

# A Simplified Geology of the Perth Metropolitan Area

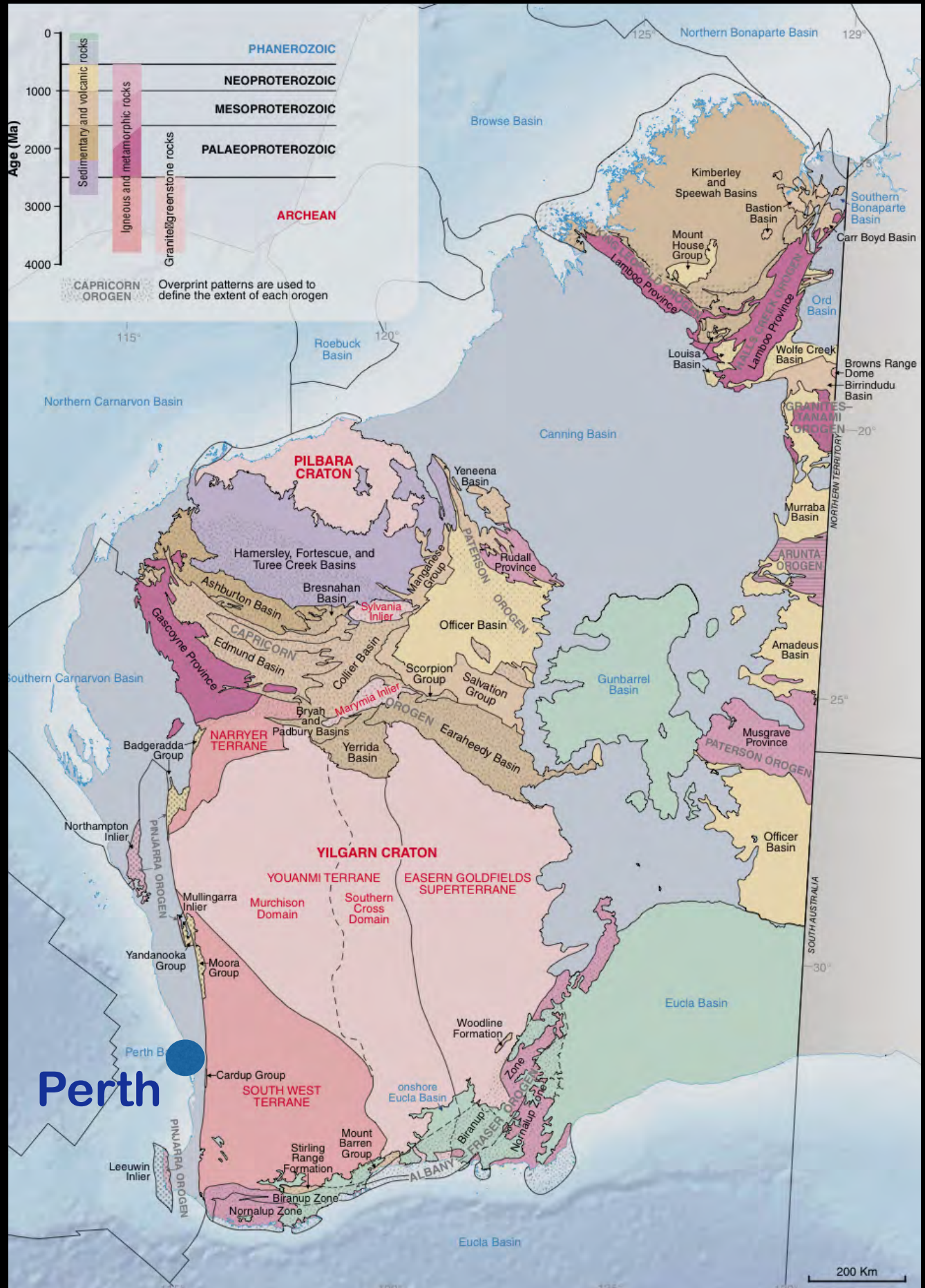
Fred Verheyde  
Geotechnical Principal / Branch Manager



# WA Geological Setting

Present

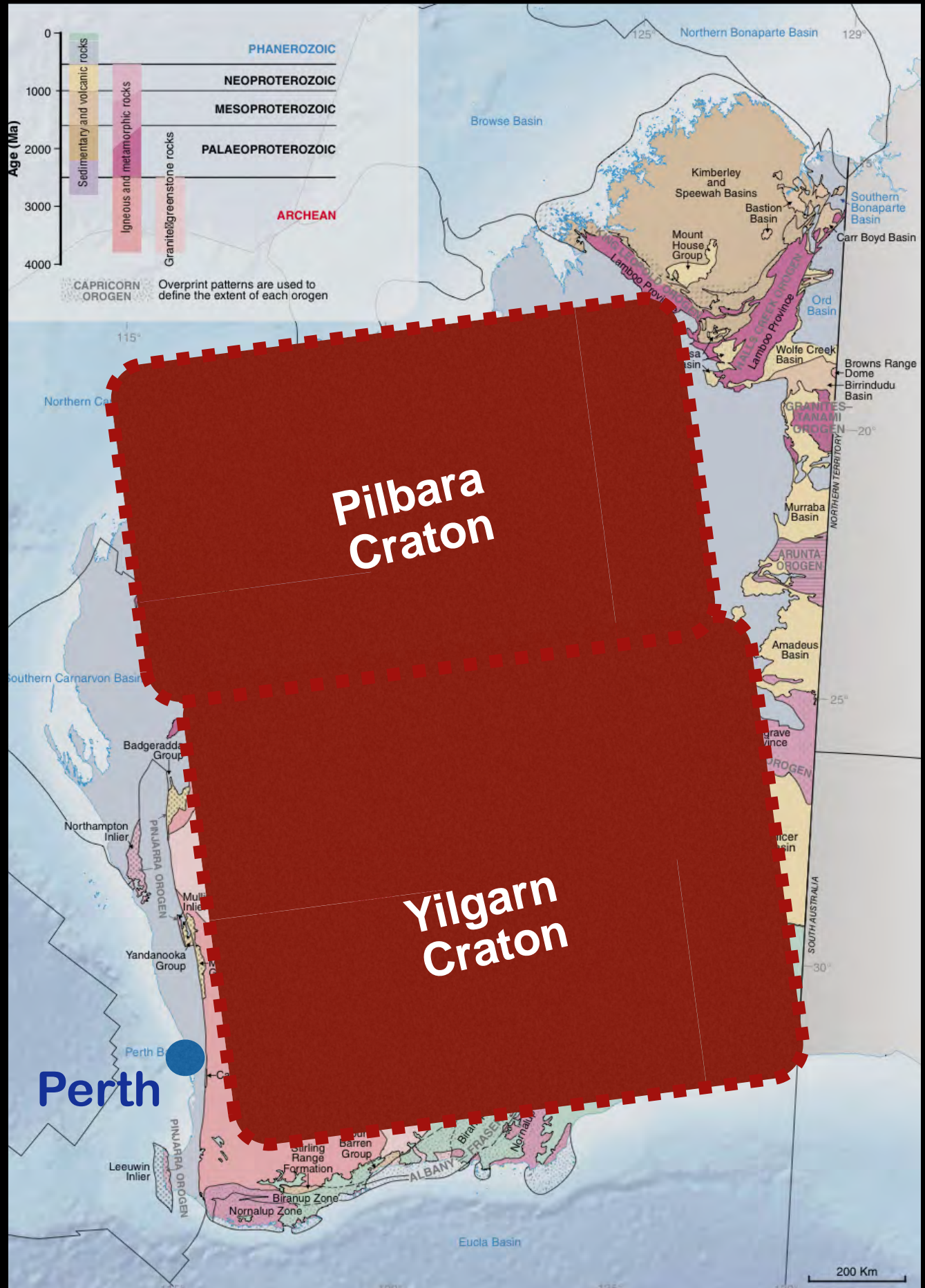
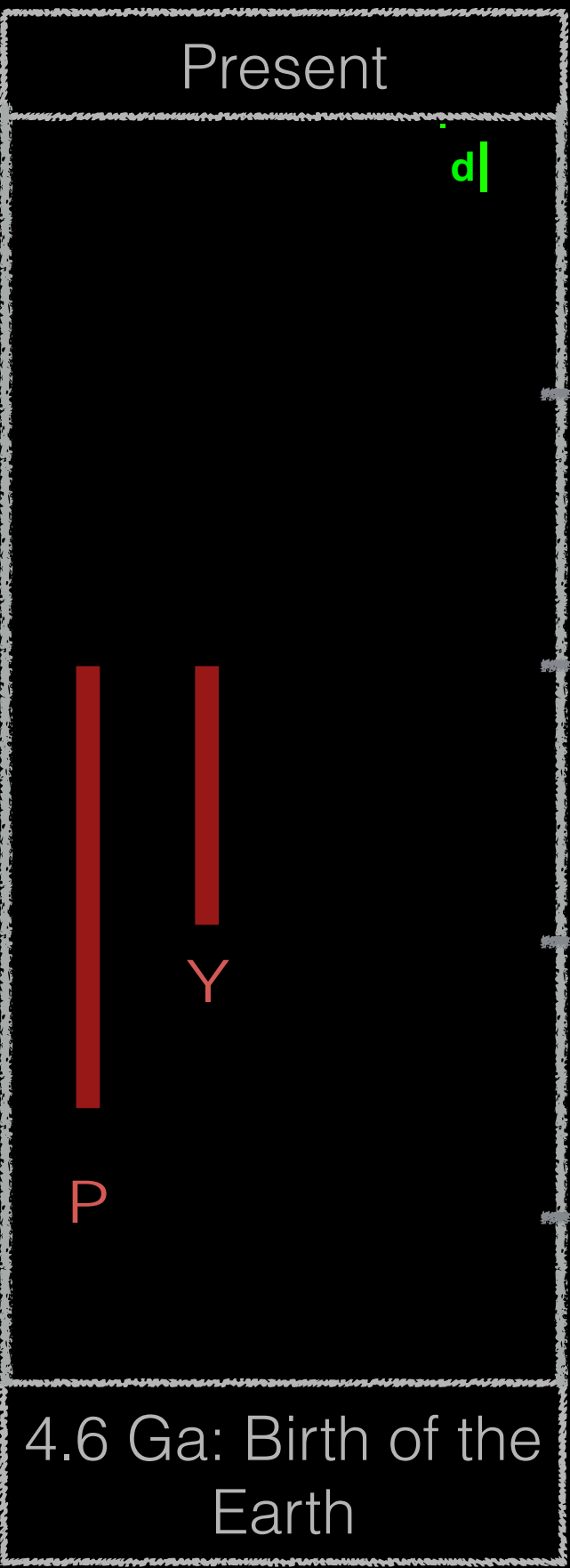
dl



4.6 Ga: Birth of the Earth

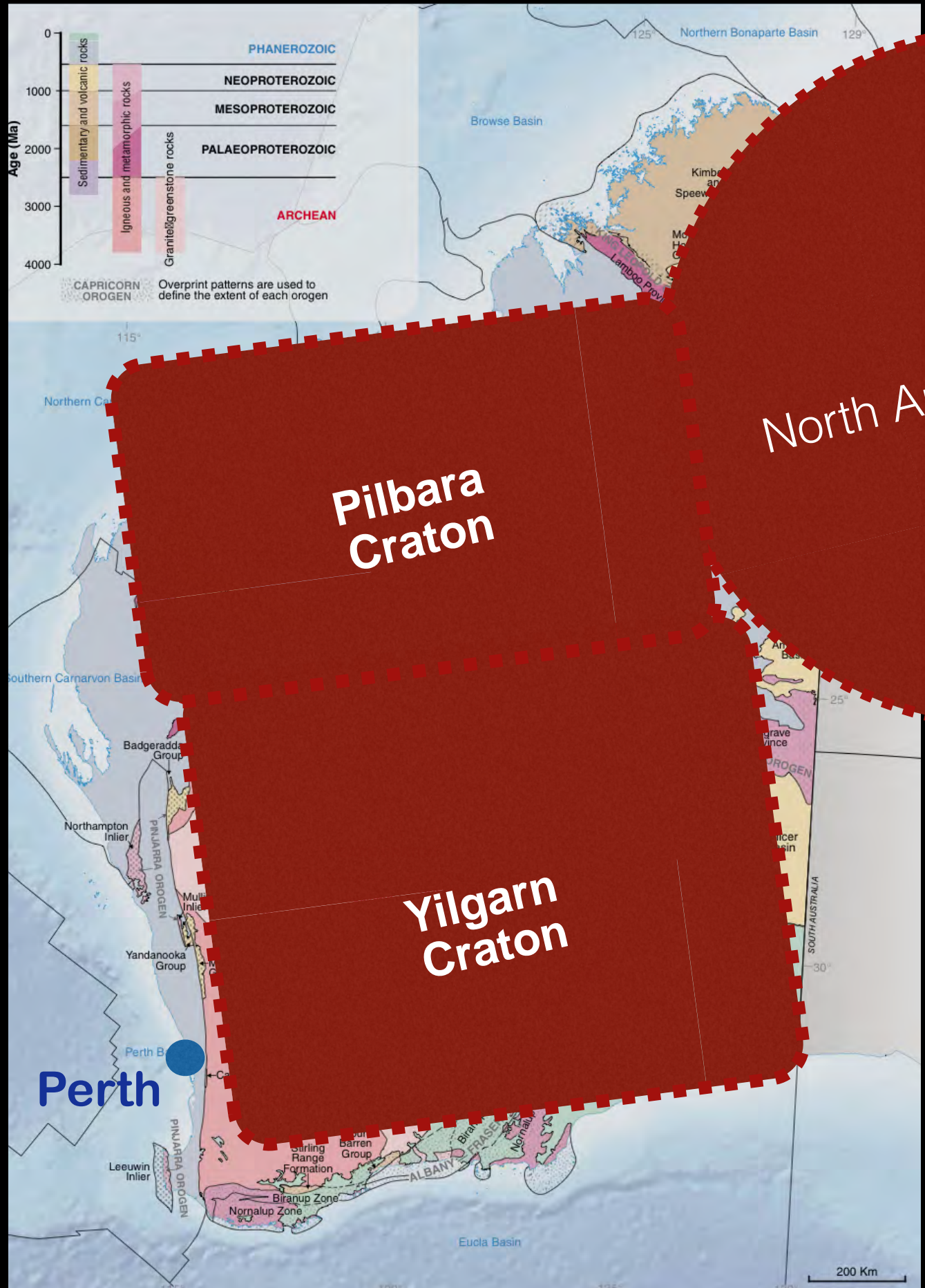
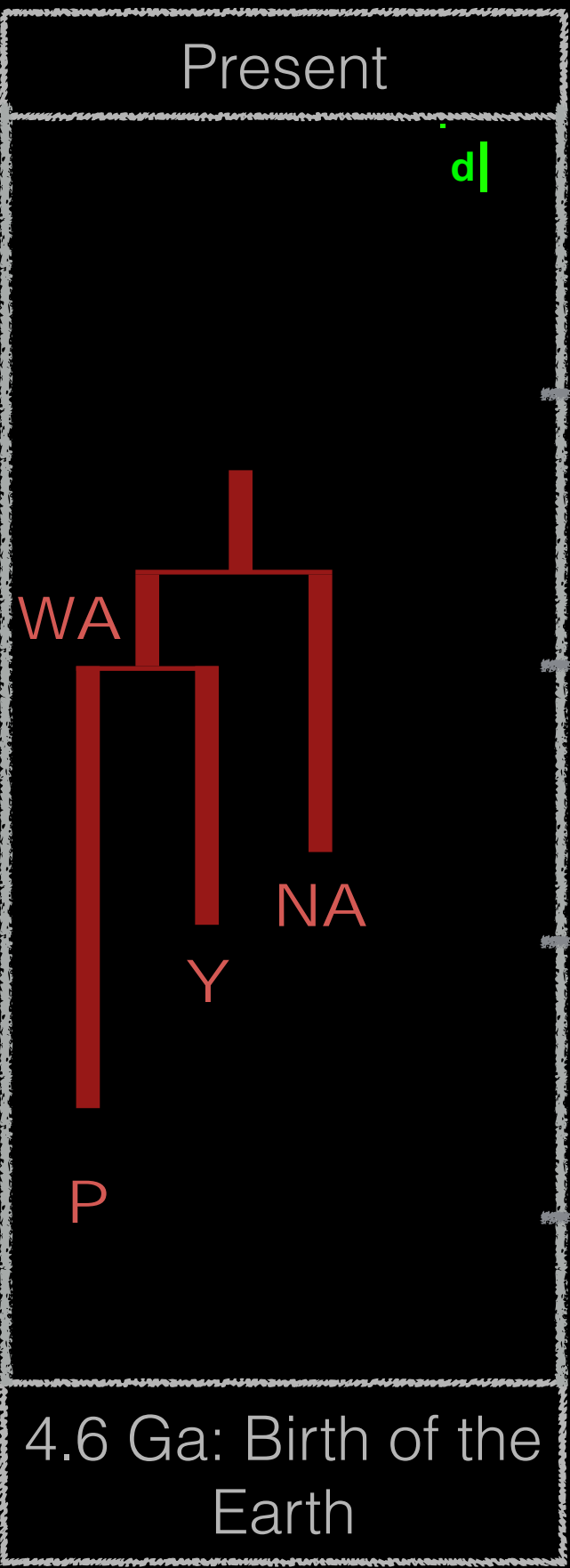


# WA Geological Setting

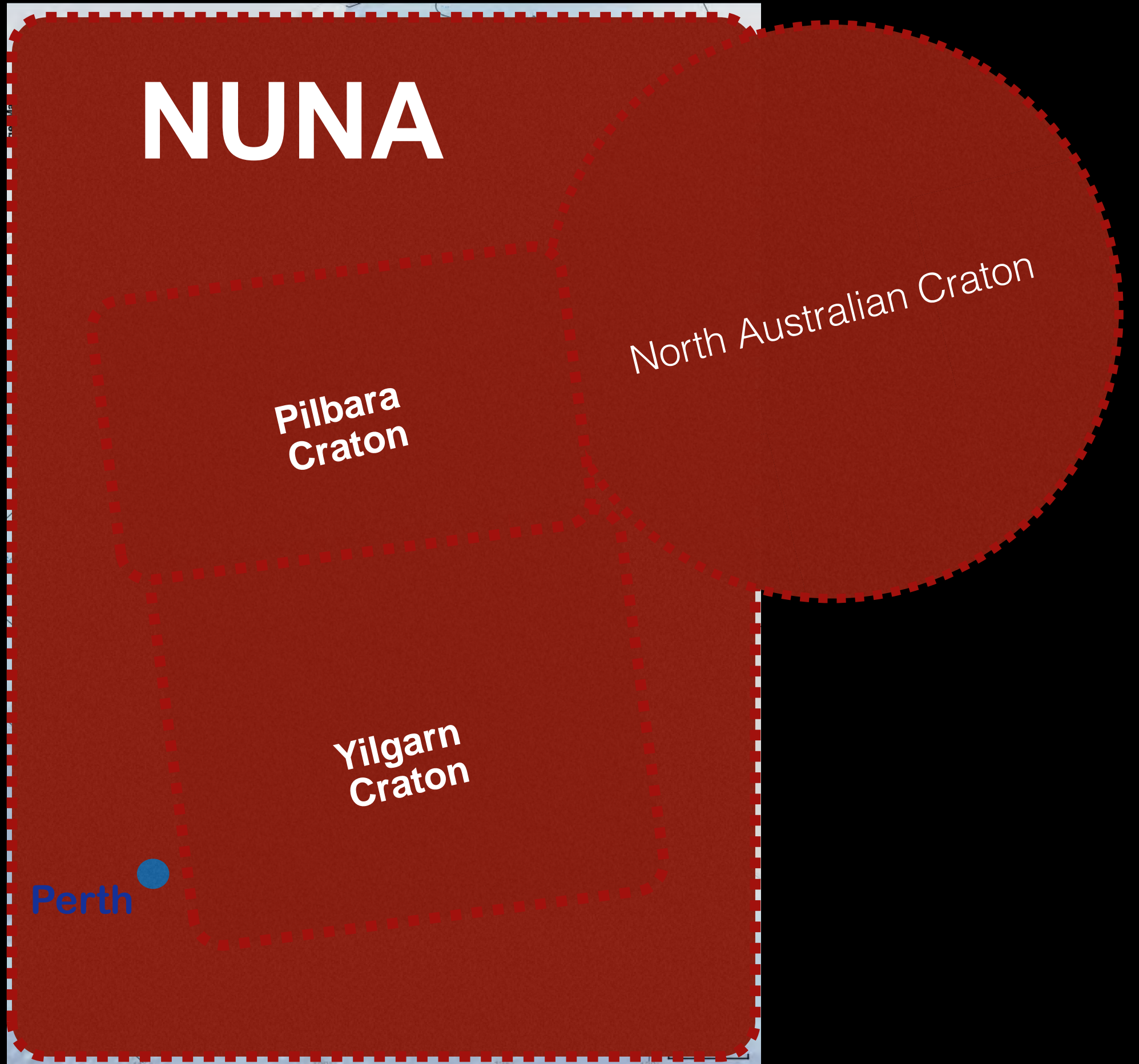
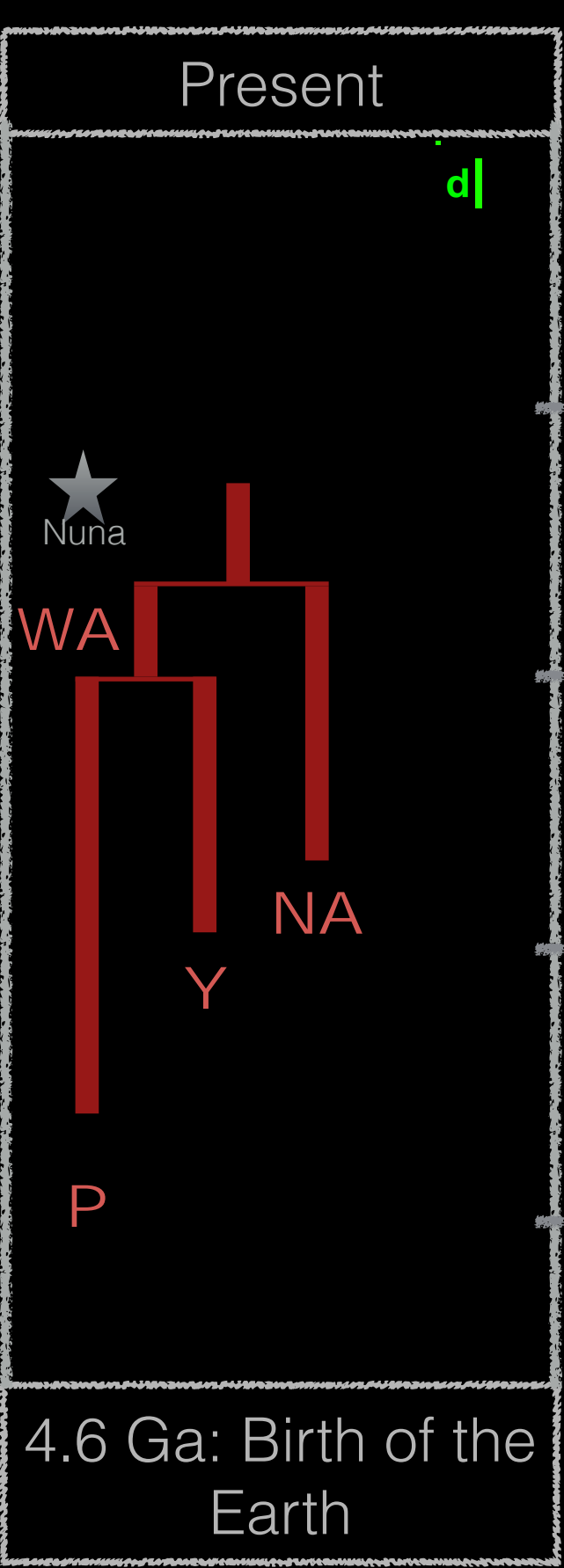




