

# CASE STUDY



## Dirke and Petra Dietsche Waimatuku Catchment

### WHAT IS A SEDIMENT TRAP?

Sediment in drains and streams is largely made up of soil (clay, silt and sand) and gravel. A sediment trap is an area where the runoff from land will collect and settle for sufficient time to allow any sediment in suspension to drop out before the water drains away through an overflow or spill way. Heavy, coarse material will drop quickly, while the finer material will take longer. Any measure that spreads water out and slows down the flow, will allow sediments to drop out.

There are many different types of sediment traps.

- » Ponds are generally the most common type and are formed by excavation into the ground or by the construction of an embankment. They are designed so water leaves at a rate that will allow suspended sediment to settle out.
- » Drains can and do catch sediment. Sections of a drain can be engineered to increase the amount of sediment that they collect.
- » Swales are relatively flat grassed areas with gently sloping sides and a gentle longitudinal slope. They are generally used to transport runoff following a heavy rain. Water flows through these areas at a low velocity so that the grass or other vegetation acts as a filter to remove sediment.

### CASE STUDY

The Dietsche's operate a large dairy property in the upper Waimatuku catchment, bordering the Bayswater Bog in the Drummond area. The topography of the property has areas of rolling hill on an upper terrace before dropping down to flatter land adjacent to the Bayswater Bog.

Dirk was interested in installing some sediment traps on his property and sought advice from Environment Southland to determine the best locations for sediment traps on the property. A number of sediment traps were constructed in three different areas of the property, all utilising small gully and swale areas. Some of these areas were being used as farm forestry blocks, with sediment traps being installed after the trees had been harvested.

Due to the locations of each of these sites, they each have their own separate catchment areas ranging from 21-28ha in size.

### SEDIMENT TRAPS CONSTRUCTION PLAN



**MAP 1:** Locations of three potential sediment trap sites on the Dietsche's dairy property. Site 1 is the top left, site 2 is on the middle with site three to the bottom right.

## SITE ONE



**MAP 2:** Location of site 1 to the north of the dairy shed

This location is situated to the north of the western dairy shed. This sediment trap consists of a series of two traps with a larger one at the top that then flows into a smaller trap below. These have been constructed by creating a bund in an existing gully system. The catchment area above this site consists of developed pasture. This sediment trap aims to slow overland flow to allow sediment and phosphorus to drop from suspension during rainfall events.

Larger vegetation in this area was removed prior to construction. Now that construction is complete, native plantings have been reestablished around the site with fencing also completed for stock exclusion. Over time, plantings will help filter surface water by removing nutrients and trapping sediment.

**Table 1:** Key calculations for Site 1 sediment trap

|   |             |
|---|-------------|
| Catchment area                                      | 25ha        |
| Fenced off area                                     | 0.555ha     |
| Sediment traps size                                 | 50 x 5 x 1m |
| Effective sediment trap/wetland area                | 0.25 Ha     |
| Effective sediment trap/wetland area % of catchment | 1%          |
| % of N reduced                                      | 20%         |
| % of P stored                                       | 23 %        |
| % of sediment collected                             | 50 %        |

Unfortunately, no images were obtained of the site prior construction. The following photographs were taken once construction and planting was complete, with the plantings to mature over time.



**IMAGE 1:** Looking upstream towards the west. You can see the swale, critical source area or natural low point in the landscape above the construction area where overland flow will collect before flowing through the sediment trap system.



**IMAGE 2:** Looking downstream towards the east. You can see the larger containment area at the top of the series in the center of the image. The overflow channel located to the site of the sediment trap flows down to a second smaller sediment trap.



**IMAGE 3:** A close up of the first and larger sediment trap in this series of two. A bund has been placed to slow water flow allowing sediment to settle. Here you can see more definition of the depth of the sediment trap, and the overflow/outlet to the side of the containment area. The outlet is located to the side of the structure to ensure flow is disrupted and minimise the risk of blow out.



