill.
Very coarse sand and granules common.
Basal 0.10 m dark green, grading to olive-green. Some grain size differentiation along foresets.
Olive-green with purple-red and ochre mottling
Red-purple, ochre and olive-green mottling
From 745 to 744.60 m, 0.01 m-thick green-grey silt drapes are present. From here up-core thinner discontinuous silt or organic material defines ripple cross-lamination.
Grain size differentiation in bands locally. High proportions of very coarse sand grains concentrated along some foresets.
Grain size, structure and sorting largely obscured by salt crust


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
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4.0 mm
Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 5/36
Comments
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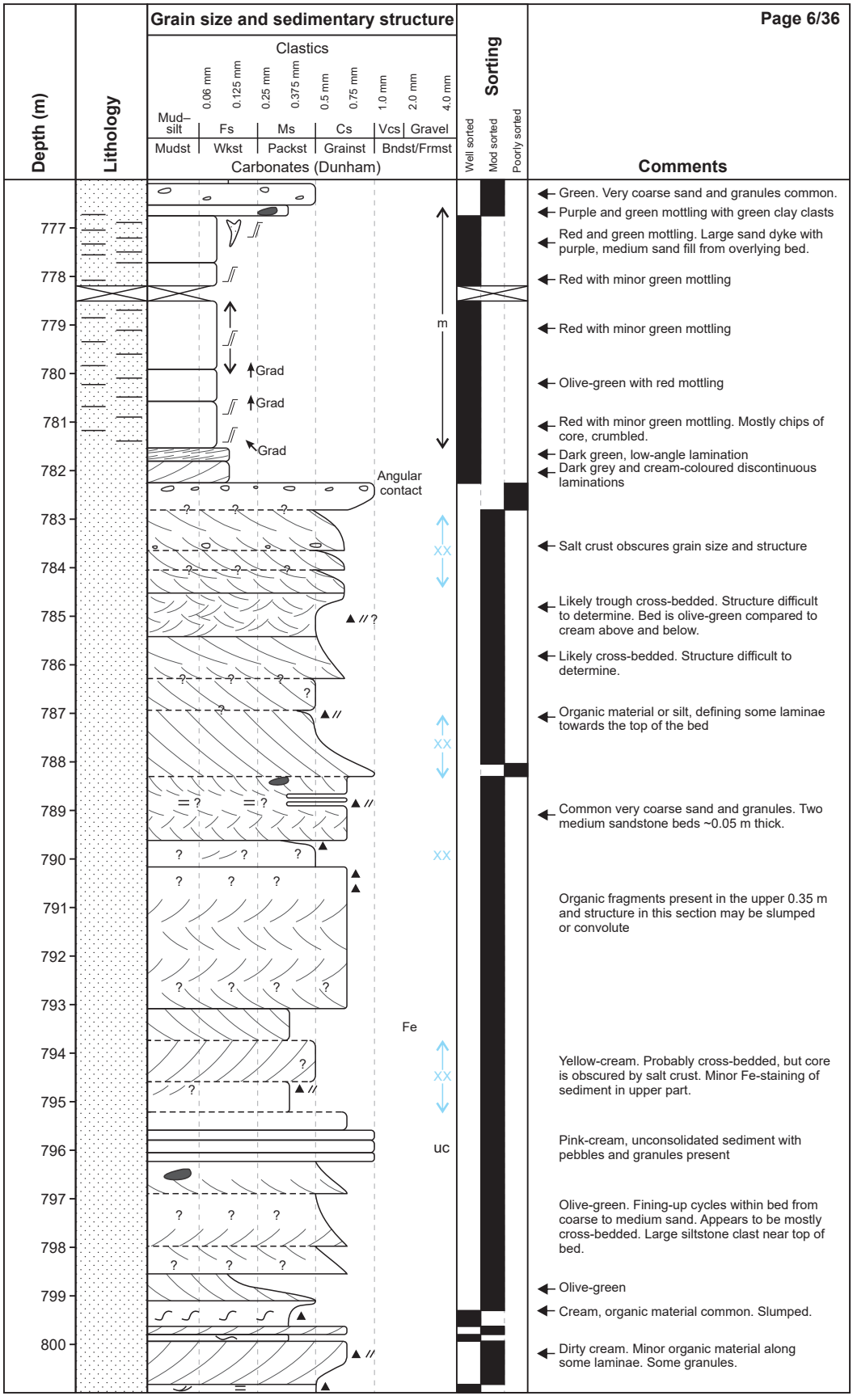
m
Organic material and dark grey silt, defining laminations from 753 m up-core
Pebble and very coarse sand concentrated in basal 0.10 m
Olive-green, mottled, with possible bioturbation
Olive-green with high clay content
Olive-green, silty clay aligned discontinuously on foresets
Distorted organic material
Organic material defines laminations at the top of the bed
Abundant convolute organic material in the top 0.10 m of the bed
Below structure is obscured by salt crust. Cross-bedding distinct at base due to grain size differentiation along foresets.
Granules common in very coarse beds
Olive-green, mottled
Cream and olive-green mixed
Olive-green. Possible convolute bedding.
Olive-green at base, grading to cream-coloured at 767 m
Possible convolute bedding with organic-rich sediment at the top of the bed
Grain size difficult to determine due to salt crust
Medium to coarse sandstone with common gradation to coarse foresets, usually less than 0.005 m thick
Common granules and pebbles especially at base
Dirty cream
Dirty cream
Olive-green with common clay
Green sandstone to green- and red-mottled
Cream and purple mottling, possibly convolute?


Grain size and sedimentary structure
Page 6/36
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
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Mud–silt
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Gravel
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Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
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Poorly sorted
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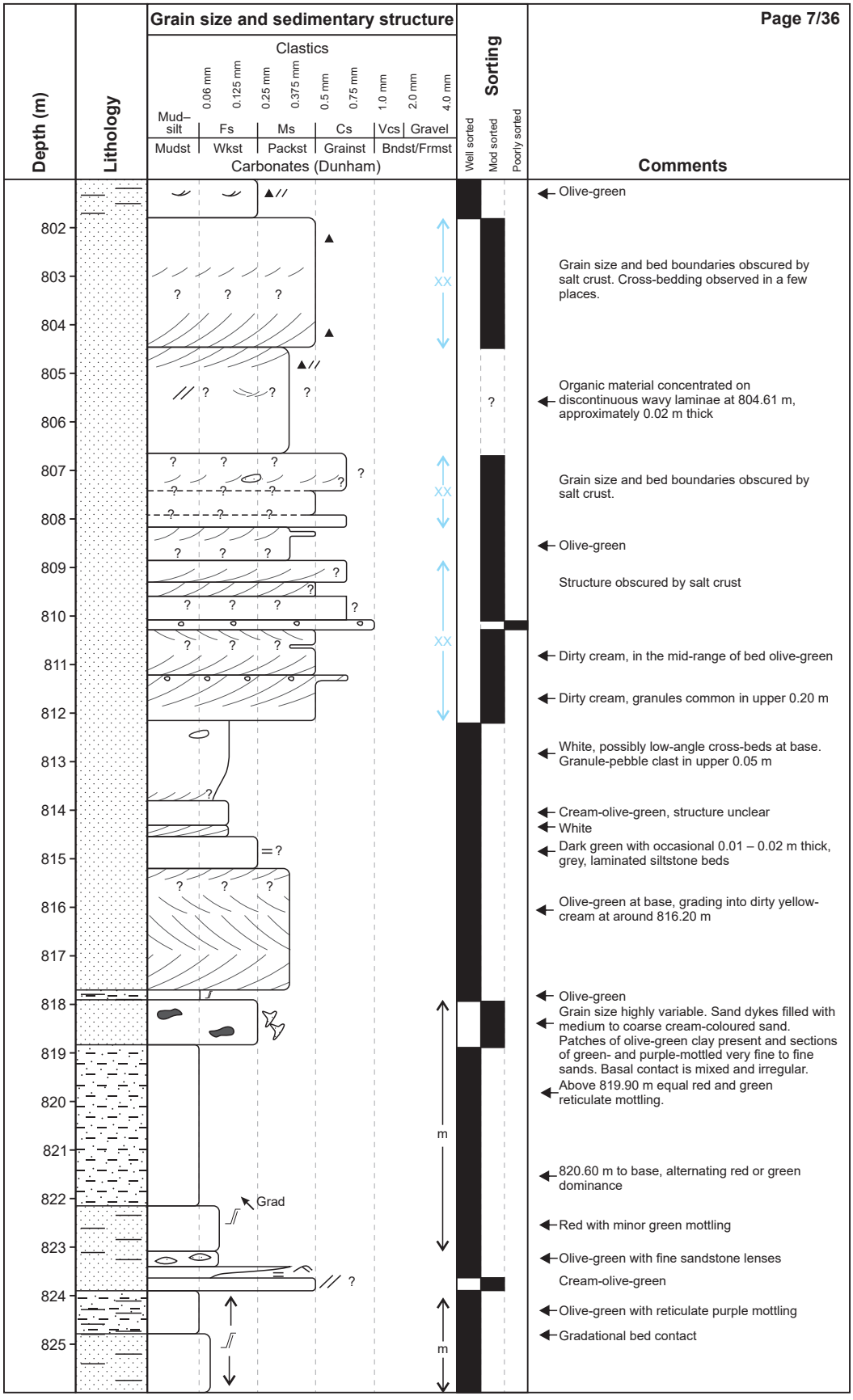
uc
Green. Very coarse sand and granules common.
Purple and green mottling with green clay clasts
Red and green mottling. Large sand dyke with purple, medium sand fill from overlying bed.
Red with minor green mottling
Red with minor green mottling
Olive-green with red mottling
Red with minor green mottling. Mostly chips of core, crumbled.
Dark green, low-angle lamination
Dark grey and cream-coloured discontinuous laminations
Salt crust obscures grain size and structure
Likely trough cross-bedded. Structure difficult to determine. Bed is olive-green compared to cream above and below.
Likely cross-bedded. Structure difficult to determine.
Organic material or silt, defining some laminae towards the top of the bed
Common very coarse sand and granules. Two medium sandstone beds ~0.05 m thick.
Organic fragments present in the upper 0.35 m and structure in this section may be slumped or convolute
Yellow-cream. Probably cross-bedded, but core is obscured by salt crust. Minor Fe-staining of sediment in upper part.
Pink-cream, unconsolidated sediment with pebbles and granules present
Olive-green. Fining-up cycles within bed from coarse to medium sand. Appears to be mostly cross-bedded. Large siltstone clast near top of bed.
Olive-green
Cream, organic material common. Slumped.
Dirty cream. Minor organic material along some laminae. Some granules.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
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1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 7/36
Comments
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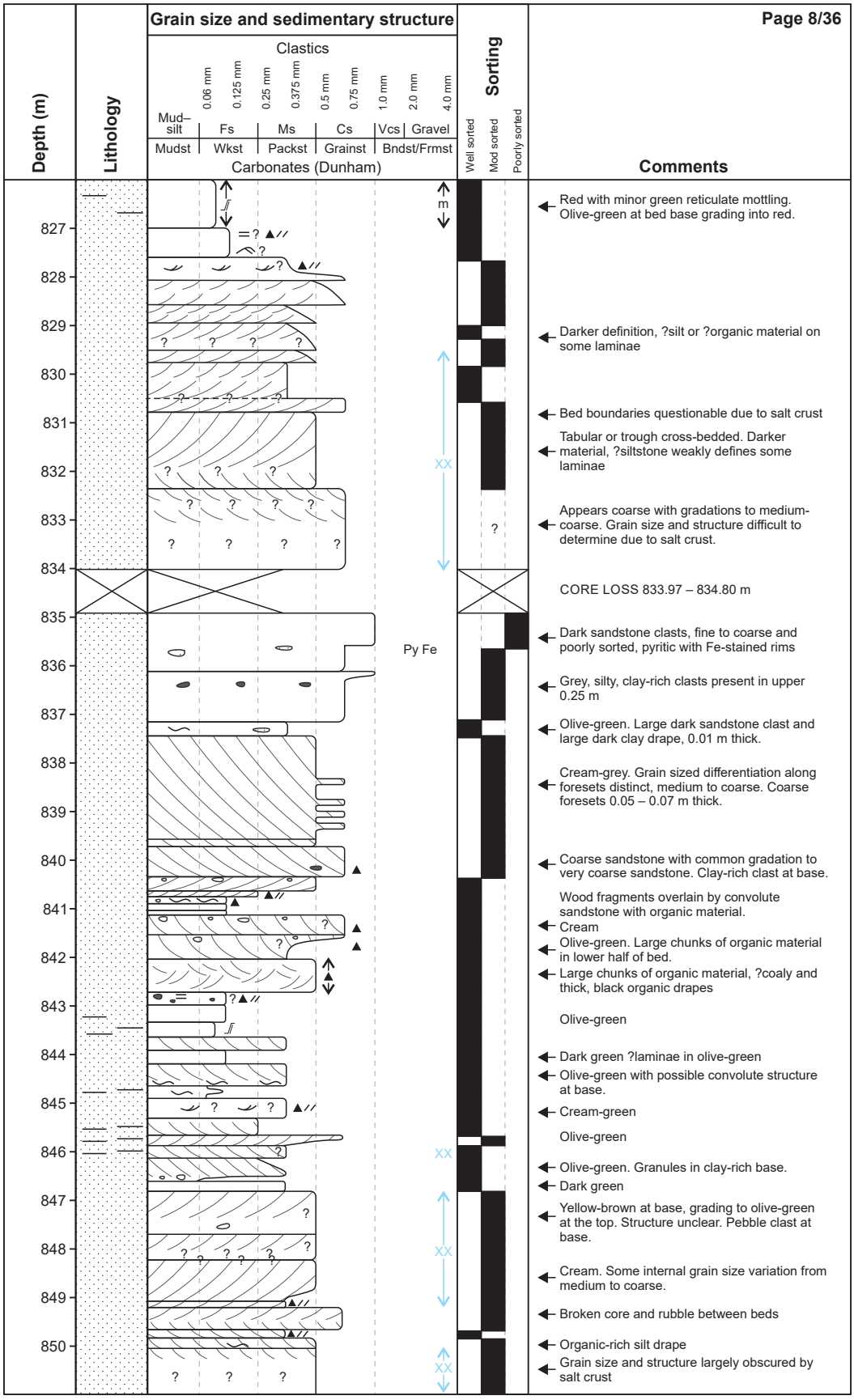
Olive-green
Grain size and bed boundaries obscured by salt crust. Cross-bedding observed in a few places.
Organic material concentrated on discontinuous wavy laminae at 804.61 m, approximately 0.02 m thick
Grain size and bed boundaries obscured by salt crust.
Olive-green
Structure obscured by salt crust
Dirty cream, in the mid-range of bed olive-green
Dirty cream, granules common in upper 0.20 m
White, possibly low-angle cross-beds at base. Granule-pebble clast in upper 0.05 m
Cream-olive-green, structure unclear
White
Dark green with occasional 0.01 – 0.02 m thick, grey, laminated siltstone beds
Olive-green at base, grading into dirty yellow-cream at around 816.20 m
Olive-green
Grain size highly variable. Sand dykes filled with medium to coarse cream-coloured sand. Patches of olive-green clay present and sections of green- and purple-mottled very fine to fine sands. Basal contact is mixed and irregular.
Above 819.90 m equal red and green reticulate mottling.
820.60 m to base, alternating red or green dominance
Red with minor green mottling
Olive-green with fine sandstone lenses
Cream-olive-green
Olive-green with reticulate purple mottling
Gradational bed contact


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
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Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 8/36
Comments
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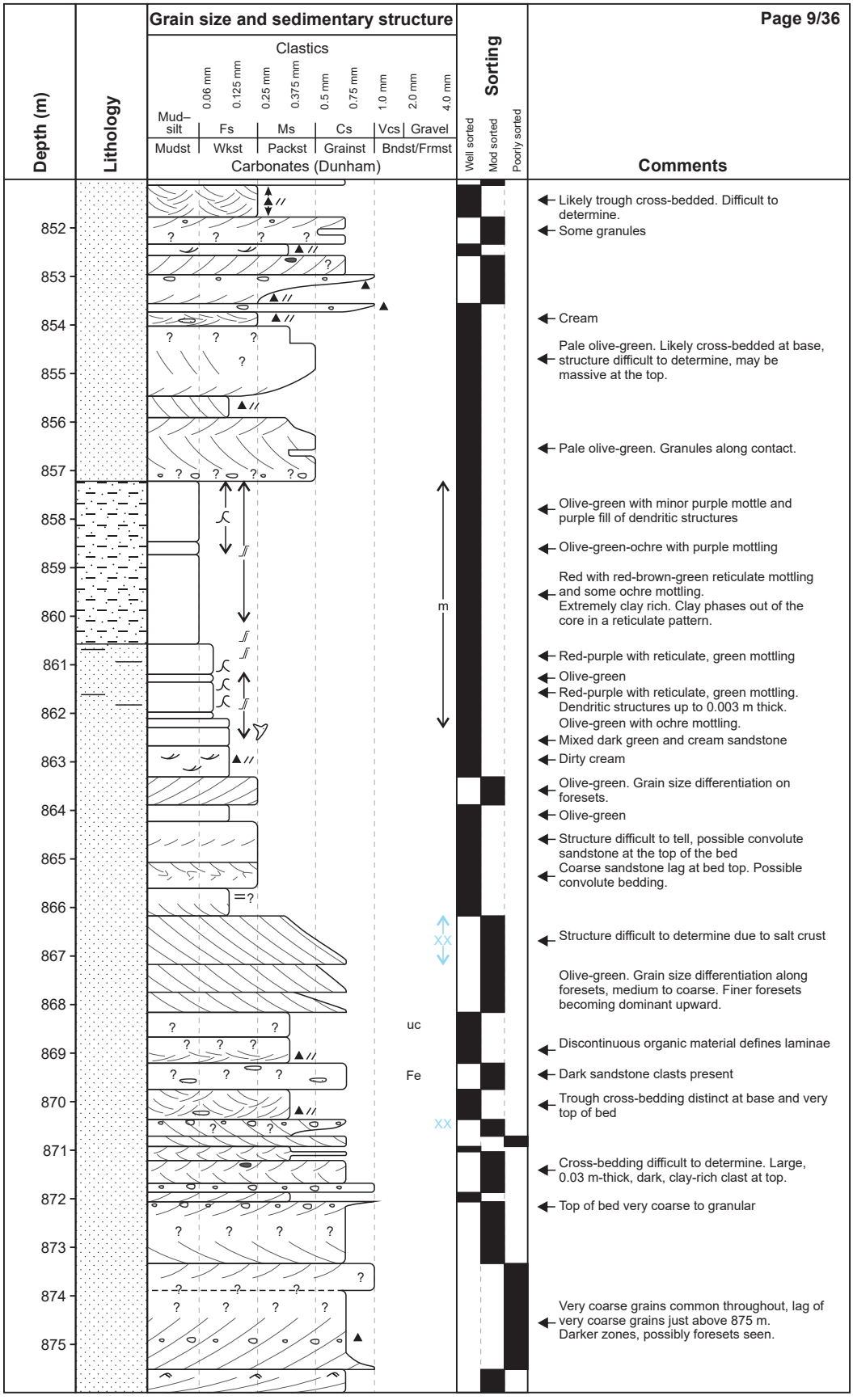
Red with minor green reticulate mottling. Olive-green at bed base grading into red.
Darker definition, ?silt or ?organic material on some laminae
Bed boundaries questionable due to salt crust
Tabular or trough cross-bedded. Darker material, ?siltstone weakly defines some laminae
Appears coarse with gradations to medium-coarse. Grain size and structure difficult to determine due to salt crust.
CORE LOSS 833.97 – 834.80 m
Dark sandstone clasts, fine to coarse and poorly sorted, pyritic with Fe-stained rims
Grey, silty, clay-rich clasts present in upper 0.25 m
Olive-green. Large dark sandstone clast and large dark clay drape, 0.01 m thick.
Cream-grey. Grain sized differentiation along foresets distinct, medium to coarse. Coarse foresets 0.05 – 0.07 m thick.
Coarse sandstone with common gradation to very coarse sandstone. Clay-rich clast at base.
Wood fragments overlain by convolute sandstone with organic material.
Cream
Olive-green. Large chunks of organic material in lower half of bed.
Large chunks of organic material, ?coaly and thick, black organic drapes
Olive-green
Dark green ?laminae in olive-green
Olive-green with possible convolute structure at base.
Cream-green
Olive-green
Olive-green. Granules in clay-rich base.
Dark green
Yellow-brown at base, grading to olive-green at the top. Structure unclear. Pebble clast at base.
Cream. Some internal grain size variation from medium to coarse.
Broken core and rubble between beds
Organic-rich silt drape
Grain size and structure largely obscured by salt crust


