New Zealand
MGCP Programme:

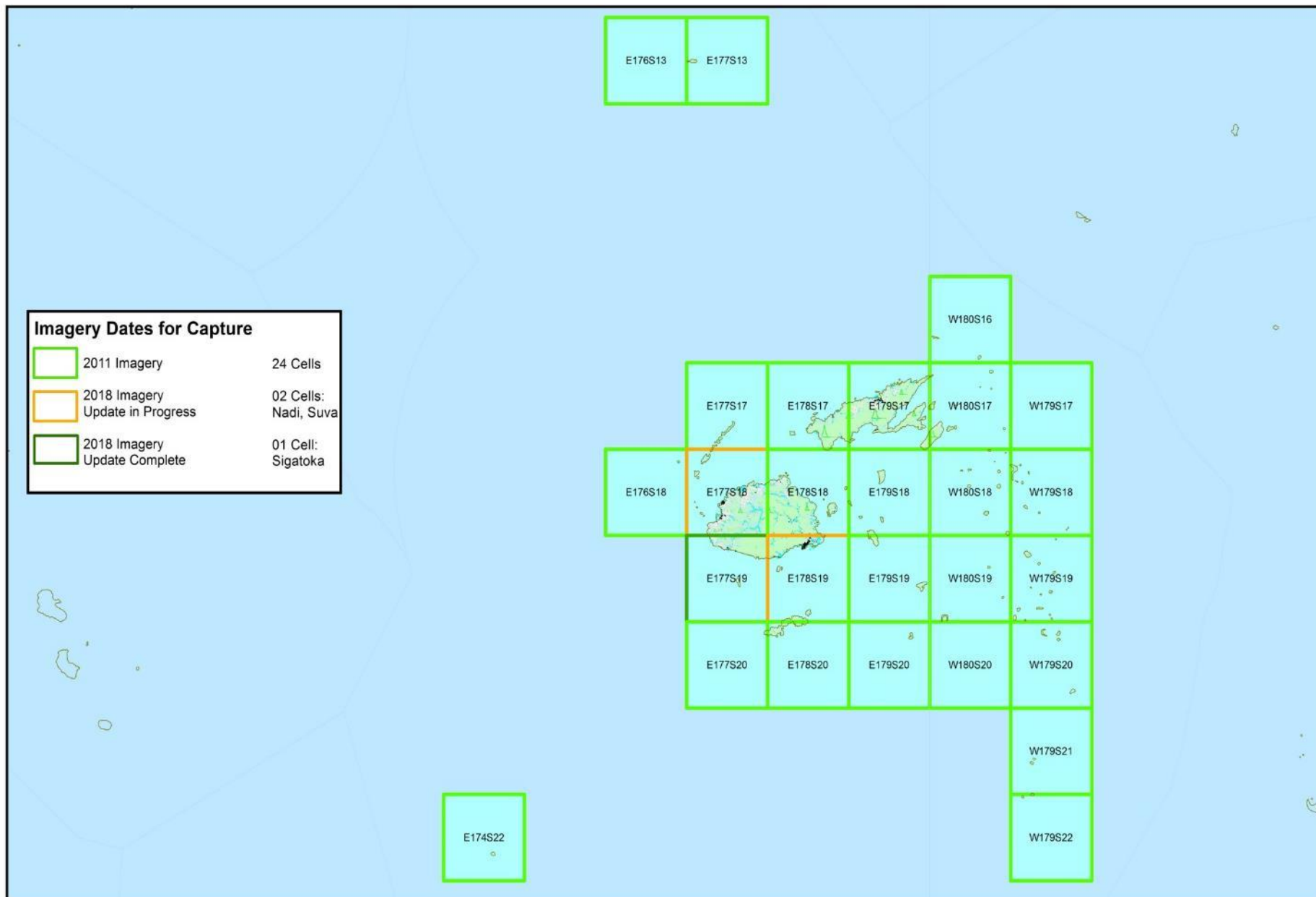# Topographic Data Revision Process over Fiji

