

# Dynamic Catchment Generator

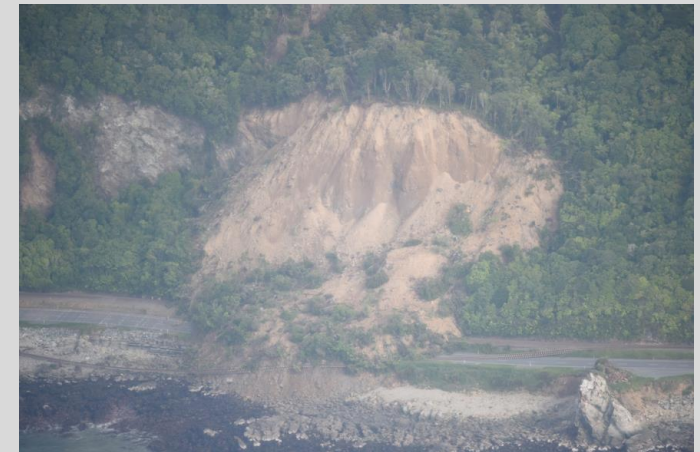


**Subodh Dhakal**  
**Senior Spatial Data Specialist**  
**Abley (on Secondment role at NCTIR)**



**Insightful solutions.**  
**Empowering advice.**

# NCTIR - North Canterbury Transport Infrastructure Recovery



*“Moving Mountains to Reconnect Communities”* **Legends**

*“Carving Enduring Connections”*  
**Legacy**

# Overview

What happened?

Why do hydrological assessment?

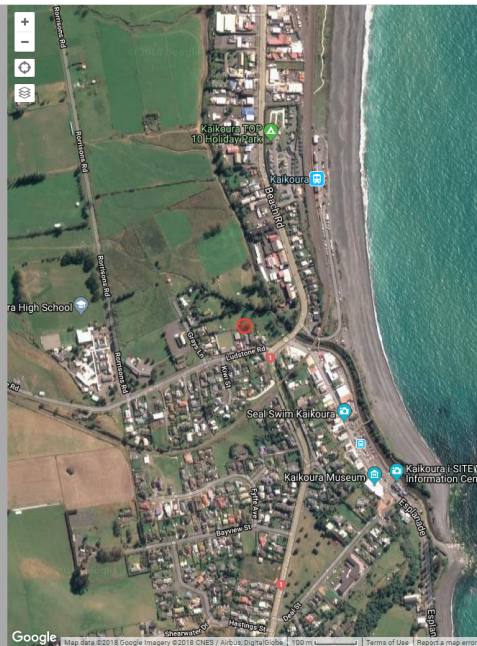
How was it done by Stormwater team?

Solutions!

Produce the catchment for all the culvert in GIS? **Issues**

**Dynamic Solutions:** How GIS team gave them solutions for dynamically creating catchment on any specified pour point.

Benefits and Lesson Learned



Share  
<https://web.fulcrumapp.com/share>

Download  
[Original](#)  
[Large](#)  
[Thumbnail](#)

Metadata

Date:	2017-11-09 13:55:40
Make/Model:	samsung SM-G930F
Software:	Fulcrum Android 2.2.3.0 (3750), Android 7.0, samsung SM-G930F
Dimensions:	810 x 1080 (0.9MP)
Size:	1 MB
Latitude:	-42.399167
Longitude:	173.678611
Accuracy:	4.0m
Altitude:	26.0m
Direction:	Unavailable
Distance:	Unavailable



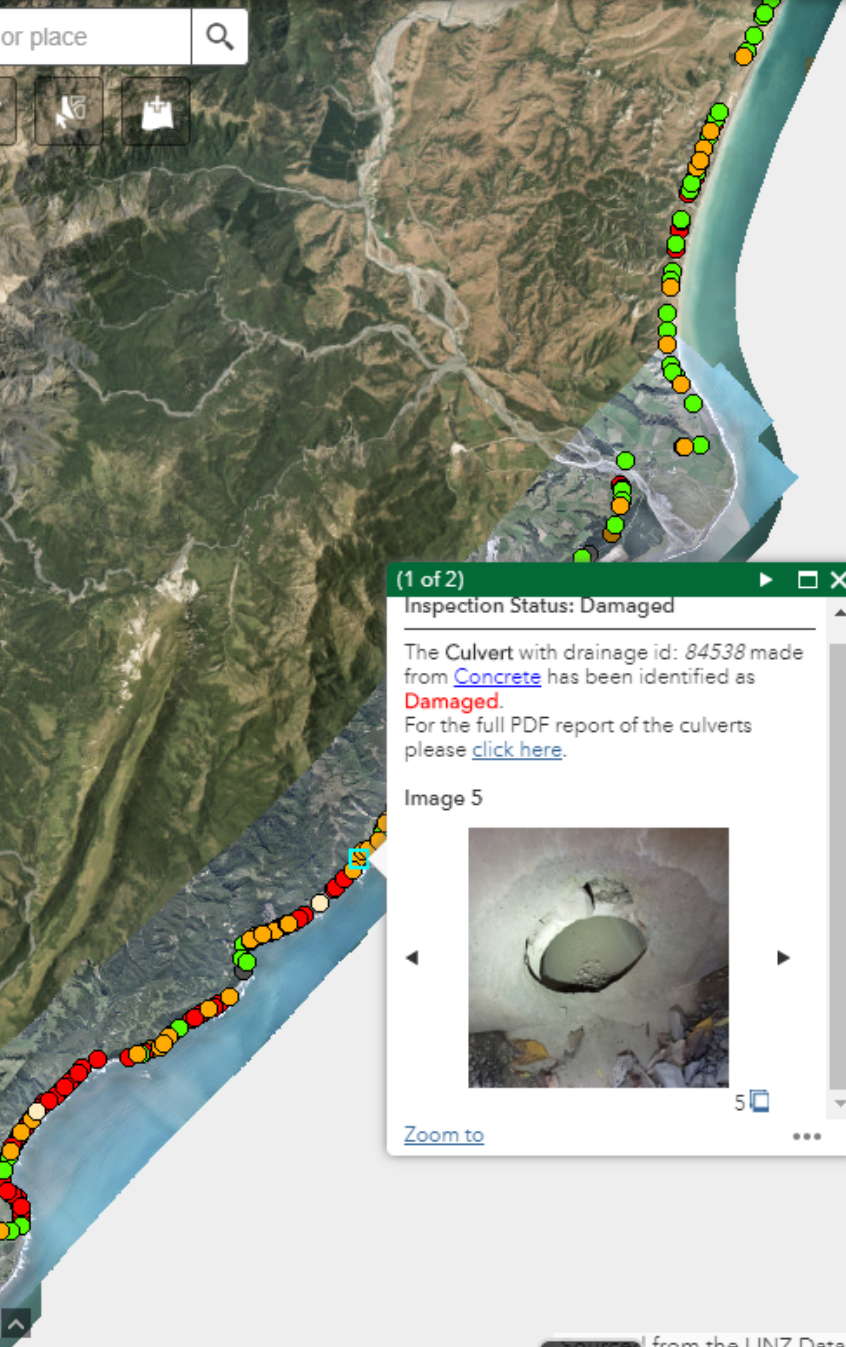
**The damage caused to the railway and SH1 along the Kaikoura coast was unprecedented in NZ**

