

ECM Submission Guidelines

PUB
Catchments & Waterways Department
August 2021



Background & Way Forward

PUB is developing a faster solution to check ALL ECM Plans using machine learning in 2 to 3 years time.

Current Gaps

No standardization of drawing labels, making Machine learning difficult.

Proposed way forward

In order to achieve accuracy checks, PUB aims to develop ECM Submission Guidelines for adoption by industries - Target by 4Q2021.

- Submission Guidelines aims to specify standards on the following:
 - *Naming of drawings*
 - *Element Labels*
 - *Hatching patterns*
 - *Types of Arrows*

Submission Document Requirements - Overview

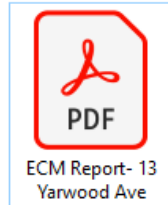
1. ECM Report (1 PDF File)

- Cover Page ([Slide No. 3](#))
- Contact Information List ([Slide No.4](#))
- Content Page ([Slide No. 5](#))
- Appendix ([Slide No. 7](#))

PDF File Name:

ECM Report – Location

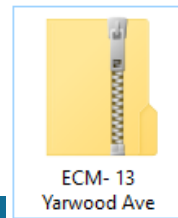
(E.g. *ECM Report -13 Yarwood Ave*)



All submission documents (*i.e. ECM Report & Drawings*) shall be submitted in a zip-file and to be named in the following format:

Zip folder name:

ECM_Project Location



2. Drawings (1 PDF File)

- Site plan ([Slide No. 8](#))
- Cross Section ([Slide No. 10](#))
- Longitudinal Section ([Slide No. 11](#))

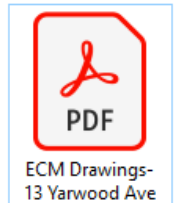
PDF File Name:

ECM Drawings – Location

(E.g. *ECM Drawings- 13 Yarwood Ave*)

Drawing Title Block Name e.g.

- ECM Site Plan- 13 Yarwood Ave
- ECM Cross Section A-A - 13 Yarwood Ave
- ECM Longitudinal Section B-B- 13 Yarwood Ave



ECM Drawings-
13 Yarwood Ave

Submission Document Requirements

1 (a). Cover Page

- i. BCA Project title & Project Reference
- ii. Subtitle on detailed scope of works E.g. Demolition works, road works etc.
- iii. Cover page to be duly endorsed by QECP.

<p style="text-align: center;">BCA PROJECT TITLE DEMOLITION OF EXISTING XX BLOCK OF XX STOREY WITH XX STOREY APARTMENT ON LOT XXXX, TS/MKXX AT XX ROAD</p> <p style="text-align: center;">PROPOSED EARTH CONTROL MEASURES</p> <p style="text-align: center;">NAME AND ADDRESS OF OCCUPIER</p> <p style="text-align: center;">PREPARED BY: NAME AND ADDRESS OF QECP</p> <p style="text-align: center;">Date (MM/YYYY)</p>

EXAMPLE OF **SAMPLE** COVER PAGE

Submission Document Requirements

1 (b). Contact Information List

- i. Contract period – *State the start & end date*
- ii. Contact information of stakeholder listed.
 - i. *Contractor*
 - ii. *Developer/ Owner*
 - iii. *QECP*
 - iv. *Architect*
- iii. The following information to be provided for the above:
 - i. *Name*
 - ii. *Company & Company Address (Provide Unit No. if any)*
 - iii. *Contact Number, Fax and Email*
- iv. This page to be duly endorsed by QECP.

Submission Document Requirements

1 (c). Content Page

- i. Brief introduction of the projects
- ii. Construction sequence- *(e.g. different phases, if any)*.
- iii. Sub-catchment calculation to be included for different storage ponds on site
- iv. Design capacity of holding pond and cut-off drain
- v. ECM design calculation for Total Suspended Solids (TSS) yield calculation.- *Before & After erosion control*
- vi. Summary Table- *Refer to [Slide No. 6](#) for details to be included.*
- vii. Inspection, Monitoring, Maintenance and Review plan

Submission Document Requirements

1 (c) vi. Summary Table

Summary of Total Runoff & Water Treatment Capacity (For All phases if any)

