

# ALLUVIAL DIAMOND DEPOSITS ACROSS AFRICA – A TRAVELOGUE



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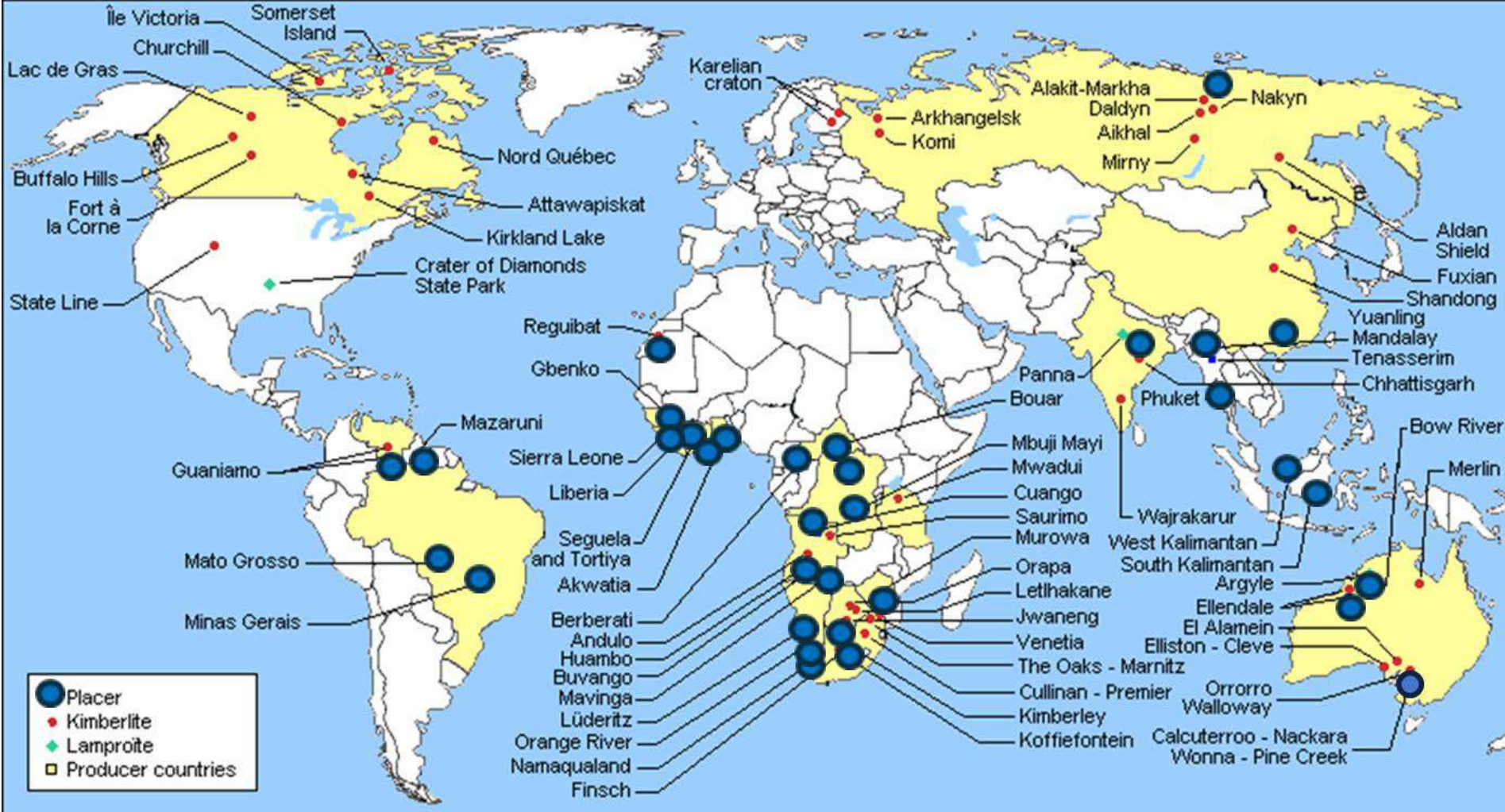
*With contributions from Steve Haggerty, Andy Moore, Renata (Spaggs) Spaggiari, Mike Lynn, Karl Smithson, Paul Nuttall, Kevin Barker, JJ Jacob, Luc Rombouts, Sue Webb, Andre van der Merwe and others*