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.75 mm
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Carbonates (Dunham)
Sorting
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Mod sorted
Poorly sorted
Page 9/36
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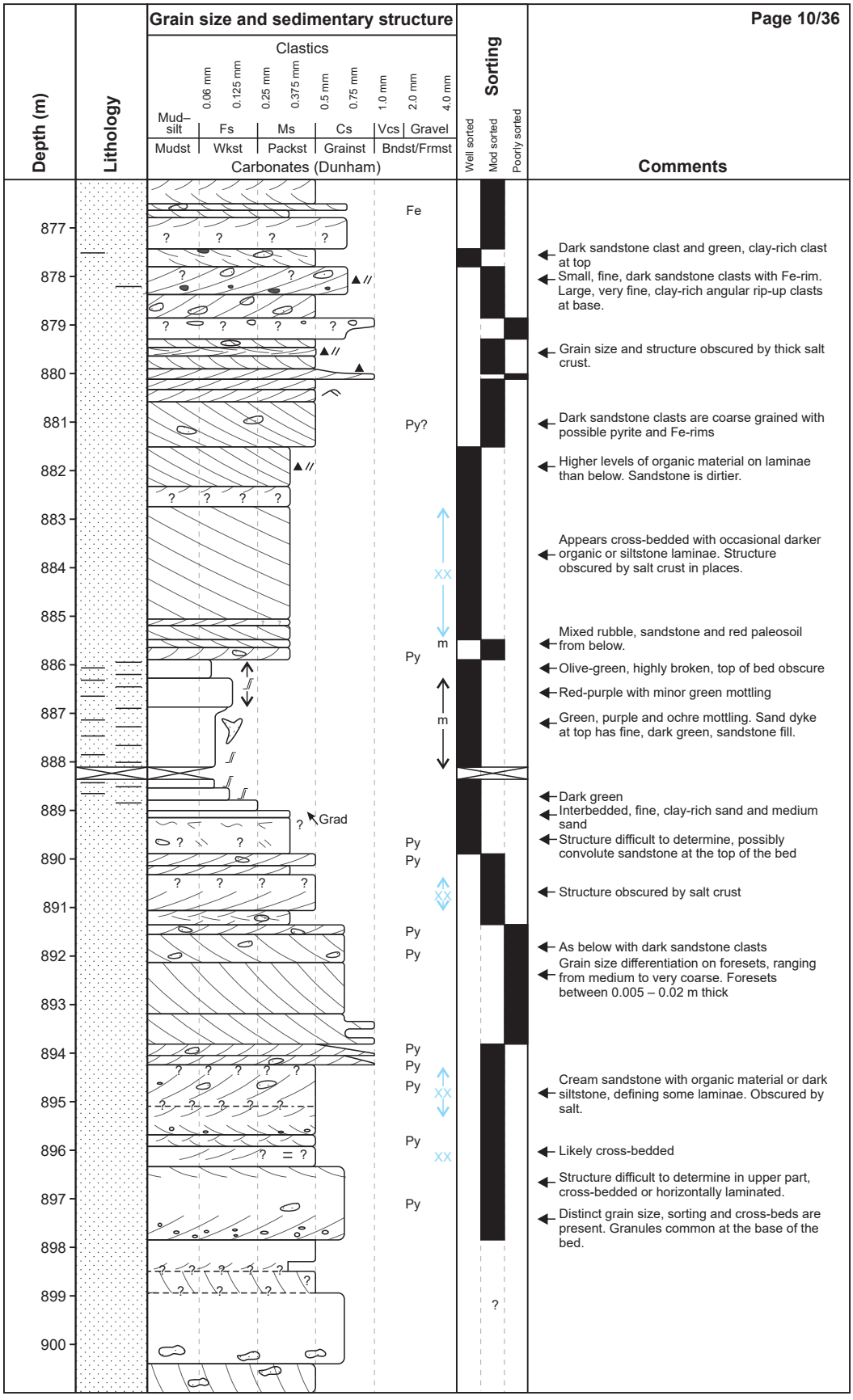
Likely trough cross-bedded. Difficult to determine.
Some granules
Cream
Pale olive-green. Likely cross-bedded at base, structure difficult to determine, may be massive at the top.
Pale olive-green. Granules along contact.
Olive-green with minor purple mottle and purple fill of dendritic structures
Olive-green-ochre with purple mottling
Red with red-brown-green reticulate mottling and some ochre mottling.
Extremely clay rich. Clay phases out of the core in a reticulate pattern.
Red-purple with reticulate, green mottling
Olive-green
Red-purple with reticulate, green mottling.
Dendritic structures up to 0.003 m thick.
Olive-green with ochre mottling.
Mixed dark green and cream sandstone
Dirty cream
Olive-green. Grain size differentiation on foresets.
Olive-green
Structure difficult to tell, possible convolute sandstone at the top of the bed
Coarse sandstone lag at bed top. Possible convolute bedding.
Structure difficult to determine due to salt crust
Olive-green. Grain size differentiation along foresets, medium to coarse. Finer foresets becoming dominant upward.
Discontinuous organic material defines laminae
Dark sandstone clasts present
Trough cross-bedding distinct at base and very top of bed
Cross-bedding difficult to determine. Large, 0.03 m-thick, dark, clay-rich clast at top.
Top of bed very coarse to granular
Very coarse grains common throughout, lag of very coarse grains just above 875 m.
Darker zones, possibly foresets seen.


Grain size and sedimentary structure
Page 10/36
Depth (m)
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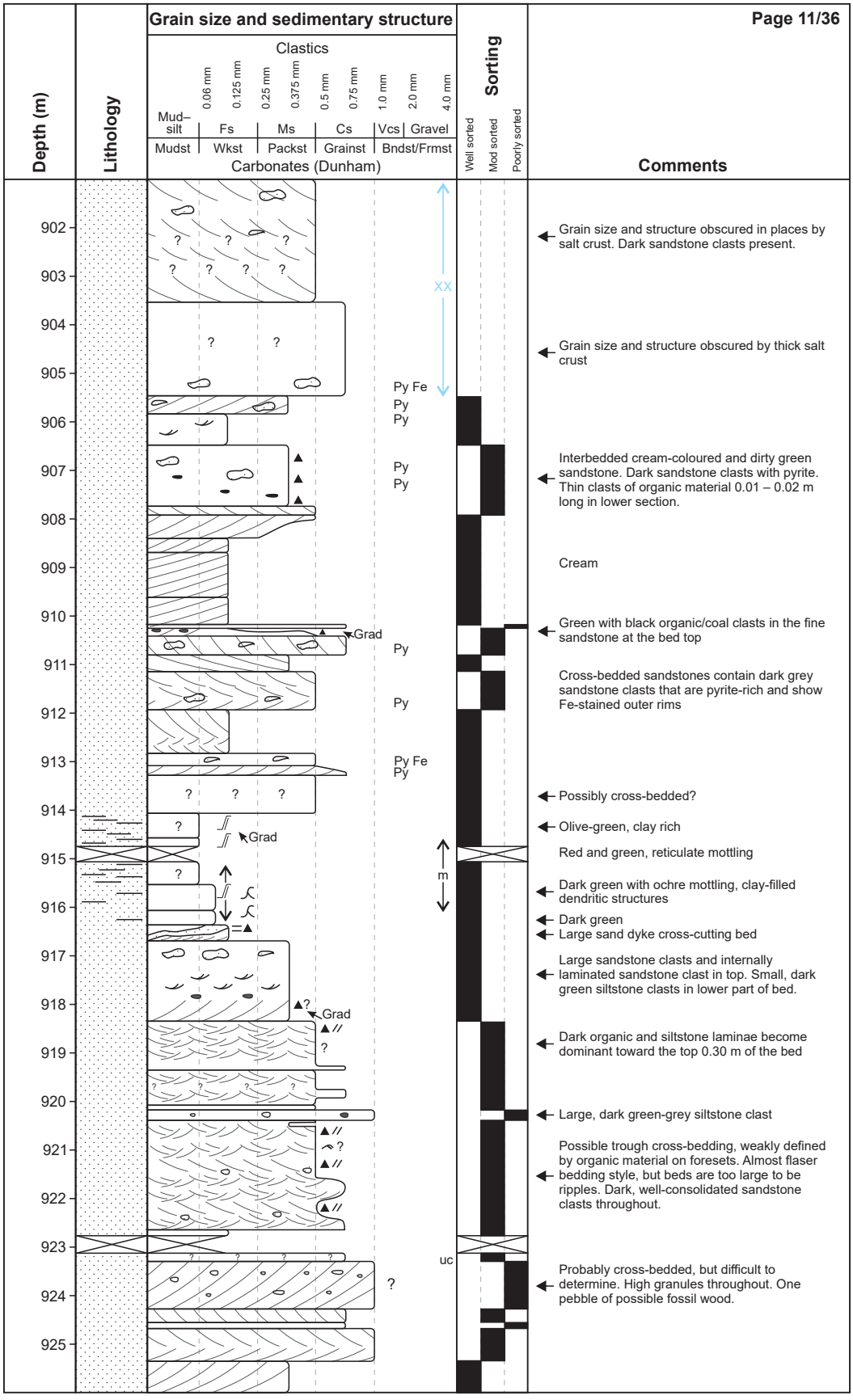
Dark sandstone clast and green, clay-rich clast at top
Small, fine, dark sandstone clasts with Fe-rim. Large, very fine, clay-rich angular rip-up clasts at base.
Grain size and structure obscured by thick salt crust.
Dark sandstone clasts are coarse grained with possible pyrite and Fe-rims
Higher levels of organic material on laminae than below. Sandstone is dirtier.
Appears cross-bedded with occasional darker organic or siltstone laminae. Structure obscured by salt crust in places.
Mixed rubble, sandstone and red paleosoil from below.
Olive-green, highly broken, top of bed obscure
Red-purple with minor green mottling
Green, purple and ochre mottling. Sand dyke at top has fine, dark green, sandstone fill.
Dark green
Interbedded, fine, clay-rich sand and medium sand
Structure difficult to determine, possibly convolute sandstone at the top of the bed
Structure obscured by salt crust
As below with dark sandstone clasts
Grain size differentiation on foresets, ranging from medium to very coarse. Foresets between 0.005 – 0.02 m thick
Cream sandstone with organic material or dark siltstone, defining some laminae. Obscured by salt.
Likely cross-bedded
Structure difficult to determine in upper part, cross-bedded or horizontally laminated.
Distinct grain size, sorting and cross-beds are present. Granules common at the base of the bed.


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 11/36
Comments
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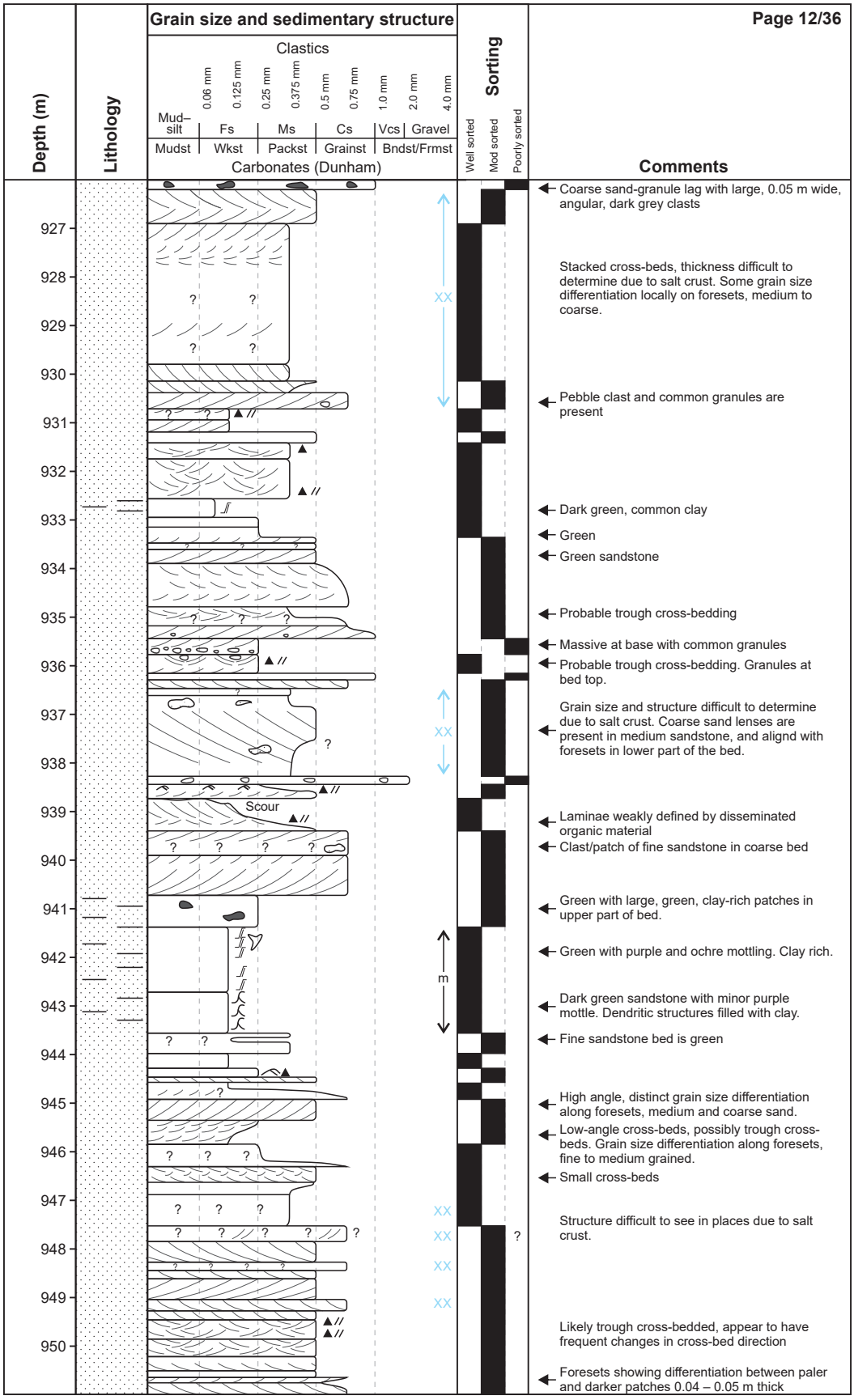
Grain size and structure obscured in places by salt crust. Dark sandstone clasts present.
Grain size and structure obscured by thick salt crust
Interbedded cream-coloured and dirty green sandstone. Dark sandstone clasts with pyrite. Thin clasts of organic material 0.01 – 0.02 m long in lower section.
Cream
Green with black organic/coal clasts in the fine sandstone at the bed top
Cross-bedded sandstones contain dark grey sandstone clasts that are pyrite-rich and show Fe-stained outer rims
Possibly cross-bedded?
Olive-green, clay rich
Red and green, reticulate mottling
Dark green with ochre mottling, clay-filled dendritic structures
Dark green
Large sand dyke cross-cutting bed
Large sandstone clasts and internally laminated sandstone clast in top. Small, dark green siltstone clasts in lower part of bed.
Dark organic and siltstone laminae become dominant toward the top 0.30 m of the bed
Large, dark green-grey siltstone clast
Possible trough cross-bedding, weakly defined by organic material on foresets. Almost flaser bedding style, but beds are too large to be ripples. Dark, well-consolidated sandstone clasts throughout.
Probably cross-bedded, but difficult to determine. High granules throughout. One pebble of possible fossil wood.


Grain size and sedimentary structure
Page 12/36
Depth (m)
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4.0 mm
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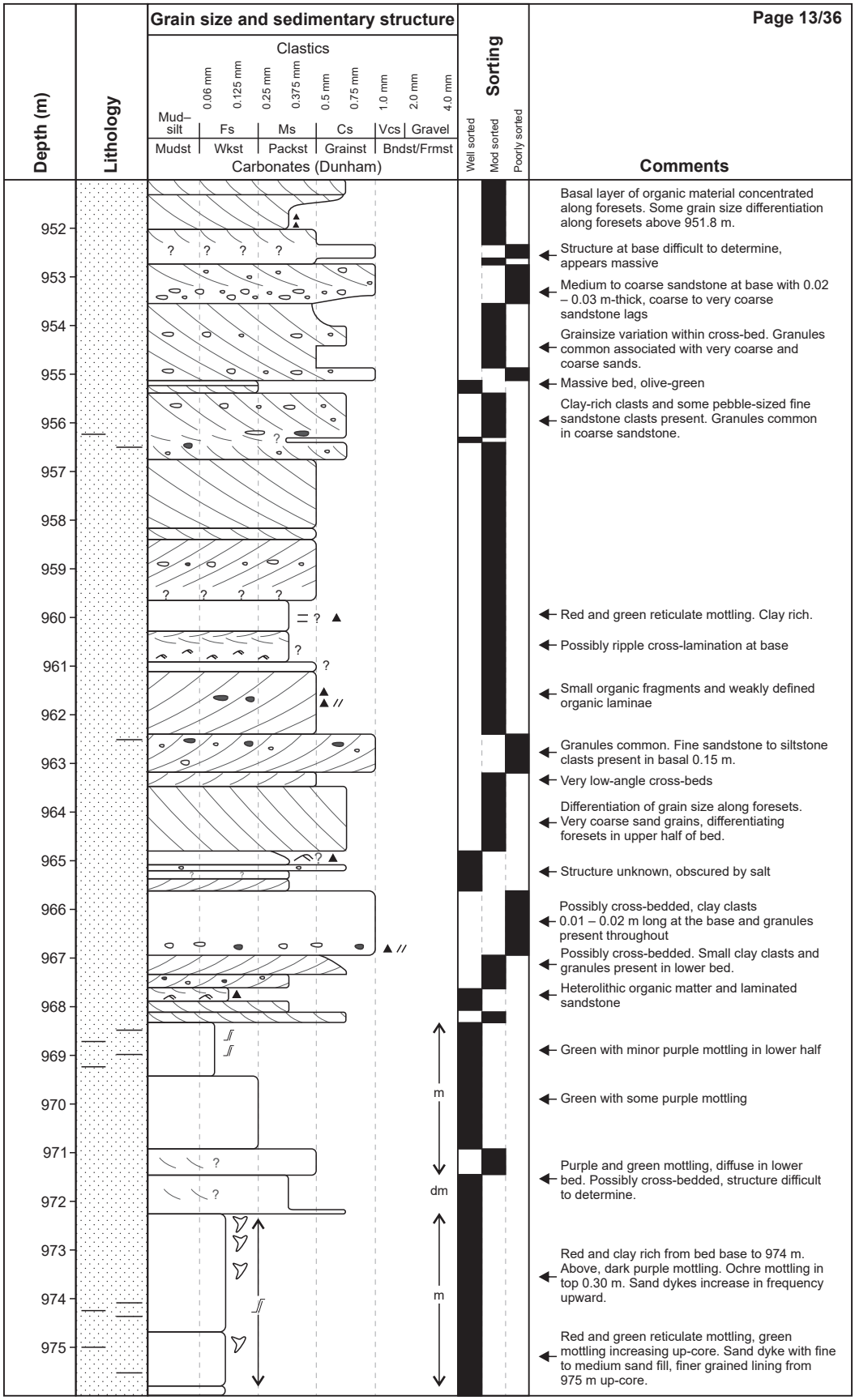
Coarse sand-granule lag with large, 0.05 m wide, angular, dark grey clasts
Stacked cross-beds, thickness difficult to determine due to salt crust. Some grain size differentiation locally on foresets, medium to coarse.
Pebble clast and common granules are present
Dark green, common clay
Green
Green sandstone
Probable trough cross-bedding
Massive at base with common granules
Probable trough cross-bedding. Granules at bed top.
Grain size and structure difficult to determine due to salt crust. Coarse sand lenses are present in medium sandstone, and alignd with foresets in lower part of the bed.
Laminae weakly defined by disseminated organic material
Clast/patch of fine sandstone in coarse bed
Green with large, green, clay-rich patches in upper part of bed.
Green with purple and ochre mottling. Clay rich.
Dark green sandstone with minor purple mottle. Dendritic structures filled with clay.
Fine sandstone bed is green
High angle, distinct grain size differentiation along foresets, medium and coarse sand.
Low-angle cross-beds, possibly trough cross-beds. Grain size differentiation along foresets, fine to medium grained.
Small cross-beds
Structure difficult to see in places due to salt crust.
Likely trough cross-bedded, appear to have frequent changes in cross-bed direction
Foresets showing differentiation between paler and darker patches 0.04 – 0.05 m thick


