Structure and Function of the South East Drainage Network

Types of drains

There are three major types of drains in the South East Region – surface water drains, flood mitigation and groundwater drains.

Surface water drains

Surface water drains aim to drain surface water from the landscape, generally without the requirement to intercept groundwater (i.e. relevant in the lower South East and parts of the upper South East). The drains can be relatively shallow and narrow at the top of the catchment (or headwaters) and become deeper (and in some case broader) as they move downstream.

Some surface water drains were developed at a much larger scale to enable large volumes of surface water to be transported through the landscape. These drains had a focus on improving production from agricultural land, and increasing transportation, but also drained wetlands, and hence made more land available for agricultural purposes.

Although surface water drains generally start as quite shallow structures at the top of the catchment, they need to become deeper as they move through the flat landscape to maintain the hydraulic gradient to their discharge point. They can therefore also become groundwater drains when they intercept the groundwater table.

Surface water drains harvest fresh water and move it away from the landscape, preventing broad-scale prolonged flooding of farmland. Historically, these drains were very often designed to discharge this water to the sea - but, if designed to do so, they can direct this harvested fresh water into wetland area lower in the catchment.

Flood Mitigation

Floodwater drainage serves to alleviate the broad-scale and prolonged inundation of the landscape, associated with significant seasonal rainfall events. Such inundation has been known to put large areas modified for production under water for many months. This can deny access to stock (and landholders) and can destroy large areas of improved pasture. It also contributes to the recharge of the groundwater table across the region and in the Upper South East can exacerbate the expression of salinity at the ground surface.

Importantly, regional landholders have expressed the view that such surface water drainage can give them the confidence to establish deep-rooted perennial pastures (without the risk of loss due to flooding) that they otherwise would not be prepared to invest in.

The topography of the South East by nature retains large volumes of water across what is now a developed agricultural landscape; with water pooling in extensive shallow depressions, covering large parts of the land surface. Small-scale on-farm drainage networks were historically developed on many properties to drain these low-lying basins into watercourses. In the natural state the watercourse country of the region also retained much water in broad shallow wetlands. In what has become a highly developed agricultural landscape this type of widespread and prolonged inundation conflicts with agricultural land management and business and so many watercourses have substantially been modified to move the water on. This creates its own problems, by exacerbating downstream flooding.

We now know that with careful planning and infrastructure development, these floodwaters can be carried through the landscape by way of catch-drains, contained flood-ways and natural watercourses, to be delivered as environmental flows to remaining wetlands; which can serve as flood attenuation (reduction) and flow balancing storages, as well as high value biodiversity assets in their own right.

Groundwater Drains

The development of groundwater drains has largely occurred in the upper South East where the salinity that exists in the shallow unconfined aquifer is a particular land management problem.

Groundwater drainage provides for drawdown of saline groundwater away from the surface root zone of plants. Most significantly this drawdown of the groundwater table during the summer months can impede the wicking (drawing up) of salts into the root zone by lowering the water-table beyond the effective zone of influence of evaporation.

The subsequent leaching of salts from the upper soil profile (with winter rainfall) provides the opportunity for plants to access fresh water in the profile during winter, which can dramatically improve their health. These drains are generally constructed to a depth of 2-3 metres but, as with surface water drains they need to become deeper as they move through the flat landscape to maintain the hydraulic to their discharge point.

These drains create a drawdown effect on the (winter) ground water table reducing the accumulation of salt in the upper soil profile in the 'at risk' low-lying areas of the landscape. The drawn down zone of influence area is asymmetric and can conservatively extend 1.5km to 2.5km east of the drain and usually only around 0.5km to 1km west of the drain.

Unfortunately many older design groundwater drains also capture surface water and (mixed with saline groundwater) discharge this from the landscape – which is a significant loss to the regions wetland environments. However: groundwater drains can be used to transfer fresh surface water to wetlands (following large rainfall events – and subject to specific water quality conditions) by the use of regulators.