

# **Rain Gardens**

## **North Kellyville Release Area**

### **Installation Guide and Specifications**

*This "installation guide and specifications" relates to the design and construction of rain gardens on individual residential lots in the North Kellyville Release Area and should be read in conjunction with the associated "standard drawing".*

*This is a technical document intended to assist developers, builders, engineers, plumbers at the construction stage. For more general information concerning these rain gardens refer to the separate fact sheet entitled "Rain Gardens North Kellyville Release Area" which is available on Council's website.*

#### **SCHEDULE OF AMENDMENTS**

A		September 2012
B	Clarify area/ volume Specify landscaping density/ species Other housekeeping amendments	October 2015
C	Minimum width updated to match standard drawing	May 2018

The following instructions have been ordered according to the expected construction sequence for a typical rain garden.

These instructions should be followed as shown unless a variation is approved by Council staff, in writing.

The person responsible for constructing the rain garden is required to complete the checklist included as "Appendix A" and submit it to the principal certifying authority (PCA) at the end of the project. Where Council is not the certifier, a copy of the completed checklist must be submitted to Council.

#### **General Requirements**

1. The rain garden should be constructed as late as possible in the project otherwise sediment and gross pollutants generated by building works will damage the rain garden.
2. The rain garden must be located at the lowest part of the site, clear of driveways, services and other constraints.
3. For lots that fall to the street the rain garden must be provided in the front setback.
4. For lots that fall to the rear the rain garden must be provided in the rear yard.
5. The minimum rain garden width is 1.1m. Otherwise, the rain garden can be any shape provided the surface area matches that required for the site, as referred to in the restriction that appears on the property title.
6. The surface area required for the site, as referred to in the restriction that appears on the property title, refers to the area of the rain garden measured from the top of the batter (the area where ponding will occur).
7. The depth of the rain garden excavation should be 800mm (minimum). This depth is composed of a "drainage layer", "transition layer", "filter media" and "extended detention area", which are described in more detail below.
8. The storage volume required for the site, as referred to in the restriction that appears on the property title, refers to the area above the surface (where ponding will occur). Importantly, the area below the surface does not count towards this volume. For example, where the restriction calls for a rain garden with a surface area of 10m<sup>2</sup> and a storage volume of 1.5m<sup>3</sup>, 150mm of ponding over the 10m<sup>2</sup> footprint will provide the 1.5m<sup>3</sup> of required storage volume.
9. Both the surface area and storage volume are important. Hence why they are both cited in the restriction that appears on the property title. A rain garden with the correct surface area but no depression/ ponding above the surface will not comply/ detain stormwater, whilst a rain garden with the correct volume (via deeper ponding) but with a smaller surface area will not comply/ treat stormwater quality.

10. Noting that the system is designed to hold water, the rain garden footprint needs to be setback from the dwelling and any property boundary. The typical batter called for in the standard drawing is 450mm which means if the top of the batter is located on the property boundary, the treatment area/ filter media would then be setback 450mm from the boundary, complying with this requirement.

### Lining

11. Geotextile fabric lining must be provided in the base of the rain garden and all sides.
12. Geotextile fabric lining must not be provided between layers as it increases the risk of clogging, stopping the system from functioning properly.
13. Where infiltration from the rain garden into the surrounding soil is undesirable (salinity, groundwater levels etc;) an impermeable (waterproof) liner must also be provided in the base of the rain garden and all sides.

### Drainage

14. A sub-soil drain in the base of the rain garden and one flushing point (minimum) must be provided.
15. Depending on the size and shape of the rain garden, a single sub-soil drain must be located centrally in the base of the rain garden or two parallel sub-soil drains provided on either side of the base of the rain garden.
16. The sub-soil drain can be either 90mm diameter flexible agricultural pipe drain (ag-drain) in a sock or a 100mm diameter perforated pipe with no sock. A perforated pipe is preferred as it is easier to clean whilst ribbed pipes retain moisture which may attract plant roots into the pipes.
17. The base of the rain garden must fall towards the sub-soil drain.
18. The sub-soil drain must connect to the "inter-allotment drainage pit" that exists in the low point of the site.
19. Where the rain garden is located further than 2m from the existing "inter-allotment drainage pit", a new 300mm square plastic (or similar) "outlet pit" will be required between the rain garden and the "inter-allotment drainage pit". This important design detail is shown on the standard drawing, which includes an example of a rain garden located away from the existing "inter-allotment drainage pit".
20. Similarly, an "outlet pit" must be used where the surface level of the existing "inter-allotment drainage pit" does not match the proposed ponding/ top water level of the rain garden.
21. Once the depth of ponding in the rain garden has exceeded 150mm stormwater will overflow into the "inter-allotment drainage pit" (or new "outlet pit" as above). The area between the rain garden and the "outlet pit" must remain clear of obstructions.
22. The surface level of the "inter-allotment drainage pit" (or new "outlet pit" as above) must be 150mm higher than the surface level within the rain garden, to allow for extended detention.
23. All surface areas, downpipes, overflow from the rainwater tank must be directed towards the rain garden.
24. Any piped drainage from the site must be connected to a new 300mm square plastic (or similar) "surcharge pit" within the rain garden.
25. The purpose of this "surcharge pit" is to transfer inflow to the surface, so that it may pass through the rain garden.
26. The surface level of the "surcharge pit" must be 150mm lower than the surface level of the "inter-allotment drainage pit" (or new "outlet pit" as above) and the surrounding finished ground level to provide for "extended detention" above the rain garden.
27. The surface level of any other drainage pits on site directed to this "surcharge pit" must be higher than the surface level of the "surcharge pit".
28. Weep holes must be drilled in the base of the "surcharge pit" to avoid stagnant water in the base. These weep holes must still allow stormwater to surcharge into the "extended detention" area.