Phase 1

Area	Total Site Area (ha)	Max Exposed Area (ha)	Total Runoff Volume (m ³)	Storage Tank Volume (m ³)	Cut-off Drain volume (m ³)	Total Storage Volume(m ³)	Water Treatment plant provided (m ³ /hr)
Area 1	0.24	0.12	62.00	33.00	30.00	63.00	10.00
Area xx	xx	xx	xx	xx	xx	xx	xx

Phase xx

Area	Total Site Area (ha)	Max Exposed Area (ha)	Total Runoff Volume (m ³)	Storage Tank Volume (m ³)	Cut-off Drain volume (m ³)	Total Storage Volume(m ³)	Water Treatment plant provided (m ³ /hr)
Area 1	xx	xx	xx	xx	xx	xx	xx
Area xx	xx	xx	xx	xx	xx	xx	xx

Submission Document Requirements

1 (d). Appendix

- i. Soil Investigation report. QECs shall only submit relevant sections of the SI report.
 - i. Limited to 4 Boring logs (up to 20m depth) at various location on site*
- ii. Silty water treatment system catalogue - *Limit to 1 page*

Submission Document Requirements

2 (a). Site Plan

The Layout View of the CAD drawings recommended to be presented in scale of: **1: 100, 1:500 or 1:1000**
Whichever is appropriate

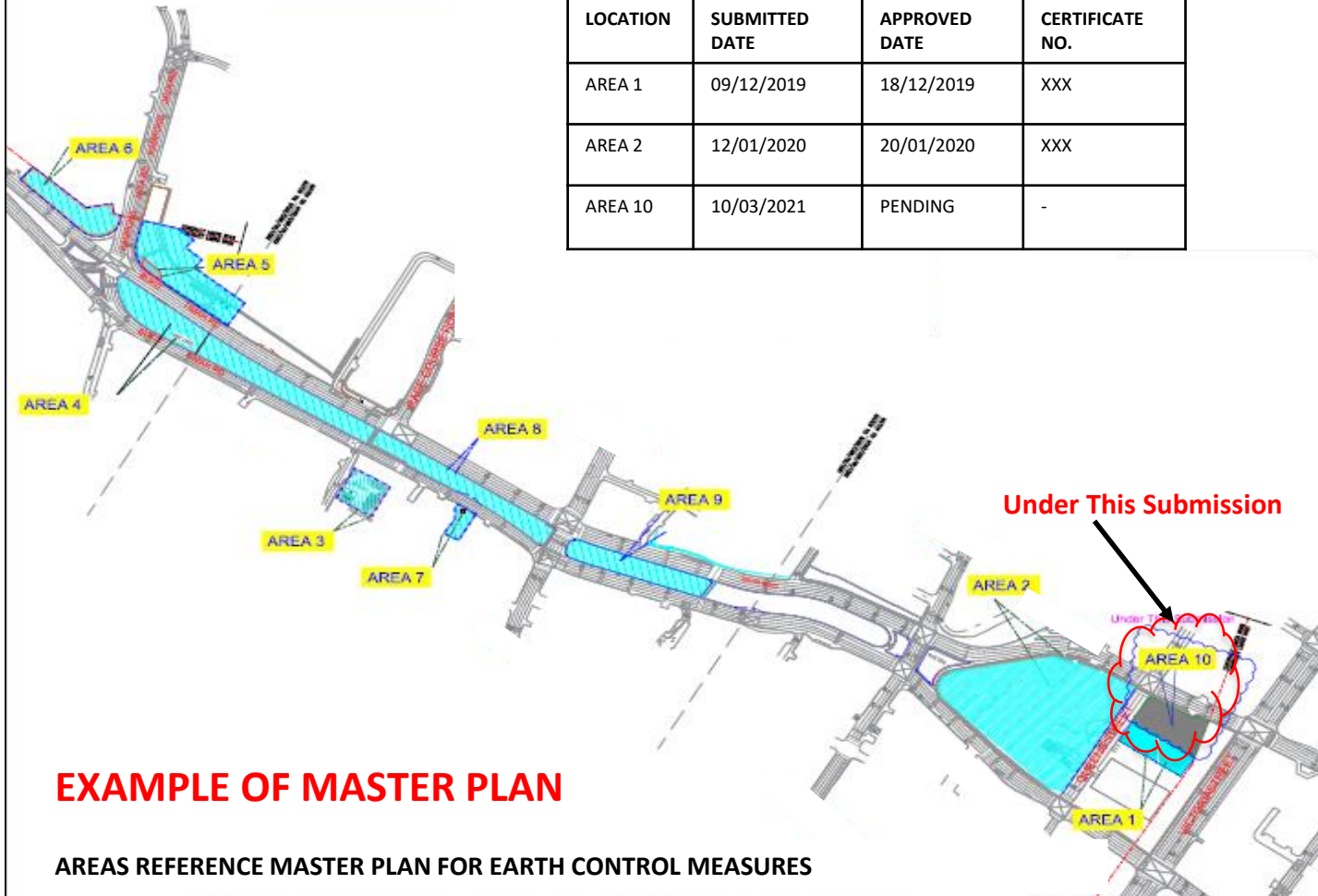
- i. Title block drawing name format: “ECM Site Plan – Location”
- ii. Location map of proposed works. - *Showing at least two road/street names.*
- iii. For specific works that are part of a larger project (e.g. MRT/ NSC projects) and spilt into different contracts/parts- *An overall master plan showing extent of contract to be included.*
- iv. For Sub-catchment plans, QECP is to indicate how the silty runoff will be channelled to storage pond.
- v. At least **5 spot levels** (in SHD) to indicate the profile terrain of the development site. One level should be near the holding pond.
- vi. Drawing scale, general notes, legends & summary table.
- vii. Drawings shall be submitted in colour.**
- viii. To be duly endorsed by QECP.