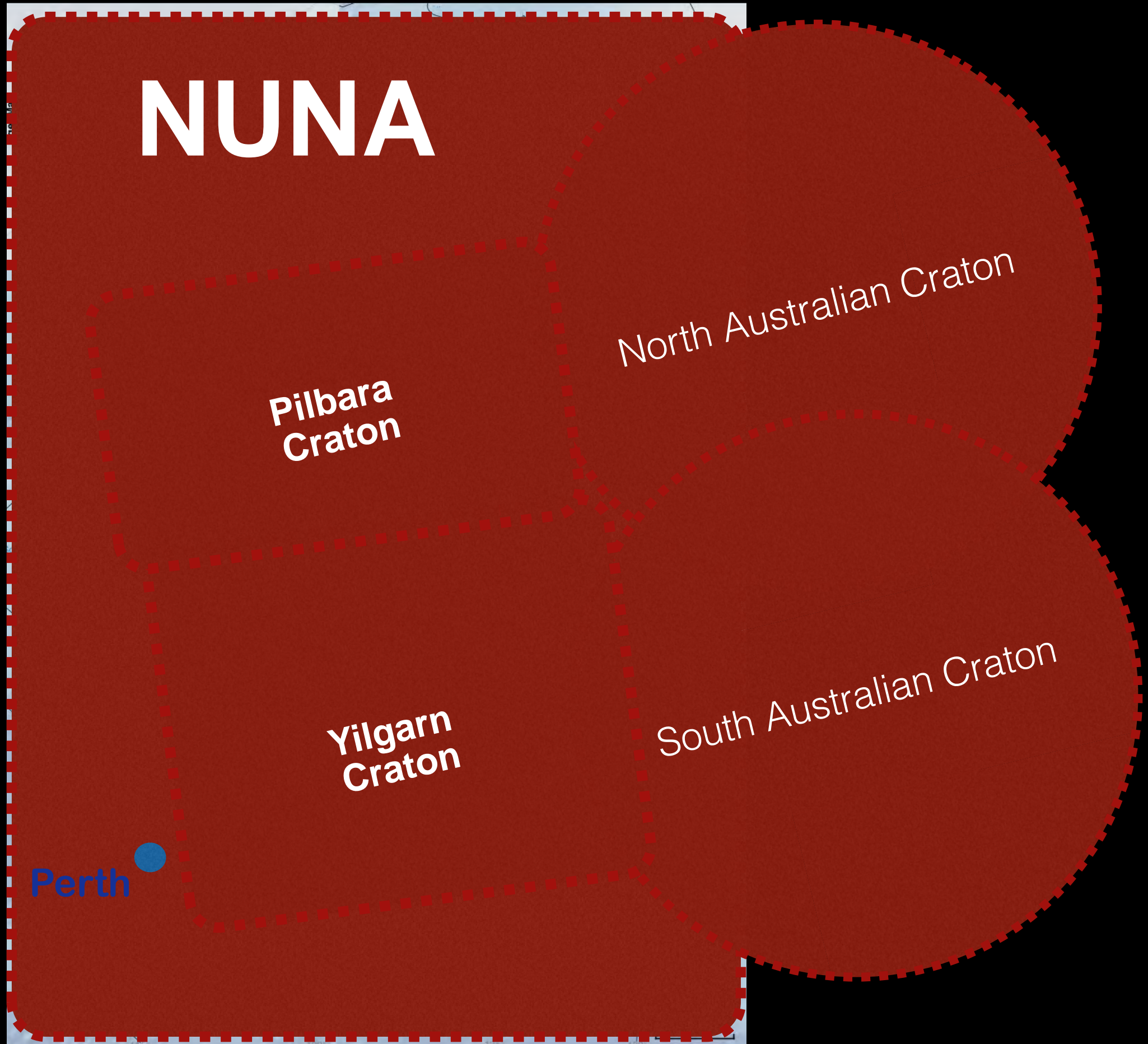
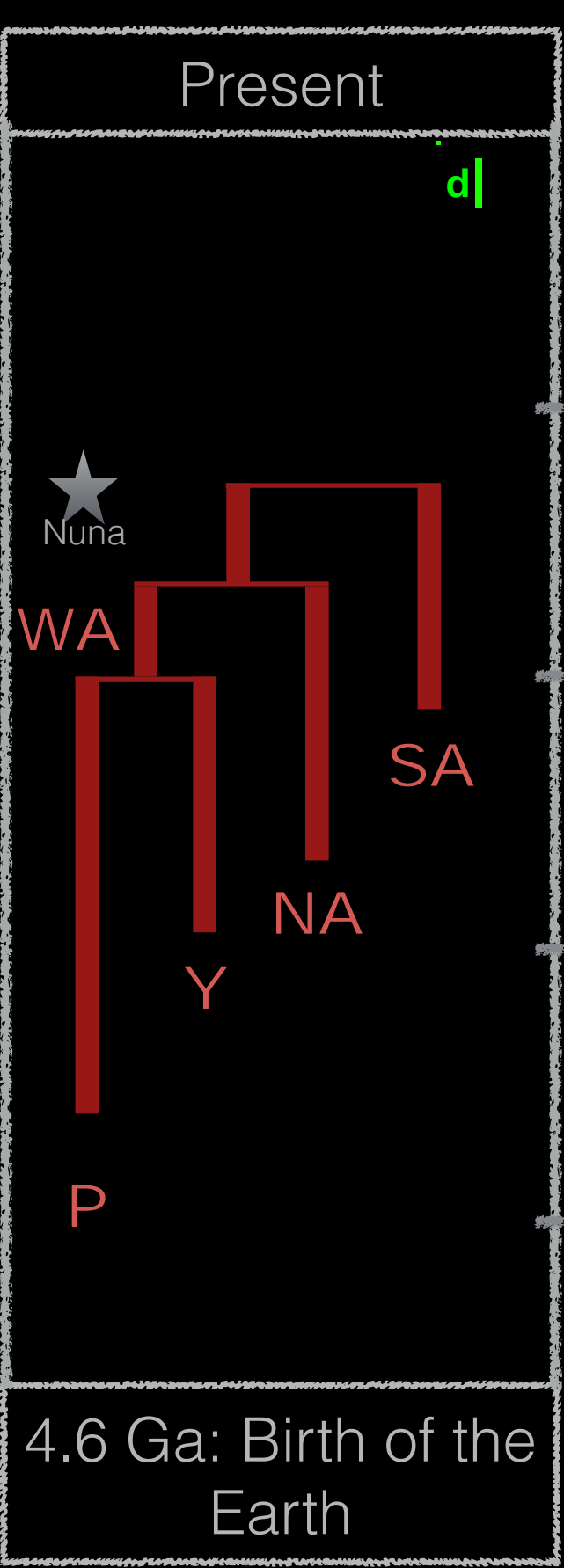
# WA Geological Setting



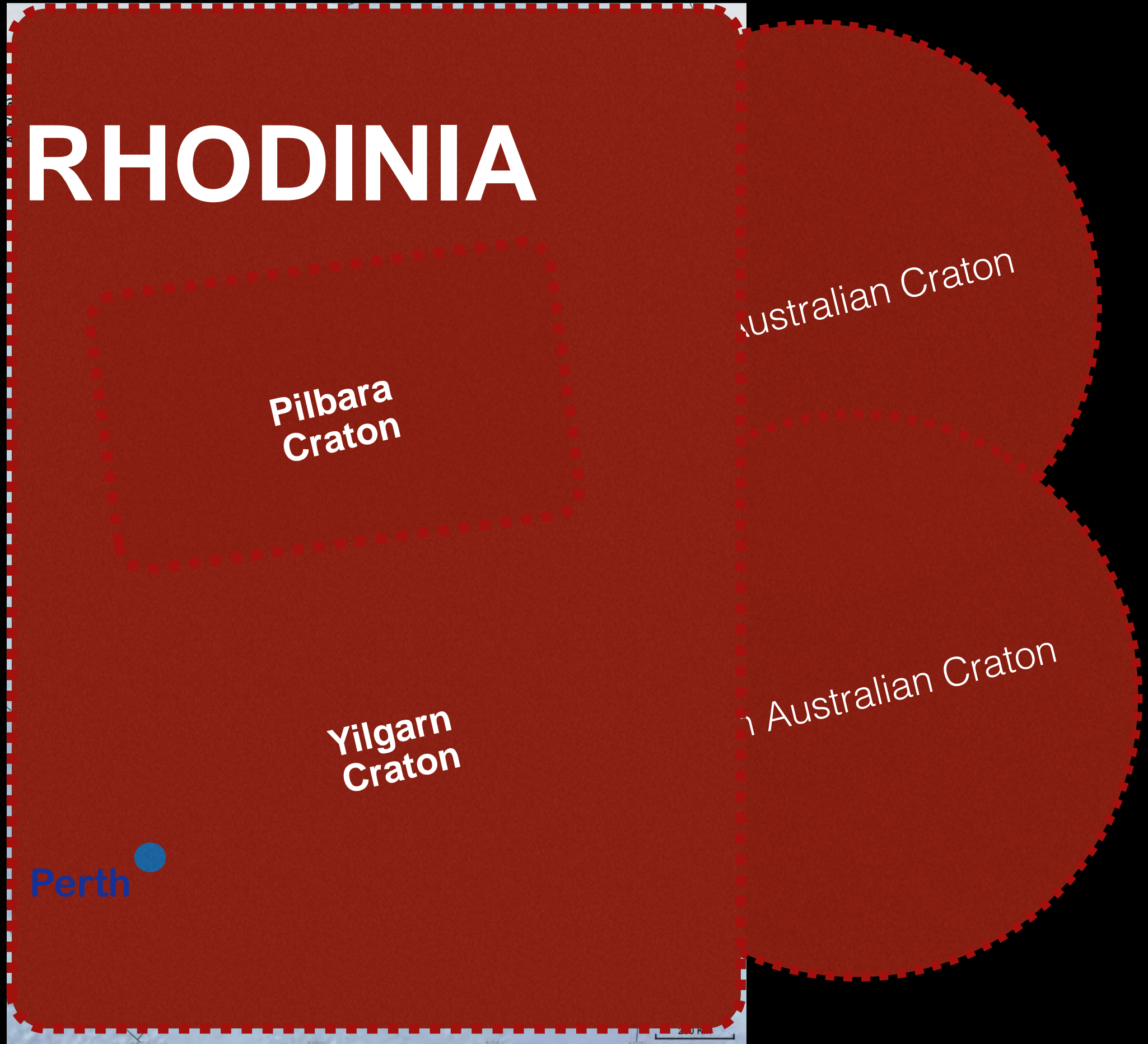
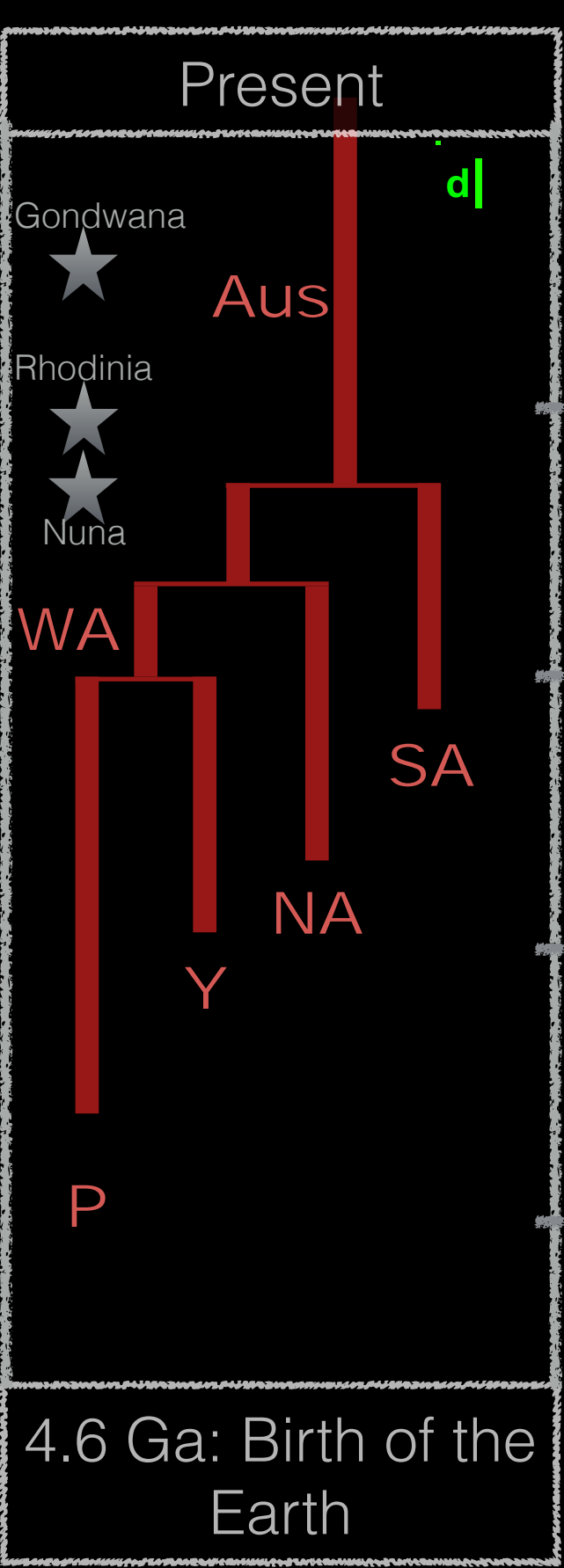




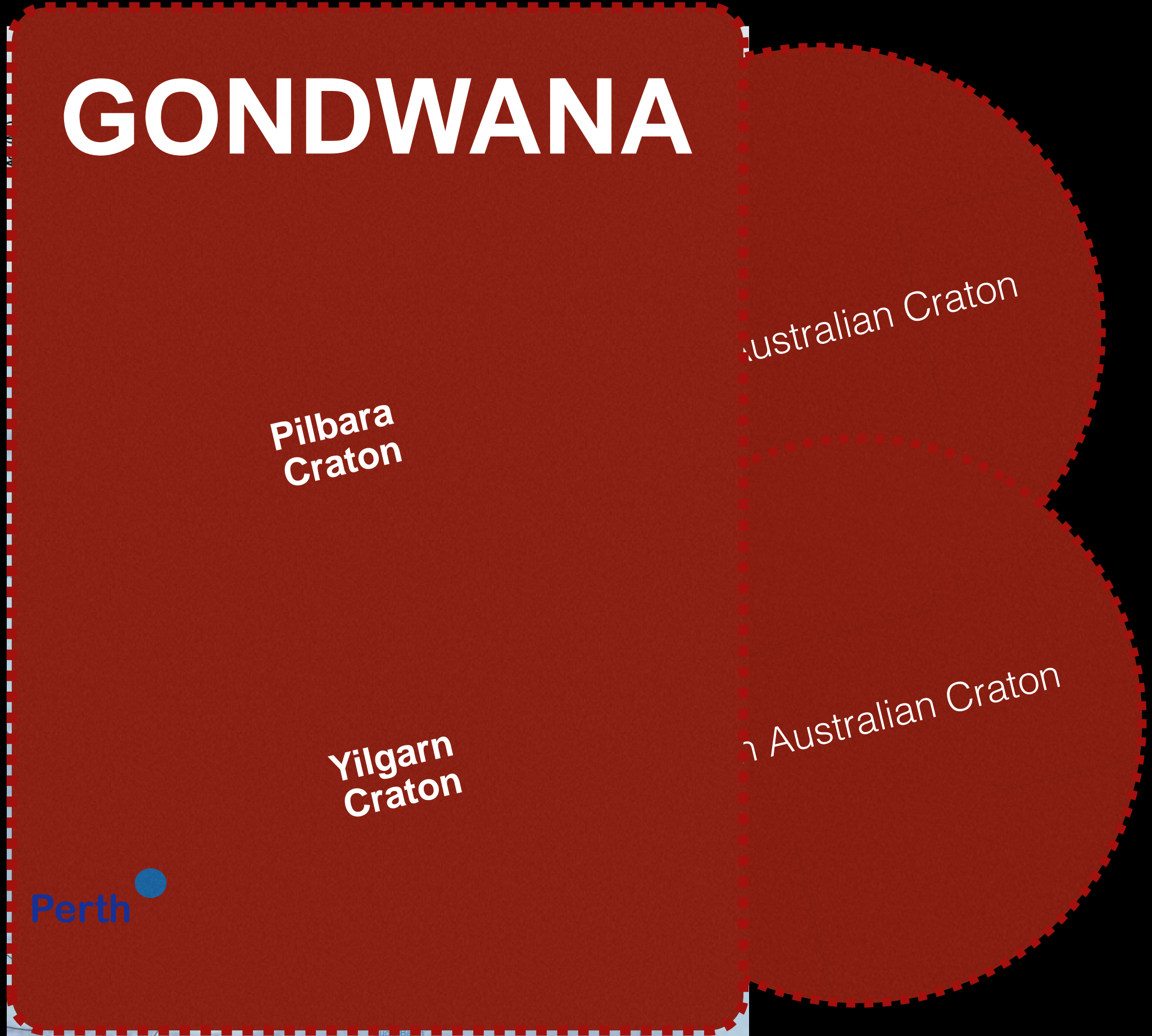
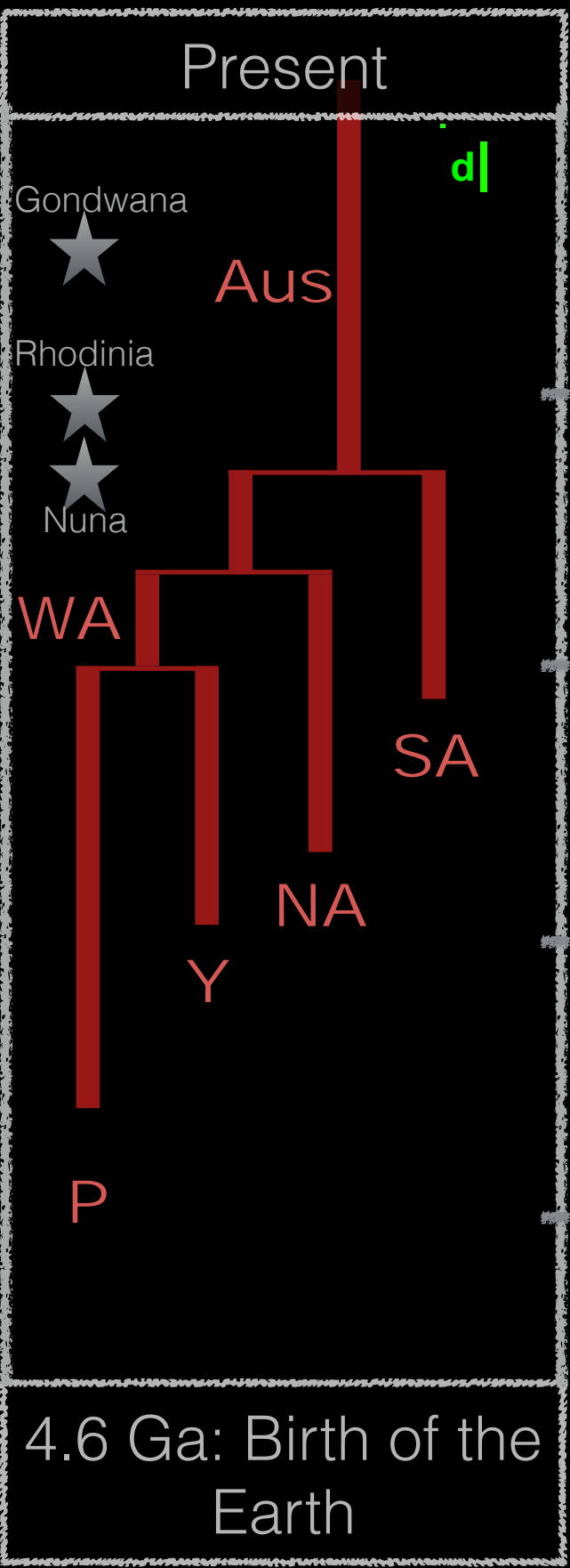








