Geology 214 Final Feb 1998

Name _____ Number _____

Answer all Sections. Read instructions carefully. Time allotted. 2hours

SECTION 1 40% Mezze:

Answer ten of the following at four marks each

1) What are the advantages of using the Udden Wentworth scale for grain size measurements?

2) What does a coarsening upwards sequence in terrigenous clastics mean? Why is it different in limestones?

3) Why are there problems in comparing grain size distribution values based on sieving and on thin section measurement?

4) How is Shaw's method of quantitative biostratigraphic correlation useful in determining subsidence rates across a basin?

5) How can a limestone that is impermeable shortly after its formation gain porosity with time?

6) Why are erosive bedding features such as sole marks most commonly found on the base of the overlying sedimentary units?

7) What is a lithostratigraphic stratotype? What is a reference section?

8) How do we get planar tabular and trough cross bedding?

9) Why is coring a well desirable? If so, why is it so little practiced?

10) Why may liquefaction structures form under earthquake conditions?

11) Why are trace fossils of no interest to biostratigraphers but of great interest to sedimentologists?

12) Why is Magnetostratigraphy useful to determine if sediments are diachronous?.

13) What are/were epeiric seas and why do they pose a challenge to uniformitarianism?

14) What sedimentary structures may be found associated with sabkhas.

15) What the three main fluids that move sediments? How do they differ?

SECTION 2 40 % Sediments à la Libanaise:

Consider the attached Figure 1 and answer the following questions. ***Answer all parts***

1) What are units such as the Kesrouane Formation etc? What criteria are they based on?

2) What is, for instance, the Pliensbachian (see Lower Jurassic)? How do you understand it to be defined?

3) Give good examples from the map of a) facies changes, b) diachronous units c) units where correlation with absolute age dates can be made?

4) How many units are represented by the 50Ma from the base of the Lower Jurassic until the top of the Oxfordian? How many units are represented by the 15 million years of the rest of the Jurassic? Why do you think there is this difference?

5) What does CDW exactly mean by 'extreme stratigraphic uncertainty'.

6) If you had to study good unconformities in Lebanon where would you go? Give two examples.

7) Compare the distribution of the Chouf and Abeih Formations in Mount Lebanon and the Anti-Lebanon. a) If we assume that the Chouf is a fluvial-deltaic sequence and the Abeih a deltaic to marine sequence what does this suggest about the pattern of sedimentation in the Early Cretaceous? b) How would Larry Sloss or Peter Vail interpret this.?

8) Tracing the Jurassic to Early Cretaceous sequence eastwards we get a picture like that in Fig.2 so that in central Syria the Mdairej equivalent lies directly on the Kesrouane Formation equivalent. What does this tell you about the nature of the end Jurassic event as we go eastwards into the interior of the Arabian Plate?

9) Along the most western exposures of the Abieh Formation Barremian marine faunas occur and a marine biostratigraphy can be created. a) What sort of animals might this be based on? b) In the extreme east of Lebanon the Barremian is represented by terrigenous clastics and coals;. how might these be dated?

10) What possible explanations are there for the absence of the post-Turonian strata over Mount Lebanon and the Anti-Lebanon?

11) What biostratigraphic problems are there likely to be in correlating between the Miocene coastal and Bekaa sediments.

12) Which is the one lithostrat unit which is probably closest to being non-diachronous in the Mesozoic?

13) If we were to create lithostratigraphic groups in Lebanon suggest a *troika*[1] of the most natural possibilities ('Groups A, B and C ') from the sheet; briefly giving a justification.

14) The early Aptian Mdairej Limestone Formation is a major marker unit in Lebanon as it forms a prominent pale cliff with corals and rudist bivalves. Both the underlying and the overlying beds are clayey and sandy units with nearshore to deltaic faunas. a) Explain what this unit represents? To what extent can we consider it to be isochronous? b) How might you try to identify whether or not it was isochronous? c) There are similar units across North Africa and western Europe all of the same early Aptian age. What reasons can you suggest for this?

15) Most of the post Turonian Bekaa units are un-named. Why can we not just use a Mount Lebanon terminology here? What does this suggest about the tectonic history of Lebanon? How would you go about giving names to these formations?

16) What is the Oligocene of Lebanon represented by? What does this suggest about events of this time episode?

SECTION 3 20% Dessert: Answer briefly two of the following

1) What is the probable origin of first and second order eustatic cycles. Why is there doubt over the correlation schemes which try to identify third order cycles world wide?