# CCTV Pipeline Images Report Viewer

Help



Catchment	Catchment Description	Asset No	Date
		146.296	21/09/2017
<b>START</b>		<b>FINISH</b>	
Manhole/Node	INLET	OUTLET	
Street Name	CLAVERLY	CLAVERLY	
East/Northing	0 / 0	0 / 0	
<b>Material</b>	<b>Lining</b>	<b>Height</b>	<b>Diameter</b>
Concrete, Spun			300
<b>Comments</b> CULVERT CCTV			

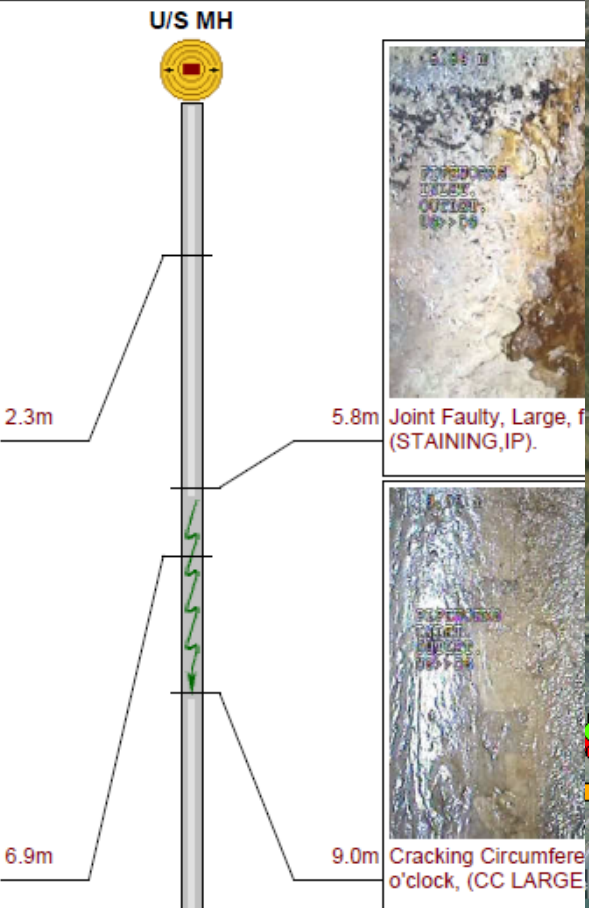


### Layer List

- Safety
- Environmental
- Chainages
- Client Assets
- Fulcrum Inspection
- Culvert Inspection
  - Damaged
  - No Damage
  - Not Inspected
  - Replaced
  - Unable to Inspect
  - Unable to Locate
- Slope Movement Observations
- KiwiRail Call Out
- Survey
- Coastal Uplift
- LiDAR Elevation Change (m) May2017-Nov2017
- LiDAR Elevation Change (m) Nov2016-May2017
- Hillshade LiDAR Nov2017
- Hillshade LiDAR May2017



Cracking Circumferential, Large, from 12 to 12 o'clock, (CC,IP,OT).



Joint Faulty, Large, f (STAINING,IP).



Cracking Circumferential, Large, from 12 to 12 o'clock, (CC LARGE).

(1 of 2)

**Inspection Status: Damaged**

The Culvert with drainage id: 84538 made from **Concrete** has been identified as **Damaged**. For the full PDF report of the culverts please [click here](#).

Image 5

Zoom to

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Produce the catchment for all the culvert in GIS? **Issues**