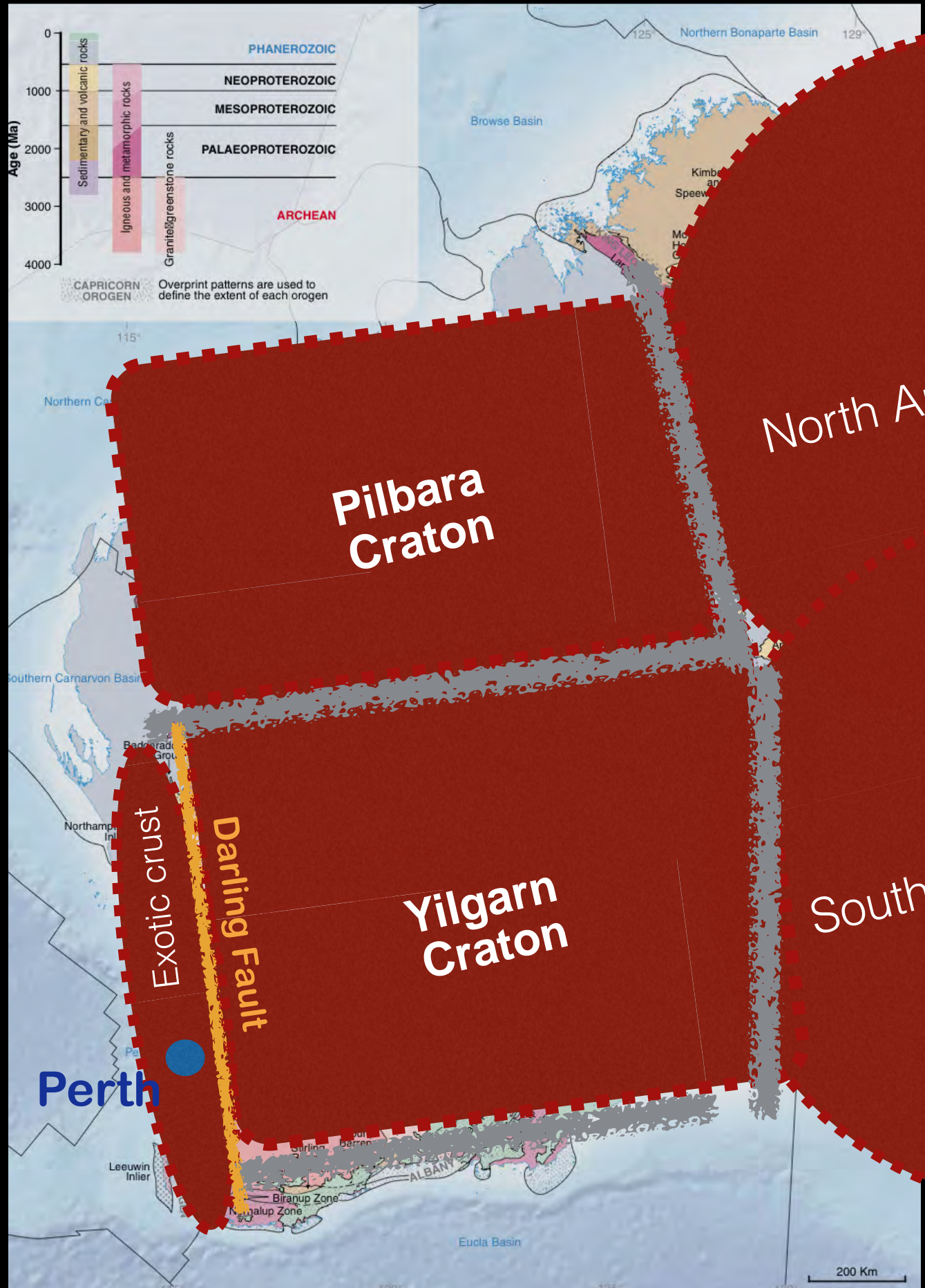
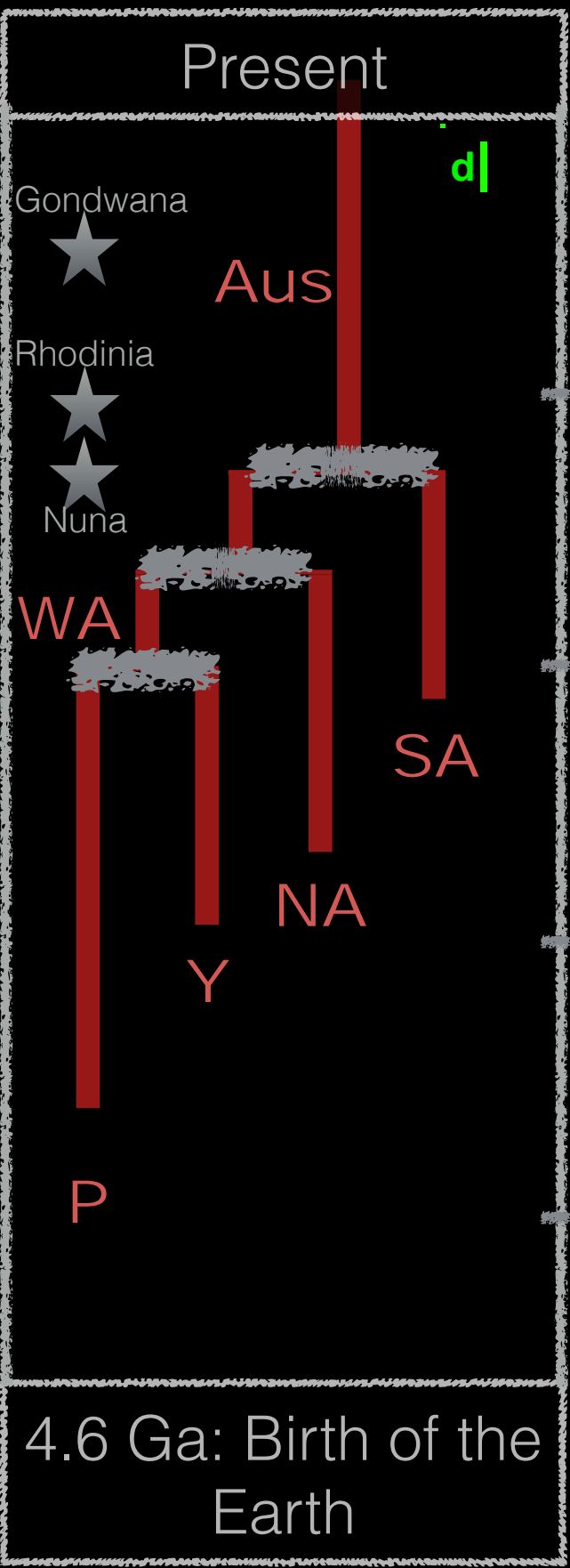




# GONDWANA

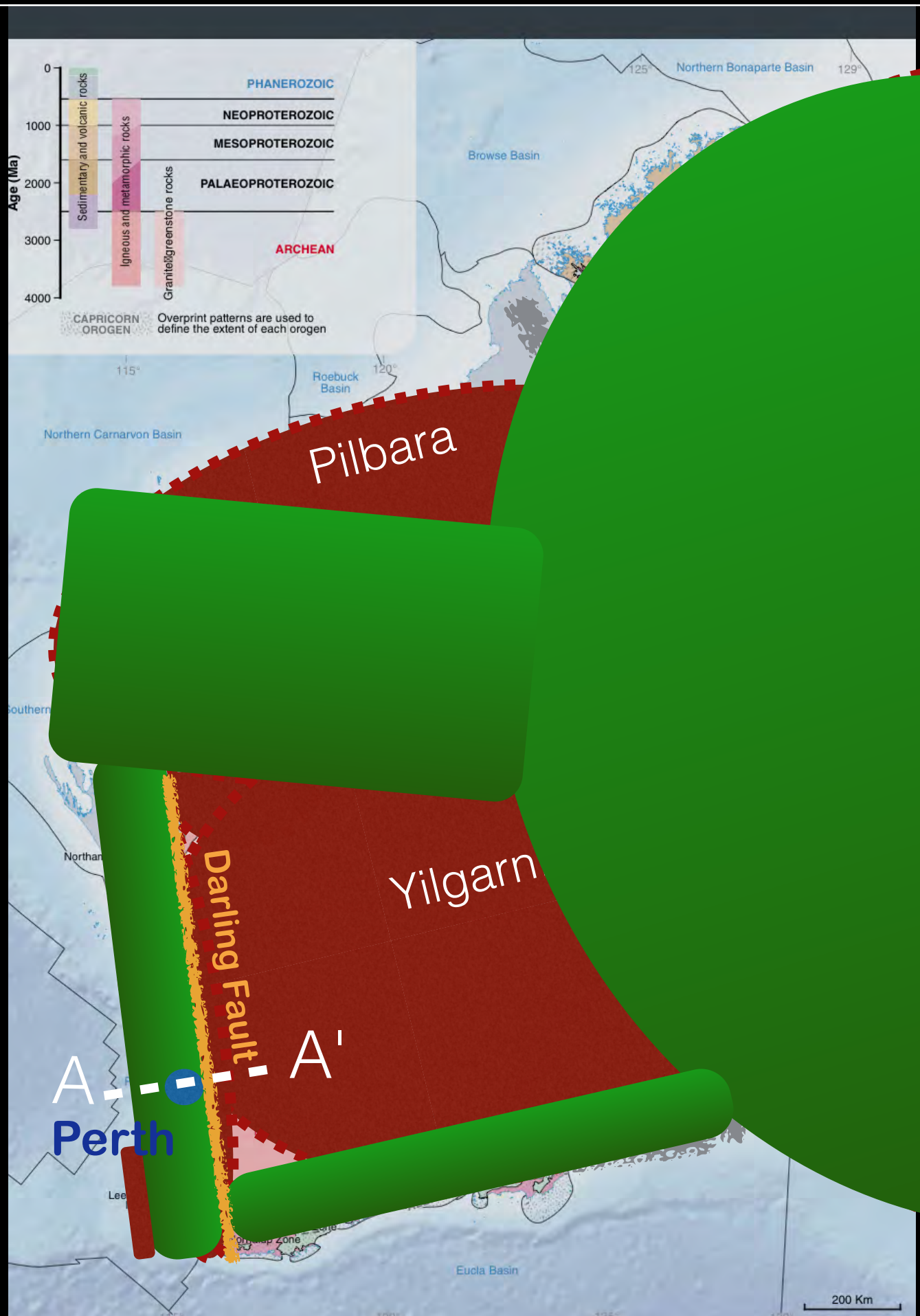
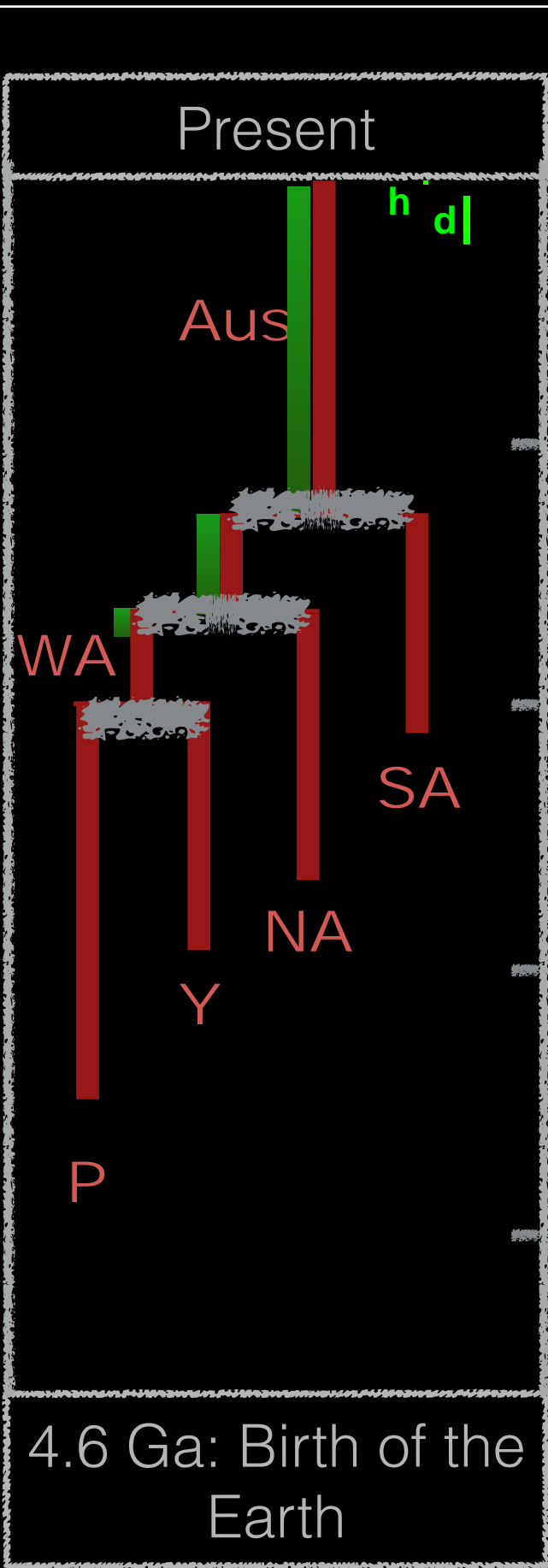


# WA Geological Setting



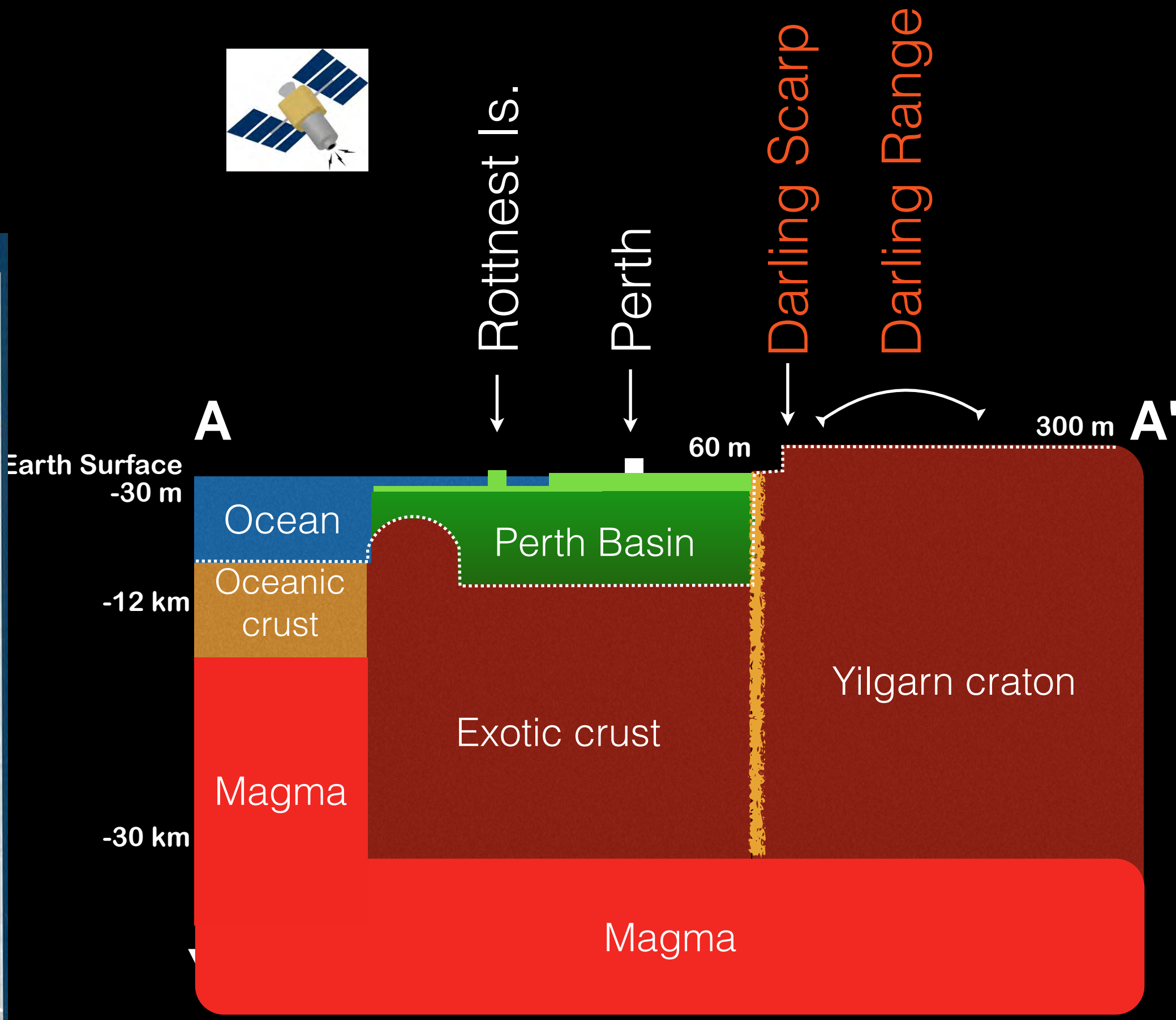
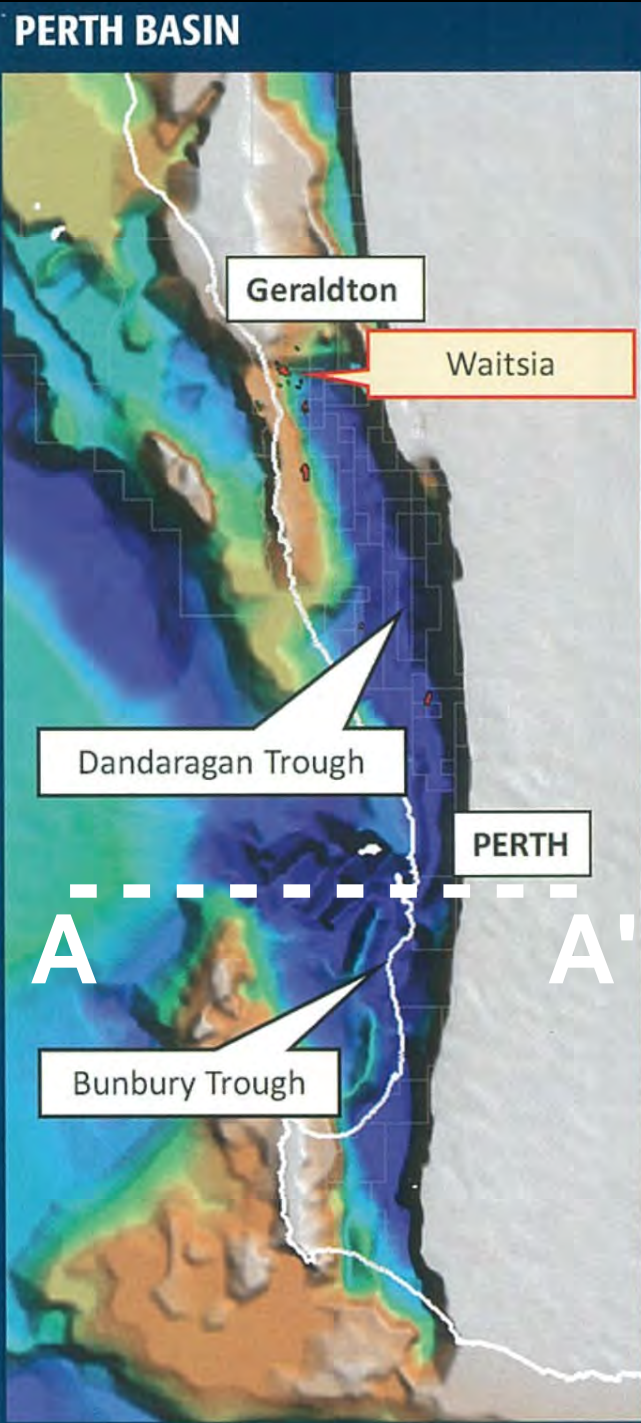
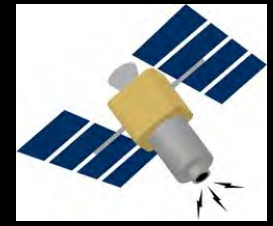
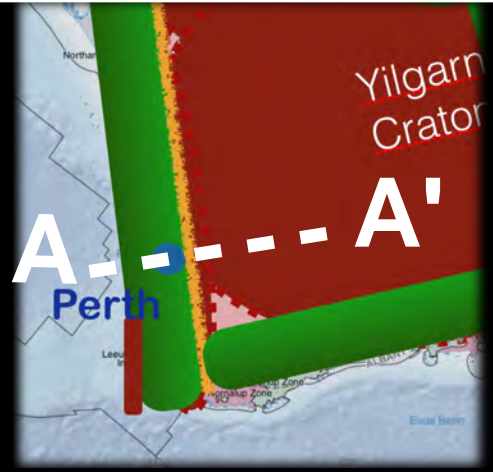


