EROSION & SEDIMENT CONTROL AT CONSTRUCTION SITES

– for site implementation

GUIDEBOOK
6th Edition (2026)



Produced by:

新加坡建築商公會有限公司
THE SINGAPORE CONTRACTORS ASSOCIATION LTD
Building Our Nation Together

Supported by:

PUB SINGAPORE'S NATIONAL WATER AGENCY

Flexi Systems

SINGAPORE'S LARGEST SILTY WATER TREATMENT SPECIALIST

Protecting Waterways, Enabling Compliance, Supporting Resilient Cities



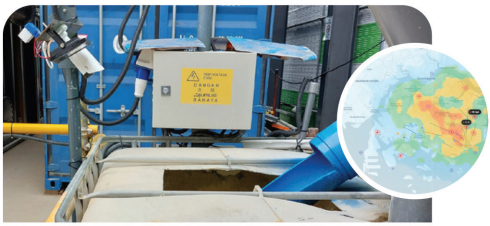
ECM SILTY WATER TREATMENT PLANTS

- **Fast flow, scalable system** – able to handle capacities ranging from 5-80m3/h
- **Effective silt and sediment removal** – more than 99% reduction in Total Suspended Solids
- **Compact, mobile design** – rapid deployment even in space-constrained urban sites



TSS CCTV MONITORING SYSTEMS

- **Integrated monitoring** – solar powered, compatible with smart switch control
- **Compliant and traceable** – time-stamped TSS values and images for verification
- **Visible in real time** – mobile-friendly dashboard with data analytics and alerts



SMART SWITCH CONTROL SYSTEMS

- **Immediate cut-off** – detects silt and automatically diverts silty water outflow
- **Online system** – alerts users to troubleshoot ECM or top up chemicals
- **Control at your fingertips** – integrated with Flexi Systems' Tethys platform



AUTO WHEEL WASHING SYSTEMS

- **Fully/semi automatic** – customised solutions for different trucks and loading
- **Environmentally-friendly** – makes effective use of recycled water to wash the tyres
- **Reliable, simple-to-use** – minimal maintenance and complies with regulation

Flexi Systems is a Singapore-based engineering and water-technology company specialising in integrated environmental and digital solutions for stormwater treatment and erosion control management applications.

We provide system design, equipment supply, installation, maintenance, and data-driven monitoring solutions that support regulatory compliance, operational efficiency, and sustainable water management across infrastructure and construction projects.

Listed as one of PUB's Earth Control Measures Technology Suppliers for silty water treatment systems and instrumentation, we provide quality systems proven in Singapore and ready for Asia.

Get in touch with our Stormwater Specialists for a customised consultation!

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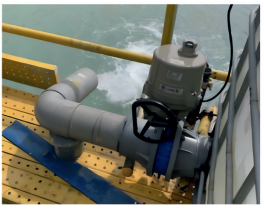
Oxen deliver integrated TSS and CCTV, Noise, WBGT, Water Level Monitoring System, Portable Variable Message Sign and CCTV for construction sites.

TSS & CCTV Real-Time Monitoring with Smart Valve System



- Authority-aligned solution using smart valve to reduce silty water discharge from construction sites.
- Prevents incidents caused by faulty equipment or procedural lapses.
- Avoids cleanup costs and extra management effort for polluted watercourses.





Real-Time WBGT (Heatstress) Monitoring System



- Solar-powered system
- 24/7 web-based access
- Real-time alerts when WBGT exceeds MOM preset limits
- Export reports to PDF and Excel
- See WSH reference articles below

https://www.tal.sg/wshc/resources/publications/checklists-and-articles/heat-stress-management-for-land-transport-infrastructure-works#

NEA Approved Real-time Noise Monitoring System



- 24/7 web-based monitoring
- Easy to use
- Green Energy

Unified web dashboard — monitor all sites and devices in one place.
Always-on monitoring — 24/7 data capture with live status and historical trends.
Smart alerts — real-time Email & WhatsApp notifications with thresholds and escalation rules.
Solar-powered resilience — solar + battery for 24/7 power.
Secure access — user roles and password protection for project teams.

WITCO ENVIROTECH PTE LTD

Your Reliable Partner in ECM Silt Treatment Management for Construction Site

- Provides complete ECM solutions for construction sites
- Offers both Chemical and Ultrafiltration silt treatment systems
- Delivers cost-effective solutions tailored to site requirements
- Supplies tunnelling wastewater treatment systems for LTA projects



Chemical Silt Treatment ECM Plant

- Flowrate 5 m^3/hr to 80 m^3/hr
- Environmentally Sustainable



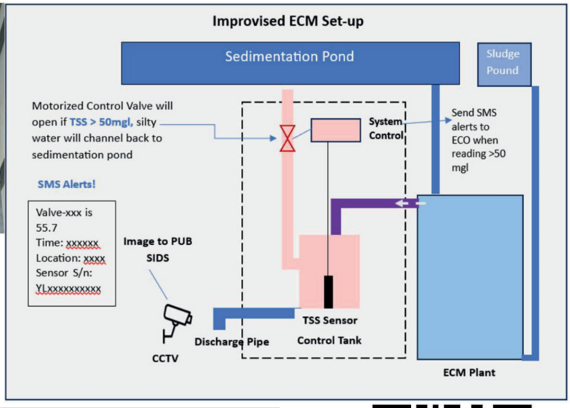
Ultrafiltration Silt Treatment ECM Plant

- Membrane Type Filtration
- Flowrate 5 m^3/hr to 120 m^3/hr



SMTEC-200 Smartec Monitoring System

- WITCO Revolutionised Smart System for Silty Water Monitoring & Control Discharge System



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Scan the QR code to download the e-version of the guidebook.

Wee Hur Construction

Built on Responsibility,

at Wee Hur, every foundation is laid with care. For the environment, for compliance, and for the future. Our Earth Control Measures reflect our commitment to responsible construction

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Joint SCAL-PUB Message

Managing our construction sites well is a key component in keeping Singapore's waterways and reservoirs clean and functioning well. The construction industry plays a vital role in preventing silty discharges through proper erosion and sediment control. Silty discharges not only clog our drains and waterways, reducing their conveyance capacity, but also affect the water quality of our reservoirs. Effective implementation and proper maintenance of earth control measures (ECM), led by ECM-trained staff, not only safeguards our drainage system and the environment, but also strengthens industry professionalism and project outcomes.

The ECM guidebook serves as a practical reference for existing regulations, best practices and updated standards to help us manage our construction sites effectively. Since the release of the 5th edition of the ECM guidebook eight years ago, we have made significant progress in developing and implementing enhanced ECM measures. Initiatives such as the Silt Imagery Detection System (SIDS), the requirement for appointing a full-time ECM Officer (ECMO) at sites of 0.5 ha and above, and practical guidance on avoiding common pitfalls in ECM operations have helped to raise standards and reduce non-compliances.

In this 6th edition, we have incorporated the latest Code of Practice on Surface Water Drainage as well as updated requirements on CCTVs for SIDS to further improve the implementation of ECM on sites. We have also included examples of ECM non-compliances so that contractors do not commit them.

Let us continue to make full use of this guidebook. We are confident that we will find it both practical and easy to apply these initiatives on site. With our shared commitment, we must continue to employ responsible construction practices and protect our waterways, keeping Singapore clean and sustainable for generations to come. Thank you for your steadfast support.

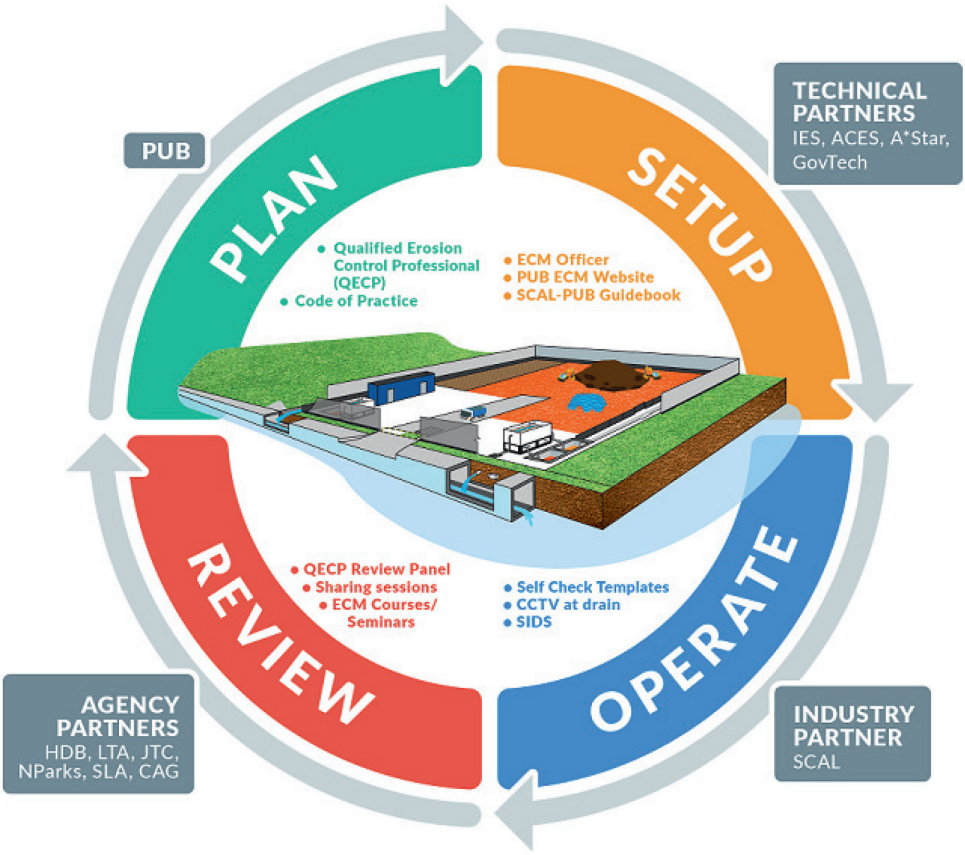


Mr Lee Kay Chai
President
The Singapore Contractors Association Ltd



Mr Maurice Neo
Director, Catchment & Waterways
PUB, Singapore's National Water Agency