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
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Page 13/36
Comments
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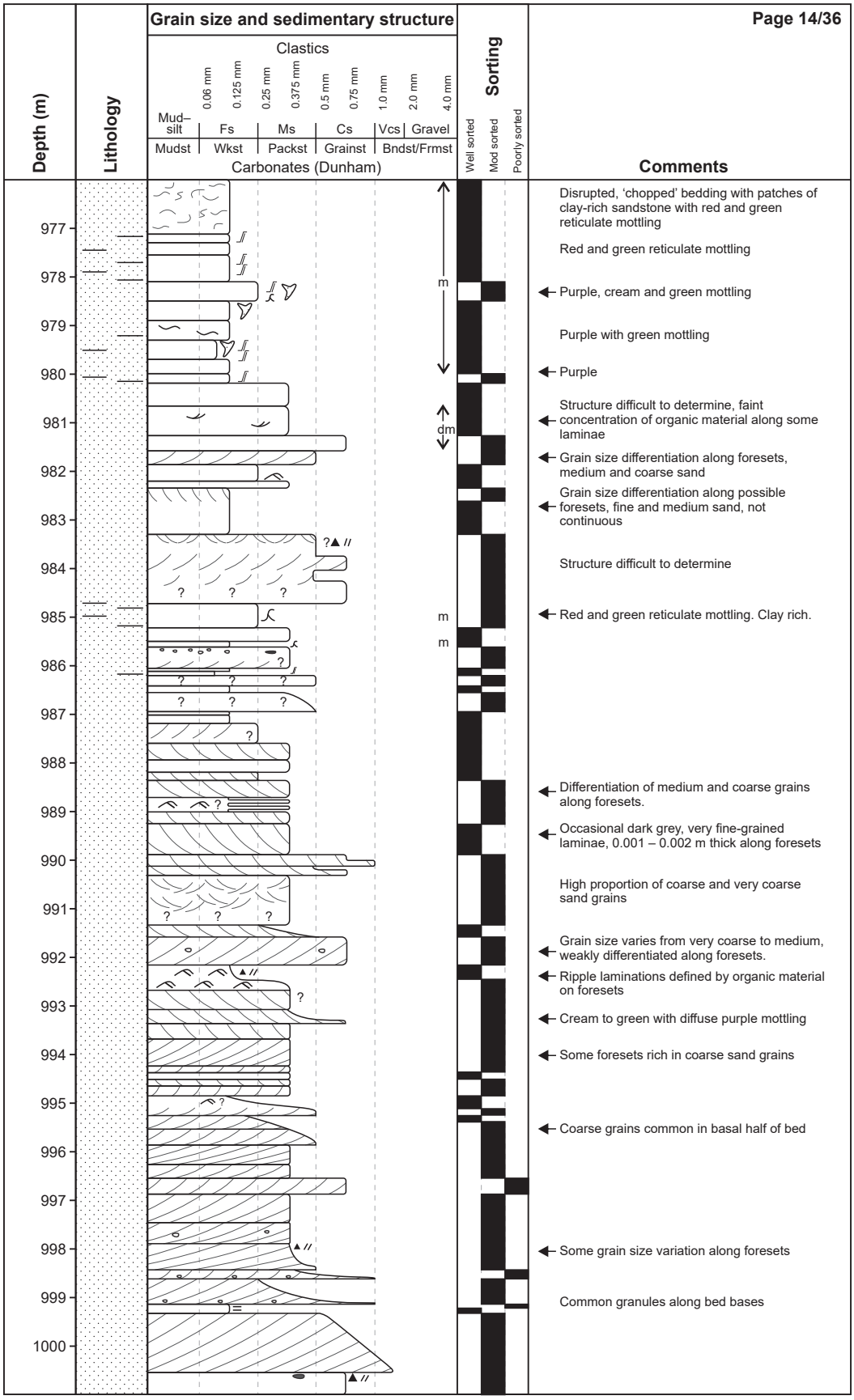
Basal layer of organic material concentrated along foresets. Some grain size differentiation along foresets above 951.8 m.
Structure at base difficult to determine, appears massive
Medium to coarse sandstone at base with 0.02 – 0.03 m-thick, coarse to very coarse sandstone lags
Grainsize variation within cross-bed. Granules common associated with very coarse and coarse sands.
Massive bed, olive-green
Clay-rich clasts and some pebble-sized fine sandstone clasts present. Granules common in coarse sandstone.
Red and green reticulate mottling. Clay rich.
Possibly ripple cross-lamination at base
Small organic fragments and weakly defined organic laminae
Granules common. Fine sandstone to siltstone clasts present in basal 0.15 m.
Very low-angle cross-beds
Differentiation of grain size along foresets. Very coarse sand grains, differentiating foresets in upper half of bed.
Structure unknown, obscured by salt
Possibly cross-bedded, clay clasts 0.01 – 0.02 m long at the base and granules present throughout
Possibly cross-bedded. Small clay clasts and granules present in lower bed.
Heterolithic organic matter and laminated sandstone
Green with minor purple mottling in lower half
Green with some purple mottling
Purple and green mottling, diffuse in lower bed. Possibly cross-bedded, structure difficult to determine.
Red and clay rich from bed base to 974 m. Above, dark purple mottling. Ochre mottling in top 0.30 m. Sand dykes increase in frequency upward.
Red and green reticulate mottling, green mottling increasing up-core. Sand dyke with fine to medium sand fill, finer grained lining from 975 m up-core.


Depth (m)
Lithology
Grain size and sedimentary structure
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Page 14/36
Comments
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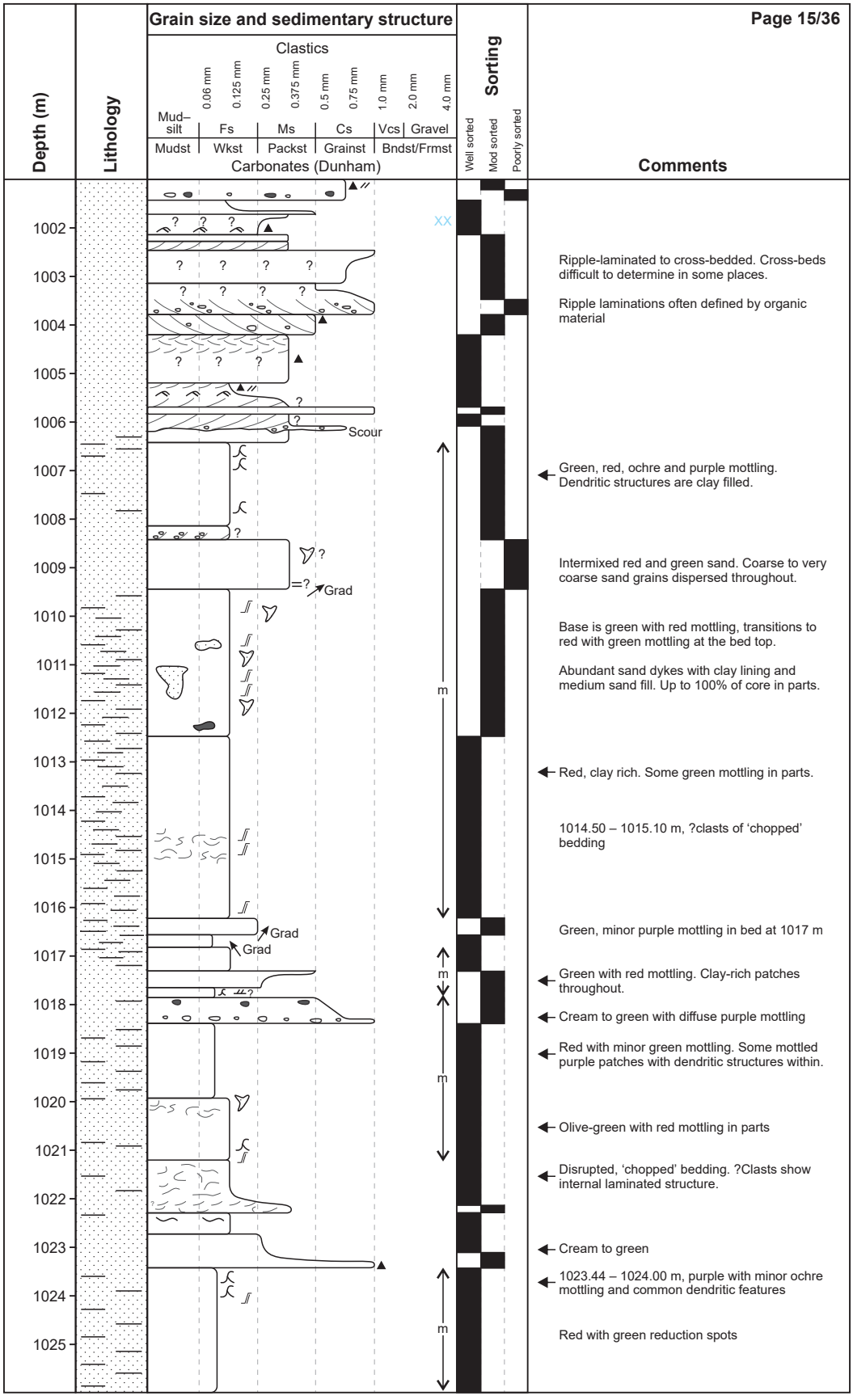
Disrupted, 'chopped' bedding with patches of clay-rich sandstone with red and green reticulate mottling
Red and green reticulate mottling
Purple, cream and green mottling
Purple with green mottling
Purple
Structure difficult to determine, faint concentration of organic material along some laminae
Grain size differentiation along foresets, medium and coarse sand
Grain size differentiation along possible foresets, fine and medium sand, not continuous
Structure difficult to determine
Red and green reticulate mottling. Clay rich.
Differentiation of medium and coarse grains along foresets.
Occasional dark grey, very fine-grained laminae, 0.001 – 0.002 m thick along foresets
High proportion of coarse and very coarse sand grains
Grain size varies from very coarse to medium, weakly differentiated along foresets.
Ripple laminations defined by organic material on foresets
Cream to green with diffuse purple mottling
Some foresets rich in coarse sand grains
Coarse grains common in basal half of bed
Some grain size variation along foresets
Common granules along bed bases


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Carbonates (Dunham)
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Mod sorted
Poorly sorted
Page 15/36
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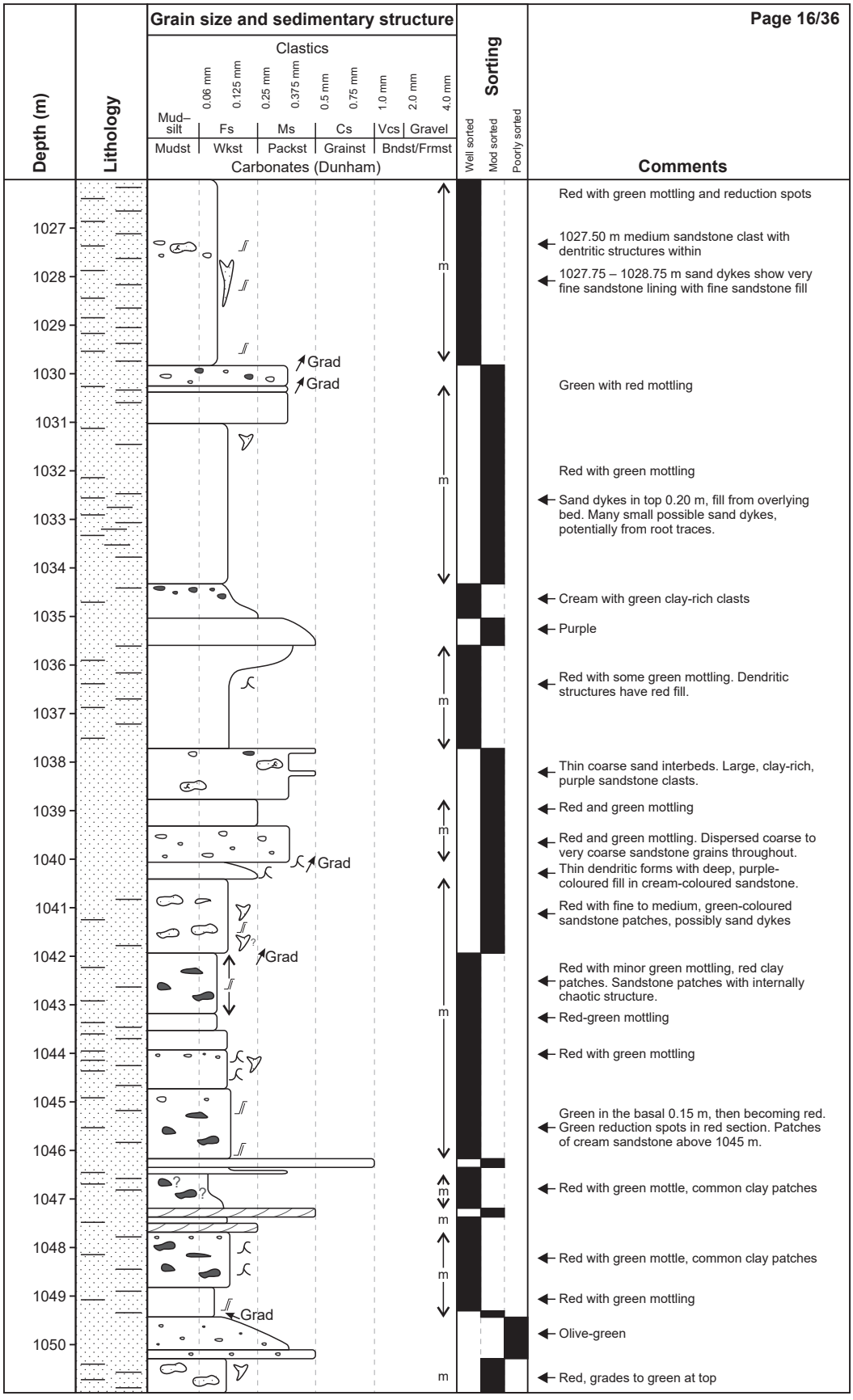
Ripple-laminated to cross-bedded. Cross-beds difficult to determine in some places.
Ripple laminations often defined by organic material
Green, red, ochre and purple mottling. Dendritic structures are clay filled.
Intermixed red and green sand. Coarse to very coarse sand grains dispersed throughout.
Base is green with red mottling, transitions to red with green mottling at the bed top.
Abundant sand dykes with clay lining and medium sand fill. Up to 100% of core in parts.
Red, clay rich. Some green mottling in parts.
1014.50 – 1015.10 m, ?clasts of ‘chopped’ bedding
Green, minor purple mottling in bed at 1017 m
Green with red mottling. Clay-rich patches throughout.
Cream to green with diffuse purple mottling
Red with minor green mottling. Some mottled purple patches with dendritic structures within.
Olive-green with red mottling in parts
Disrupted, ‘chopped’ bedding. ?Clasts show internal laminated structure.
Cream to green
1023.44 – 1024.00 m, purple with minor ochre mottling and common dendritic features
Red with green reduction spots


Grain size and sedimentary structure
Page 16/36
Depth (m)
Lithology
Clastics
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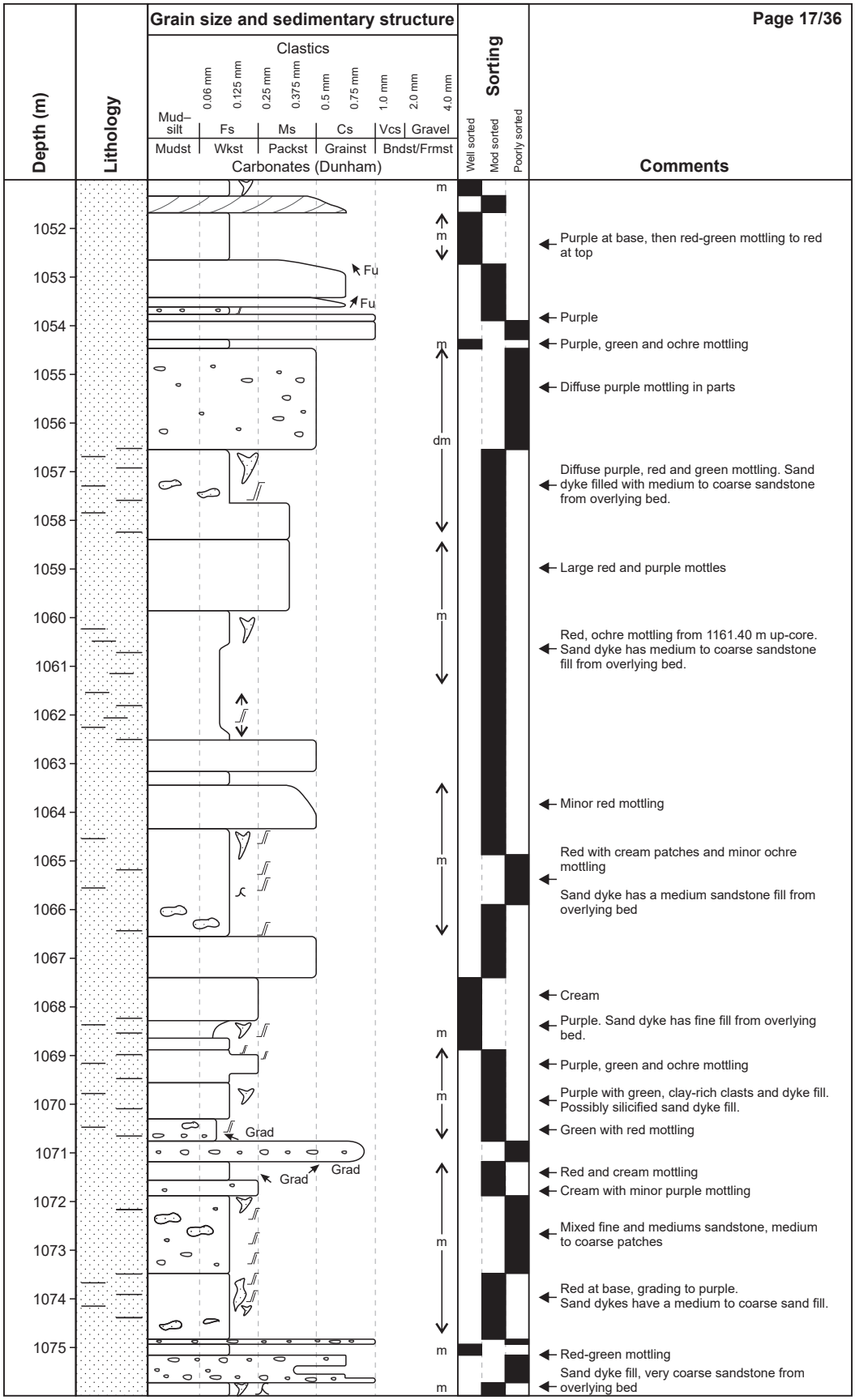
Red with green mottling and reduction spots
1027.50 m medium sandstone clast with dentritic structures within
1027.75 – 1028.75 m sand dykes show very fine sandstone lining with fine sandstone fill
Green with red mottling
Red with green mottling
Sand dykes in top 0.20 m, fill from overlying bed. Many small possible sand dykes, potentially from root traces.
Cream with green clay-rich clasts
Purple
Red with some green mottling. Dendritic structures have red fill.
Thin coarse sand interbeds. Large, clay-rich, purple sandstone clasts.
Red and green mottling
Red and green mottling. Dispersed coarse to very coarse sandstone grains throughout.
Thin dendritic forms with deep, purple-coloured fill in cream-coloured sandstone.
Red with fine to medium, green-coloured sandstone patches, possibly sand dykes
Red with minor green mottling, red clay patches. Sandstone patches with internally chaotic structure.
Red-green mottling
Red with green mottling
Green in the basal 0.15 m, then becoming red. Green reduction spots in red section. Patches of cream sandstone above 1045 m.
Red with green mottle, common clay patches
Red with green mottle, common clay patches
Red with green mottling
Olive-green
Red, grades to green at top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Well sorted
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Page 17/36
Comments
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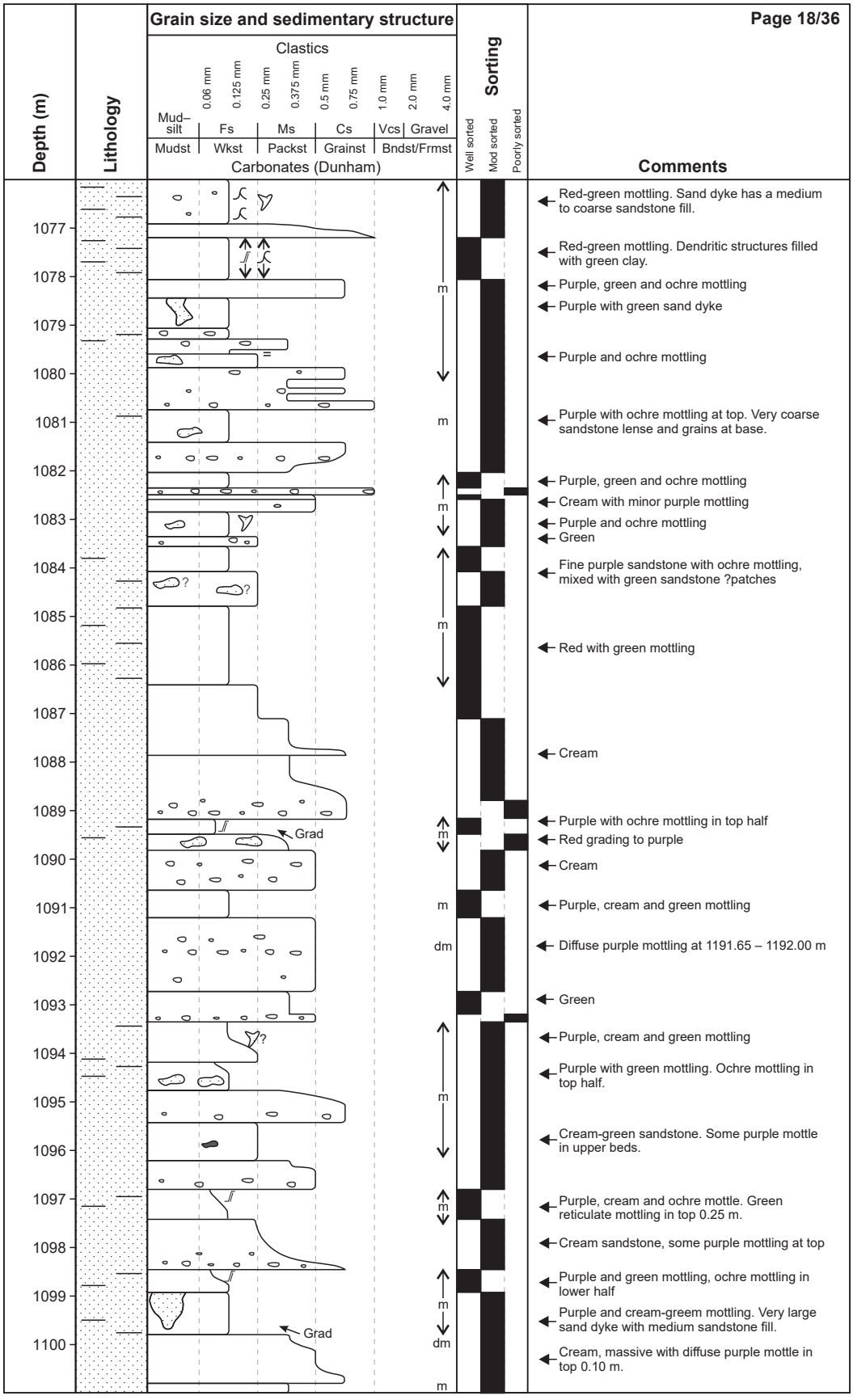
Purple at base, then red-green mottling to red at top
Purple
Purple, green and ochre mottling
Diffuse purple mottling in parts
Diffuse purple, red and green mottling. Sand dyke filled with medium to coarse sandstone from overlying bed.
Large red and purple mottles
Red, ochre mottling from 1161.40 m up-core. Sand dyke has medium to coarse sandstone fill from overlying bed.
Minor red mottling
Red with cream patches and minor ochre mottling
Sand dyke has a medium sandstone fill from overlying bed
Cream
Purple. Sand dyke has fine fill from overlying bed.
Purple, green and ochre mottling
Purple with green, clay-rich clasts and dyke fill. Possibly silicified sand dyke fill.
Green with red mottling
Red and cream mottling
Cream with minor purple mottling
Mixed fine and mediums sandstone, medium to coarse patches
Red at base, grading to purple. Sand dykes have a medium to coarse sand fill.
Red-green mottling
Sand dyke fill, very coarse sandstone from overlying bed