# WA Geological Setting





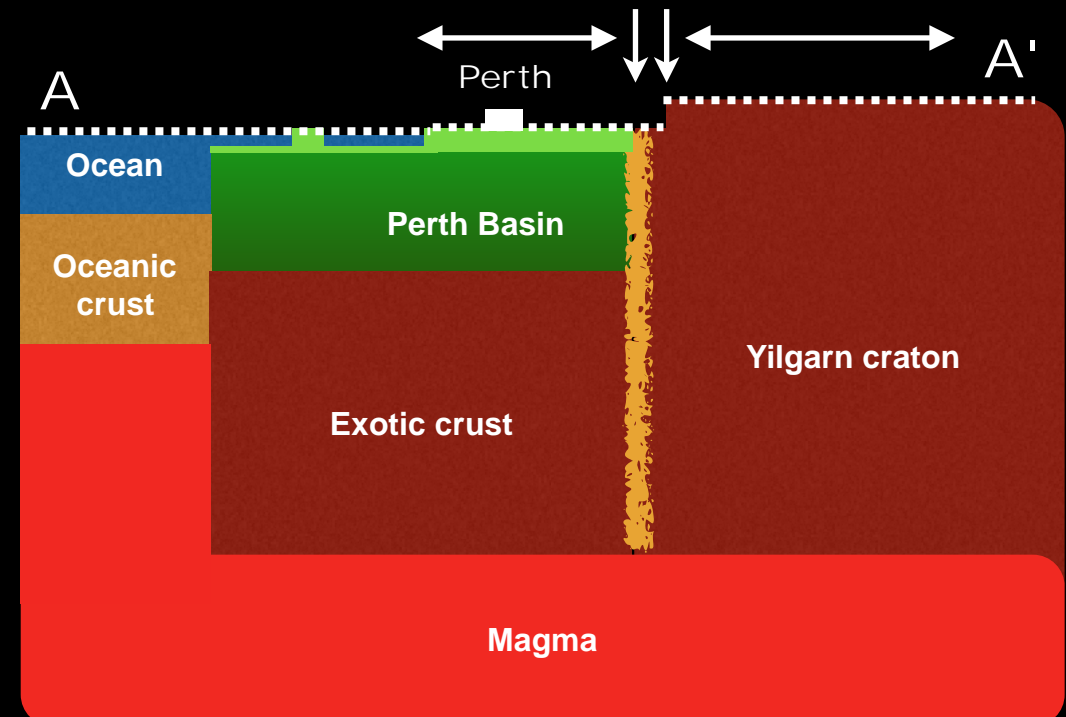
# Deep Geology in the Perth Area





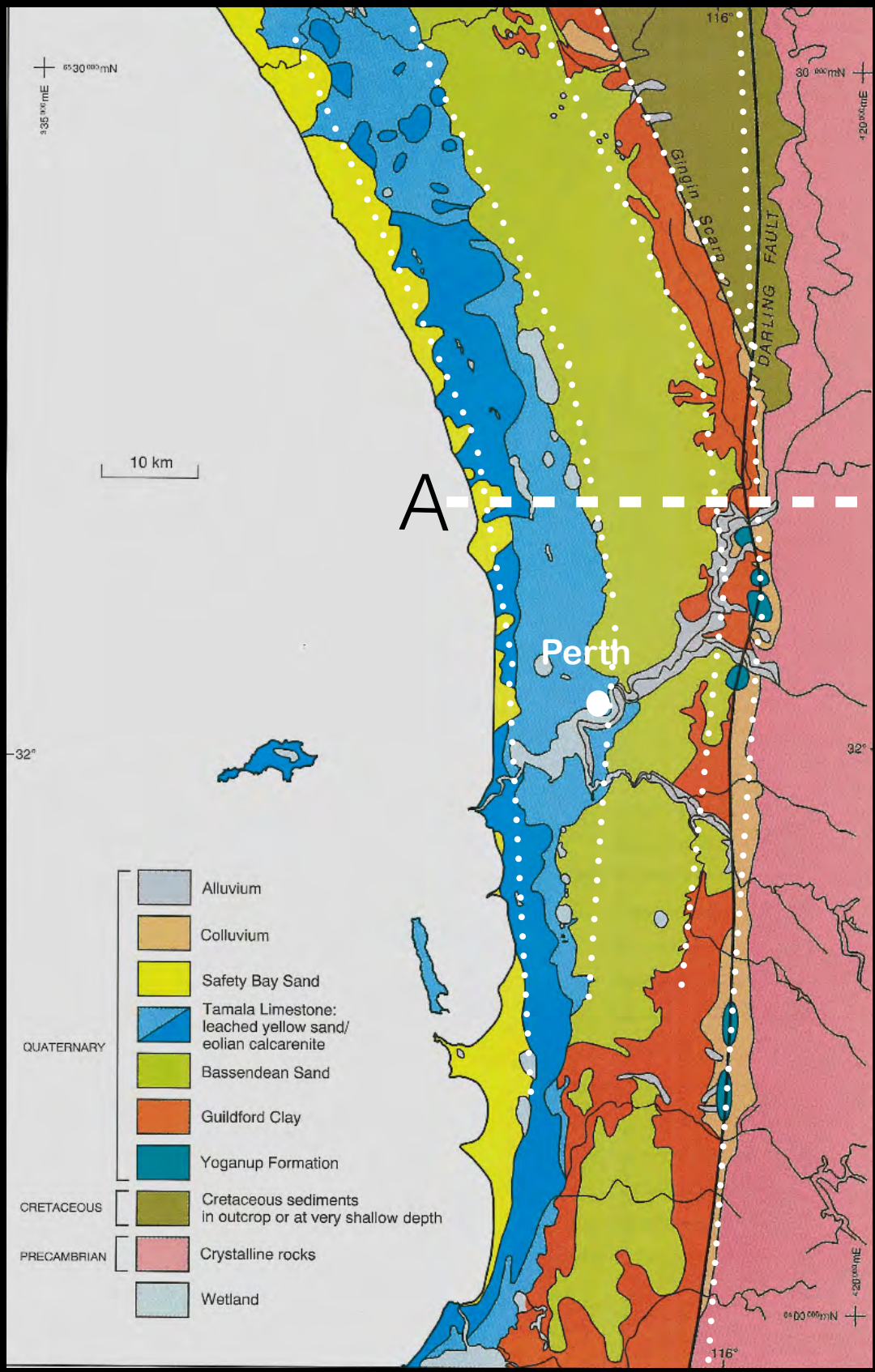


- ← Darling Range (**Granitic rock of Yilgarn Craton**)
- ← Darling Scarp (**Darling Fault**)
- ← Gingin Scarp: Former foreshore
- ← Coastal Plain:
- ← Pinjarra Plain (**Guildford Formation**)
- ← Bassendean Dune System (**Bassendean Sand**)
- ← Spearwood Dune System (**Tamala Limestone and sand**)
- ← Quindalup Dune System (**Safety Bay Sand**)

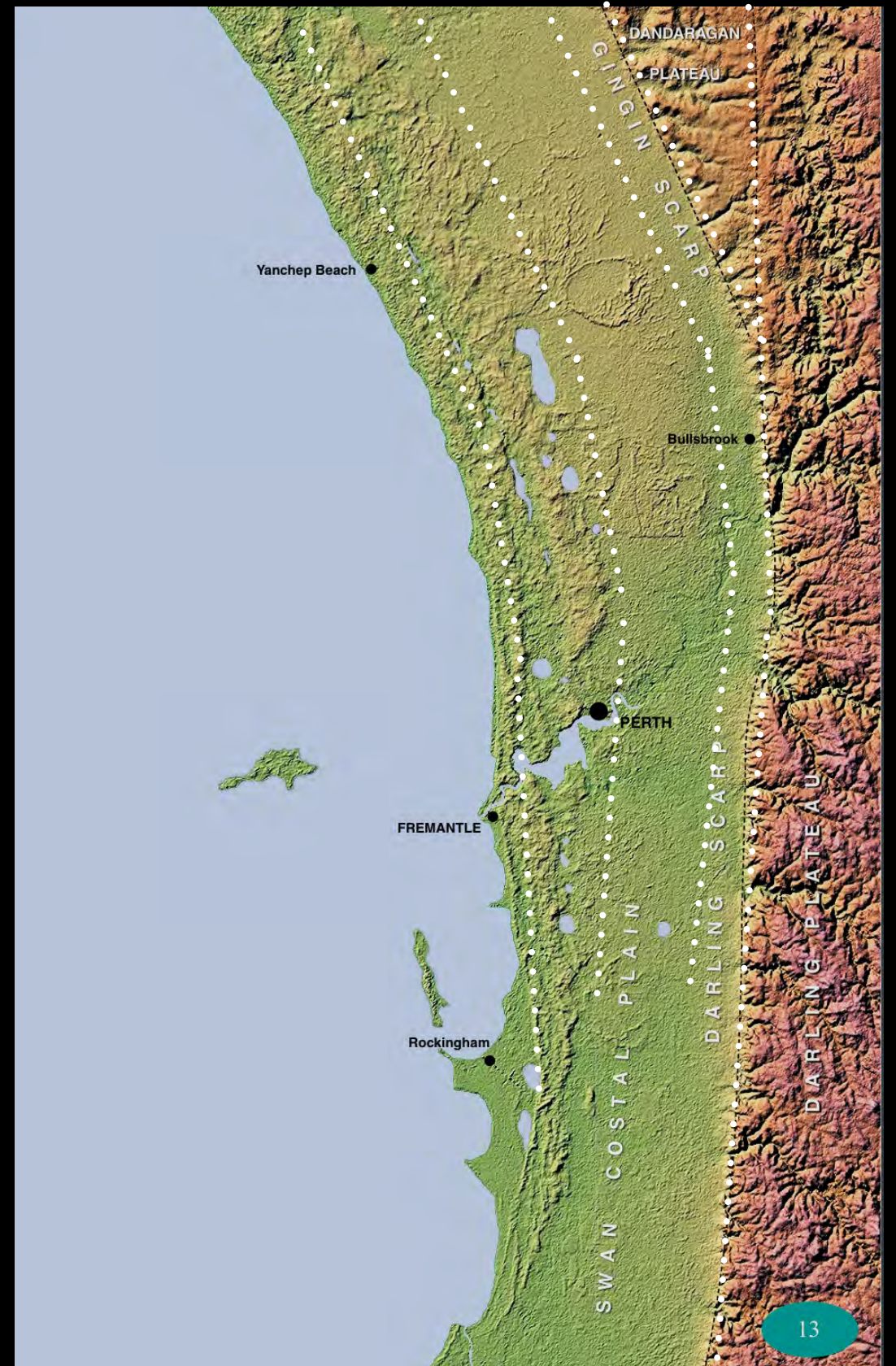




## Surface Geology

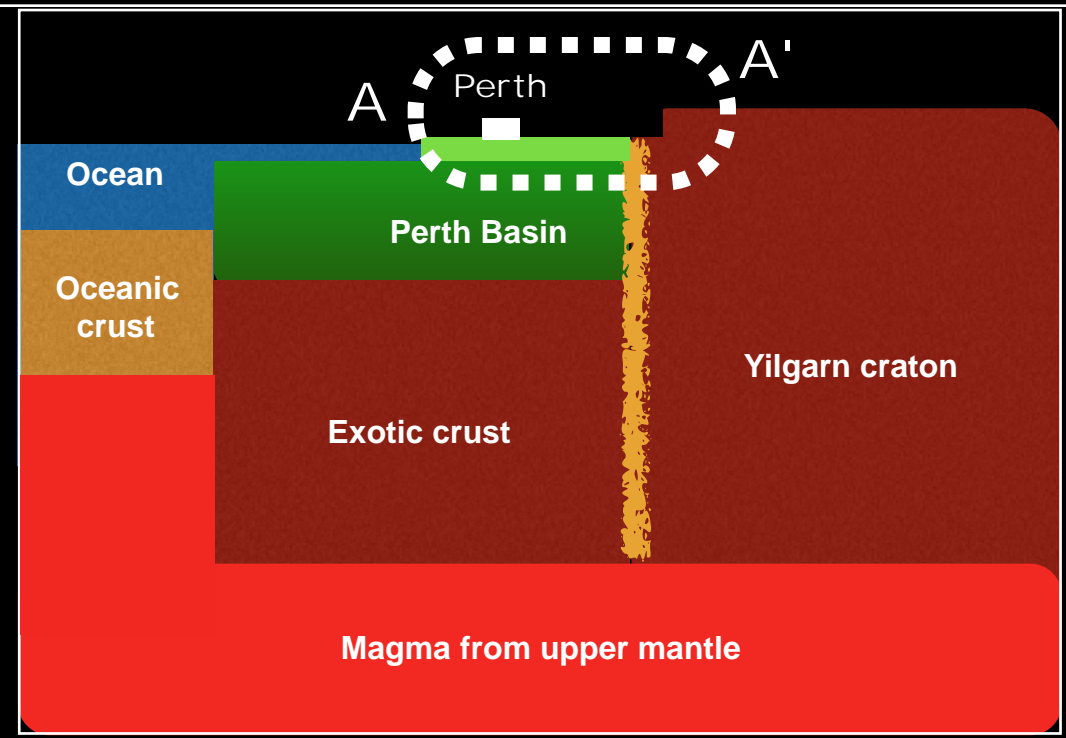
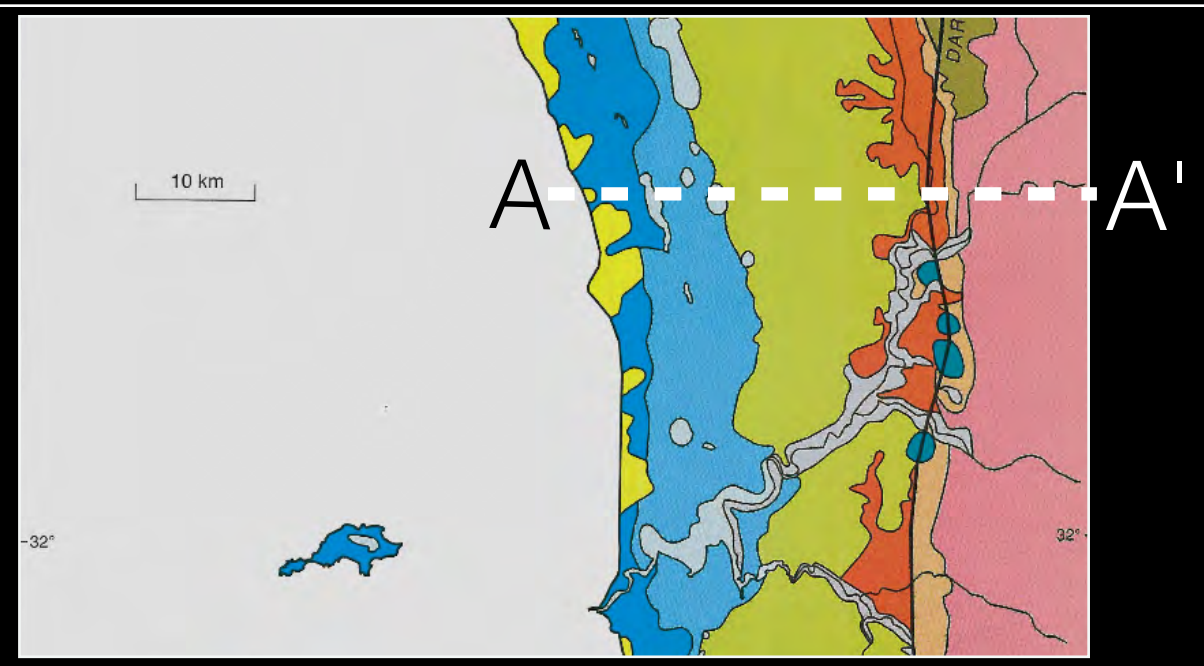