1. Co-ownership Framework



2. Keeping Our Waterways Free of Muddy Water

Having clean and beautiful waterways and water bodies is a key to good living standard in our highly urbanised settings. In the 70s and early 80s, we cleaned up the Singapore and Kallang Rivers. Since then, relentless efforts have also been made in land use planning, solid waste management and providing separate used water and rainwater network to sustain and improve the quality of our waters.

These efforts paved the way for us to create Marina Reservoir, a reservoir in the city, as well as beautiful water theme sites like Bishan Parks' meandering streams, Alkaff Lake and Sengkang Floating Wetland. Under such programmes, stable bodies of water have been transformed into beautiful waterfronts for the community to enjoy and raised the quality of the living environment for all in Singapore.



Bishan-Ang Mo Kio Park Park



Alkaff Lake



Sengkang Floating Wetland

Therefore, it is crucial for us to keep the water in the waterways and reservoirs as clean and as pristine as possible. However, storm water run-off will affect the cleanliness of the water in our waterways and pristine water bodies. When it rains, at times the waters would turn brown and muddy. The cause of muddy water is mainly from construction activities which disturb existing grounds and expose the earth. Bare earth surfaces would result in muddy runoff when it rains.



Silty water at Punggol Waterway

The construction industry stakeholder viz. developers, professionals and especially the building contractors, hold the key in preventing muddy water discharge from their construction activities. The contractor should at all times, implement adequate earth control measures and operate these measures properly at their construction sites to prevent causing muddy discharge.

This guidebook, launched since 2001, has undergone several updates. This 6th edition provides an update on the latest changes in the Code of Practice on Surface Water Drainage (Seventh Edition – December 2018) with amendments under Addendum No. 3 – April 2025. The guidebook continues to be written in a simple and easy to read manner, to serve as a quick and handy reference for contractors.

3. 10 Essential Steps to Effective ECM



Inspect

Rectify

Monitor

Treat

Calibrate

Check

Implement

Staff

Design

Price

STEP	REFERENCE
Price for ECM	Annex 1 – Sample ECM Specifications at Tender Stage Annex 4 – Roles of Construction Industry
Engage Qualified Erosion Control Professional (QECP) to **Design** ECM and submit ECM plan to PUB	Annex 2 – ECM Plan Submission Checklist Annex 3 – Guidelines to Re-Submission of ECM Plan
Appoint a supervisory **Staff**, who attend and pass the certified course, as an ECM Officer	Annex 10 – ECMO Requirements Annex 11 – Useful Websites, Contacts and Apps
Implement ECM according to ECM plan	Page 21 – ECM Provisions at a Construction Site
Check ECM daily	Annex 5 – Sample ECM Inspection Report Annex 12 – Breakdown of Non-compliance Found in 2024 Site Inspection
Check and **Calibrate** silty water treatment system regularly to ensure that the discharge complies with required discharge standard	Annex 9 – Colour of Water Samples at Various Silt Concentrations
Treat silty water at holding sump and clear the sump within 10 hours after rain, to prepare for the next rain event	Page 14 – ECM Best Practices
Monitor discharge at discharge outlet and public drain	Annex 8 – CCTV Requirements with Silty Imagery Detection System (SIDS)
Rectify and report non-compliance to PUB	Annex 6 – Guidelines for Submission of ECM Rectification Report
Inspect public drain in the vicinity regularly and clear any obstruction	Annex 7 – Sample Drainage Inspection Report

4. ECM Best Practices

SETUP STAGE

Seal up the bottom of hoardings



Provide hump at site entrances



Pave up access paths / roads



Pave up site office areas



Provide adequate silty water treatment plants



Provide adequate holding ponds



Provide cut-off drains to channel silty water to the holding ponds



Provide silt traps for cut-off drains within worksite



Provide silt / turbidity curtains for works near or adjacent to water bodies



CONSTRUCTION STAGE

Carry out earth work in stages to minimise exposed earth surface



Cover bare earth surfaces with Erosion Control Blankets (ECBs)



Cover up earth stockpiles with ECBs



Keep adequate stock of chemicals, ECBs and other equipment for ECM



Provide silt fences along vacant lands adjacent to open drains





ECM OPERATIONS STAGE

Inspect surrounding drains after rain events



Silty water shall be treated and discharged within 10 hours after the rainstorm



Monitor and calibrate silty water treatment system regularly



Install CCTV link to the Silt Imagery Detection System (SIDS) at public drain to monitor discharge of treated effluent



Carry out regular maintenance for cut-off drains, silt traps and holding ponds / sumps



Review ECM in tandem with progress of the construction works



5. EXAMPLES OF ECM ENFORCEMENT CASES

PUB wishes to draw attention to several notable incidents of silty discharges arising from inadequate implementation of Erosion and Sediment Control Measures (ECM) at various construction sites.

In these cases, the contractors failed to implement the ECM on site in accordance with the endorsed and approved ECM plan prior to the commencement of works. In addition, the ECM implemented on site were not properly checked and maintained. These lapses resulted in silty discharges onto public roads and into drains/canals. The contractors were subsequently prosecuted in court.

The details of the enforcement cases are set out below.

ECM Enforcement Case 1

In May 2025, following feedback on silty discharges from a construction site flowing onto the road, PUB conducted a site inspection.

The inspection revealed that Contractor A had committed offences under Section 26(2)(c) of the Sewerage and Drainage Act for failing to comply with the conditions of PUB's Clearance Certificate, specifically:

1(a) – Implement the ECM in accordance with the ECM plan endorsed by a Qualified Erosion Control Professional ("QECP") and approved by PUB before the commencement of any earthworks.

1(j) – Comply with all ECM requirements stipulated in the Code of Practice on Surface Water Drainage, specifically Clause 6.3.7(2)(d) on Effective ECM Components:

"All silty runoff shall be collected and channelled to ground holding pond/sump for treatment to the required water quality standard before discharging the runoff into the drain."

Contractor A was subsequently prosecuted in court and fined $16,000.

Tables 1a and 1b below outline the non-compliances that led to the offences and the rectification required to comply with ECM standards and requirements.

TABLE 1A

FAILURE TO IMPLEMENT ECM IN ACCORDANCE WITH THE ENDORSED AND APPROVED ECM PLAN BEFORE COMMENCEMENT OF WORKS

Photos	Details
 	Contractor A failed to seal the gap beneath the site hoarding as specified in the approved ECM plan. This resulted in silty water flowing out of the construction site and onto the road. The gap at the base of the site hoarding should be properly sealed to prevent outflow of silty water from the site.
 	Contractor A failed to provide a concrete hump across the construction site entrance as specified in the approved ECM plan. This resulted in silty water flowing out of the construction site and onto the road. Concrete hump should be provided across the construction site entrance to prevent silty water from flowing out of the construction site and onto the road.

TABLE 1B
FAILURE TO COLLECT AND CHANNEL SILTY RUNOFF TO HOLDING POND FOR TREATMENT BEFORE DISCHARGE

Photos	Details
 	Contractor A failed to regularly inspect and remove silt accumulated within the perimeter cut-off drains. This caused blockage of the drains and prevented silty water from flowing into the holding pond for treatment. Perimeter cut-off drains should be checked and cleaned regularly to prevent silt accumulation.
 	Contractor A failed to reinstate the damaged perimeter cut-off drain. This prevented silty water from flowing into the holding pond for treatment. Perimeter cut-off drains should be concrete-lined and of adequate capacity to capture and channel all runoff from site to the holding pond.

ECM Enforcement Case 2

In July 2025, following feedback on silty discharges from a construction site flowing into a canal, PUB conducted a site inspection.

The inspection revealed that Contractor B had committed offences under Section 26(2)(c) of the Sewerage and Drainage Act for failing to comply with the conditions of PUB's Clearance Certificate, specifically:

1(a) – Implement the ECM in accordance with the ECM plan endorsed by a Qualified Erosion Control Professional ("QECP") and approved by PUB before the commencement of any earthworks.

Contractor B was subsequently prosecuted in court and fined $14,500.