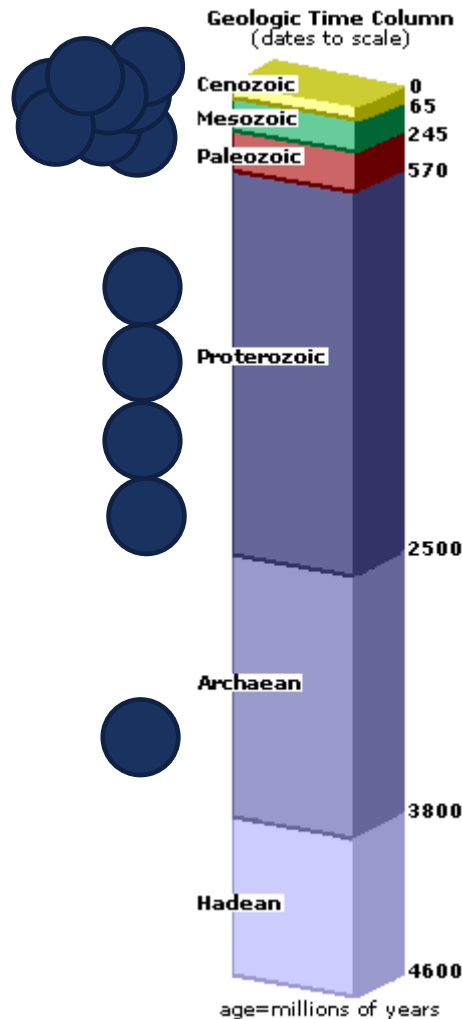


# ALLUVIAL DIAMOND DEPOSITS

## GLOBAL ALLUVIAL PRODUCTION

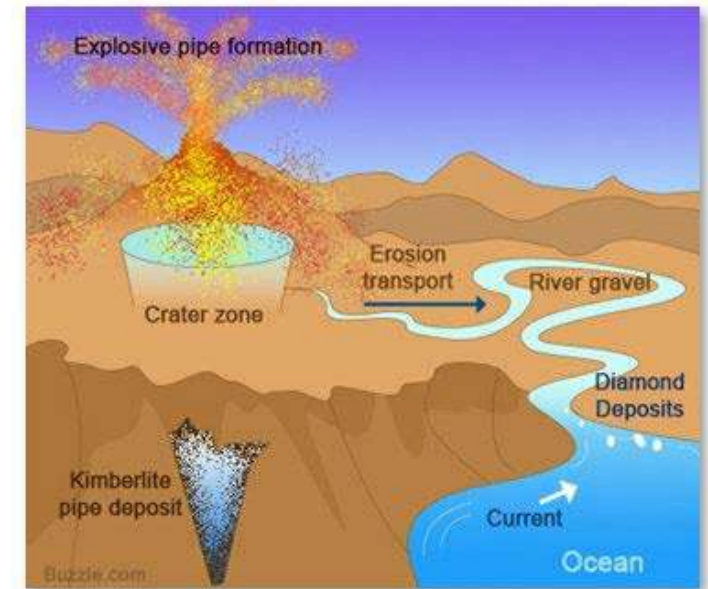


# ALLUVIAL DIAMOND DEPOSITS DEPOSITIONAL AGES/SETTINGS

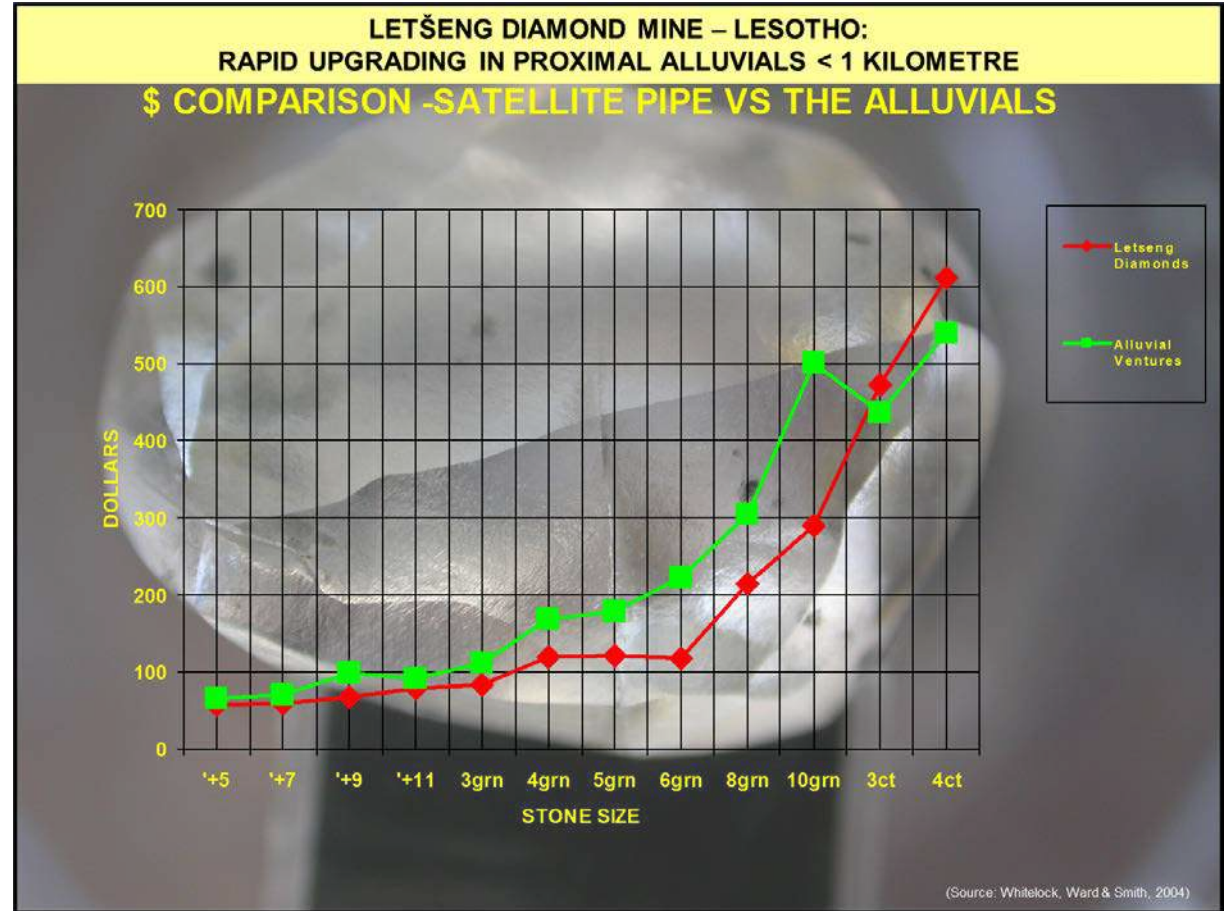
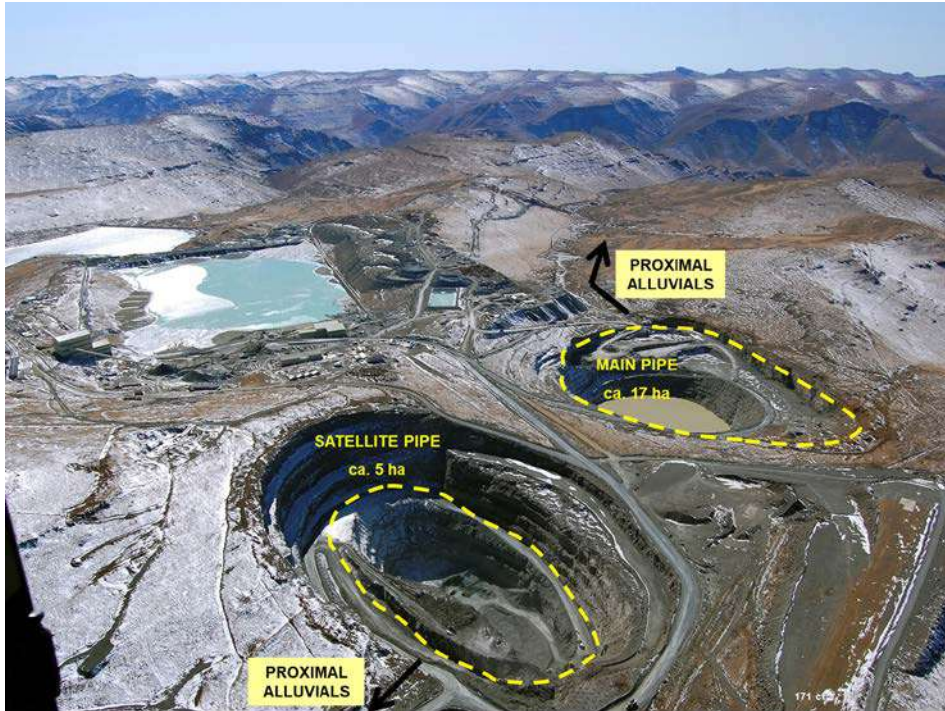


## Depositional Settings

- Proximal to Primary Source
- Inter/Intra Cratonic Basins
- Fluvial
- Other
  - Glacial
  - Karstic Sinkholes
  - Deflation (Colluvial/Eluvial)







# PROXIMAL TO SOURCE

- ❖ CRATON: PRIMARY SOURCES
- ❖ DRAINAGES CAN BE ACTIVE OR PASSIVE
- ❖ RAPID (VALUE) UPGRADING IN PROXIMAL ALLUVIALS





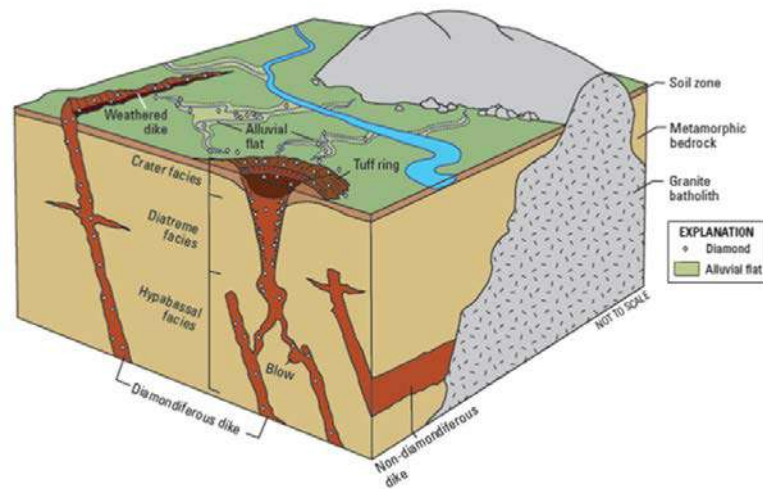
# CÔTE D'IVOIRE SÉGUÉLA



Toubabouko Dyke (Eluvial deposits)



Terrace deposits



Floodplain deposits





# DEMOCRATIC REPUBLIC OF CONGO

## MBUJI MAYE



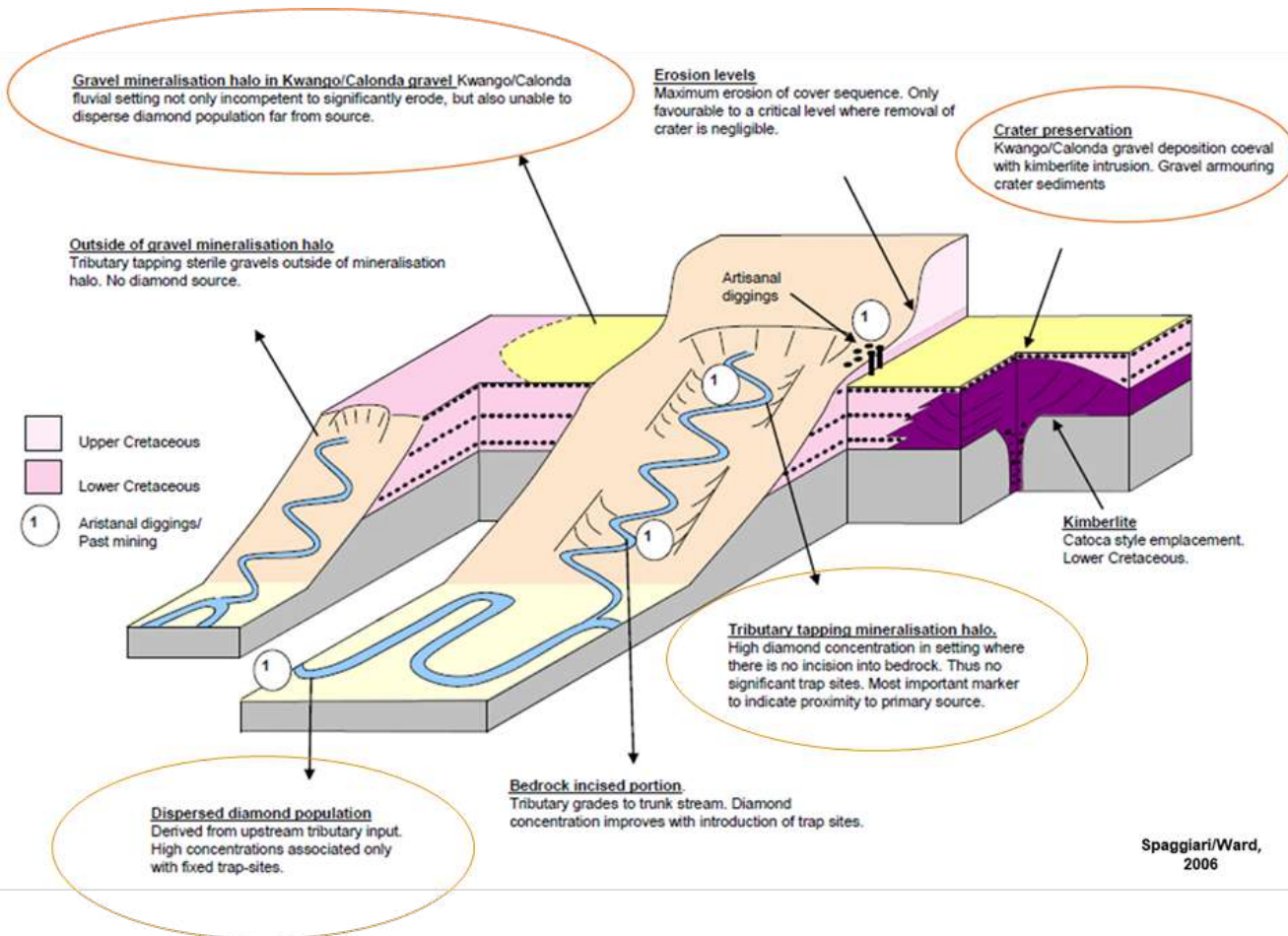
- Eluvial (karstic) gravels
- Alluvial terraces on Sankuru River