Depth (m)
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Bndst/Frmst
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Well sorted
Mod sorted
Poorly sorted
Page 18/36
Comments
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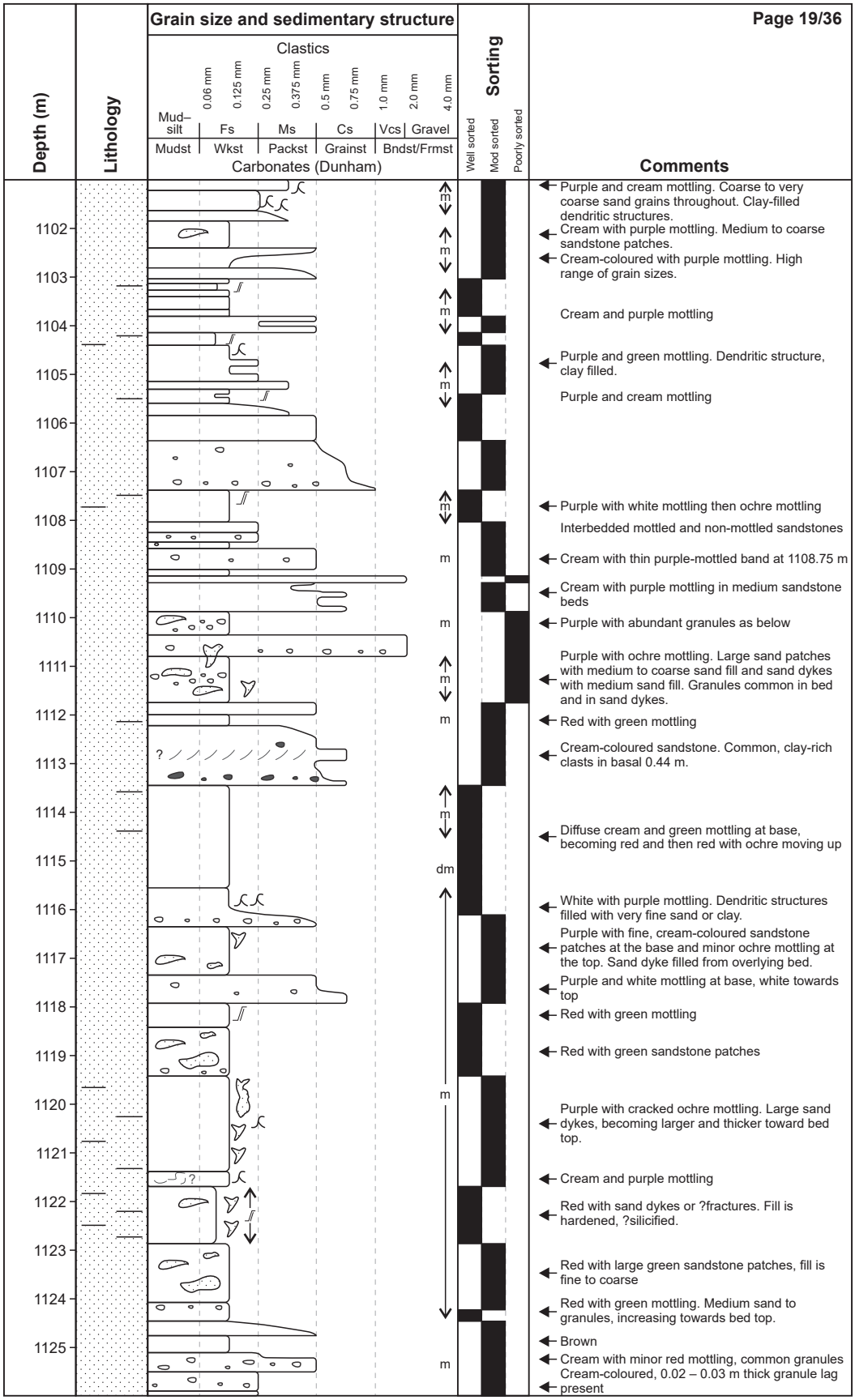
Red-green mottling. Sand dyke has a medium to coarse sandstone fill.
Red-green mottling. Dendritic structures filled with green clay.
Purple, green and ochre mottling
Purple with green sand dyke
Purple and ochre mottling
Purple with ochre mottling at top. Very coarse sandstone lense and grains at base.
Purple, green and ochre mottling
Cream with minor purple mottling
Purple and ochre mottling
Green
Fine purple sandstone with ochre mottling, mixed with green sandstone ?patches
Red with green mottling
Cream
Purple with ochre mottling in top half
Red grading to purple
Cream
Purple, cream and green mottling
Diffuse purple mottling at 1191.65 – 1192.00 m
Green
Purple, cream and green mottling
Purple with green mottling. Ochre mottling in top half.
Cream-green sandstone. Some purple mottle in upper beds.
Purple, cream and ochre mottle. Green reticulate mottling in top 0.25 m.
Cream sandstone, some purple mottling at top
Purple and green mottling, ochre mottling in lower half
Purple and cream-greem mottling. Very large sand dyke with medium sandstone fill.
Cream, massive with diffuse purple mottle in top 0.10 m.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Carbonates (Dunham)
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Poorly sorted
Page 19/36
Comments
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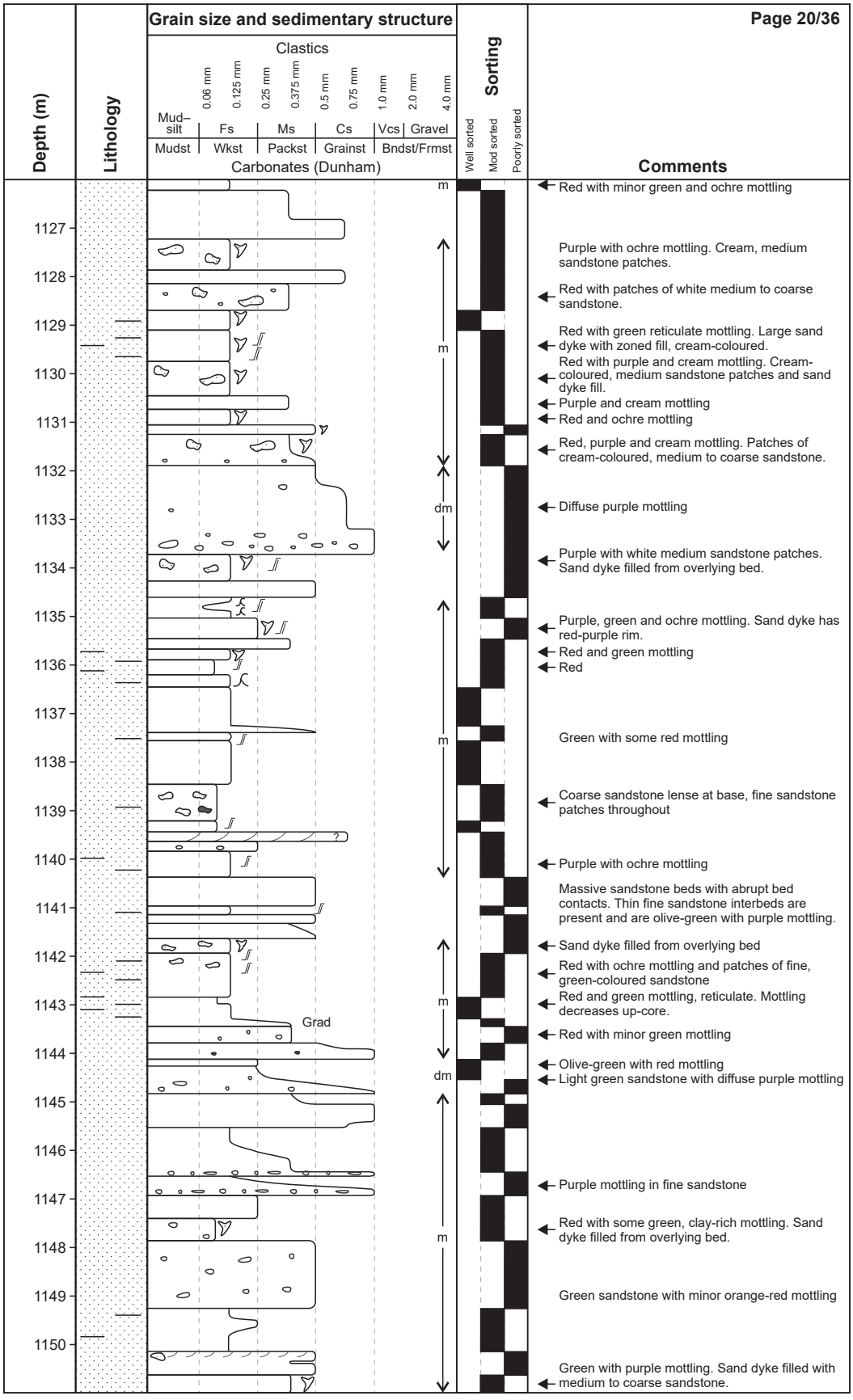
Purple and cream mottling. Coarse to very coarse sand grains throughout. Clay-filled dendritic structures.
Cream with purple mottling. Medium to coarse sandstone patches.
Cream-coloured with purple mottling. High range of grain sizes.
Cream and purple mottling
Purple and green mottling. Dendritic structure, clay filled.
Purple and cream mottling
Purple with white mottling then ochre mottling
Interbedded mottled and non-mottled sandstones
Cream with thin purple-mottled band at 1108.75 m
Cream with purple mottling in medium sandstone beds
Purple with abundant granules as below
Purple with ochre mottling. Large sand patches with medium to coarse sand fill and sand dykes with medium sand fill. Granules common in bed and in sand dykes.
Red with green mottling
Cream-coloured sandstone. Common, clay-rich clasts in basal 0.44 m.
Diffuse cream and green mottling at base, becoming red and then red with ochre moving up
White with purple mottling. Dendritic structures filled with very fine sand or clay.
Purple with fine, cream-coloured sandstone patches at the base and minor ochre mottling at the top. Sand dyke filled from overlying bed.
Purple and white mottling at base, white towards top
Red with green mottling
Red with green sandstone patches
Purple with cracked ochre mottling. Large sand dykes, becoming larger and thicker toward bed top.
Cream and purple mottling
Red with sand dykes or ?fractures. Fill is hardened, ?silicified.
Red with large green sandstone patches, fill is fine to coarse
Red with green mottling. Medium sand to granules, increasing towards bed top.
Brown
Cream with minor red mottling, common granules
Cream-coloured, 0.02 – 0.03 m thick granule lag present


Grain size and sedimentary structure
Page 20/36
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Cs
Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
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Mod sorted
Poorly sorted
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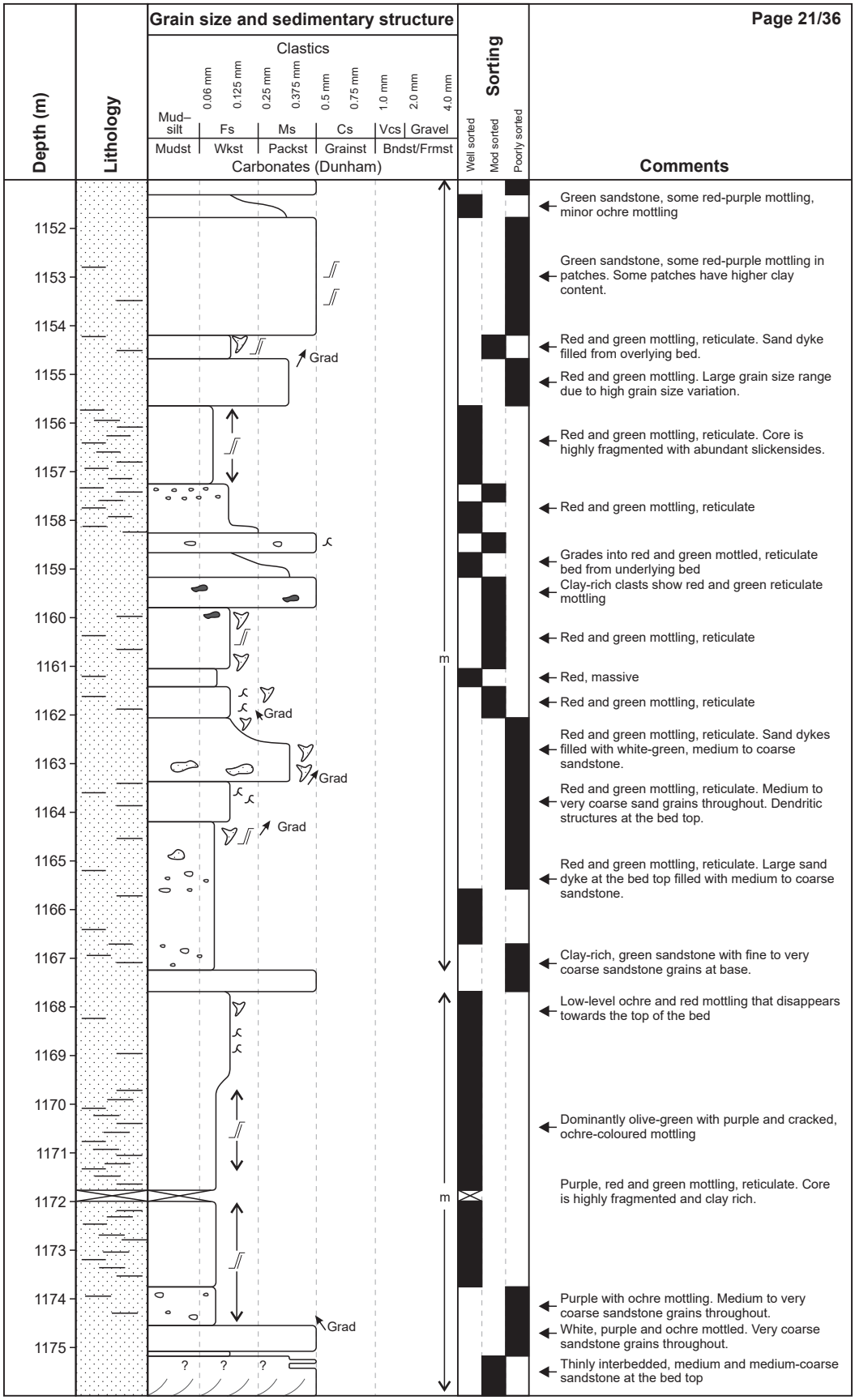
Grad
Red with minor green and ochre mottling
Purple with ochre mottling. Cream, medium sandstone patches.
Red with patches of white medium to coarse sandstone.
Red with green reticulate mottling. Large sand dyke with zoned fill, cream-coloured.
Red with purple and cream mottling. Cream-coloured, medium sandstone patches and sand dyke fill.
Purple and cream mottling
Red and ochre mottling
Red, purple and cream mottling. Patches of cream-coloured, medium to coarse sandstone.
Diffuse purple mottling
Purple with white medium sandstone patches. Sand dyke filled from overlying bed.
Purple, green and ochre mottling. Sand dyke has red-purple rim.
Red and green mottling
Red
Green with some red mottling
Coarse sandstone lense at base, fine sandstone patches throughout
Purple with ochre mottling
Massive sandstone beds with abrupt bed contacts. Thin fine sandstone interbeds are present and are olive-green with purple mottling.
Sand dyke filled from overlying bed
Red with ochre mottling and patches of fine, green-coloured sandstone
Red and green mottling, reticulate. Mottling decreases up-core.
Red with minor green mottling
Olive-green with red mottling
Light green sandstone with diffuse purple mottling
Purple mottling in fine sandstone
Red with some green, clay-rich mottling. Sand dyke filled from overlying bed.
Green sandstone with minor orange-red mottling
Green with purple mottling. Sand dyke filled with medium to coarse sandstone.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.375 mm
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1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Cs
Vcs
Gravel
Mudst
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Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 21/36
Comments
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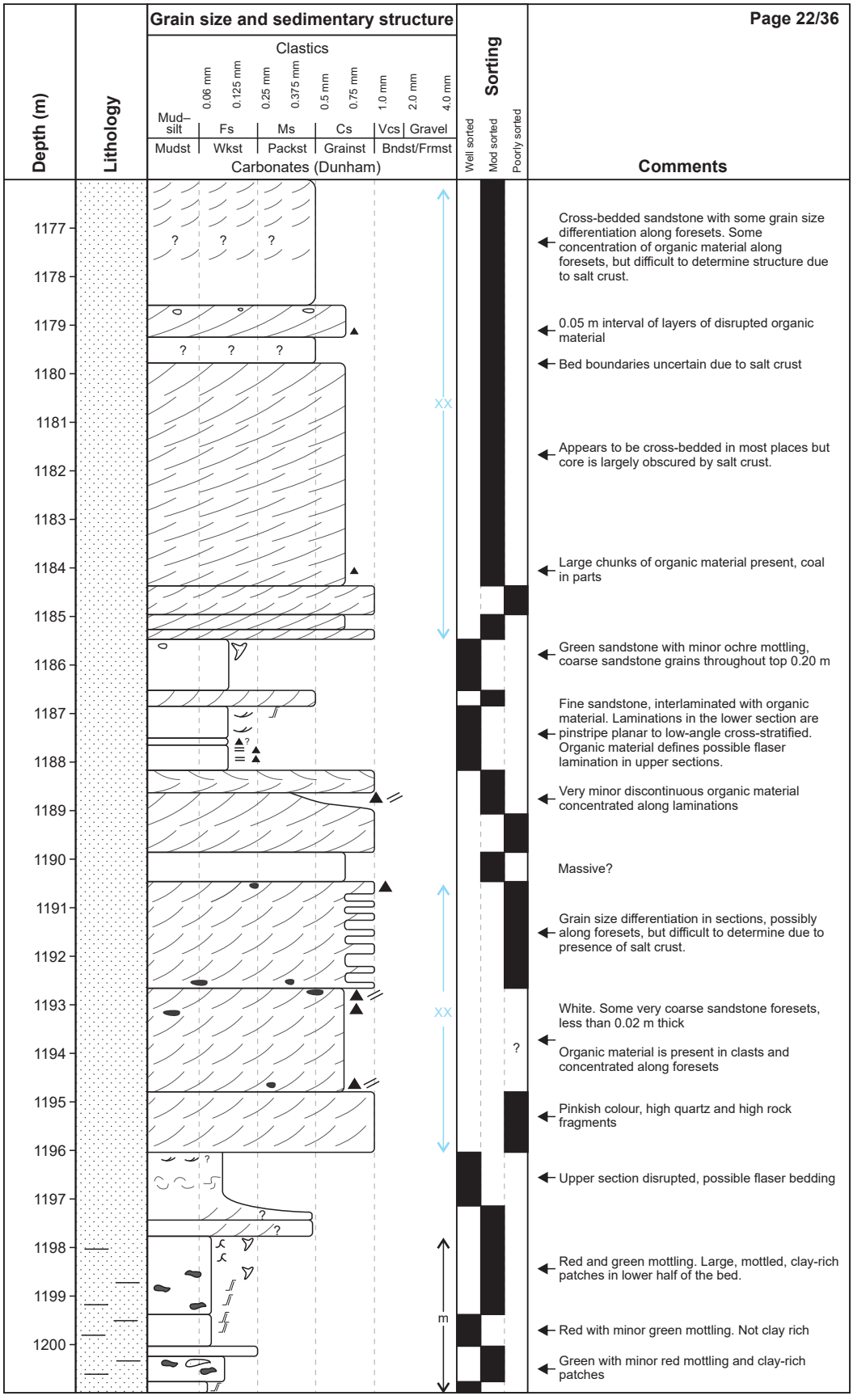
? ? ?
Green sandstone, some red-purple mottling, minor ochre mottling
Green sandstone, some red-purple mottling in patches. Some patches have higher clay content.
Red and green mottling, reticulate. Sand dyke filled from overlying bed.
Red and green mottling. Large grain size range due to high grain size variation.
Red and green mottling, reticulate. Core is highly fragmented with abundant slickensides.
Red and green mottling, reticulate
Grades into red and green mottled, reticulate bed from underlying bed
Clay-rich clasts show red and green reticulate mottling
Red and green mottling, reticulate
Red, massive
Red and green mottling, reticulate
Red and green mottling, reticulate. Sand dykes filled with white-green, medium to coarse sandstone.
Red and green mottling, reticulate. Medium to very coarse sand grains throughout. Dendritic structures at the bed top.
Red and green mottling, reticulate. Large sand dyke at the bed top filled with medium to coarse sandstone.
Clay-rich, green sandstone with fine to very coarse sandstone grains at base.
Low-level ochre and red mottling that disappears towards the top of the bed
Dominantly olive-green with purple and cracked, ochre-coloured mottling
Purple, red and green mottling, reticulate. Core is highly fragmented and clay rich.
Purple with ochre mottling. Medium to very coarse sandstone grains throughout.
White, purple and ochre mottled. Very coarse sandstone grains throughout.
Thinly interbedded, medium and medium-coarse sandstone at the bed top