## Landform





# Superficial Geological Formations

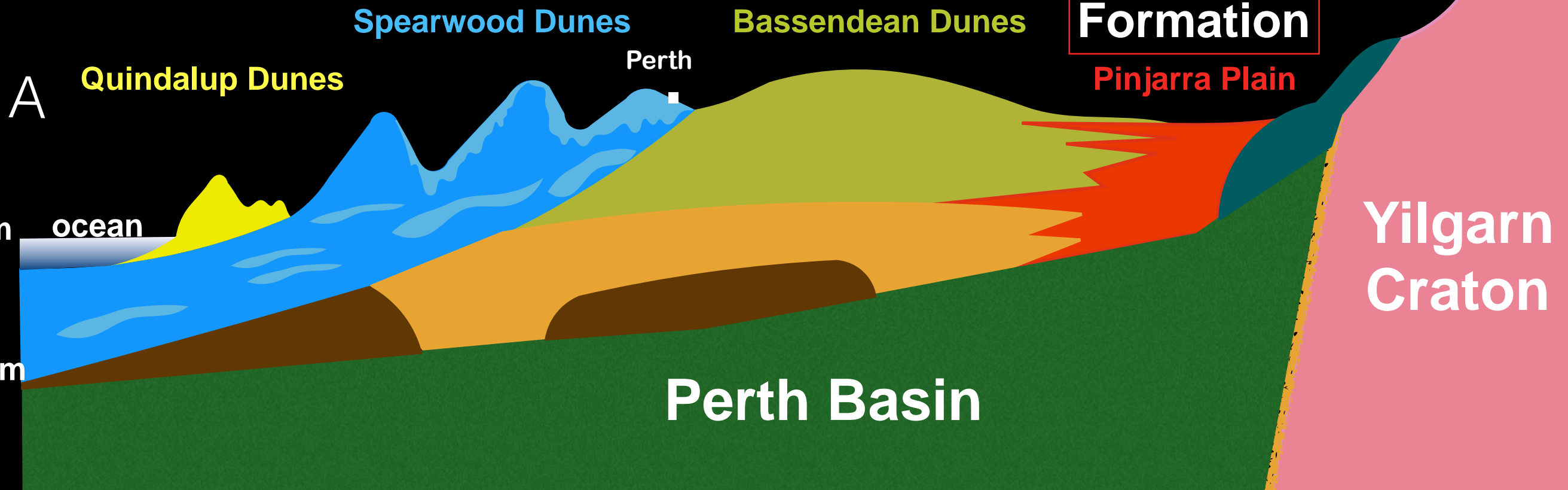


**Safety Bay Sand**

**Tamala Limestone and sand**

**Bassendean Sand**

**Yoganup Sand**



**Quindalup Dunes**

**Spearwood Dunes**

**Bassendean Dunes**

**Guildford Formation**

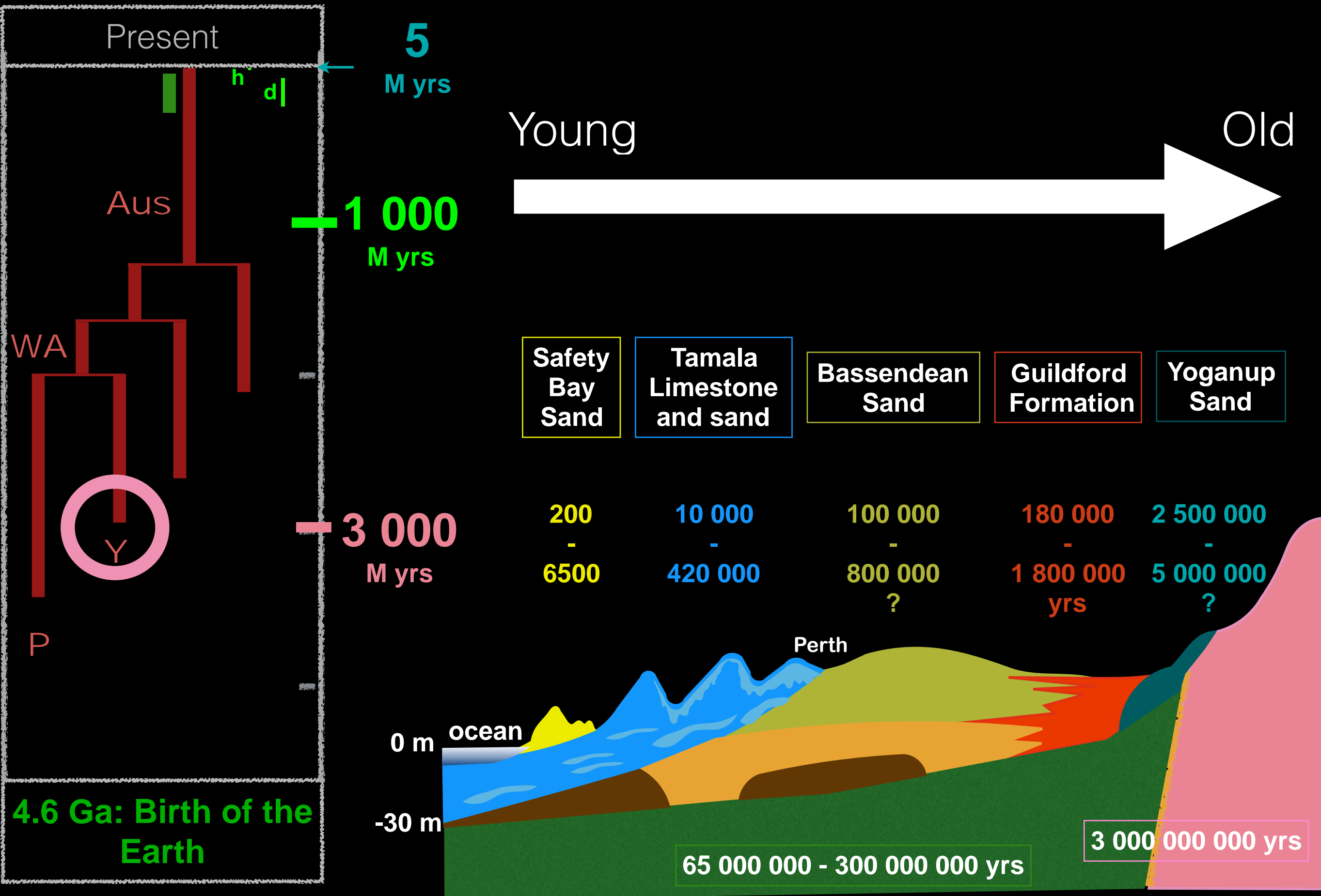
**Pinjarra Plain**

**Yilgarn Craton**

**Perth Basin**

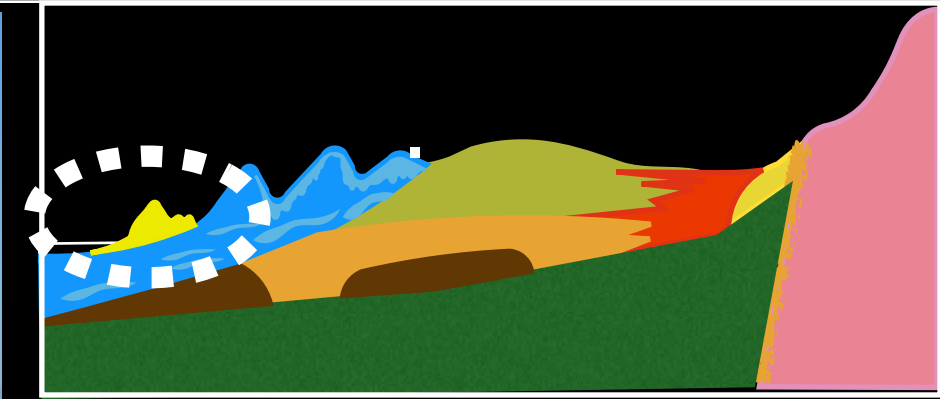


# Chronology of the Local Geology

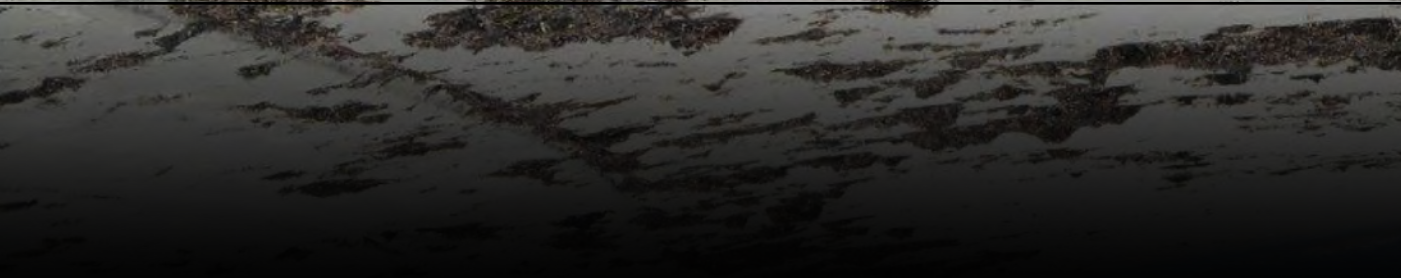




# Safety Bay Sand



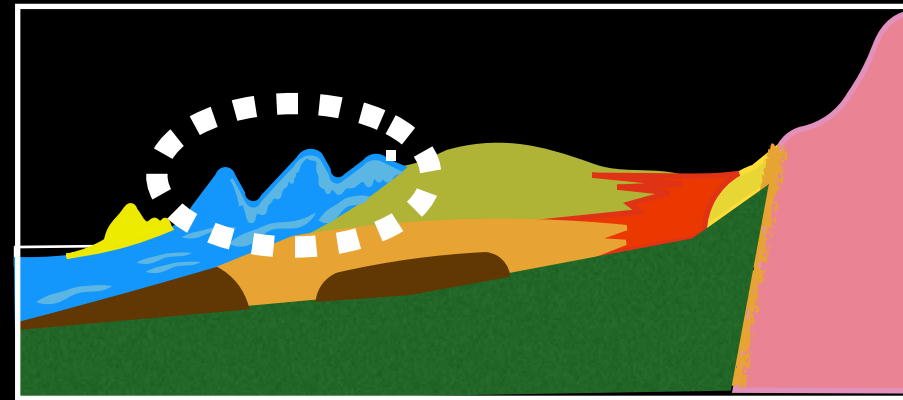
Quindalup Dune System



Safety Bay limestone



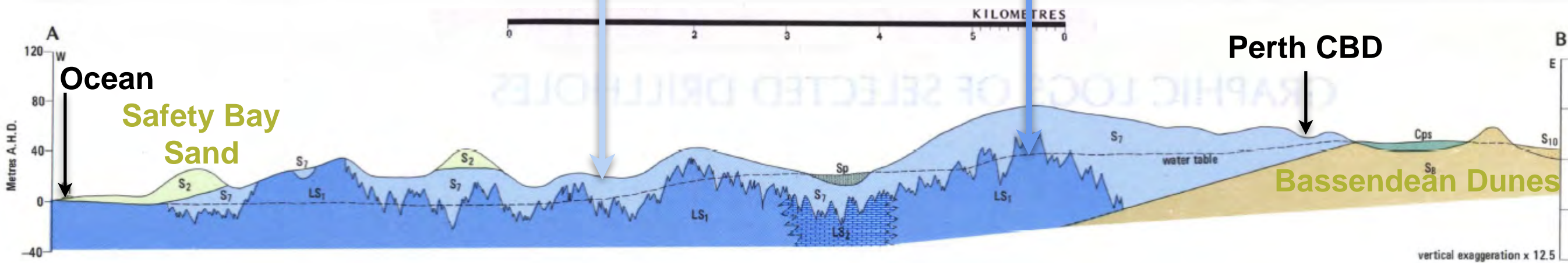
# Tamala Limestone and Sand



Quindalup Dune System

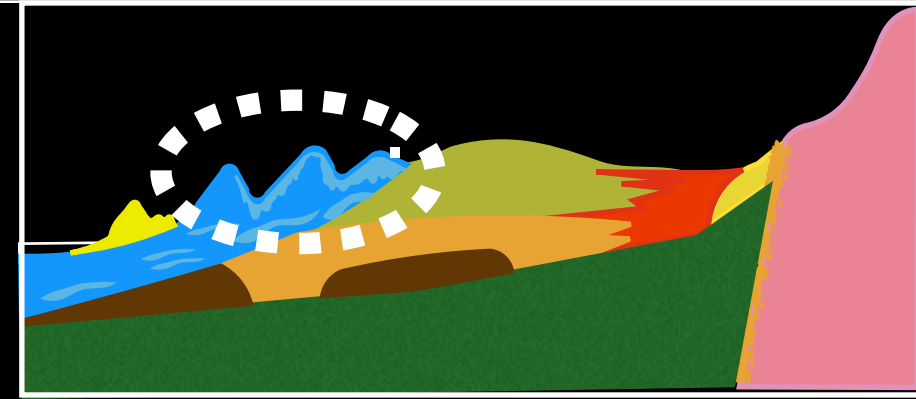
★ Sand derived from Tamala Limestone

★ Tamala Limestone





# Sand from Tamala Limestone





# Tamala Limestone

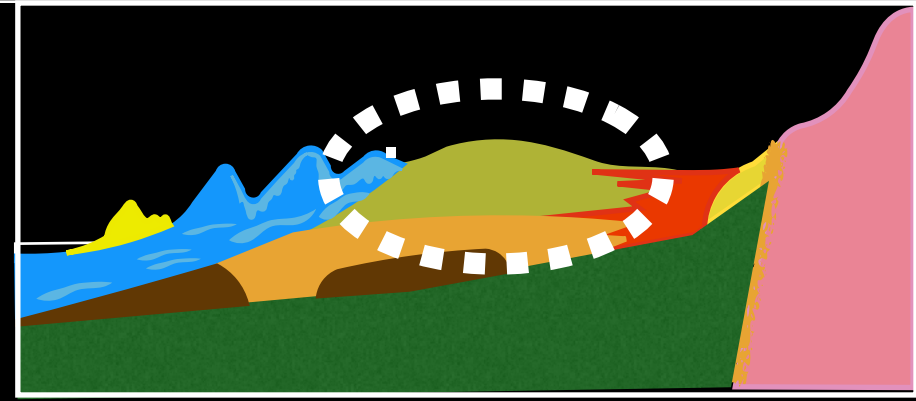


Tamala limestone



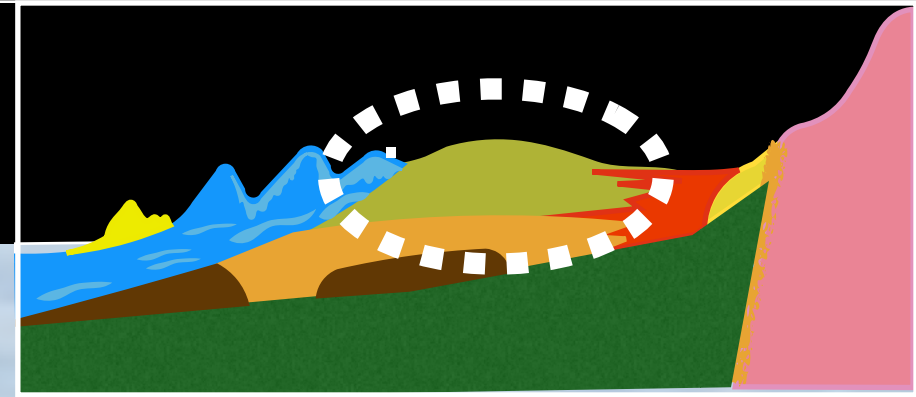


# Bassendeau Sand





# Bassendean Sand



*Sand derived from Tamala Limestone*



*Bassendean Sand*

*Coffee rock*





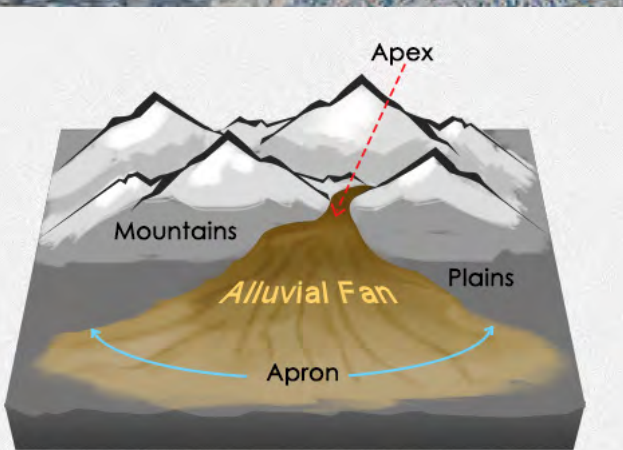
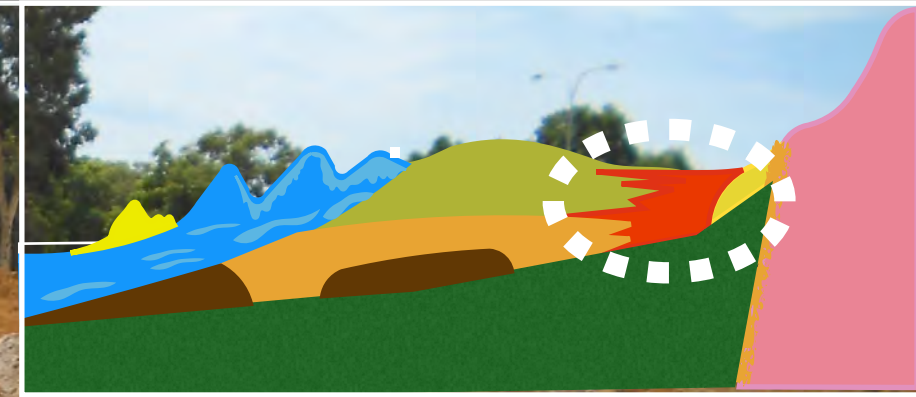
# Guildford Formation

1,000,000 yrs ago  
(model)

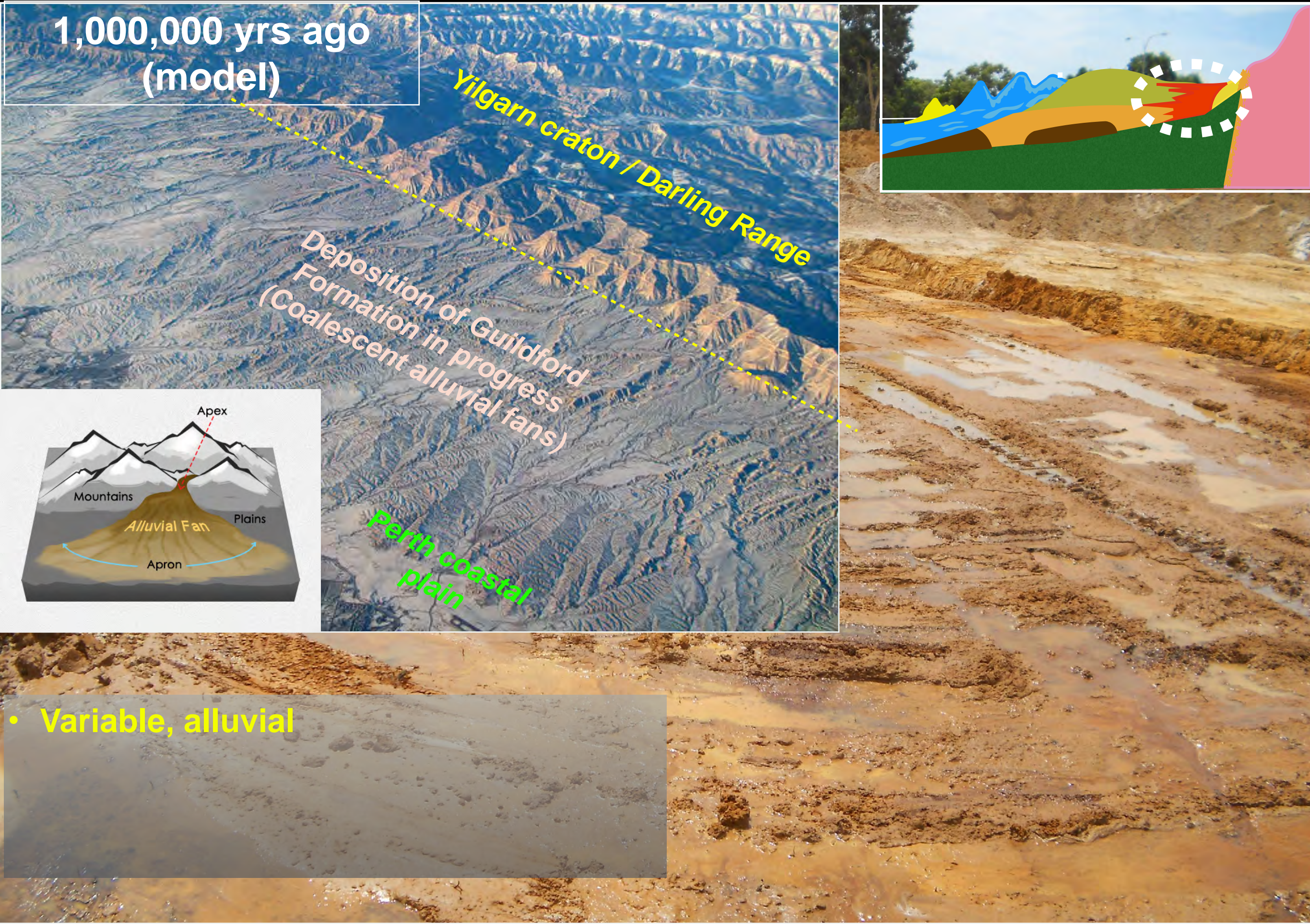
Yilgarn craton / Darling Range

Deposition of Guildford  
Formation in progress  
(Coalescent alluvial fans)

