

Appendix 6. Marker beds database, MIDK42CS.

Maximum stratigraphic ranges in mega-annums of stage boundaries (MA), bentonite beds (MB), magnetochrons (MA/MB), geochemical markers (GC), and sequence marker beds (MB) in outcrop and cored sections in the MIDK3, MIDK4, MIDK41, & MIDK42.CAT databases. The sections in which each taxon occurs are listed showing in which section the maximum age occurs indicated by *; + marks second longest occurrence. Where a species is listed twice, the maximum range is highlighted yellow. The number at bottom of each entry is number of graphed sections, some of which have been graphed twice to re-adjust to revised Cenomanian/Turonian age. Date: 08/16/2006, revised 12/06. Age of the Cenomanian/Turonian boundary is 90.5 Ma in MIDK3 to MIDK41 and 93.0 Ma in MIDK42.

Stage boundaries from Gradstein et al., 2004

Base Albian			Morphologic Code - MA
2004 Ages Modified		-113.00*	-111.00*
MIDK41 CS		-113.00*	-111.00*
	2	-113.00	-111.00
Base Aptian			Morphologic Code - MA
2004 Ages Modified		-126.00*	-124.00*
MIDK41 CS		-126.00*	-124.00*
	2	-126.00	-124.00
Base Barremian			Morphologic Code - MA
2004 Ages Modified		-131.50*	-128.50*
MIDK41 CS		-131.50*	-128.50*
	2	-131.50	-128.50
Base Berriasian			Morphologic Code - MA
2004 Ages Modified		-149.50*	-141.50*
MIDK41 CS		-149.50*	-141.50*
	2	-149.50	-141.50
Base Campanian			Morphologic Code - MA
2004 Ages Modified		-84.20*	-82.80*
MIDK41 CS		-84.20*	-82.80*
	2	-84.20	-82.80
Base Cenomanian			Morphologic Code - MA
2004 Ages Modified		-100.50*	-98.70*
MIDK41 CS		-100.50*	-98.70*
	2	-100.50	-98.70
Base Coniacian			Morphologic Code - MA
2004 Ages Modified		-90.30*	-88.30*
MIDK41 CS		-90.30*	-88.30*
	2	-90.30	-88.30
Base Danian			Morphologic Code - MA
2004 Ages Modified		-65.80*	-65.20*
MIDK41 CS		-65.80*	-65.20*
	2	-65.80	-65.20
Base Hauterivian			Morphologic Code - MA
2004 Ages Modified		-138.40*	-134.40*
MIDK41 CS		-138.40*	-134.40*

	2	-138.40	-134.40
Base Maastricht			Morphologic Code - MA
2004 Ages Modified		-71.20*	-70.00*
MIDK41 CS		-71.20*	-70.00*

	2	-71.20	-70.00
Base Santonian			Morphologic Code - MA
2004 Ages Modified		-86.50*	-85.10*
MIDK41 CS		-86.50*	-85.10*

	2	-86.50	-85.10
Base Turonian			Morphologic Code - MA
2004 Ages Modified		-94.30*	-92.70*
MIDK41 CS		-94.30*	-92.70*

	2	-94.30	-92.70
Base Valanginian			Morphologic Code - MA
2004 Ages Modified		-143.20	-1138.20
MIDK41 CS		-143.20	-1138.20

	2	-1138.20	-143.20

Stage boundaries from Harland et al., 1990

Top Albian			Morphologic Code - MA
20-Trinity River, Texas Sect, Alb-Cen		***	-97.12
24-Mt. Risou, Rosans, SE France, Alb-Cen		***	-97.13
MIDK41 CS		-97.00	-97.12

	2	-97.13	-97.00
Top Aptian			Morphologic Code - MA
3b-Santa Rosa Canyon Section, Mexico, Be		-112.04+	-112.04
20-Trinity River, Texas Sect, Alb-Cen		***	-113.33
MIDK41 CS		-112.04*	-112.04*

	2	-113.33	-112.04
Top Barremian			Morphologic Code - MA
3b-Santa Rosa Canyon Section, Mexico, Be		-126.15*	-126.15
27-Pie' del Dosso Section, Italy (Barrem		***	-124.50*
43-Gorgo a Cerbara Section, Italy		***	-124.50*
69 Coupe de la Gare de Cassis, SE France		***	-124.56
MIDK41 CS		-126.15*	-124.50*

	2	-126.15	-124.50
Top Berriasian			Morphologic Code - MA
3b-Santa Rosa Canyon Section, Mexico, Be		-140.36	-140.36*
MIDK41 CS		-140.50*	-140.36*

	2	-140.50	-140.36
Top Campanian			Morphologic Code - MA
MIDK41 CS		-74.00*	***

	2	-74.00	-74.00
Top Cenomanian			Morphologic Code - MA
1-Kalaat Senan, Turonian		***	-90.50*
2-Harland Geologic Time Scale, 1990		-90.50*	***
15B Pueblo, Colorado, Turonian GSSP		-92.96*	-92.96+
MIDK41 CS		-92.96*	-90.50*

	2	-92.96	-90.50	
Top Coniacian				Morphologic Code - MA
UPK 3 Olazagutia, Spain			***	-85.91*
MIDK41 CS		-86.50*		-85.91*
	2	-86.50	-85.91	
Top Early Barremian				Morphologic Code - MA
43-Gorgo a Cerbara Section, Italy				-129.68* -129.60*
MIDK41 CS		-129.68*		-129.60*
	2	-129.68	-129.60	
Top Early Turonian				Morphologic Code - MA
1-Kalaat Senan, Turonian			***	-89.82*
MIDK41 CS			***	-89.82*
	2	-89.82	-89.82	
Top Hauterivian				Morphologic Code - MA
2-Harland Geologic Time Scale, 1990				-132.00* ***
3b-Santa Rosa Canyon Section, Mexico, Be				-130.15 -130.15*
26-Cismon Section, Italy (VU Data), Apt-				*** -131.40
43-Gorgo a Cerbara Section, Italy				-130.61 -130.23
MIDK41 CS		-132.00*		-130.15*
	2	-132.00	-130.15	
Top Maastricht				Morphologic Code - MA
MIDK41 CS				-65.00* ***
	2	-65.00	-65.00	
Top Middle Turonian				Morphologic Code - MA
1-Kalaat Senan, Turonian				*** -89.16*
MIDK41 CS				*** -89.16*
	2	-89.16	-89.16	
Top Santonian				Morphologic Code - MA
MIDK41 CS				-83.00* ***
	2	-83.00	-83.00	
Top Tithonian				Morphologic Code - MA
MIDK41 CS				-145.50* ***
	2	-145.50	-145.50	
Top Turonian				Morphologic Code - MA
2-Harland Geologic Time Scale, 1990				-88.50+ ***
1-Kalaat Senan, Turonian				*** -88.50
MIDK41 CS				-88.50 -88.50
	2	-88.50	-88.50	
Top Valanginian				Morphologic Code - MA
3b-Santa Rosa Canyon Section, Mexico, Be				-134.55 -134.55*
MIDK41 CS				-135.00* -134.55*
	2	-135.00	-134.55	

Bentonites in the Greenhorn Formation at Pueblo, Colorado;

age is range of uncertainty rather than mid-point (Obradovich, 1993):

Bentonite 96 Morphologic Code - MB
 2004 Ages Modified -94.03* -92.77*
 15B Pueblo, Colorado, Turonian GSSP -92.82 -92.79
 MIDK41 CS -94.03* -92.77*

 2 -94.03 -92.77

Bentonite 88 Morphologic Code - MB
 2004 Ages Modified -93.80* -92.70*
 15B Pueblo, Colorado, Turonian GSSP -92.88 -92.88
 MIDK41 CS -93.80* -92.70*

 2 -93.80 -92.70

Bentonite 80 Morphologic Code - MB
 2004 Ages Modified -94.05* -93.07*
 15B Pueblo, Colorado, Turonian GSSP -93.12 -93.11
 MIDK41 CS -94.05* -93.07*