# ANGOLA CALONDA FORMATION



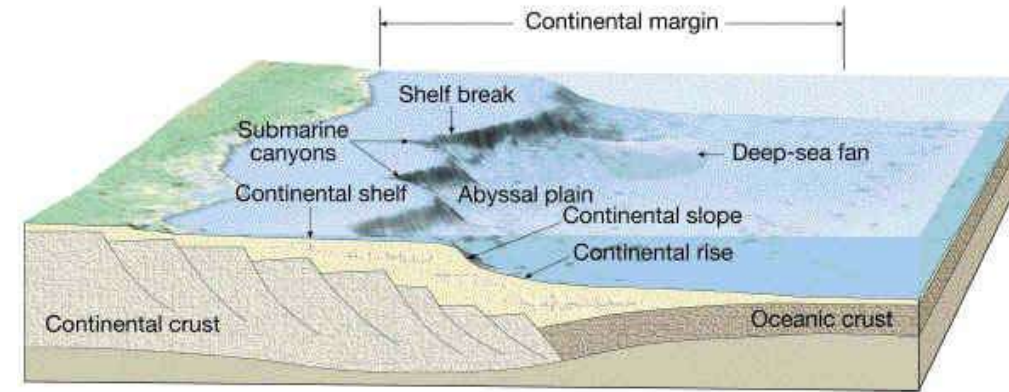
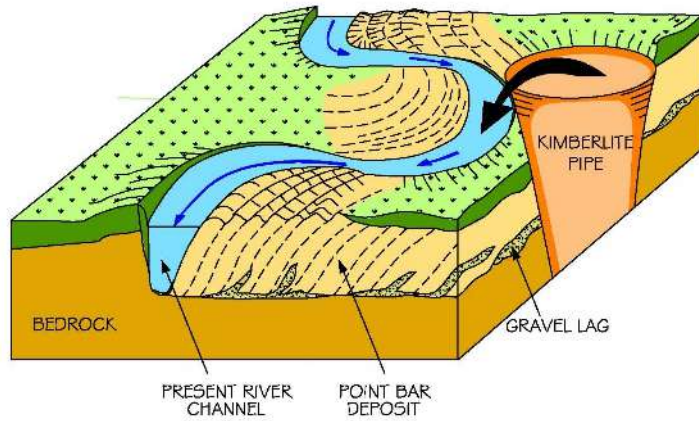




# TANZANIA MWADUI







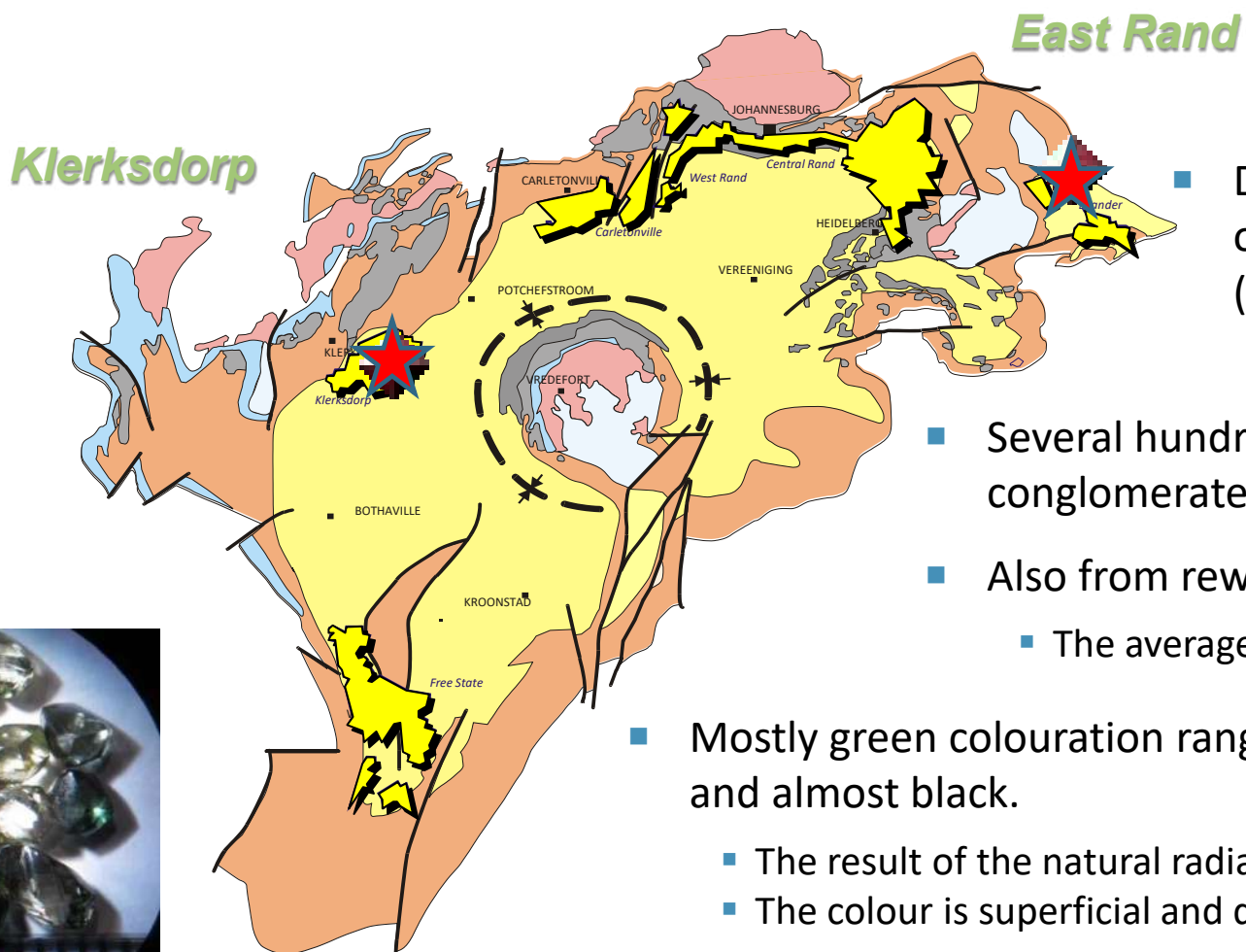
# INTER/INTRA CRATONIC BASINS

- ❖ CRATON / CRATON MARGIN: PRIMARY SOURCES & RETAINED PLACERS
- ❖ DRAINAGES OFF CRATON INTO INTER / INTRA-CRATONIC BASIN
- ❖ TERMINAL PLACERS AT / DOWNSTREAM FROM FLUVIAL INPUTS REWORKED BY LONGSHORE DRIFT INTO LITTORAL DEPOSITS AT PALAEO-STRANDLINE ELEVATIONS





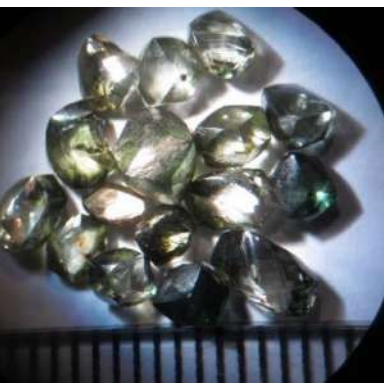
# SOUTH AFRICA WITWATERSRAND



- Diamonds recovered historically from sediments of the Upper Witwatersrand conglomerates (2.7-2.9Ga)

- Several hundred carats have been recovered from the conglomerates of the East Rand and Klerksdorp
- Also from reworked younger alluvials (Klerksdorp district).
  - The average size 0.1-1.5ct; Largest stone 10ct.