Submission Document Requirements

2 (a) iii. Site Plan – Master Plan

SUMMARY TABLE

LOCATION	SUBMITTED DATE	APPROVED DATE	CERTIFICATE NO.
AREA 1	09/12/2019	18/12/2019	XXX
AREA 2	12/01/2020	20/01/2020	XXX
AREA 10	10/03/2021	PENDING	-



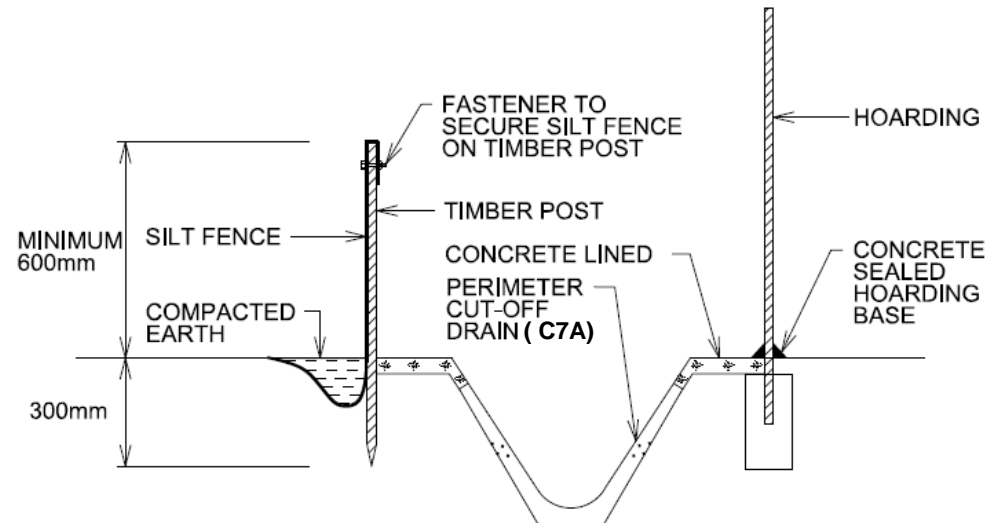
EXAMPLE OF MASTER PLAN

AREAS REFERENCE MASTER PLAN FOR EARTH CONTROL MEASURES

Submission Document Requirements

2 (b). Cross Sections

- Cross-sectional details for the key design elements as shown below shall be provided. Please note that this list is not exhaustive and the QECP is to also include any other relevant details.
- Cross sectional details listed:-
 - Cut off drain, silt fence and hoarding;
 - Silt traps
 - Concrete hump, sand bags
 - Holding pond/Storage tank
- To be duly endorsed by QECP.



