Assessing the Feasibility of Replanting on Peatlands through the Drainability Assessment Procedure

Datuk Paduka Ir Keizrul b Abdullah
Wetlands International

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Background

- **RSPO : P&C 2013 → Indicator 4.3.5 → Drainability Assessment <u>shall</u> be required <u>prior</u> to replanting on <u>peat</u> to determine the long term viability of the necessary drainage for oil palm growing**
- **The RSPO Drainability Assessment Guidelines and related concepts and detailed actions are currently being fine-tuned/tested by PLWG. A final version should be approved by PLWG in January 2019. A further 12 months methodolgy trial period is proposed to enable further refinement of procedure as appropriate before January 2020.**

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Background

- RSPO : P&C 2018 → Indicator 7.7.5 → For plantations planted on peat, drainability assessments are conducted following the RSPO Drainability Assessment Procedure, or other RSPO recognised methods, at least five years prior to replanting. The assessment result is used to set the timeframe for future replanting, as well as for phasing out of oil palm cultivation at least 40 years, or two cycles, whichever is greater, before reaching the natural gravity drainability limit for peat.

Drainability Assessment

- Purpose → to project how long drainage can sustain under existing soil subsidence
- To determine → if there will be high risk of serious flooding and/or salt water intrusion within two crop cycles (40 years) after replanting
- If risk is high → need to plan for appropriate rehabilitation OR alternative use of such areas

Drainability Assessment

- RSPO → Commissioned Wetlands International to develop a Drainability Assessment Procedure under the guidance of the RSPO Peatland Working Group 2 (PLWG2)

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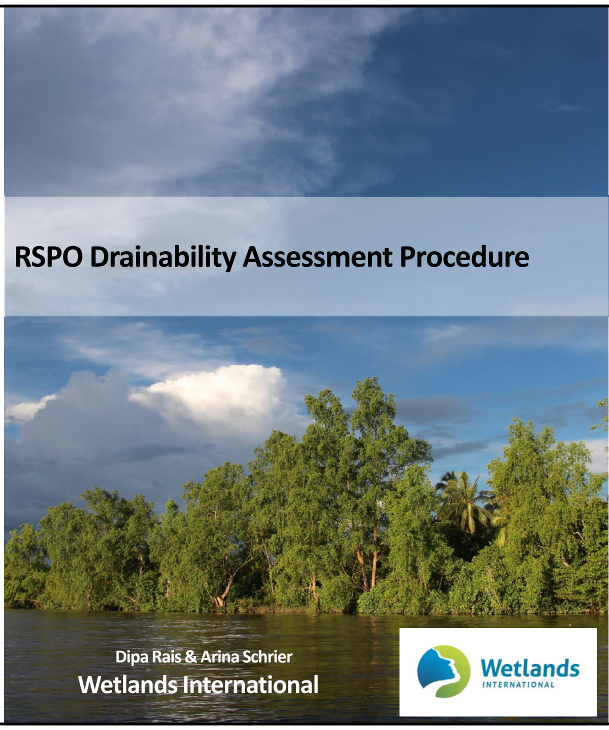

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Drainability Assessment

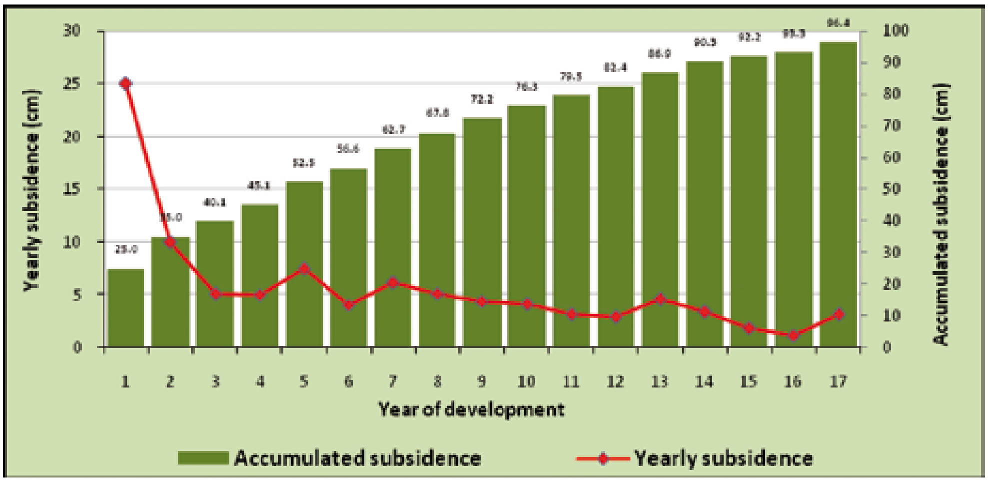
Factors to be considered in assessing drainability :