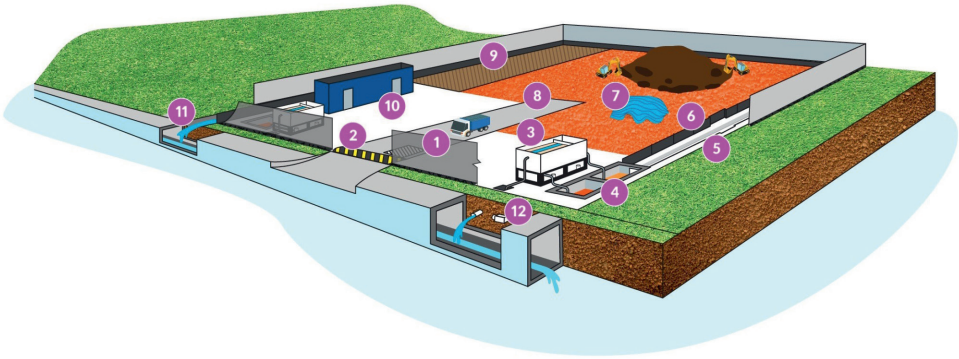
Table 2 below outlines the non-compliances that led to the offences and the rectification required to comply with ECM standards and requirements.

TABLE 2

FAILURE TO IMPLEMENT ECM IN ACCORDANCE WITH THE ENDORSED AND APPROVED ECM PLAN BEFORE COMMENCEMENT OF WORKS

Photos	Details
	Contractor B declared a smaller exposed bare area in the approved ECM plan (~74,600m^2) compared to the actual bare area observed on site (~111,500m^2). This resulted in an undersized holding pond and ECM treatment plant being indicated in the approved ECM plan and subsequently provided for on site. Actual bare area on site should be declared in the ECM plan so that holding pond and ECM treatment plant can be adequately designed and sized to treat the silty water.
 	Contractor B provided ECM treatment plants with total capacity of 300m^3/hr, which is 23% less than the ECM treatment plant capacity of 390m^3/hr indicated in the approved ECM plan. Consequently, silty water flowed out of the construction site and into the canal, as not all silty water could be treated prior to discharge into drains. Adequately sized ECM treatment plants should be installed to treat all silty water before it is discharged into the drains.

6. ECM Provisions at a Construction Site



1. Seal up the bottom of hoardings
2. Provide hump at site entrances
3. Provide adequate silty water treatment plants
4. Provide adequate holding ponds
5. Provide cut-off drains to channel silty water to the holding ponds
6. Provide silt traps for cut-off drains within worksite
7. Cover up earth stockpiles with Erosion Control Blankets (ECBs)
8. Pave up access paths / roads
9. Cover bare earth surfaces with ECBs
10. Pave up site office areas
11. Provide cut-off drains to separate clean water from silty water
12. Install CCTV link to the Silt Imagery Detection System (SIDS) at public drain to monitor discharge of treated effluent


marina
barrage

(Revised as of Sep 2025)

1. The Contractor shall implement effective Earth Control Measures (ECM) during construction stage. The ECM shall be implemented according to the Code of Practice on Surface Water Drainage.

   [**Important Note**: The contractor shall note that ECM are meant for the containment and treatment of silty rainwater runoff only and not meant for the treatment of process water from construction activities such as slurry from tunnelling, pipe-jacking and bore-piling works. Such process water should be handled and treated to comply with the requirements under Environmental Protection and Management Act (Chapter 94A).]

2. In the tender submission, the Contractor shall provide schematic diagrams outlining the ECM for the whole duration of the construction activities, considering the various ECM requirements under different phases of construction activities. The ECM plan shall be designed and endorsed by a Qualified Erosion Control Professional (QECP) and form the basis for the Contractor to price for ECM. The Contractor shall be deemed to have included the price of ECM in the total contract price, even if the contractor did not separately priced for the ECM.

3. The Contractor shall engage a QECP to design ECM. The Contractor shall implement ECM accordingly to the QECP's ECM plan before earth works starts. During construction works, the Contractor shall engage his QECP to review the effectiveness of the ECM regularly, in tandem with the various phases of construction works. The Contractor shall revise the ECM as and when advised by his QECP.

4. The Contractor shall keep good records of the ECM operation and maintenance.

5. The Contractor shall not remove the ECM until all works are completed and upon the advice of his QECP.

6. The Contractor shall submit the ECM plan duly endorsed by his QECP to Director, Catchment and Waterways (PUB) to obtain the necessary clearance before earth works start, in the format as prescribed by PUB. The ECM plan shall include the following content:

   I. Project Brief
      The Brief shall include:
      a. Project description
      b. Company name and address of site occupier
      c. Site area and contract period
      d. Location map and site plan
      e. Construction phases and schedules

II. ECM design calculations

III. Erosion Control Plan
The plan shall include minimal bare earth areas/slopes/stockpiles via sequencing and phasing of earth works, paving up/covering bare earth surfaces with lean concrete, erosion control blankets, close-turfing, canvas etc.

IV. Sediment Control Plan
The plan shall include:
a. Concrete-lined cut-off drains (minimum C7 precast channel) along the perimeter of the construction sites.
b. Sealing of site hoarding.
c. Ramp/curb at site entrance/exit.
d. Separate drainage for bare earth surfaces and non-bare earth surfaces.
e. Silt fence shall be installed by firmly embedding into the ground along the internal and perimeter cut-off drains.
f. Silt traps.
g. Holding sumps/ponds for silty water.
h. Adequate silty water treatment systems with automated intervention features such as automatic shutting down of treatment system, automatic diversion of silty water to holding pond with a motorised valve, etc. to treat silty water before the discharge points into public drain.
i. Turbidity curtains for works in or adjacent to water bodies, such as canals, rivers, sea or in a reclamation work.

V. Site ECM Management System
The Management System shall include:
a. Daily ECM inspection and report by the ECM-trained site staff.
b. Regular ECM review and report by QECP.
c. Continuous monitoring and alerts of the quality of discharge into public drain by linking CCTV to the Silt Imagery Detection System (SIDS).

7. The contractor shall deploy ECM-trained site staff to supervise the operation and maintenance of the ECM implemented on site as well as conduct daily checks. The site staff shall be the project manager, a qualified ECO, RTO or Safety Officer, who has obtained a valid ECM certificate for site staff such as “Certificate of Competency in ECM for Construction Site Personnel Course” conducted by IES.

SAMPLE BREAKDOWN FOR EARTH CONTROL MEASURES					
S/No	**Description**	**Qty**	**Unit**	**Rate**	**Amount ($)**
A	Allow for engaging a Qualified Erosion Control Professional (QECP) to design and supervise the implementation of Earth Control Measures (ECM)	-	Item	-	
B	Allow for the implementation and maintenance of the Erosion Control Measures	-	Item	-	
C	Allow for the implementation and maintenance of Sediment Control Measures	-	Item	-	
D	Allow for site reporting and monitoring system, inclusive of deployment of ECM-trained staff	-	Item	-	
E	Allow for regular ECM review by the QECP	-	Item	-	
F	Allow for installation and maintenance of CCTV link to Silt Imagery Detection System (SIDS)	-	Item	-	
TOTAL					

Shecey

TSS & CCTV MONITORING FOR ECM · AUTOMATED INTERVENTION

When TSS goes over your limit, the system shuts treatment down and diverts the silty water.



YOU SEE

Alerts on your phone

TSS readings and CCTV snapshots stored; system linked to SIDS

SYSTEM INTERVENES

No action needed

Stops silty water reaching the public drain

WE MAINTAIN

Calibrated and checked

Through the life of your project



TSS & CCTV Monitoring System for ECM

Installed with motorised valves at your discharge point



Portable TSS meter

Check your treated water on the spot

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www.shecey.com

Explore our ECM monitoring solutions
shecey.com/go/ecm-guidebook-2026

EARTH CONTROL MEASURES (ECM) SUBMISSION CHECKLIST

APPLICATION FOR EARTH CONTROL MEASURES (ECM) CLEARANCE CERTIFICATE TO COMMENCE WORKS			
Project Title:			
BCA / Project Ref. no.:		Submission Type: New / Resubmission / Update*	
Total Site Area (m^2):		Type of work: Building / Linear / Site Clearance / Others: _____*	
Max exposed area (m^2):		Sediment yield (ppm):	
Runoff coefficient:		Total treatment plant capacity (m^3/hr):	
Total runoff volume (m^3):		Total holding volume capacity (m^3):	
Scheduled frequency of QECP site inspection	Weekly / Fortnightly / Monthly / pls specify: Every _____ mth	Contract Commencement Date: _____.	Contract Completion Date: _____.

S/no	Checklist Item	YES	NO (Pls explain)	NA (Pls explain)	REMARKS
1	Project background, description and construction activities described?				
2	Design calculations provided?				
3	Runoff coefficient ≥ 0.65?				
4	To-scale ECM drawing, location plan, topo plan provided?				
5	Boundary hoarding with sealed footing, and crest at site entrance provided and indicated in drawing?				
6	Total holding / storage capacity > total run off provided and indicated in drawing?				
7	Exposed areas and covered areas indicated in drawing?				
8	Separate drainage systems for clean runoff and silty runoff provided and indicated in drawing?				
9	Drainage catchment, flow direction, cut-off drain provided and indicated in drawing?				
10	Holding pond(s), treatment plant(s), and discharge outlets, provided and indicated with dimensions in drawing?				
11	Copy of Valid QECP License attached?				

