

TUAS WRP DTSS 2



Industry Briefing

30 November 2017



SAFETY • SCHEDULE • BUDGET • QUALITY



The Tuas Water Reclamation Plant Industry Briefing was held on 30 November 2017. The intent of the presentation was to provide a brief overview of the key features of the Tuas Water Reclamation Plant project, including the contract packaging and overall timeline of its execution. The briefing was delivered by:

- Mr Yong Wei Hin, Director, DTSS 2 Department, PUB,
- Mr Scott Trusler, Project Director, CH2M Hill - PUB's Detailed Design Consultant

TUAS WRP

DTSS 2



Programme		Speakers
3.00pm	Registration	
3.30pm	Welcome Address Part A: Overview of Deep Tunnel Sewerage System (DTSS) 2 and Tuas Water Reclamation Plant (TWRP)	Yong Wei Hin DTSS 2 Director, PUB
3.40pm	DTSS 2 Technical Video	
3.45pm	Part B: Implementation of TWRP	Scott Trusler TWRP Project Director, CH2M
4.30pm	Q&As	
5.00pm	Networking Session	

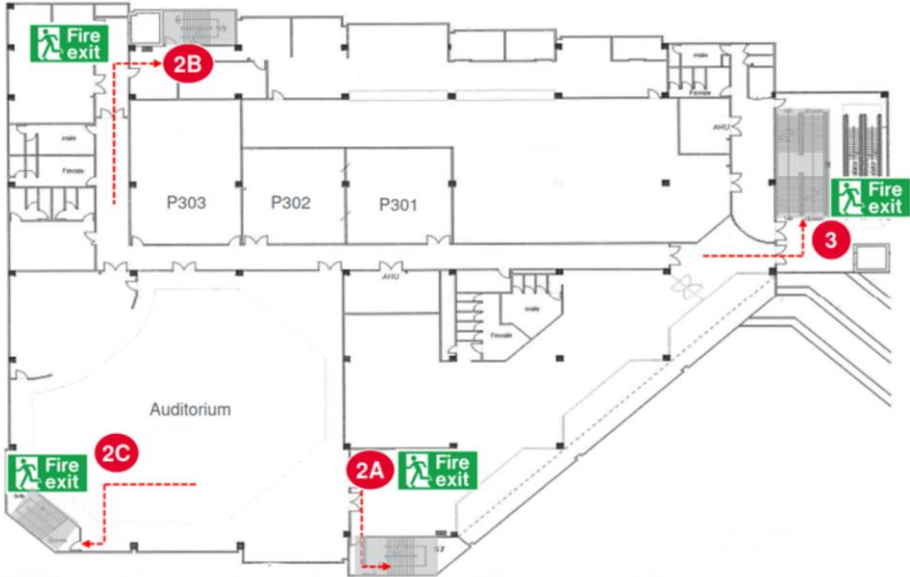


SAFETY • SCHEDULE • BUDGET • QUALITY



This slide outlines the agenda of the briefing session.

In case of an Emergency



SAFETY • SCHEDULE • BUDGET • QUALITY

This slide highlights to the audience the emergency exits at the briefing venue.

TUAS WRP DTSS 2



Overview of DTSS Phase 2

Yong Wei Hin
DTSS 2 Director, PUB



SAFETY • SCHEDULE • BUDGET • QUALITY



This section of the briefing was presented by Mr Yong Wei Hin, Director of DTSS 2 Department, PUB.

Agenda



- Safety Commitment
- Overview of Deep Tunnel Sewerage System (DTSS)
- DTSS Phase 2



Tunnel Section of DTSS Phase 1



Concept Rendering of Tuas WRP



This slide outlines the key topics that were covered by Director Yong Wei Hin.



SAFETY COMMITMENT



This section covers the safety commitment of the DTSS Phase 2 team.

DTSS Phase 2 Safety Mission



We aim for ZERO HARM
and
promote the well-being of everyone.

No injury is too small and one injury is one too many.

We will not be limited by past practices,
and are committed to surpass current industry norms.

Every person on the DTSS Phase 2 project has the responsibility
and is empowered to take action on issues of

SAFETY.



This slide shows the safety mission of the DTSS Phase 2 project team. Mr Yong shared that zero harm may sound impossible, but it is in fact possible. He cited the London Olympic Stadium as an example where over 5 years of construction, there had been zero fatality.

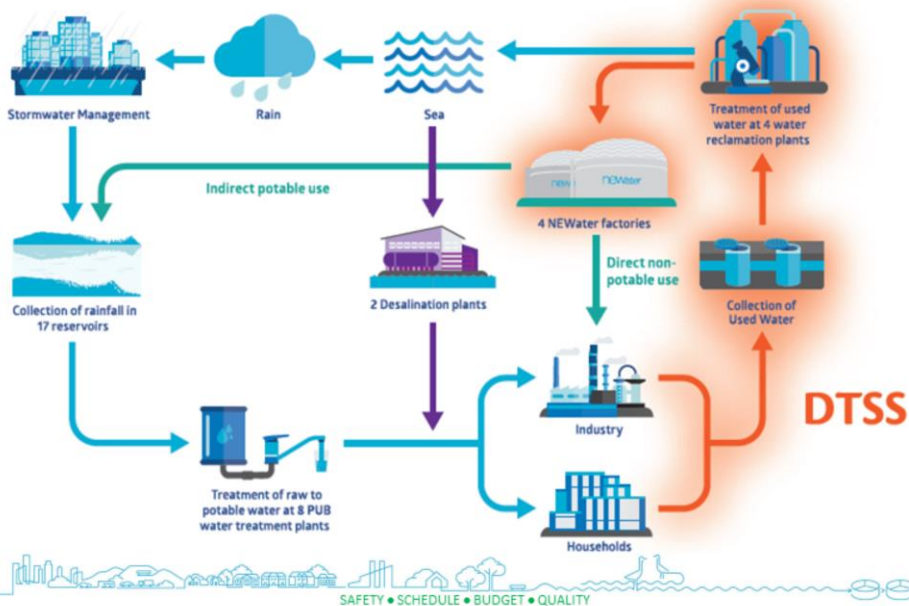


DEEP TUNNEL SEWERAGE SYSTEM



This section provides an overview of the Deep Tunnel Sewerage System.

Overview – Integrated Water Management



This slide presents an overview of how PUB manages the entire water loop in Singapore; the collection, production, supply and reclamation of water.

The Deep Tunnel Sewerage System (DTSS) uses deep tunnel sewers to convey used water entirely by gravity to centralised water reclamation plants to be reclaimed, closing the water loop.

Overview and Benefits of the DTSS



This slide presents an overall view of the Deep Tunnel Sewerage System (DTSS). The DTSS comprises of link sewers and tunnels connecting the 3 Water Reclamation Plants (WRP) at Changi, Kranji and Tuas.

Phase 1 (in the East) of the DTSS was completed in 2008. DTSS Phase 2 (in the West) is an extension of DTSS phase 1.

Overview and Benefits of the DTSS



Water Security

Reclaiming used water for
NEWater production



Adopting Advanced Technology

For efficient use of land and
resources



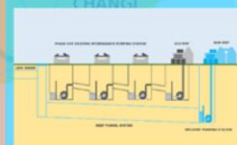
Free Land & Compact

50% Land reduction in
overall used water
infrastructure



Robust & Reliable

Eliminate the risk overflow



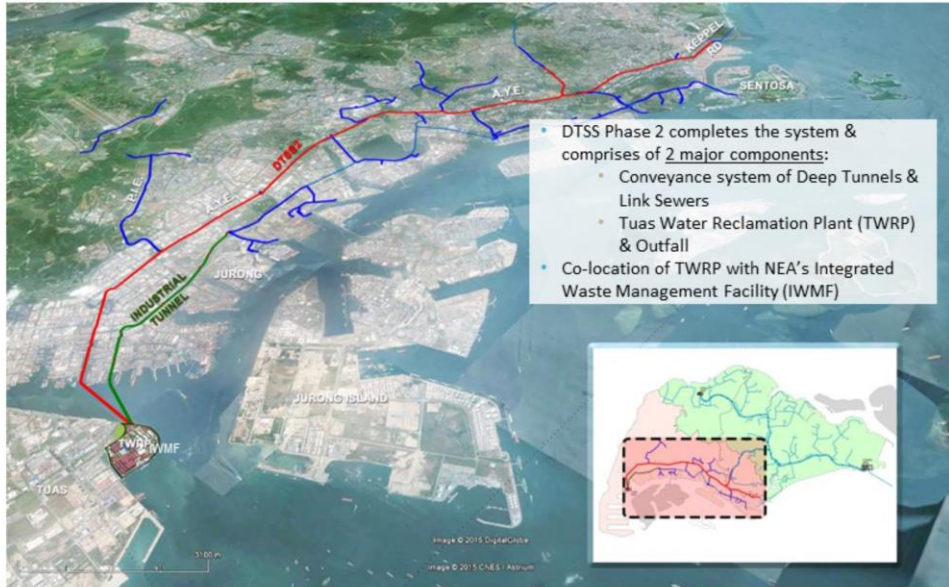
SAFETY • SCHEDULE • BUDGET • QUALITY

11

This slide presents the benefits of the DTSS.