1. **Subsidence of Peat**

Peat

- **RSPO definition → Organic soil with cumulative organic layer(s) comprising more than half of the upper 80 cm or 100 cm of the soil surface containing 35% or more organic matter**
- **When peatland is drained (e.g. to plant oil palm) → subsidence will occur caused mostly by oxidation of the organic material**
- **The subsidence rate is continuous → higher in the initial years and reduces over time**

Accumulated subsidence



Yearly Average and Accumulated Peat Subsidence

Ref : Faizal Parish RSPO RT15 (2017)

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All thorough long-term studies report that subsidence rate is continuous, because subsidence is caused mostly by oxidation

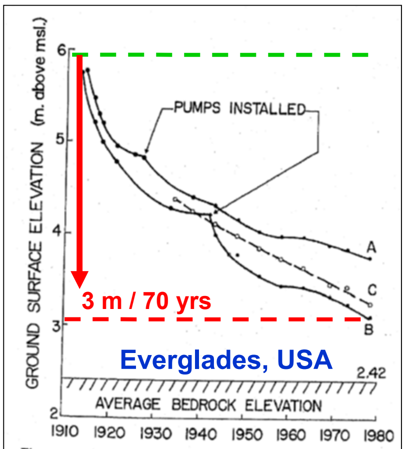

Figure 3. Sequence of observed subsidence of organic soils in the Florida Everglades after initial drainage, circa 1912.

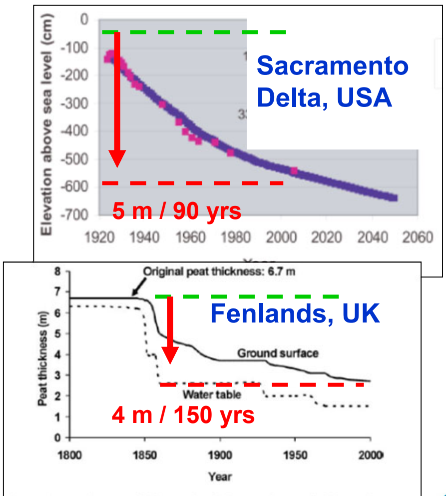

Fig. 1. Stages of peat subsidence after drainage of a peatland at Holme Fen, Cambridgeshire, UK, modified after Hutchinson (1980).

Ref : Hooijer et al (2012)

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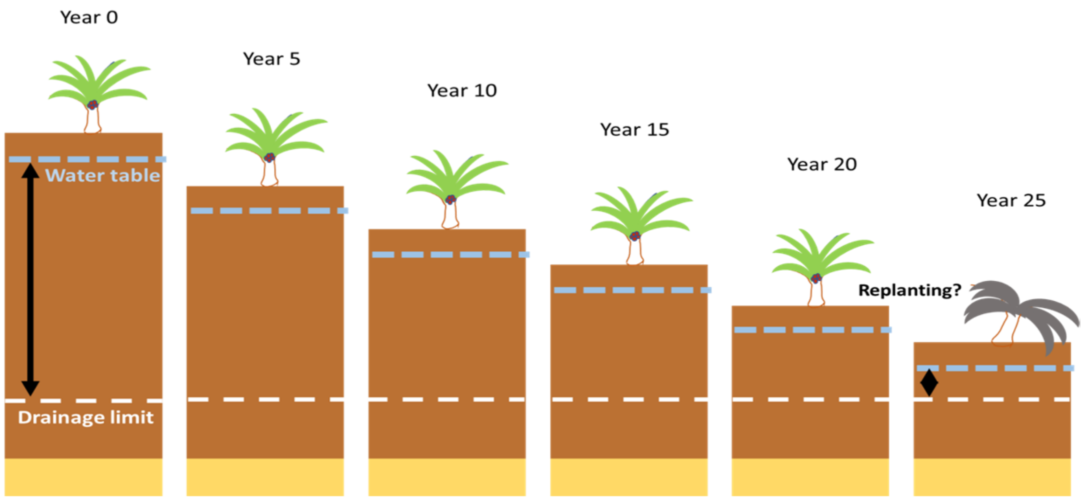