- Mostly green colouration ranging from a nuance of green to bottle green and almost black.
  - The result of the natural radiation by uraninite and uranothorite.
  - The colour is superficial and disappears during cutting







# CÔTE D'IVOIRE TORTILLA

- Diamondiferous conglomerates confined to the basal formation of the Birimian Sequence (2.3Ga)
  - Ancient beach placers
- *Reworked younger alluvials*
- Diamonds are small (4-18st/ct)
  - Green colouration
  - U pigmentation spots
- Unknown source rocks
  - Graphite/actinolite schists ?







# GHANA BONSA

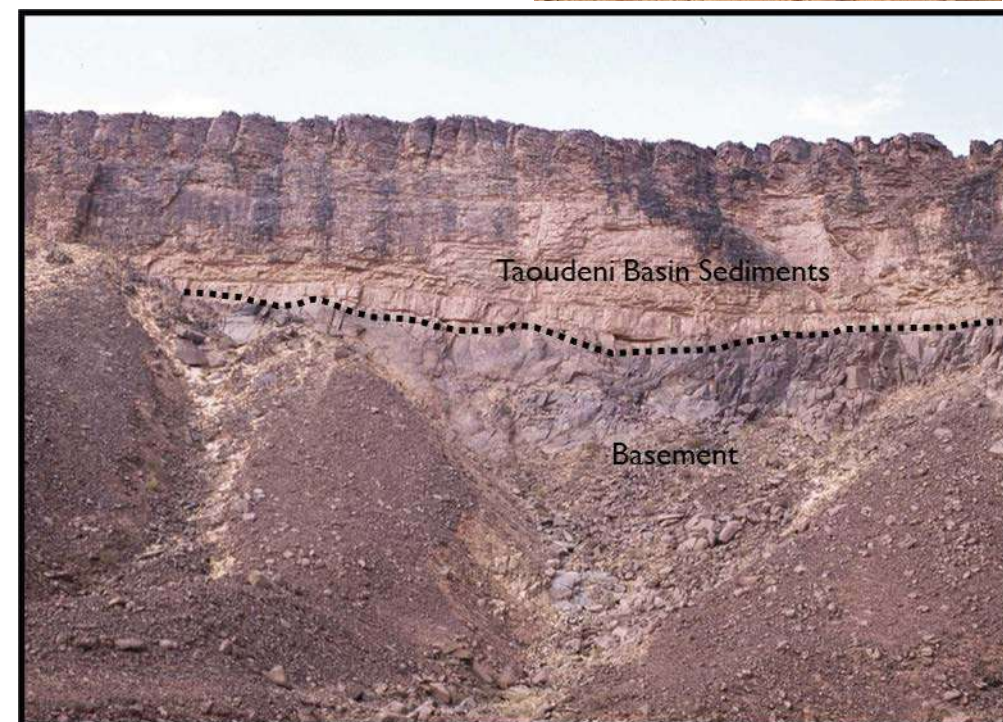
- Diamonds recovered as a by-product from Tarkwa Au palaeo-placer (2.1-2.0Ga) along Ashanti Belt
  - Banket Group conglomerates (red coloured, commercial Au producers)
  - Kavere Group conglomerates with higher diamond content (continental basal sequence)
- Produce *rich placers in the younger rivers*
  - Grades of 7-27cpt
- 10Mct recovered since 1919
- Diamonds are small (40st/ct) and low quality
  - Brown, grey, yellowish, green or black colours
  - Source: graphite/actinolite schists?





# MAURETANIA TAOUDENI BASIN

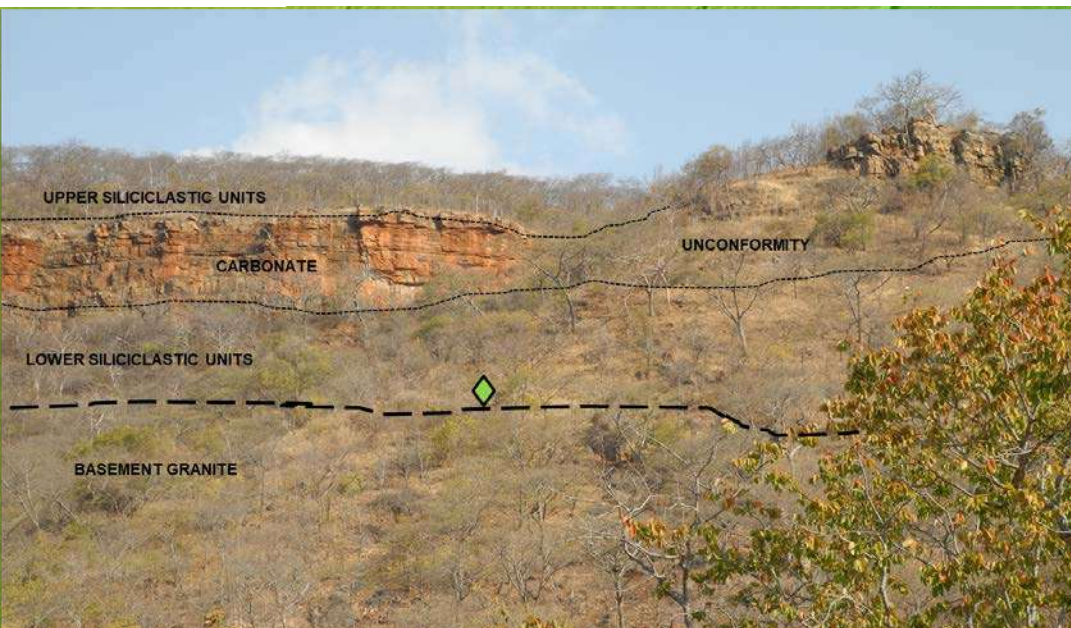
- Taoudeni basin covers large parts of Mauritania, Northern Mali and even extends into Southern Algeria
  - Intracratonic basin (1.6-1.0Ga) on the Requibat Craton
  - Known kimberlites (21) very low grade / barren
  - Sand-sized diamonds ( $\pm 1,000\text{st}$ ) and G10 garnets recovered at various localities in the Sahara
  - Deflation grains presumed derived from weathering of basal Taoudeni Formation



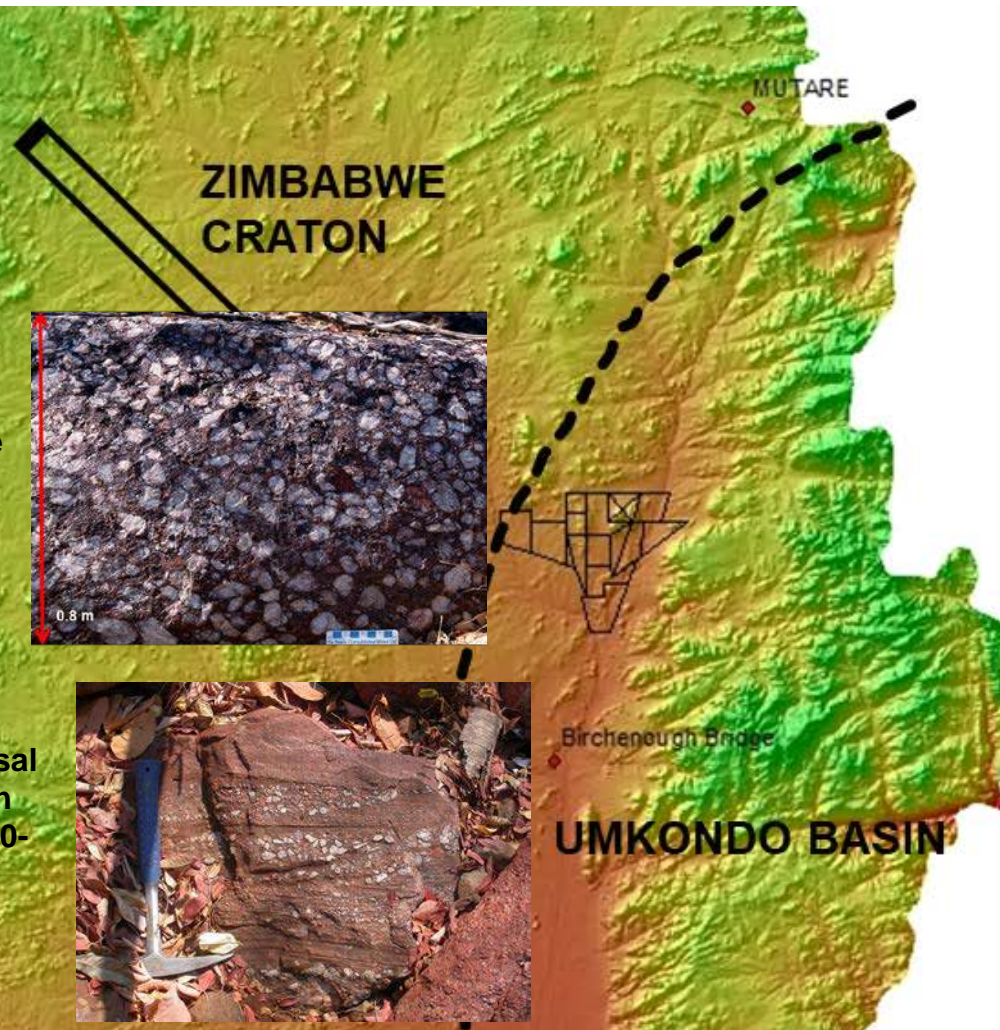




# ZIMBABWE MARANGE



Thick (0.6 – 1 m) cobble basal conglomerate on margin,  
2,000 – 8,000 cpht  
(USD50/ct)



