



CSDM Asia 2016

Integrated Infrastructure Value- Chain Planning for Industrial Estates and Buildings

About JTC

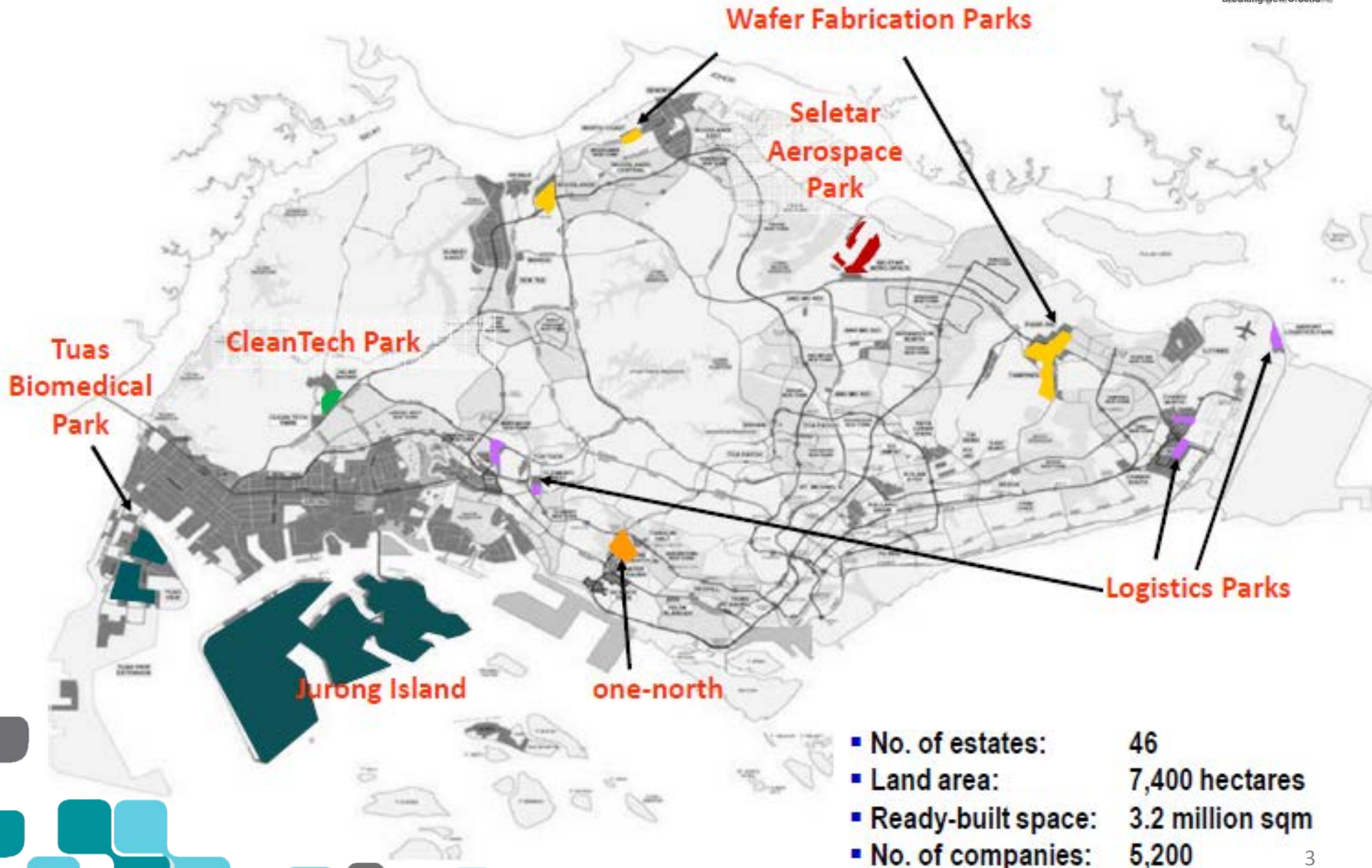
- A statutory board under the Ministry of Trade & Industry
- Formed in 1968 to spearhead Singapore's industrialisation programme & develop industrial estates and related infrastructure