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.125 mm
0.25 mm
0.375 mm
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0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Cs
Vcs
Gravel
Mudst
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Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 22/36
Comments
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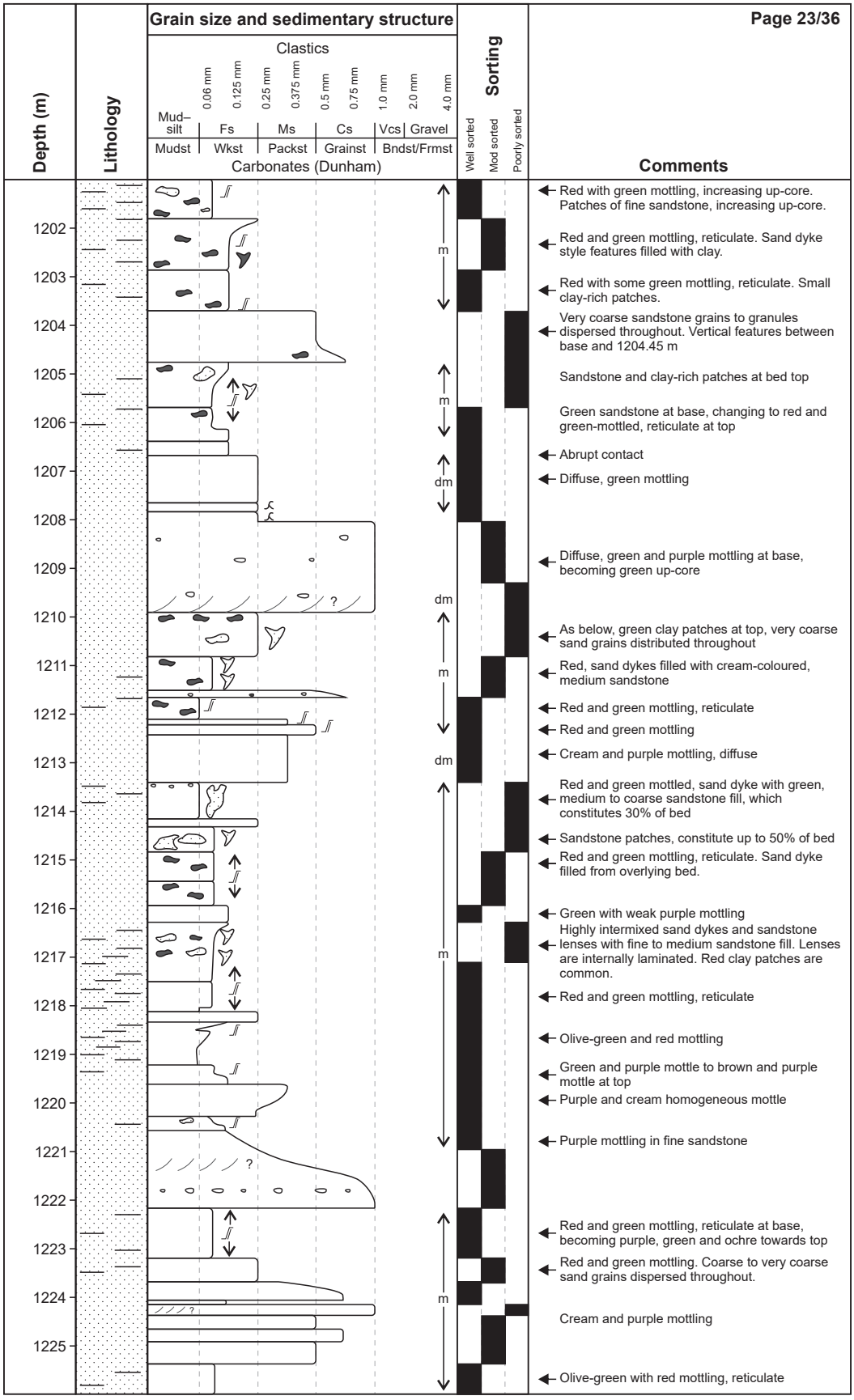
m
Cross-bedded sandstone with some grain size differentiation along foresets. Some concentration of organic material along foresets, but difficult to determine structure due to salt crust.
0.05 m interval of layers of disrupted organic material
Bed boundaries uncertain due to salt crust
Appears to be cross-bedded in most places but core is largely obscured by salt crust.
Large chunks of organic material present, coal in parts
Green sandstone with minor ochre mottling, coarse sandstone grains throughout top 0.20 m
Fine sandstone, interlaminated with organic material. Laminations in the lower section are pinstripe planar to low-angle cross-stratified. Organic material defines possible flaser lamination in upper sections.
Very minor discontinuous organic material concentrated along laminations
Massive?
Grain size differentiation in sections, possibly along foresets, but difficult to determine due to presence of salt crust.
White. Some very coarse sandstone foresets, less than 0.02 m thick
Organic material is present in clasts and concentrated along foresets
Pinkish colour, high quartz and high rock fragments
Upper section disrupted, possible flaser bedding
Red and green mottling. Large, mottled, clay-rich patches in lower half of the bed.
Red with minor green mottling. Not clay rich
Green with minor red mottling and clay-rich patches


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Vcs
Gravel
Mudst
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Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 23/36
Comments
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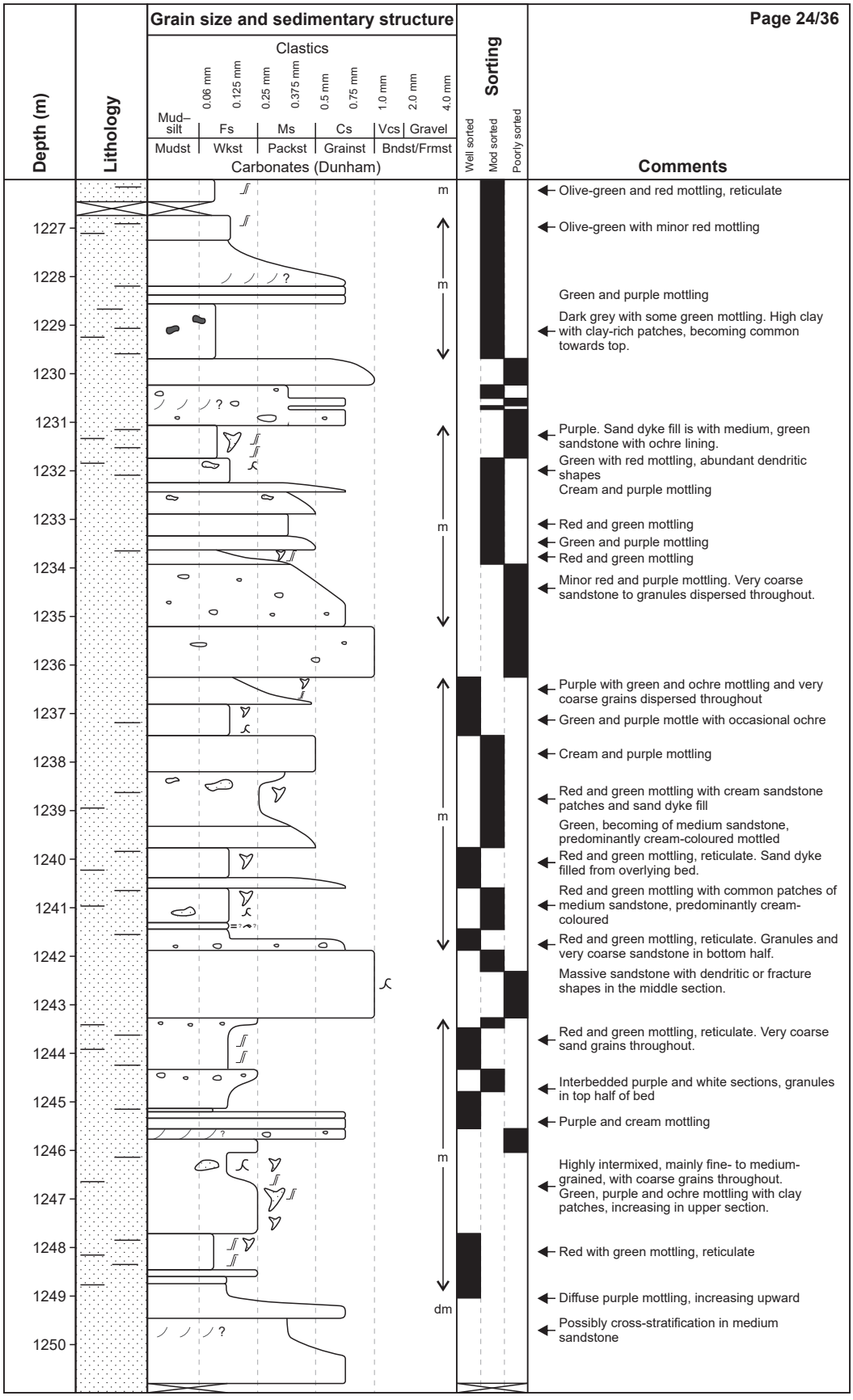
Red with green mottling, increasing up-core. Patches of fine sandstone, increasing up-core.
Red and green mottling, reticulate. Sand dyke style features filled with clay.
Red with some green mottling, reticulate. Small clay-rich patches.
Very coarse sandstone grains to granules dispersed throughout. Vertical features between base and 1204.45 m
Sandstone and clay-rich patches at bed top
Green sandstone at base, changing to red and green-mottled, reticulate at top
Abrupt contact
Diffuse, green mottling
Diffuse, green and purple mottling at base, becoming green up-core
As below, green clay patches at top, very coarse sand grains distributed throughout
Red, sand dykes filled with cream-coloured, medium sandstone
Red and green mottling, reticulate
Red and green mottling
Cream and purple mottling, diffuse
Red and green mottled, sand dyke with green, medium to coarse sandstone fill, which constitutes 30% of bed
Sandstone patches, constitute up to 50% of bed
Red and green mottling, reticulate. Sand dyke filled from overlying bed.
Green with weak purple mottling
Highly intermixed sand dykes and sandstone lenses with fine to medium sandstone fill. Lenses are internally laminated. Red clay patches are common.
Red and green mottling, reticulate
Olive-green and red mottling
Green and purple mottle to brown and purple mottle at top
Purple and cream homogeneous mottle
Purple mottling in fine sandstone
Red and green mottling, reticulate at base, becoming purple, green and ochre towards top
Red and green mottling. Coarse to very coarse sand grains dispersed throughout.
Cream and purple mottling
Olive-green with red mottling, reticulate


Grain size and sedimentary structure
Page 24/36
Depth (m)
Lithology
Clastics
0.06 mm
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4.0 mm
Mud–silt
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Cs
Vcs
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Wkst
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Bndst/Frmst
Carbonates (Dunham)
Sorting
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Mod sorted
Poorly sorted
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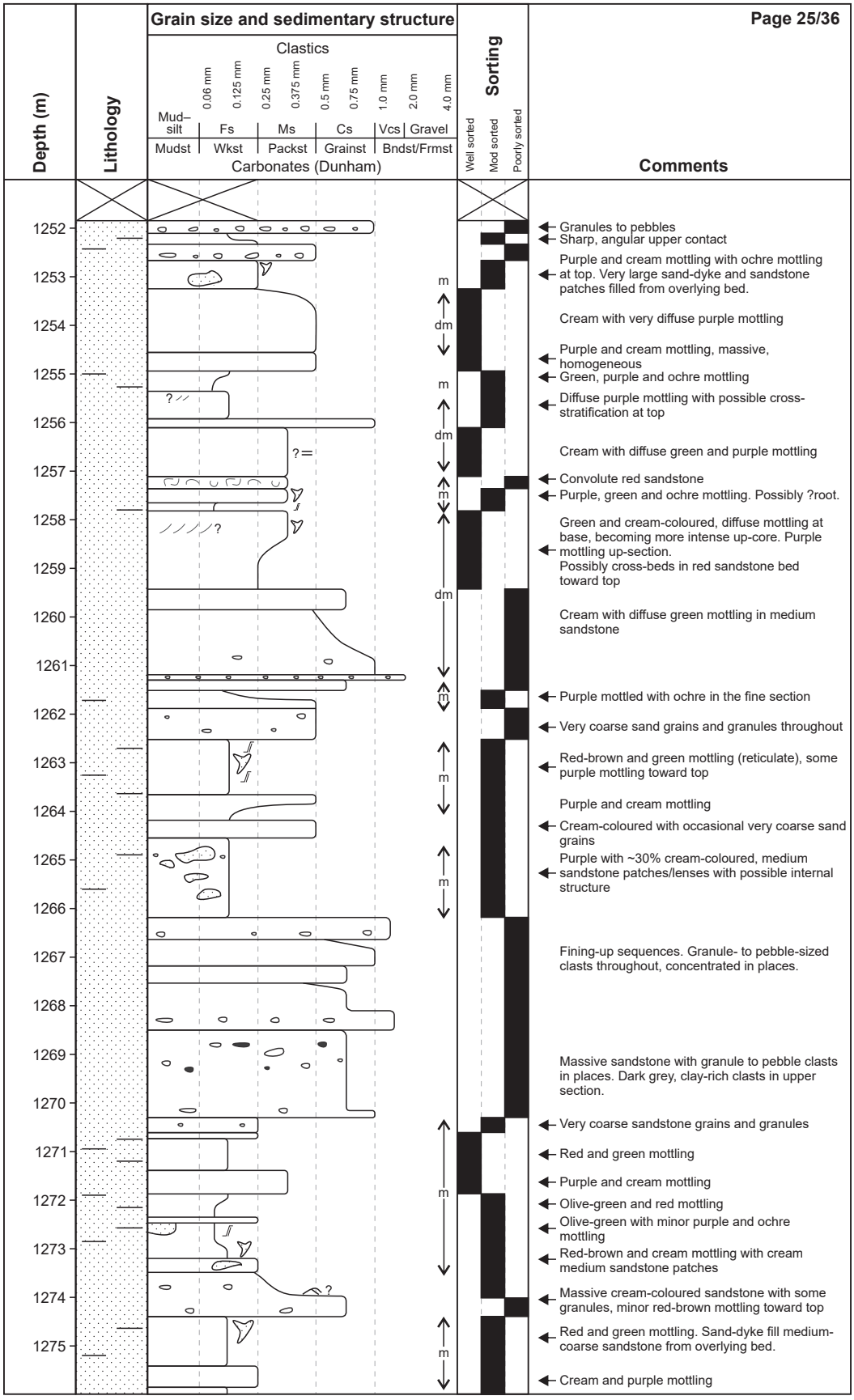
Olive-green and red mottling, reticulate
Olive-green with minor red mottling
Green and purple mottling
Dark grey with some green mottling. High clay with clay-rich patches, becoming common towards top.
Purple. Sand dyke fill is with medium, green sandstone with ochre lining.
Green with red mottling, abundant dendritic shapes
Cream and purple mottling
Red and green mottling
Green and purple mottling
Red and green mottling
Minor red and purple mottling. Very coarse sandstone to granules dispersed throughout.
Purple with green and ochre mottling and very coarse grains dispersed throughout
Green and purple mottle with occasional ochre
Cream and purple mottling
Red and green mottling with cream sandstone patches and sand dyke fill
Green, becoming of medium sandstone, predominantly cream-coloured mottled
Red and green mottling, reticulate. Sand dyke filled from overlying bed.
Red and green mottling with common patches of medium sandstone, predominantly cream-coloured
Red and green mottling, reticulate. Granules and very coarse sandstone in bottom half.
Massive sandstone with dendritic or fracture shapes in the middle section.
Red and green mottling, reticulate. Very coarse sand grains throughout.
Interbedded purple and white sections, granules in top half of bed
Purple and cream mottling
Highly intermixed, mainly fine- to medium-grained, with coarse grains throughout. Green, purple and ochre mottling with clay patches, increasing in upper section.
Red with green mottling, reticulate
Diffuse purple mottling, increasing upward
Possibly cross-stratification in medium sandstone