Endorsement by QECP	Endorsement by Contractor
I have checked that the above items have been provided in my ECM plan.	*I have fully read and understood the ECM plan and will implement according to design.*
QECP name, sign & date and stamp: **PE Registration No.:** **Company Name:**	**Contractor Rep name, sign & date:** **Designation.:** **Company Name and Stamp:**

Version – Oct 2024

The Revised Earth Control Measures (ECM) plan shall include the following:

(i) Previous approved ECM plan
(ii) Current revised ECM plan with changes clouded/circled. Separation of clean water and silty water flows shall be clearly showed on the plan.
(iii) Tabulate (in rows and columns) previous and revised calculations for comparison.

	Previous Approved Calculations	Current Revised Calculations
Total Site Area		
Exposed Area		
Runoff Volume		
Holding Pond Sizes		
Total Storage Volume		
Treatment Capacity		

(iv) Previous ECM clearance certificate
(v) Updated contact particulars

*There is no need to provide soil loss calculations and write-up for review submission.



Project Development Process	ROLES	
	Owner / Developer / Qualified Person	**QECP (Engaged by Owner / Developer)**
(I) Planning & Design	1. Qualified Person could consult PUB on the need to engage QECP for proposals that involve minimum early disturbance in the early stage (i.e. during DC Clearance). Qualified Person to advise the owner / developer accordingly 2. Developer to engage QECP for preliminary ECM & specifications. 3. Developer to endorse BP for compliance with ECM as specified in Code of Practice on Surface Water Drainage (Latest Edition)	1. Conduct site assessment, plan, design and submit preliminary ECM to PUB for record 2. Advise Owner / Developer / Qualified Person to: a. include ECM specifications in tender to allow for costing (attach the preliminary ECM plan for project) b. refer to ECM website @ https://www.pub.gov.sg/Professionals/Requirements/Earth-Control-Measures
(II) Tender	1. Developer / Qualified Person to evaluate preliminary ECM plan in tender submission 2. Qualified Person to submit successful Contractor's particulars to PUB	1. Stipulate ECM requirements according to site conditions of the project and allow tenderers to price for them in the tender document 2. Provide advice / evaluation on submitted preliminary ECM plan and method statements received from tenderers

Project Development Process	ROLES	
	Contractor	**QECP (Engaged by Contractor. May or may not be the same QECP of Developer / Owner above)**
(III) Before Commencement of works	1. Engage QECP to design ECM 2. Provide information on topography, soil, construction work and schedule, site facilities, etc. to QECP 3. Submit ECM plan prepared and endorsed by both QECP and Contractor to PUB together with an application for approval to commence earthworks 4. Obtain approval to commence earthworks from PUB 5. Engage a trained person in ECM 6. Implement QECP's endorsed ECM plan before commencement of works <u>Erosion Control</u> Minimise exposure of bare surface by paving up, using erosion control blankets or scheduling works in phases, etc. <u>Sediment Control</u> a. Perimeter silt fence b. Perimeter cut-off drains c. Silt trap d. Holding ponds / sumps e. Silty water treatment system with automated intervention features such as automatic shutting down of treatment system, automatic diversion of silty water to holding pond with a motorised valve etc.	1. Prepare a detailed ECM plan (basing on information provided on topography, soil, construction work and schedule, site facilities, etc.) for all phases of the project for submission to PUB. QECP may be required to make presentation to PUB 2. Advise Contractor to submit ECM plan to PUB and obtain approval before commencement of earthworks 3. Advise Contractor on setting up of a monitoring and control system at site, including: a. Appointment of a trained person in ECM on the ECM plan and checklist b. Monitoring the installation of ECM to accordance to approved QECP's ECM plan and ensuring its effectiveness c. Scheduling of maintenance of ECM and inspections

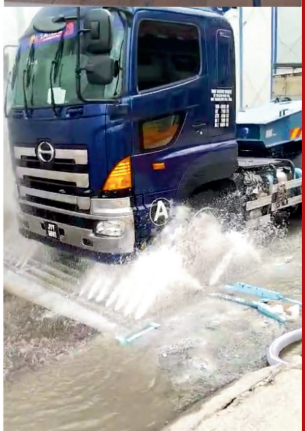
Project Development Process	ROLES	
	Contractor	**QECP (Engaged by Contractor. May or may not be the same QECP of Developer / Owner above)**
(IV) During Construction	1. Monitor, Maintain the ECM to ensure effectiveness 2. Engage QECP to a. Set up site monitoring and management system for ECM b. Review in tandem with progress of works and implement the revised ECM accordingly 3. Submit weekly reports of ECM at site to QECP 4. Provide continuous monitoring and recording system at discharge point before public drain and link CCTV to the Silt Imagery Detection System (SIDS) 5. Cover up the active work surfaces with canvas sheet during rain or at the end of the workday 6. Make available to PUB Officers at all times of visits the following: a. Endorsed ECM plan b. Records of inspections by QECP and trained person in ECM c. Continuous CCTV monitoring records	1. Advise contractor on the effectiveness of the site monitoring and management systems 2. Review ECM in tandem with progress of works 3. Oversee the keeping of ECM inspections records. 4. Requiring Contractor's trained person in ECM to submit weekly reports for checking and compilation 5. Inform PUB of any non-compliances of ECM plan
(V) Before Completion	1. Provide / establish finishing surfaces (close turfing, concrete paving, road surfaces etc) 2. Obtain QECP's approval before ECM is removed	Ensure ECM is removed only after completion of all works











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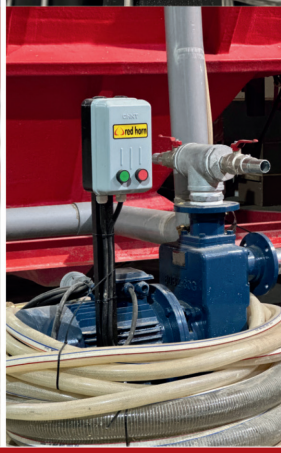




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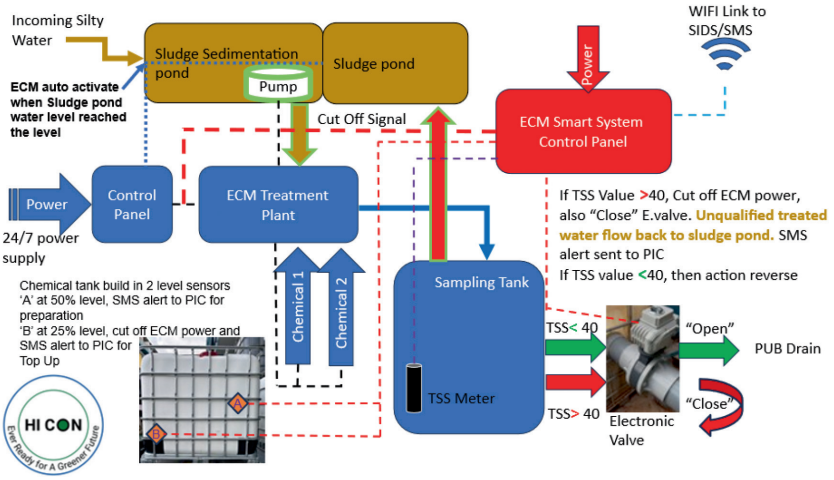
HI CON (S) PTE LTD

16H Enterprise Road, Singapore 627657
Tel: (65) 6862 3126
Website: www.hicon.com.sg
Email: james.chen@hicon.com.sg