JTC's role in the evolution

- Focus remains on traditional role of providing key infrastructure to support strategic economic activities
 - Prepared land with ready infrastructure
 - Ready-built space
- Expanding role to provide supporting amenities to meet demand from changing demographics of end users while promoting land productivity

JTC's Portfolio



Outline of Presentation



Integrated
Infrastructure
Value Chain
Systems

JTC Surface
Engineering
Hub Systems
Design

JTC
nanoSpace @
Tampines
Systems
Design

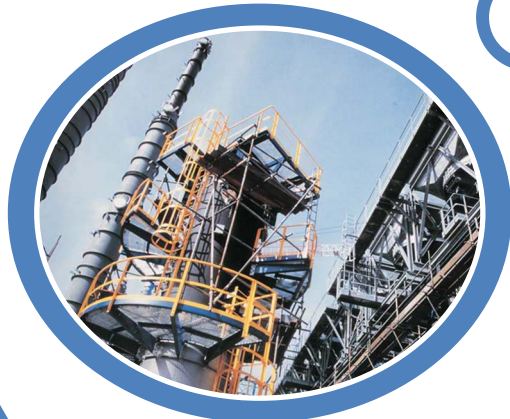
Jurong Island
Systems
Design

one north
Systems
Design

Integrated Value Chain Systems

An Industrial Developer's Perspective

Interconnectivity



At building level systems



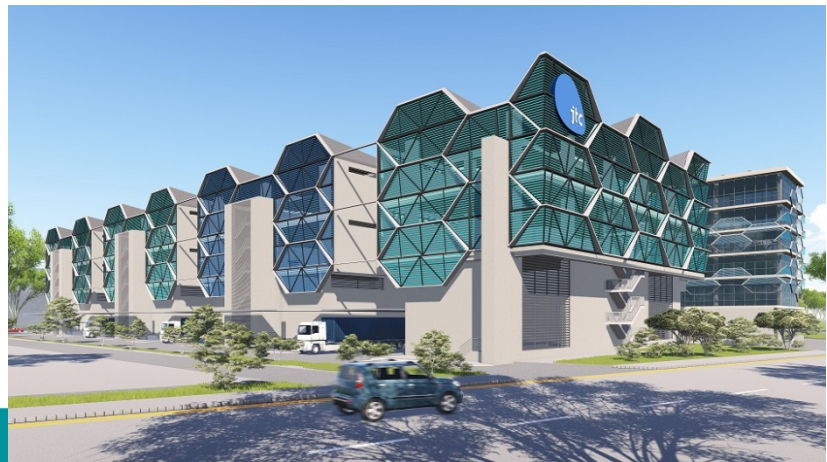
At industrial estate level

Integrated Value Chain Systems

An Industrial Developer's Perspective



Systems at Building Level



Systems at Building Level

- Understanding the industry value-chain and manufacturing processes
- Translating requirements into building services and systems
- Linking the systems up and implementation into building designs
- Sharing of two unique building systems for surface engineering and semiconductor electronics