**Dynamic Solutions:** How GIS team gave them solutions for dynamically creating catchment on any specified pour point.

Benefits and Lesson Learned

# Culvert Design Process

Hydrology

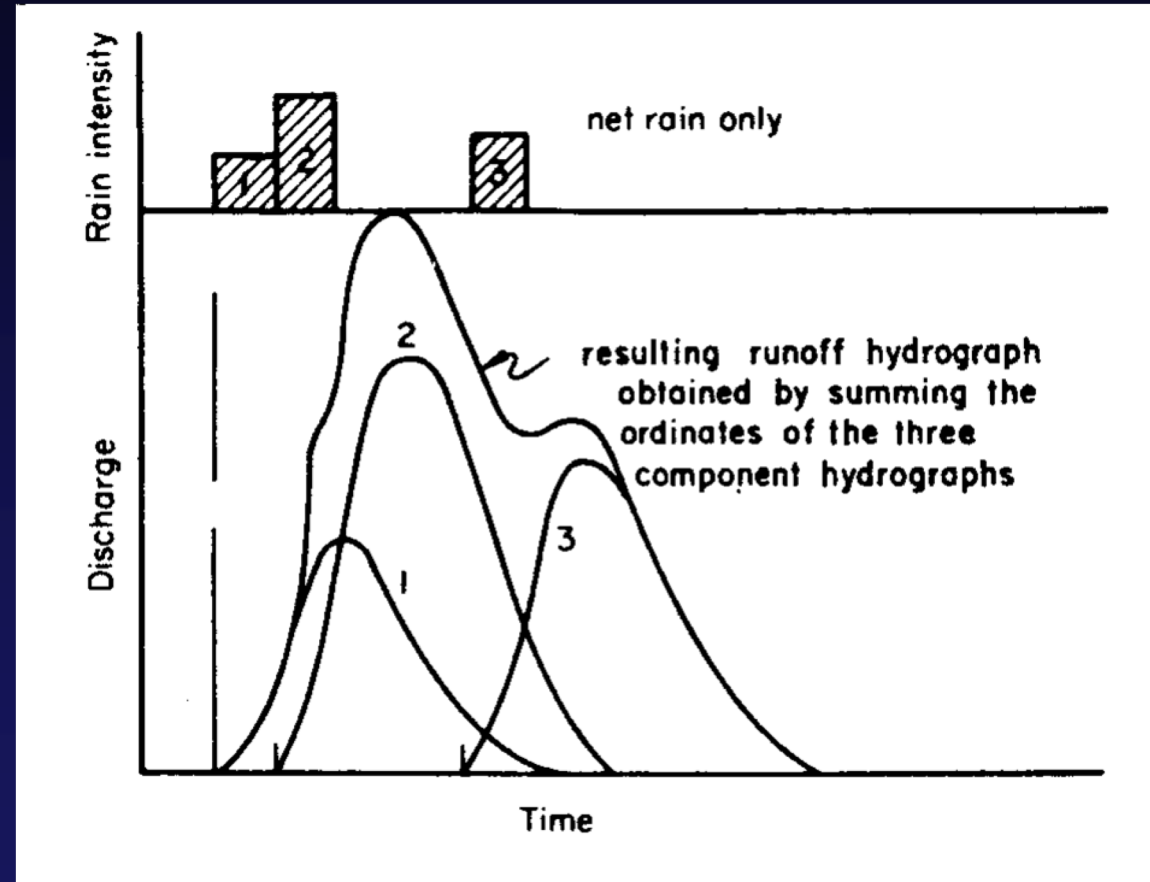
Site Assessment

Alignment and Profile

Bed and Banks

Structure

Sediment Mobility & Stability







# Culvert Design Process

## Hydrology



ensity

rain only

lting runoff hydrograph  
tained by summing the  
dicates of the three  
component hydrographs



# What if not designed correctly?



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Benefits and Lesson Learned

# Manually.....Err...

The screenshot displays the NCTIR Map Viewer interface. The main map area shows a topographic map with contour lines and a road along a coastline. Several red dots are scattered along the road, representing inspection points. The interface includes a search bar at the top left, a toolbar with various map tools, and a 'Layer List' panel on the right side. The 'Layer List' panel is currently expanded to show the 'Culvert Inspection' layer, which is checked. Below this layer, there are several status categories with corresponding colored dots: Damaged (yellow), No Damage (green), Not Inspected (red), Replaced (blue), Unable to Inspect (orange), and Unable to Locate (black). Other layers in the list include Projects, NCTIR Works, Geohazards, Geology, Utilities, Safety, Environmental, Chainages, Client Assets, Slope Movement Observations, KiwiRail Call Out, Survey, Coastal Uplift, and two LIDAR Elevation Change layers for different time periods (May 2017-Nov 2017 and Nov 2016-May 2017), along with Hillshade LiDAR Nov 2017.

NCTIR Map Viewer Help

Find address or place

Layer List

- Projects
- NCTIR Works
- Geohazards
- Geology
- Utilities
- Safety
- Environmental
- Chainages
- Client Assets
- Fulcrum Inspection
  - Culvert Inspection
    - Damaged
    - No Damage
    - Not Inspected
    - Replaced
    - Unable to Inspect
    - Unable to Locate
- Slope Movement Observations
- KiwiRail Call Out
- Survey
- Coastal Uplift
- LIDAR Elevation Change (m) May2017-Nov2017
- LIDAR Elevation Change (m) Nov2016-May2017
- Hillshade LiDAR Nov2017

# Manually.....Err...

The screenshot shows the NCTIR Map Viewer interface. The main map area displays a topographic map with contour lines and a coastline. A red polygon is drawn on the land area, and several red dots are scattered along the coast. A 'Draw' window is open on the left, showing a 'Drawings list' with one entry: 'CulvertNo' with a red polygon symbol. The 'Layer List' on the right shows various layers, with 'Fulcrum Inspection' and 'Culvert Inspection' checked. The 'Culvert Inspection' layer is expanded, showing a legend with symbols for 'Damaged' (orange circle), 'No Damage' (green circle), 'Not Inspected' (red circle), 'Replaced' (blue circle), 'Unable to Inspect' (yellow circle), and 'Unable to Locate' (black circle).

**NCTIR Map Viewer** Help

Find address or place

**Draw**

Hide drawings

**Drawings list**

Name	Symbol	1 drawings
CulvertNo		

**Layer List**

- Projects
- NCTIR Works
- Geohazards
- Geology
- Utilities
- Safety
- Environmental
- Chainages
- Client Assets
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- LIDAR Elevation Change (m) Nov2016-May2017
- Hillshade LIDAR Nov2017

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EMPLOYEE ORIENTATION

THIS JOB WILL LEAVE YOU WITH NO TIME FOR EXERCISE.



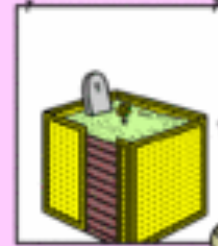
www.dilbert.com scottadams@aol.com

YOU WILL WORK LONG HOURS AND CONSUME TRANS FATS UNTIL YOU ARE SHAPED LIKE THIS.



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ON A POSITIVE NOTE, OUR PAYROLL DEDUCTION SERVICE ALLOWS YOU TO SAVE MONEY FOR DIRT TO TURN YOUR CUBICLE INTO A BURIAL SITE.



DO I HAVE YOUR PERMISSION TO WORK SMARTER AND NOT HARDER?



Dilbert.com @ScottAdamsSays

UM... SURE. THAT SOUNDS LIKE A GOOD THING TO DO.



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BUT HOW WOULD I KNOW YOU WERE WORKING?

I DON'T EVEN KNOW IF I'M WORKING RIGHT NOW.



# Overview

What happened?