February 2021

Auckland

Fiji 1:50K Vector Capture Status - 02 February 2021

Imagery Dates for Capture

2011 Imagery		24 Cells
2018 Imagery Update in Progress		02 Cells: Nadi, Suva
2018 Imagery Update Complete		01 Cell: Sigatoka

E176S13 E177S13

W180S16

E177S17 E178S17 E179S17 W180S17 W179S17

E176S18 E177S18 E178S18 E179S18 W180S18 W179S18

E177S19 E178S19 E179S19 W180S19 W179S19

E177S20 E178S20 E179S20 W180S20 W179S20

W179S21

E174S22

W179S22

Q: How do we update Topographic Data?
A: Using a "Jigsaw" approach

- A jigsaw approach uses existing capture workflow in ArcGIS

- Import previous TRD data into pre-formatted new TRD layers

- New capture occurs only on certain themes or amounts of change; and fits with new TRD requirements
  - Urban growth, road network, land-use change OR
  - Shift of > 15m from previous vectors against new imagery OR
  - New feature types available in the new TRD (Settlements, Facilities)

- Lower focus & therefore higher retention of previous captured data for natural/physical geography.

- Geometry updates using select 'Editor' tools available
  - Topology modify and reshape.

Fiji Revision Process Summary

- Set-up Work to support Revision Efficiency involved 3 staff focusing on a specific task/theme:

    - Land vs Sea areas - 1 staff member developed semi-automated feature capture using Normalised Difference Water Index (NDWI): raster indexing to extract land areas and water-body areas using ENVI

    - Rivers and Coastline - 1 staff member assessed visual shift (imagery) and data shift (MLMR against original MGCP vectors) for rivers and coastal areas.

    - Significant urban features - 1 staff member assessed visual shift and data shift for all significant urban features: roads, important building points (health centres, hotels/resorts, police stations, education centres).

Land-Water Boundary Update

- Our MGCP team developed the following process used successfully as part of Fiji Vector Revision

  - In ENVI: Satellite images are converted to 'rasters' to classify water areas using an NDWI toolset; the classes are then used to create vector files

  - In ESRI: the vector shapefiles are cartographically smoothed and simplified (Toolbox)

  - MGCP production: the smoothed simplified vectors then used to topologically align the old features to the new geometry.