JTC Surface Engineering Hub



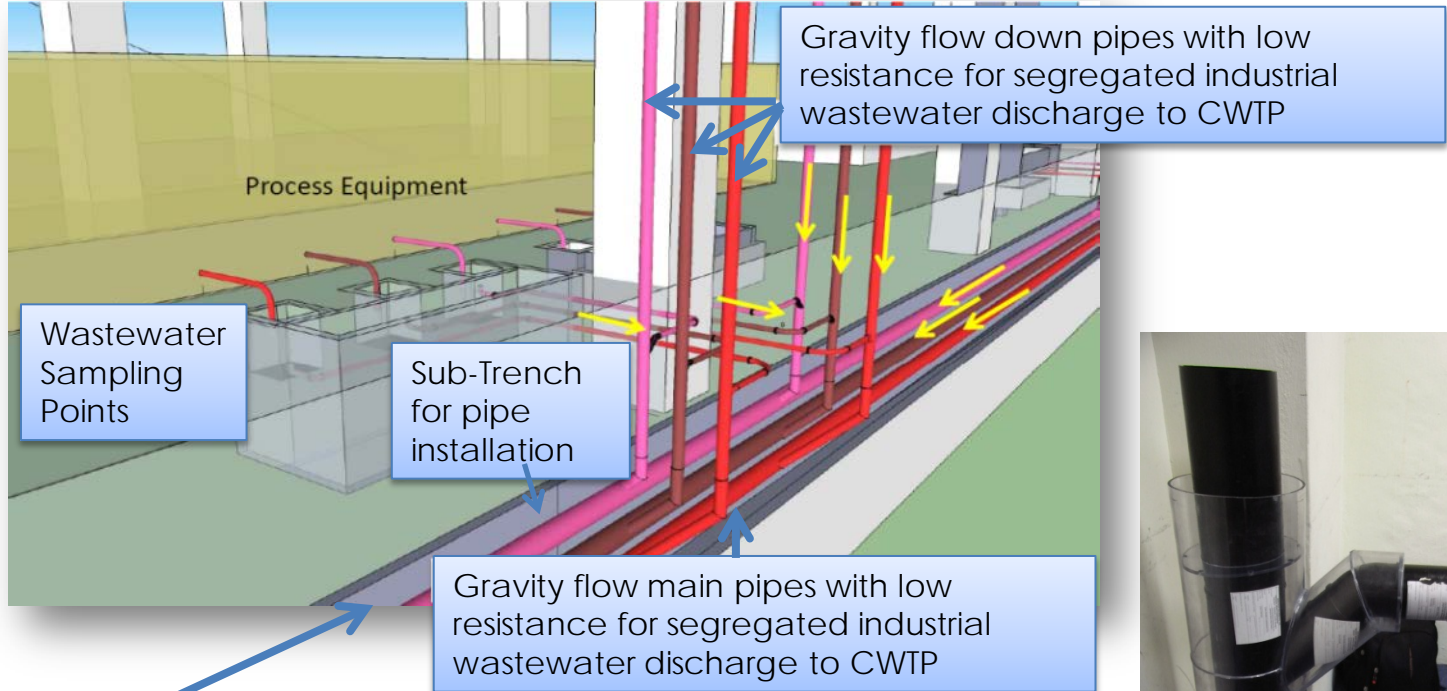
Building Name	JTC Surface Engineering Hub
Gross Floor Area	26,242 sqm
Usage	a unique, first-of-its-kind multi-tenanted development in Singapore that integrates companies along the entire surface engineering value-chain
TOP Date	17 December 2013

JTC Surface Engineering Hub Centralised Wastewater Treatment System



JTC Surface Engineering Hub

Centralised Wastewater Treatment System



Sub-Trench would channel spillages to CWTP in the event of pipe burst to mitigate pollution risk of trade effluent flowing into public drains

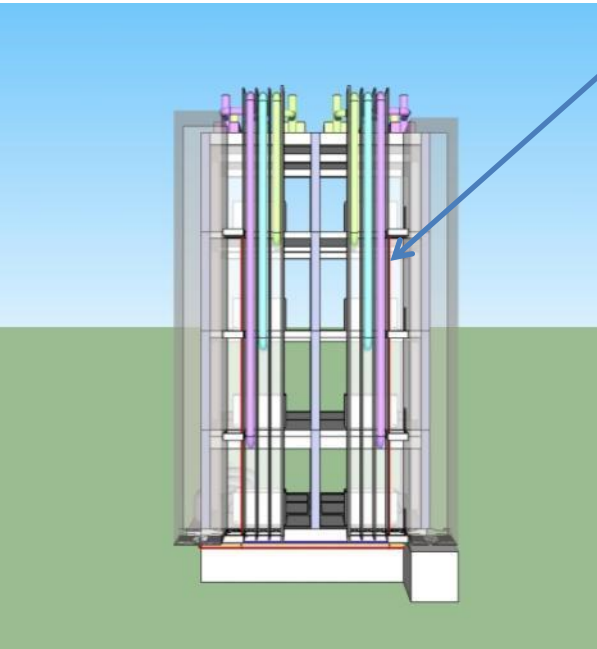


Double containment detail (clear enclosure) for gravity flow down pipes to prevent accidental spillages from polluting the facility and potentially injuring occupants