Perth coastal  
plain



- Variable, alluvial



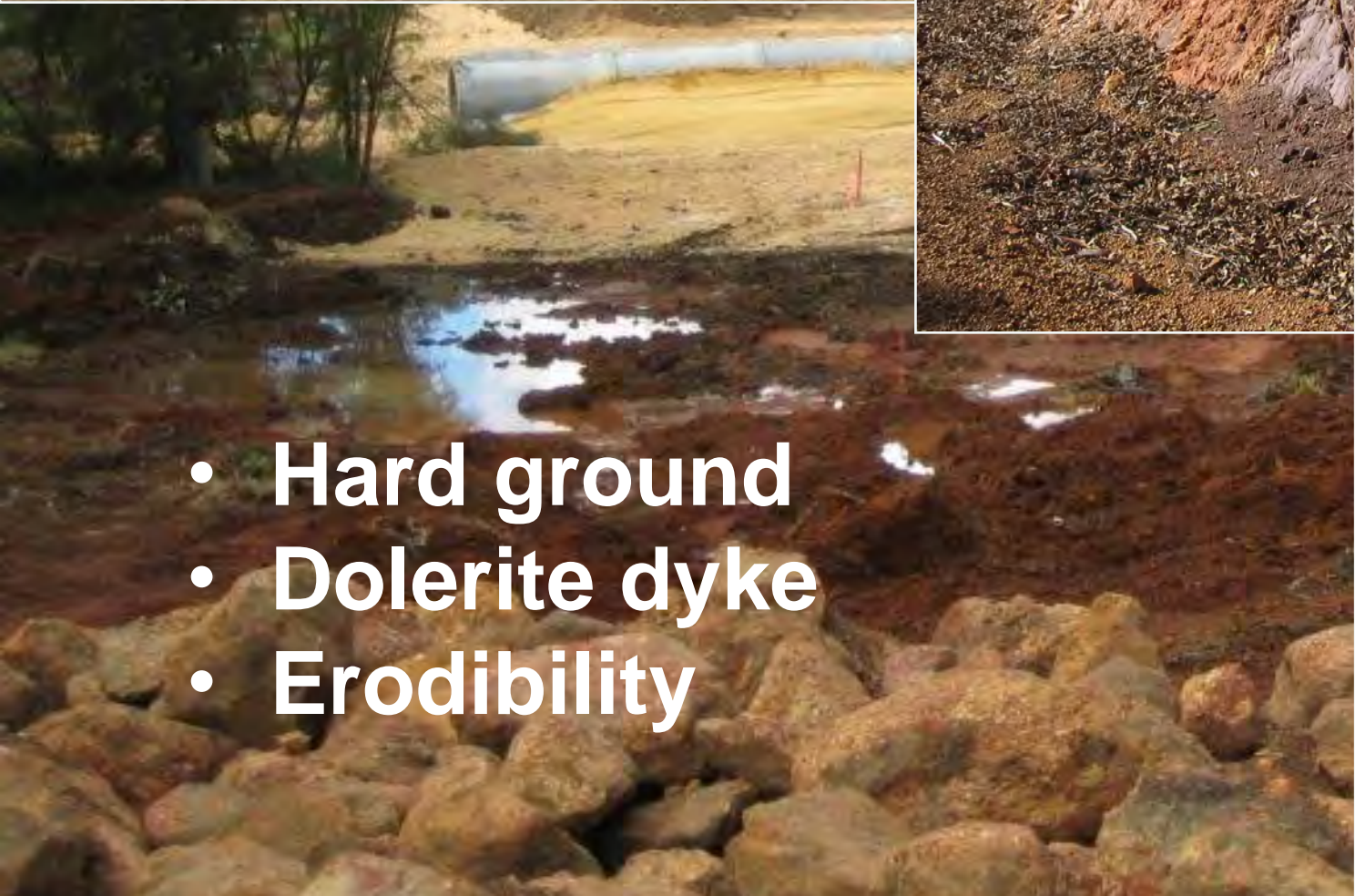
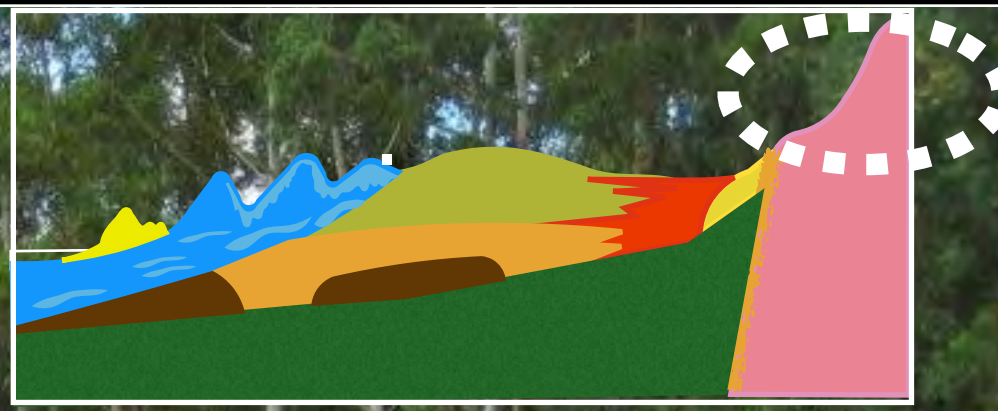


# Guildford Formation



- Variable, alluvial
- Poor trafficability, water management
- Excavation
- Locally blanketed by Bassendean sand

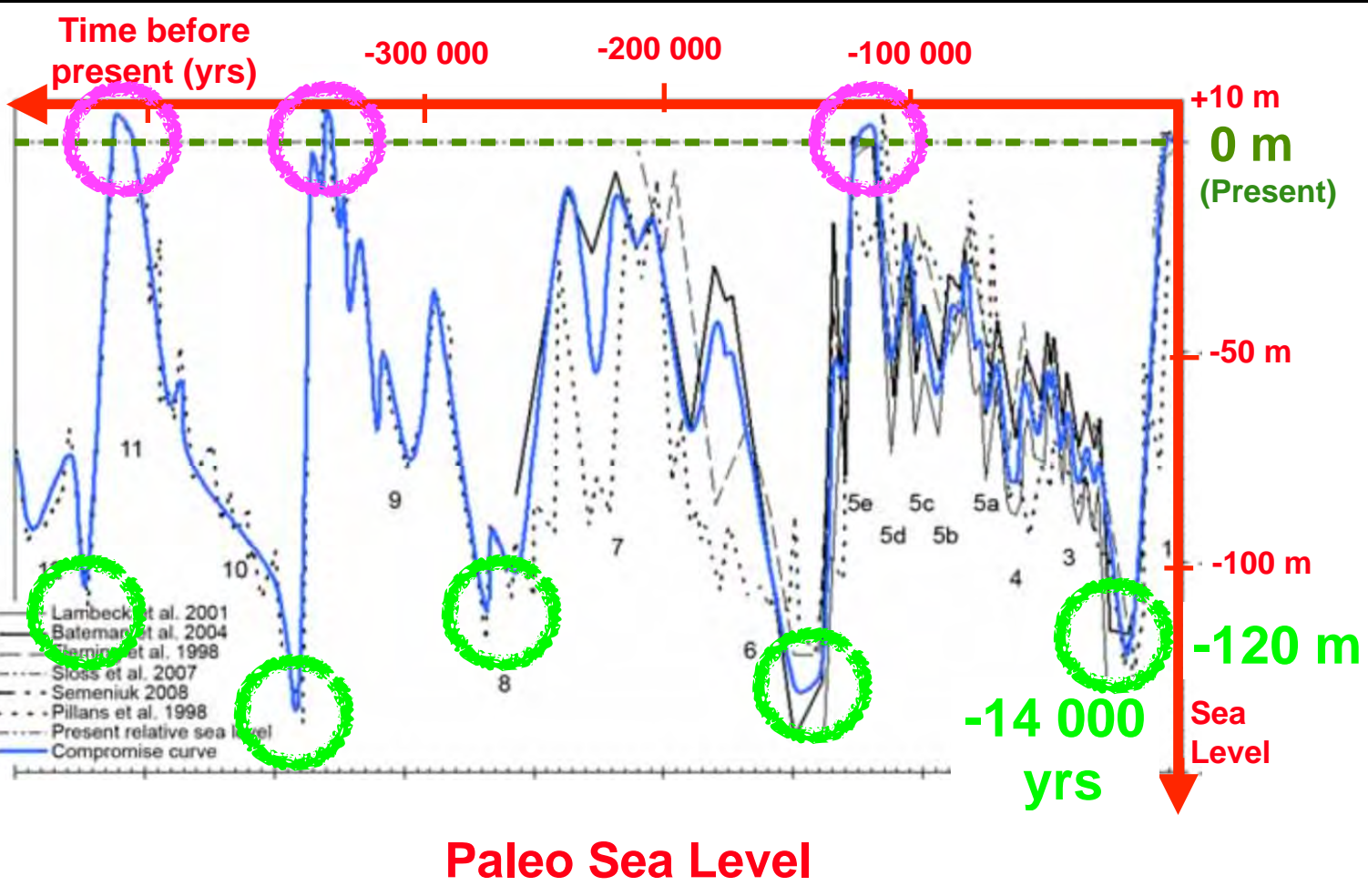




- Hard ground
- Dolerite dyke
- Erodibility



# Sea Level (Fremantle)



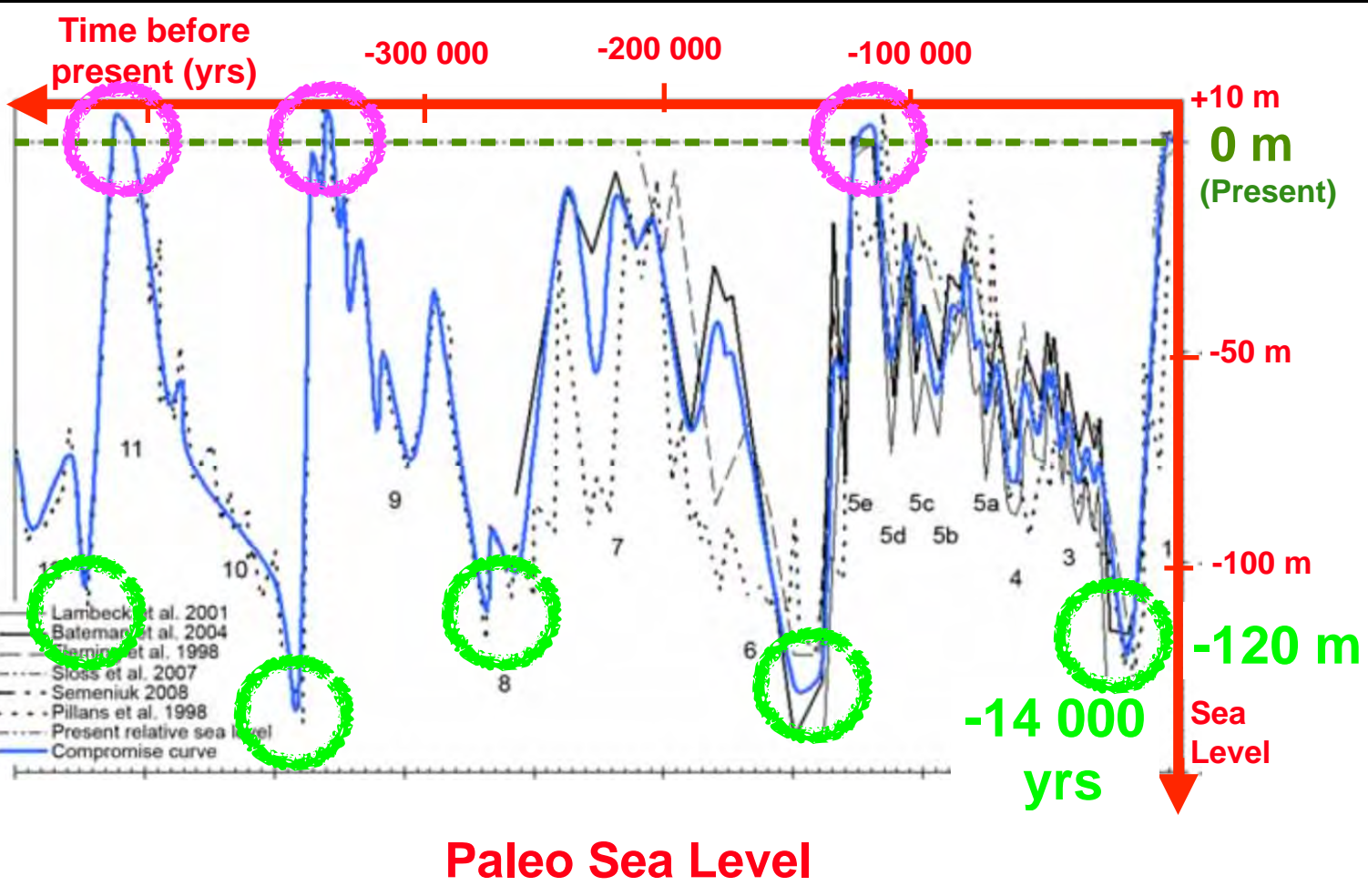
→ Humans in Perth

→ Modern humans on Earth

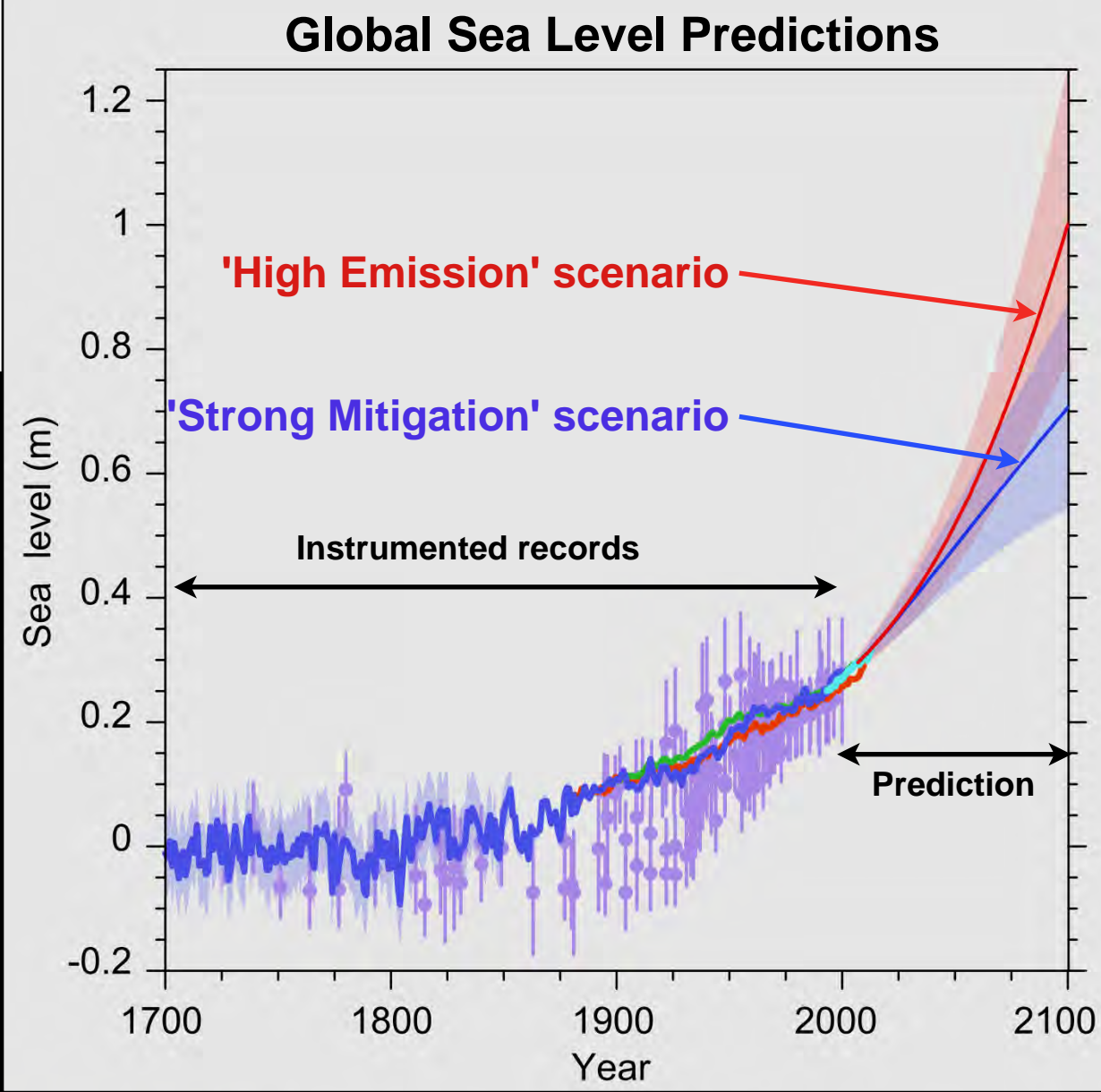
← 164 x earlier (-66 000 000 yrs)  
Extinction of dinosaurs



# Sea Level (Fremantle)



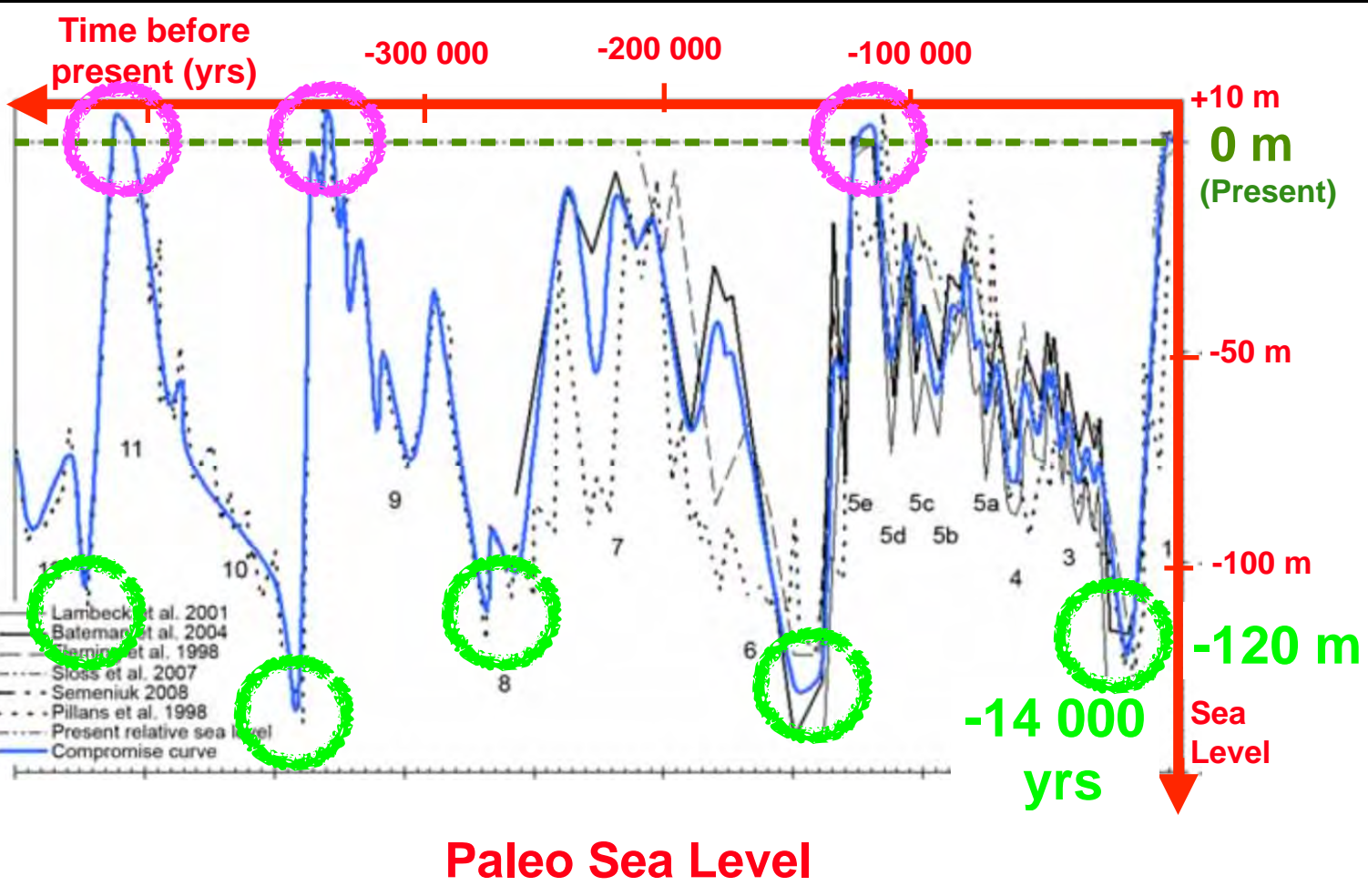
- Fremantle:  
1897-2004: **1.54 mm/yr**  
1992-2010: **4 mm/yr**  
(consistent with global trend)



(Intergovernmental Panel on Climate Change, 2013 )