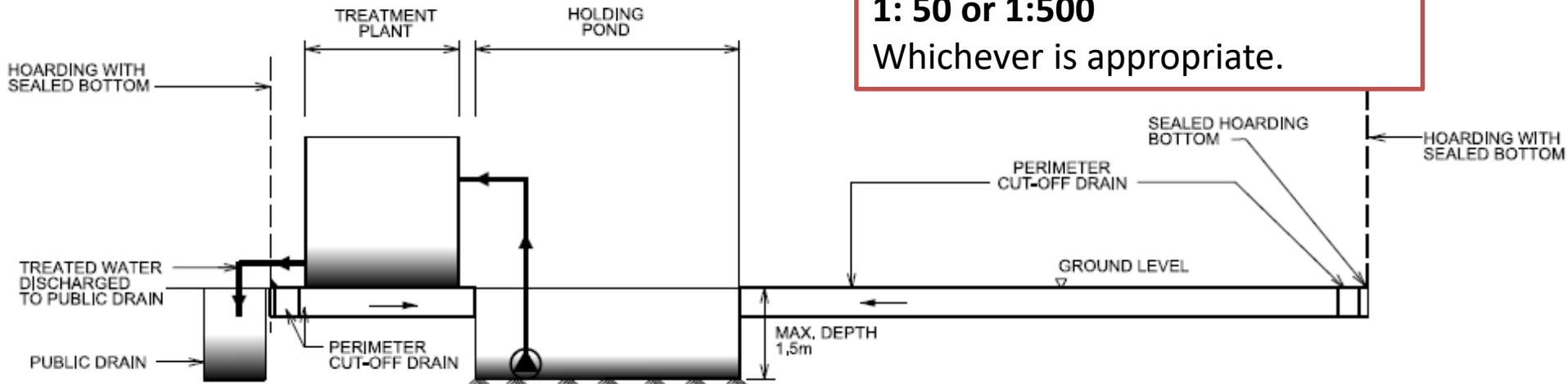
EXAMPLE CROSS SECTION DETAIL OF PERIMETER CUT-OFF DRAIN, SILT FENCE AND HOARDING

Submission Document Requirements

2 (c). Longitudinal Sections

- Longitudinal section details should include:
 - Cut off drain flow, Holding pond, treatment plant and connection to public drain
- To be duly endorsed by QECP.

The Layout View of the CAD drawings recommended to be presented in scale of:
1: 50 or 1:500
 Whichever is appropriate.



EXAMPLE LONGITUDINAL SECTION

Annotations & Naming of Drawing Title Block

- If section details are included in the same drawing sheet as Site Plan, section details shall be annotated clearly in the drawing for example “Cross Section A-A”; “Longitudinal Section B-B” etc. The Drawing sheet Title Block shall be labelled as “ ECM Site Plan & Sections-Location”.
- If section details are in separate drawing sheets, the drawing sheet title block to be labelled clearly as “ECM Cross Section- Location”; “ECM Longitudinal Section– Location” etc.
- For ECM works that are proposed in multiple phases drawn in the same sheet, each phase shall be clearly annotated as follows: “Site Plan (Phase xx) ”, where xx is the phase number. If each phase provided in different drawing sheets, the sheet title block to be labelled as “ ECM Site Plan (Phase xx) – Location”