Wastewater is segregated into three main streams – one each for general heavy metals, cyanide and chromium - before being centrally treated at the CWTP, where contaminants are removed. This enables the wastewater to meet the standard permissible requirements before it is discharged to the public sewers

JTC Surface Engineering Hub

Pre-built Service Routing

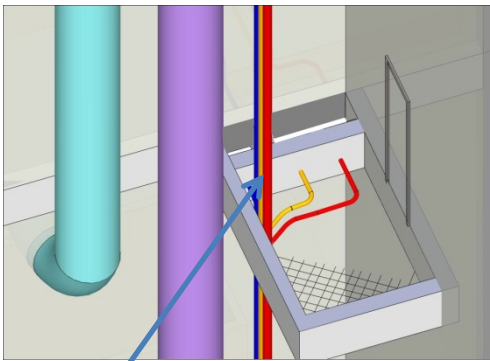


Visualization of customers' exhaust ducts installation

Stacks for Customers to install exhaust ducts from scrubbers



Stacks with pre-installed gravity flow down pipes with low resistance for customers to discharge segregated industrial wastewater directly to the CWTP



Visualization of pre-installed gravity flow down pipes with low resistance with space provision for installing an additional pipe to cater to a new wastewater stream in future

1. No floor traps at individual production units as a safety feature to prevent unintended discharge of trade effluent into the house sewers
2. Common toilets provided at each floor with security cameras as deterrent against unauthorized discharge of trade effluent into house sewers
3. 2 penstocks, one for treated trade effluent from the CWTP and the other for common grey/black water where source out of specifications discharge can be identified, isolated and rectified