The DTSS, as the backbone of NEWater production, ensures water security through the reclamation of used water. To ensure that every drop of used water is treated, advanced technologies are needed to efficiently reclaim used water amidst land and resource constraints. The DTSS frees up land through the elimination of pumping stations and the centralising of reclamation plants. Furthermore, the conveyance of used water through gravity, enhances the robustness and reliability of the used water collection system.

Overview of DTSS Phase 2



This slide shows the 2 major components of the DTSS Phase 2 project:

- (1) Deep tunnels & Link Sewers for the collection and conveyance of used water and
- (2) The Tuas Water Reclamation Plant (TWRP) where the collected used water will be treated, with a percentage of it being further purified into NEWater. TWRP will be co-located with NEA's Integrated Waste Management Facility (IWMF) to allow both installations to benefit from the synergies afforded by their co-location.

DTSS Phase 2 (By 2025)



- Implementation period: 2014 to 2025
- Overall Project Cost: S\$6.5 billion

Conveyance – Tunnel and Link Sewers

- Sized adequately for the future
- Designed for Maintenance & Resilience

South Tunnel	—	32km/ 3m to 6m int. dia.
Industrial Tunnel	—	7km/ 3.3m to 4m int. dia.
Link Sewer	—	60km/ 0.3m to 4m int. dia.

TUAS WRP

Tuas WRP

- Co-location with NEA's IWMF within compact footprint
- Energy self-sufficient
- Less manpower

Initial Used Water Treatment Capacity: 800 MLD (176 MGD)

Initial NEWater Treatment Capacity: 114 MLD (25 MGD)

SAFETY • SCHEDULE • BUDGET • QUALITY

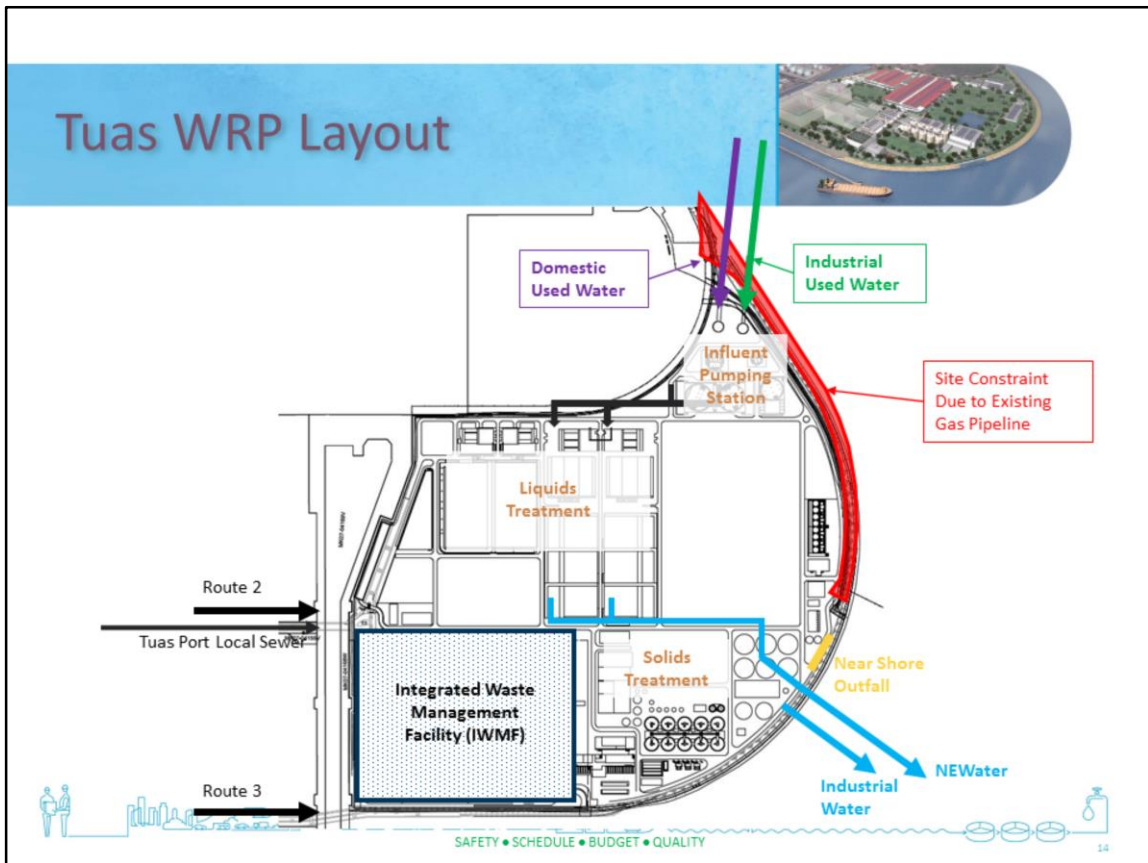
13

The DTSS Phase 2 project will be completed by 2025 at a total project cost of S\$6.5 billion.

The tunnel contract has been awarded and the groundbreaking ceremony was conducted on 20 November 2017.

Tuas WRP has been conceived as a compact and energy self-sufficient installation that will be operated with a lean manpower. TWRP will have a initial used water treatment capacity of 800 MLD (650 MLD for domestic used water & 150 MLD for industrial used water) and initial NEWater treatment capacity of 114 MLD.

Tuas WRP Layout



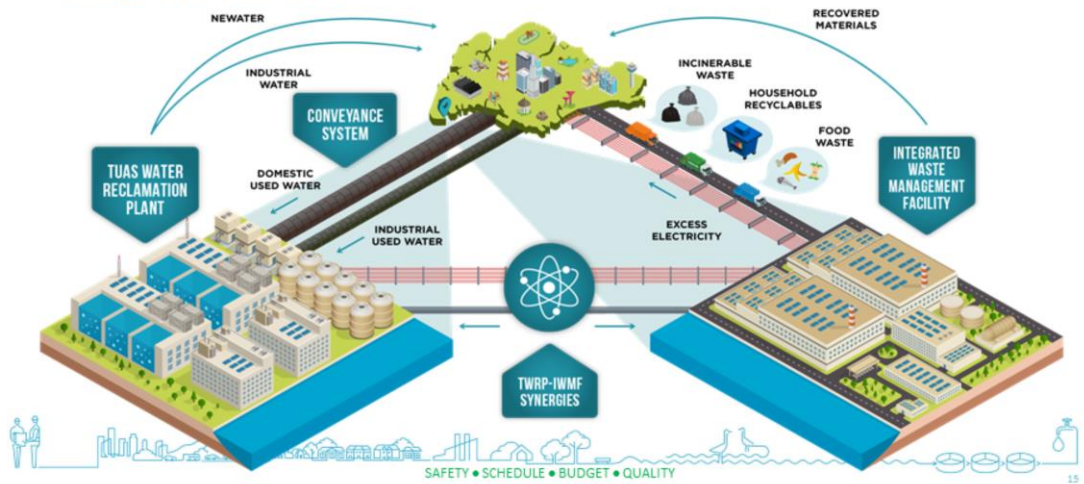
This slide shows the site layout of Tuas WRP. The location of the buildings and process units have been almost finalised. The layout has been determined in view of interfacing requirements. For instance, the Influent Pumping Stations have been identified to be located close to where the tunnels enter the site.

The Integrated Waste Management Facility (IWMF) will be co-located with Tuas WRP.