Upon drainage, the peat surface comes closer to the natural drainage limit over time

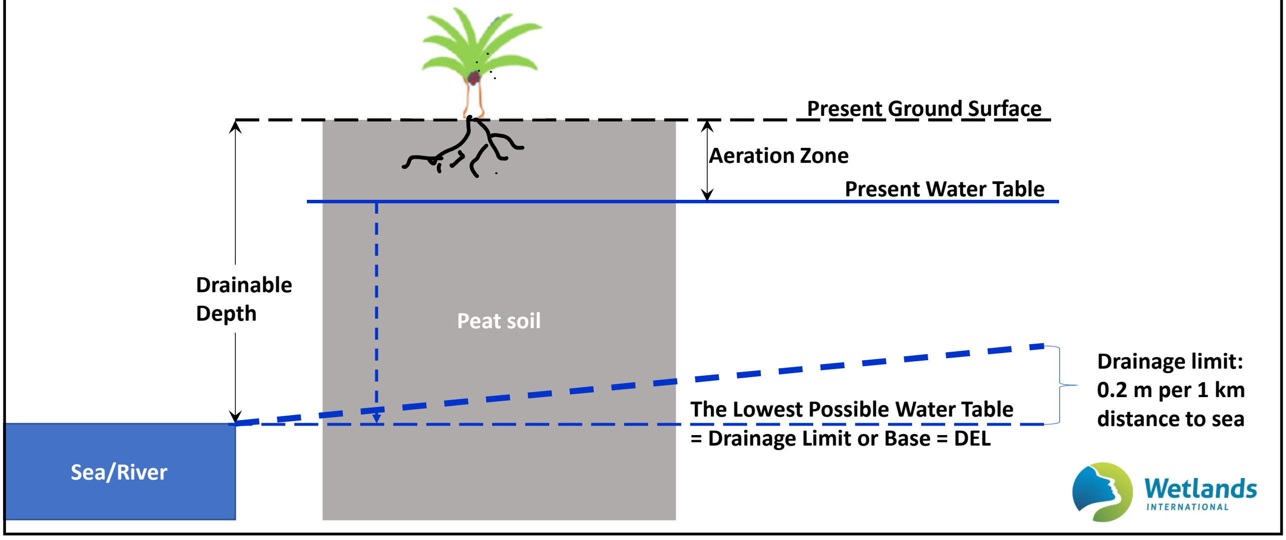
Drainability Assessment

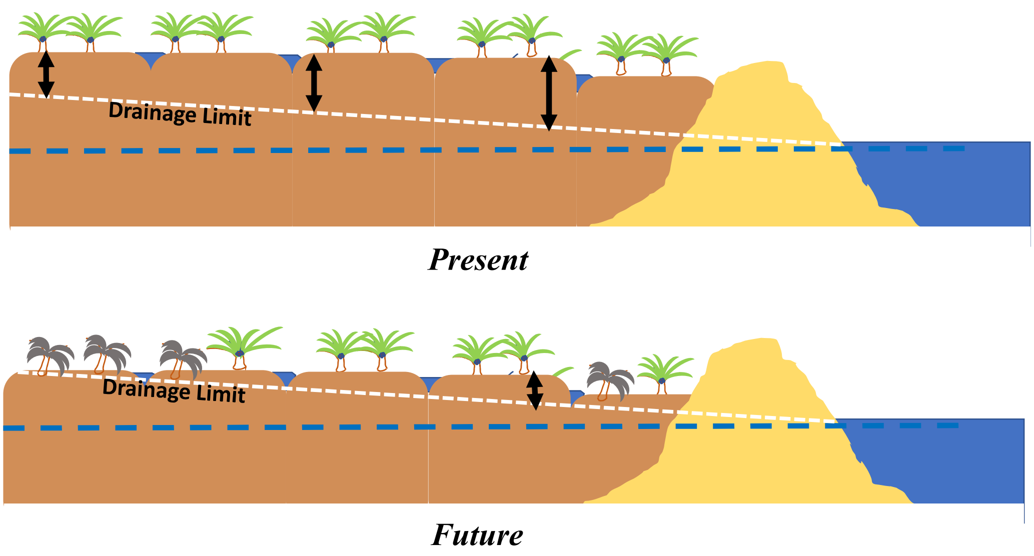
Factors to be considered in assessing drainability :