Smart ECM System

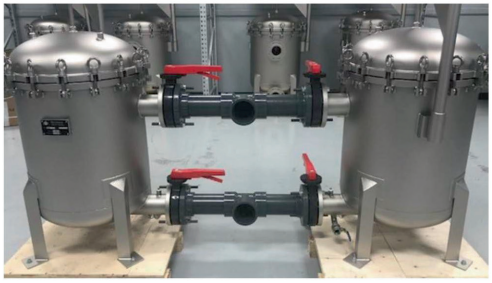






Hi Con Green ECM

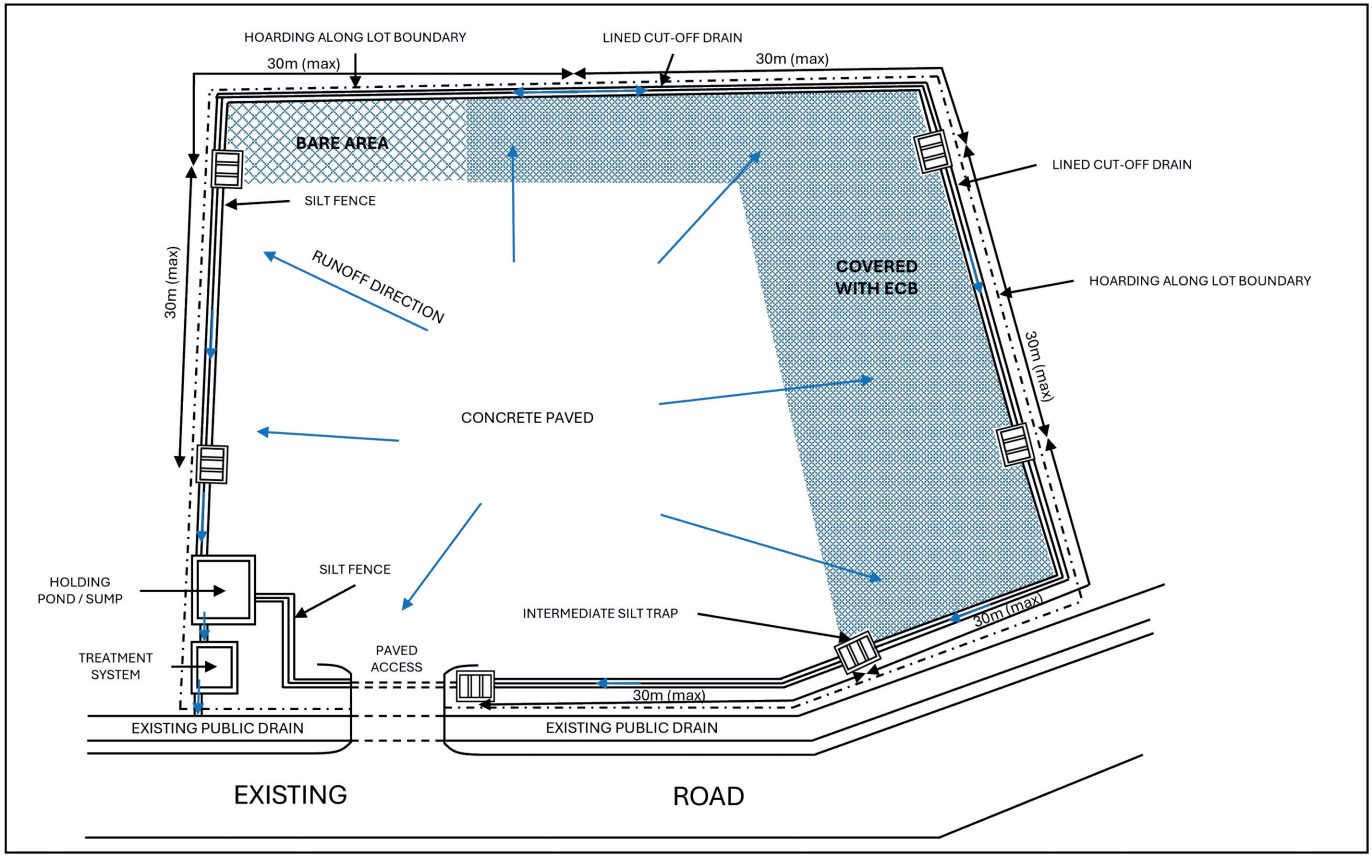
Newly developed Chemicalless ECM System



Project Site:	
Name of Developer:	
Name of Contractor:	
Name of QECP:	
Date/Time of Inspection: _____ (_____am/pm) Weather: _____ Last rain event: _____	
(1) Silty Water Sump/Holding Area	
Capacity (on site): _____	Water Level: High / Medium / Low
(2) Silty Water Treatment Plant(s)	
No. of plants: _____ Capacity (on site): _____	In Operation: Yes / No Operable: Yes / No
(3) Discharge Point(s)	
CCTV installed: Yes / No Angle of CCTV clearly showing the discharges: Yes / No	if yes, is CCTV in operation: Yes / No Traces of muddy water at discharge point and public drain downstream: Yes / No
(4) Internal Drainage and others	
Approved ECM Plan available on site: Yes / No Cut-off drains - Clearly configured to lead all silt discharges to holding area: Yes / No Extensive use of ECBs and other covers: Yes / No (_____% covered)	Gaps at the foot of hoarding around Site Boundary: Yes / No Adequacy and proper erection of silt fencing: Yes / No Siltation of public drain: Yes / No
(5) Public Drain	
Obstruction / Damage / Interference to Public Drain: Yes / No	
Prepared by: _____	Acknowledge by: _____
Date & Sign	Date & Sign
Name / Designation:	Name / Designation:
Contact Number:	Contact Number:

Project Title: _____

ECM LAYOUT PLAN



Project Title :	
Name of Contractor:	
Photos	
Project Signboard	Overview Project Site
Holding Area 1	Holding Area 2
Treatment Plant Photo 1	Treatment Plant Photo 2
Discharge Point Photo 1	Discharge Point Photo 2
Discharge Point Photo 3	Discharge Point Photo 4
Site Hoarding Photo	Use of ECBs and Covers Photo
Cut-off Drain / Silt Fence Photo	Public Drain Overview Photo
Closed Drain Photo 1	Closed Drain Photo 2
Remarks:	

The Earth Control Measures (ECM) report shall include the following:

(i) Photos of problem areas before/after rectification

(ii) A site layout plan indicating clearly the following:

- The ECM implemented on site and quantities e.g. indicate holding pond volume, treatment plant capacity.
- The bare earth areas (shade and indicate percentage as compared to total area)
- Bare earth areas are configured to drain to the holding pond.
- Bare areas covered up
- Curbs, hoardings, cut-off drain and silt fencing are properly provided at the site boundary including at the site entrance and exit
- Points where the photos were taken (photos should also be labelled accordingly)

(iii) Endorsement by QECP



Project Title :_____

Contractor :_____

Developer :_____

Project Manager :_____

Date of Inspection :_____

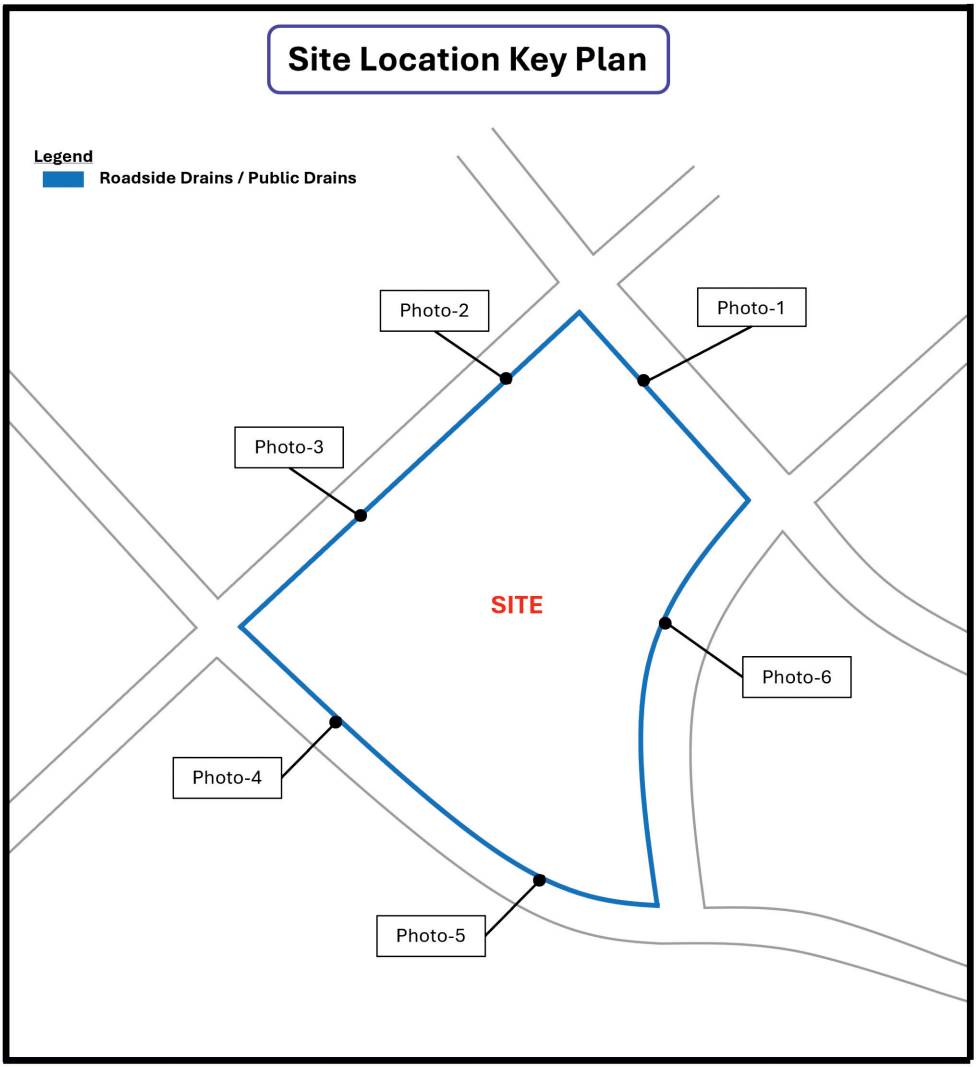


Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Name of Project Manager or QP / Signature / Date

PUB SINGAPORE'S NATIONAL WATER AGENCY

Our Ref: PUB/CWD/SIDS/2024/01

Date: 28 Mar 2024

Attn: Developers/Contractors/CCTV Vendors

Dear Sir

REVISED CCTV REQUIREMENTS FOR SILT IMAGERY DETECTION SYSTEM (SIDS) IMPLEMENTATION

This letter is to inform the industry on the issuance of revised CCTV requirements taking effect from 1 Apr 2024 for all new construction sites required to install the Silt Imagery Detection System (SIDS) for monitoring of their treated water discharge (with site area of 0.2ha and above).