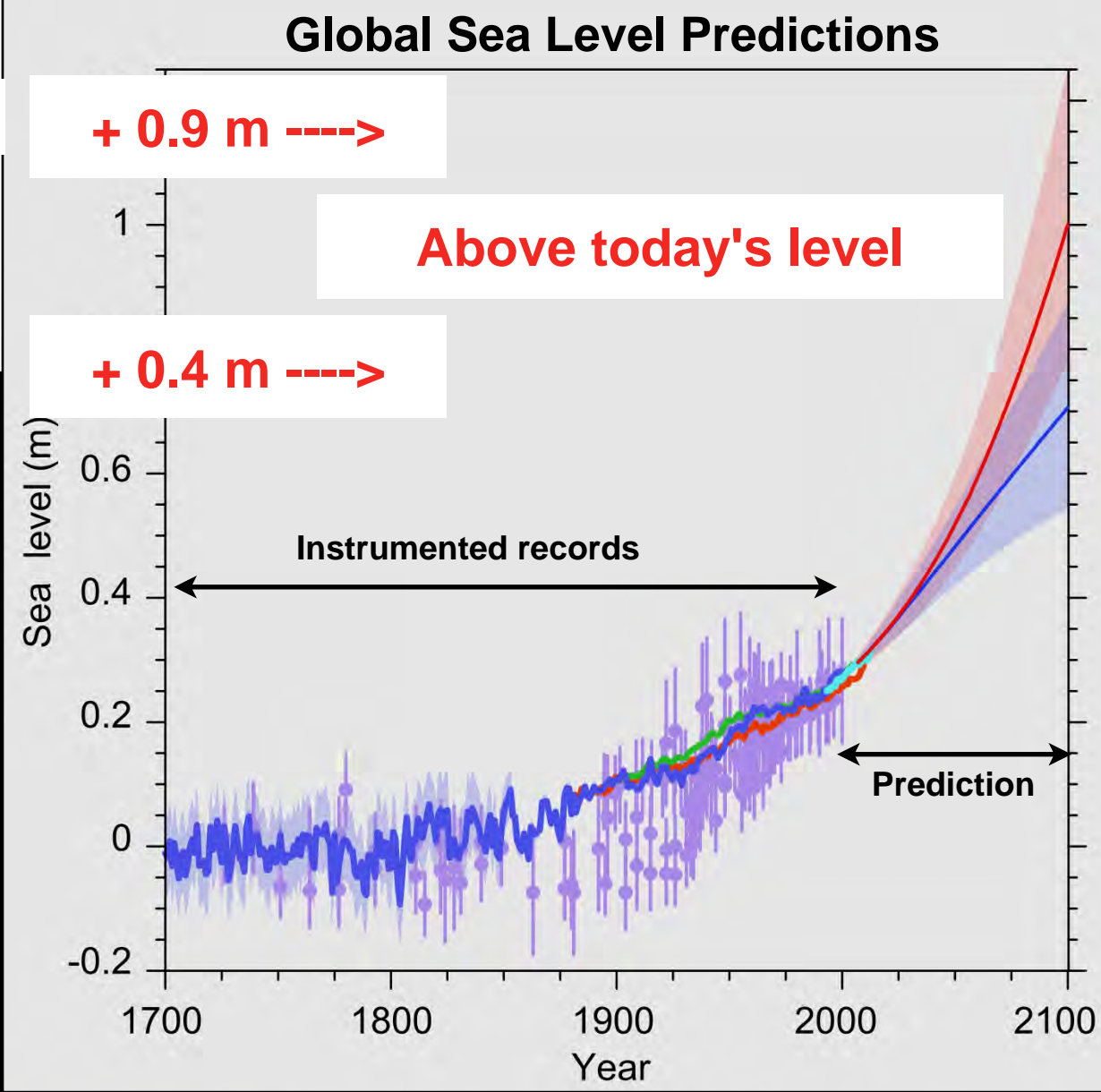


# Sea Level (Fremantle)



- Fremantle:  
1897-2004: **1.54 mm/yr**  
1992-2008: **4 mm/yr**  
(consistent with global trend)

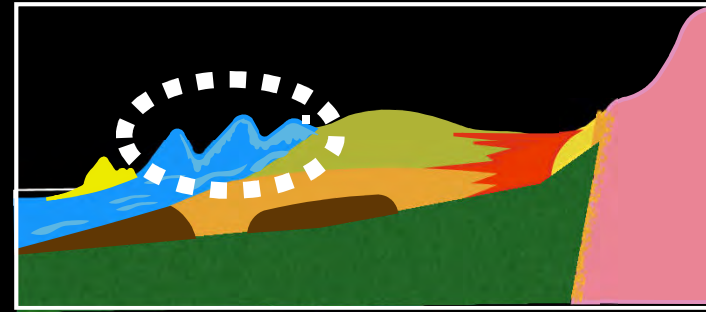
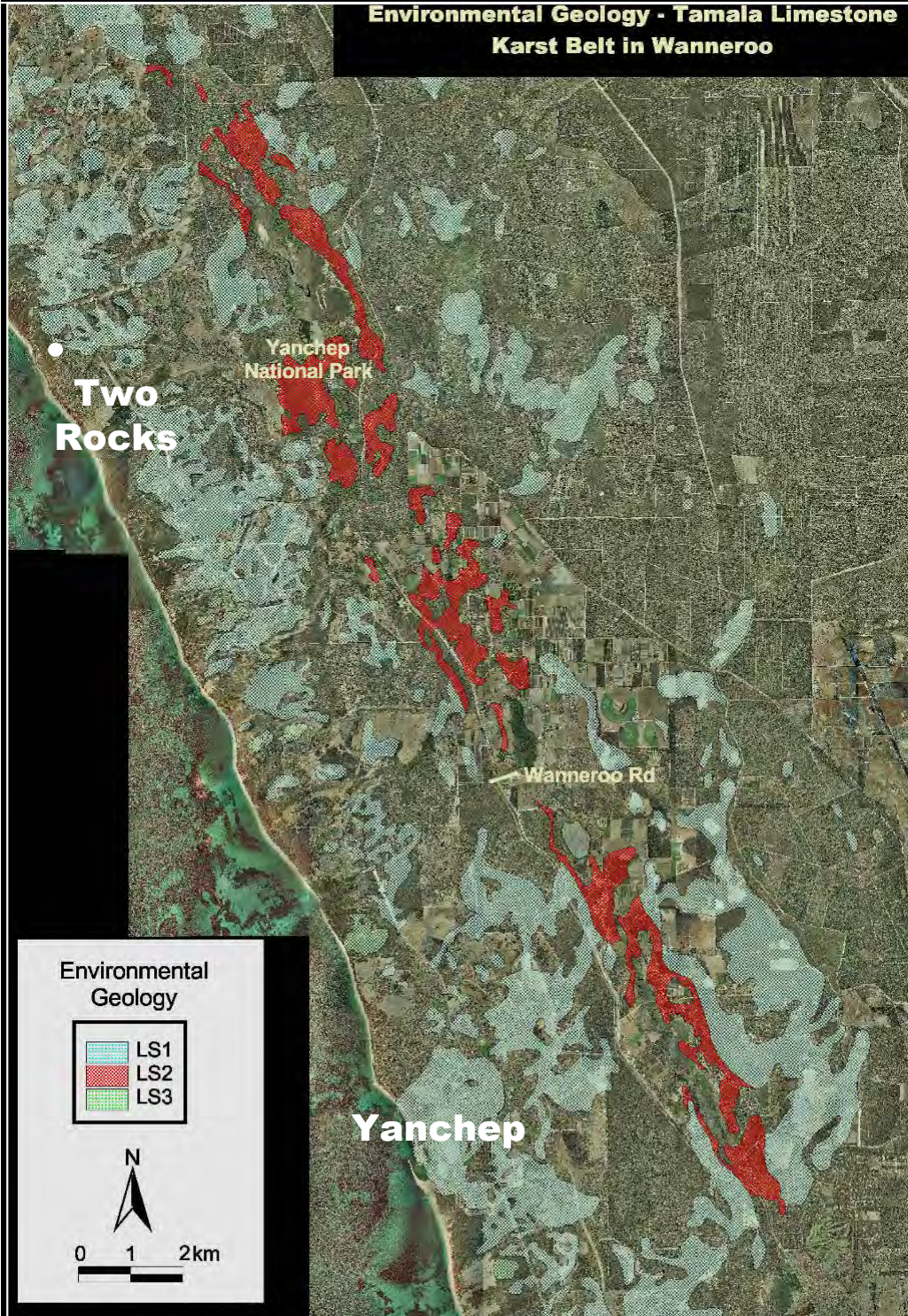
- State Coastal Planning Policy:
  - Until **2010**: **0.38 m** sea rise for **next 100 yrs.**
  - 2013**: **0.9 m** over next 100 years, then **10 mm per year.**
- Excludes extreme water levels.



(Intergovernmental Panel on Climate Change, 2013 )

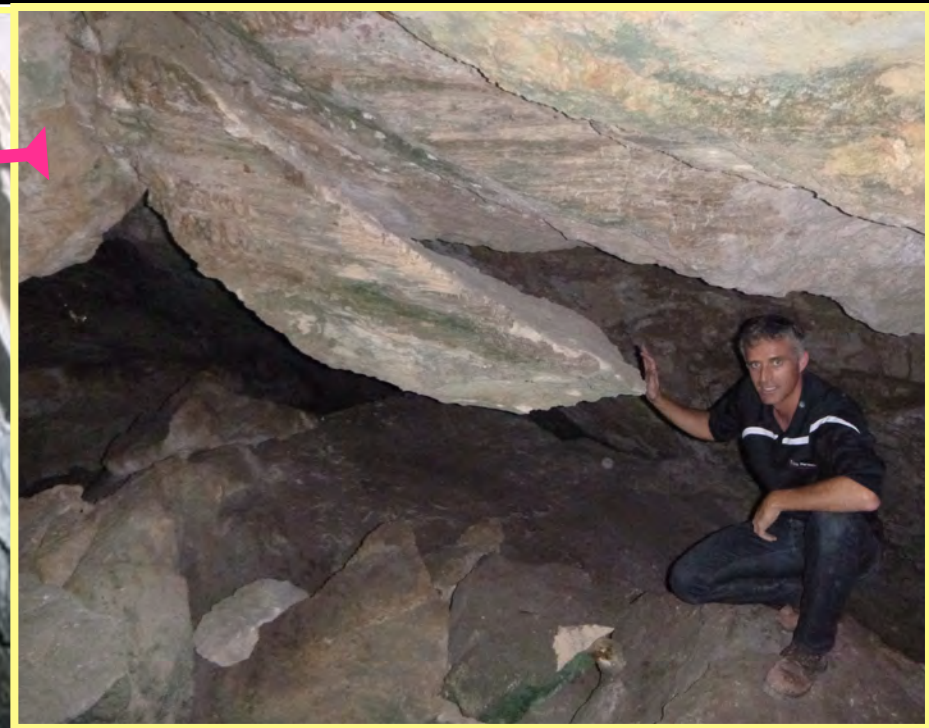
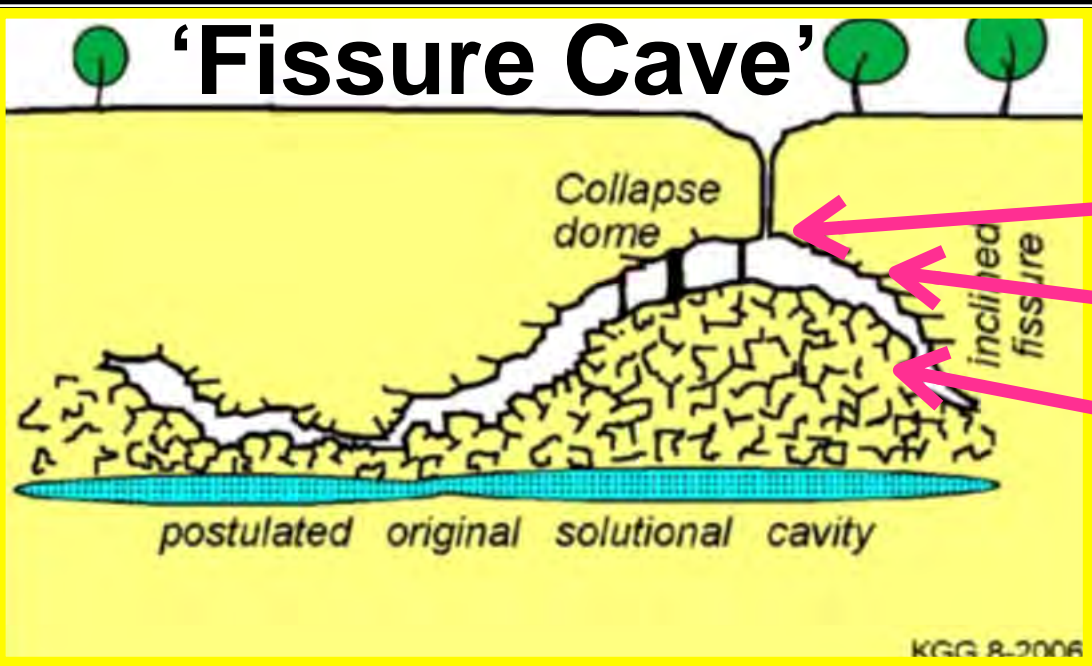


## Environmental Geology - Tamala Limestone Karst Belt in Wanneroo

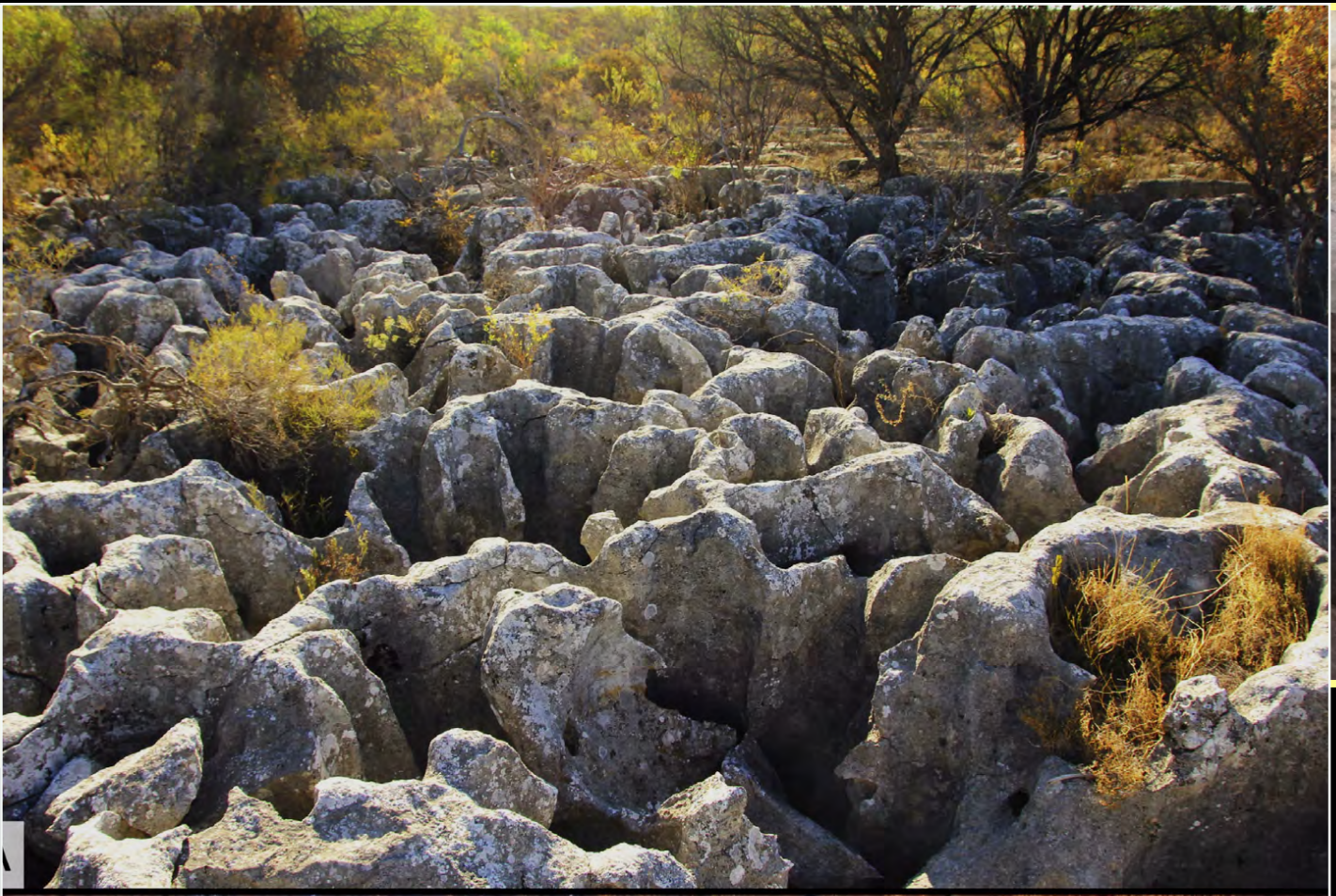
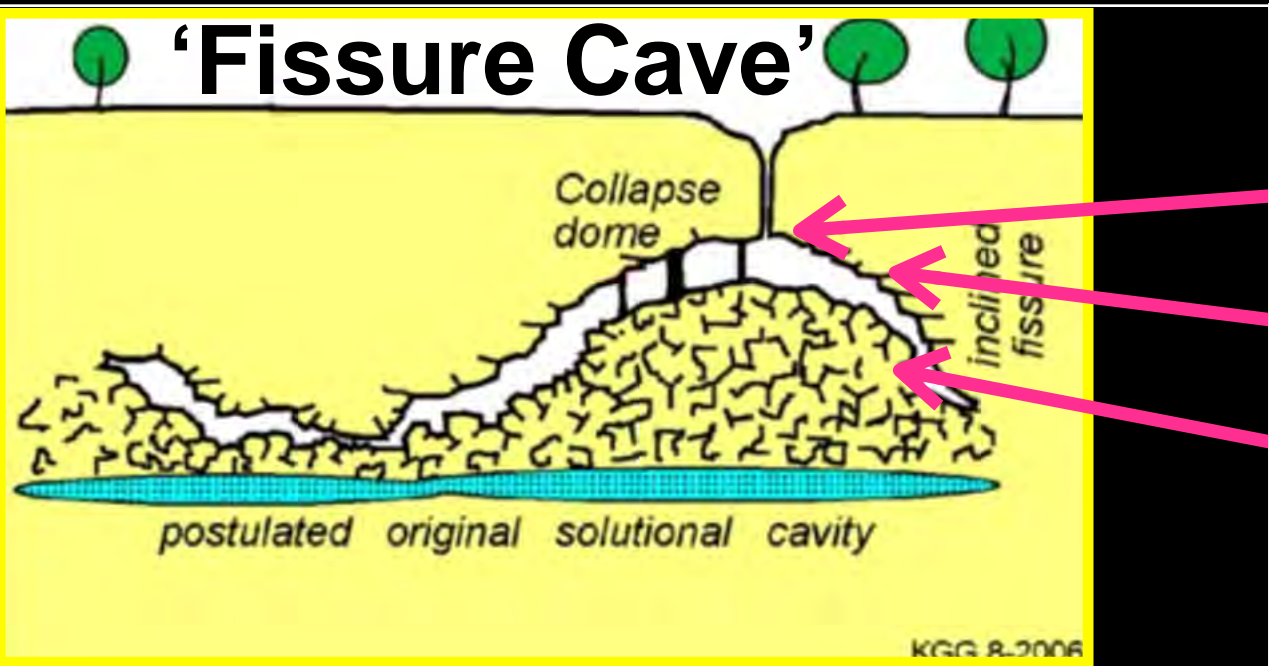


- Cavities occur in high strength limestone.
- Greater risk near groundwater level, in contact with acidic water, specific vegetation.
- City of Wanneroo local Planning Policy 4.13: Caves and Karstic Features