 2 -94.05 -93.07

Bentonite 69 Morphologic Code - MB
 2004 Ages Modified -94.38* -92.60*
 15B Pueblo, Colorado, Turonian GSSP -93.29 -93.27
 MIDK41 CS -94.38* -92.60*

 2 -94.38 -92.60

Bentonite 64 Morphologic Code MB
 2004 Ages Modified -94.62* -93.18*
 15B Pueblo, Colorado, Turonian GSSP -93.35 -93.35
 MIDK41 CS -94.62* -93.18*

 2 -94.62 -93.18

Graneros Fm., Colorado:

Marker bed "X" bentonite Morphologic Code - MB
 9-Amoco No. 1 Bounds core, Kansas, U. Al -93.69 -93.67*
 15-Pueblo, Colorado outcrop, U. Alb-Con -93.80* -93.80
 46-North Colo Front Range -93.80 -93.76
 MIDK41 CS -93.80* -93.67*

 2 -93.80 -93.67 recalibrated to new age 95.1-94.9

Mowry Fm., Wyoming

Marker bed Clay Spur bentonite Morphologic Code - MB
 Bentonite age = 97.17±.69 Ma (Obradovich, 1993)
 37-Type Shell Creek Fm., Wyoming (Alb-Tu -97.01* ***
 46-North Colo Front Range -96.98+ -96.93*
 2004 Ages Modified -97.86* -96.48*
 MIDK41 CS -97.86* -96.48*

 2 -97.86 -96.48

Marker bed Arrow Creek bentonite Morphologic Code - MB
 2004 Ages Modified -98.93* -98.11*
 MIDK41 CS -98.93* -98.11*

 2 -98.93 -98.11

Magnetochrons

C25n Morphologic Code - MA

		84 DSDP Core Hole 549, SW Offshore Engla	***	-55.84*
		121 ODP 762C Exmouth Plateau, Indian Oce	***	-55.85+
		131 DSDP 515F Western Atlantic	***	-55.85

	3	-55.85	-55.84	
C25r		Morphologic Code - MA		
		84 DSDP Core Hole 549, SW Offshore Engla	***	-56.74*

	1	-56.74	-56.74	
C26n		Morphologic Code - MA		
		84 DSDP Core Hole 549, SW Offshore Engla	***	-57.72+
		PAL 141 ODP 752 Indian Ocean	***	-57.55*

	2	-57.72	-57.55	
C26r		Morphologic Code - MA		
		84 DSDP Core Hole 549, SW Offshore Engla	***	-57.93+
		PAL 141 ODP 752 Indian Ocean	***	-57.91*

	2	-57.93	-57.91	
C27n		Morphologic Code - MA		
		PAL 141 ODP 752 Indian Ocean	***	-60.92*
		MIDK41 CS	***	-60.92*

	2	-60.92	-60.92	
C27r		Morphologic Code - MA		
		PAL 141 ODP 752 Indian Ocean	***	-61.20*
		MIDK41 CS	***	-61.20*

	2	-61.20	-61.20	
C28n		Morphologic Code - MA		
		PAL 141 ODP 752 Indian Ocean	***	-62.45*
		MIDK41 CS	***	-62.45*

	2	-62.45	-62.45	
C28r		Morphologic Code - MA		
		PAL 141 ODP 752 Indian Ocean	***	-63.63*
		PAL 151 DSDP 550+550B NE Atlantic	***	-63.64+
		MIDK41 CS	***	-63.63*

	2	-63.64	-63.63	
C29n		Morphologic Code - MA		
		121 ODP 762C Exmouth Plateau, Indian Oce	***	-64.51
		131 DSDP 515F Western Atlantic	***	-63.98+
		PAL 141 ODP 752 Indian Ocean	***	-63.98*
		PAL 151 DSDP 550+550B NE Atlantic	***	-63.98+
		MIDK41 CS	***	-63.98*
		121 ODP 762C Exmouth Plateau, Indian Oce	***	-64.53

	5	-64.53	-63.98	
C29r		Morphologic Code - MA		
		131 DSDP 515F Western Atlantic	***	-65.07
		PAL 151 DSDP 550+550B NE Atlantic	***	-64.75+
		PAL 161 DSDP 548A NE Atlantic	***	-64.74*
		PAL 211 ODP 690B Weddell Sea, Antarctica	***	-64.76
		MIDK41 CS	***	-64.74*

	4	-65.07	-64.74	
C30n		Morphologic Code - MA		

84 DSDP Core Hole 549, SW Offshore Ensla	***	-66.58	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-66.31	
131 DSDP 515F Western Atlantic	***	-65.90+	
PAL 141 ODP 752 Indian Ocean	***	-65.94	
PAL 151 DSDP 550+550B NE Atlantic	***	-65.96	
PAL 161 DSDP 548A NE Atlantic	***	-65.91	
PAL 211 ODP 690B Weddell Sea, Antarctica	***	-65.89*	
UPK 18 Bottacione Gorge, Italy	***	-65.86*	
MIDK41 CS	***	-65.89*	
84 DSDP Core Hole 549, SW Offshore Ensla	***	-66.37	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-66.33	

	10	-66.58	-65.86
C30r		Morphologic Code - MA	
84 DSDP Core Hole 549, SW Offshore Ensla	***	-67.59*	
PAL 141 ODP 752 Indian Ocean	***	-67.59+	
PAL 161 DSDP 548A NE Atlantic	***	-67.61	
UPK 18 Bottacione Gorge, Italy	***	-67.59+	
MIDK41 CS	***	-67.59*	
84 DSDP Core Hole 549, SW Offshore Ensla	***	-67.60	

	5	-67.61	-67.59
C31n		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-67.70+	
PAL 161 DSDP 548A NE Atlantic	***	-67.70*	
UPK 18 Bottacione Gorge, Italy	***	-67.69*	
MIDK41 CS	***	-67.69*	

	3	-67.70	-67.69
C31r		Morphologic Code - MA	
PAL 141 ODP 752 Indian Ocean	***	-68.22*	
PAL 151 DSDP 550+550B NE Atlantic	***	-68.26+	
PAL 161 DSDP 548A NE Atlantic	***	-68.27	
UPK 18 Bottacione Gorge, Italy	***	-68.22*	
UPK 19 Red Bird Section, Wyoming	***	-68.36	
MIDK41 CS	***	-68.22*	

	5	-68.36	-68.22
C32n In		Morphologic Code - MA	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-70.46	
131 DSDP 515F Western Atlantic	***	-70.46*	
PAL 151 DSDP 550+550B NE Atlantic	***	-70.56	
PAL 161 DSDP 548A NE Atlantic	***	-70.46	
PAL 211 ODP 690B Weddell Sea, Antarctica	***	-70.46+	
UPK 18 Bottacione Gorge, Italy	***	-71.00	
UPK 19 Red Bird Section, Wyoming	***	-70.53+	
MIDK41 CS	***	-70.46*	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-70.51	

	8	-70.56	-70.46
C32n 1r		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-71.30*	
UPK 18 Bottacione Gorge, Italy	***	-71.28*	
MIDK41 CS	***	-71.30*	

	2	-71.30	-71.28
C32n 2n		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-71.87*	

UPK 18 Bottacione Gorge, Italy	***	-71.87*	
MIDK41 CS	***	-71.87*	

	2	-71.87	-71.87
C32r 1n		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-73.49*	
UPK 18 Bottacione Gorge, Italy	***	-73.60+	
MIDK41 CS	***	-73.49*	

	2	-73.60	-73.49
C32r 1r		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-73.31+	
PAL 211 ODP 690B Weddell Sea, Antarctica	***	-73.29*	
UPK 18 Bottacione Gorge, Italy	***	-73.29+	
UPK 19 Red Bird Section, Wyoming	***	-74.23	
MIDK41 CS	***	-73.29*	