Land-Water Boundary Update:
Overview for E178S19

E178 S19
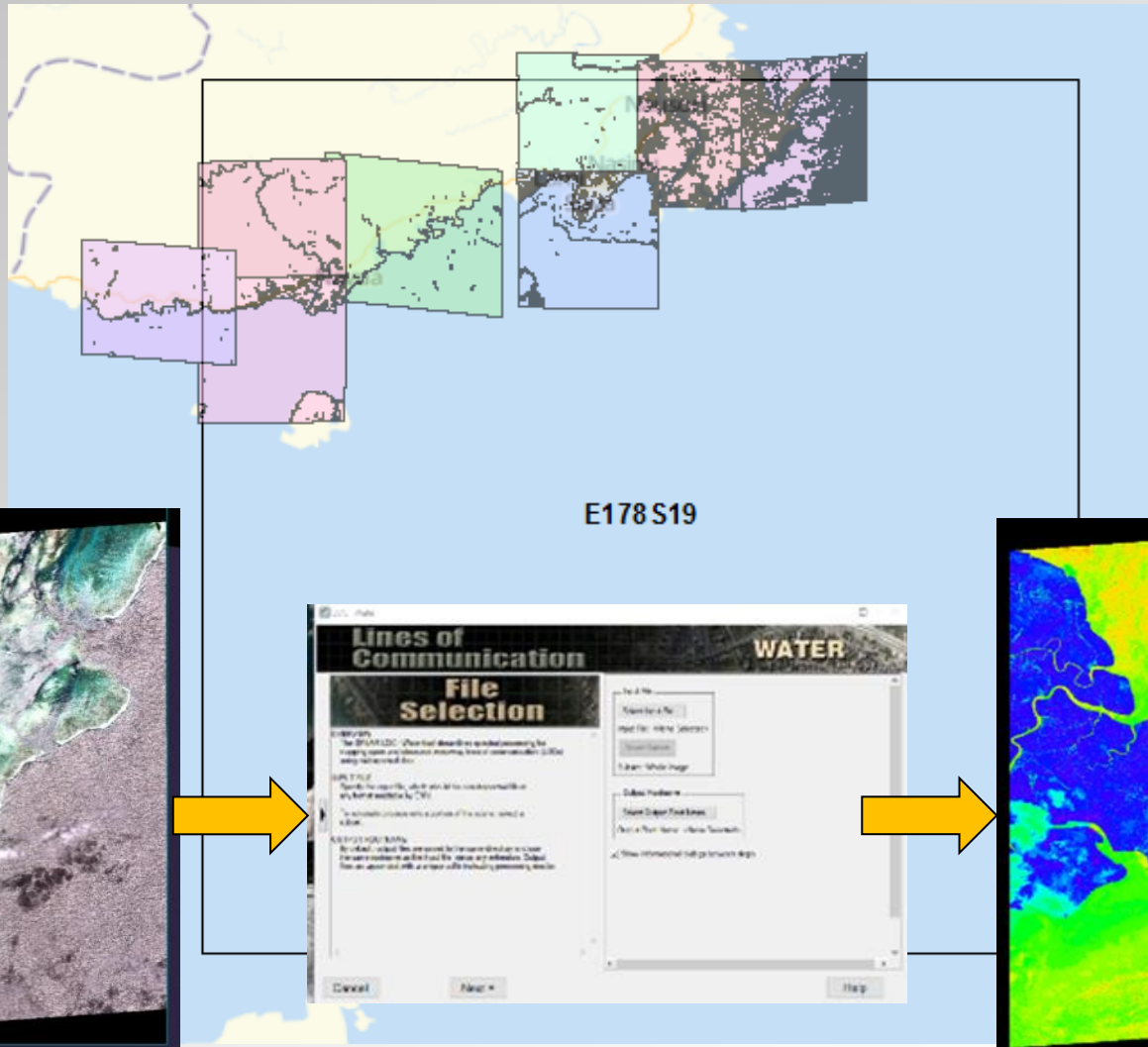
Land-Water Boundary Update: ENVI