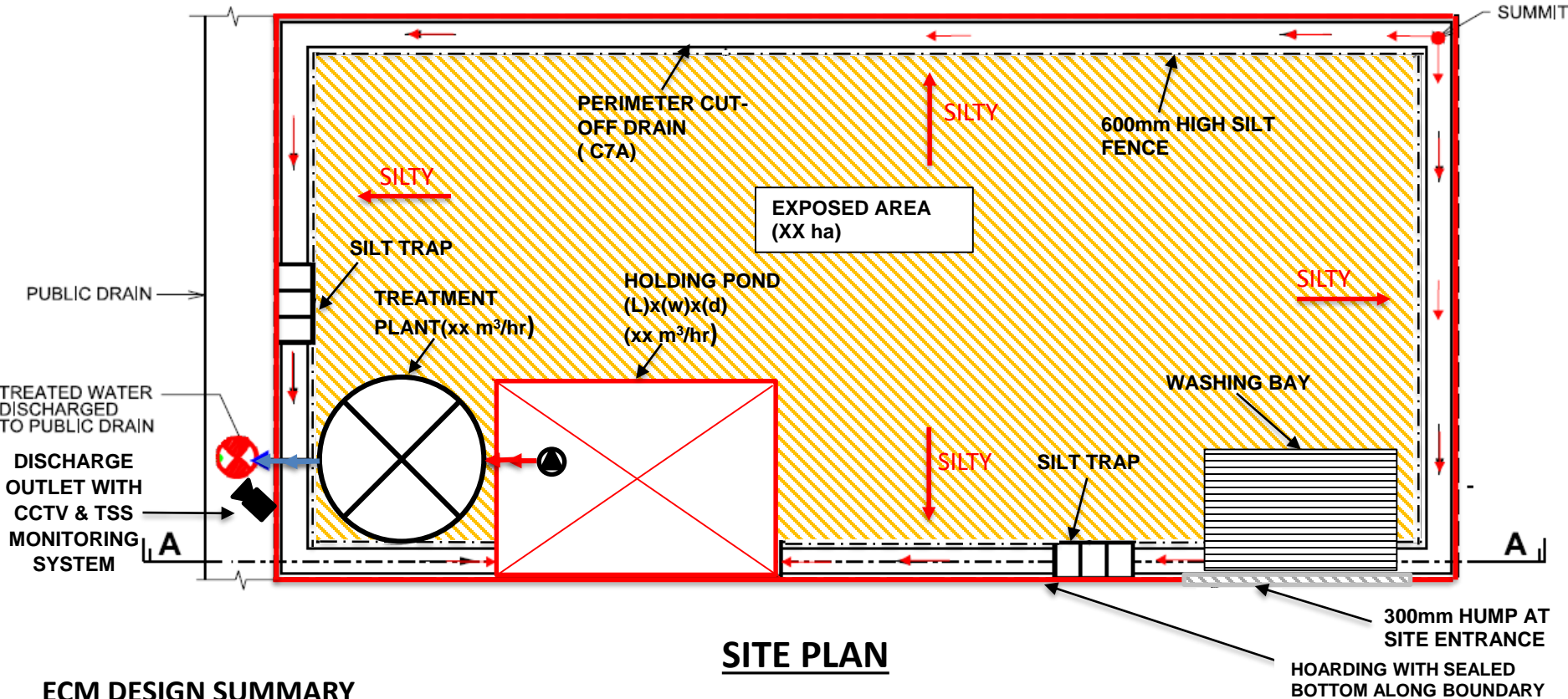
Revised to Approved ECM Plan Submission Requirements

The following information shall be provided;

1. Cover letter to explain why the revision to the approved plan is made, the submission number to which the approval was issued and the approval certificate;
2. Proposed revised ECM plan with clear indication on the difference before and the revised plan;
3. Segregation of clean water (completed/unexposed area) and silty water (exposed area/on going area) and discharge outlet shall be indicated on plan;
4. Updated contact particulars list
5. Summary table on the following parameters to compare previous and current ECM:

		Previous Approved ECM	Current Revised ECM
a.	Total Site Area		
b.	Exposed Area		
c.	Surface Runoff Volume		
d.	Total Storage Volume Provided		
e.	Storage Pond Sizes		
f.	Treatment Plant Capacity		

Example of ECM Plan following Standard Guideline



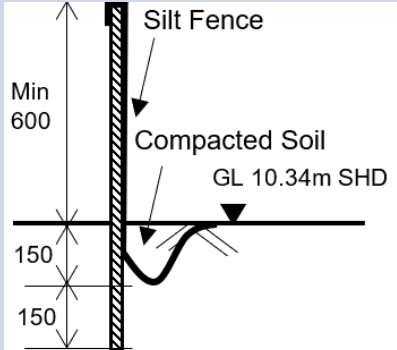
SITE PLAN

ECM DESIGN SUMMARY

Area	Total Site Area (ha)	Max Exposed Area (ha)	Total Runoff Volume (m ³)	Storage Tank Volume (m ³)	Cut-off Drain volume (m ³)	Total Storage Volume(m ³)	Water Treatment plant provided (m ³ /hr)
Area 1	0.24	0.12	62.00	33.00	30.00	63.00	10.00


Element Labels

Line Type: wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
Ground Level	Ground level. To be indicated in cross and longitudinal section showing excavations.	Site Plan: Indicated as spot levels Cross section: E.g. ▼ GL 10.34m SHD
Silt Fence (xxx mm)	Silt fence with height clearly indicated. Silt fences are to have a minimum 600mm height.	To be indicated as dashed-dot-dashed line on plan. - . - . - .
Toe In (xxx mm)	Toe in of silt fence. Toe in to be minimum 150mm in length.	Cross- Section as shown: 

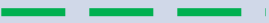
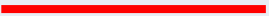