2 Currently, there are over 900 CCTVs installed by the contractors actively being monitored by the SIDS. These CCTVs have enabled built industry, including contractors, developers, construction industry professionals and PUB, to monitor the performance of the Earth Control Measures (ECM) for the construction sites and take prompt action should silty discharge be generated.

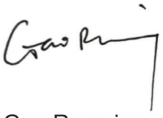
3 In the current CCTV requirements, contractors are required to paint specified background colour on the discharge pipe and set the CCTV image link for SIDS to receive real time images from the CCTV vendors for the monitoring of water discharge from the sites. It has however been observed that there are recurring alerts received due to improper setup of CCTV system including the discharge pipes and lightings as well as poor maintenance of the system.

4 PUB has since updated the CCTV requirements to provide clearer guidance to contractors and CCTV vendors on the system setup and maintenance as well as connection to SIDS, including the latest cyber security requirements. The revised CCTV requirement would be reflected in the Annex A of the ECM approval letter issued by PUB for new construction sites that are required to implement SIDS. You may also refer to Annex of this letter for the revised CCTV requirements.

5 PUB would like to remind all contractors with SIDS implemented for their existing sites to operate and maintain their CCTV system in good working condition at all times. For sites that fail to meet the operational uptime and maintenance requirement, PUB would not hesitate to take necessary enforcement action under the Sewerage and Drainage Act.

6 We look forward to your continued cooperation in keeping our waterways and reservoirs clean and free of silty water discharge. For any clarifications on the revised CCTV requirements and SIDS, kindly email pub_cwenf@pub.gov.sg.

Yours faithfully,



Gao Ruoming

Deputy Director (Drainage Operations)

Catchment & Waterways Department

PUB, Singapore's National Water Agency

CCTV Requirements for ECM (Annex of letter dated 28 Mar 2024)

Installation of CCTV System

(1) Contractor shall provide a CCTV system at the public drain near the discharge outlet(s) of the site to monitor the discharge from the site. The CCTV shall display the following clearly:

(i) Site discharge outlet(s) at the public drain and the condition of public drain

(ii) Distinct colour image indicating whether the discharged water is clear or muddy

(iii) Discharge pipe with blue-marker to be shown about half height of the image and placed towards the centre of image

(2) Discharge pipe shall be painted with a waterproof blue-marker with the painting colour code of RAL 5012 (CMYK 77% 41% 4% 0%, Sky Blue) and installed at a fixed location (i.e. discharge point) where the discharged water would always flow downwards. The pipe shall be cut open to expose the inner side where a blue background can be implemented. Please refer to Figure 1.

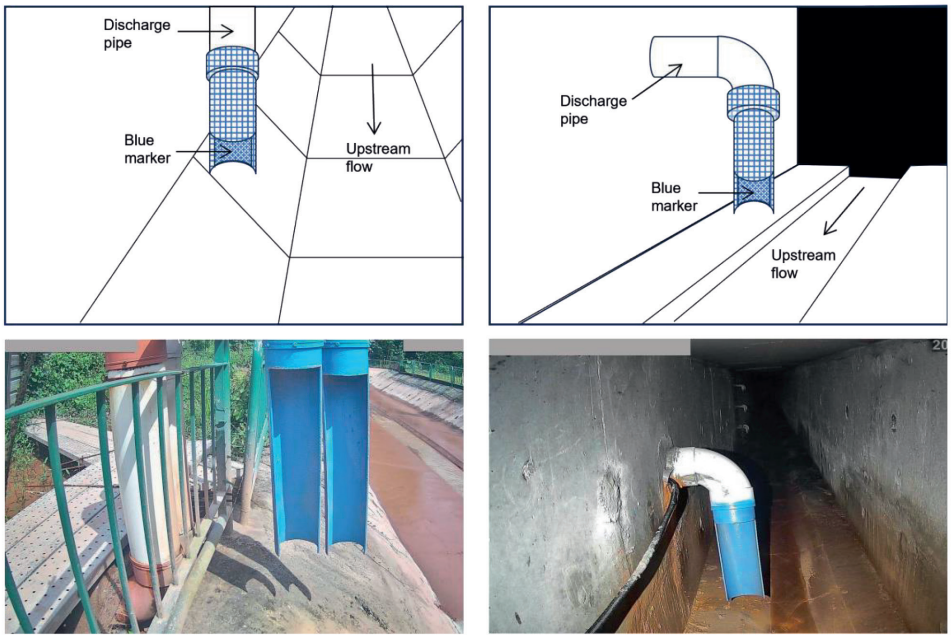


Figure 1. Examples of painted Blue-Marker at discharge points

(3) Adequate white LED lighting shall be provided during night time and kept on at all time, with colour temperature within 5,000K to 10,000K to ensure that the Blue-Marker is clearly visible in the CCTV image for detection of silty discharge.

(4) Contractor can refer to Appendix 1 for common issues observed from installation of CCTV system and suggested workarounds.

Connection of CCTV to Silt Imagery Detection System (SIDS)

(5) Upon commencement of the site work, contractor shall, with the assistance of the CCTV vendor (refer to Appendix 2) complete the CCTV installation checklist (refer to Appendix 3) and submit the completed copy to PUB via pub_cwenf@pub.gov.sg to apply for connection to SIDS and creation of account to access SIDS.

(6) Contractor shall arrange with CCTV vendor to provide web access to the CCTV system include the following:

(i) A colour snapshot of the drain at 5 min interval at 1280x720 resolution in JPEG image format shall be displayed

(ii) The snapshot shall only be imprinted with date/time stamp and CCTV number but without other information

(iii) Read access for the snapshot image of the CCTV shall be provided via a URL link in the following format: http://www.CameraVendorCo.com/SiteName/current_image.jpg

(iv) CCTV system shall whitelist SIDS IP for access and deny unauthorised web traffic

(v) Archived images of snapshots must be kept in separate folders for each year, month, and day in format of YYYY/MM/DD

(vi) The image name in these archived folder must be in the format of hhmmss.jpg (hh =hours in 24 hours format, mm = minutes, ss = seconds) in the respective DD subfolder and shall be accessed via the URL link in the following format: http://www.CameraVendorCo.com/SiteName/yyyy/mm/dd/hhmmss.jpg

(vii) The web access shall be of open platform and easily accessible via mobile or desktop browser without the need to install any extra/specific version of software or plug-in. Web protocol shall be minimally secured using HTTPS to ensure strong security, where unauthorised users would be unable to view the image without authentication

Operation and Maintenance of CCTV System

(7) Upon request by PUB, Contractor/CCTV vendor shall provide at least the past 14-day, 5-min interval snapshots of the CCTV within 3 working days to facilitate PUB's investigation.

(8) CCTV system including the camera lens, lighting and blue-marker discharge pipe shall be well maintained to be free of stain/silt deposit, debris and other objects at all times (refer to Appendix 1 for illustration of common maintenance issues). The marker should be replaced or repainted once the blue colour fades.

(9) SIDS would send alerts via mobile messages and email for contractor to when the following scenarios occur, which would be considered as operational downtime as this impacts SIDS's ability to detect any silty discharge:

(i) Installation of CCTV system does not meet with the requirements as specified above; or

(ii) CCTV system is found to be offline; or

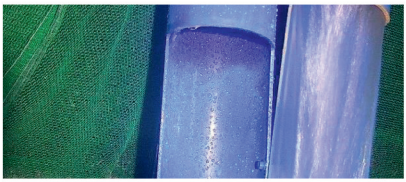
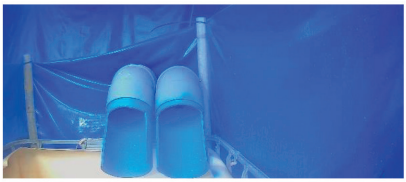
(iii) There is no further update of CCTV image in SIDS; or

(iv) Blue-marker discharge pipe is found to be faded or obstruted by stain/silt deposit, debris or other objects.

(10) For sites that consistently fail to meet the operational uptime and maintenance requirement, PUB would not hesitate to take enforcement action under the Sewerage and Drainage Act.