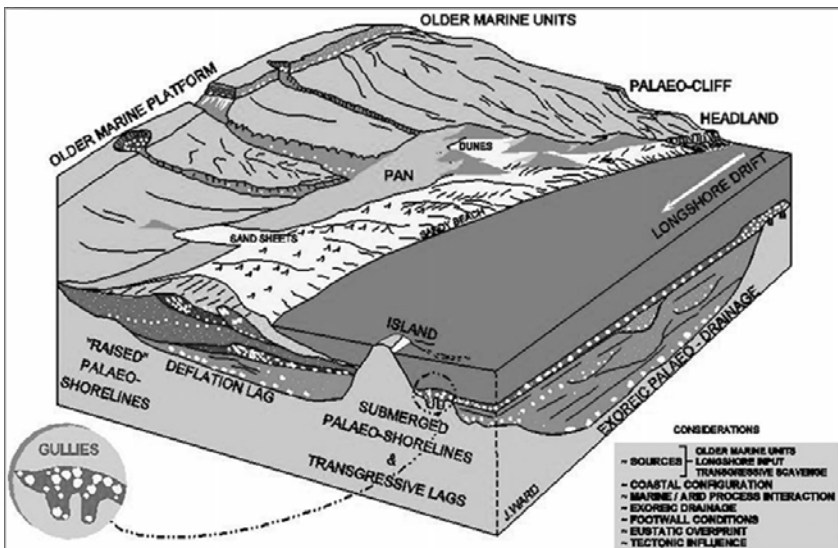
Thin (<0.1 m) basal conglomerate in basin, grades 250-2,000cpht



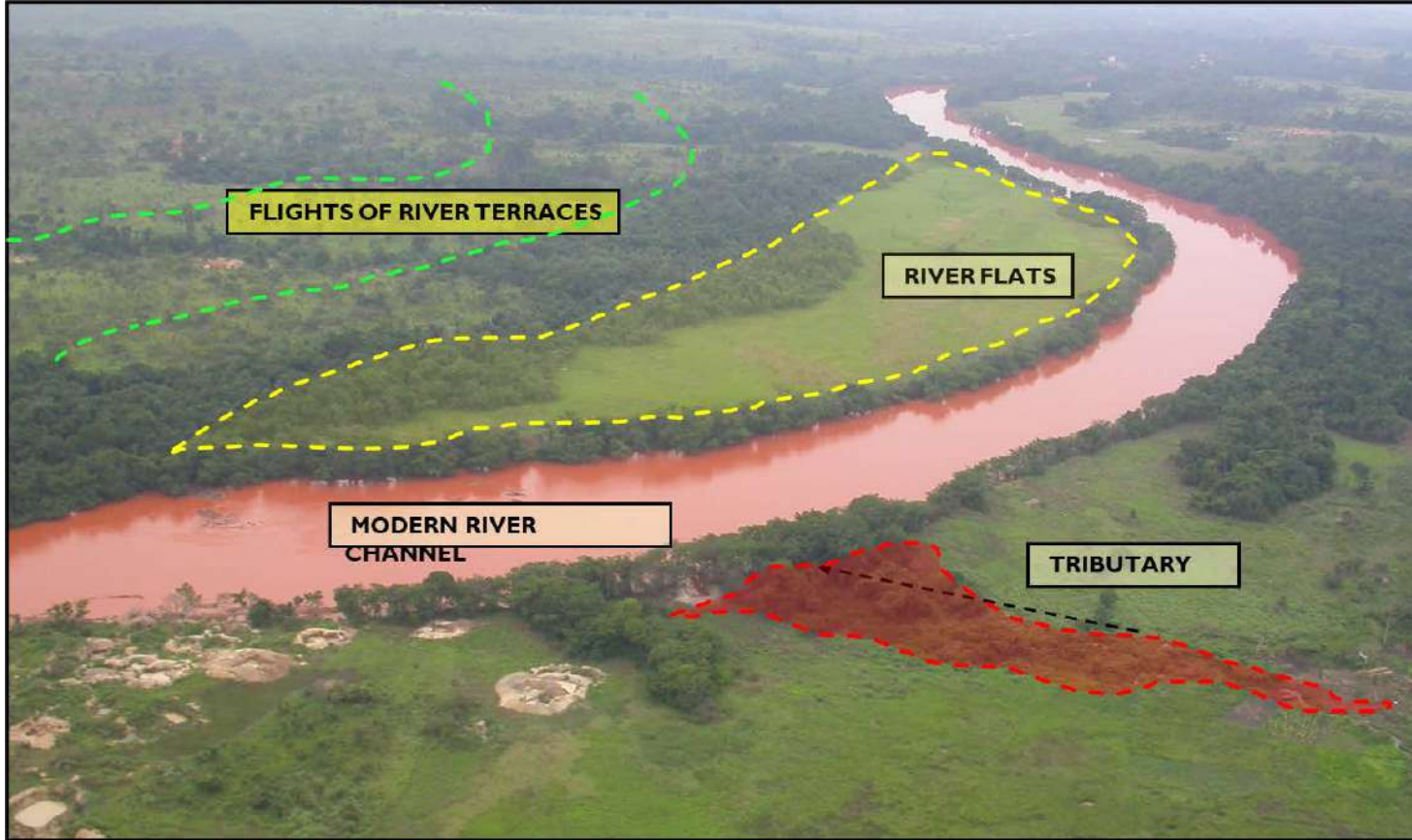




# NAMIBIA/SOUTH AFRICA WEST COAST







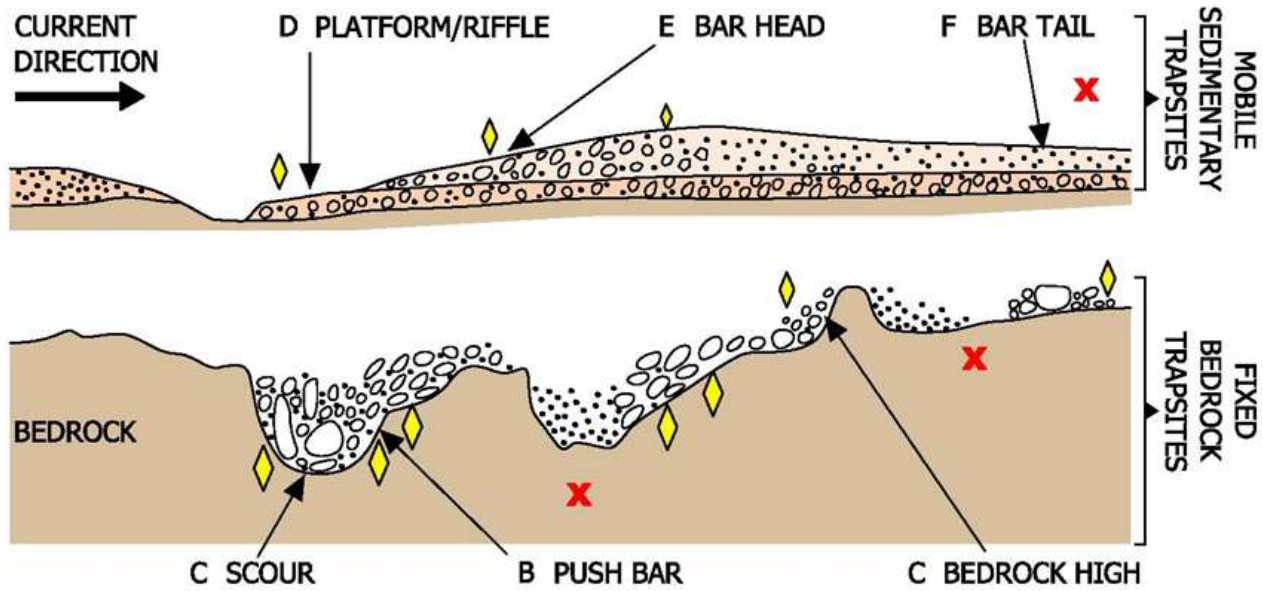
## FLUVIAL ALLUVIAL DEPOSITS



*Principal Geological Setting for Terrace and River (flats and channel) Deposits*