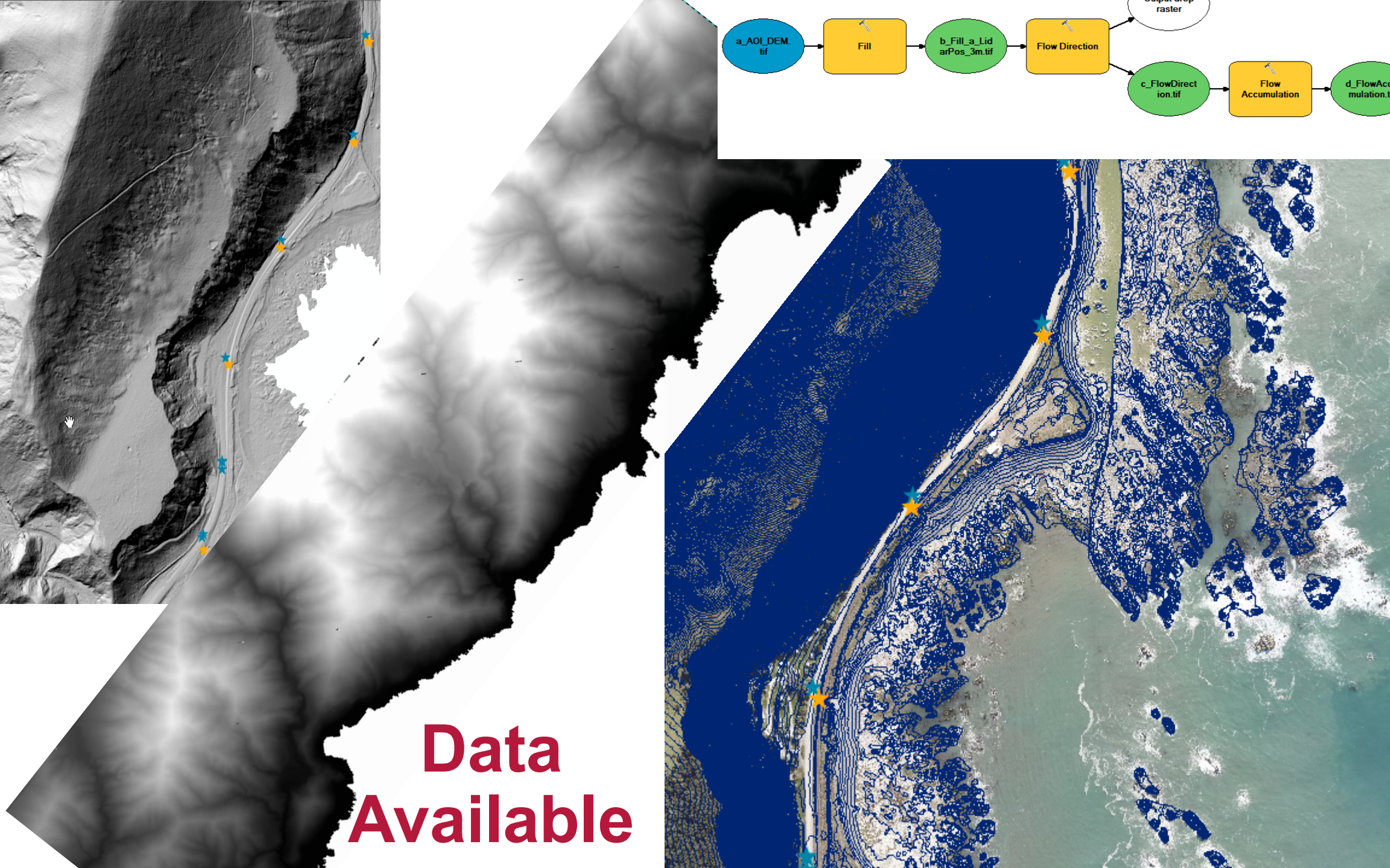
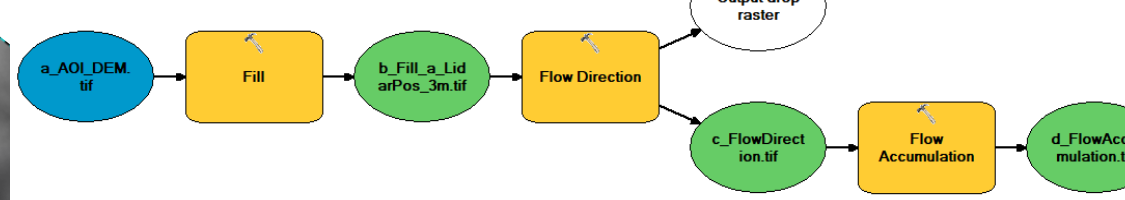
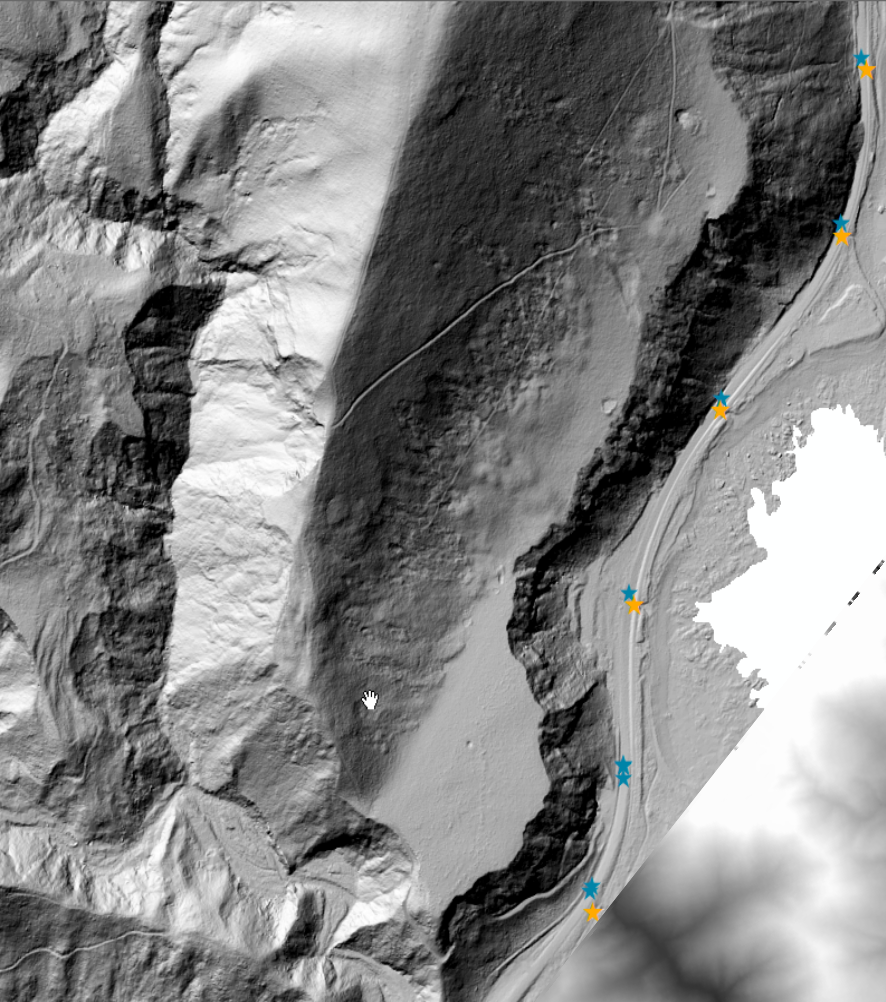
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Solutions! Produce the catchment for all the culvert in GIS? **Issues**