	4	-74.23	-73.29
C32r 2r		Morphologic Code - MA	
PAL 151 DSDP 550+550B NE Atlantic	***	-73.75*	
UPK 18 Bottacione Gorge, Italy	***	-73.71*	
MIDK41 CS	***	-73.75*	

	2	-73.75	-73.71
C33n		Morphologic Code - MA	
84 DSDP Core Hole 549, SW Offshore Engla	***	-69.25*	
UPK 13 Tercis Quarry section, France (Od	***	-74.02	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-73.17+	
PAL 151 DSDP 550+550B NE Atlantic	***	-74.04	
PAL 211 ODP 690B Weddell Sea, Antarctica	***	-74.05	
UPK 18 Bottacione Gorge, Italy	***	-74.02+	
UPK 19 Red Bird Section, Wyoming	***	-74.75	
MIDK41 CS	***	-73.93*	
84 DSDP Core Hole 549, SW Offshore Engla	***	-69.33	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-71.96	

	9	-74.05	-69.33
C33r		Morphologic Code - MA	
84 DSDP Core Hole 549, SW Offshore Engla	***	-72.13*	
UPK 18 Bottacione Gorge, Italy	***	-79.77+	
MIDK41 CS	***	-78.59*	
84 DSDP Core Hole 549, SW Offshore Engla	***	-83.71	

	3	-83.71	-72.13
C34n		Morphologic Code - MA	
84 DSDP Core Hole 549, SW Offshore Engla	***	-83.44+	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-83.37*	
UPK 18 Bottacione Gorge, Italy	***	-83.37*	
MIDK41 CS	***	-83.37*	
84 DSDP Core Hole 549, SW Offshore Engla	***	-84.07	
121 ODP 762C Exmouth Plateau, Indian Oce	***	-83.37	

	5	-84.07	-83.37
Magnetochron CM0R		Morphologic Code - MB	
26-Cisonon Section, Italy (VU Data), Apt-	-124.50*	-123.78*	
27-Pie' del Dosso Section, Italy (Barrem	-124.50*	-124.38	
41-ODP 641C, Offshore Portugal (Alb-Bar)	-124.20	-124.00	
43-Gorgo a Cerbara Section, Italy	-124.50*	-123.84+	

26B Cison Core, Italy	-124.31	-123.81
2004 Ages Modified	-125.00*	***
MIDK41 CS	-125.00*	-123.78*

6	-125.00	-123.78
Magnetochron CM1R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	-128.45	-128.09+
27-Pie' del Dosso Section, Italy (Barrem	-128.91*	-127.70*
43-Gorgo a Cerbara Section, Italy	-128.90+	-128.14
26B Cison Core, Italy	-128.28	-128.01
MIDK41 CS	-128.91*	-127.70*

4	-128.91	-127.70
Magnetochron CM3R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	-130.40*	-129.41*
43-Gorgo a Cerbara Section, Italy	-130.34+	-129.44+
26B Cison Core, Italy	-130.30	-129.03*
MIDK41 CS	-130.40*	-129.03*

3	-130.40	-129.03
Magnetochron CM5R	Morphologic Code - MB	
43-Gorgo a Cerbara Section, Italy	-130.99*	-130.78*
MIDK41 CS	-130.99*	-130.78*

1	-130.99	-130.78
Magnetochron CM6R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	-131.14*	***
26B Cison Core, Italy	-131.12	***
MIDK41 CS	-131.14*	***

2	-131.14	-131.12
Magnetochron CM7R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	-131.44*	-131.35*
26B Cison Core, Italy	-131.51*	-131.35
MIDK41 CS	-131.51*	-131.35*

2	-131.51	-131.35
Magnetochron CM8R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	-131.81*	-131.48*
26B Cison Core, Italy	-133.93*	-131.86
MIDK41 CS	-133.93*	-131.48*

2	-133.93	-131.48
Magnetochron CM9R	Morphologic Code - MB	
26-Cison Section, Italy (VU Data), Apt-	***	-131.97*
26B Cison Core, Italy	***	-135.36
MIDK41 CS	***	-131.97*

2	-135.36	-131.97

Geochemical Units

Carbon peak OAE 1a	Morphologic Code - GC	
3b-Santa Rosa Canyon Section, Mexico, Be	-123.05+	-122.65
26-Cison Section, Italy (VU Data), Apt-	-123.05*	-122.33
41-ODP 641C, Offshore Portugal (Alb-Bar)	-121.87	***
43-Gorgo a Cerbara Section, Italy	-122.77	-122.32+
69 Coupe de la Gare de Cassis, SE France	-123.04	-122.54

98 Roter Sattel, Switzerland	-123.00+	-122.67+
MIDK41 CS	-123.05*	-122.32*

6	-123.05	-122.32
Carbon peak OAE 1b	Morphologic Code - GC	
3b-Santa Rosa Canyon Section, Mexico, Be	-110.19	-109.86
11-DSDP 386 Bermuda Plateau, Atlantic, A	-110.27+	-109.86+
41-ODP 641C, Offshore Portugal (Alb-Bar)	-110.32*	-109.83*
11B DSDP 386 Upper & Lower Cretaceous	-110.27	-109.83+
57 Tartonne, France, Aptian-Albian	-112.01*	-109.87
58 Pre-Guitard, France, Aptian-Albian	-111.90+	-111.90
MIDK41 CS	-112.01*	-109.83*

6	-112.01	-109.83
Carbon peak OAE 1c	Morphologic Code - GC	
11-DSDP 386 Bermuda Plateau, Atlantic, A	-98.91*	-98.23*
11B DSDP 386 Upper & Lower Cretaceous	-98.88+	-98.33+
MIDK41 CS	-98.91*	-98.23*

2	-98.91	-98.23
Carbon peak OAE 2	Morphologic Code - GC	
1-Kalaat Senan, Turonian	-90.82	-90.68
9-Amoco No. 1 Bounds core, Kansas, U. Al	-90.75	-90.46
10-Kalaat Senan, Tunisia Section, Cenoma	-90.84*	-90.64
12-Boulonnaise Section, France, Alb-Tur	-90.83+	-90.76
15-Pueblo, Colorado outcrop, U. Alb-Con	-90.73	-90.48
26-Cismon Section, Italy (VU Data), Apt-	-90.69	-90.61
29-Eastbourne, UK, (Cen-Tur)	-90.78	-90.46*
32-Sopeira Section, Pyrenees, (Cen)	-90.64	-90.46+
34-Montsec Section, Pyrenees (Cen)	-90.61	-90.57
72 Oued Melleque, Tunisia	-90.85*	-90.57
74 Antruiles, Trento Plateau, Italy	-90.71	-90.20*
88 Chimana Grande, Venezuela	-90.85+	-90.20+
121 ODP 762C Exmouth Plateau, Indian Oce	-90.82	-90.81
SCALE CHANGE		
15B Pueblo, Colorado, Turonian GSSP	-93.40	-92.86+
98 Roter Sattel, Switzerland	-93.53	-93.03
UPK 17 Casamance Well 10, Offshore W. Af	-93.55+	-93.25
ODP 641A North Central Atlantic (corb641	-93.55*	-93.52
Khalagork, Caucasus, Russia (corbrus-1)	-93.52	-93.52
MIDK41 CS	-93.55	*
72 Oued Melleque, Tunisia	-93.55+	-93.23
74 Antruiles, Trento Plateau, Italy	-93.45	-93.34
88 Chimana Grande, Venezuela	-93.56*	-92.86

21	-93.56	-92.86
Carbon peak Risou L Cen D	Morphologic Code - GC	
24-Mt. Risou, Rosans, SE France, Alb-Cen	-97.04*	-96.94*
MIDK41 CS	-97.04*	-96.94*