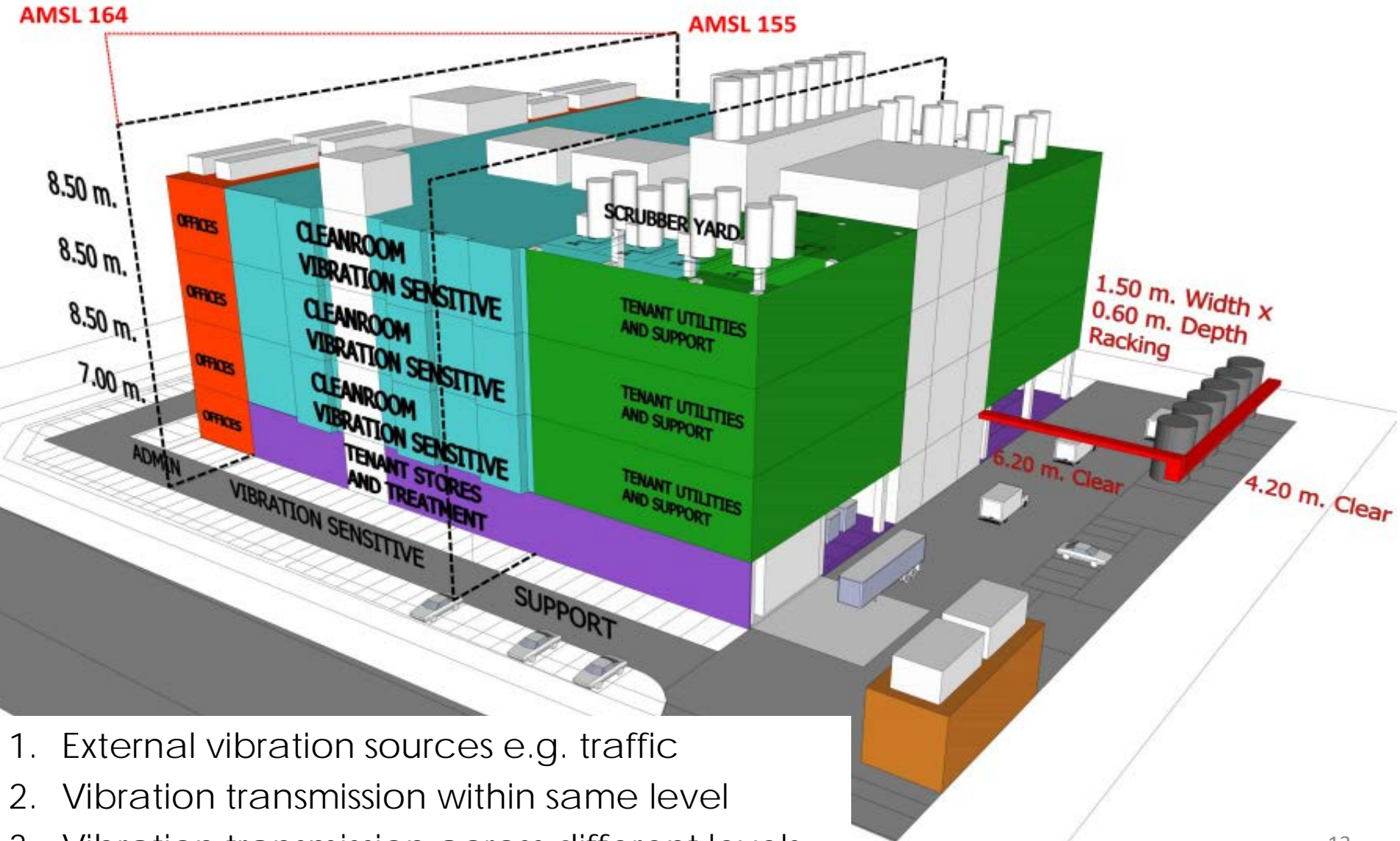
JTC nanoSpace @ Tampines



Building Name	JTC nanoSpace @ Tampines
Gross Floor Area	22830sqm
Usage	Multi Tenanted Cleanrooms with Support Facilities
Commencement Date:	2 nd May, 2015
Completion Date	30 th March, 2017

JTC nanoSpace @ Tampines

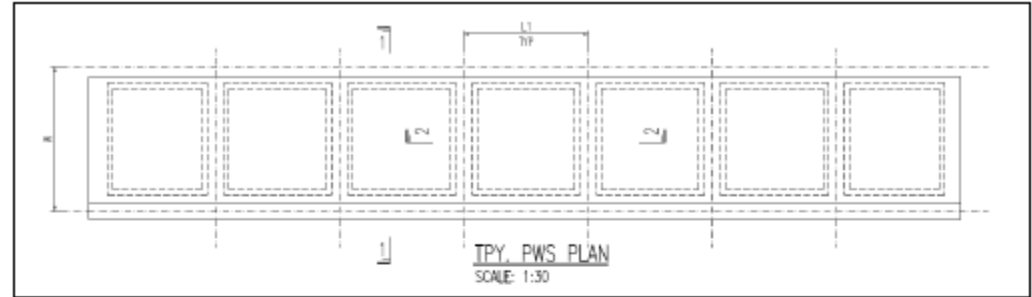
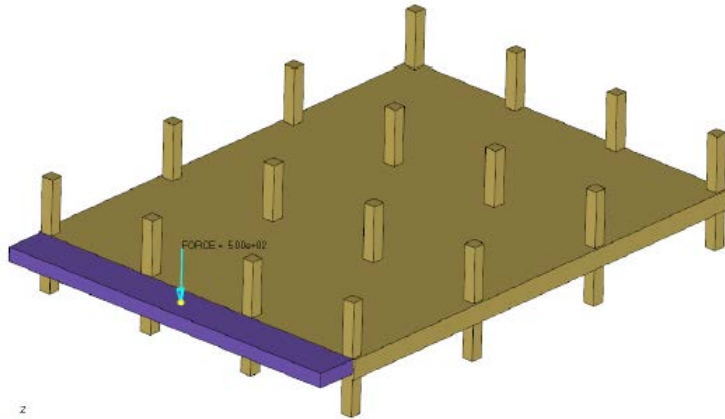
Extensive Vibration Mitigation