Co-location of TWRP & IWMF

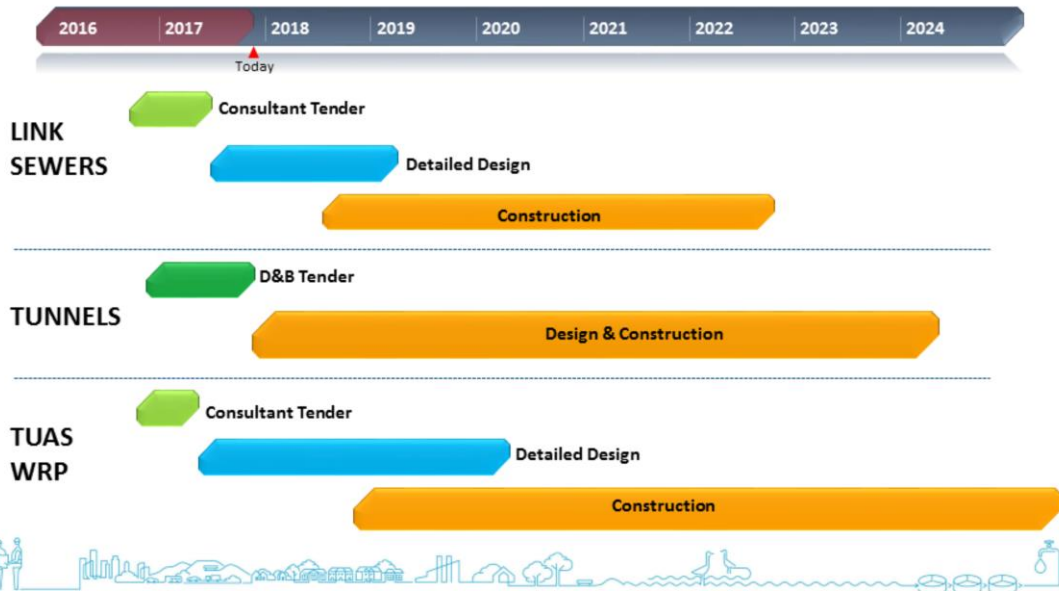


- To leverage the water-energy-waste nexus
- First of its kind planned from the ground up (greenfield project)
- Energy-self-sufficient



The co-location of TWRP and IWMF was conceptualised to allow the installations to leverage on the water-energy-waste nexus. For example, IWMF's food waste will be sent to TWRP to be co-digested in its digesters. The biogas produced at TWRP will then be conveyed to IWMF where it will be used to produce electricity. This electricity will then be supplied to TWRP to meet its electrical needs, leading to energy self-sufficiency.

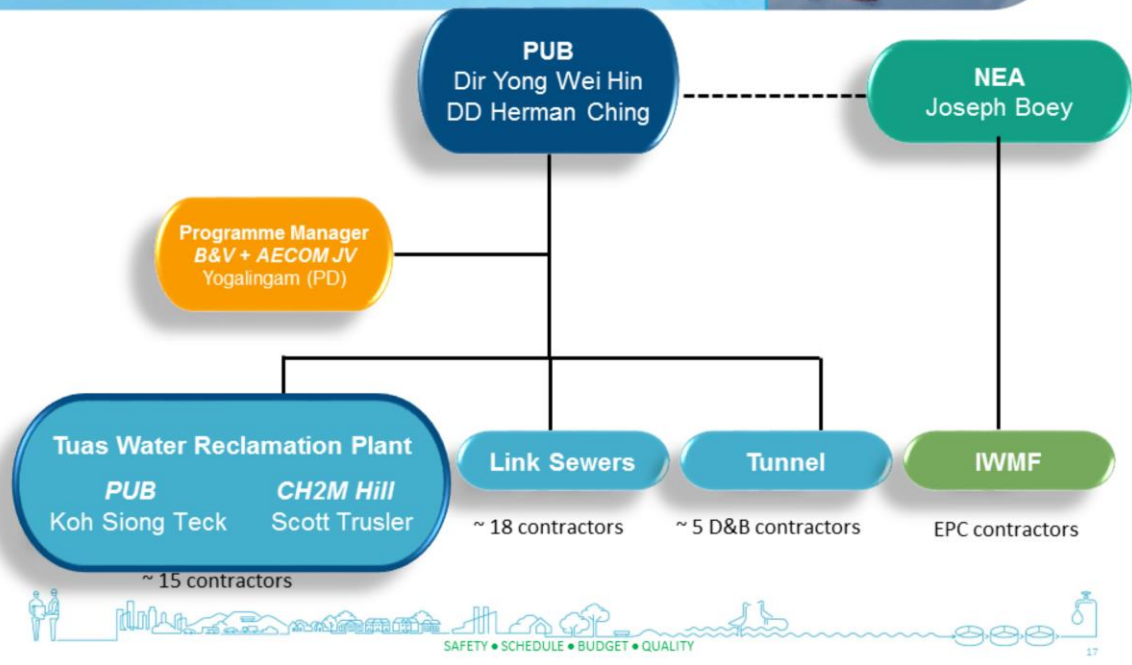
DTSS Phase 2 Project Timeline



This slide depicts the rough timelines of the 3 components that make up DTSS Phase 2.

As can be seen, there will be some overlap between the detailed design phase and the construction phase of Tuas WRP as the construction of the plant will be carried through multiple staggered contract packages.

DTSS 2 Programme Structure



This slide shows the Programme Structure for DTSS Phase 2.

The project is led by PUB’s Director Yong Wei Hin and Deputy Director Herman Ching who oversee the construction of the Tuas WRP, the link sewers and the tunnel. The Programme Manager for the project is a joint venture between Black & Veatch and AECOM with Mr Yogalingam as the Project Director.

The development of Tuas WRP will be carried out jointly by PUB and CH2M Hill who has been appointed as the detailed design consultant. PUB’s Chief Engineer Koh Siong Tech and CH2M Hill’s Project Director Scott Trusler will be leading the team.



THANK YOU



DTSS Phase 2 Technical Video



The DTSS Phase 2 Technical Video depicts the key elements of the DTSS Phase 2 project.

TUAS WRP

DTSS 2



Implementation of TWRP

Scott Trusler
TWRP Project Director, CH2M



SAFETY • SCHEDULE • BUDGET • QUALITY



This section is presented by Scott Trusler, Project Director of Tuas WRP, from CH2M.

Agenda



- TWRP Safety Mission
- Scope of TWRP
 - » *Objectives*
 - » *The Site*
 - » *Principal Work Elements*
- Delivery of TWRP
 - » *Contract Packages*
 - » *Timeline*
 - » *Progress and Ongoing Preparation Works*
 - » *Key Project Requirements*
 - » *Key Project Challenges*
- Summary and Next Steps



This slide outlines the key topics presented on the Implementation of TWRP by Scott Trusler.

Tuas WRP Safety Mission



- To fully implement PUB's DTSS 2 Safety Mission
- To team with the Contractors to create a collaborative safety culture committed to PUB's Mission of ZERO HARM
- We will not compromise on safety for any reason
- We will recognise and reward safe performance
- We will continuously learn and improve our approach to the safety and health of everyone involved in the delivery of TWRP



This slide highlights the safety mission the Tuas WRP team drives towards to.



OBJECTIVES



This section covers the objectives to be achieved in the construction of Tuas WRP.

1. Produce NEWater & Industrial Water



- Treat 650 MLD domestic and 150 MLD industrial used water from two incoming tunnels
- Produce and store 114 MLD NEWater and 45 MLD Industrial used water
- Future treatment expansion to 1,550 MLD domestic and 350 MLD industrial used water



This slide talks about the need to produce NEWater and industrial water by treating the domestic and industrial used water from the two incoming tunnels. Future expansions will be required to treat a higher capacity of domestic and industrial used water.

2. Meet Programme Milestones



● Milestone 1 – June 2023

» *Industrial used water influent pump station and treatment stream commissioned and into production*

● Milestone 2 – August 2024

» *Domestic used water influent pump station and one-half of liquid treatment stream commissioned and into production*

» *NEWater plant commissioned and into production*

● Milestone 3 – December 2025

» *Completion and commissioning of whole of TWRP (Phase 1)*



This slide depicts the critical milestones to be met during the construction of Tuas WRP. The whole of Tuas WRP (Phase 1) is expected to be completed and commissioned by December 2025.