1	-97.04	-96.94
Carbon peak Risou U Alb A	Morphologic Code - GC	
Synchronous with OAE 1c		
24-Mt. Risou, Rosans, SE France, Alb-Cen	-98.21*	-98.13*
MIDK41 CS	-98.21*	-98.13*

1	-98.21	-98.13
Carbon peak Risou U Alb B	Morphologic Code - GC	

24-Mt. Risou, Rosans, SE France, Alb-Cen	-97.86*	-97.59*
MIDK41 CS	-97.86*	-97.59*

1	-97.86	-97.59
Carbon peak Risou U Alb C	Morphologic Code - GC	
24-Mt. Risou, Rosans, SE France, Alb-Cen	-97.48*	-97.19*
MIDK41 CS	-97.48*	-97.19*

1	-97.48	-97.19
K-T Iridium anomaly	Morphologic Code - GC	
131 DSDP 515F Western Atlantic	-65.55*	-65.31*
PAL 141 ODP 752 Indian Ocean	-65.50+	-65.50+
2004 Ages Modified	-65.50+	***
MIDK41 CS	-65.55*	-65.31*

3	-65.55	-65.31
In Maastrichtian, Romania (corbrom.1):		
Last red bed	Morphologic Code - MB	
Pietrosita, Romania (corbrom-1)	***	-63.60*
MIDK41 CS	***	-63.60*

1	-63.60	-63.60

Sequence Stratigraphic Marker Beds

Pecos River, Texas Albian sequences 18-21 & Albian-Cenomanian sequences 1, 2 defined in Segovia Fm., (Scott & Kerans, 2004):

AL SEQ 18	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	***	-102.25*
MIDK41 CS	***	-102.25*

1	-102.25	-102.25
AL SEQ 19	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	-102.25*	-100.25*
MIDK41 CS	-102.25*	-100.25*

1	-102.25	-100.25
AL SEQ 20	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	-100.26*	-99.70*
MIDK41 CS	-100.26*	-99.70*

1	-100.26	-99.70
AL SEQ 21	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	-99.70*	-98.73*
MIDK41 CS	-99.70*	-98.73*

1	-99.70	-98.73
AL-CEN SEQ 1	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	-98.73*	-97.71*
MIDK41 CS	-98.73*	-97.71*

1	-98.73	-97.71
AL-CEN SEQ 2	Morphologic Code - MB	
Pecos River Comp. Std. Section, TX	-97.71*	-97.15*
MIDK41 CS	-97.71*	-97.15*

1	-97.71	-97.15
DEL RIO SEQ	Morphologic Code - MB	

Pecos River Comp. Std. Section, TX	-97.15*	-97.09*
MIDK41 CS	-97.15*	-97.09*

1	-97.15	-97.09

Marker beds in Oman section (Scott 1990; Simmons, 1987)

Marker Bed T Natih A Mbr SB	Morphologic Code - MB	
16-Wadi Miaidin, Oman, Scott, '90, Alb-C	-91.20*	-91.20*
17-Wadi Miaidin, Oman, Simmons, '87, Alb	-91.20*	-91.20*
16B Wadi Miaidin, Oman (Scott, 1990)	-91.47*	-91.47
MIDK41 CS	-91.47	-91.20*
16B Wadi Miaidin, Oman (Scott, 1990)	-92.86*	-92.86

3	-92.86	-91.20 recalibrated to 94.6 - 93.6
Marker Bed T Natih E Mbr SB	Morphologic Code - MB	
16-Wadi Miaidin, Oman, Scott, '90, Alb-C	-94.21	-94.21*
17-Wadi Miaidin, Oman, Simmons, '87, Alb	-94.21*	-94.21
16B Wadi Miaidin, Oman (Scott, 1990)	-94.21*	-94.21
MIDK41 CS	-94.21	-94.21*
16B Wadi Miaidin, Oman (Scott, 1990)	-94.68*	-94.68

3	-94.68	-94.21 recalibrated to 95.6 - 95.3
Marker Bed T Nahr Umr	Morphologic Code - MB	
16-Wadi Miaidin, Oman, Scott, '90, Alb-C	-96.69*	-96.69*
17-Wadi Miaidin, Oman, Simmons, '87, Alb	-96.69*	-96.69*
16B Wadi Miaidin, Oman (Scott, 1990)	-96.69+	-96.69*
400 Wadi Bani Kharus, Oman	***	-96.70
MIDK41 CS	-96.69*	-96.69*
16B Wadi Miaidin, Oman (Scott, 1990)	-96.69*	-96.69*

3	-96.69	-96.69
Max flood-4 (Nahr Umr Fm., Oman)	Morphologic Code - MB	
400 Wadi Bani Kharus, Oman	-108.35*	***
MIDK41 CS	-108.35*	***

2	-108.35	-108.35
Marker Bed B Nahr Umr SB	Morphologic Code - MB	
16-Wadi Miaidin, Oman, Scott, '90, Alb-C	-113.80*	-113.80*
17-Wadi Miaidin, Oman, Simmons, '87, Alb	-113.80*	-113.80*
16B Wadi Miaidin, Oman (Scott, 1990)	-113.45	-113.45*
400 Wadi Bani Kharus, Oman	-113.79	***
MIDK41 CS	-113.80*	-113.45*
16B Wadi Miaidin, Oman (Scott, 1990)	-113.67	-113.67

5	-113.80	-113.45

Immenhauser et al.

HG = hardground horizons in Nahr Umr Fm., Oman

Marker bed HG-1	Morphologic Code - MB	
400 Wadi Bani Kharus, Oman	-114.15*	-113.79*
MIDK41 CS	-114.15*	-113.79*

2	-114.15	-113.79
Marker bed HG-2	Morphologic Code - MB	
400 Wadi Bani Kharus, Oman	-113.77+	-111.96+
406 Wadi El Assyi, Oman	-113.77*	-110.39*

MIDK41 CS		-113.77*	-111.96*

	2	-113.77	-111.96
Marker bed HG-3			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-111.94*	-110.39+
406 Wadi El Assyi, Oman		***	-110.39*
MIDK41 CS		-111.94*	-110.39*

	2	-111.94	-110.39
Marker bed HG-4			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-110.37*	-106.88*
406 Wadi El Assyi, Oman		***	-106.88+
MIDK41 CS		-110.37*	-106.88*

	2	-110.37	-106.88
Marker bed HG-5			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-106.87*	-103.09*
MIDK41 CS		-106.87*	-103.09*

	2	-106.87	-103.09
Marker bed HG-6			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-103.08*	-101.21*
MIDK41 CS		-103.08*	-101.21*

	2	-103.08	-101.21
Marker bed HG-7			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-101.19*	-100.89*
MIDK41 CS		-101.19*	-100.89*

	2	-101.19	-100.89
Marker bed HG-8			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-100.88*	-99.36*
MIDK41 CS		-100.88*	-99.36*

	2	-100.88	-99.36
Marker bed HG-9			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-99.36*	-99.15*
MIDK41 CS		-99.36*	-99.15*

	2	-99.36	-99.15
Marker bed HG-10			Morphologic Code - MB
400 Wadi Bani Kharus, Oman		-99.14*	-97.17*
MIDK41 CS		-99.14*	-97.17*

	2	-99.14	-97.17
Marker bed Thatcher Mbr.			Morphologic Code - MB
Bentonite C. 0.9 m below Thatcher = 95.78±0.61 Ma (Obradovich, 1993)			
9-Amoco No. 1 Bounds core, Kansas, U. Al		-95.40+	-95.38+
15-Pueblo, Colorado outcrop, U. Alb-Con		-95.40*	-95.35*
2004 Ages Modified		-96.39*	-95.17*
MIDK41 CS		-96.39*	-95.17*

	2	-96.39	-95.17

Sequence horizons defined in Texas section (Scott et al., 2000)

Marker bed Al MF FR 1 Morphologic Code – MB

Dark gray marl in middle of Goodland Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-106.14*	-105.88*	
20B Trinity River Composited Section Rev	-105.44	-105.44*	
21B Colorado River Composited Section Re	-106.34+	***	
86 Leon River, Tx Composited Section	-106.58*	***	
MIDK41 CS	-106.58*	-105.44*	