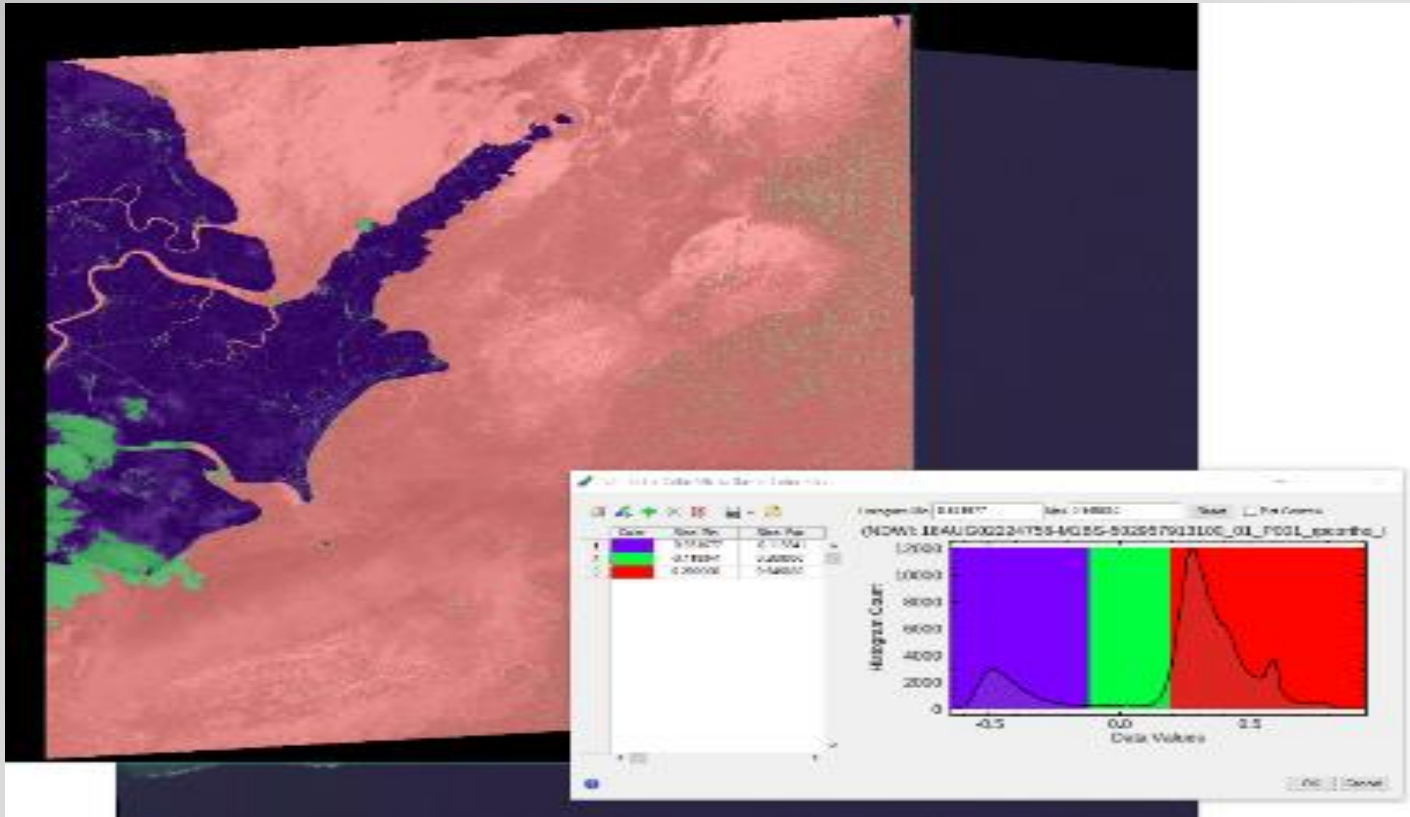
Raster Slice using '3' value ranges to separate: Land, Water, Cloud into distinct 'areas'.