3. Achieve Synergies With IWMF



Material Handling

- » *Food waste from IWMF to TWRP*
 - for co-digestion with used water sludge
- » *Dewatered sludge from TWRP to IWMF*
 - for treatment and electricity production
- » *Screening/Grit from TWRP to IWMF for treatment*

Energy

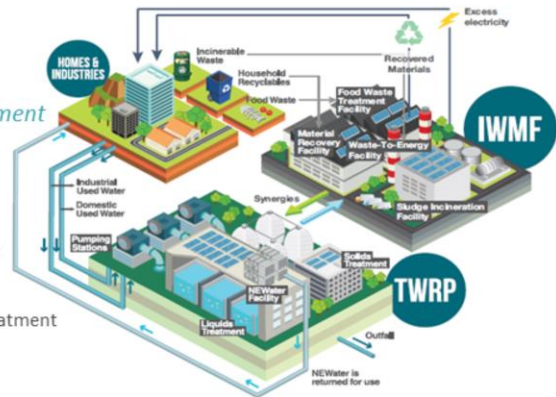
- » *Power supply from IWMF to TWRP*
- » *Biogas from TWRP to IWMF*
 - for higher overall plant thermal efficiency at IWMF
- » *Steam from IWMF to TWRP*
 - for sludge thermal hydrolysis and greasy waste treatment

Water

- » *Water from TWRP to IWMF for process use*
- » *Used water from IWMF to TWRP for treatment*

Others

- » *Foul exhaust air from TWRP to IWMF*
 - for combustion



This slide summarises the synergies that are achieved when both plants are co-located together.

4. Productivity and Innovations



- BIM coordination & integration
- CCTV for real time monitoring of site progress
- Biometric authentication system/ face recognition/ RFID for collection of manpower data
- Use of information management systems, e.g. ProjectWise, cloud services, Project Management Information Systems (PMIS)
- Adoption of web based, real time, automated instrumentation and monitoring
- Construction innovations to improve productivity, reduce time and enhance safety



CCTV Monitoring



27

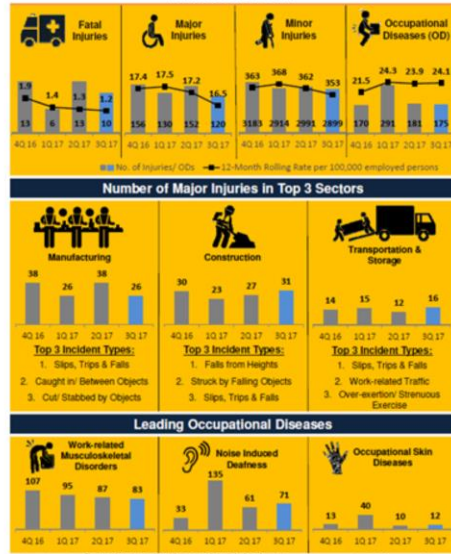
This slide emphasises the key productivity and innovations for the Tuas WRP project. PUB is looking forward to the industry to help achieve the goal of delivering the Tuas WRP project in a more productive and innovative way.

5. Workplace Safety and Health



- No fatalities or life-changing incidents
- Full compliance with all statutory regulations
- Implementation of PUB's safety requirements and life-saving rules
- Raise the bar
- Don't know, don't care

National Workplace Safety and Health Statistics In Brief
Third Quarter 2017



www.wsh-institute.sg



This slide reiterates the emphasis on workplace safety and health. Contractors onboard are required to fully comply with all statutory regulations and implement PUB's safety requirements and life-saving rules. This also includes raising the bar for the minimum Personal Protection Equipment (PPE) and the abolition of the 'Don't Know, Don't Care' behavior within the delivery team.



THE SITE

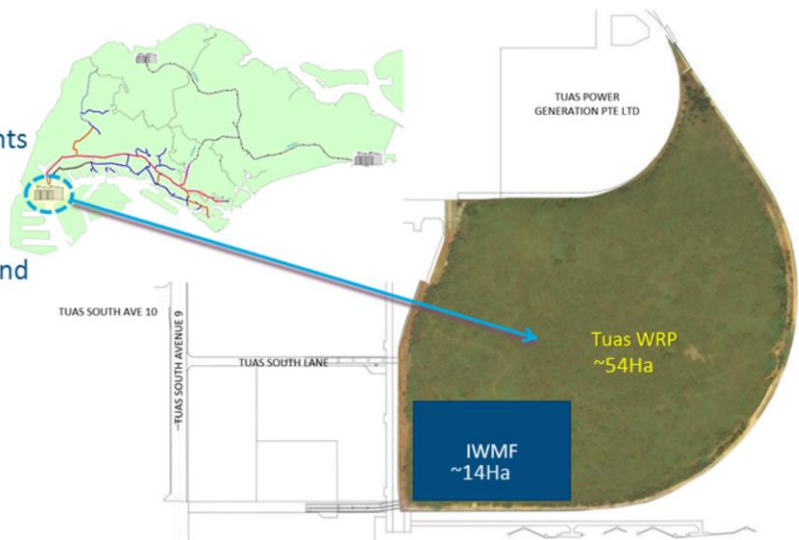


This section covers the location, site layout and staging areas of the Tuas WRP project.

Project Location

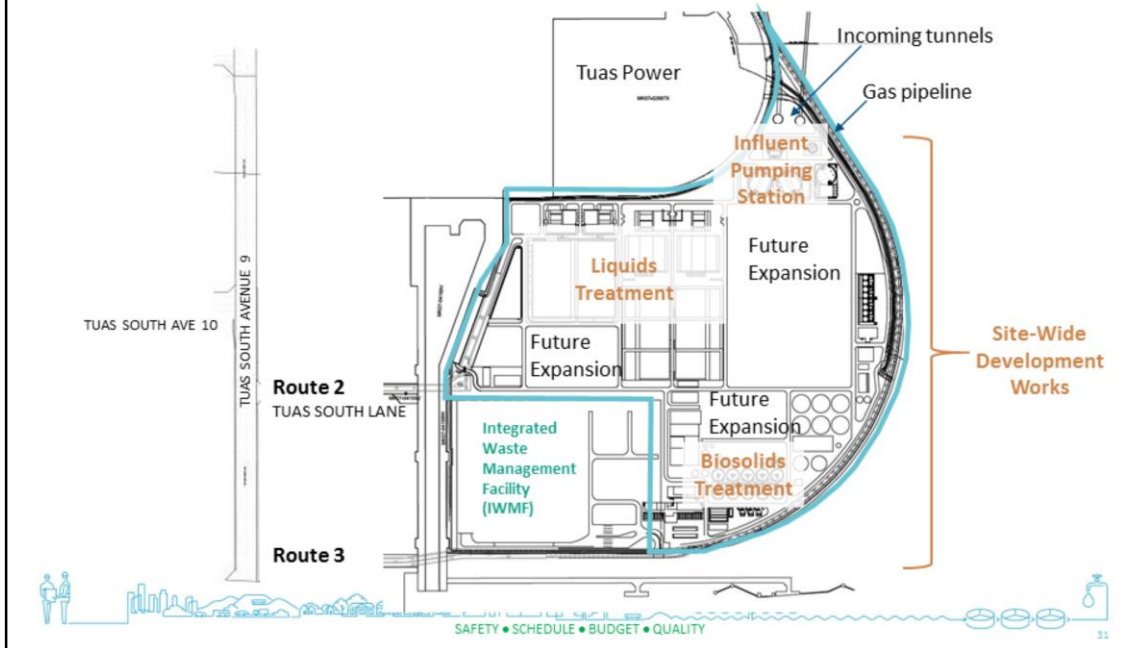


- 68 hectares of reclaimed land
- Undeveloped
- Ground improvements ongoing to stabilise and compact
- Site bounded by sea water intake canal and Tuas Power



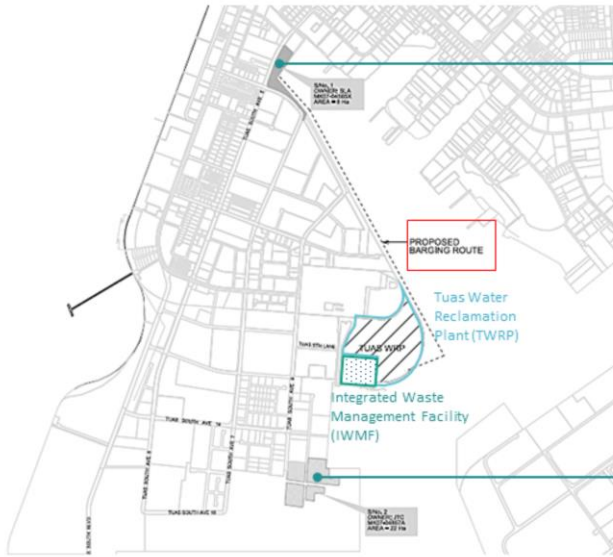
This slide presents a map of the Tuas WRP site including the area allocated for IWMF. The entire area is made up of 68ha of reclaimed and undeveloped land. There are currently some ongoing preparation works that aim to improve and stabilize the ground for the construction of Tuas WRP. The site is bounded by sea water intake canal and Tuas Power Generation.