(Jacob, 2004)

## FLUVIAL ALLUVIAL DEPOSITS

*Principal Areas of Diamond Concentration in Mobile (Sedimentary) and Fixed (Bedrock) Trapsites*



# LULO ALLUVIAL DIAMOND MINE (LUCAPA DIAMOND COMPANY LTD)

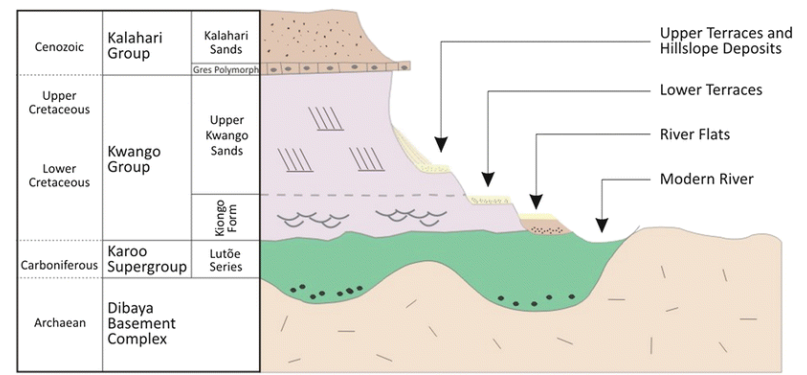
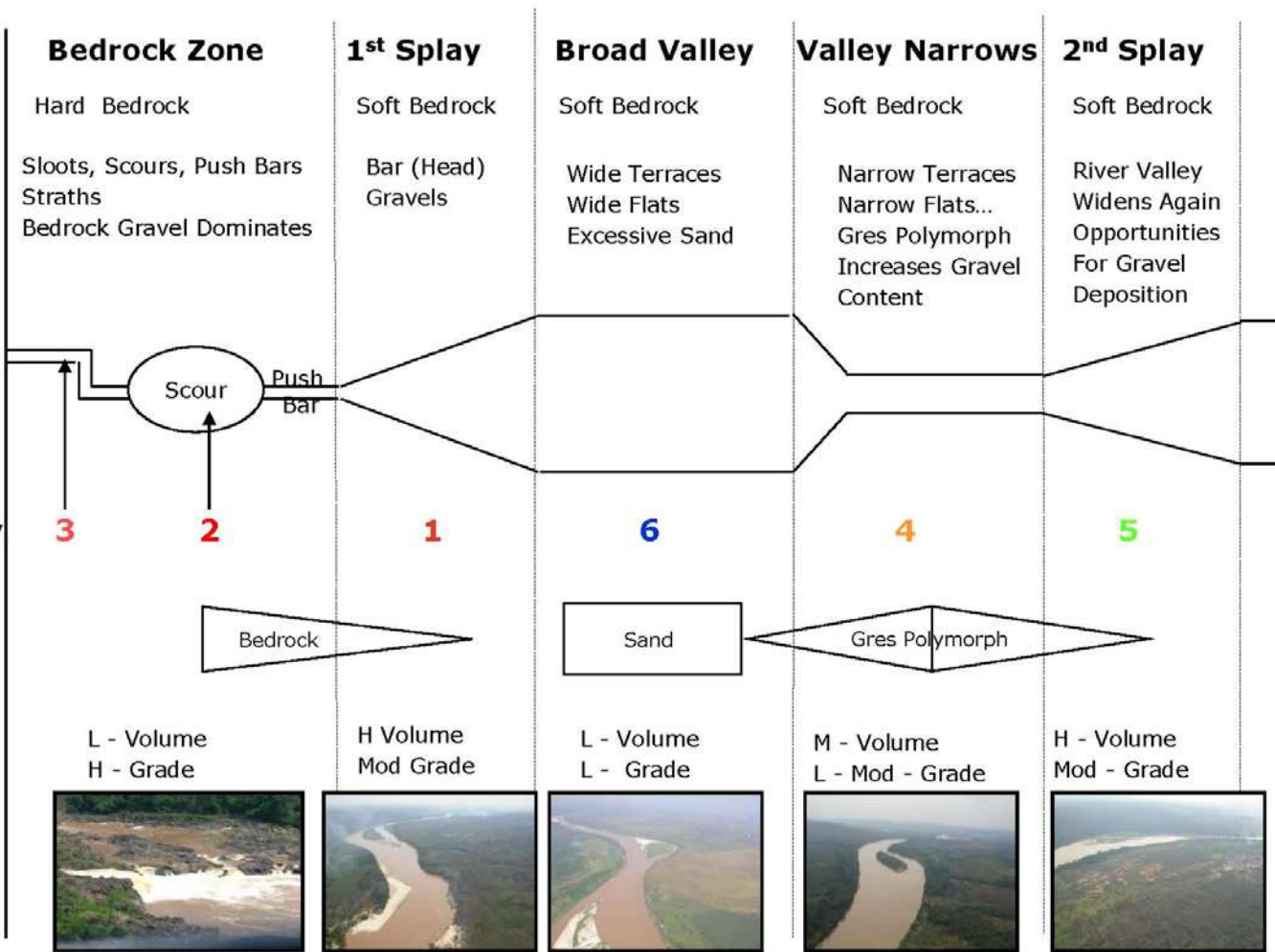
- Lunda Norte district (Cacuillo River)
- To date, Lulo has produced > 60,000ct (including 13 +100ct)
- In February 2016, Lulo produced Angola's largest recorded diamond – the 404ct 4th February Stone – which sold for US\$16M
  - In February 2017, Lulo produced Angola's second biggest recorded diamond, a Type IIa D-colour gem weighing 227ct.
- Resource Grade: 7ct/100m<sup>3</sup>
- Average stone size: 1.6ct/st
- 2020 average value USD1,918/ct