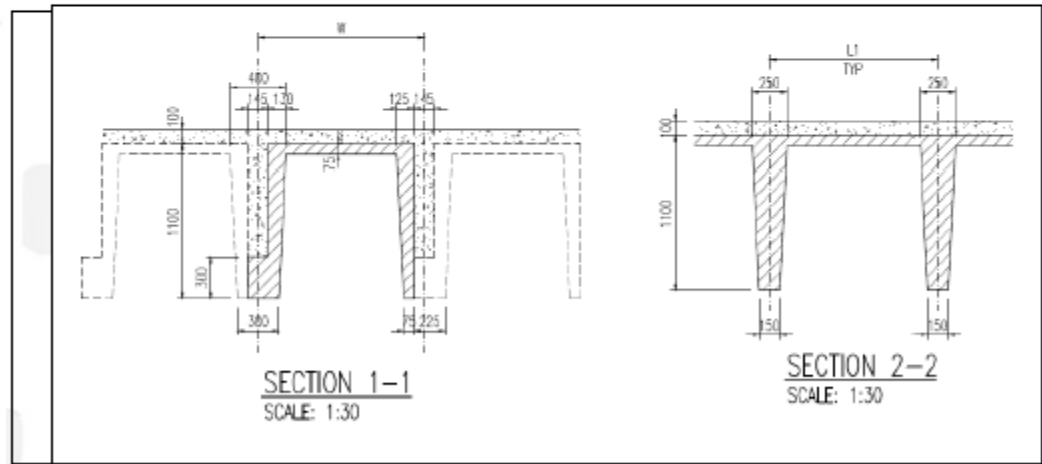
1. External vibration sources e.g. traffic
2. Vibration transmission within same level
3. Vibration transmission across different levels