	4	-106.58	-105.44
Marker bed Al SB FR 1			Morphologic Code – MB
Base of Walnut Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-108.40*	-108.40	
21-Austin, Texas Composite Section, Apt-	-107.46	-107.46*	
20B Trinity River Composited Section Rev	-108.10	-108.10	
21B Colorado River Composited Section Re	-108.02	***	
85 Blanco River, TX Composited Section	-108.40*	***	
86 Leon River, Tx Composited Section	-107.40	***	
MIDK41 CS	-108.40*	-107.46*	

	6	-108.40	-107.46
Marker bed Al SB GR 1			Morphologic Code – MB
18-Shell No. 1 Chapman Core, Texas, Apt-			
20-Trinity River, Texas Sect, Alb-Cen	-113.08	-113.08*	
20B Trinity River Composited Section Rev	-113.33*	-113.33	
20B Trinity River Composited Section Rev	-113.31+	-113.31+	
MIDK41 CS	-113.33*	-113.08*	

	3	-113.33	-113.08
Marker bed Al SB GR 2			Morphologic Code – MB
Base of "Corbula" Bed			
21-Austin, Texas Composite Section, Apt-	-111.16*	-111.16*	
21B Colorado River Composited Section Re	-112.31*	***	
85 Blanco River, TX Composited Section	-112.30+	***	
MIDK41 CS	-112.31*	-111.16*	

	3	-112.31	-111.16
Marker bed Al SB GR 3			Morphologic Code – MB
21B Colorado River Composited Section Re	-110.01*	***	
MIDK41 CS	-110.01*	***	

	1	-110.01	-110.01
Marker bed Al SB WA 1			Morphologic Code – MB
Base of Kiamichi Fm./top Stuart City Fm.			
9-Amoco No. 1 Bounds core, Kansas, U. Al	-103.60	-103.60	
18-Shell No. 1 Chapman Core, Texas, Apt-	-103.87*	***	
19-Shell No. 1 Tomasek Core, Texas, Apt-	-103.87*	***	
20-Trinity River, Texas Sect, Alb-Cen	-103.00	-103.00*	
89 Stanolind #1 Schmidt, Guadalupe Co.,	-103.87+	***	
Pecos River Comp. Std. Section, TX	***	-102.25*	
Lampazos, Sonora Section	-103.92*	***	
86 Leon River, Tx Composited Section	-103.78	***	
95 4898 # 1, Chandeleur Sound, Louisiana	-103.79	***	
97 Ballard Carey-Carolla No. 1, Texas	-104.00*	***	
MIDK41 CS	-104.00*	-102.25*	

	10	-104.00	-102.25
Marker bed Ce TS WA 6			Morphologic Code - MB
20-Trinity River, Texas Sect, Alb-Cen	-97.12	-97.12*	
21-Austin, Texas Composite Section, Apt-	-97.12*	-97.12	

Pecos River Comp. Std. Section, TX	***	-97.15	
20B Trinity River Composited Section Rev	-97.12*	-97.12	
21B Colorado River Composited Section Re	-96.68	***	
85 Blanco River, TX Composited Section	-97.07	***	
86 Leon River, Tx Composited Section	-96.99	***	
89 Stanolind #1 Schmidt, Guadalupe Co.,	-96.99*	***	
95 4898 # 1, Chandeleur Sound, Louisiana	-97.01	***	
97 Ballard Carey-Carolla No. 1, Texas	-89.70	***	
MIDK41 CS	-97.12*	-97.12*	

	2	-97.12	-96.68
Marker bed AI SB WA 6			Morphologic Code – MB
Top of Georgetown Fm.			
89 Stanolind #1 Schmidt, Guadalupe Co.,	-96.99*	***	
MIDK41 CS	-96.99*	***	

	1	-96.99	-96.99
Marker bed Ce SB WB			Morphologic Code – MB
Base Woodbine Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-95.02*	-95.02	
21-Austin, Texas Composite Section, Apt-	-95.02	-95.02*	
89 Stanolind #1 Schmidt, Guadalupe Co.,	-94.24	***	
20B Trinity River Composited Section Rev	-95.48+	-95.48	
21B Colorado River Composited Section Re	-95.30	***	
86 Leon River, Tx Composited Section	-96.04*	***	
MIDK41 CS	-96.04*	-95.02*	

	2	-96.04	-95.02 recalibrated to 96.4 – 95.8
Marker bed AI TS WA 2			Morphologic Code – MB
Mid-Duck Creek Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-101.81*	-101.81	
21-Austin, Texas Composite Section, Apt-	-101.81	-101.81*	
20B Trinity River Composited Section Rev	-101.77	-101.77*	
86 Leon River, Tx Composited Section	-103.78+	***	
MIDK41 CS	-103.93*	-101.77*	

	4	-103.93	-101.77
Marker bed AI TS WA 3			Morphologic Code – MB
Top of Fort Worth Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-100.60*	-100.60*	
Pecos River Comp. Std. Section, TX	***	-100.26*	
20B Trinity River Composited Section Rev	-100.42+	-100.42	
86 Leon River, Tx Composited Section	-100.06	***	
MIDK41 CS	-100.60*	-100.26*	

	4	-100.60	-100.26
Marker bed AI TS WA 4			Morphologic Code – MB
Top of lower limestone bed of Weno Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-99.86*	-99.86*	
Pecos River Comp. Std. Section, TX	***	-99.70*	
20B Trinity River Composited Section Rev	-99.66	-99.66*	
MIDK41 CS	-99.86*	-99.66*	

	3	-99.86	-99.66
Marker bed AI TS WA 5			Morphologic Code – MB
Top of Weno Fm.			
20-Trinity River, Texas Sect, Alb-Cen	-98.72*	-98.72*	
Pecos River Comp. Std. Section, TX	***	-98.73	

20B Trinity River Compositated Section Rev	-98.75*	-98.75
MIDK41 CS	-98.75*	-98.72*

3	-98.75	-98.72
Marker bed Ap SB PR 1	Morphologic Code – MB	
Base Pearsall Fm. Or equivalent		
3b-Santa Rosa Canyon Section, Mexico, Be	-123.87	-123.87+
18-Shell No. 1 Chapman Core, Texas, Apt-	-123.87*	-123.87
21-Austin, Texas Composite Section, Apt-	-123.00	***
89 Stanolind #1 Schmidt, Guadalupe Co.,	-124.00*	***
Lampazos, Sonora Section	-123.74	***
21B Colorado River Compositated Section Re	-123.60	***
85 Blanco River, TX Compositated Section	-120.60	***
93 Gulf McAlpin Well, Louisiana	-123.04	-123.04+
95 4898 # 1, Chandeleur Sound, Louisiana	-123.80	***
97 Ballard Carey-Carolla No. 1, Texas	-123.98+	***
MIDK41 CS	-124.00*	-123.04*

10	-124.00	-123.04
Marker bed Ap SB PR 2	Morphologic Code – MB	
Top of Cow Creek Ls. Or equivalent		
21-Austin, Texas Composite Section, Apt-	-119.00*	***
21B Colorado River Compositated Section Re	-119.00+	***
85 Blanco River, TX Compositated Section	-115.60	***
93 Gulf McAlpin Well, Louisiana	-118.13	-118.13+
MIDK41 CS	-119.00*	-118.13*

4	-119.00	-115.60
Marker bed Ap SB SL 1	Morphologic Code – MB	
Top Sligo Fm.		
93 Gulf McAlpin Well, Louisiana	-123.04*	-123.04*
MIDK41 CS	-123.04*	-123.04*