1. **Subsidence of Peat**
2. **Drainability**
    - **Criteria → drain by gravity alone, without the use of mechanical pumps**

What is Drainability?

Drainable Depth = Depth from ground surface to the lowest level water table can drop in relation to surrounding hydro-topography





T0: distance to drainage limit is sufficient to grow palms

Tx: distance to drainage limit is in some areas not sufficient anymore as a result of soil subsidence.

Projection of future drainability

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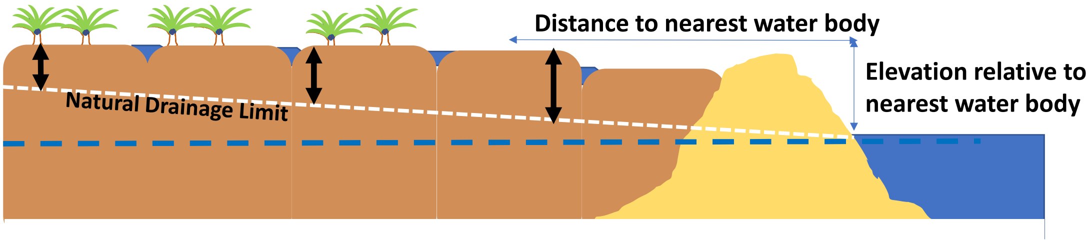
Drainability Assessment

Factors to be considered in assessing drainability :

1. **Subsidence of Peat**
2. **Drainability**
3. **Drainage Limit**

Drainage Limit

The natural drainage limit → based on the water level in the closest water body and on the distance to this water body



A general rule of thumb is that for each kilometer, the drainage limit elevation increases by 20 cm relative to water body level (DID Sarawak, 2001) i.e. 0.2 m per 1 km (1:5,000)

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Drainage Limit

$$Z_{DL} = Z_{NWB} + C \times \Delta X$$

Z_{DL} = *Drainage Limit elevation (m-msl)*
Z_{NWB} = *Water Elevation at the (relevant) nearest natural water body (m-msl)*
ΔX = *Distance to the nearest (relevant) natural water body*
C = *Head loss slope constant (0.0002 m/m)*

Example
Distance to the nearest relevant water body = 1 km = 1000 m
Water elevation at the nearest relevant water body = 2 m-dpl

$$Z_{DL} = 2 + 0.0002 \times 1000$$
$$Z_{DL} = 2.2 \text{ m msl}$$

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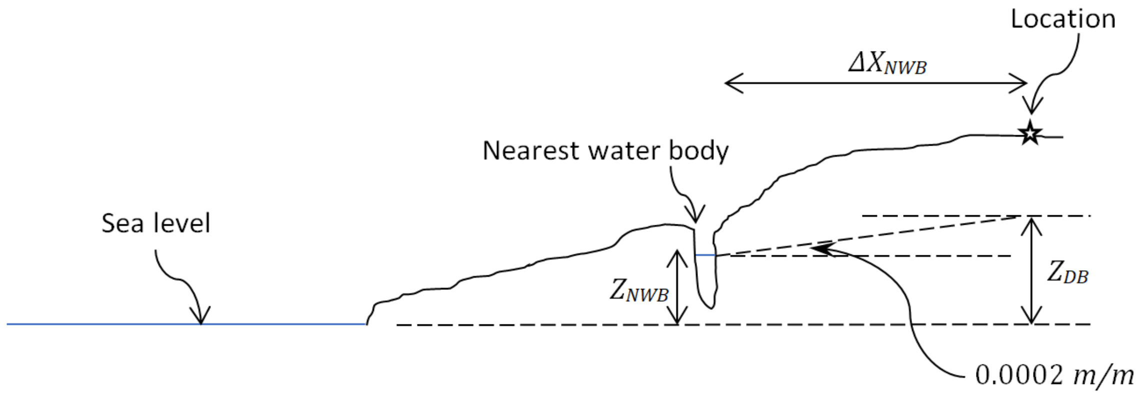
Drainage Limit