Land-Water Boundary Update: ArcGIS

Start 'raw' red ENVI output vector

End 'pure' state green vectors ready for MGCP

Two processes run: Smooth and Simplify

Land-Water Boundary Update:
Align Edge topology tool
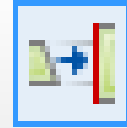
Reshape Feature/Reshape Topology Tools

Select feature > Select tool
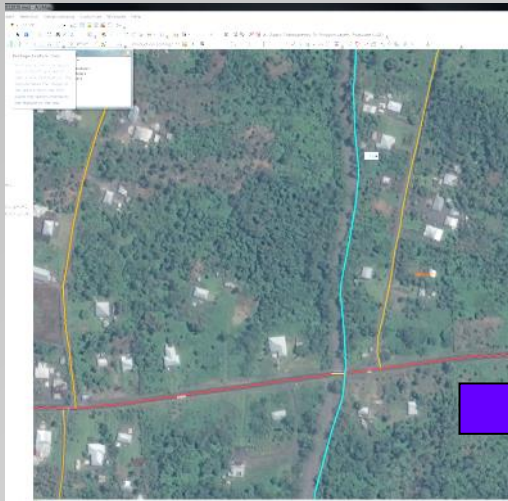
Re-draw feature between nodes: green dotted line indicating 'current' mode
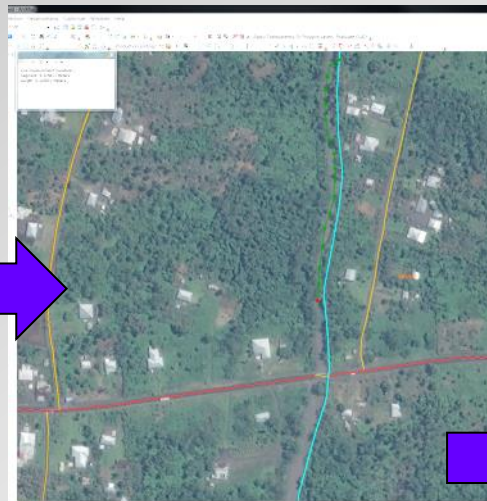
Double click when finished to complete an update based on redraw
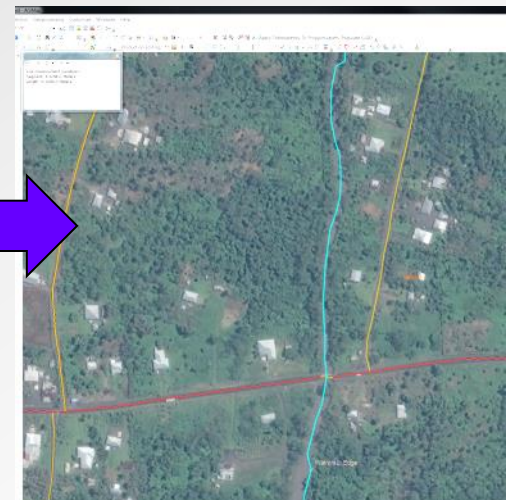
Advantage:
No need to rely on contiguous node per node replacing, simply click as required ensuring return point is on part of feature already existing.
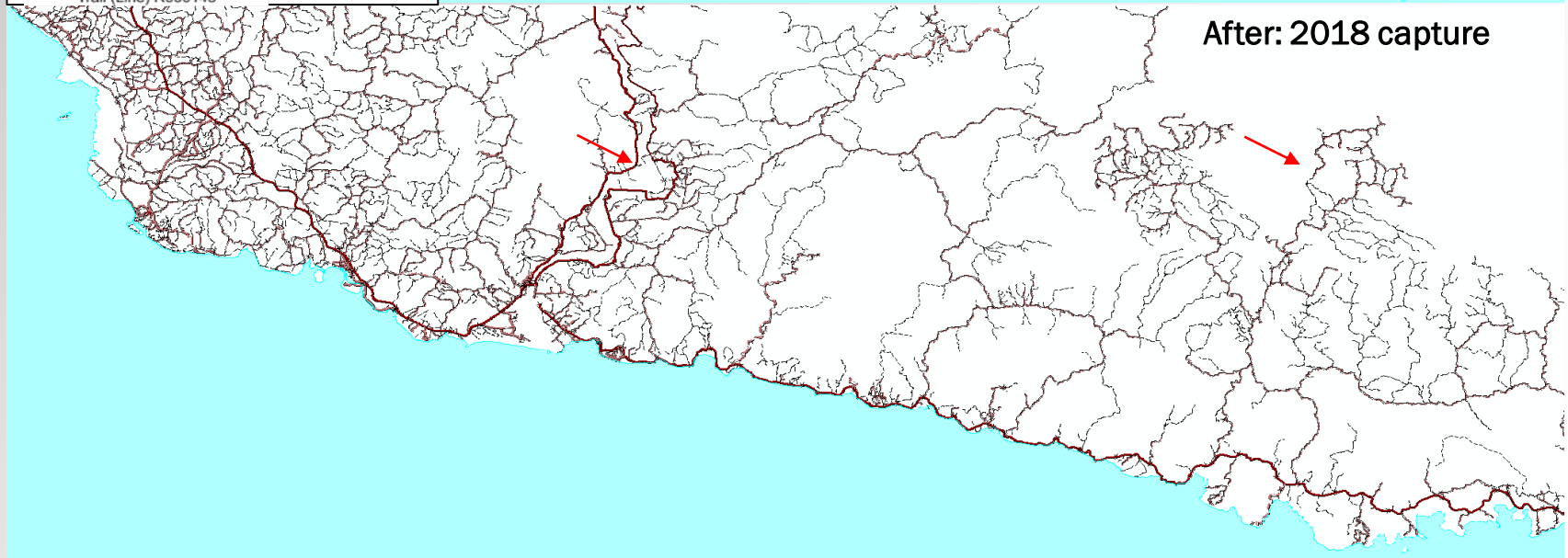
Transportation Update
in E177S19