JTC nanoSpace @ Tampines

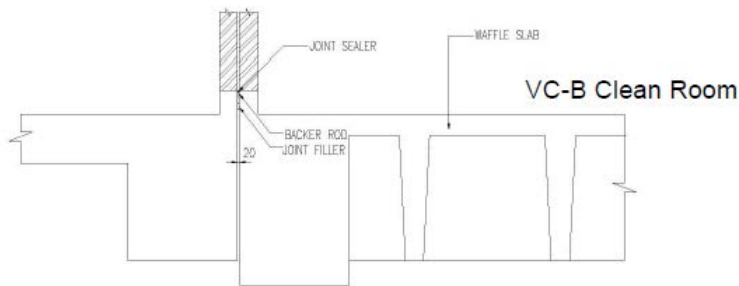
Extensive Vibration Mitigation



Typical precast waffle slab (PWS) – Plan View



Typical precast waffle slab (PWS) – Sectional View



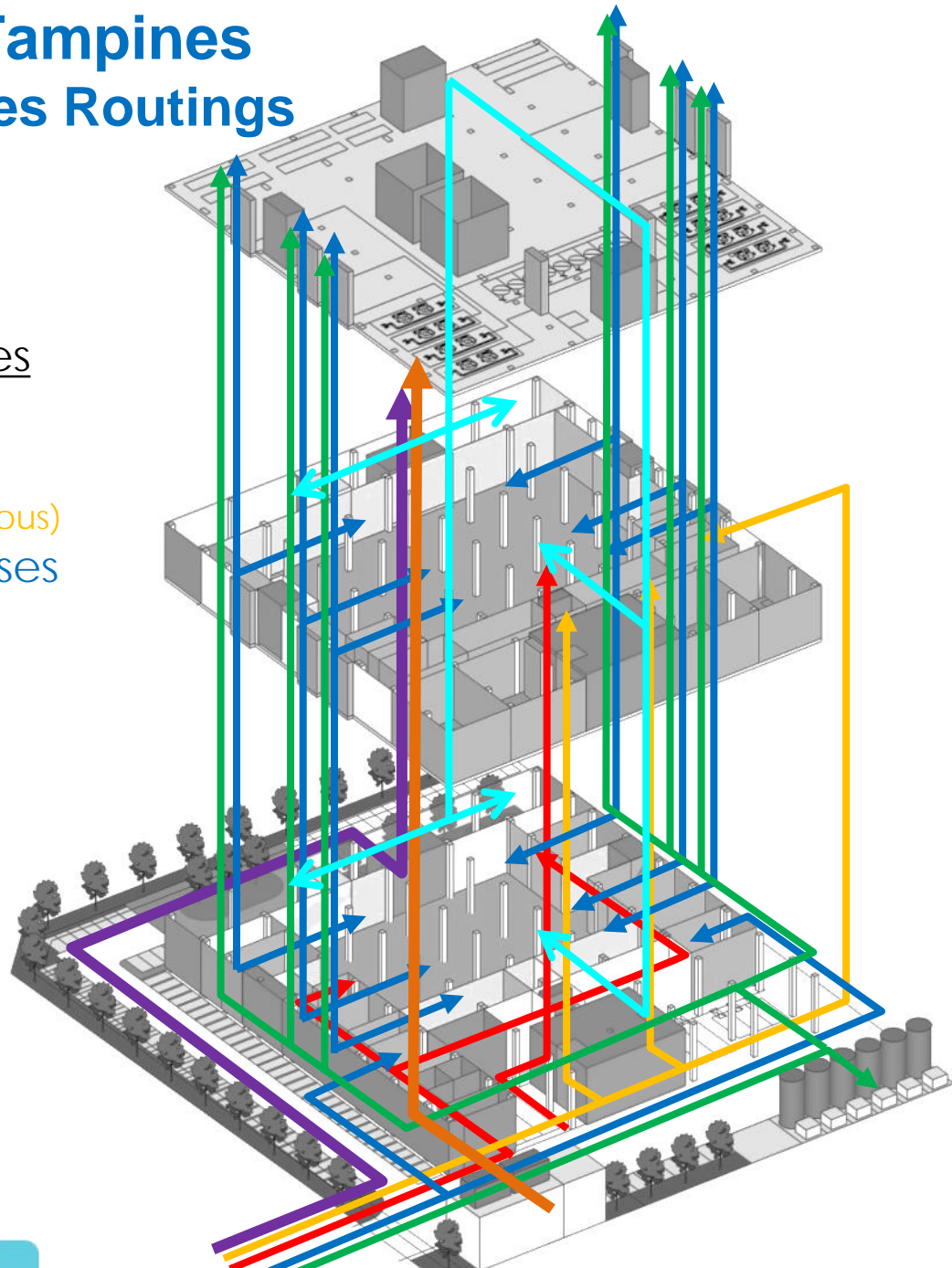
STRUCTURE ISOLATION GAP DETAILS AT TYPICAL STOREY
1:30

