SEDIMENT BASINS

WHAT IS THIS?

Sediment basins are primarily used for large development sites. They are temporary dams or ponds which capture sediment-laden water from large disturbed areas. A sediment basin is a Type 1 Sediment Control, effective for capturing fine, medium, and large particles. Sediment basins are one of the most useful and cost-effective means of treating runoff. If designed to be part of the final development, they can be an effective water sensitive urban design (WSUD) feature, ensuring better post-construction water quality outcomes, and adding amenity and value to the site.

A sediment basin is formed by excavating a dam or constructing an embankment with an appropriately designed outlet structure and overflow spillway – it MUST have an emergency spillway. A sediment basin is the only sediment control measure which will effectively treat highly turbid runoff, which has fine clay particles not captured by other controls. Where clay particles are suspended in runoff, using a coagulant or flocculant will be necessary to settle the clay particles out.

The requirement for a sediment basin will be determined at the planning permit stage if the expected ground disturbance area is greater than 2,500m² or for reasons determined by the council, such as specific water quality objectives associated with a receiving waterbody. A sediment basin must be designed by a suitably qualified person such as a Certified Professional in Erosion and Sediment Control (CPESC). Sediment basins over one megalitre may require a Dam Works Permit under the *Water Management Act 1999* (see: www.nre.tas.gov.au/water/dams/dam-works-permit-guidelines).

For smaller development sites where a large sediment basin is not required, an 'undersized' sediment basin can work well to achieve required water quality with the use of a coagulant or flocculant. These basins work the same way as larger basins, including a protected spillway. Construction should aim to maximise the storage volume as much as practical. Performance limitations will largely be due to capacity.

The preferred options for sediment basin construction are high efficiency sediment (HES) basins with automated dosing, namely Type A or Type B basins (Figure 24). Type D batch basins may be used where Type A/B HES basins are not considered reasonable or practicable. Due to their proven performance in achieving water quality discharge parameters, smaller footprint and ease of operation, Type B HES basins are quickly becoming the norm in Australia and are considered best practice in many parts of the country, where duration of soil disturbance does not exceed 12 months. The design procedure for Type A, B and D basins is specified in IECA Appendix B, 2018.

WHAT DO I NEED TO DO?

Before starting site works:

Have your sediment basin designed by a suitably qualified person and include the design specifications and associated reports in your ESCP (see page 17). More information on sediment basins can be found in the Sediment Basins factsheet (IECA Book 4 Design Factsheets, 2010) and in IECA Appendix B, 2018. The following factors will be taken into account by the designer:

- catchment size, gradient, and dominant soils;
- presence of dispersive soil;
- located so that if failure occurs, damage or a nuisance to property, people, or the environment will be minimised;
- located off-line and up-stream of the stormwater system and natural and constructed waterways and water bodies;
- location of existing flood event overland flow paths;
- access for machinery to remove sediment;
- chemical dosing requirements and equipment for adding flocculant or coagulant. See *Jar testing*, page 77;
- placement of a marker post within the basin to indicate depth; and
- the post-construction function of the sediment basin (i.e. the design will be different depending on whether the basin will be in-filled or converted to a wetland).

A sediment basin must be used in conjunction with other drainage, erosion and sediment controls upstream of the basin. The basin must remain functional until any potential erosion has been stabilised – usually just prior to completion. The ESCP, design plans and report must include detailed instructions about how the basin will be constructed, maintained, and decommissioned. Include the function and maintenance of sediment basins in all site inductions.

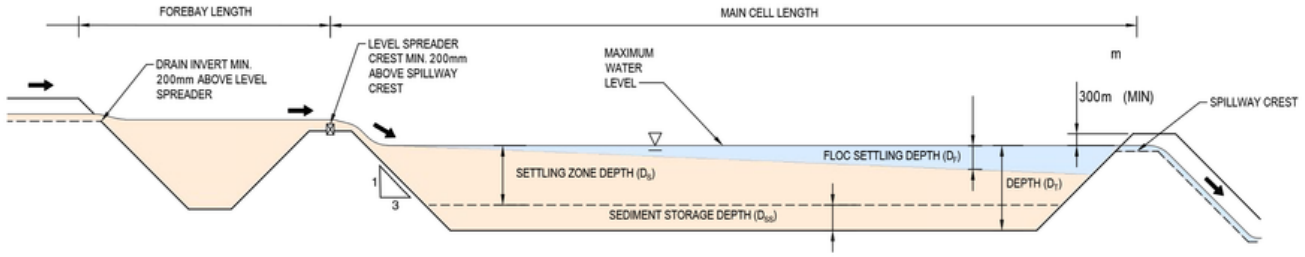
Note: When water is being released/pumped from the sediment basin to the receiving environment or a stormwater connection, 80% of the average annual runoff volume should be treated to less than 50mg/L Total Suspended Solids (TSS), and pH in the range 6.5 – 8.5. Automated coagulant or flocculant dosing systems are available, using either rainfall or flow activated inputs to determine required dosing volumes.