TWRP Scope and Site Layout



This slide highlights the key components of Tuas WRP, starting with the Influent Pumping Station (IPS), Liquids Treatment, Biosolids Treatment, Site-Wide Development Works, Future Expansion as well as the IWMF. The construction of 2 new bridges are underway via Route 2 and 3 to provide the necessary road access into the site during the construction of the plant.

TWRP Staging Areas



8Ha

Tuas South Avenue 5

- Two off-site staging areas currently available.
- The 8Ha area is now serving as site for barging and ferry services.
- One or both areas can be made available to Contractors depending on needs.

22Ha

Tuas South Avenue 9



32

This slide presents the two available off-site staging areas that are currently available to Tuas WRP.

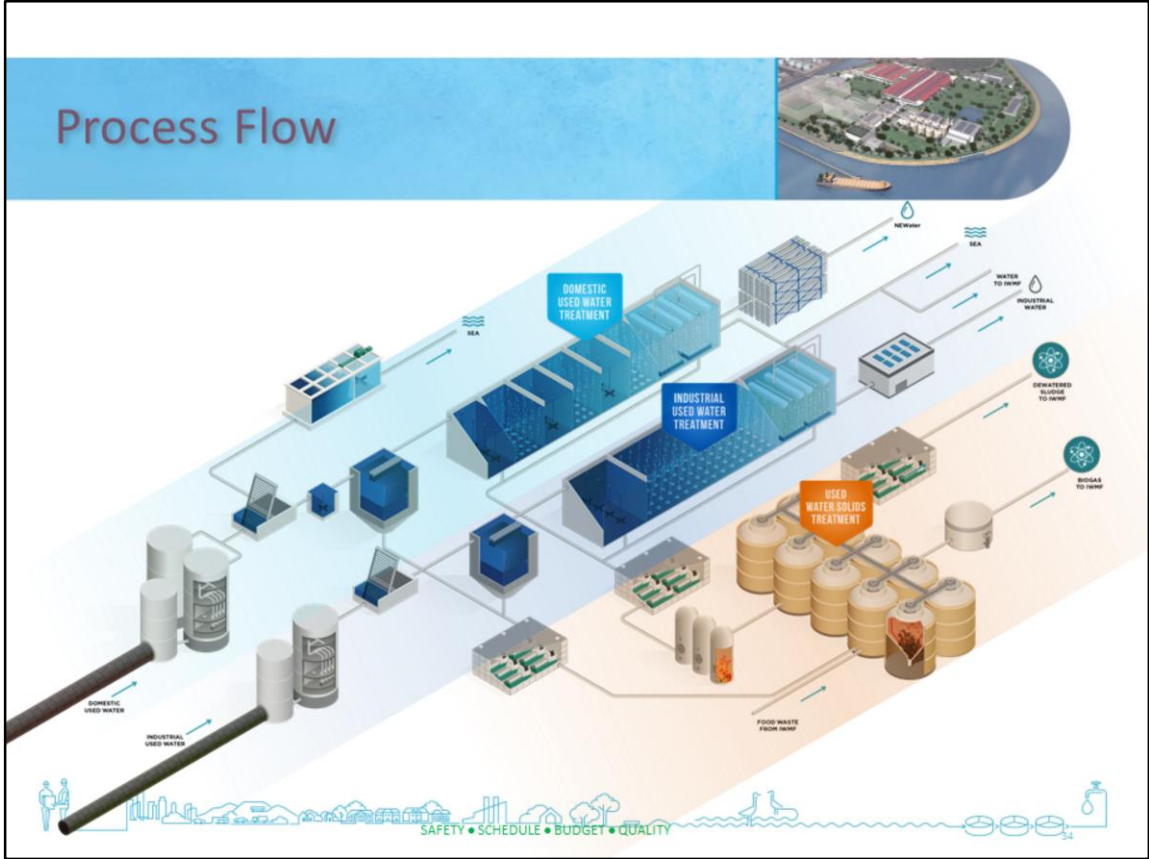


PRINCIPAL WORK ELEMENTS



This section covers the principal work elements and scope identified for the Tuas WRP project.

Process Flow



This slide presents an overview on how the Tuas WRP process flows through the key design features in the Domestic Used Water Treatment, Industrial Used Water Treatment and Biosolids Treatment.

Site Development Works and Support



Permanent Works:

- » Permanent Roads
- » Major Yard Piping
- » Permanent Utility Reticulation
- » Tuas Port Local Sewer
- » Near Shore Outfall

Tuas Port Local Sewer

Temporary Works and Support:

- » Temporary Roads and Diversions
- » Temporary Utilities Reticulation
- » 22kV substation
- » Site Hoarding and Security
- » Canteen(s)
- » Medical, Emergency Facilities and Services
- » Potential Barging Facility

Near Shore Outfall

22kV Substation



SAFETY • SCHEDULE • BUDGET • QUALITY

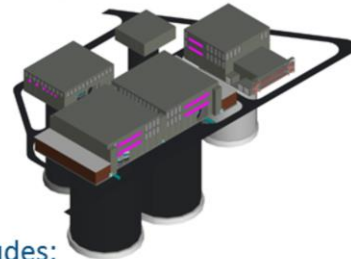
35

This slide presents the site development works and support ranging from permanent works to temporary works and support designed for the Tuas WRP.

Influent Pump Station (IPS)



IPS adjacent to incoming two tunnels under T-08



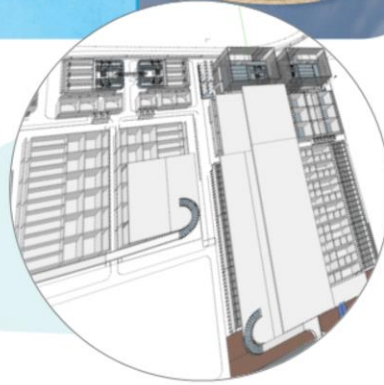
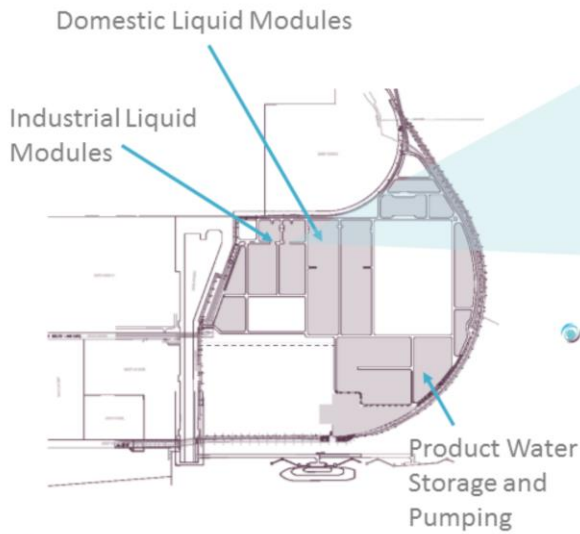
Scope includes:

- » 2 Coarse Screen Shafts and 3 Pump Station Shafts with mined connections from T-08
- » Shaft diameters from 22m to 52m; depths at 65m and 80m
- » Domestic IPS – 16 pumps with total pumping capacity of 1950 MLD
- » Industrial IPS – 10 pumps with total pumping capacity of 450 MLD
- » 6 rising mains underground and on grade to Liquids modules headworks
- » Centralised Odour Control Facility



This site diagram illustrates the locations of the influent pumping station (IPS) and two incoming tunnels. This slide also broadly discusses the scope of works; the construction of 5 shafts and installation of various pumps as well as 6 rising mains beyond ground level. The scope also involves the construction of a centralised Odour Control Facility.