Original capture

After: 2018 capture

Legend

— Road / Dual, No Median, Paved (Line) R000133
▬▬ Road / Dual, No Median, Unpaved (Line) R000136
— Road / Single, No Median, Paved (Line) R000132
— Road / Single, No Median, Unpaved (Line) R000135
- - - Cart Track (Line) R000130
······ Trail (Line) R000143

E177S19

River Network Update
in E177S19

Legend

Rivers Before

— BH030_Ditch_Line, Perennial

--- BH140_River_Line, Perennial

— BH140_River_Line, Intermittent

Rivers After

— BH030_Ditch_Line, Perennial

--- BH140_River_Line, Perennial

— BH140_River_Line, Intermittent

River Network Update
in E177S19
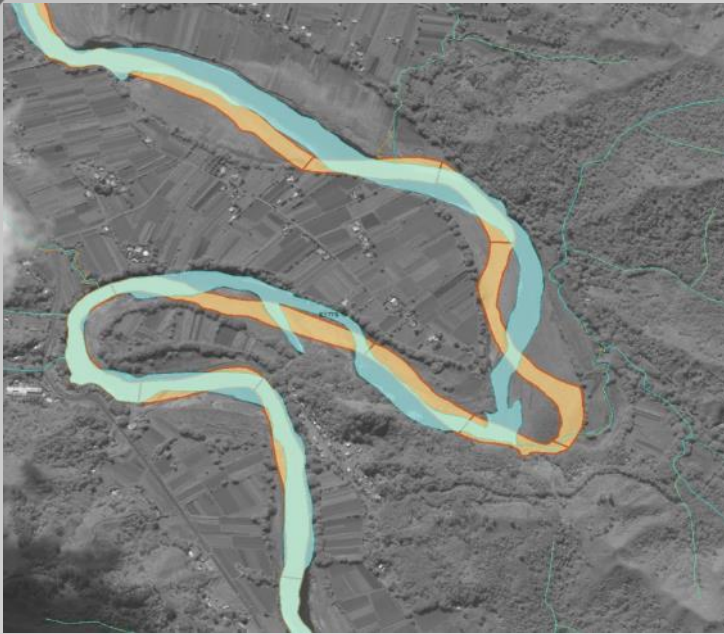
Sigatoka River
177.555456 -18.017077
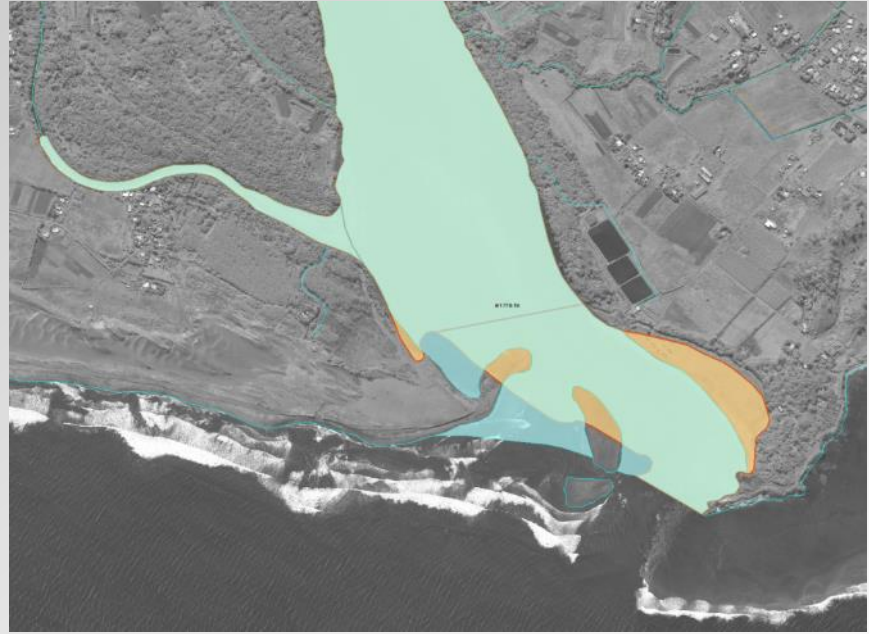
Sigatoka River mouth
177.518685 -18.172428