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Benefits and Lesson Learned



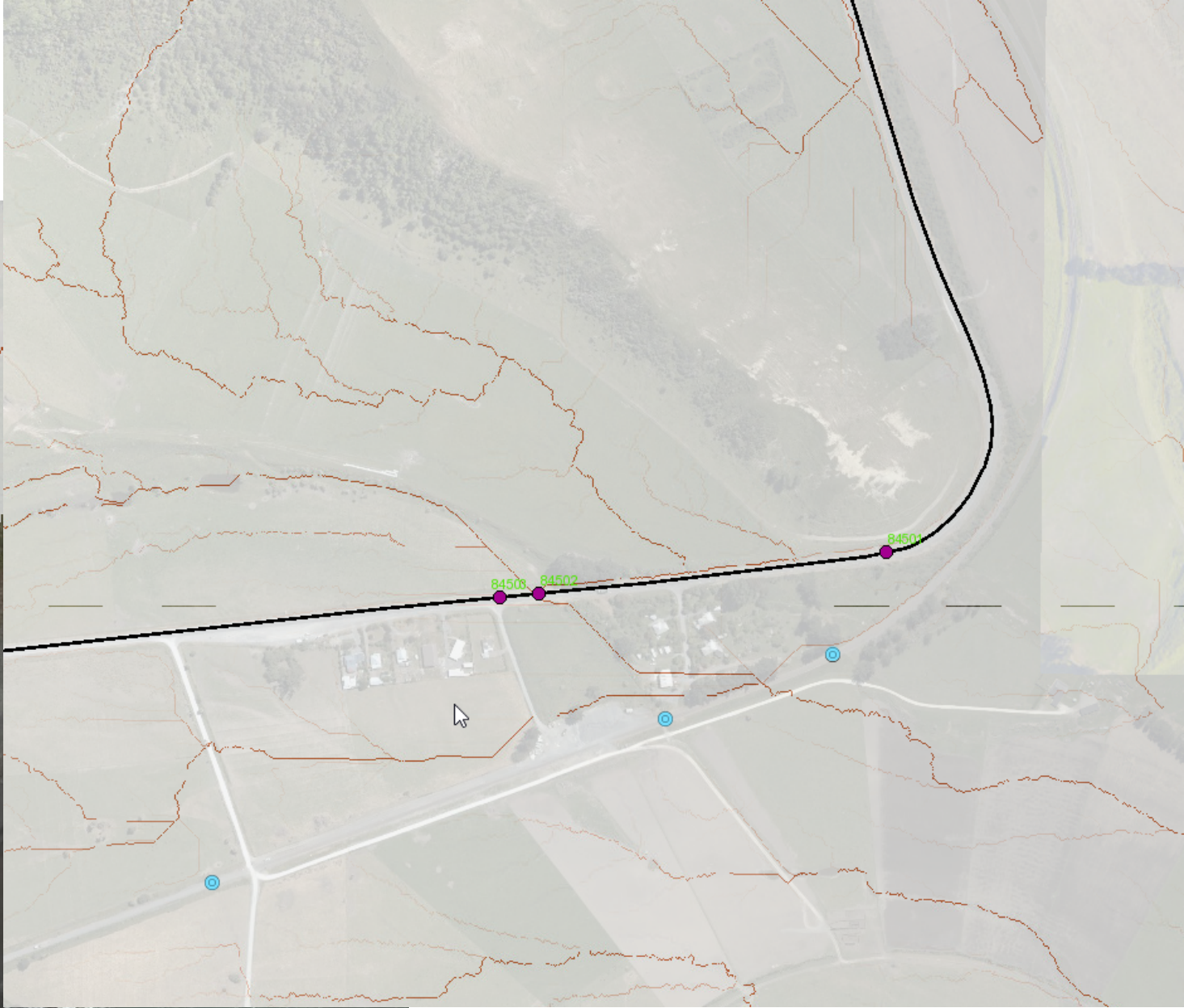
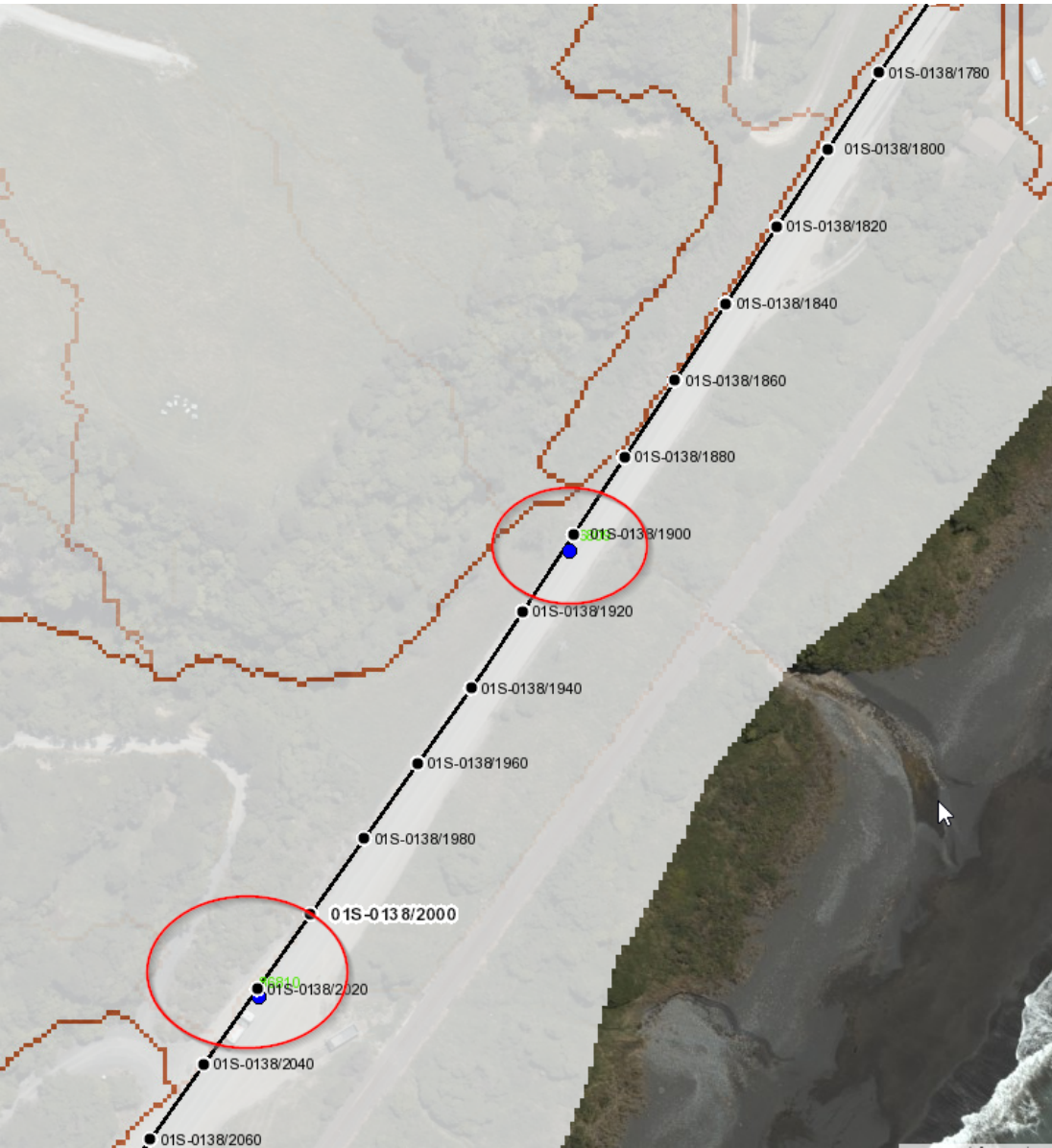
**Data  
Available**