Industrial and Domestic Used Water Treatment Modules



Scope includes:

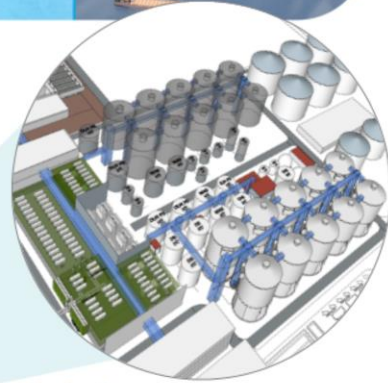
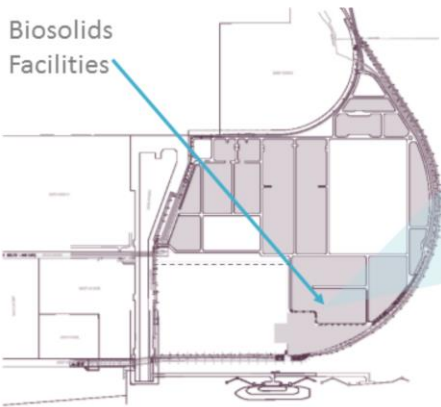
- » Two liquid treatment trains each module
- » Headworks, primary treatment tanks, secondary bioreactor and membranes tanks
- » Polymeric membranes in domestic module ceramic and/or polymeric in industrial module
- » NEWater treatment on roof using RO



37

This site diagram depicts the locations of the Industrial Liquid Modules and Domestic Liquid Modules. The scope includes Membrane Bioreactors (MBR) and Reverse Osmosis (RO) treatment.

Biosolids Treatment



Scope includes:

- » *Biosolids building with space for future equipment*
- » *Thermal Hydrolysis pre-digestion, centrifuges for pre-dewatering and thickening*
- » *10 Silo digesters – Potential construction with post-tensioned precast panels*
- » *Majority of the IWMF interfaces*



SAFETY • SCHEDULE • BUDGET • QUALITY

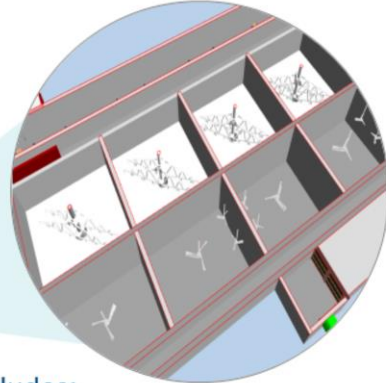
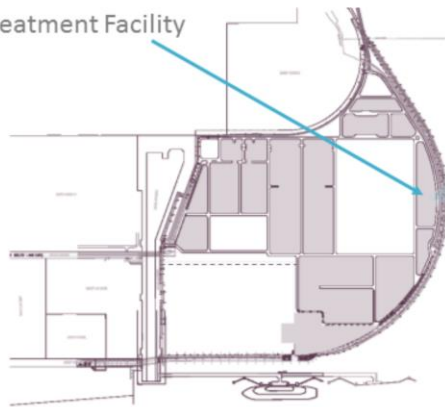
38

This slide identifies the location of the Biosolids Treatment Facility where the scope involves building the facility with space for future equipment, the use of Thermal Hydrolysis Pre-Digestion (THP) and various silo digesters. Majority of these equipment are expected to interface actively with the IWMF.

Wet Weather Treatment Facility



Wet Weather Treatment Facility



Scope includes:

- » 487.5 MLD treatment capacity
- » Treats only excess domestic used water flows
- » Treatment technology to be determined with successful tenderer or vendor

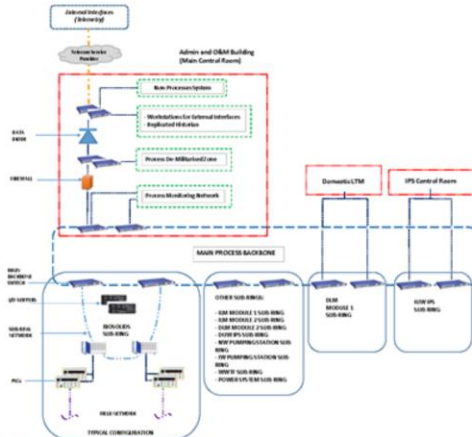
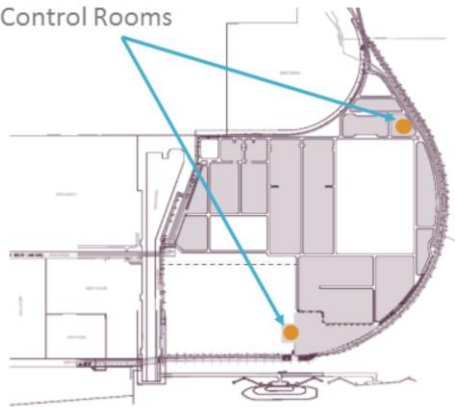


This slide presents the location of the Wet Weather Treatment Facility which holds a treatment capacity of 487.5 MLD. This facility only treats excess domestic used water and will be a design and built contract.

Plant Monitoring and Control System



Control Rooms



Scope includes:

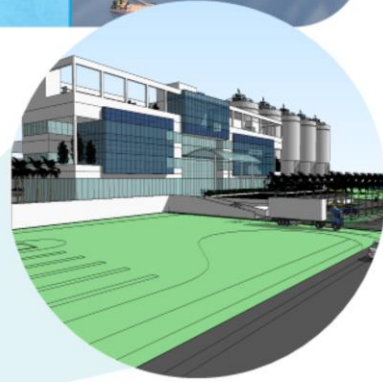
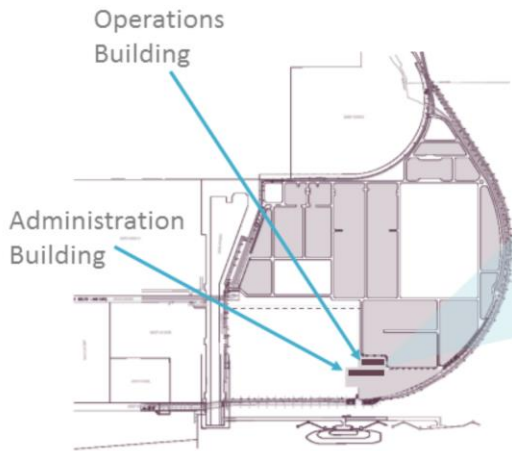
- » A SCADA/PLC based system
- » Progressive build out to meet Milestones 1, 2 and 3



SAFETY • SCHEDULE • BUDGET • QUALITY

This slide highlights the locations of the two control rooms which include a SCADA/PLC-based system. This work element will be built out progressively to meet the Tuas WRP's key project milestones.

Administration and Operations Buildings



Scope includes:

- » *Admin Building for PUB and NEA Offices*
 - Located outside secured zone
- » *Operations Building for TWRP operators*
 - Located inside secured zone



The administration building for PUB and NEA offices will be located outside the secured zone while the operations building for TWRP operators will be located within the secured zone.

Electrical Power and Odour Control Facilities

Two 66kV Substations



OCFs Scope includes:

- » *Two 66/22kV substations fed from 230kV to be built by IWMF*
 - 100% redundancy to power entire plant
 - Space for future equipment to support plant expansion
- » *Solar panels to be installed on facility roofs*
- » *Odour Control Facilities at IPS and Liquids Treatment Modules*
 - Odour treatment using bio-trickling filters and activated carbon



SAFETY • SCHEDULE • BUDGET • QUALITY

42

These two 66kV substations will be built with 100% redundancy to power the entire Tuas WRP. Solar panels are expected to be installed on facility roofs to supplement that plant's electrical needs. Odour Control Facilities (OCFs) will be located at the IPS and Liquids Treatment Modules.



CONTRACT PACKAGES



This section introduces the 11 contract packages of the Tuas WRP project.