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.125 mm
0.25 mm
0.375 mm
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0.75 mm
1.0 mm
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Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 25/36
Comments
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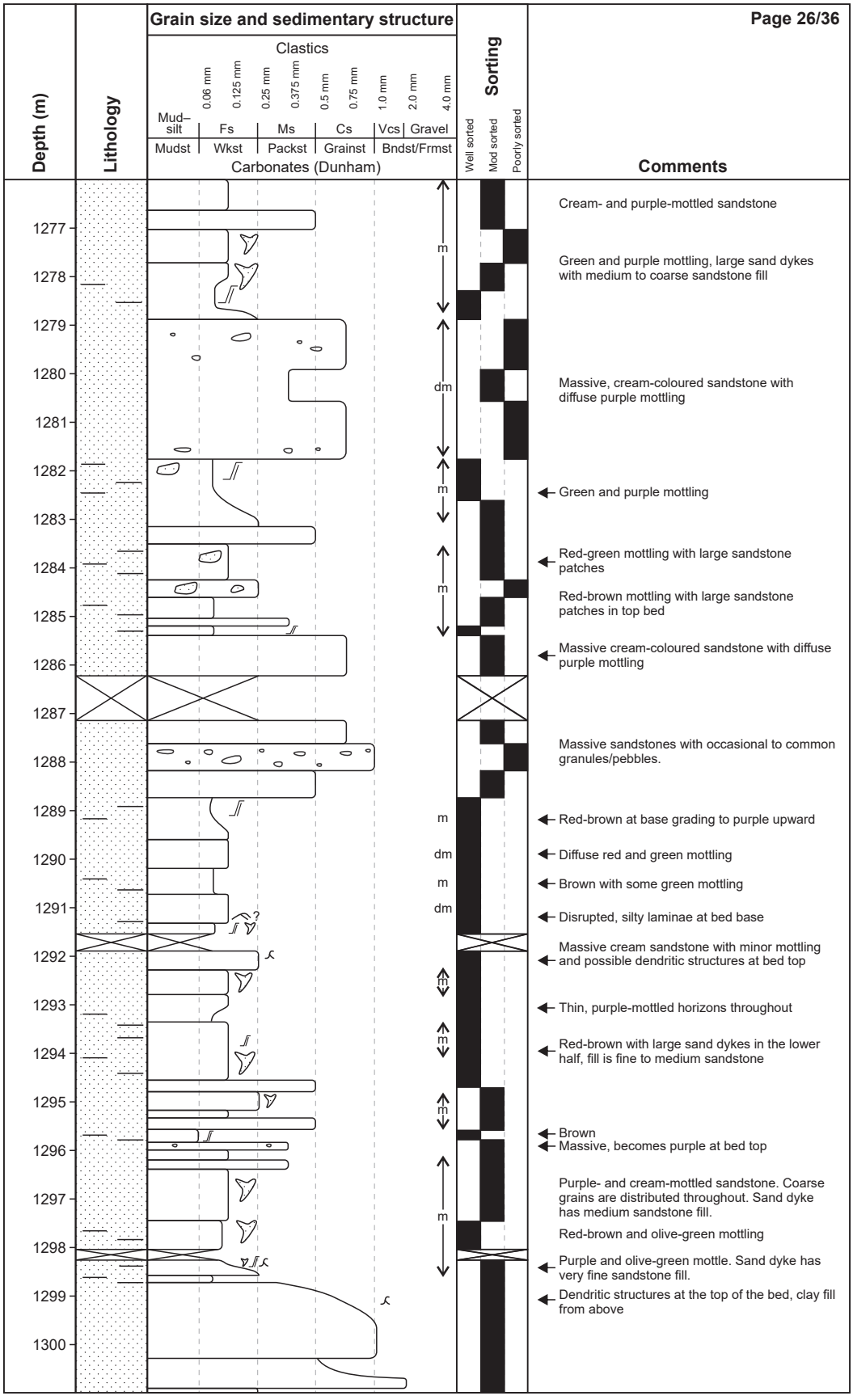
Granules to pebbles
Sharp, angular upper contact
Purple and cream mottling with ochre mottling at top. Very large sand-dyke and sandstone patches filled from overlying bed.
Cream with very diffuse purple mottling
Purple and cream mottling, massive, homogeneous
Green, purple and ochre mottling
Diffuse purple mottling with possible cross-stratification at top
Cream with diffuse green and purple mottling
Convolute red sandstone
Purple, green and ochre mottling. Possibly ?root.
Green and cream-coloured, diffuse mottling at base, becoming more intense up-core. Purple mottling up-section.
Possibly cross-beds in red sandstone bed toward top
Cream with diffuse green mottling in medium sandstone
Purple mottled with ochre in the fine section
Very coarse sand grains and granules throughout
Red-brown and green mottling (reticulate), some purple mottling toward top
Purple and cream mottling
Cream-coloured with occasional very coarse sand grains
Purple with ~30% cream-coloured, medium sandstone patches/lenses with possible internal structure
Fining-up sequences. Granule- to pebble-sized clasts throughout, concentrated in places.
Massive sandstone with granule to pebble clasts in places. Dark grey, clay-rich clasts in upper section.
Very coarse sandstone grains and granules
Red and green mottling
Purple and cream mottling
Olive-green and red mottling
Olive-green with minor purple and ochre mottling
Red-brown and cream mottling with cream medium sandstone patches
Massive cream-coloured sandstone with some granules, minor red-brown mottling toward top
Red and green mottling. Sand-dyke fill medium-coarse sandstone from overlying bed.
Cream and purple mottling


Grain size and sedimentary structure
Page 26/36
Depth (m)
Lithology
Clastics
0.06 mm
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Mud–silt
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Carbonates (Dunham)
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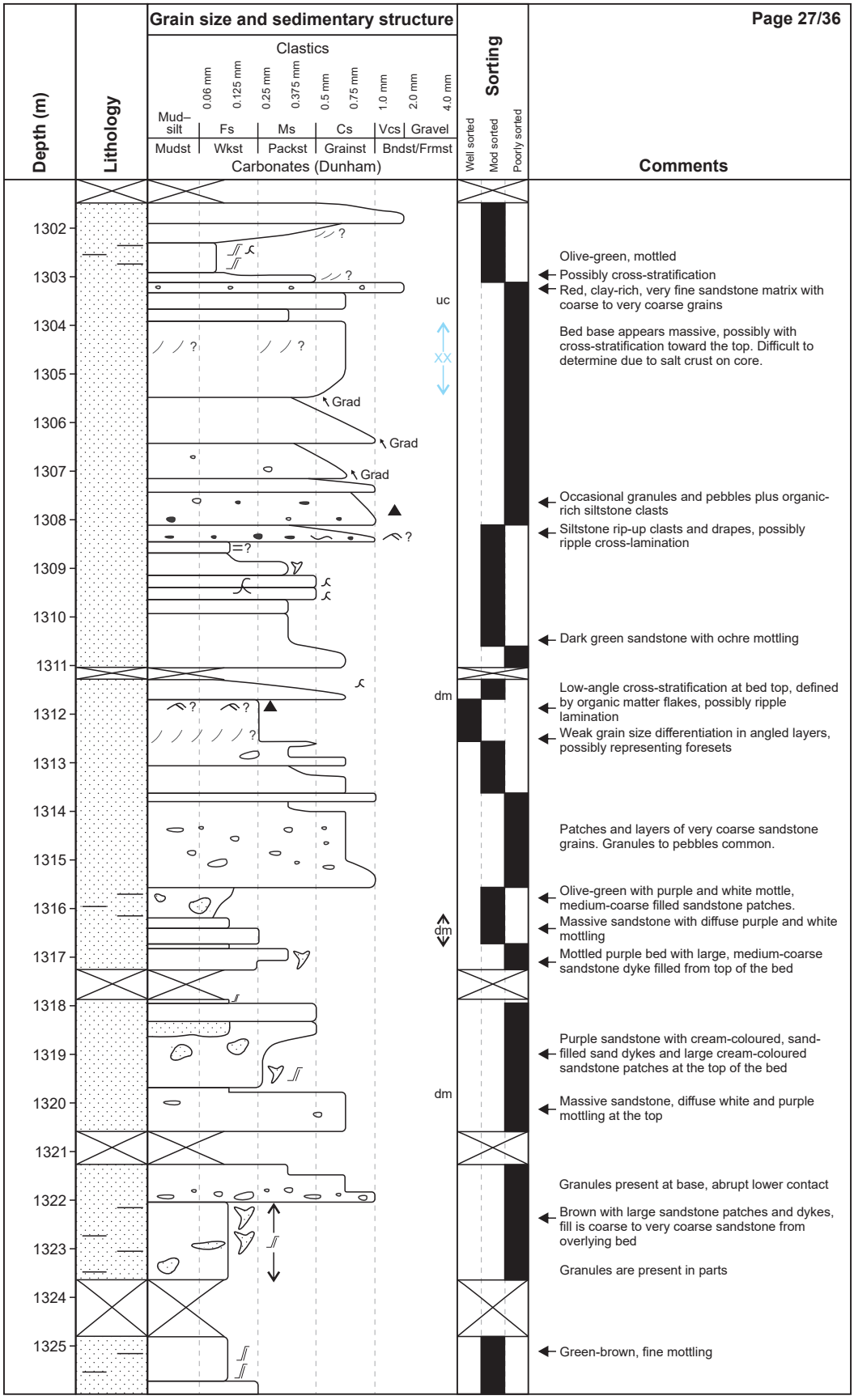
Cream- and purple-mottled sandstone
Green and purple mottling, large sand dykes with medium to coarse sandstone fill
Massive, cream-coloured sandstone with diffuse purple mottling
Green and purple mottling
Red-green mottling with large sandstone patches
Red-brown mottling with large sandstone patches in top bed
Massive cream-coloured sandstone with diffuse purple mottling
Massive sandstones with occasional to common granules/pebbles.
Red-brown at base grading to purple upward
Diffuse red and green mottling
Brown with some green mottling
Disrupted, silty laminae at bed base
Massive cream sandstone with minor mottling and possible dendritic structures at bed top
Thin, purple-mottled horizons throughout
Red-brown with large sand dykes in the lower half, fill is fine to medium sandstone
Brown
Massive, becomes purple at bed top
Purple- and cream-mottled sandstone. Coarse grains are distributed throughout. Sand dyke has medium sandstone fill.
Red-brown and olive-green mottling
Purple and olive-green mottle. Sand dyke has very fine sandstone fill.
Dendritic structures at the top of the bed, clay fill from above


Depth (m)
Lithology
Grain size and sedimentary structure
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 27/36
Comments
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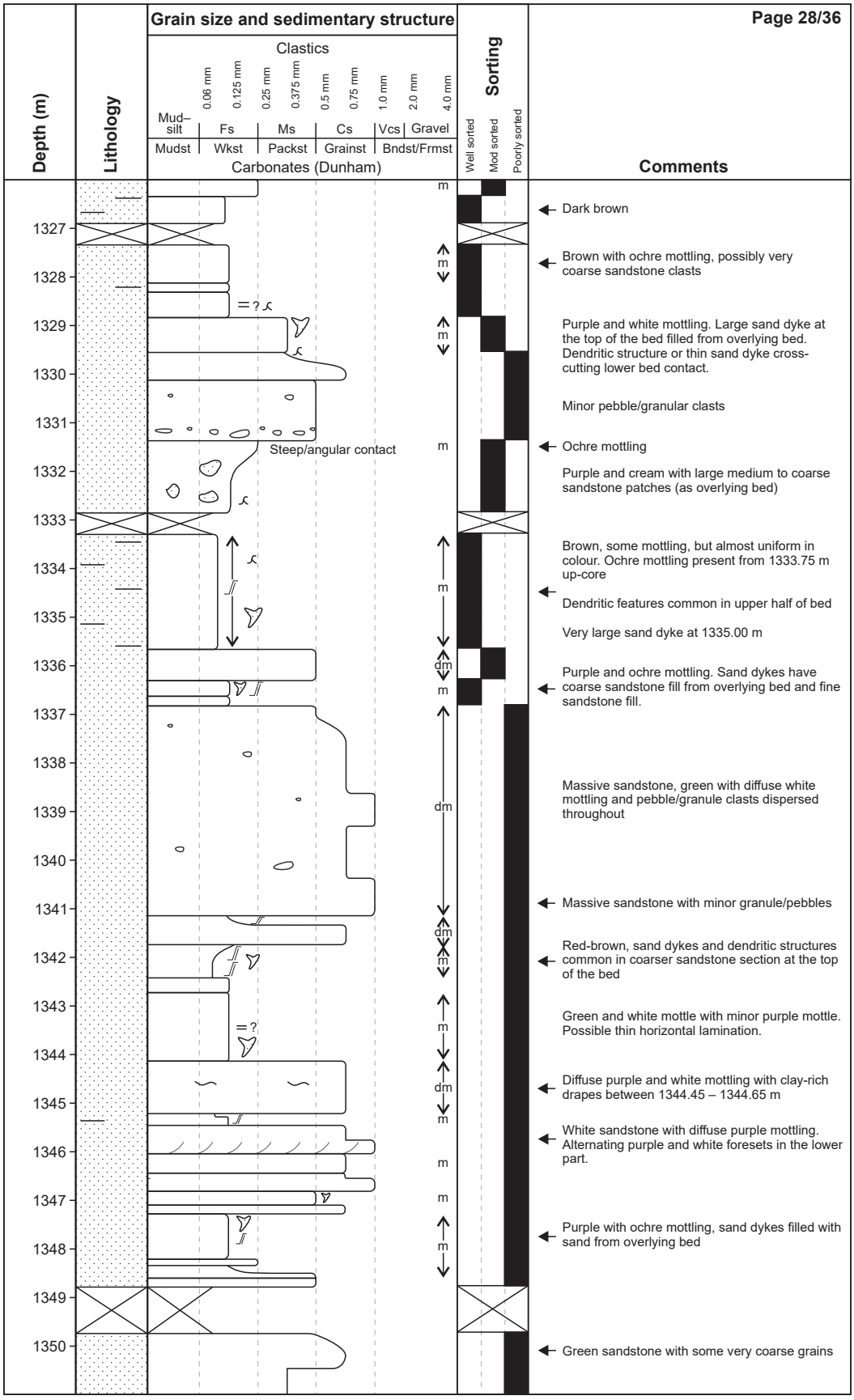
Grad
Olive-green, mottled
Possibly cross-stratification
Red, clay-rich, very fine sandstone matrix with coarse to very coarse grains
Bed base appears massive, possibly with cross-stratification toward the top. Difficult to determine due to salt crust on core.
Occasional granules and pebbles plus organic-rich siltstone clasts
Siltstone rip-up clasts and drapes, possibly ripple cross-lamination
Dark green sandstone with ochre mottling
Low-angle cross-stratification at bed top, defined by organic matter flakes, possibly ripple lamination
Weak grain size differentiation in angled layers, possibly representing foresets
Patches and layers of very coarse sandstone grains. Granules to pebbles common.
Olive-green with purple and white mottle, medium-coarse filled sandstone patches.
Massive sandstone with diffuse purple and white mottling
Mottled purple bed with large, medium-coarse sandstone dyke filled from top of the bed
Purple sandstone with cream-coloured, sand-filled sand dykes and large cream-coloured sandstone patches at the top of the bed
Massive sandstone, diffuse white and purple mottling at the top
Granules present at base, abrupt lower contact
Brown with large sandstone patches and dykes, fill is coarse to very coarse sandstone from overlying bed
Granules are present in parts
Green-brown, fine mottling


Grain size and sedimentary structure
Page 28/36
Depth (m)
Lithology
Clastics
0.06 mm
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0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
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Vcs
Gravel
Mudst
Wkst
Packst
Grainst
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Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
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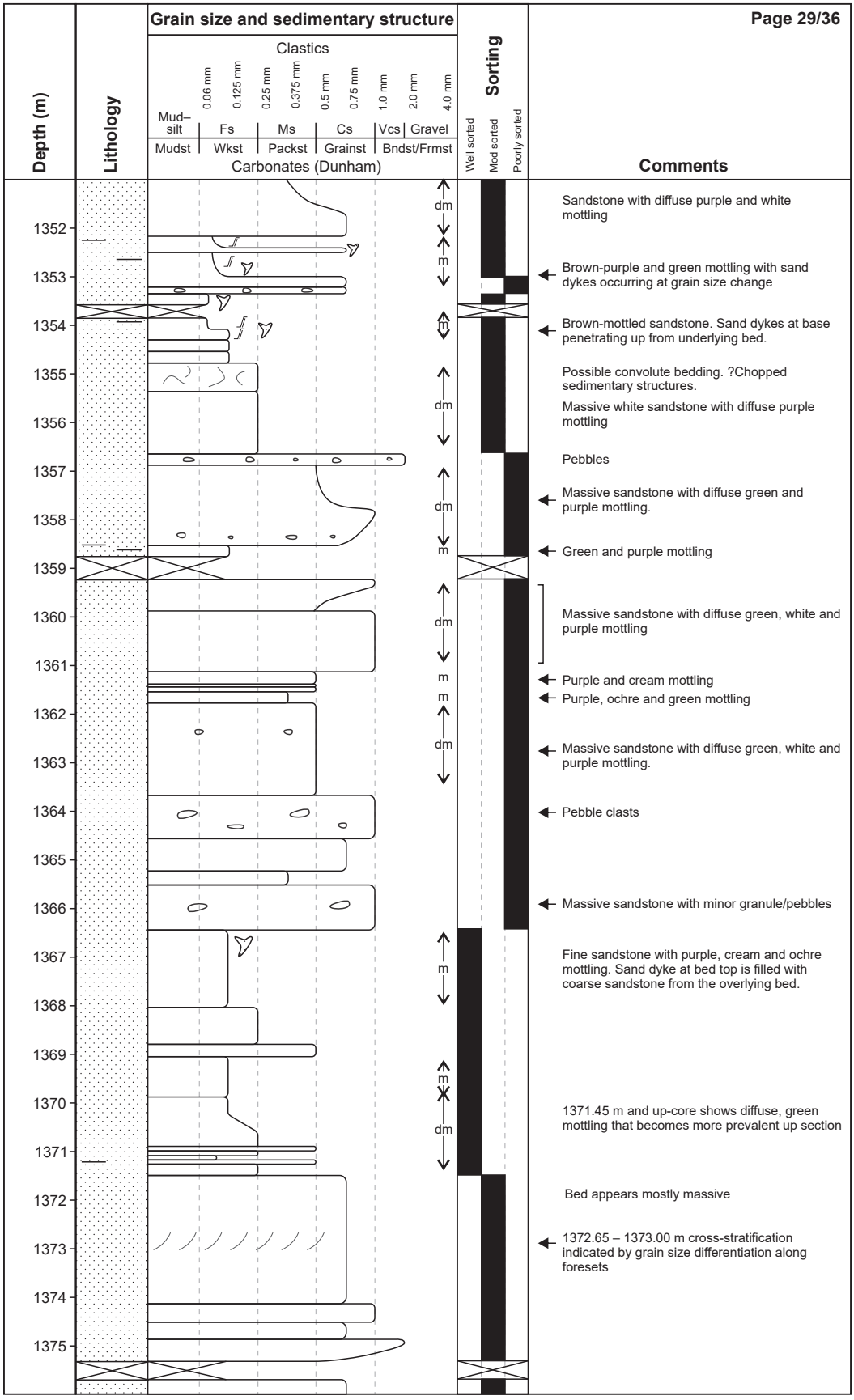
Steep/angular contact
Dark brown
Brown with ochre mottling, possibly very coarse sandstone clasts
Purple and white mottling. Large sand dyke at the top of the bed filled from overlying bed. Dendritic structure or thin sand dyke cross-cutting lower bed contact.
Minor pebble/granular clasts
Ochre mottling
Purple and cream with large medium to coarse sandstone patches (as overlying bed)
Brown, some mottling, but almost uniform in colour. Ochre mottling present from 1333.75 m up-core
Dendritic features common in upper half of bed
Very large sand dyke at 1335.00 m
Purple and ochre mottling. Sand dykes have coarse sandstone fill from overlying bed and fine sandstone fill.
Massive sandstone, green with diffuse white mottling and pebble/granule clasts dispersed throughout
Massive sandstone with minor granule/pebbles
Red-brown, sand dykes and dendritic structures common in coarser sandstone section at the top of the bed
Green and white mottle with minor purple mottle. Possible thin horizontal lamination.
Diffuse purple and white mottling with clay-rich drapes between 1344.45 – 1344.65 m
White sandstone with diffuse purple mottling. Alternating purple and white foresets in the lower part.
Purple with ochre mottling, sand dykes filled with sand from overlying bed
Green sandstone with some very coarse grains