**Very random results.....due to flat surface**



# Flow Accumulation Vs Existing Culvert Location



Batch Processing to generate  
catchment didn't worked 😞



# Overview

What happened?

Why do hydrological assessment?

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**Issues**

**Web Solutions:** Dynamically creating catchment on any specified pour point.

Benefits and Lesson Learned

# Dynamic Solutions..... Easier to do many iterations

**NCTIR** Catchment Delineation Viewer

Find address or place

**Delineate Catchment**

Input Output

Input Pour Point

[Help](#)

**Layer List**

**Operational Layers**

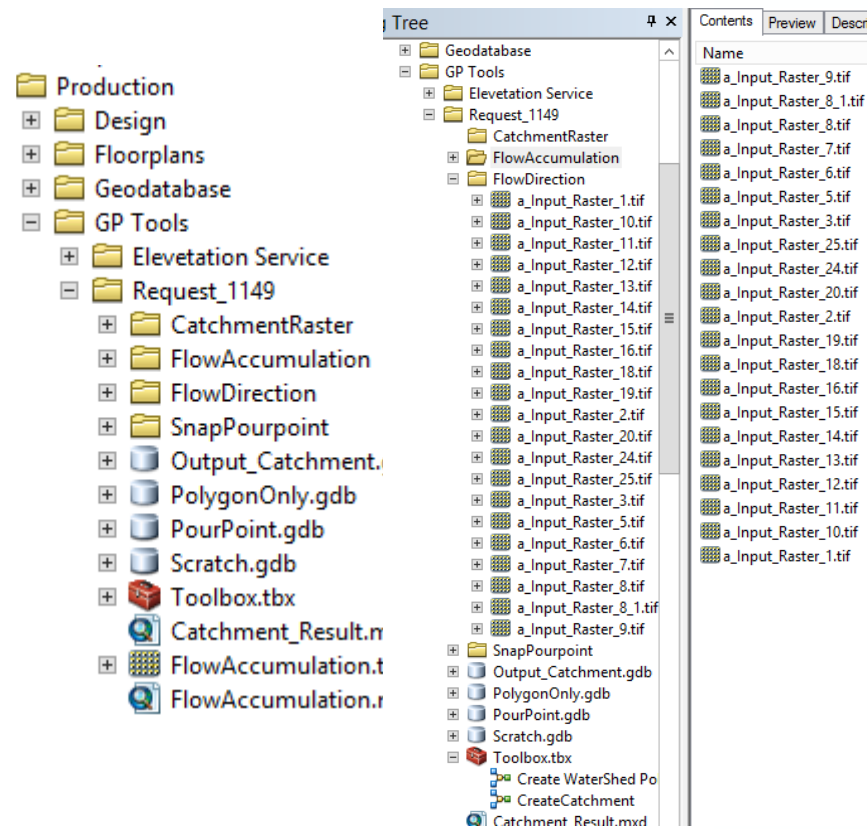
- PourPoint (Editable)
- Delineated Catchment Area (Editable)
- Catchment Result - Catchment Area
- ECan Contours (Pre - EQ)
- Terrain
- Reference
- Projects
- Geohazards
- Geology
- Environmental
- Chainages
- Client Assets
  - NZTA
  - Kiwi Rail
  - KiwiRail Culverts within 50m of River
- FlowAccumulation
  - Flow Accumulation
- DEM May2017