1	-123.04	-123.04
Marker bed Ap TS GR 1	Morphologic Code – MB	
Top Hensel Ss.		
21-Austin, Texas Composite Section, Apt-	-113.71*	***
89 Stanolind #1 Schmidt, Guadalupe Co.,	-114.16*	***
21B Colorado River Compositated Section Re	-113.51	***
85 Blanco River, TX Compositated Section	-115.16*	***
MIDK41 CS	-115.16*	***

4	-115.16	-113.51

Sequence horizons in Tunisia (Robaszynski et al. 1990, 1993)

Marker bed Ce DL 1	Morphologic Code - MB	
10-Kalaat Senan, Tunisia Section, Cenoma	-95.67*	-95.67*
MIDK41 CS	-95.67*	-95.67*

1	-95.67	-95.67
Marker bed Ce DL 1.1	Morphologic Code - MB	
10-Kalaat Senan, Tunisia Section, Cenoma	-96.42*	-96.42
25-Cap Blanc-Nez Revised, France	-96.40	-96.40*
MIDK41 CS	-96.42*	-96.40*

1	-96.42	-96.40
Marker bed Ce DL 2	Morphologic Code - MB	

MIDK41 CS		-94.86*	-94.86*

	1	-94.86	-94.86
Marker bed Ce DL 3			Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma		-93.18*	-93.18
25-Cap Blanc-Nez Revised, France		-93.15	-93.15*
MIDK41 CS		-93.18*	-93.15*

	2	-93.18	-93.15
Marker bed Ce DL 4			Morphologic Code - MB
6-Type Cenomanian section,France		-91.99	-91.99*
10-Kalaat Senan, Tunisia Section, Cenoma		-92.05+	-92.05
25-Cap Blanc-Nez Revised, France		-92.05*	***
MIDK41 CS		-92.05*	-91.99*

	3	-92.05	-91.99
Marker bed Ce DL 5			Morphologic Code - MB
1-Kalaat Senan, Turonian		-90.48*	-90.48*
MIDK41 CS		-90.48*	-90.48*

	1	-90.48	-90.48
Marker bed Ce SB 1			Morphologic Code - MB
6-Type Cenomanian section,France		-95.98	-95.98
10-Kalaat Senan, Tunisia Section, Cenoma		-96.11*	-96.11
25-Cap Blanc-Nez Revised, France		-95.97	-95.97*
MIDK41 CS		-96.11*	-95.97*

	3	-96.11	-95.97
Marker bed Ce SB 1.1			Morphologic Code - MB
6-Type Cenomanian section,France		-96.99	-96.99
10-Kalaat Senan, Tunisia Section, Cenoma		-97.00*	-97.00
12-Boulonnaise Section, France, Alb-Tur		-96.99	-96.99
25-Cap Blanc-Nez Revised, France		-96.98	-96.98*
89 Stanolind #1 Schmidt, Guadalupe Co.,		-96.99	***
MIDK41 CS		-97.00*	-96.98*

	5	-97.00	-96.98
Marker bed Ce SB 2			Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma		-95.18*	-95.18+
25-Cap Blanc-Nez Revised, France		-95.18	***
MIDK41 CS		-95.33*	-95.18*

	2	-95.33	-95.18
Marker bed Ce SB 3			Morphologic Code - MB
6-Type Cenomanian section,France		-94.33	-94.33*
10-Kalaat Senan, Tunisia Section, Cenoma		-94.44*	-94.44
25-Cap Blanc-Nez Revised, France		-94.39	-94.39
MIDK41 CS		-94.44*	-94.33*

	2	-94.44	-94.33
Marker bed Ce SB 4			Morphologic Code - MB
6-Type Cenomanian section,France		-92.63*	-92.63*
10-Kalaat Senan, Tunisia Section, Cenoma		-92.63*	-92.63*
25-Cap Blanc-Nez Revised, France		-92.63*	***
MIDK41 CS		-92.63*	-92.63*

	2	-92.63	-92.63
Marker bed Ce SB 5			Morphologic Code - MB

1-Kalaat Senan, Turonian	-91.00	-91.00
6-Type Cenomanian section,France	-90.96	-90.96*
10-Kalaat Senan, Tunisia Section, Cenoma	-90.96	-90.96*
12-Boulonnaise Section, France, Alb-Tur	-91.01*	-91.01
25-Cap Blanc-Nez Revised, France	-91.01*	***
78 Oued Bahloul, central Tunisia	-90.98	-90.98
MIDK41 CS	-91.01	-90.96*
78 Oued Bahloul, central Tunisia	-95.34*	-95.34

3	-95.34	-90.96
Marker bed Ce TS 1		Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma	-95.98*	-95.98*
12-Boulonnaise Section, France, Alb-Tur	-95.98*	-95.98*
MIDK41 CS	-95.98*	-95.98*

2	-95.98	-95.98
Marker bed Ce TS 1.1		Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma	-96.89*	-96.89*
97 Ballard Carey-Carolla No. 1, Texas	-89.70	***
MIDK41 CS	-96.89*	-96.89*

2	-96.89	-96.89
Marker bed Ce TS 2		Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma	-95.01	-95.01*
25-Cap Blanc-Nez Revised, France	-95.01*	-95.01
MIDK41 CS	-95.01*	-95.01*

2	-95.01	-95.01
Marker bed Ce TS 3		Morphologic Code - MB
10-Kalaat Senan, Tunisia Section, Cenoma	-93.45*	-93.45
25-Cap Blanc-Nez Revised, France	-93.45	-93.45*
MIDK41 CS	-93.45*	-93.45*

2	-93.45	-93.45
Marker bed Ce TS 4		Morphologic Code - MB
6-Type Cenomanian section,France	-92.31	-92.31*
10-Kalaat Senan, Tunisia Section, Cenoma	-92.31+	-92.31
25-Cap Blanc-Nez Revised, France	-92.43*	***
MIDK41 CS	-92.43*	-92.31*

2	-92.43	-92.31
Marker bed Ce TS 5		Morphologic Code - MB
1-Kalaat Senan, Turonian	-90.76+	-90.76
6-Type Cenomanian section,France	-90.75	-90.75
10-Kalaat Senan, Tunisia Section, Cenoma	-90.74	-90.74*
25-Cap Blanc-Nez Revised, France	-90.77*	***
78 Oued Bahloul, central Tunisia	-90.76	-90.76
MIDK41 CS	-90.77	-90.74*
78 Oued Bahloul, central Tunisia	-95.17*	-95.17

3	-95.17	-90.74
Marker bed Tu DL 1		Morphologic Code - MB
1-Kalaat Senan, Turonian	-89.66*	-89.66*
MIDK41 CS	-89.66*	-89.66*

2	-89.66	-89.66
Marker bed Tu DL 2		Morphologic Code - MB
1-Kalaat Senan, Turonian	-89.26*	-89.26*

MIDK41 CS		-89.26*	-89.26*

2		-89.26	-89.26
Marker bed Tu DL 3		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-88.78*	-88.78*
MIDK41 CS		-88.78*	-88.78*

2		-88.78	-88.78
Marker bed Tu SB 1		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-90.41*	-90.41*
81 Dugi Otok, Croatia		-90.41	***
MIDK41 CS		-90.41+	-90.41*
81 Dugi Otok, Croatia		-92.80*	*** (Identification doubtful)

3		-92.80	-90.41
Marker bed Tu SB 2		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-89.48*	-89.48*
81 Dugi Otok, Croatia		-89.41	***
MIDK41 CS		-89.48+	-89.48*
81 Dugi Otok, Croatia		-91.27*	*** (Identification doubtful)

3		-91.27	-89.48
Marker bed Tu SB 3		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-89.15*	-89.15*
81 Dugi Otok, Croatia		-89.24*	***
MIDK41 CS		-89.24+	-89.15*
81 Dugi Otok, Croatia		-91.01*	*** (Identification doubtful)

3		-91.01	-89.15
Marker bed Tu SB 4		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-88.66*	-88.66*
81 Dugi Otok, Croatia		-88.71*	***
MIDK41 CS		-88.71+	-88.66*
81 Dugi Otok, Croatia		-90.20*	*** (Identification doubtful)