**IMAGE 4:** A close up of the second, smaller sediment trap in this series. Water from the outlet flows into an open drainage channel and into an adjacent waterway.

## SITE TWO



**MAP 2:** Location of site 2 located at 733 Otautau Drummond Road

This location is situated near 733 Otautau Drummond Road and is visible from the road. This sediment trap consists of a series of three similar sized traps. This site is similar to site one in that a series of bunds have been placed in an existing gully system to slow water flow allowing sediment to settle. The catchment area above this site also consists of developed pastures.

**Table 2:** Key calculations for Site 2 sediment trap

|   |             |
|---|-------------|
| Catchment area                                      | 21ha        |
| Fenced off area                                     | 1.46ha      |
| Sediment traps size                                 | 50 x 5 x 1m |
| Effective sediment trap/wetland area                | 0.53Ha      |
| Effective sediment trap/wetland area % of catchment | 2.5 %       |
| % of N reduced                                      | 30%         |
| % of P stored                                       | 38 %        |
| % of sediment collected                             | 70 %        |



**IMAGE 5:** A bund has been placed to slow water flow allowing sediment to settle. The containment area for this series is shaped to aid in reducing water velocity. As with the other sites, the outlet is located to the side of the structure to ensure flow is disrupted and minimise the risk of blow out.



**IMAGE 6:** Looking upstream showing the containment areas, bunds and outlet locations.



**IMAGE 7:** Looking downstream showing the two top containment areas.

## SITE THREE



**MAP 3:** Location of site 3 located at 905 Otautau Drummond Road. This site was previously planted in mature pines that have been recently harvested.

This location is situated near 905 Otautau Drummond Road and is visible from the road. This sediment trap also consists of a series of three similar sized traps by placing a series of bunds in an existing gully system to slow water flow allowing sediment and phosphorus to drop from suspension during rainfall events. The catchment area above this site also consists of developed pastures.

**Table 3:** Key calculations for Site 3 sediment trap

|   |             |
|---|-------------|
| Catchment area                                      | 28ha        |
| Fenced off area                                     | 1.5ha       |
| Sediment traps size                                 | 50 x 5 x 1m |
| Effective sediment trap/wetland area                | 0.55Ha      |
| Effective sediment trap/wetland area % of catchment | 2 %         |
| % of N reduced                                      | 27%         |
| % of P stored                                       | 34 %        |
| % of sediment collected                             | 67 %        |



**IMAGE 8:** Downstream view where each bund and containment area can be easily seen.



**IMAGE 9:** View of the containment areas, bunds and outflow areas looking upstream

## COSTS

|  |  |
|--|--|
| <p>Number of digger hours to construct using 20 ton digger</p> | <p>It took a total of 47 digger hours to construct the sediment traps at all three locations in Sediment trap in existing gully systems.</p> <p>Breakdown for each site is as follows:</p> <ul style="list-style-type: none"> <li>» Site 1: Two containment areas– 8 hours.</li> <li>» Site 2: Three containment areas- 16 hours</li> <li>» Site 3: Three containment areas – 23 hours</li> </ul> <p>It must be noted that each of these sites had previously been used for forestry purposes so more work/time was required to prepare the site when compared to a similar site that would be in pasture.</p> |
| <p>Any ongoing costs</p>                                       | <p>The cleaned when required which will largely depend in the farming activities occurring within their catchments.</p>  |

## SUMMARY

An important element to a cost effective and efficient sediment trap is choosing the best location - designing it to suit the situation and ensuring it is accessible for maintenance and removal of sediment to be put back on the paddock.

There are many factors to consider, each of which needs to be tailored to each site. These factors include the shape, size, depth and presence of any existing waterways.

Environment Southland have produced a guide to sediment trap construction that provides more details around the factors that need to be considered. Environment Southland staff are also on hand to visit your site to discuss the best options and put together a plan specific to your property.