Drainage Limit Schematic

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Drainability Assessment

Factors to be considered in assessing drainability :

1. **Subsidence of Peat**
2. **Drainability**
3. **Drainage Limit**
4. **Future Drainability Assessment Model**

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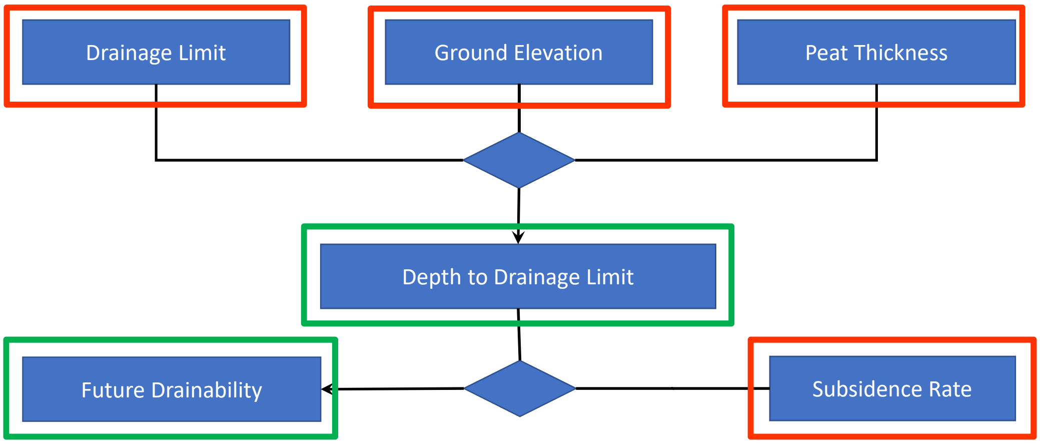
Future Drainability Assessment Model



Future Drainability = Drainage Limit Time → time required, with continuing subsidence, for land surface to drop to the position of Drainage Limit

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Drainability Assessment Approaches

- **Drainability assessment → required prior to replanting on peat to determine the long-term viability**
- **For future drainability → gravity drainage must be still possible over two crop cycles (~40 years)**
- **Guidance provided for two-tier approaches**
- **TIER 1 assessment is a quick and less costly way but is conservative, and a larger caution-range is built in**
- **TIER 2 has higher precision and confidence, but requires more resources than that of TIER 1**

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Drainability Assessment - TIER 1

- Calculate average drainage limit of replanting peatland area (from desk studies)
- Calculate average peat thickness of replanting area
- Calculate average ground elevation of replanting area
- Calculate depth to drainage limit of replanting area
- Input default subsidence rate
- Determine future drainage limit time (in years) → must be > 40 years

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Drainability Assessment - TIER 1

- Calculate average drainage limit of replanting peatland area (from desk studies)
- Calculate average peat thickness of replanting area
- Calculate average ground elevation of replanting area
- Calculate depth to drainage limit of replanting area
- Input default subsidence rate = 5 cm/yr
- Determine future drainage limit time (in years) → must be > 40 years