3		-90.20	-88.66
Marker bed Tu TS 1		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-90.01*	-90.01*
MIDK41 CS		-90.01*	-90.01*

2		-90.01	-90.01
Marker bed Tu TS 4		Morphologic Code - MB	
1-Kalaat Senan, Turonian		-88.50*	-88.50*
MIDK41 CS		-88.50*	-88.50*

2		-88.50	-88.50

Pujalte et al., 1995, Earth & Planetary Sci. Let. 136:17-30, fig. 5; base sequence boundaries

Marker bed DS-1		Morphologic Code - MB	
UPK 4 Zumaya, Spain		-72.15*	***
MIDK41 CS		-72.15*	***

2		-72.15	-72.15
Marker bed DS-2.1		Morphologic Code - MB	
UPK 4 Zumaya, Spain		-68.08*	***
MIDK41 CS		-68.07*	***

	2	-68.07	-68.07	
Marker bed DS-2.2				Morphologic Code - MB
UPK 4 Zumaya, Spain			-66.13*	***
MIDK41 CS		-66.13*		***

	2	-66.13	-66.13	
Marker bed DS-3				Morphologic Code - MB
UPK 4 Zumaya, Spain			-65.67*	***
MIDK41 CS		-65.67*		***

	2	-65.67	-65.67	

GN = Greenhorn Fm., Colorado Reference

Marker bed Gn Cycle 1				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-91.50*
MIDK41 CS		***		-91.50*

	2	-91.50	-91.50	
Marker bed Gn Cycle 2				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.47*
MIDK41 CS		***		-90.47*

	2	-90.47	-90.47	
Marker bed Gn Cycle 3				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.46*
MIDK41 CS		***		-90.46*

	2	-90.46	-90.46	
Marker bed Gn Cycle 4				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.44*
MIDK41 CS		***		-90.44*

	2	-90.44	-90.44	
Marker bed Gn Cycle 5				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.43*
MIDK41 CS		***		-90.43*

	2	-90.43	-90.43	
Marker bed Gn Cycle 6				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.40*
MIDK41 CS		***		-90.40*

	2	-90.40	-90.40	
Marker bed Gn Cycle 7				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.32*
MIDK41 CS		***		-90.32*

	2	-90.32	-90.32	
Marker bed Gn Cycle 8				Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al			***	-90.31*
MIDK41 CS		***		-90.31*

	2	-90.31	-90.31	

HL = Hartland Shale of Greenhorn Fm., Colorado

Marker bed HL 1 Morphologic Code - MB

9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.95+
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.75*
MIDK41 CS	***	-90.83*

2	-90.83	-90.83
Marker bed HL 2	Morphologic Code - MB	
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.62*
MIDK41 CS	***	-90.62*

2	-90.62	-90.62
Marker bed HL 3	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.54*
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.55+
MIDK41 CS	***	-90.54*

2	-90.54	-90.54
Marker bed HL 4	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.46*
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.48+
MIDK41 CS	***	-90.46*

2	-90.46	-90.46
Marker bed HL 5	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.45*
MIDK41 CS	***	-90.45*

2	-90.45	-90.45

JT = Jetmore Member of Greenhorn Fm., Colorado

Marker bed JT 1	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.45*
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.46+
MIDK41 CS	***	-90.45*

2	-90.45	-90.45
Marker bed JT 10	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.41+
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.40*
MIDK41 CS	***	-90.40*

2	-90.40	-90.40
Marker bed JT 11	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.39*
MIDK41 CS	***	-90.38*

2	-90.38	-90.38
Marker bed JT 12	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.37*
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.39+
MIDK41 CS	***	-90.37*

2	-90.37	-90.37
Marker bed JT 13	Morphologic Code - MB	
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.37*
MIDK41 CS	***	-90.37*

2	-90.37	-90.37
Marker bed JT 6	Morphologic Code - MB	

15-Pueblo, Colorado outcrop, U. Alb-Con	***	-90.43*
MIDK41 CS	***	-90.43*

2	-90.43	-90.43
Marker bed JT 9	Morphologic Code - MB	
MIDK41 CS	***	-90.41*

2	-90.41	-90.41

PF = Pfeiffer Shale in Greenhorn Fm, Colorado

Marker bed PF 1	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.34*
MIDK41 CS	***	-90.34*

2	-90.34	-90.34
Marker bed PF 2	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.33*
MIDK41 CS	***	-90.33*

2	-90.33	-90.33
Marker bed PF 3	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-90.30*
MIDK41 CS	***	-90.30*

2	-90.30	-90.30

KN = Niobrara Fm., Colorado

Marker bed Kn 1	Morphologic Code - MB	
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-88.54*
15 Pueblo Colorado - Niobrara Fm.	***	-88.54*
MIDK41 CS	***	-88.54*

2	-88.54	-88.54
Marker bed Kn 2	Morphologic Code - MB	
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-88.48*
15 Pueblo Colorado - Niobrara Fm.	***	-88.48*
MIDK41 CS	***	-88.48*

2	-88.48	-88.48
Marker bed Kn 3	Morphologic Code - MB	
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-88.42*
15 Pueblo Colorado - Niobrara Fm.	***	-88.42*
MIDK41 CS	***	-88.42*

2	-88.42	-88.42
Marker bed Kn 4	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-88.38+
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-88.38*
Bounds Core, Kansas - Niobrara Fm.	***	-88.38
15 Pueblo Colorado - Niobrara Fm.	***	-88.38*
MIDK41 CS	***	-88.38*

2	-88.38	-88.38
Marker bed Kn 5	Morphologic Code - MB	
9-Amoco No. 1 Bounds core, Kansas, U. Al	***	-88.35+
15-Pueblo, Colorado outcrop, U. Alb-Con	***	-88.32*
Bounds Core, Kansas - Niobrara Fm.	***	-88.35
15 Pueblo Colorado - Niobrara Fm.	***	-88.32*

MIDK41 CS		***	-88.32*

	2	-88.32	-88.32
Marker bed Kn 6			Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al		***	-88.27*
15-Pueblo, Colorado outcrop, U. Alb-Con		***	-88.27+
Bounds Core, Kansas - Niobrara Fm.		***	-88.27+
15 Pueblo Colorado - Niobrara Fm.		***	-88.27
MIDK41 CS		***	-88.27*

	2	-88.27	-88.27
Marker bed Kn 7			Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al		***	-88.23*
Bounds Core, Kansas - Niobrara Fm.		***	-88.23+
MIDK41 CS		***	-88.23*

	2	-88.23	-88.23
Marker bed Kn 8			Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al		***	-88.17*
Bounds Core, Kansas - Niobrara Fm.		***	-88.17+
MIDK41 CS		***	-88.17*

	2	-88.17	-88.17
Marker bed Kn 9			Morphologic Code - MB
9-Amoco No. 1 Bounds core, Kansas, U. Al		***	-88.08*
Bounds Core, Kansas - Niobrara Fm.		***	-88.08+
MIDK41 CS		***	-88.08*

	2	-88.08	-88.08

PS = Pierre Shale, Montana & Wyoming:

Marker bed PS clinobatus bentonite			Morphologic Code - MB
2004 Ages Modified		-69.94*	-69.20*
MIDK41 CS		-69.94*	-69.20*

	2	-69.94	-69.20
Marker bed PS Ardmore bentonite			Morphologic Code - MB
2004 Ages Modified		-80.44*	-79.64*
UPK 19 Red Bird Section, Wyoming		-80.15	-80.14
MIDK41 CS		-80.44*	-79.64*

	2	-80.44	-79.64
Marker bed PS SB 1			Morphologic Code - MB
UPK 19 Red Bird Section, Wyoming		***	-80.15*
MIDK41 CS		***	-80.15*