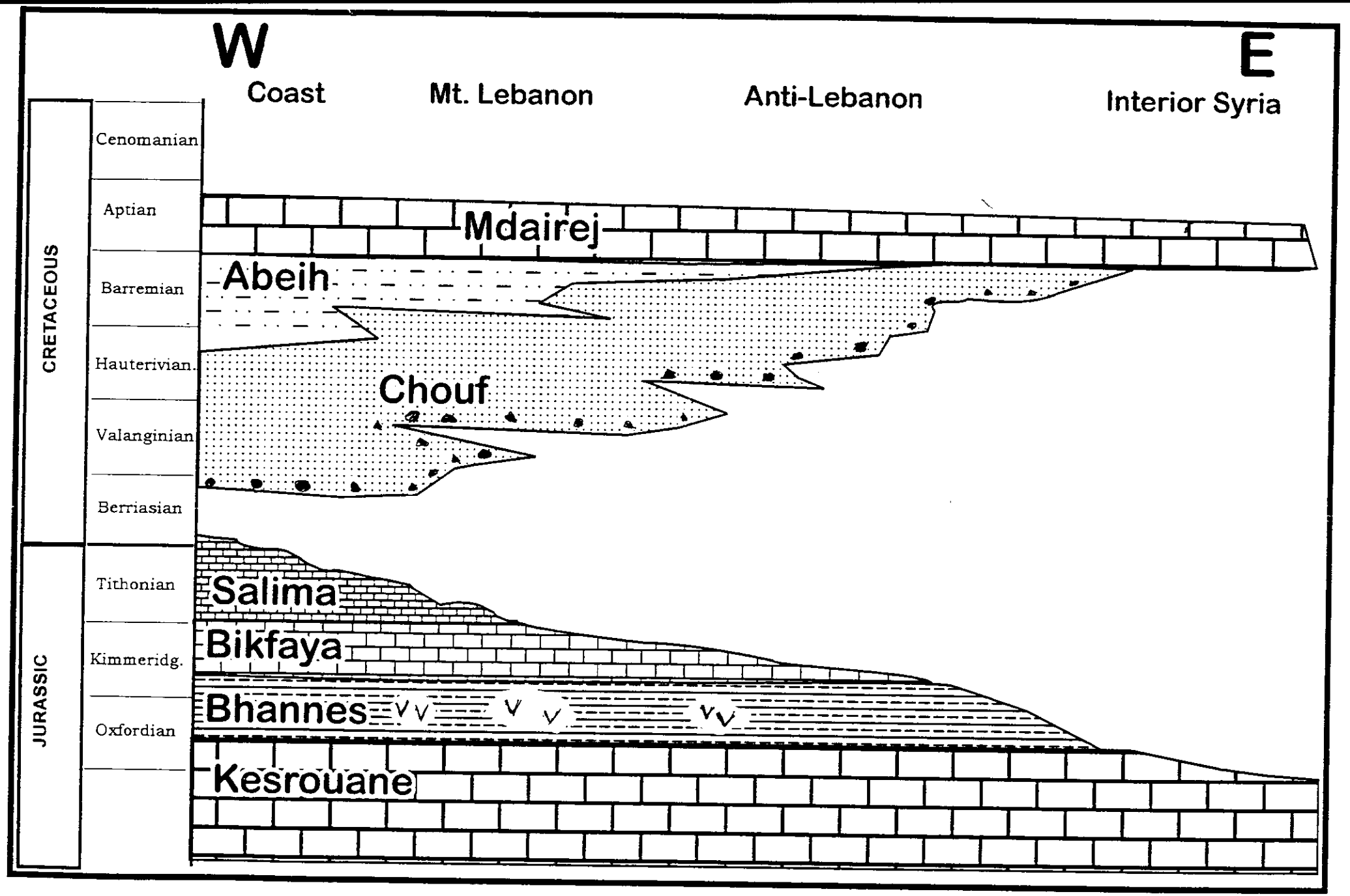
2) Why study sedimentary structures? What information can be gained from them?