Depth (m)
Lithology
Grain size and sedimentary structure
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Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Page 29/36
Comments
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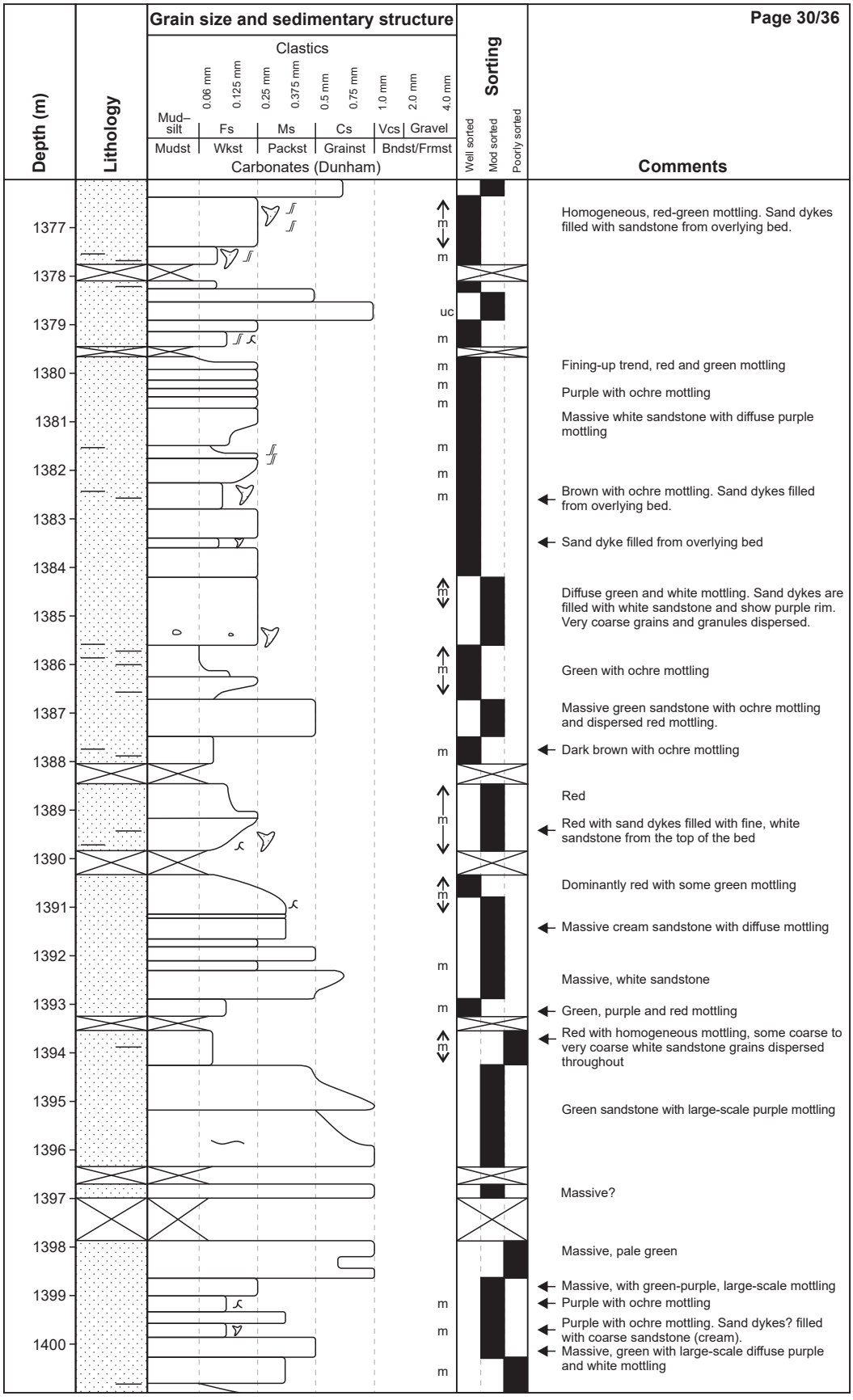
Sandstone with diffuse purple and white mottling
Brown-purple and green mottling with sand dykes occurring at grain size change
Brown-mottled sandstone. Sand dykes at base penetrating up from underlying bed.
Possible convolute bedding. ?Chopped sedimentary structures.
Massive white sandstone with diffuse purple mottling
Pebbles
Massive sandstone with diffuse green and purple mottling.
Green and purple mottling
Massive sandstone with diffuse green, white and purple mottling
Purple and cream mottling
Purple, ochre and green mottling
Massive sandstone with diffuse green, white and purple mottling.
Pebble clasts
Massive sandstone with minor granule/pebbles
Fine sandstone with purple, cream and ochre mottling. Sand dyke at bed top is filled with coarse sandstone from the overlying bed.
1371.45 m and up-core shows diffuse, green mottling that becomes more prevalent up section
Bed appears mostly massive
1372.65 – 1373.00 m cross-stratification indicated by grain size differentiation along foresets


Grain size and sedimentary structure
Page 30/36
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
4.0 mm
Mud–silt
Fs
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Gravel
Mudst
Wkst
Packst
Grainst
Bndst/Frmst
Carbonates (Dunham)
Sorting
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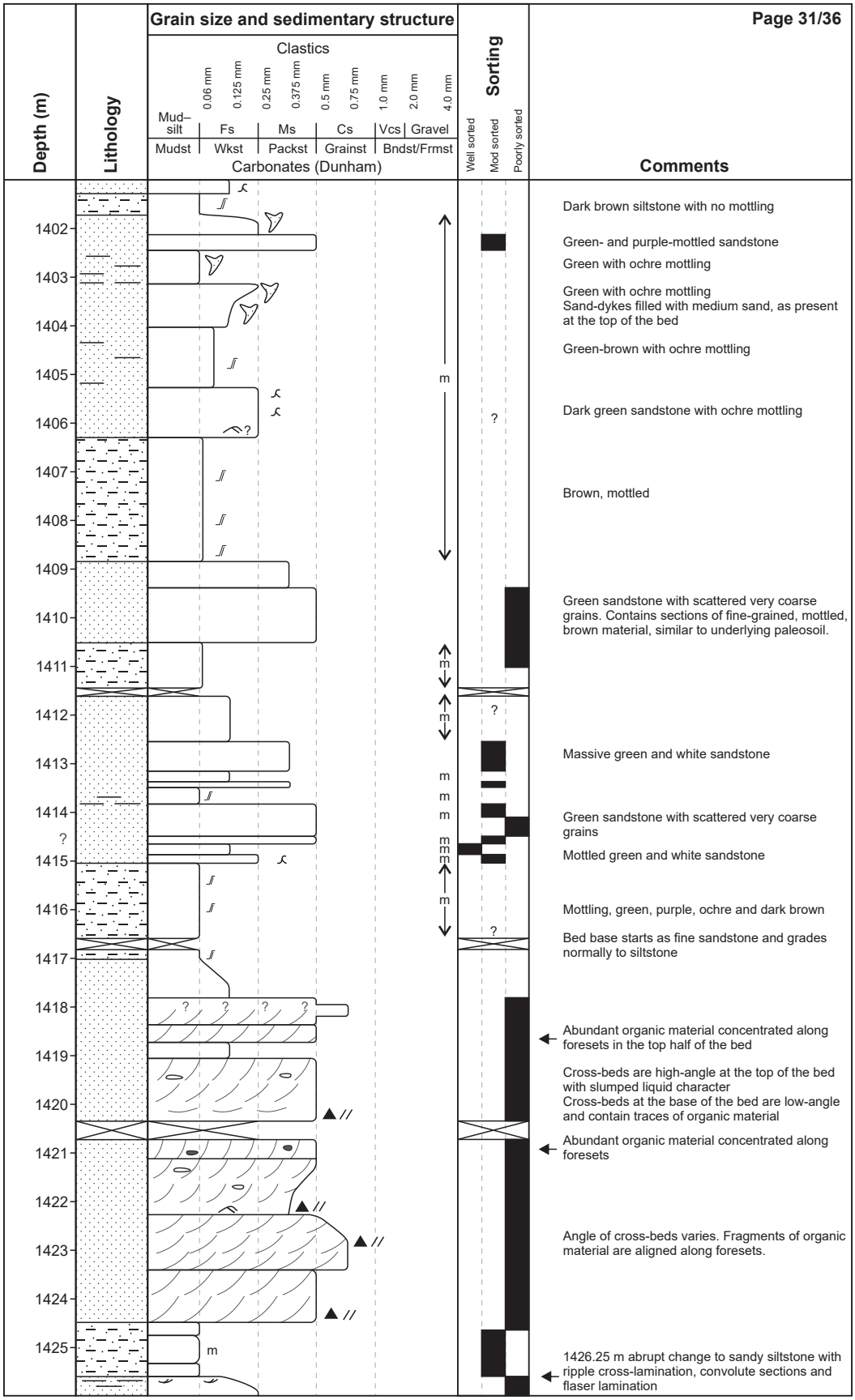
uc
Homogeneous, red-green mottling. Sand dykes filled with sandstone from overlying bed.
Fining-up trend, red and green mottling
Purple with ochre mottling
Massive white sandstone with diffuse purple mottling
Brown with ochre mottling. Sand dykes filled from overlying bed.
Sand dyke filled from overlying bed
Diffuse green and white mottling. Sand dykes are filled with white sandstone and show purple rim. Very coarse grains and granules dispersed.
Green with ochre mottling
Massive green sandstone with ochre mottling and dispersed red mottling.
Dark brown with ochre mottling
Red
Red with sand dykes filled with fine, white sandstone from the top of the bed
Dominantly red with some green mottling
Massive cream sandstone with diffuse mottling
Massive, white sandstone
Green, purple and red mottling
Red with homogeneous mottling, some coarse to very coarse white sandstone grains dispersed throughout
Green sandstone with large-scale purple mottling
Massive?
Massive, pale green
Massive, with green-purple, large-scale mottling
Purple with ochre mottling
Purple with ochre mottling. Sand dykes? filled with coarse sandstone (cream).
Massive, green with large-scale diffuse purple and white mottling


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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0.25 mm
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Page 31/36
Comments
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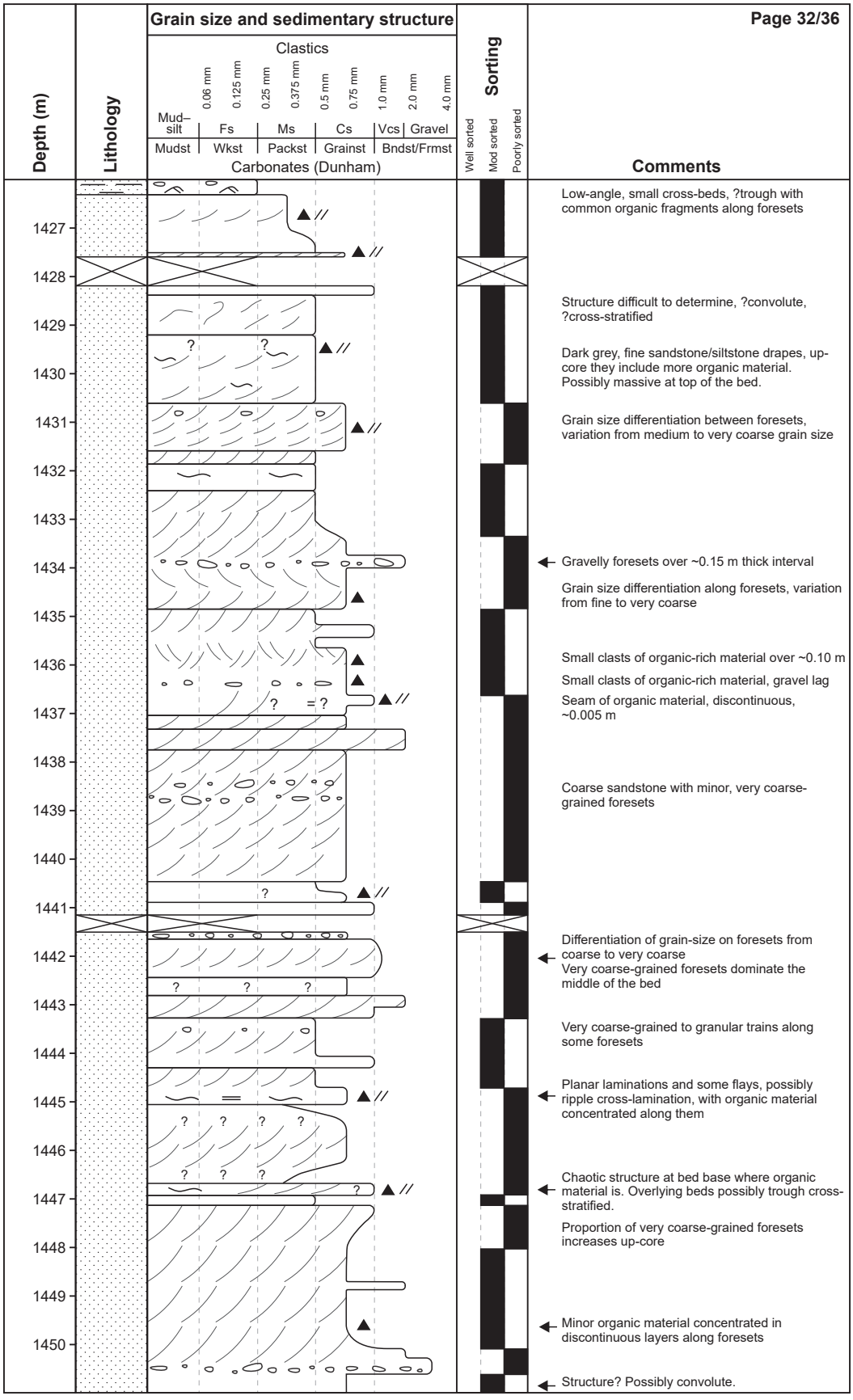
Dark brown siltstone with no mottling
Green- and purple-mottled sandstone
Green with ochre mottling
Green with ochre mottling
Sand-dykes filled with medium sand, as present at the top of the bed
Green-brown with ochre mottling
Dark green sandstone with ochre mottling
Brown, mottled
Green sandstone with scattered very coarse grains. Contains sections of fine-grained, mottled, brown material, similar to underlying paleosoil.
Massive green and white sandstone
Green sandstone with scattered very coarse grains
Mottled green and white sandstone
Mottling, green, purple, ochre and dark brown
Bed base starts as fine sandstone and grades normally to siltstone
Abundant organic material concentrated along foresets in the top half of the bed
Cross-beds are high-angle at the top of the bed with slumped liquid character
Cross-beds at the base of the bed are low-angle and contain traces of organic material
Abundant organic material concentrated along foresets
Angle of cross-beds varies. Fragments of organic material are aligned along foresets.
1426.25 m abrupt change to sandy siltstone with ripple cross-lamination, convolute sections and flaser lamination


Grain size and sedimentary structure
Page 32/36
Depth (m)
Lithology
Clastics
0.06 mm
0.125 mm
0.25 mm
0.375 mm
0.5 mm
0.75 mm
1.0 mm
2.0 mm
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Mud–silt
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Carbonates (Dunham)
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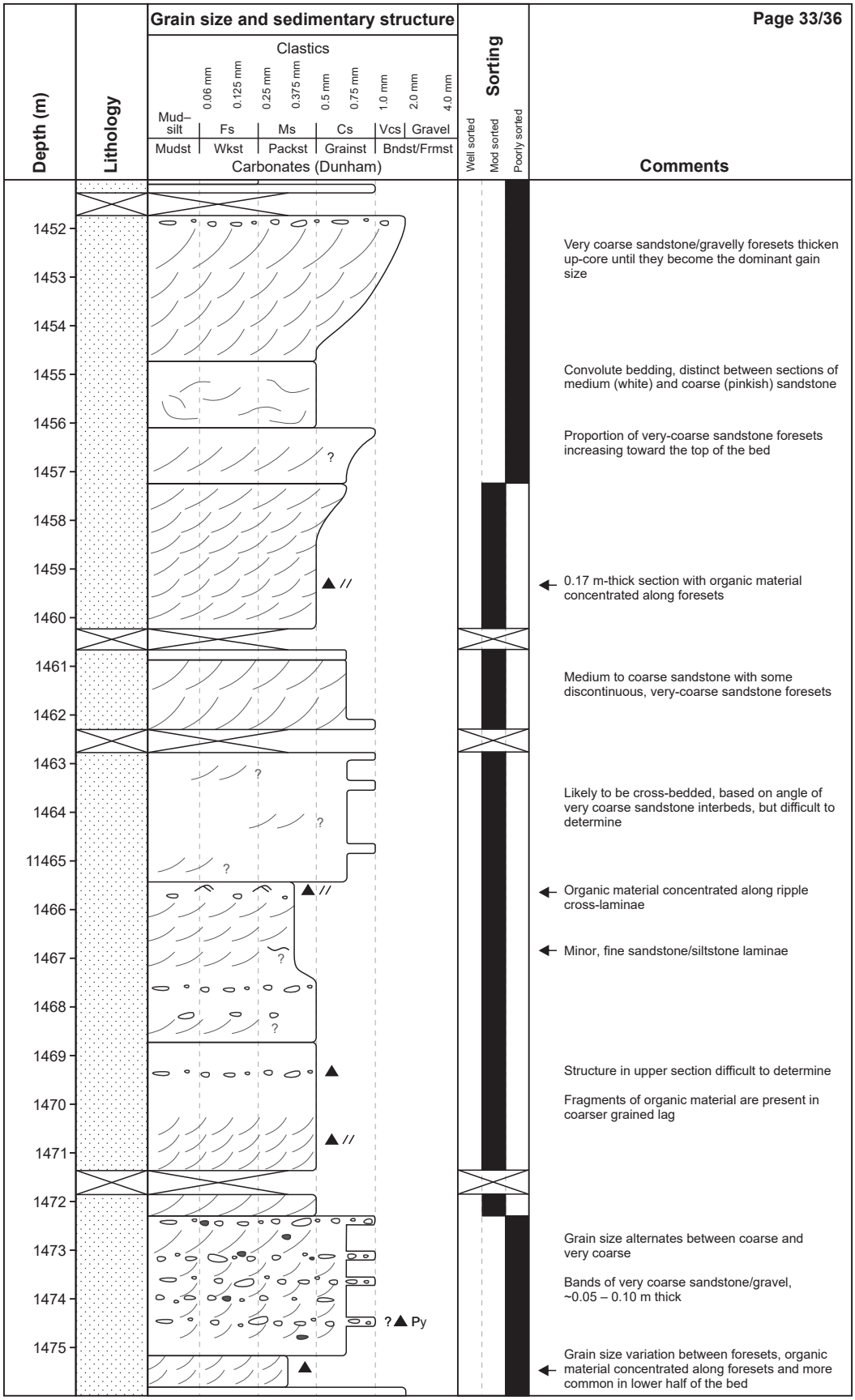
Low-angle, small cross-beds, ?trough with common organic fragments along foresets
Structure difficult to determine, ?convolute, ?cross-stratified
Dark grey, fine sandstone/siltstone drapes, up-core they include more organic material. Possibly massive at top of the bed.
Grain size differentiation between foresets, variation from medium to very coarse grain size
Gravelly foresets over ~0.15 m thick interval
Grain size differentiation along foresets, variation from fine to very coarse
Small clasts of organic-rich material over ~0.10 m
Small clasts of organic-rich material, gravel lag
Seam of organic material, discontinuous, ~0.005 m
Coarse sandstone with minor, very coarse-grained foresets
Differentiation of grain-size on foresets from coarse to very coarse
Very coarse-grained foresets dominate the middle of the bed
Very coarse-grained to granular trains along some foresets
Planar laminations and some flays, possibly ripple cross-lamination, with organic material concentrated along them
Chaotic structure at bed base where organic material is. Overlying beds possibly trough cross-stratified.
Proportion of very coarse-grained foresets increases up-core
Minor organic material concentrated in discontinuous layers along foresets
Structure? Possibly convolute.