100m

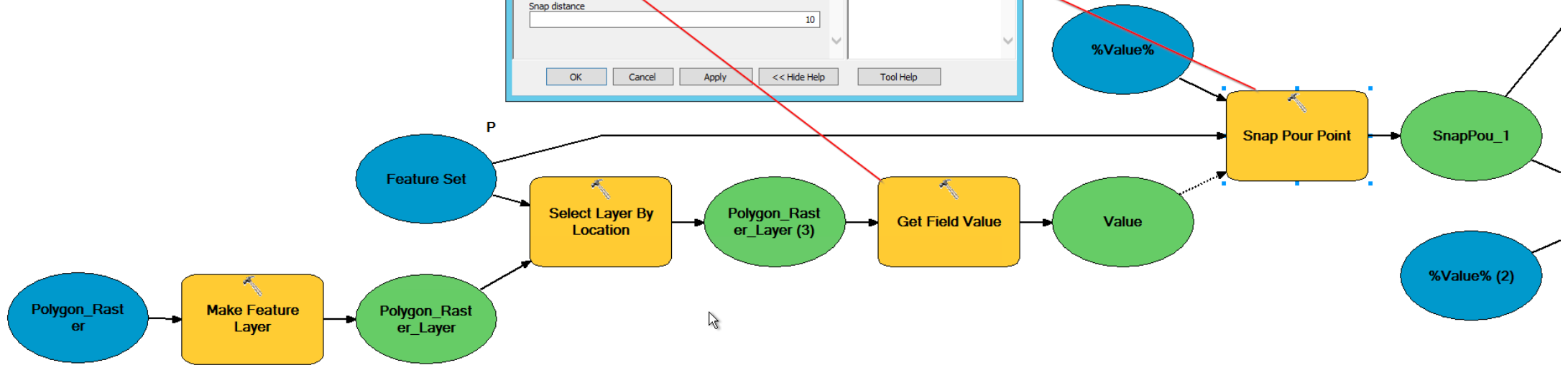
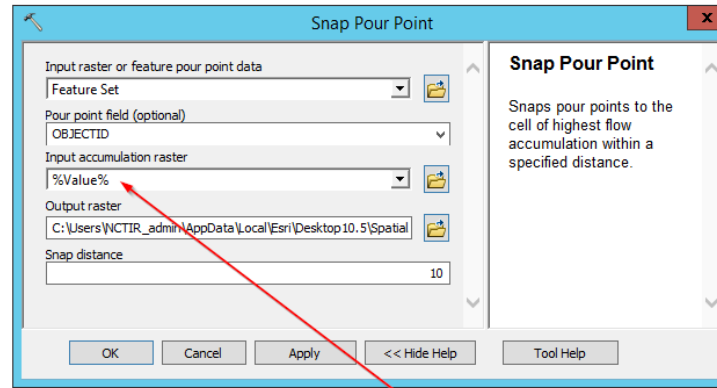
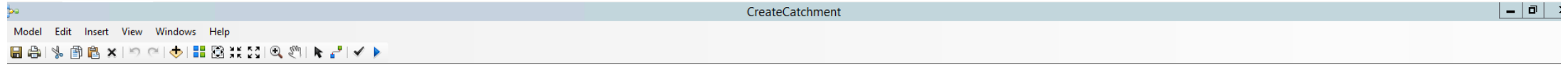
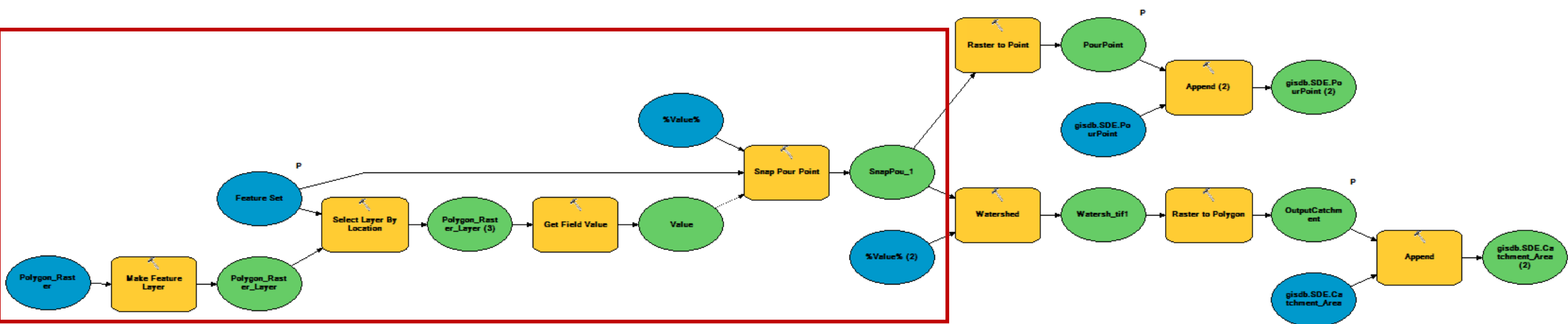
1,674,570.602 5,331,033.893 Meters

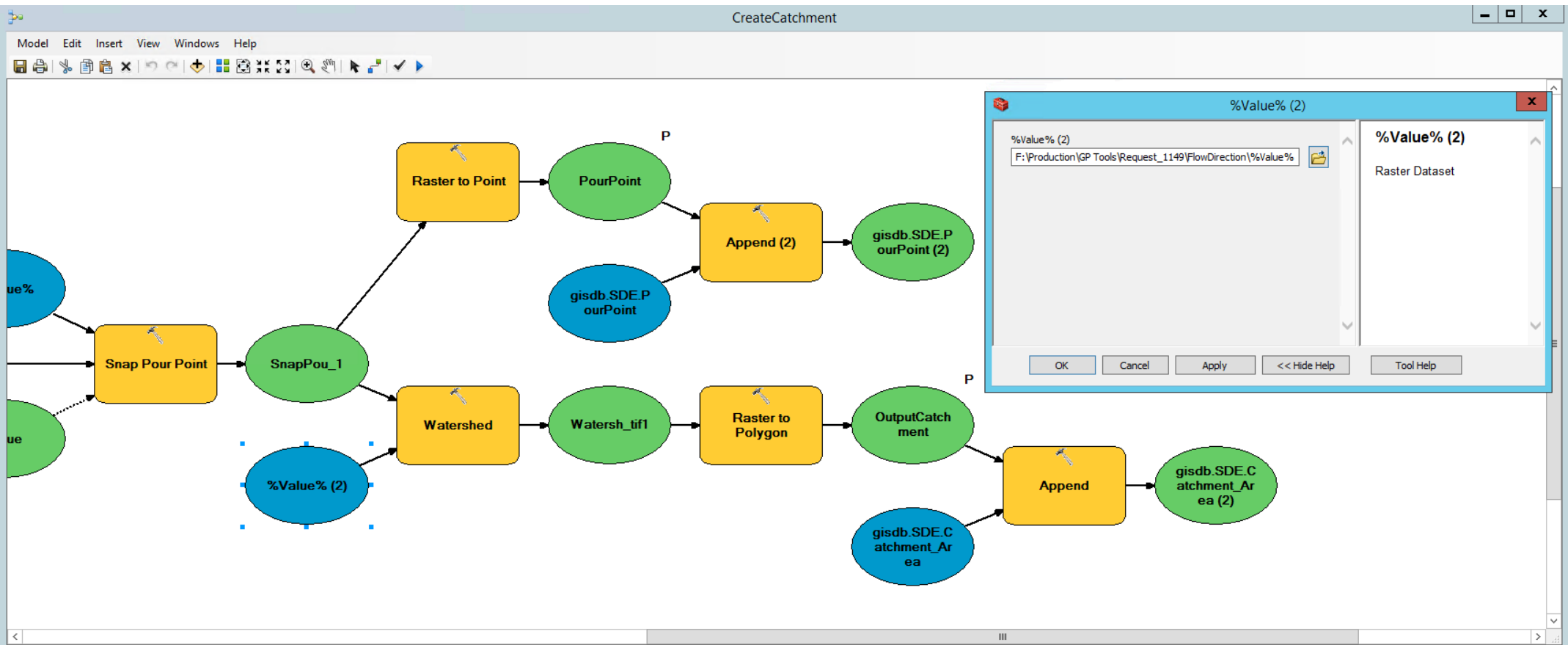
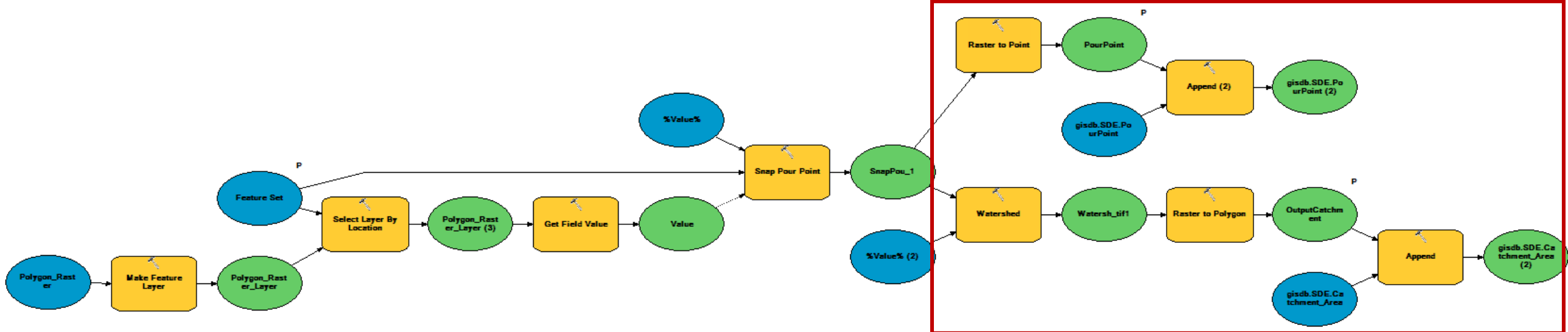
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# The process