11 TWRP Contract Packages

No.	Name	Description
C1A	Site Development Works	<ul style="list-style-type: none"> • Temporary site wide support infrastructure and services • Permanent yard piping, utilities, 22 kV, link sewer, near-shore outfall
C2A	Influent Pumping Stations	<ul style="list-style-type: none"> • Two coarse screen shafts, three pump stations and rising mains • Two 66 kV substations
C3A	Industrial Liquids Modules	<ul style="list-style-type: none"> • Headworks, Primary Treatment, Secondary Treatment, Tertiary Treatment to produce Industrial Water
C3B	Domestic Liquids Modules – Primary	<ul style="list-style-type: none"> • Headworks and Primary Treatment
C3C	Domestic Liquids Modules – Secondary and NEWater	<ul style="list-style-type: none"> • Secondary Treatment and NEWater Production
C3D	Product Water Storage and Pumping	<ul style="list-style-type: none"> • Storage and pumping of NEWater and Industrial Water
C4A	Biosolids and Digesters	<ul style="list-style-type: none"> • THP, digestion, thickening, dewatering, solids conveyance
C5A	Plant Monitoring and Control System	<ul style="list-style-type: none"> • SCADA/PLC system with progressive buildout
C6A	Administration and Operations Buildings	<ul style="list-style-type: none"> • Two separate buildings
C6B	Site Completion	<ul style="list-style-type: none"> • Scope to be defined
C6C	Wet Weather Treatment Facility	<ul style="list-style-type: none"> • Domestic used water overflow treatment and discharge



This slide provides an overview of the 11 Tuas WRP contract packages i.e. Contract No., Name and Description of contract packages.

Implementation Considerations



- C1A provides temporary infrastructure and services throughout project
 - » *Improves site wide coordination, reduces tender prices*
- Major site piping and site wide utilities installed early
 - » *Reduces interfaces with major facility contracts*
- Fewer design-bid-build packages
 - » *Attract broader competition to increase innovation*
- Civil & Structural, piling and MEICA combined in facility packages
 - » *Reduces contractual interfaces, improves schedule efficiencies*
- Wet weather treatment expected to be design build
 - » *Provides flexibility for best vendor technology*
- No deep excavations other than shafts and major site utilities
 - » *Reduces schedule and cost, less dewatering, improves safety*
- Owner Controlled Insurance Programme (OCIP)
 - » *Covers entire DTSS2 and provides contractor all risk, 3rd party liability and worker injury*



SAFETY • SCHEDULE • BUDGET • QUALITY

45

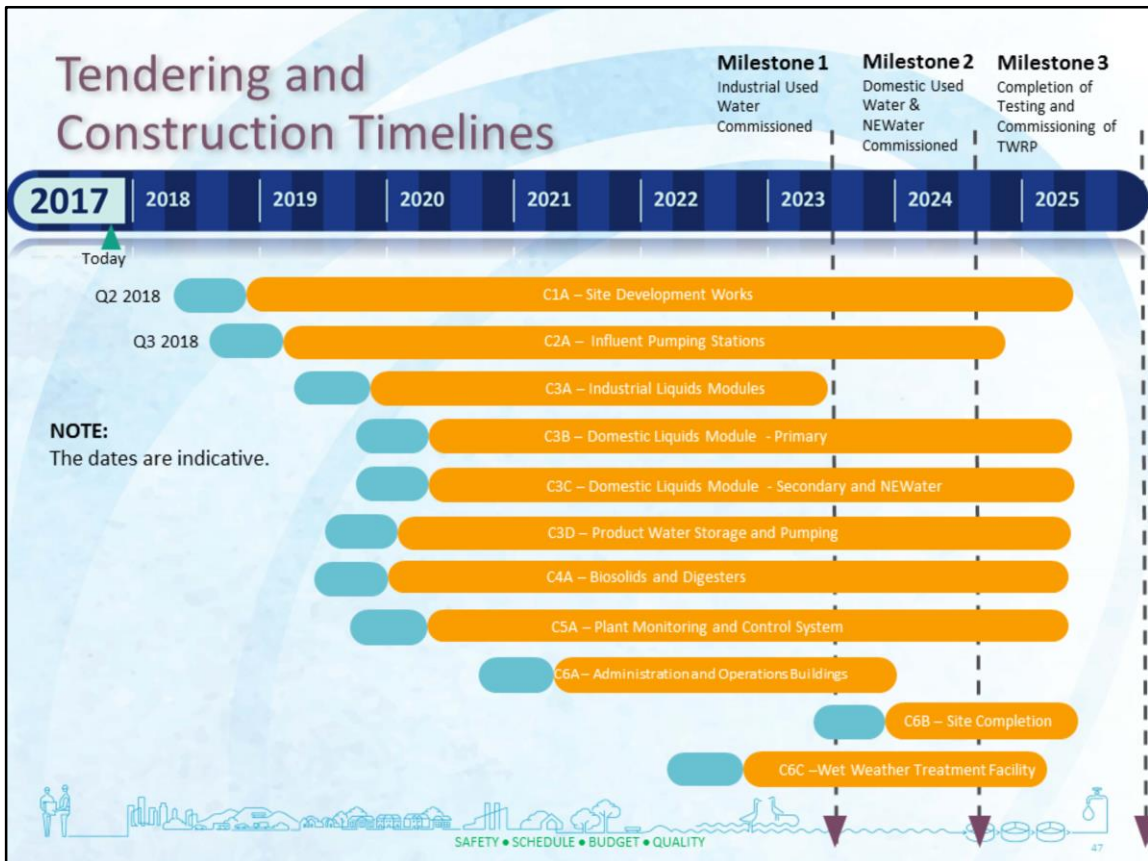
This slide presents the implementation considerations for the Tuas WRP project.



TIMELINE



This section covers the implementation timeline of the 11 contract packages for the Tuas WRP project.



This slide presents the overall timeline planned for the 11 contract packages of the Tuas WRP project. Tenders will be called for Contract 1A and 2A from Q2 2018 and Q3 2018 respectively. The remaining 9 contracts will be called subsequently. Completion of the majority of the contracts are expected to be between 2023 and 2025.



PROGRESS & ONGOING PREPARATION WORKS

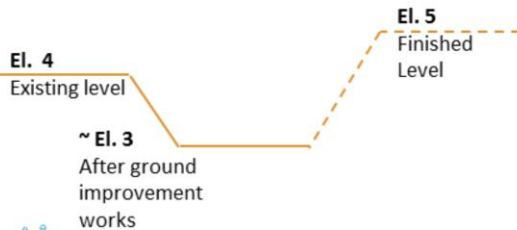


This section introduces the ongoing preparation works in advance of awarding the main construction contracts for Tuas WRP.

Ongoing Preparation Works



- Ground Improvement Work to complete by August 2018
- Vibro-compaction and perforated vertical drain (PVD) with surcharge
- Covering entire site



SAFETY • SCHEDULE • BUDGET • QUALITY

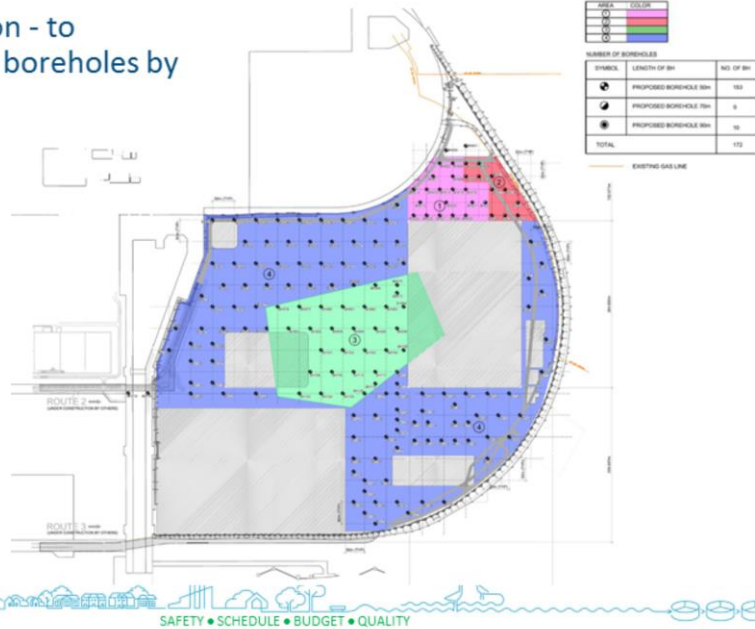
49

Ground improvement works are on-going to compact the entire site which is undeveloped and made from reclaimed materials. The ground improvement works utilises two techniques to compact the site; vibro-compaction for the majority of the site and perforated vertical drains with surcharge loading for specific areas not appropriate for vibro-compaction. The ground improvement works is planned to be completed ahead of all construction contracts. The slide also shows that the typical final elevation of the site will be brought back to elevation 5.