	2	-80.15	-80.15
Marker bed PS TS 1			Morphologic Code - MB
UPK 19 Red Bird Section, Wyoming		-73.80*	-72.93*
MIDK41 CS		-73.80*	-72.93*

	2	-73.80	-72.93
Marker bed PS compressus			Morphologic Code - MB
2004 Ages Modified		-73.91*	-73.13*
MIDK41 CS		-73.91*	-73.13*

2	-73.91	-73.13
Marker bed PS grandis bentonite		Morphologic Code - MB
2004 Ages Modified	-70.80*	-69.50*
UPK 19 Red Bird Section, Wyoming	-70.35	-70.33
MIDK41 CS	-70.80*	-69.50*

2	-70.80	-69.50
Marker bed PS jenneyi bentonite		Morphologic Code - MB
2004 Ages Modified	-74.74*	-73.88*
UPK 19 Red Bird Section, Wyoming	-74.02	-73.88
MIDK41 CS	-74.74*	-73.88*

2	-74.74	-73.88
Marker bed PS obtusus bentonite		Morphologic Code - MB
2004 Ages Modified	-80.44*	-79.64*
UPK 19 Red Bird Section, Wyoming	-80.00	-80.00
MIDK41 CS	-80.44*	-79.64*

2	-80.44	-79.64
Marker bed PS scotti bentonite		Morphologic Code - MB
2004 Ages Modified	-76.58*	-75.56*
UPK 19 Red Bird Section, Wyoming	-75.94	-75.56*
MIDK41 CS	-76.58*	-75.56*

2	-76.58	-75.56
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Leb = Lebanon carbonate section

Marker bed Leb TS T 12		Morphologic Code - MB
22-Nahr Ibrahim, Lebanon, Alb-Cen	-91.78*	-91.78*
MIDK41 CS	-91.78*	-91.78*

2	-91.78	-91.78
Marker bed Leb TS T 2b		Morphologic Code - MB
22-Nahr Ibrahim, Lebanon, Alb-Cen	-100.96*	-100.96*
MIDK41 CS	-100.96*	-100.96*

2	-100.96	-100.96
Marker bed Leb TS T 6a		Morphologic Code - MB
22-Nahr Ibrahim, Lebanon, Alb-Cen	-95.75*	-95.75*
MIDK41 CS	-95.75*	-95.75*

2	-95.75	-95.75
Marker bed Leb TS T 7		Morphologic Code - MB
23-Dlebta-Chenin Aair, Lebanon, Alb-Cen	-94.27*	-94.27*
MIDK41 CS	-94.27*	-94.27*

2	-94.27	-94.27
Marker bed Leb TS T 8		Morphologic Code - MB
22-Nahr Ibrahim, Lebanon, Alb-Cen	-94.43*	-94.43*
MIDK41 CS	-94.43*	-94.43*

2	-94.43	-94.43
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European Sections Marker beds

Marker first red bed (Maastrichtian, Romania)		Morphologic Code - MB
Pietrosita, Romania (corbrom-1)	-72.70*	***

MIDK41 CS		-72.70*	***

	2	-72.70	-72.70
Marker bed Bonarelli		Morphologic Code - MB	
26-Cismon Section, Italy (VU Data), Apt-		-90.69*	-90.67*
98 Roter Sattel, Switzerland		-93.53*	-93.03+
MIDK41 CS		-93.53*	-90.67*

	2	-93.53	-90.67
Marker bed Breistroffer		Morphologic Code - MB	
24-Mt. Risou, Rosans, SE France, Alb-Cen		-98.16*	-98.05*
MIDK41 CS		-98.16*	-98.05*

	2	-98.16	-98.05
Marker bed Niveau Leenhardt		Morphologic Code - MB	
58 Pre-Guitard, France, Aptian-Albian		-110.29*	-110.26*
MIDK41 CS		-110.29*	-110.26*

	2	-110.29	-110.26
Marker bed Niveau Paquier		Morphologic Code - MB	
57 Tartonne, France, Aptian-Albian		-112.72*	-112.62
58 Pre-Guitard, France, Aptian-Albian		-111.98	-111.90*
MIDK41 CS		-112.72*	-111.90*

	2	-112.72	-111.90
Marker bed Niveau Kilian		Morphologic Code - MB	
58 Pre-Guitard, France, Aptian-Albian		-116.53*	-116.37*
MIDK41 CS		-116.53*	-116.37*

	2	-116.53	-116.37
Marker bed Niveau Jacob		Morphologic Code - MB	
58 Pre-Guitard, France, Aptian-Albian		-122.10*	-121.86*
MIDK41 CS		-122.10*	-121.86*

	2	-122.10	-121.86
Marker bed Selli Level		Morphologic Code - MB	
13-Piobbico Core, Marche, Italy, Apt-Alb		-122.91	-122.35+
26-Cismon Section, Italy (VU Data), Apt-		-123.05*	-122.33*
43-Gorgo a Cerbara Section, Italy		-123.05+	-122.77
26B Cismon Core, Italy		-123.06*	-122.42
98 Roter Sattel, Switzerland		-122.87+	-122.67+
MIDK41 CS		-123.06*	-122.33*

	2	-123.06	-122.33
Marker bed Nannoconid crisis		Morphologic Code - MB	
3b-Santa Rosa Canyon Section, Mexico, Be		-124.00*	-122.86*
13-Piobbico Core, Marche, Italy, Apt-Alb		***	-123.47
26-Cismon Section, Italy (VU Data), Apt-		***	-123.42
43-Gorgo a Cerbara Section, Italy		***	-123.41+
26B Cismon Core, Italy		-123.09	***
MIDK41 CS		-124.00*	-122.86*

	2	-124.00	-122.86

Reference

Marker bed Sant SB 1 Morphologic Code - MB

UPK 10 Tiefenbach, Brandenburg, Austria	-89.00*	***	
MIDK41 CS	-89.00*	***	

2	-89.00	-89.00	
Marker bed Sant SB 2		Morphologic Code - MB	
UPK 10 Tiefenbach, Brandenburg, Austria	-86.05*	***	
MIDK41 CS	-87.10*	***	

2	-87.10	-87.10	
Marker bed Sant SB 3		Morphologic Code - MB	
UPK 10 Tiefenbach, Brandenburg, Austria	-84.40*	***	
MIDK41 CS	-84.90*	***	

2	-84.90	-84.90	

Marker beds in NW Germany (Wood et al., 1984)

Marker bed Tu Marl Bed D2		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.89*	***	
Tur-Con Comp. Std. Section, N. Germany	-88.86*	-88.86*	
MIDK41 CS	-88.89*	***	

2	-88.89	-88.89	
Marker bed Tu Marl Bed E		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.86*	-88.86*	
MIDK41 CS	-88.86*	-88.86*	

2	-88.86	-88.86	
Marker bed Tu Marl Bed G		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.72*	***	
MIDK41 CS	-88.72*	***	

2	-88.72	-88.72	
Marker bed Tu Tuff Bed C		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-89.03*	-89.03*	
MIDK41 CS	-89.03*	-89.03*	

2	-89.03	-89.03	
Marker bed Tu Tuff Bed D1		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.97*	-88.96*	
MIDK41 CS	-88.97*	-88.96*	

2	-88.97	-88.96	
Marker bed Tu Tuff Bed D2		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.90+	-88.90+	
MIDK41 CS	-88.90	-88.90	

2	-88.90	-88.90	
Marker bed Tu Tuff Bed E		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.87*	-88.87*	
MIDK41 CS	-88.87*	-88.87*	

2	-88.87	-88.87	
Marker bed Tu Tuff Bed F		Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.73*	-88.71*	
MIDK41 CS	-88.73*	-88.71*	

2	-88.73	-88.71	

Marker bed Tu Tuff Bed G	Morphologic Code - MB	
Tur-Con Comp. Std. Section, N. Germany	-88.72*	-88.70*
MIDK41 CS	-88.72*	-88.70*
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2	-88.72	-88.70

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