- Generate Flow direction & Flow Accumulation raster
- Divide the project area into several smaller
- Publish the workflow as GP service
- WAB GP widget...







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**Benefits and Lesson Learned**

Find address or place

Map navigation icons: Home, Refresh, Previous View, Next View, Previous Layer, Next Layer, Previous Map, Next Map.



6km  
1,649,647.353 5,291,844.390 Meters

1,666,182.290 5,317,358.654 Meters

# Benefits

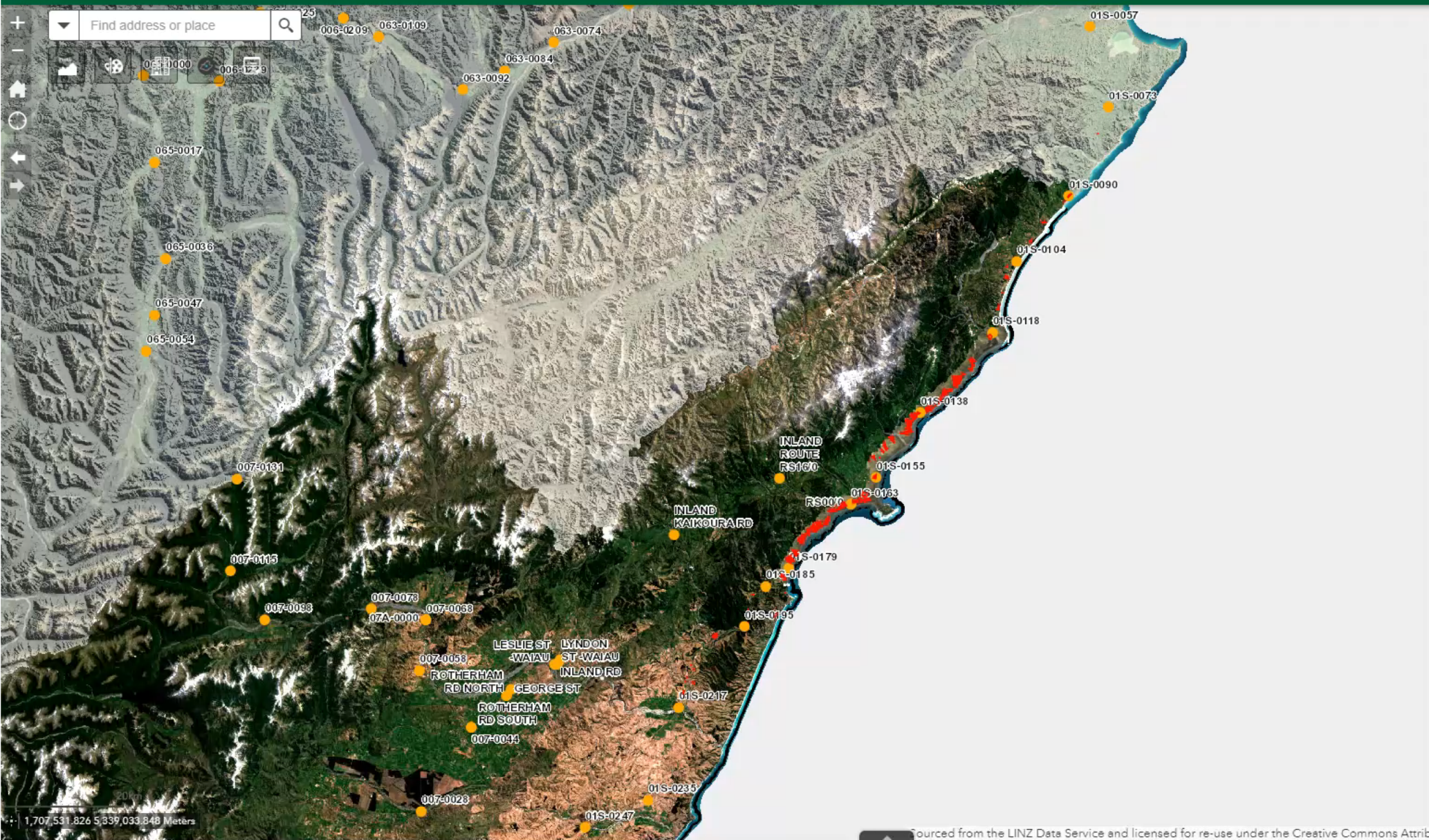
- More than 500 catchment generated saving huge number of professional hours
- Less error prone
- Hand over process of digital data easier
- Multiple people working on the same platform, data validation and approval process became more structured
- Feed back process and Supervising easier

# Lesson learned

- Try the software that suits you, rather than hanging on same (eg. FME Vs Arcmap)
- Working with Raster – Break down the DEM into smaller sections (within larger catchments) to make the process faster
- Continuous feedback from the end user and seek their opinions

# Demo.....

## NCTIR Catchment Delineation Viewer



### Layer List

- Operational Layers
  - FourPoint (Editable) ...
  - Delineated Catchment Area (Editable) ...
  - Catchment Result - Catchment Area ...
  - ECan Contours (Pre - EQ) ...
  - Terrain ...
  - Reference ...
  - Projects ...
  - Geohazards ...
  - Geology ...
  - Environmental ...
  - Chainages ...
  - Client Assets ...
  - KiwiRail Culverts within 50m of River ...
  - FlowAccumulation ...
  - DEM May2017 ...

Missing data? Something not working? Contact or come see us! We don't bite!

[Click to dismiss](#)

# Thank you very much for listening...



Subodh Dhakal

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[Subodh.Dhakal@abley.com](mailto:Subodh.Dhakal@abley.com)