Depth (m)
Lithology
Grain size and sedimentary structure
Clastics
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Page 33/36
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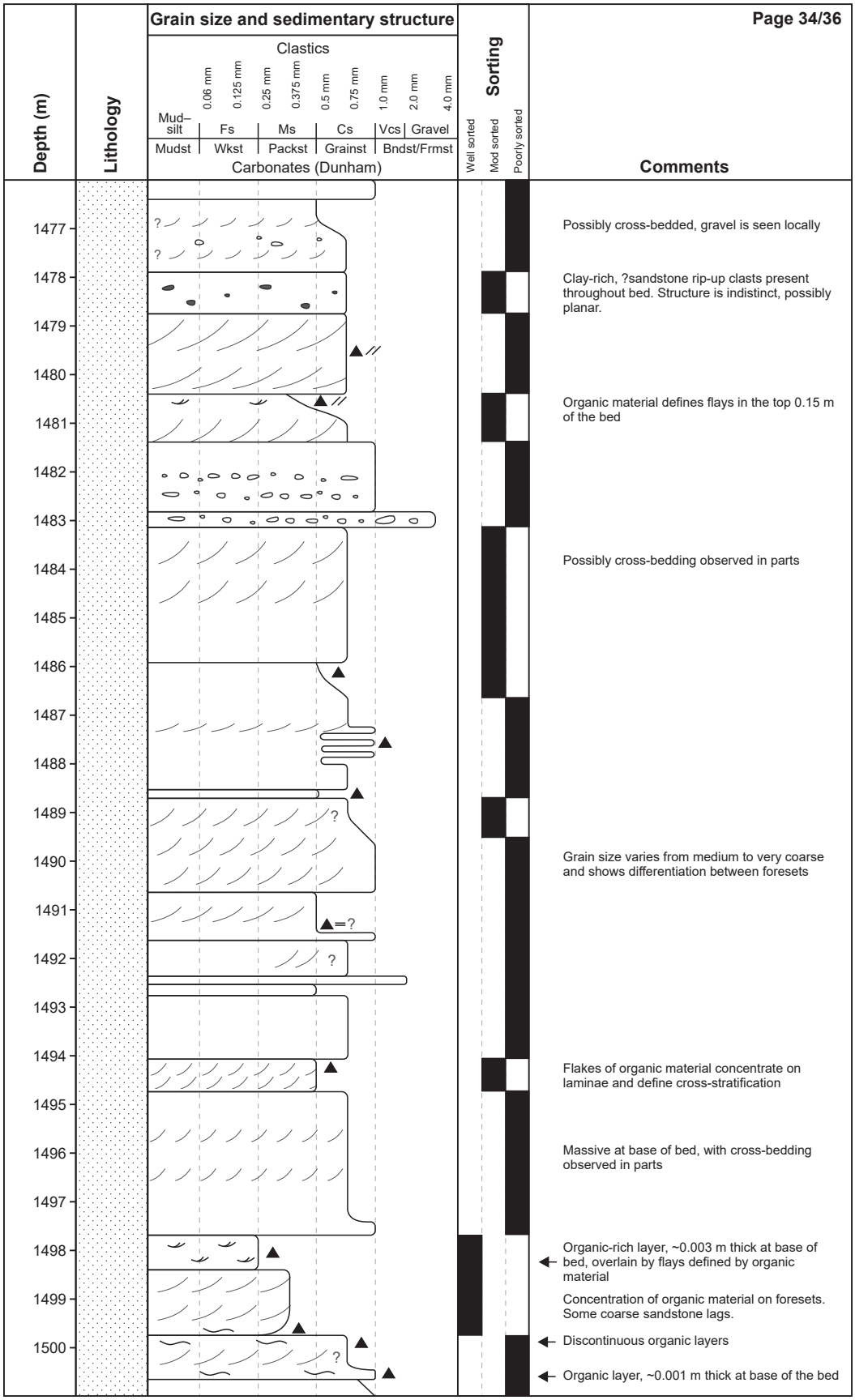
Very coarse sandstone/gravelly foresets thicken up-core until they become the dominant gain size
Convolute bedding, distinct between sections of medium (white) and coarse (pinkish) sandstone
Proportion of very-coarse sandstone foresets increasing toward the top of the bed
0.17 m-thick section with organic material concentrated along foresets
Medium to coarse sandstone with some discontinuous, very-coarse sandstone foresets
Likely to be cross-bedded, based on angle of very coarse sandstone interbeds, but difficult to determine
Organic material concentrated along ripple cross-laminae
Minor, fine sandstone/siltstone laminae
Structure in upper section difficult to determine
Fragments of organic material are present in coarser grained lag
Grain size alternates between coarse and very coarse
Bands of very coarse sandstone/gravel, ~0.05 – 0.10 m thick
Grain size variation between foresets, organic material concentrated along foresets and more common in lower half of the bed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Page 34/36
Comments
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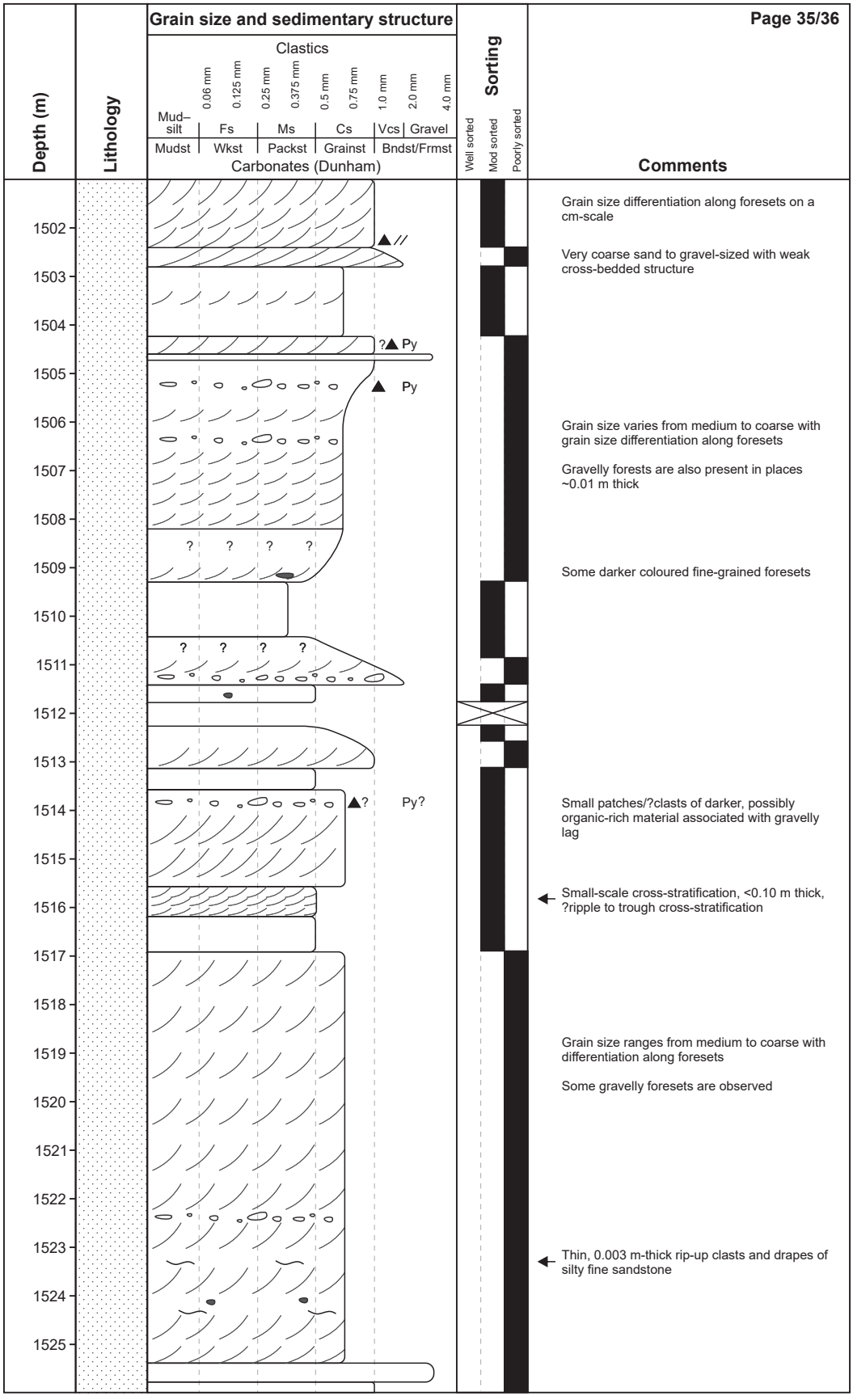
Possibly cross-bedded, gravel is seen locally
Clay-rich, ?sandstone rip-up clasts present throughout bed. Structure is indistinct, possibly planar.
Organic material defines flays in the top 0.15 m of the bed
Possibly cross-bedding observed in parts
Grain size varies from medium to very coarse and shows differentiation between foresets
Flakes of organic material concentrate on laminae and define cross-stratification
Massive at base of bed, with cross-bedding observed in parts
Organic-rich layer, ~0.003 m thick at base of bed, overlain by flays defined by organic material
Concentration of organic material on foresets. Some coarse sandstone lags.
Discontinuous organic layers
Organic layer, ~0.001 m thick at base of the bed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Bndst/Frmst
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Page 35/36
Comments
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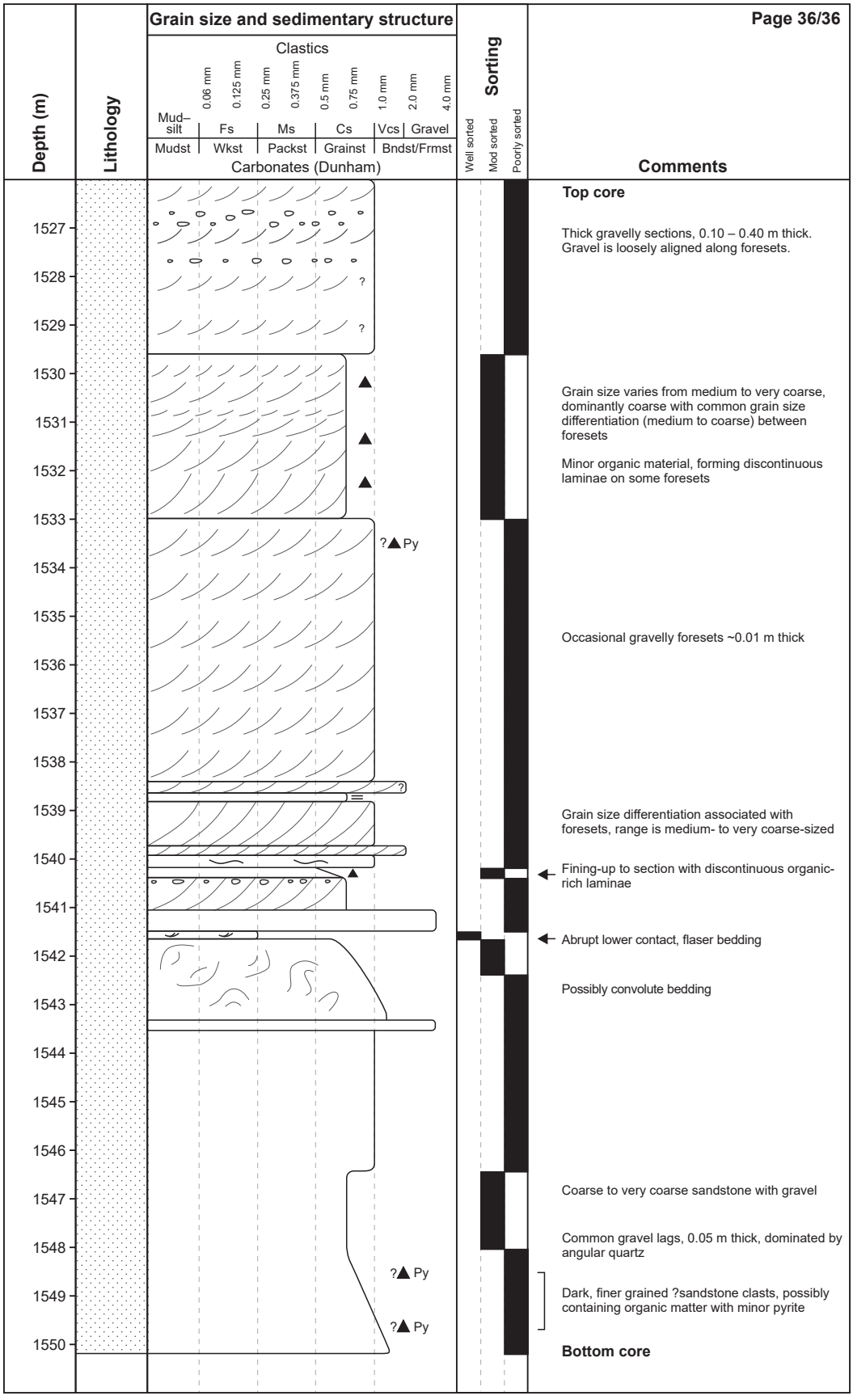
Py?
Grain size differentiation along foresets on a cm-scale
Very coarse sand to gravel-sized with weak cross-bedded structure
Grain size varies from medium to coarse with grain size differentiation along foresets
Gravelly forests are also present in places ~0.01 m thick
Some darker coloured fine-grained foresets
Small patches/?clasts of darker, possibly organic-rich material associated with gravelly lag
Small-scale cross-stratification, <0.10 m thick, ?ripple to trough cross-stratification
Grain size ranges from medium to coarse with differentiation along foresets
Some gravelly foresets are observed
Thin, 0.003 m-thick rip-up clasts and drapes of silty fine sandstone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Page 36/36
Comments
1527
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Top core
Thick gravelly sections, 0.10 – 0.40 m thick. Gravel is loosely aligned along foresets.
Grain size varies from medium to very coarse, dominantly coarse with common grain size differentiation (medium to coarse) between foresets
Minor organic material, forming discontinuous laminae on some foresets
Occasional gravelly foresets ~0.01 m thick
Grain size differentiation associated with foresets, range is medium- to very coarse-sized
Fining-up to section with discontinuous organic-rich laminae
Abrupt lower contact, flaser bedding
Possibly convolute bedding
Coarse to very coarse sandstone with gravel
Common gravel lags, 0.05 m thick, dominated by angular quartz
Dark, finer grained ?sandstone clasts, possibly containing organic matter with minor pyrite
Bottom core

Appendix 3

Core logs for DMP Harvey 4

Legend for Harvey 4 core logs

Lithology

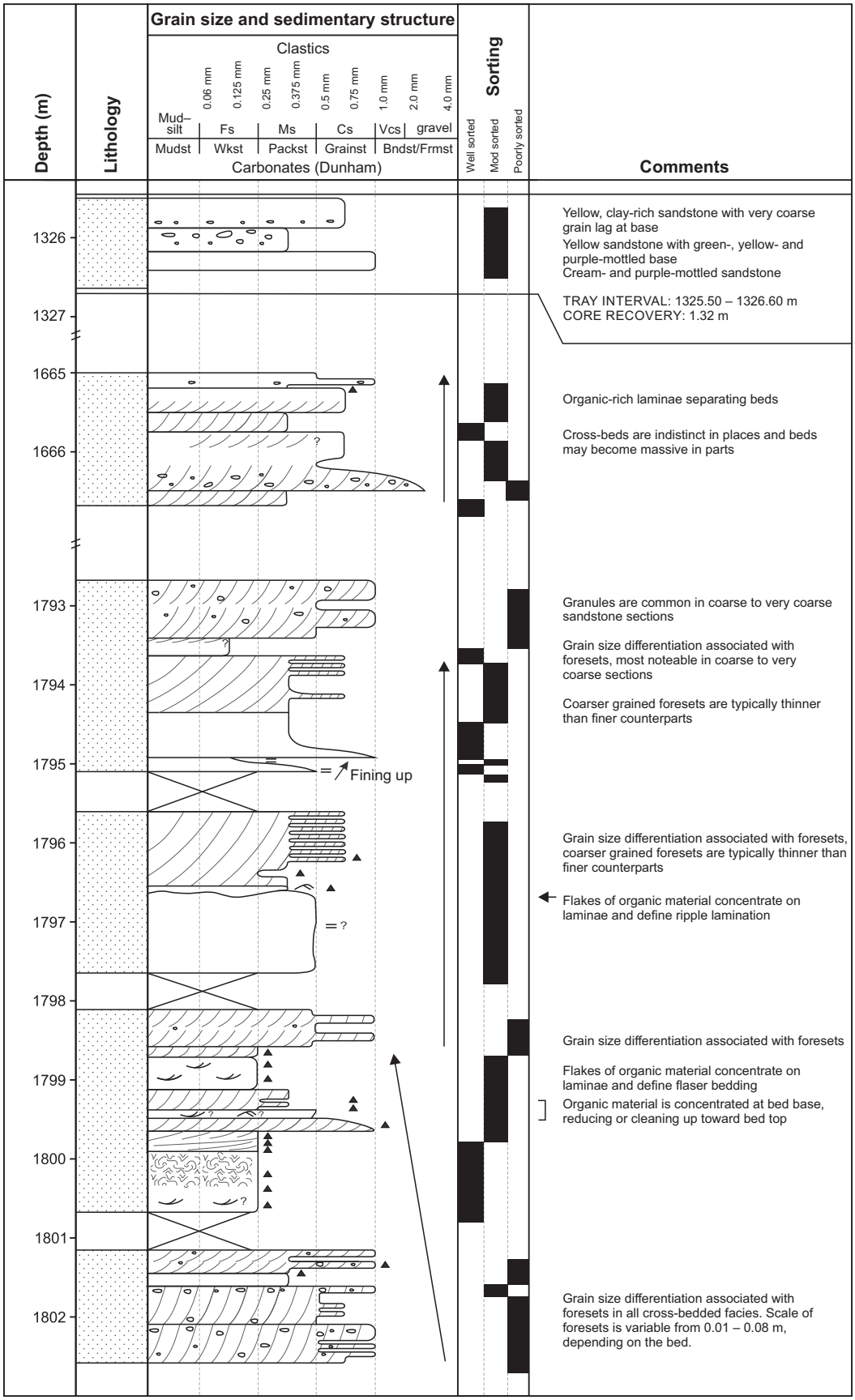
- Sandstone
- Clay-rich sandstone
- Clay-rich siltstone
- Sandy claystone
- Cross-stratification
- Trough cross-stratification
- Ripple lamination
- Horizontal lamination
- Flaser bedding
- Wavy bedding
- Convolute bedding
- Slump
- Mud drape
- Slickenside
- Sandstone patches
- Clay-rich patches
- Sandstone lenses
- Sand dyke
- Dendritic structure
- Flame structure
- Granules - pebbles
- Clay-rich clasts
- Sandstone clasts
- Organic material

▲ //	Organic material defining lamination
m	Mottling
dm	Diffuse mottling
uc	Unconsolidated sediment
Py	Pyrite
Fe	Iron stain
xx	Salt crust

Grain size classification

Mudst	Mudstone
Wkst	Wackestone
Packst	Packstone
Grainst	Grainstone
Bndst/ Frmst	Bindstone/Framestone
Fs	Fine sand
Ms	Medium sand
Cs	Coarse sand
Vcs	Very coarse sand

LD282 21.06.24


Depth (m)
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Grain size and sedimentary structure
Clastics
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0.125 mm
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0.75 mm
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Mud–silt
Fs
Ms
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Vcs
gravel
Mudst
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Grainst
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Carbonates (Dunham)
Sorting
Well sorted
Mod sorted
Poorly sorted
Comments
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Fining up
Yellow, clay-rich sandstone with very coarse grain lag at base
Yellow sandstone with green-, yellow- and purple-mottled base
Cream- and purple-mottled sandstone
TRAY INTERVAL: 1325.50 – 1326.60 m
CORE RECOVERY: 1.32 m
Organic-rich laminae separating beds
Cross-beds are indistinct in places and beds may become massive in parts
Granules are common in coarse to very coarse sandstone sections
Grain size differentiation associated with foresets, most noteable in coarse to very coarse sections
Coarser grained foresets are typically thinner than finer counterparts
Grain size differentiation associated with foresets, coarser grained foresets are typically thinner than finer counterparts
Flakes of organic material concentrate on laminae and define ripple lamination
Grain size differentiation associated with foresets
Flakes of organic material concentrate on laminae and define flaser bedding
Organic material is concentrated at bed base, reducing or cleaning up toward bed top
Grain size differentiation associated with foresets in all cross-bedded facies. Scale of foresets is variable from 0.01 – 0.08 m, depending on the bed.

RECORD 2024/2

SEDIMENTOLOGICAL CORE LOGS OF THE DMP HARVEY 2, 3/3A AND 4 STRATIGRAPHIC WELLS IN THE SOUTHERN PERTH BASIN

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