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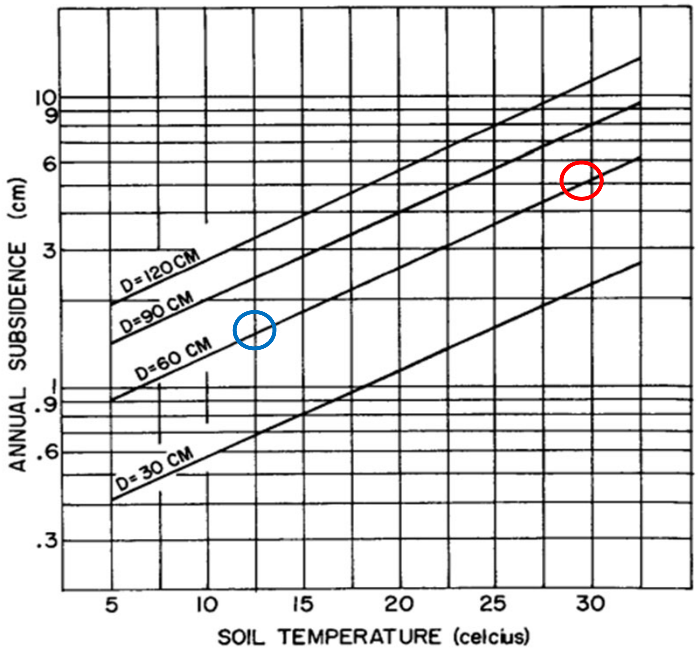


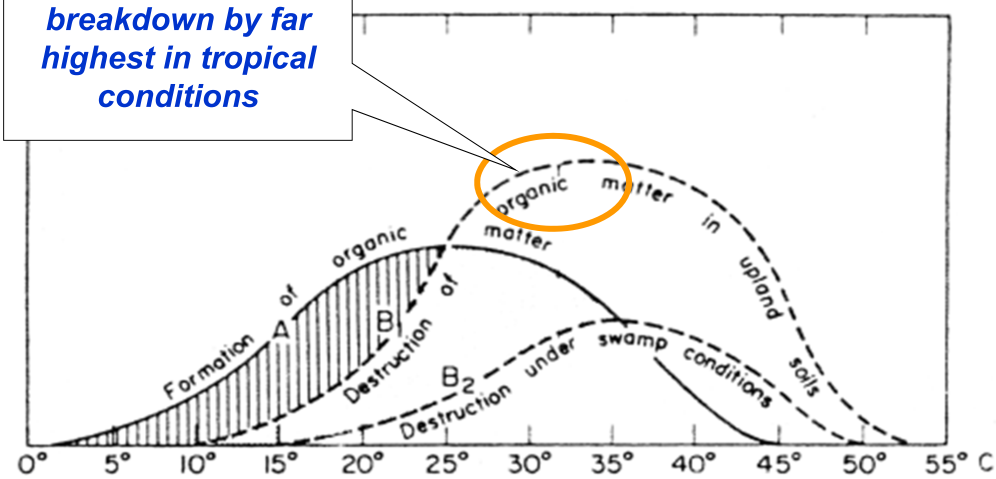
Model by Stephens et al 1984 for USDA (for water table depths ~0.6 m).

For tropics, it finds ~5 cm/yr

Compared with ~1.5 cm/yr in temperate regions

Temperature vs Subsidence Rate

Organic matter breakdown by far highest in tropical conditions



Ref : Mohr, Van Baren & Van Schuylenborg (1972)

Drainability Assessment - TIER 2

- Determine average drainage limit of replanting peatland area (from field studies)
- Measure average peat thickness of replanting area
- Survey average ground elevation of replanting area
- Measure depth to drainage limit of replanting area
- Input actual subsidence rate of replanting area
- Determine future drainage limit time (in years) → must be > 40 years

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Stratum/ Spatial Unit	Average peat thickness	Depth to Drainage Limit	Average Subsidence Rate	Drainage Limit Time
	(D_P)	(D_{DB})	(S)	(DLT)
	(meters)	(meters)	(cm/year)	(years)
A22 Fibric	1.5	2.7	5	30
…	…	…	…	…
B21 Fibric	1.7	2.7	5	34
…	…	…	…	…
C14 Fibric	4.5	2.7	5	54
C14 Hemic	5.2	2.7	4	67.5
…	…	…	…	…
J12 Hemic	3.8	2.65	4	66.25
J12 Sapric	3.8	2.65	3	88.33
…	…	…	…	…
So forth..	So forth..	So forth..	So forth..	So forth..

Typical Set of Results

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