Appendix 1 - Common Issues Observed for CCTV System and Suggested Workarounds

Installation issues

S/N	Common issues and suggested workarounds	Illustrated photos
1	Zoom settings too close to the blue pipe (i.e. full extent of blue pipe cannot be seen from CCTV) -> Contractors are advised to zoom out, where the size of the blue pipe shall be about half height of the image and placed towards the centre (see example below). 	
2	Greyscale images -> Contractors shall ensure that the lighting be turned on and image is not in greyscale so that the blue marker can be clearly seen.	
3	Discharge pipe does not face downwards -> Contractors shall either physically rotate the camera or digitally rotate via camera settings, to ensure that the blue pipe is shown to be facing downwards.	
4	Discharge pipe overexposed by white light -> Contractors shall ensure that the lighting be adjusted to a colour temperature within 5000K to 10000K so that blue marker can be clearly seen.	
5	Background of discharge pipe is also in blue -> Contractors shall ensure that the bluemarker of the discharge pipe is distinct	

Maintenance issues

1	Obstructions to viewing of the full blue pipe discharge -> Contractor shall ensure that any obstructions be removed during the installation and routine inspections.	
2	Stain/silt deposit on blue-marker discharge pipe -> Contractor shall ensure blue pipe has been cleaned on a regular basis and upon receiving alerts from SIDS	
3	Blurry image due to rain or discharge splatter -> Contractor shall ensure that the camera lens is well maintained and free of wet mark/ stain.	

Appendix 2 - List of CCTV Vendors (Redacted)

Appendix 3 - CCTV Installation Checklist

BCA Ref No:			
ECM Clearance Cert No:			
Number of CCTVs:	_____ of _____	(separate checklist to be provided for each CCTV)	
Image URL:			
Site Latitude:		Site Longitude:	

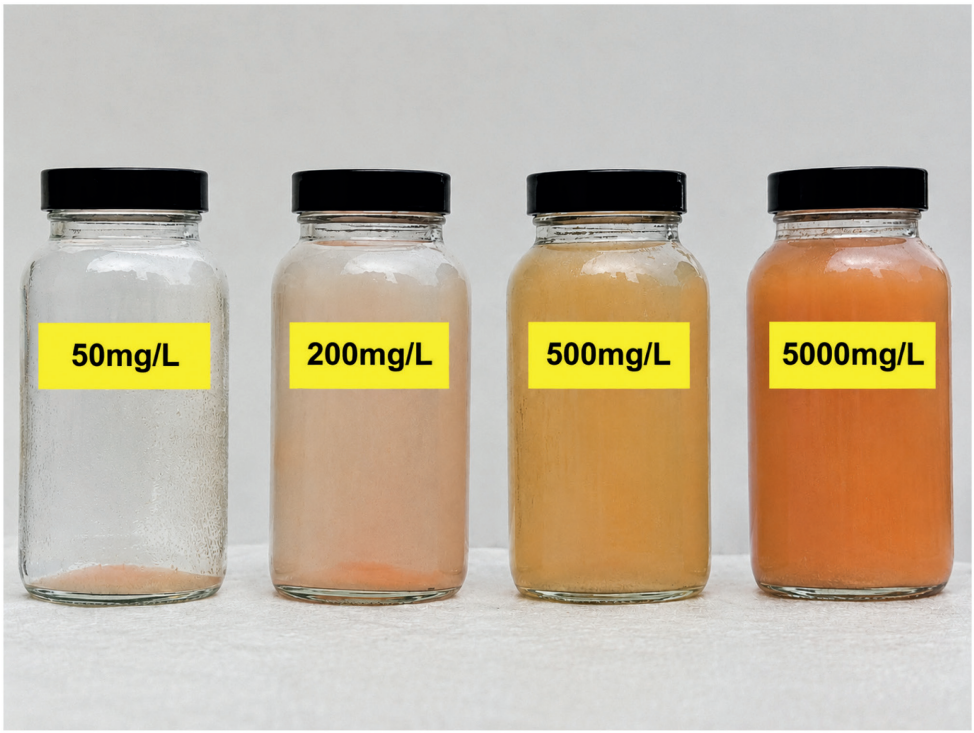
S/No:	Items	Yes	No	Attach Photos
1	The installed CCTV shows the discharge outlet to public drain and pipe discharge is facing downwards	☐	☐	Photo 1
2	Discharge pipe with blue marker is shown about half height of the image and placed towards the centre of the image	☐	☐	
3	The blue marker is clearly captured in the CCTV image during day time	☐	☐	
4	White LED lighting with colour temperature within 5000K to 10000K	☐	☐	Photo 2
5	The blue marker is clearly captured in the CCTV image during night time	☐	☐	

☐ I confirm that the above information and the CCTV installation are in order.

Name of Contractor/ Signature/Date

Company stamp

Please refer to SIDS website at https://siltycctv.pub.gov.sg CCTV Installation Checklist Template



Measurement of Total Suspended Solids (TSS) in mg/l

WALL TAG

Contact us at
(65) 6398 0308
enquiries@walltag.com.sg
www.walltag.com



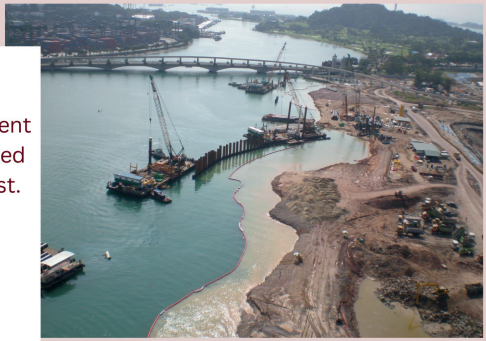


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PUB
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Our Reference: PUB(CWD) 513/13/001

09 Dec 2014

See Distribution List

Dear Sir/Madam,

IMPLEMENTATION OF EARTH CONTROL MEASURES OFFICER (ECMO) AT THE CONSTRUCTION SITES

This circular is to inform the construction industry of the requirement to have a full-time site personnel with Earth Control Measures Officer (ECMO) qualification for construction projects involving earthworks.

Background

2 The Earth Control Measures (ECM) programme, implemented in about 2006, has been evolving for the better. The erosion control sub-committee comprises representatives from The Institution of Engineers Singapore (IES), Association of Consulting Engineers Singapore (ACES), PUB, industry professionals and government agencies meets regularly to review the technical aspect of programme implementation. The committee noted that while the ECM design is amply supported by the Qualified Erosion Control Professional (QECP), the operation of ECM still lacks a ECM-trained staff on site to link up with the QECP, as well as to supervise the operation and maintenance of the ECM implemented on site.

3 In this aspect, the committee has recommended that a ECMO be made available on site to assist the building contractors to implement effective ECM on site.

ECMO Requirement and Roles

4 The ECMO need not be a site personnel dedicated solely to perform the ECMO role. The ECMO role could be covered by the site project manager, project supervisor, ECO, or safety officer. This arrangement of not needing an additional staff as ECMO is to integrate the requirement into the current construction site setup as seamlessly as possible.

40 Scotts Road #22-01 Environment Building Singapore 228231 Republic of Singapore
Tel: 62358888 Fax: 67313020 Website: www.pub.gov.sg

5 To attain the ECMO qualification, the site personnel shall complete and pass a 1-day ECM course conducted by IES or its affiliates and be registered as a ECMO under the IES ECMO Registry. More details on the registry framework is attached at Annex 1 and can be obtained from IES's website at http://www.ies.org.sg.

6 The ECMO's role shall include: (1) implement ECM plan according to QECP design; (2) devise ECM operation; (3) maintenance and inspection programme on site; and (4) assist the QECP to monitor ECM effectiveness throughout various stages of construction.

Implementation

7 In consultation with The Singapore Contractors Association Ltd, we will require all construction sites of site area 0.5 ha and above to have at least a full-time site staff with ECMO qualification at the construction site.

8 In conjunction with the above, the consultant team involved in supervising construction projects is also advised to have a full-time site staff with the ECMO qualification, so as to enable the team to supervise the ECM implemented on site accordingly.

9 This requirement will take effect for all new construction sites with site area of 0.5ha and above, and starting construction works on and after 1 Apr 2015.

