

# Memo

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Date	23 March 2016
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From	Sungsoo Koh

## **Subject: Aerial Inference of Septic Tank Distribution in Waimakariri District**

### **Introduction**

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In preparation for the Waimakariri Canterbury Water Management Strategy (CWMS) zone sub-regional planning process, Environment Canterbury is estimating how much nutrients are entering waterbodies. Septic tanks are one source of nutrients and this work concentrates on mapping the spatial distribution within the Waimakariri District.

Human effluent consent layer provides indicative information on the distribution of the septic tanks but it is not an exhaustive list because many septic tanks are installed as a permitted activity.

This work aims to identify the locations of residential buildings outside the known sewered urban area (Waimakariri District Council, 2015) as a para-measure of septic tank distribution. The primary assumption was that rural residential houses require at least one septic tank to accommodate the human wastes. The points placed on top of residential houses form approximate location of the septic tanks. Residential buildings within the mapped sewered area were not added to the map. The most recent aerial photo (as at Jan 2016) was used to create the layer.

### **Method**

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Cadastral Parcel layers (ECAN GIS, 2016) was used as the base layer for this analysis. The parcel layer was used to keep track of progress of the mapping to ensure no parcel was left out uninspected and to avoid duplication. The preparation of the parcel layer was done as following:

1. Parcel layer was clipped to the district boundary.
2. Loaded Human effluent consent point layer.
3. Used [Select by Location] tool to select Parcel polygons that do not contain Human effluent consent points.
4. Created layer from the selection and exported the layer to a file.
5. Turned to Layer Edit mode.
6. Deleted parcel polygons that falls within the sewered area.

- Deleted parcel polygons that do not have buildings (e.g. Roads, Mountainous, Rivers). This was done based on FEATCODE<sup>1</sup> and visual inspection of aerial photo.

After the guide parcel layer was prepared, the actual mapping was carried out as following:

- Created a new point feature class that will contain the location of the inferred septic tanks.
- Inspect one of the visible parcel polygons.
- If a parcel polygon contained a building, the building was classified as either residential house, shed or warehouse (see figure 1 and 2 for description of how buildings are classified). A new field called [Note] was created and the parcel classification was recorded as one of: House, Possible Sewer Area, Shed only, or Warehouse only.
- Go to the property of the parcel layer and set the definition query as: Note NOT IN ( 'House' , 'Possible Sewer Area' , 'Shed only' , 'Warehouse only' ). This removes the processed polygons from being visible.
- If house was found in the remaining visible polygons, a point was added to the inferred septic tank layer.
- Repeat the process from Step 9 until no parcel polygon is visible on the map.



**Figure 1. Examples of parcels with Warehouse category (190 instances).** Buildings that have larger footprint than a usual residential house were classified as warehouses. They could be barns or industrial warehouse. There is a relatively high probability these land parcels will have a septic tanks but they were not included in the map because of the ambiguity.

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<sup>1</sup> FEATCODE provides a classification of the land regarding to the legal owner type and their rate paying status. In particular, I removed the parcels with FEATCODE 'hydro' and 'road'.

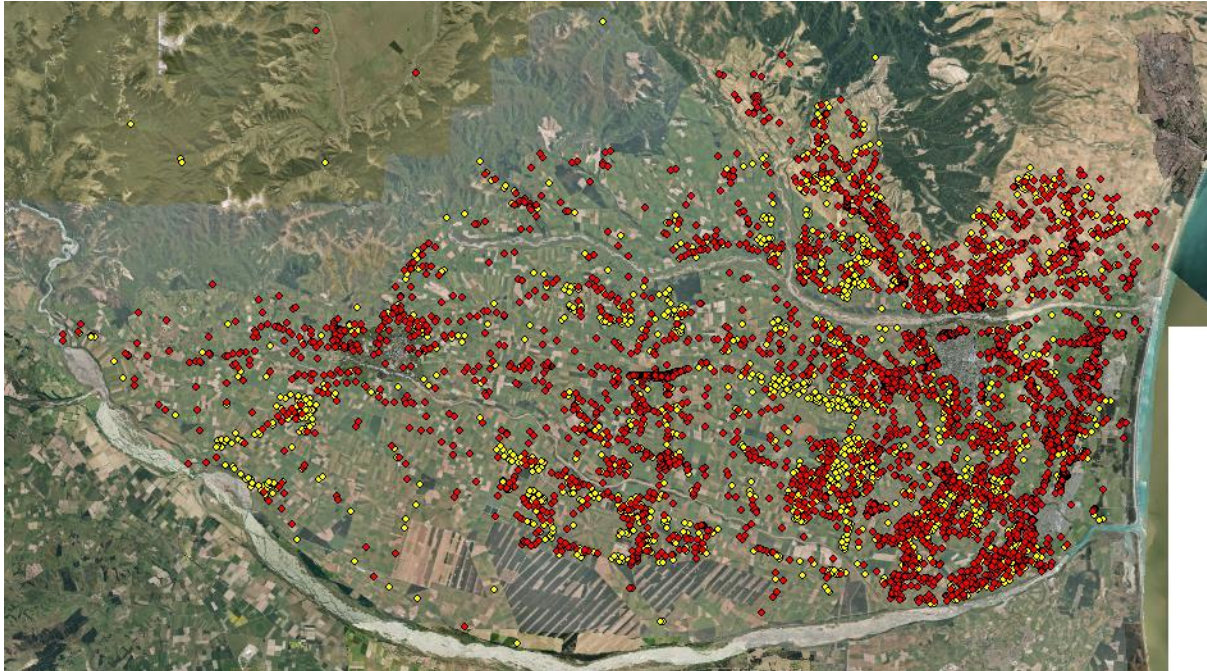


**Figure 2. An example of parcels with Shed category (751 instances).** Buildings that have smaller footprint than residential buildings are classified as shed and these have very low probability of having septic tanks installed. A few of these could be public toilets if positioned near the hilly areas.

## Results

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There were more permitted-activity septic tanks than consented ones in the district. This work could infer 3749 permitted-activity septic tanks from an exhaustive visual inspection of the aerial photo of the Waimakariri District (Figure 3). 190 parcels remain yet to be classified if they have septic tanks (Figure 1; there is a high probability that they will). These parcels contain buildings that are larger than residential houses and may have septic tanks.



**Figure 3. Coverage of the Created Point Map.** Red points are the inferred septic tanks (permitted activity: 3749 instances). Yellow points are the human effluent consent points (1786 instances).

## Reference

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Waimakariri District Council (2015). Wastewater Activity Management Plan. DISTRICT OVERVIEW. Accessed on 24/02/2016.

[http://www.waimakariri.govt.nz/\\_data/assets/pdf\\_file/0012/12720/Wastewater-Activity-Management-Plan-Overview-Document-2015.pdf](http://www.waimakariri.govt.nz/_data/assets/pdf_file/0012/12720/Wastewater-Activity-Management-Plan-Overview-Document-2015.pdf)

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