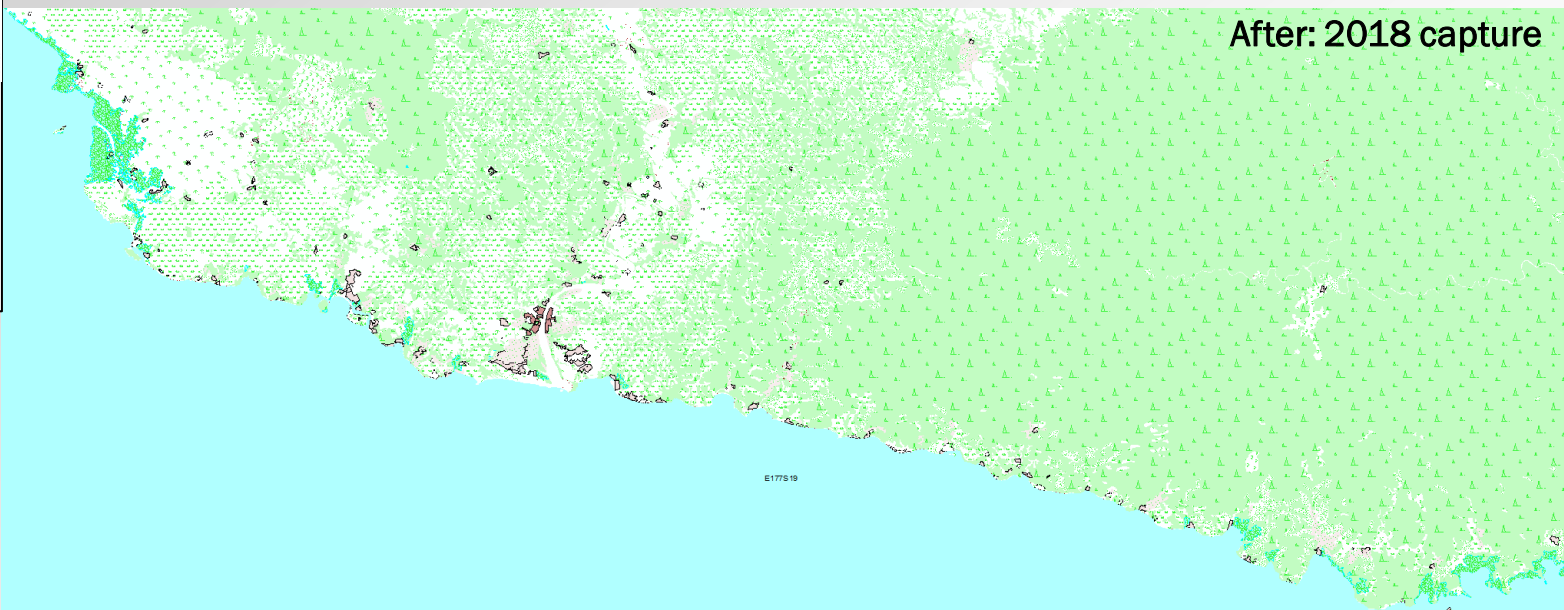River Before

River After

Tuva River
177.364555 -18.078614

Landcover Update
in E177S19

Original capture
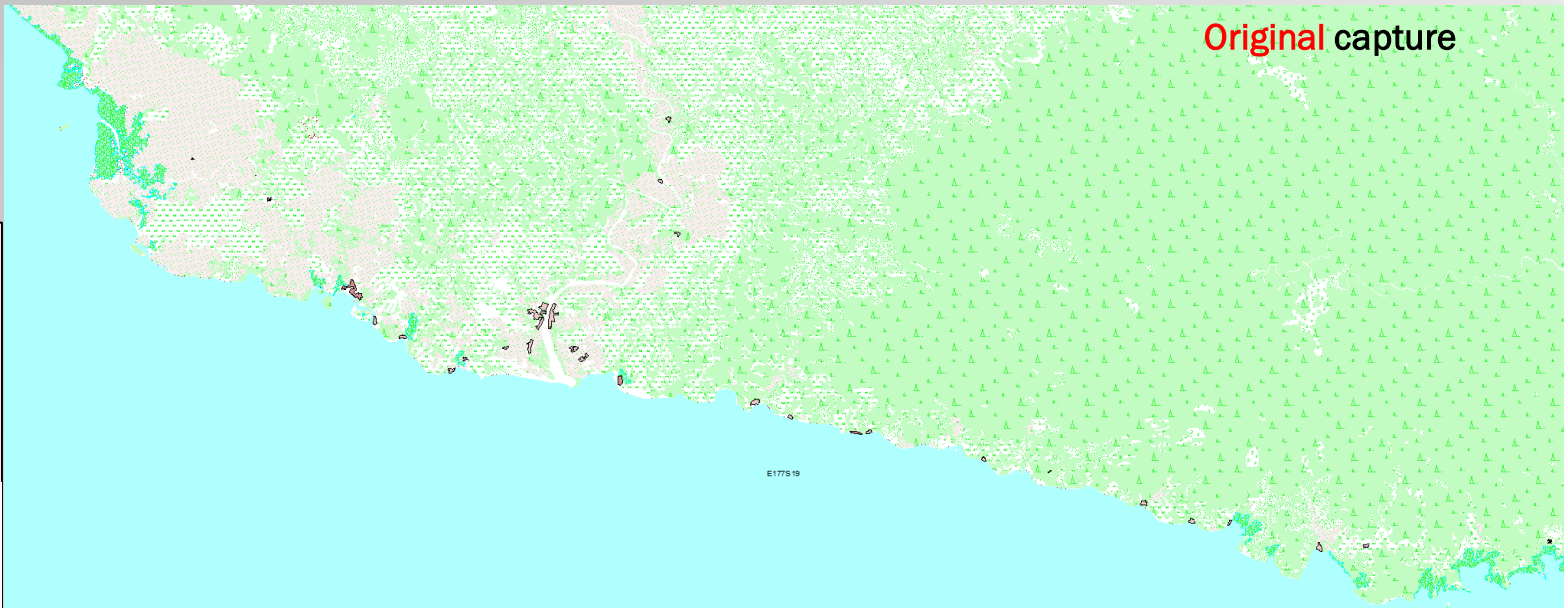
After: 2018 capture

Legend

- Built-Up Area / Dense (Area) R000286
- Built-Up Area / Sparse (Area) R000287
- Crop Land / Dry Crops (Area) R000094
- Crop Land / Orchard (Area) R000095
- Quarry (Area) R000008
- Grassland (Area) R000097
- Thicket (Area) R000098
- Soil Surface Region / Sand (Area) R000081
- Reservoir (Area) R000067
- Marsh (Area) R000106
- Swamp (Area) R000107
- Wood / Deciduous (Area) R000101

E177S19

Summary of Revision Processes in E177S19

- E177S19 Feature counts

  - 15, 387 features in 2018 > 14, 700 from 2010

  - 39 new types of features overall

- Total time to complete revision

  - 558 hours or 93 days (6 hour days) or 19 weeks (5 day weeks)

Conclusions

- Revision of Topographic Vector data to improve coverage

- More time-efficient to utilise a "jigsaw approach":
  - Re-using previous data and updating only where required to fit current imagery

- ArcGIS 'Editing' suite and 'Topology' tools vastly improve revision process while maintaining geometric contiguity

- Incorporating imagery processing methods to segment raster images and create vector outputs is useful method

Questions?

For further information or technical details please contact me anytime:

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