Ongoing Preparation Works



Soil Investigation - to complete ~170 boreholes by October 2018



Soil investigation works will be completed by October 2018. Approximately 172 boreholes will be done over the entire TWRP.

Ongoing Preparation Works



- Route 2 and 3 bridges – to complete June and December 2018



This slide shows the ongoing construction of the two access bridges to the TWRP site at Routes 2 and 3.

Ongoing Detailed Design



● Detailed Design by CH2M with PUB



The pictures on this slides demonstrate the collaboration between CH2M and PUB in the current detailed design stage for the Tuas WRP project.



KEY PROJECT REQUIREMENTS



This section covers the key project requirements for the Tuas WRP project.

Key Project Requirements



Building & Construction Authority (BCA) Registration



Primavera P6 Programme



6D BIM

Key Project Requirements for Tuas Water Reclamation Plant



Workplace Safety & Health



Smart Innovations



Document Control



SAFETY • SCHEDULE • BUDGET • QUALITY

54

This slide introduces 6 key requirements for all the contracts: BCA Registration, Primavera P6 for programmes, 6D BIM, Smart Innovations, Workplace Health and Safety, and Document Control.

BCA Registration



- Tenders are open to BCA registered contractors including Workheads CW01, CW02, ME02, ME05, ME11 and Financial Grades A1 and L6.

Workhead	Title	Tendering Limit	Financial	Track Record (past 3 years)
CW01	General Building	A1 (unlimited)	S\$15M	\$150M
CW02	Civil Engineering	A1 (unlimited)	S\$15M	\$150M
ME02	Building Automation, Industrial & Process Control Systems	L6 (unlimited)	S\$1.5M	\$30M
ME05	Electrical Engineering	L6 (unlimited)	S\$1.5M	\$30M
ME11	Mechanical Engineering	L6 (unlimited)	S\$1.5M	\$30M

For complete details, please visit:

https://www.bca.gov.sg/ContractorsRegistry/contractors_registration_requirements.html

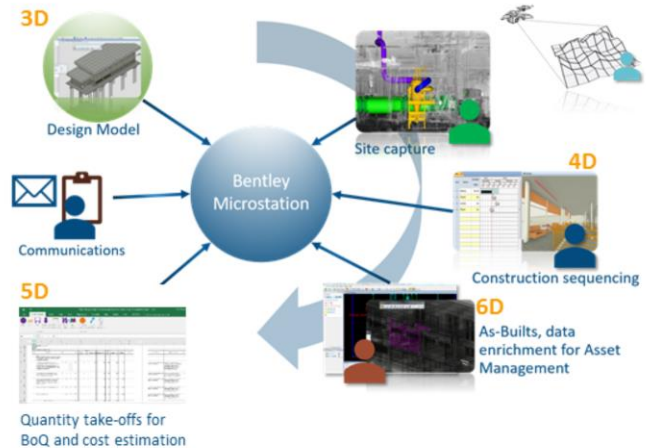


This slide summarises the expected BCA requirements for tenderers based upon the expected size and scope of the 11 TWRP contracts. Firms not registered with the Building and Construction Authority (BCA) can obtain registration information from BCA www.bca.gov.sg.

6D BIM



- Design provided in BIM model with limited 2D drawings
- Bentley Microstation platform with Navisworks
- Contractors to update model; MEICA design completion and construction as-builts
- Aligned to Singapore BIM Guide (BCA)
- Contractors to deliver updated as-built model with COBie data embedded for all managed assets



This slide highlights the structure and importance of BIM to the delivery and operation of the TWRP. The design will be delivered to Contractors in a 3D Model and the Contractors will be required to update it during construction and provide an as-built model with COBie data for all managed assets.

Document Control



- Supervision team will use a single document system (Aconex) for all document and workflow control
- Contractors can choose their own system but must interface with SO Aconex system
- Contractors to be provided with an Aconex license

Revision	Status	Review Status	Discipline	Type	PBS	Plant Area	Project Prefix	Created By	Date Modified	Revision Date	Date Created
S2	Submittable for Information		Plat - Project Management	Letter	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	02112017	02112017	
S2	Submittable for Information		Plat - Project Management	Letter	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	02112017	02112017	
S3	Submittable for Review and Comment		Plat - Project Management	Meeting Minutes	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	29092017	29092017	29092017
S3	Submittable for Review and Comment	Accepted	Plat - Project Management	Meeting Minutes	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	03102017	29092017	29092017
S3	Submittable for Review and Comment		Plat - Project Management	Meeting Minutes	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	09112017	27102017	
S3	Submittable for Review and Comment		Plat - Project Management	Meeting Minutes	13101 - Taps WSP SO and CS	GS - General Services	WG000 - General Services	CHN.HH Singapore	09112017	27102017	



The SO will utilise a common document control system, Aconex, for all communications with the Contractors. Contractors are free to select their own system provided that they communicate with the SO through Aconex. It is planned to provide each Contractor with a license to Aconex to facilitate their communications with the SO.

Smart Innovations



Autonomous Vehicles

» *Use autonomous vehicles for the transportation of screenings & grit and sludge from TWRP to IWMF*

- Enhances reliability
- Reduces manpower

Personnel Tracking System

» *Implement a plant-wide personnel tracking system that also incorporates data analytics to identify inactivity*

- Enhances safety and security



Internet of Things (IoT) for Equipment

» *Next-generation sensors for dynamic controls*

- Calibration-free and high data confidence
- Less maintenance and better effluent quality



SAFETY • SCHEDULE • BUDGET • QUALITY

59

PUB is encouraging the application of smart innovations in the design, construction and operation of the TWRP. This slide shows three examples of innovations being considered; autonomous vehicles, electronic personnel tracking and internet of things.

Workplace Safety and Health



- Raise the bar for Personal Protective Equipment (PPE)
- Incentive & Disincentive Scheme
 - » *Rewards for commitment and demonstrable actions leading to exemplary performance in safety*
 - » *Deductions for poor safety performance, including inadequate supervision of sub-contractors*
 - » *Assessed and scored on KPIs in line with safety targets*



Protect Yourself At Work

Checklist :



Ready? Now You Can Start Working

The TWRP delivery will encourage the use of best practices in Workplace Safety and Health; including full Personal Protective Equipment and contract Incentive & Disincentive schemes.



KEY PROJECT CHALLENGES



This section covers an overview of the key project challenges likely to be faced during the delivery of the Tuas WRP project.

Challenges



🕒 Tight site

- » *Thousands of workers at peak*
- » *Thousands of vehicle movements on site*

🚧 Restricted Access

- » *Two land routes*
- » *Limited site road network*

🏗️ Several tall structures

- » *38.5 m digester tanks*

🤝 Interfaces

- » *Between contracts and with incoming tunnels, IWMF*
- » *With site-wide roads, utilities*

🏆 Competition with other major infrastructure programmes in Singapore

📅 Meeting first milestone by June 2023; concurrent plant operation thereafter



This slide summarises several of the key challenges in the construction of TWRP. PUB and its consultants are developing measures to address these and will need the industry's full support to successfully mitigate these and other challenges during the construction.



SUMMARY



This section brings us to a summary of key takeaways emerged from the briefing presented to all attending industry partners.

Key Takeaways



- **Safety is a MUST**
- **Timely** completion of project
- **Value for Money**
- Industry's **collaboration** needed to succeed
- **Productivity and Innovations**



SAFETY • SCHEDULE • BUDGET • QUALITY

The slide concludes the key takeaways of the Tuas WRP construction project.



NEXT STEPS



This section presents the upcoming events and/or ways to keep industry partners updated with important insights of the Tuas WRP project.

Upcoming



- Singapore International Water Week in July 2018
 - » Visit TWRP Booth at Sands Expo and Convention Centre, Basement 2
- Use TWRP@ch2m.com mailbox for general queries
- Presentation and other related resources can be found on <https://www.pub.gov.sg/dtss/phase2/resources>



This slide presents the upcoming events and/or initiatives that keep industry partners stay connected to the Tuas WRP team and related insights. One of which is the bi-annual Singapore International Water Week (SIWW), happening in July 2018, where PUB and NEA will showcase Tuas WRP and IWMF in an exhibition at Marina Bay Sands. To get in touch with the Tuas WRP team, one way is to go through the sending of emails to the TWRP mailbox. This presentation deck will be posted onto PUB DTSS 2 website and on the same webpage, there are also other DTSS 2 related resources available.



Q&As