# DEMOCRATIC REPUBLIC OF CONGO KWANGO RIVER

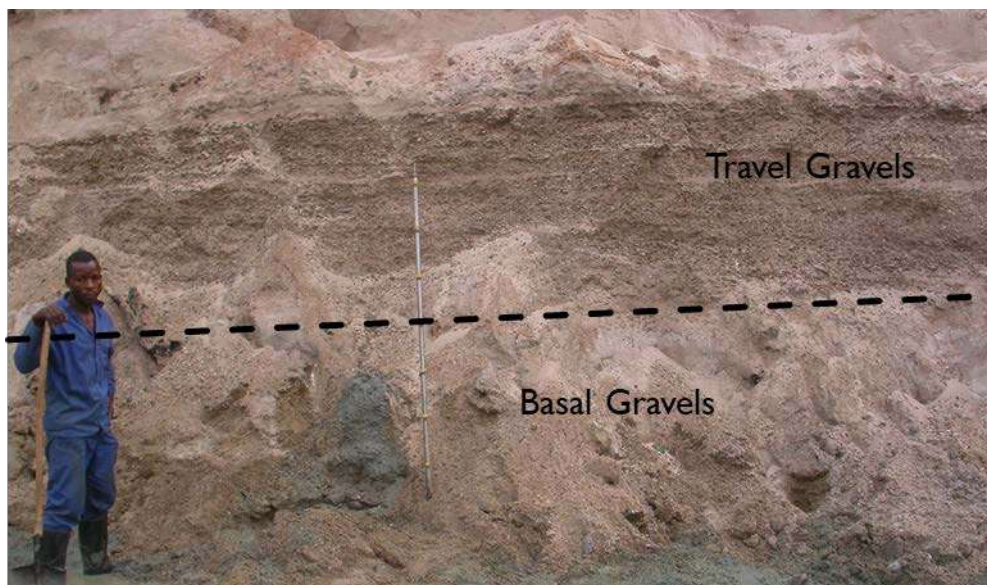






# DEMOCRATIC REPUBLIC OF CONGO

## TSHIKAPA

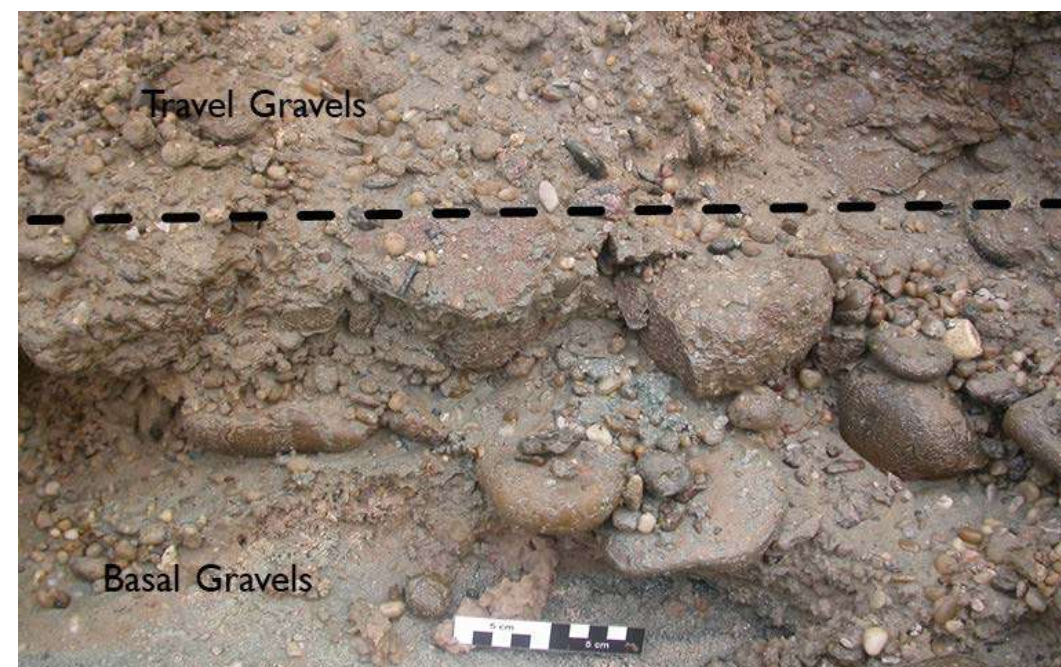


- Basal Gravels (Muchanga)

- Grade range 10-60cpht
- Average grade 30cpht
- Poorer sorted gravel

- Travel Gravels (Bingalagala)

- Grade range 2-10cpht
- Average grade 5cpht
- Better sorted gravel







# DEMOCRATIC REPUBLIC OF CONGO

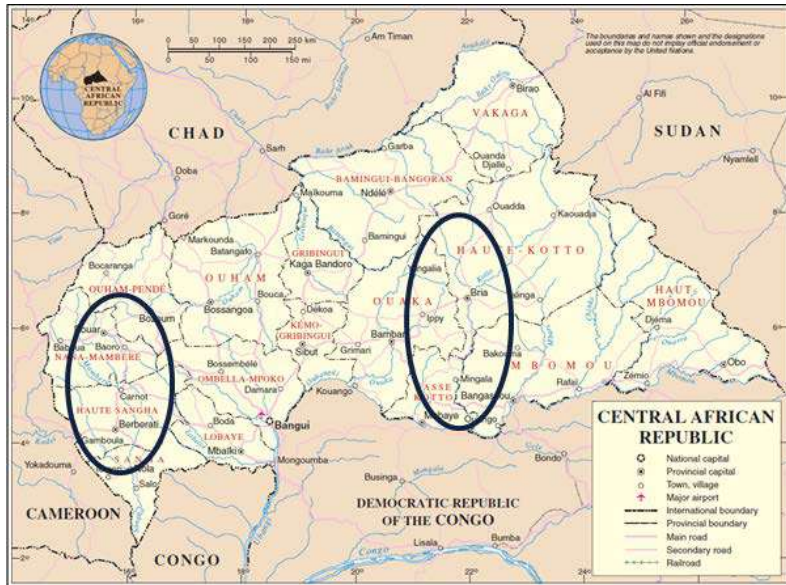
## TSHIKAPA







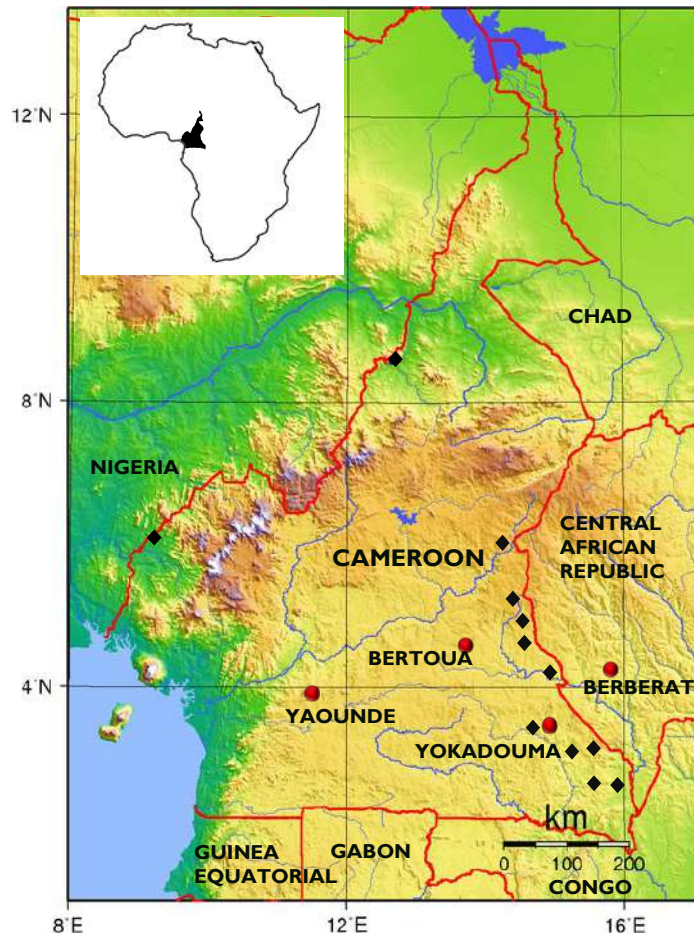
# CENTRAL AFRICAN REPUBLIC CARNOT







# CAMEROON MOBILONG



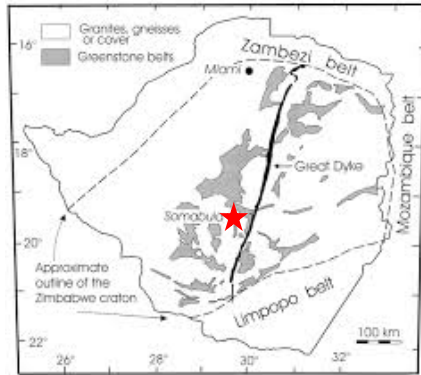
- Holocene floodplain/channels
  - Incised into Proterozoic bedrock (conglomerate)
  - Thin (<0.5m thick) gravels
  - Two populations of diamonds
  - High % of carbonado







# ZIMBABWE SOMABULA



- Basal gravel representing winnowed and concentrated lag (colluvial) of a Permian till
  - 1-40m red sands and sandy/silty arkose sequence
  - Basal diamictite (2m)
- Diamonds concentrated in basal gravels
  - Good-excellent quality stones, relatively large stones recovered
  - Grades highly variable
    - sub-economic (<5cpt)
  - Heavy minerals include emerald, ruby, gold, garnet, PGM alloys, topaz, tourmaline, zircon



(Moore, 2006)