Element Labels

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
Exposed Area (xxx ha)	Exposed Area	Refer to Section 4. Hatch Patterns
Unexposed Area (xxx ha)	Unexposed Area	Refer to Section 4. Hatch Patterns
Cut Off Drain (type/width)	<p>Cut off drain. Type/width to be indicated in parenthesis. Type to be used when precast channel drains are proposed width to be used when U drains are proposed</p> <p><i>More than one type of drain may be used on site. To annotate clearly the drain type on site.</i></p>	<p>To be indicated in black solid line. Flow direction of drain to be indicated.</p> <p>U drain (Internal width & Depth) OR Precast channel (Type e.g. C7)</p> 




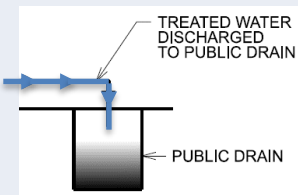
Element Labels

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
Hoarding with sealed bottom (Separate from Site boundary) e.g. A&A Works in big factory compound	Hoarding with sealed bottom	To be indicated in dashed green line on site plan. 
Hoarding along Boundary with sealed bottom /Site Boundary	1. Site Boundary 2. For Hoarding along site boundary	To be indicated by bold red line 
Hump within site	Division hump separating the exposed and unexposed area.	To be indicated by dotted line type. 
Hump at site entrance	Raised hump/berm separating exposed and unexposed area.	To be indicated as rectangle box with diagonal stripes hatching. 

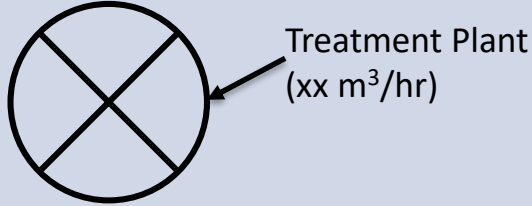
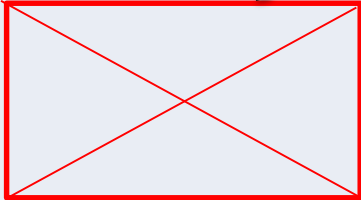
Element Labels

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
Cut off Drain Invert Level	Level taken from the bottom of the inside of the drain.	E.g. INV 10.34m SHD
Summit Point	Highest point along the perimeter cut off drain. Level taken from the bottom of the inside of the drain.	To be indicated as follows: One Way:  Two-way: 
Silt trap	Shall be provided along the perimeter cut-off drain.	To be indicated as a shown. 
Public drain	Need to show the discharge from treatment plant to public drain in cross section drawing.	

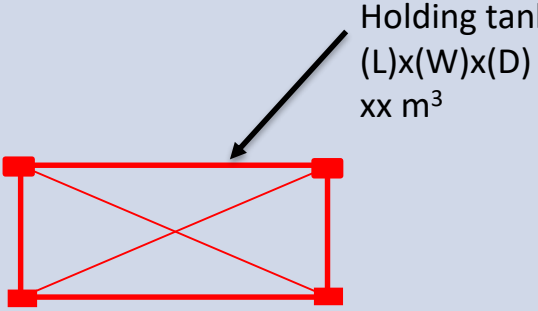

Element Labels

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
<p>Treatment Plant (xx m³/hr)</p>	<p>Treatment plant with capacity indicated.</p> <p>If there are multiple treatment plants, to indicate as “Treatment Plant 1 (xx m³/hr)”; “Treatment Plant 2 (yy m³/hr) etc”</p>	<p>To be indicated as shown. E.g</p> 
<p>Holding/Storage Pond (xx m³)</p>	<p>Storage pond with volume indicated. Storage ponds are to be located underground.</p> <p>To indicate the max depth of storage pond in the cross-section drawing. Show the internal dimension</p> <p>If there are multiple storage ponds, to indicate as “Storage pond 1, (xx m³)”; “Storage pond 2, (yy m³) etc”.</p>	<p>To be indicated as the actual size on site, to scale. Shape may be irregular E.g.</p> 