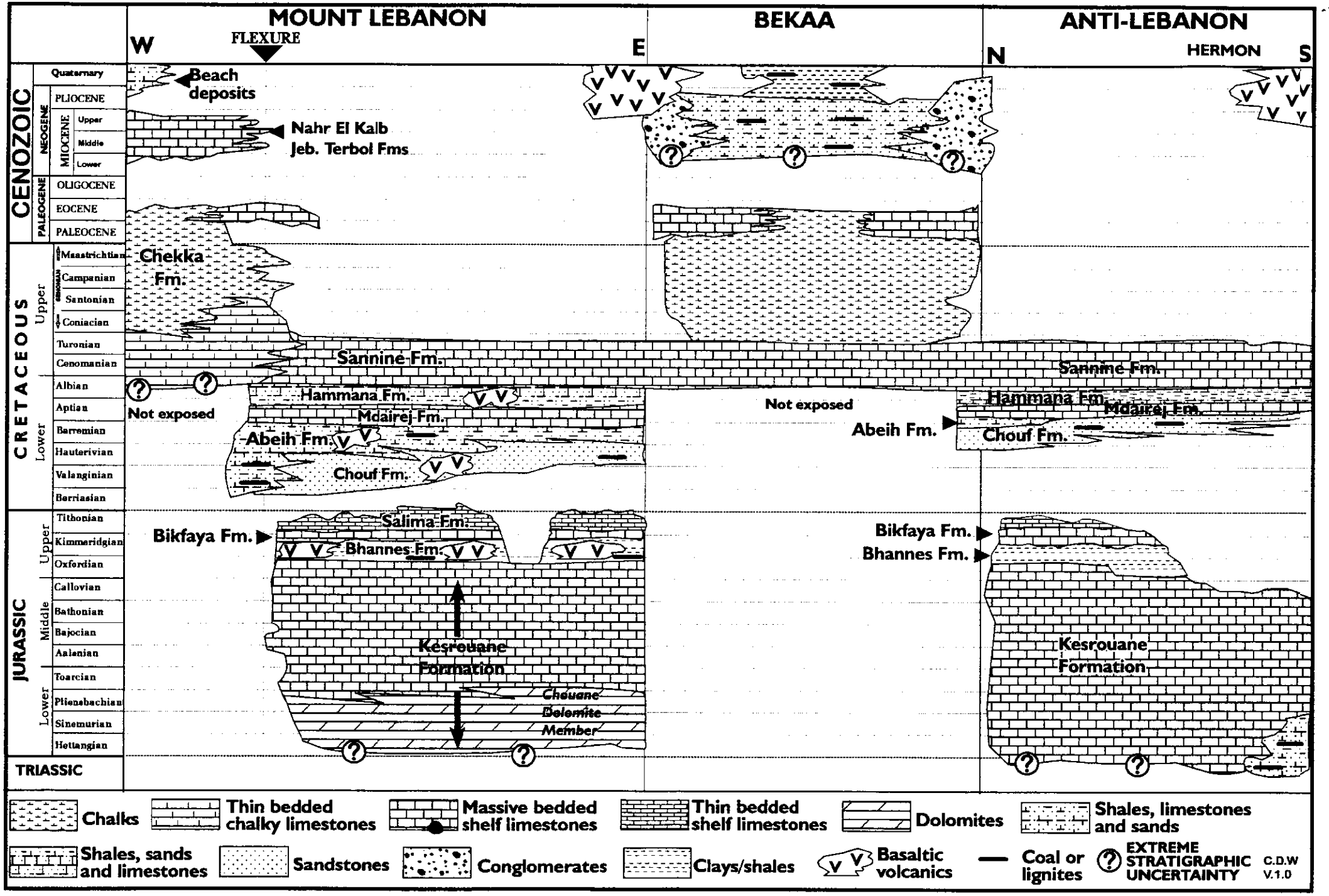
3) What does a seismic section show? Why is it different from a geological cross section?

4) Some Jurassic basalt flows may give dates of 154 ∓ 4 Ma on K-Ar method while the biostratigraphic data on interbedded shales may give a date such as the *Cardeoceras cordatum* Zone of the Oxfordian. What is the relationship between the two? Which do you trust?

Best wishes, C. D. Walley Wednesday, February 04, 1998

[1] This is Lebanon after all


W
Coast
Mt. Lebanon
Anti-Lebanon
E
Interior Syria
CRETACEOUS
JURASSIC
Cenomanian
Aptian
Barremian
Hauterivian.
Valanginian
Berriasian
Tithonian
Kimmeridg.
Oxfordian
Mdairej
Abeih
Chouf
Salima
Bikfaya
Bhannes
Kesrouane


MOUNT LEBANON
W
FLEXURE
E
BEKAA
ANTI-LEBANON
N
HERMON
S
CENOZOIC
Quaternary
PLIOCENE
NEOGENE
MIOCENE
Upper
Middle
Lower
PALEOGENE
OLIGOCENE
EOCENE
PALEOCENE
CRETACEOUS
Upper
Lower
Maastrichtian
Campanian
Santonian
Coniacian
Turonian
Cenomanian
Albian
Aptian
Barremian
Hauterivian
Valanginian
Berriasian
JURASSIC
Upper
Middle
Lower
Tithonian
Kimmeridgian
Oxfordian
Callovian
Bathonian
Bajocian
Aalenian
Toarcian
Pliensbachian
Sinemurian
Hettangian
TRIASSIC
Beach deposits
Nahr El Kalb
Jeb. Terbol Fms
Chekka Fm.
Sannine Fm.
Hammana Fm.
Mdairej Fm.
Abeih Fm.
Chouf Fm.
Not exposed
Not exposed
Salima Fm.
Bikfaya Fm.
Bhannes Fm.
Kesrouane Formation
Chouane Dolomite Member
Chalks
Thin bedded chalky limestones
Massive bedded shelf limestones
Thin bedded shelf limestones
Dolomites
Shales, limestones and sands
Shales, sands and limestones
Sandstones
Conglomerates
Clays/shales
Basaltic volcanics
Coal or lignites
EXTREME STRATIGRAPHIC UNCERTAINTY
C.D.W V.1.0