Maintaining a sediment basin:

Sediment basins require regular inspection prior to forecast rain and after rain events by a suitably qualified person. Litter and debris must be removed whenever observed in the sediment basin, and if the water within the basin is cloudy, the coagulant/flocculant dose rate should be checked.

Sediment basins must maintain a minimum sediment settling zone of 0.6m depth and should be treated and dewatered within five days after a rain event. Sediment basins must be cleaned when half full of sediment, by means of a vacuum truck or excavator bucket (depending on the depth of sediment and water). Sediment can be spread out/stockpiled to dry out above the basin above associated sediment controls, with water seeping back into the basin. The dried sediment can be left in place and vegetated/stabilised, reused on-site, or disposed of to landfill.

(a)



(b)

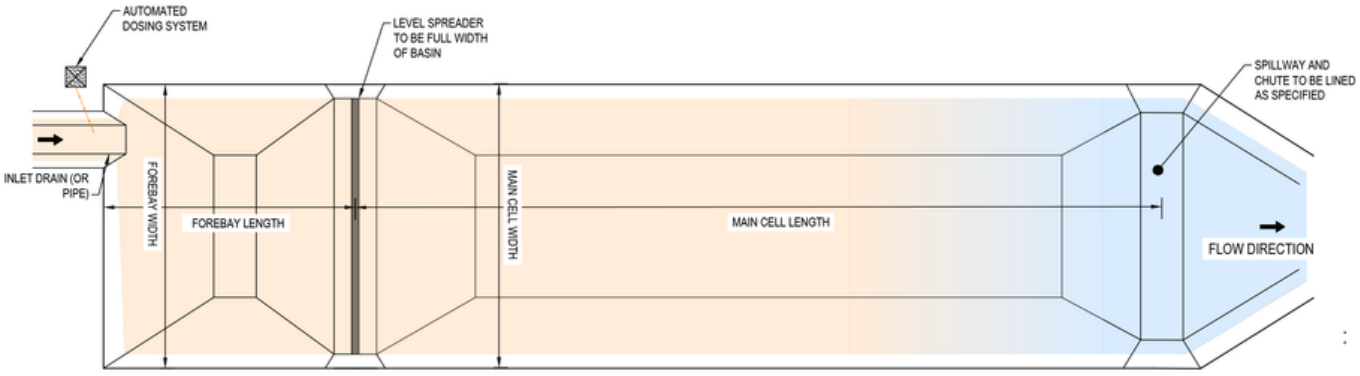


Figure 24: Technical diagrams indicating the dimensions and construction details of a Type B sediment basin in (a) cross-section and (b) plan views. Not to scale.

JAR TESTING

'Jar testing' is used to work out the chemical dosing with coagulant or flocculant which is needed to achieve acceptable water quality in sediment basins. It is recommended that this testing is done before designing the basin as the most suitable chemical (flocculant and/or coagulant) is likely to vary with different soil types. You need to keep checking whether these products are working well over time as what the basin is capturing will change during different phases of the project. More information, including a template Floc Performance Report can be found in IECA Appendix B, 2018.

Due to its effectiveness (which means lower dosing) and reduced effect on pH, the preferred coagulant for use in high efficiency sediment (HES) basins is aluminium chlorohydrate (ACH). In some cases a flocculant such as chitosan may work better. Unless justified for specific site use, aluminium sulphate (Alum) and polyaluminium chloride (PAC) should be avoided due to their potential to significantly alter pH. Gypsum may be used as an alternative coagulant in manually treated Type D batch basins, however the reduced effectiveness of gypsum compared to ACH requires significantly longer settling times (resulting in delays to dewatering). In addition, treatment with gypsum will require a considerable dose rate and labour effort to apply and effectively mix throughout the basin.