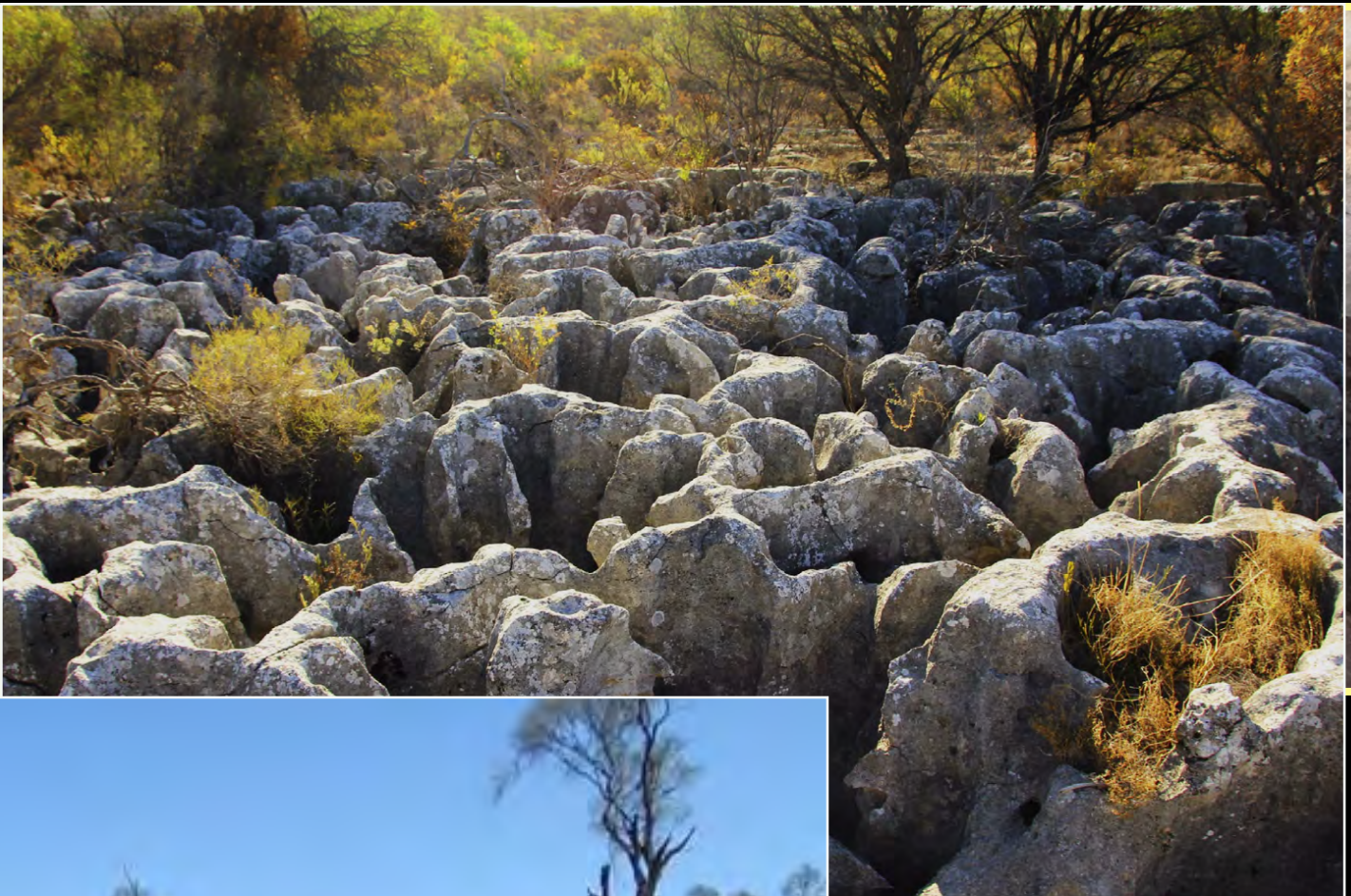
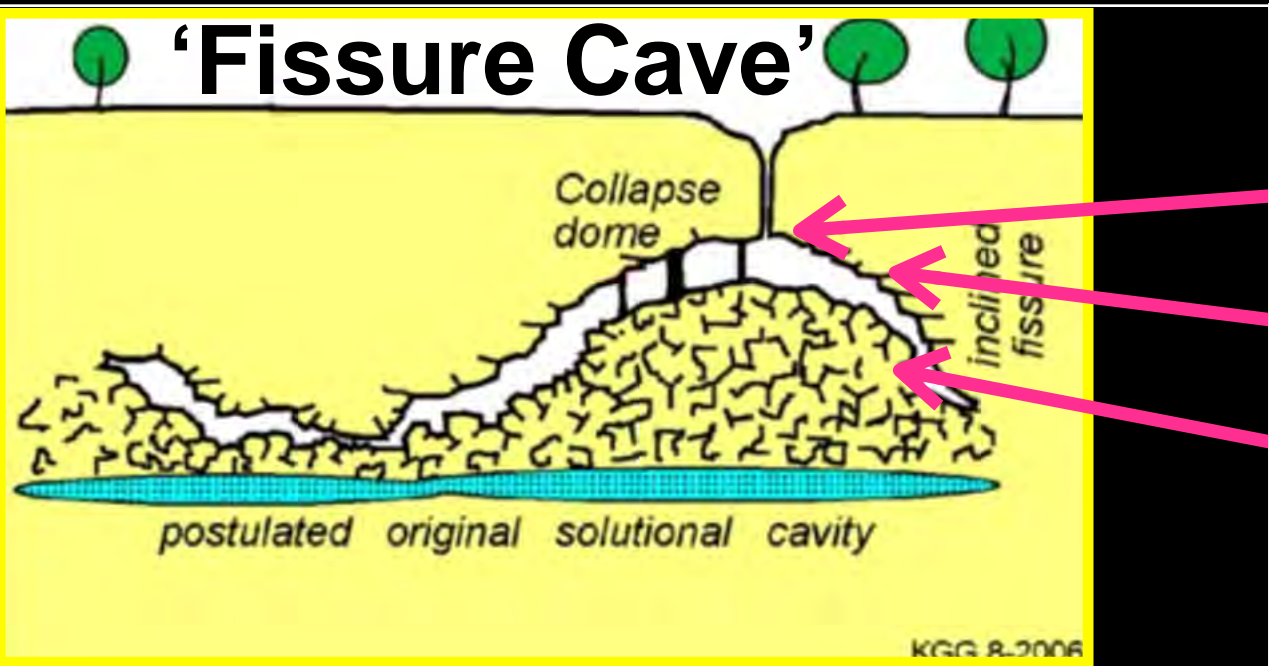






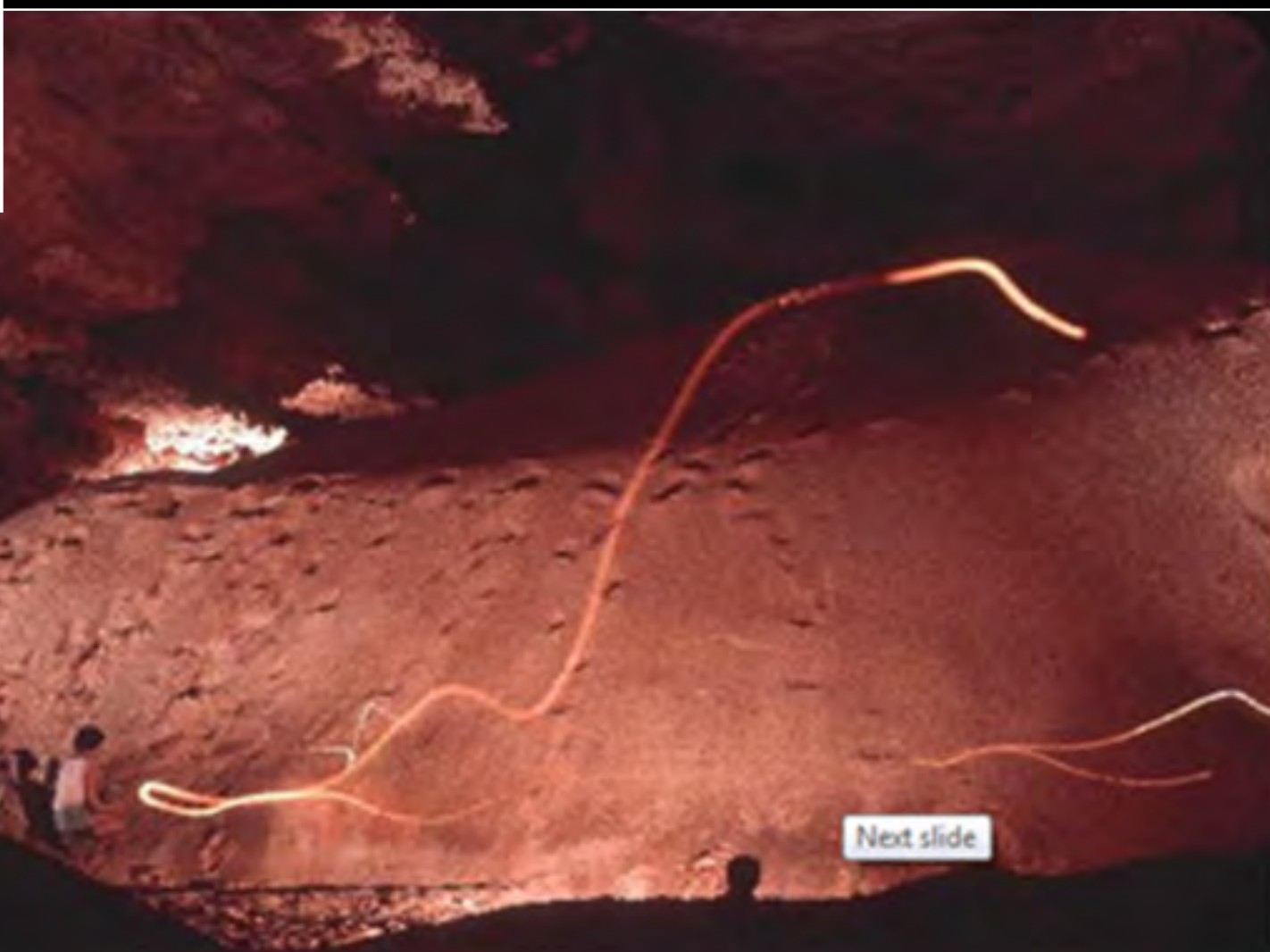
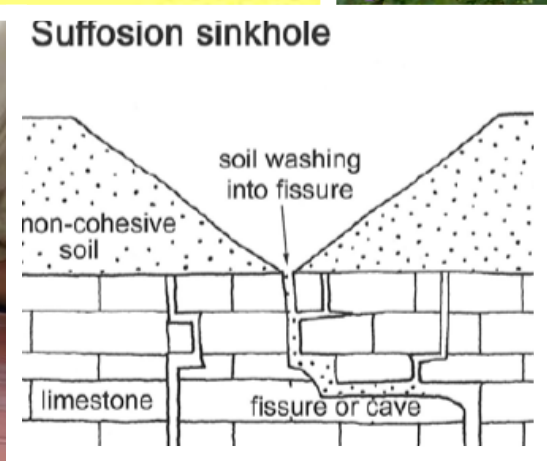
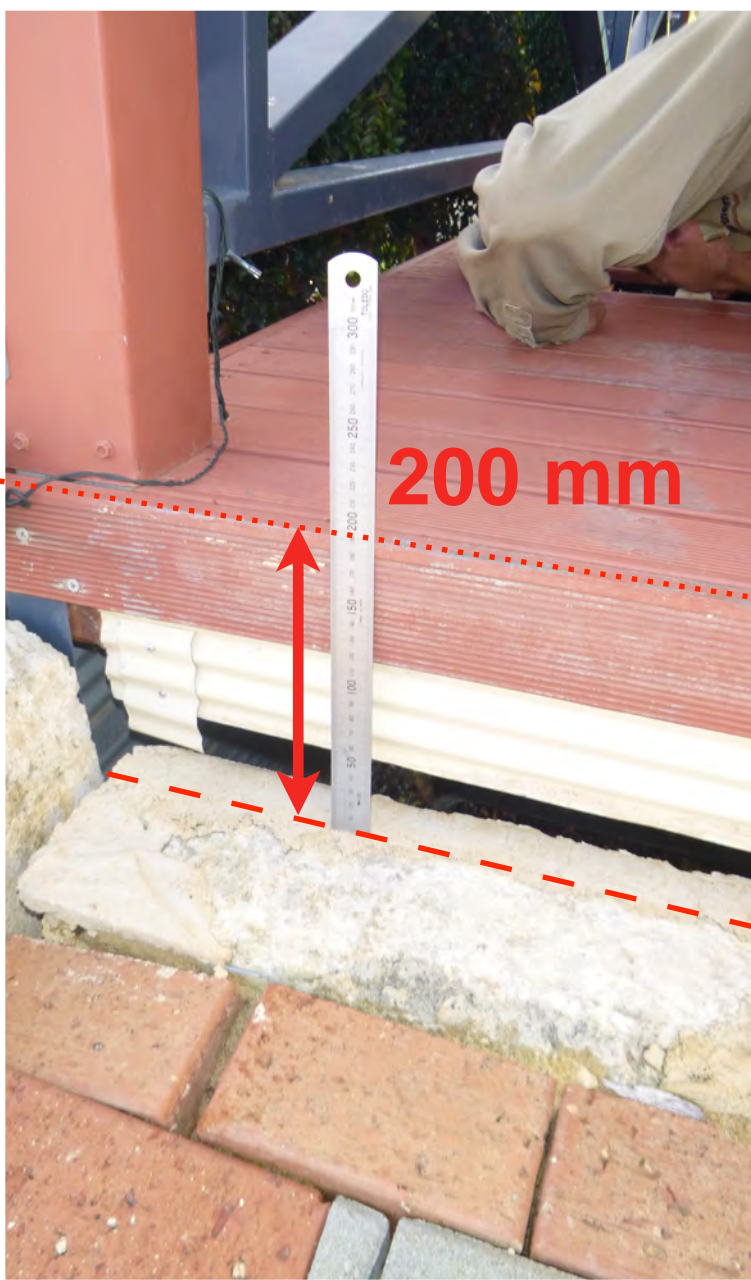
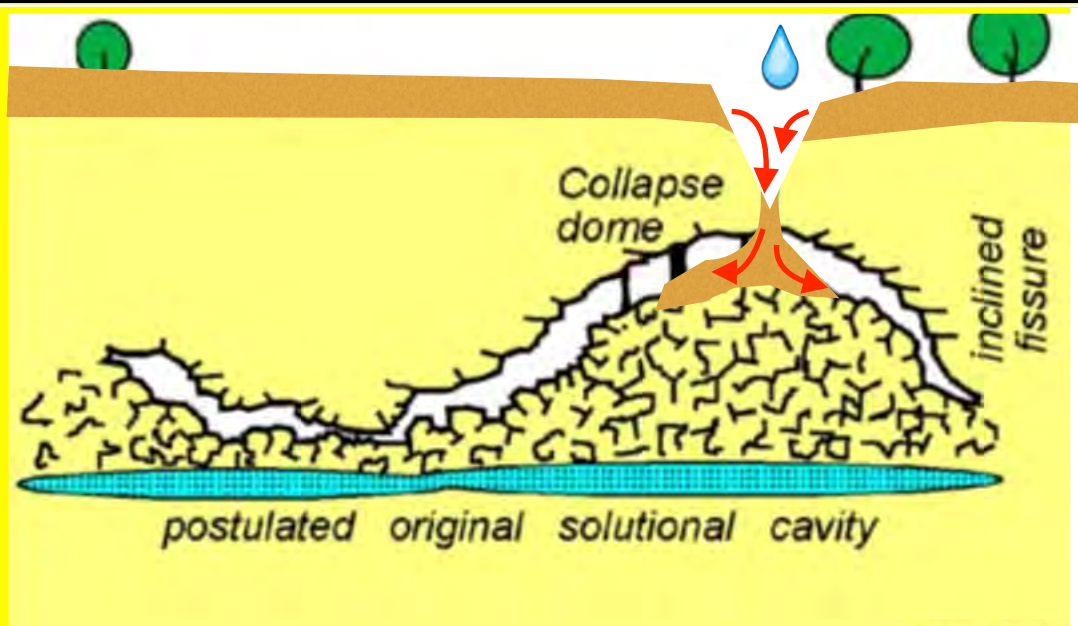








# Tamala Limestone - Karst Risk



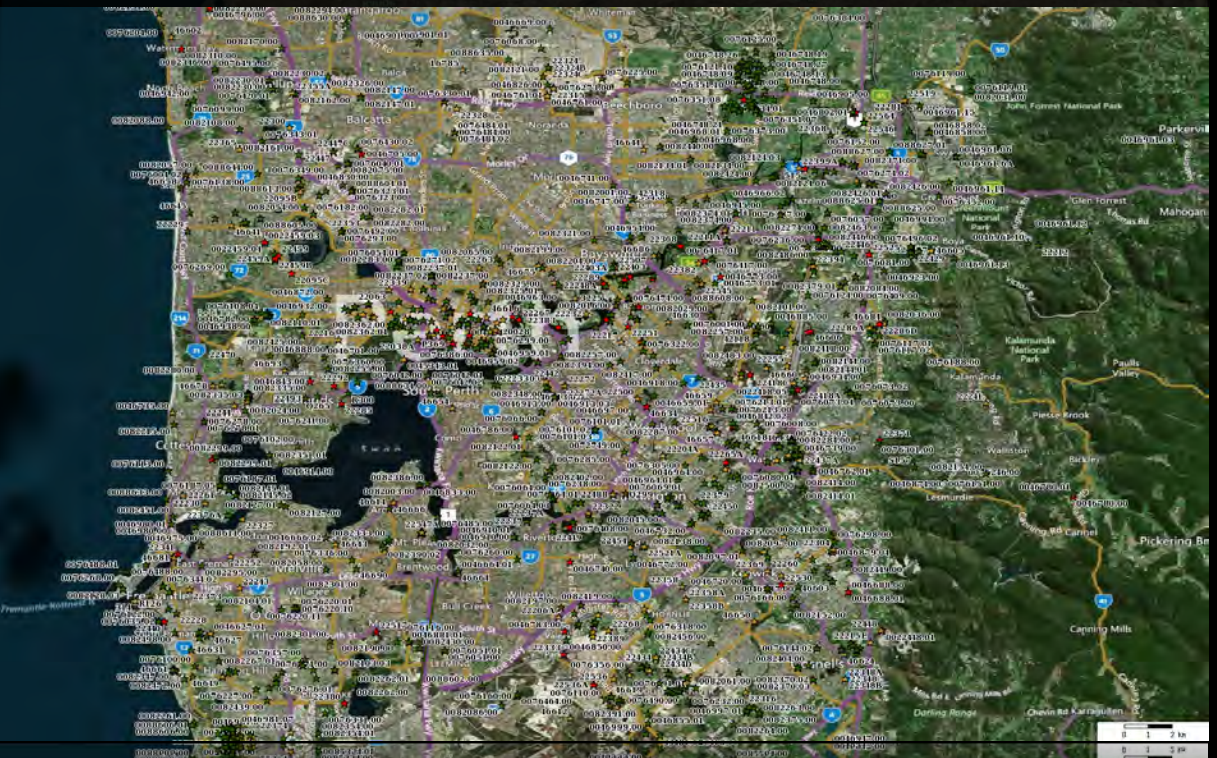




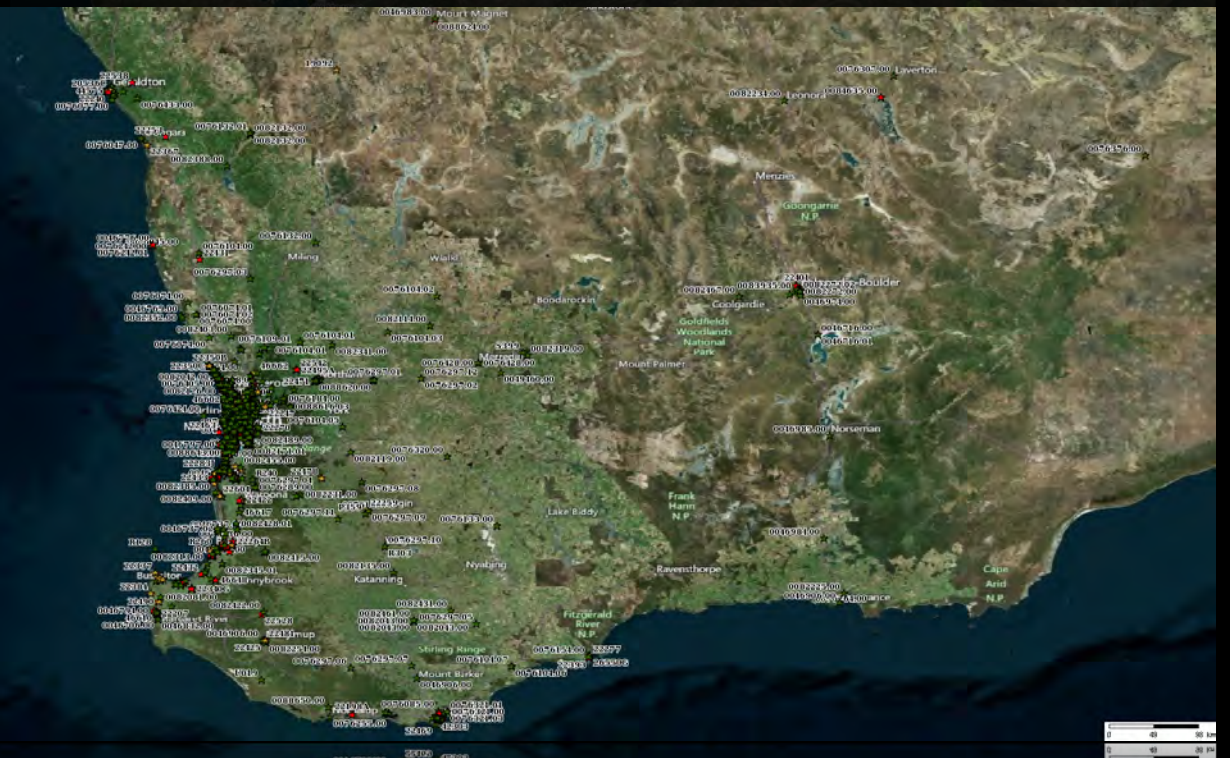
PILBARA



KIMBERLEY



PERTH



SOUTH WEST