Thank you

Yours faithfully



RIDZUAN ISMAIL
DIRECTOR
CATCHMENT AND WATERWAYS DEPARTMENT

ECM Industry Professionals and Government Agencies
(Annex of letter dated 09 Dec 2014)

President
Association of Consulting Engineers, Singapore (ACES)
70 Palmer Road #04-06, Palmer House, Singapore 079427

President
Institution of Engineers, Singapore (IES)
70 Bukit Tinggi Road, Singapore 289758

President
Real Estate Developers' Association of Singapore (REDAS)
190 Clemenceau Avenue #07-01, Singapore Shopping Centre, Singapore 239924

President
Singapore Contractors Association Limited (SCAL)
Construction House, 1 Bukit Merah Lane 2, Singapore 159760

President
Singapore Institute of Architects (SIA)
79 Neil Road, Singapore 088904

President
Singapore Institute of Building Limited (SIBL)
70 Palmer Road #03-09C, Palmer House, Singapore 079427

President
Singapore Institute of Surveyors & Valuers (SISV)
20 Maxwell Road #10-09B, Maxwell House, Singapore 069113

President
Society of Project Managers (SPM)
MacPherson Road P.O. Box 1083, Singapore 913412

Deputy Director
Project Development and Management Branch, Ministry of Education (MOE)
1 North BuonaVista Drive, Office Tower Level 9, Singapore 138675

President
Board of Architects (BOA)
5 Maxwell Road 1st storey , Tower Block MND Complex, Singapore 069110

Deputy Chief Executive Officer (Building)
Housing & Development Board (HDB)
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Deputy Chief Executive
Infrastructure & Development, Land Transport Authority (LTA)
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Director
Technical Services Division
JTC Corporation (JTC) , 8 Jurong Town Hall Road ,The JTC Summit, Singapore 609434

Senior Director (Building & Estates Management)
People's Association (PA)
9 King George's Avenue, Singapore 208581

President
Professional Engineers Board, Singapore (PEB)
5 Maxwell Road 1st storey, Tower Block MND Complex, Singapore 069110

Chief (Sports Facilities)
Singapore Sports Council (SSC)
230 Stadium Boulevard, Singapore 397799

Chief Planner & Deputy Chief Executive
Urban Redevelopment Authority (URA)
45 Maxwell Road, The URA Centre, Singapore 069118

Cc:
Director
Engineering Development & Procurement, Public Utilities Board (PUB)
40 Scotts Road #18-01, Environment Building, Singapore 228231

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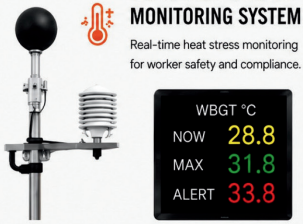
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Prevents treated water with high TSS levels from being discharged into public drains.

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- NEA compliant

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CONTACTS AND WEBSITES

PUB, Singapore's National Water Agency
Catchment & Waterways Department
40 Scotts Road, #07-01, Environment Building, Singapore 228231

24-hour call centre: 1800 2255 782
Email: PUB_CWENF@pub.gov.sg

PUB ECM webpage:
https://www.pub.gov.sg/Professionals/Requirements/Earth-Control-Measures

Sewerage, Drainage and Coastal Protection Act 1999:
https://sso.agc.gov.sg/Act/SDCPA1999?ValidDate=20260529

Sewerage and Drainage (Surface Water Drainage) Regulations:
https://sso.agc.gov.sg/SL/294-RG4

Code of Practice on Surface Water Drainage:
https://www.pub.gov.sg/-/media/PUB/PDF/Code-of-Practices-and-Submission-Guidelines/Surface-Water-Drainage/Code-of-Practice-on-Surface-Water-Drainage.pdf

Erosion & Sediment Control at Construction Sites Guidebook – 6th Edition (2026):
https://www.pub.gov.sg/Professionals/Resources/Guides-and-Handbooks

The Singapore Contractors Association Limited (SCAL)
Construction House
10 Tannery Lane, Singapore 347773

Contact: 6278 9577
Email: enquiry@scal.com.sg
SCAL webpage:
https://www.scal.com.sg/

Erosion & Sediment Control at Construction Sites Guidebook – 6th Edition (2026):
https://www.scal.com.sg/resourcesmedia-centre/scal-guidebooks

Institution of Engineers, Singapore (IES)
70 Bukit Tinggi Road, Singapore 289758

Contact: 6469 5000
Email: ies@iesnet.org.sg
IES webpage:
https://www.ies.org.sg/

ECM courses:
https://portal.ies.org.sg/programmes

IES / ACES Qualified Erosion Control Professional (QECP) Registry:
https://www.ies.org.sg/registries/ies-aces-qecp-registry/

IES / ACES Earth Control Measures Officer (ECMO) Registry:
https://www.ies.org.sg/registries/ies-aces-ecmo-registry/

myENV app
The myENV app is a one-stop platform that provides information on our environment, water services and food safety in Singapore.

It provides a comprehensive suite of information and services from the Ministry of Sustainability and the Environment (MSE) including PUB which covers weather, air quality, dengue hot spots, water levels, floods, water disruption, hawker centres, food hygiene, and recycling. Users can also report feedback to MSE and its agencies (including PUB) through this app.

PUB Flood Alerts Telegram Channel (@pubfloodalerts)

X account (@PUBsingapore)

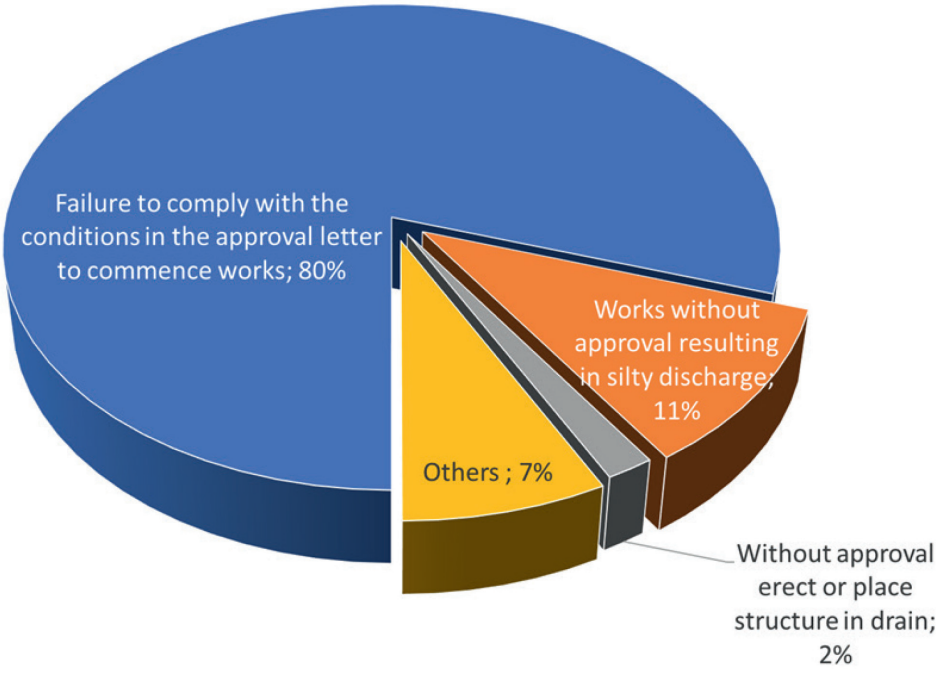
Users can receive reliable and timely updates on rainfall and flood alerts by following PUB Flood Alerts Telegram Channel (@pubfloodalerts) or X account (@PUBsingapore).

PUB and SCAL have used reasonable endeavours to ensure that the information provided in this guidebook is accurate and up to date as at 1 Aug 2026.

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Nothing in this guidebook shall in any way affect, constrain or limit PUB from exercising any right, discretion, authority or power or take any action pursuant to PUB's powers under the Sewerage, Drainage and Coastal Protection Act 1999 or any regulations or codes of practice made, or directions issued, by PUB from time to time.

Some images in this booklet have been enhanced using artificial intelligence (AI) to improve quality and presentation.



Note:

Data includes:
- Multiple visits to a same site
- Site with multiple noncompliance

Others includes:
- Works without obtaining approval affecting storm water drainage system
- Storm water drainage system constructed, altered or discontinued without approval
- QP fails to exercise due diligence in supervising and inspecting the works

NOTES

NOTES

NOTES

40th ANNIVERSARY
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CLEARTEC

ECM SYSTEMS

Our **CLEARTEC** ECM Systems are specifically designed to remove suspended solids from construction site rainwater runoff and selected industrial wastewater.



KEY BENEFITS

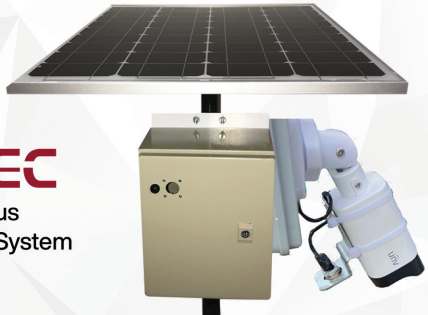
- ✓ Fully Automatic
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- ✓ Self-Contained System
- ✓ Minimal Manpower Required
- ✓ Single Phase Power
- ✓ Easy to Transport
- ✓ Cost-Effective Solution
- ✓ Uses Powdered Chemicals
- ✓ Few Mechanical Parts



SMARTEC

ECM Automatic Monitoring & Control System

- ✓ ECM Stops When TSS Exceeds Preset Limit
- ✓ Pit Influent Level Reaches Critical Height
- ✓ Chemical Tank Levels



SOLARTEC

Solar-Powered Continuous Monitoring TSS & CCTV System

SCAN the QR Code for more information.

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The Biofuel Advanced Filtration (AF) system offers a smarter, cost-effective alternative. Using cutting-edge Polyvinylidene Fluoride (PVDF) membrane technology, it delivers unmatched water treatment efficiency while ensuring compliance with environmental standards.



- Reduce costs with our automatic start-stop function and advanced backwashing technology. Save site space with our compact design.
- Engineered to meet PUB's water discharge standards, ensuring strict compliance and continuity.
- Real-time updates of your ECM System's operation parameters via our cloud-based monitoring function.
- Wide range of treatment capacity, ranging from **5m³/hr all the way to 100m³/hr** to suit the needs of every site

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