29. The area underneath the "surcharge pit" must be filled using clean, fine gravel similar to that used in the "drainage layer" (see below).
30. A well designed and located rain garden will limit the amount of additional drainage pipes/ required to be provided.

#### **Drainage (Bottom) Layer**

31. This layer is 150mm deep (minimum).
32. This layer must consist of clean, fine gravel such as a 2mm to 5mm washed screenings.
33. This layer will provide 50mm of cover over the sub-soil drain.
34. The purpose of this layer is to collect and drain the treated stormwater that has passed through the "filter media" and "transition layer".

#### **Transition (Middle) Layer**

35. This layer is 100mm deep (minimum).
36. This layer must be placed on top of the "drainage layer".
37. This layer must consist of clean, well-graded sand/ coarse sand material containing little or no fines.
38. The purpose of the transition layer is to stop the downward migration of smaller particles between the "filter media" and "drainage layer".

#### **Filter Media (Top Layer)**

39. This layer is where the majority of the water quality treatment occurs and so the sourcing and placement of this material is critical to the effective operation of the system.
40. This layer is 400mm deep (minimum).
41. This layer must be placed on top of the "transition layer".
42. The material used must comply with the following requirements:
  - This layer must have a loamy sand texture.
  - The filter media must be free of rubbish, deleterious material and toxicants and is not hydrophobic.
  - Saturated hydraulic conductivity (permeability) of 100mm/hr.
  - Particle size distribution:
    - Clay and silt (<3%) (<0.05mm)
    - Very fine sand (5% to 30%) (0.05mm to 0.15mm)
    - Fine sand (10% to 30%) (0.15mm to 0.25mm)
    - Medium to coarse sand (40% to 60%) (0.25mm to 1.0mm)
    - Coarse sand (7% to 10%) (1.0mm to 2.0mm)
    - Fine gravel (<3%) (2.0mm to 3.4mm)
  - The organic matter content must be less than 5% (weight to weight).
  - pH as for "natural soils and soil blends" of 5.5 to 7.5 (pH of 1:5 in water).
  - Electrical Conductivity (EC) as for "natural soils and soil blends" < 1.2dS/m
  - Phosphorous concentration < 100mg/kg (reducing to 20mg/kg where moderately phosphorus sensitive plants are used).
43. Once placed this layer must be lightly compacted to prevent the migration of fine particles (90% standard compaction).

#### **Earthworks**

44. The surface level of the "surcharge pit" must match the level within the rain garden.
45. The surface level of the "inter-allotment drainage pit" (or new "outlet pit") must match the level surrounding the rain garden, 150mm higher than the level within the rain garden (namely, the level of the surcharge pit).
46. The sides of the rain garden must be battered at 1(V):3(H). This batter must not extend over the "filter media".
47. Where low level retaining walls are proposed in place of the batter, which for sloping sites is typically necessary, the same surface area and storage volume must still be provided.
48. The area between the rain garden and the "inter-allotment drainage pit" (or new "outlet pit") must be shaped to direct overflow towards the "inter-allotment drainage pit" (or new "outlet pit").
49. This is the minimum level to which the rain garden can be constructed before a builder is able to issue practical completion. This only applies where the landowner is responsible for landscaping. Where the builder is responsible for landscaping, this must

occur before practical completion of the project. The PCA cannot issue any Occupation Certificate until the raingarden has been constructed and certified (completed checklist) as achieving this minimum level of completion.

50. Where there is to be a delay between the minimum level of completion (above) and the landscaping (below), an additional layer of geotextile fabric lining must be provided over the rain garden extending to the top of the batter to protect the "filter media" from sediment and gross pollutants.
51. The shaping of the surface of the rain garden carried out at this stage must ensure the area for ponding (150mm) is allowed for. As noted earlier, a rain garden with the correct surface area but no depression/ ponding above the surface will not comply/ detain stormwater.