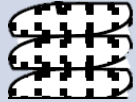
Element Labels

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
<p>Holding/Storage <u>tank</u> (xx m³)</p> <p>(Only for MRT Tunnel projects, sewer trench or basement)</p>	<p>Holding Tank with volume indicated. Holding tanks are to be located above ground.</p> <p>Holding capacity depend on proposed treatment capacity.</p> <p>If there are multiple Holding tank, to indicate as “Holding tank 1, (xx m³)”; “Holding tank 2, (yy m³) etc”</p>	<p>To be indicated as the actual size on site, to scale. Shape may be irregular. E.g.</p> <p>Holding tank (L)x(W)x(D) xx m³</p> 
<p>Discharge outlet with CCTV & TSS Monitoring system</p>	<p>Dependent on the site area. Site more than 0.2ha or at sensitive area (e.g. reservoir area, next to waterway)</p>	<p>Indicated as camera symbol.</p> 

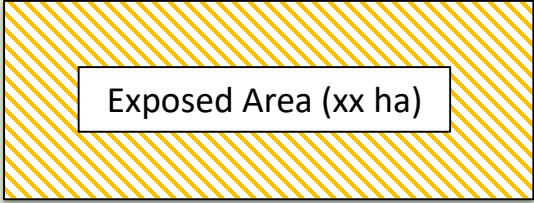

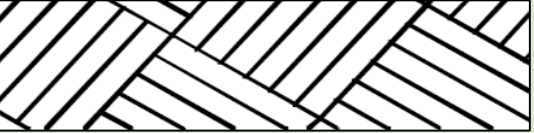
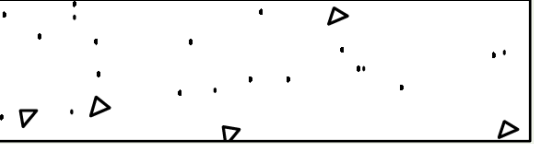
Element Labels

Line Type: Wt= 1/ Symbol: Full Fill = 0
Or whichever appropriate for clear presentation

Element Labels	Description of Elements	Recommended Symbols/ Line type & Colour
Discharge Point	Discharge point of treated water into public drains. Discharge point of internal drains into public drains. Whenever possible, shall be via gravity.	To be indicated with a red cross. 
Pump	Pumps to transfer water from the storage pond into the treatment plant. Describe Pump type. (e.g. submersible pump)	To be indicated as solid triangle inside a circle. 
Sand Bags (yy layers, xx mm)	Sand bags with number of layers and total height indicated. Sand bags are to be a minimum two layers at a maximum height of 300mm.	To be indicated as shown.   Plan Cross-Section




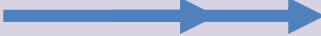
Hatch Patterns

Density of hatching shall be presentable according to drawing scale. Shading: Wt= 0

Element Labels	Description of Elements	Recommended AutoCAD Hatch Pattern
Exposed Area (xx Ha)	Exposed area. To be indicated in cross and longitudinal section showing excavations.	
Unexposed Area (xx Ha)	Unexposed area.	
Ground	When displaying a cross section/longitudinal section showing underground element, the ground level shall be hatched clearly.	<p>Typical Ground hatching</p> 
Paved Surfaces	Access path/ Road/ Site office areas Not representing hardcore.	<p>Typical concrete hatching</p> 

Arrows

Line Type: Wt= 1/ Symbol: Full Fill= 0
Or whichever appropriate for clear presentation

Arrows	Drawings Required	Recommended AutoCAD Hatch Pattern
Flow direction of surface runoff and cut-off drain. Clearly differentiate if discharge is silty or clean.	Site plan, cross- section & longitudinal sections	SILTY Silty: Red Solid Arrow. SILTY  CLEAN Clean : Blue Solid Arrow. CLEAN 
Discharge of untreated silty water from storage pond into treatment plant.	Site plan, cross section, longitudinal sections.	Double Arrow Head 
Discharge point into public drain.	Site Plan	Clean: Blue Double Arrow Head 

Sub-Catchment Plans & Sites in Multiple Catchments

- For sites separated into multiple areas with multiple storage ponds, **sub-catchment plans of each area must be submitted**, with arrows clearly indicating the flow of water into each storage pond. There should also be a physical hump separating the individual catchments, to keep the runoff within each catchment.
- For Submissions involving multiple catchments (e.g. term contract for cable/water pipe/gas pipe maintenance work) shall be indicated in the E-form as the catchment corresponding to where works **will commence first**.

Any Enquiries/ Feedback:

For any feedback or enquiry on the ECM submission guidelines, please email to the following:

- Ain @ Nurul_ain_kamarudin@pub.gov.sg
- Alan @ tan_chin_hin@pub.gov.sg
- Mr Aw @ Aw_Kwong_yew@pub.gov.sg

Thank You