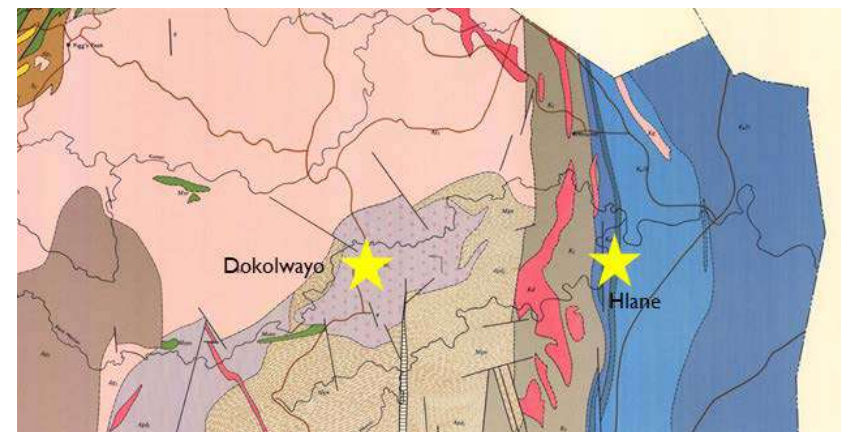






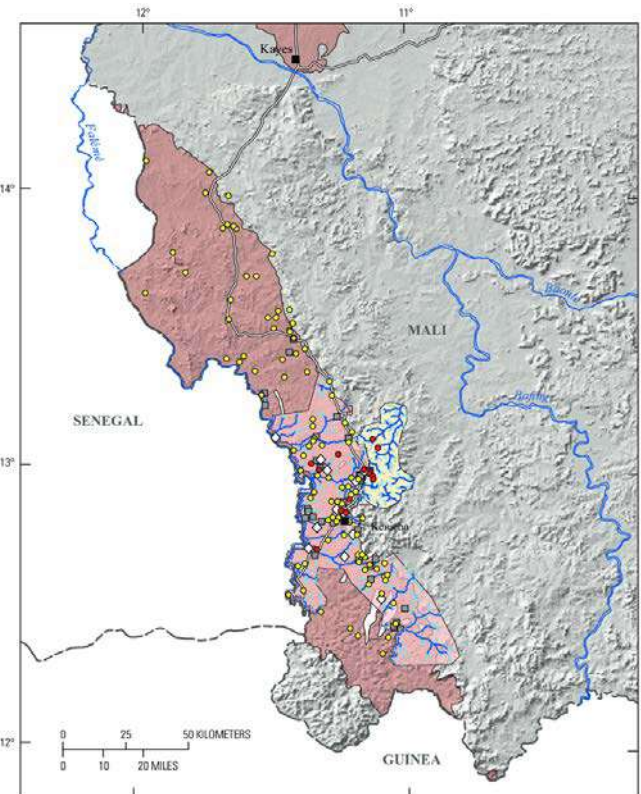
# SWAZILAND HLANE

- Occurs within the Stormberg Group near the Swaziland-Mocambique border
  - Grits and conglomerates of Red Bed age (Upper Triassic)
  - Highest concentrations in the two basal units
  - Diamonds derived from 300Mya Dokolwayo kimberlite, 30km to the west
  - Braided stream system shallowly incised into a broad floodplain of poorly consolidated, partly calcretised overbank deposits (drying out of a depositional basin)
- 5km strike along the east-bank of the Umbuluzane river.
  - Mined by Trans Hex in 1970/80's
  - Down-dip extension for 1.2km to a depth of 170m





# MALI



Shaded relief modified from Shuttle Radar Topography Mission  
Other base features modified from the U.S. Geological Survey  
Global Geographic Information Systems database

Geology modified from  
Lescuyer and Miles, 2004

#### EXPLANATION

- |                                   |                      |
|-----------------------------------|----------------------|
| Birimian Sandstone                | Diamond showing      |
| Kenieba contour zone              | Gold showing         |
| Tambaoura Escarpment contour zone | Kimberlite           |
| Major stream                      | USGS/BRGM study site |
| Minor stream                      |                      |

- Minor amounts of diamonds are recovered as a by-product of alluvial gold mining in the Kenieba District (SW Mali)
- 15% stones >15ct (95% per weight)
  - Diamonds +50ct are common, Largest known is 232.7ct







# SIERRA LEONE

- Eastern Sierra Leone
  - Sewa, Bafi, Woa, Moa, Mano Rivers
- Late Pleistocene – Recent river channels, flats, terraces
- Sourced from high-grade kimberlite dykes at Koidu/Tongo
- Grades +400cph
  - Highest recorded grade at 1,215cpt (bedrock pothole in Sewa River)
  - Large diamonds recovered
    - 969ct, 709ct



Star of Sierra Leone,  
968.9ct





# LIBERIA

- Cainozoic Alluvial deposits
  - Associated with known kimberlite occurrences (Proterozoic and Mesozoic pipes/dykes)
- Associated with (Precambrian) graphitic schists in eastern Liberia (Nimba)







# GUINEA

## ■ Mandala Mine

- Bouro district
- Well developed basal gravel unit in fixed bedrock trapsites (limited tonnage)
- Diamonds
  - Grades: 30-50cpht
  - Stone size: 0.3ct/st
  - Value: USD60/ct (2008)



## ■ Aredor Mine

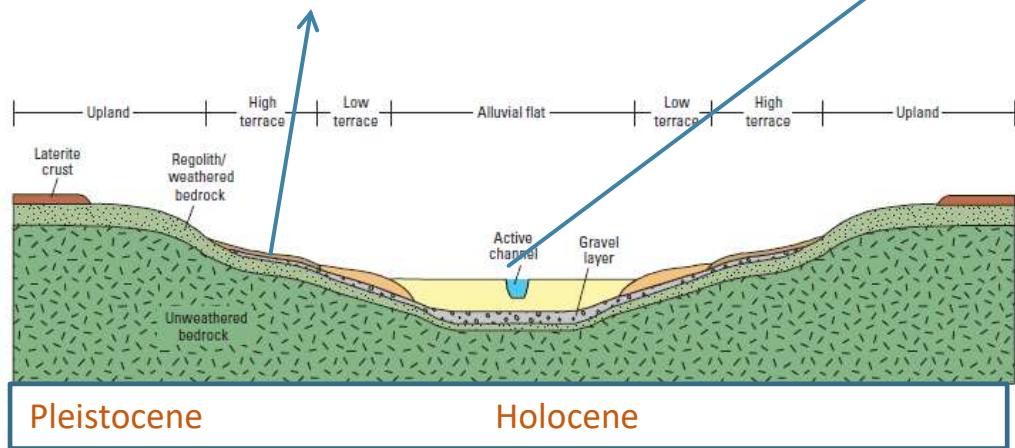
- Gbenko-Banankoro (Kerouane) district
- Very broad, slow, sluggish meandering river system on weathered (granite) clay bedrock (high tonnage)
- Diamonds
  - Grades: 4-30cpht
  - Stone size: 0.8ct/st (decrease downstream)
  - Value: USD150-500/ct (2008)







# GHANA AKWATIA





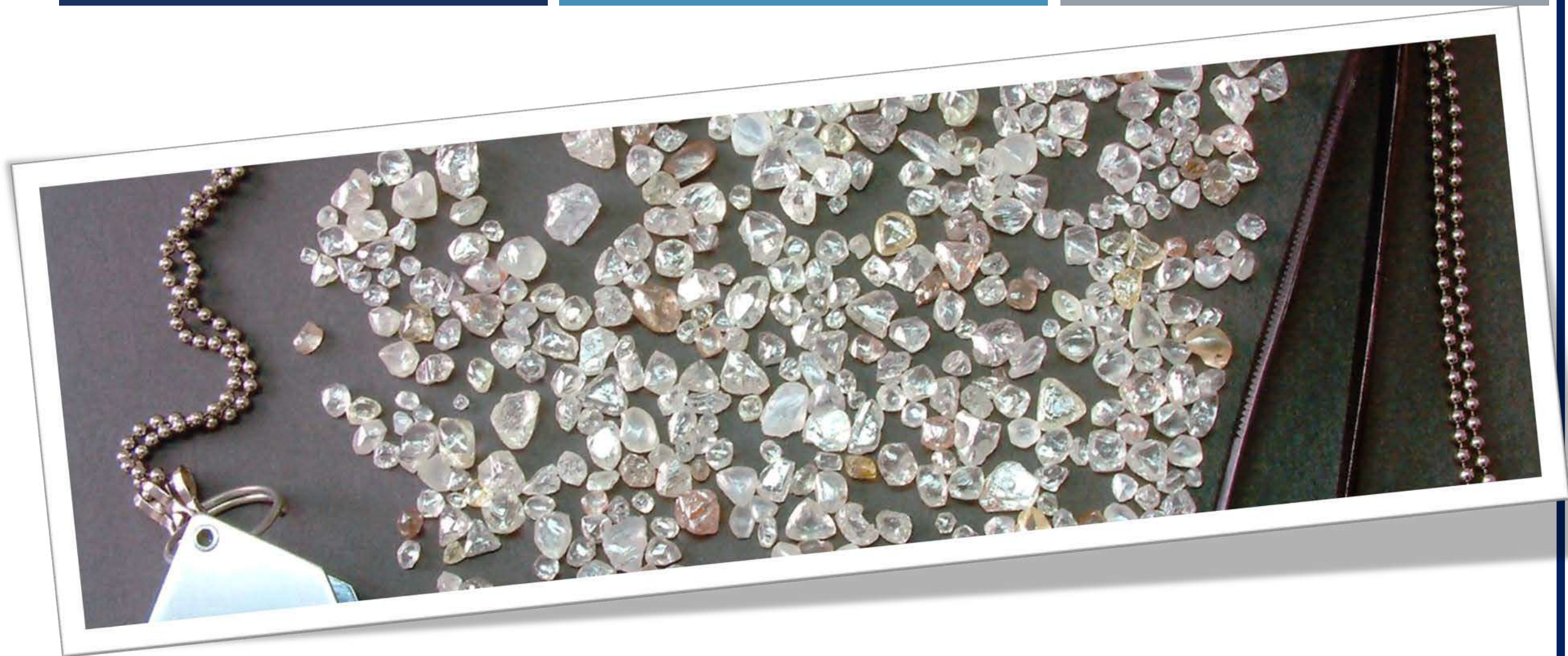


# OTHER (SOUTHERN AFRICA)

❖ Karst-hosted / Fluvial / Beach / Aeolian / Derived







THANK YOU

*Questions?*