### **Landscaping**

52. Mulch reduces weed growth and moisture loss from soils. Mulch used in a rain garden must be non-floating such as basalt, sandstone or river stone.
53. Planting within the rain garden must be able to withstand periods of inundation, longer boggy wet periods as well as long dry periods. The free draining nature of rain gardens means that they can dry out quickly.
54. Plant selection is critical for nutrient removal and hydraulic conductivity. No less than 50% of the plants used in the rain garden must be made up of Carex, Juncus, Melaleuca and Goodenia ovata species.
55. The minimum planting density is to be between six and ten plants per square metre.
56. The minimum pot size for plantings is 50mm.
57. Without the correct plants at the required density (see above) the rain garden will not work and the effective life of the filter media will be drastically reduced.
58. Turf cannot be used as it requires a thick layer of heavy topsoil to which will stop the rain garden from being free draining. Turf is also incapable of withstanding periods of inundation or longer boggy wet periods.
59. The rain garden should be separated from any adjacent turfed area by a timber edge strip or similar located at the top of the batter.
60. Intensive initial planting will reduce the establishment period and make maintenance of the rain garden easier by reducing the risk of weed invasion.

# APPENDIX "A"

## Rain Garden Construction Checklist

As explained in the "installation guide and specifications" the person responsible for constructing the rain garden is required to complete this checklist and submit it to the principal certifying authority (PCA) at the end of the project. An Occupation Certificate cannot be issued until the rain garden has been constructed to the minimum level of completion mentioned in the "installation guide and specifications" and the completed checklist submitted.

Where Council is not the PCA a copy of the completed checklist must be submitted to Council.

<b>General Requirements</b>	
The surface area of the rain garden required as per the restriction that appears on the property title is:	
The surface area of the rain garden as constructed is:	
The storage volume of the rain garden required as per the restriction that appears on the property title is:	
The storage volume area of the rain garden as constructed is:	
The rain garden is located in the lowest part of the site clear of site constraints:	
The base of the rain garden is 800mm below the final surface level:	

<b>Lining</b>	
Geotextile fabric lining has been installed in the base of the rain garden and all four sides:	
Geotextile fabric lining has not been installed between layers:	
An impermeable (waterproof) liner has been installed (only where site conditions warrant):	

<b>Drainage</b>	
A sub-soil drain has been installed and connected to the inter-allotment drainage pit or outlet pit:	
A flushing point has been installed:	
A flexible agricultural pipe drain (ag-drain) in a sock or a perforated pipe was installed (specify which):	
The base of the rain garden slopes towards the sub-soil drain:	
Has a new outlet pit been installed (where the rain garden is too far from the inter-allotment drainage pit):	
The surface level of the inter-allotment drainage pit or outlet pit is 150mm higher than the rain garden:	
All surface areas, downpipes, overflow from the rainwater tank are directed to the rain garden:	
A 300mm square plastic surcharge pit has been provided in the rain garden:	
Weep holes have been drilled in the base of the surcharge pit:	
The surface level of the surcharge pit is 150mm lower than the surface level of the inter-allotment drainage pit:	
The surface level of any other drainage pits on site are higher than the surface level of the surcharge pit:	

<b>Drainage Layer</b>	
The depth of this layer is 150mm:	
Clean, fine gravel has been used (a copy of the suppliers receipt must be attached):	

<b>Transition Layer</b>	
The depth of this layer is 100mm:	
Clean, well-graded sand/ coarse sand material has been used (a copy of the suppliers receipt must be attached):	

<b>Filter Media</b>	
The depth of this layer is 400mm:	
The loamy sand material used complies with the "installation guide and specifications" (a copy of the suppliers receipt must be attached):	
This layer has been lightly compacted (90% standard compaction):	

<b>Earthworks</b>	
The surface level of the surcharge pit is level with the rain garden:	
The surface level of the inter-allotment drainage pit or outlet pit is level with the surrounding area:	
1(V):3(H) side batters or a low level retaining wall (for sloping sites) clear of the filter media have been provided:	
The area between the rain garden and the inter-allotment drainage pit or outlet pit is clear of obstructions:	
The rain garden surface is "shaped" to provide the required ponding depth (150mm) between the surface level of the surcharge pit and the surface level of the inter-allotment drainage pit or outlet pit:	
Geotextile fabric lining has been installed over the rain garden (where landscaping is deferred):	

<b>Landscaping</b>	
These works are being deferred but as per the "installation guide and specifications" requirements:	
Non-floating mulch has been installed:	
The rain garden has been separated from adjoining turfed areas by a timber edge strip (or similar):	
Plants have been installed as per the "installation guide and specifications", both with respect to the type and density of planting, (a copy of the suppliers receipt must be attached):	

**Sketch**

A sketch of the site showing the location of the constructed rain garden in relation to the dwelling must be provided below:

<b>Name:</b>	
<b>Company:</b>	
<b>Address:</b>	
<b>Contact Number:</b>	
<b>Accreditation/ Qualification:</b>	
<b>Date:</b>	
<b>Signature:</b>	