JTC nanoSpace @ Tampines

Integrated M&E Services Routings

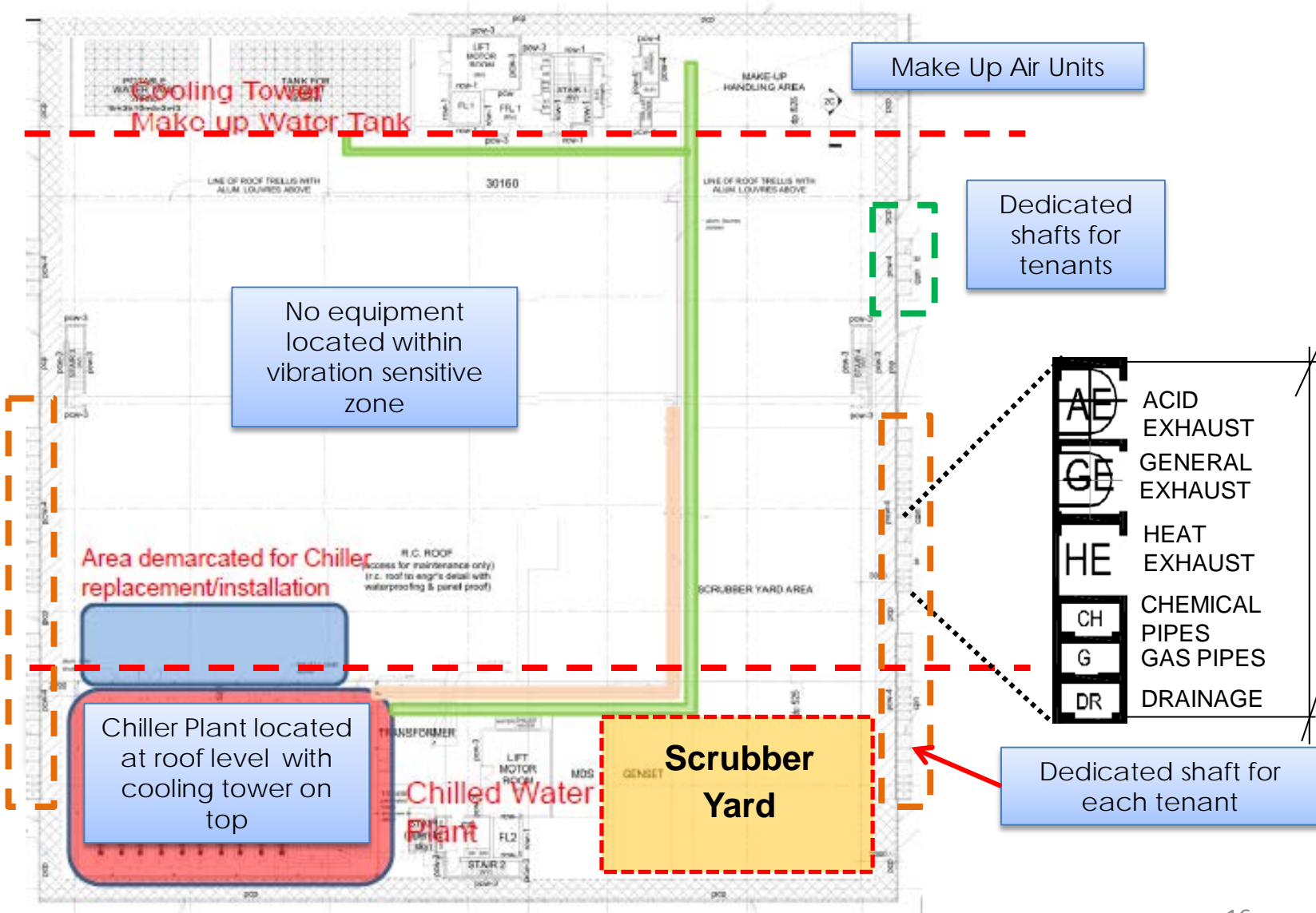
People and Goods/Utilities Movement

- Raw Material (Non Hazardous)
- Special Chemical & Gases
- Hazardous Chemicals
- Chilled Water
- Bulk Gases
- Power
- People



JTC nanoSpace @ Tampines

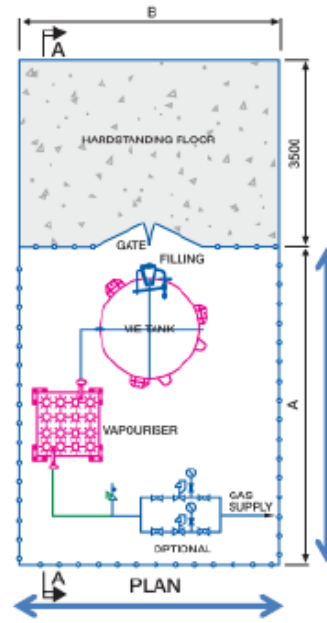
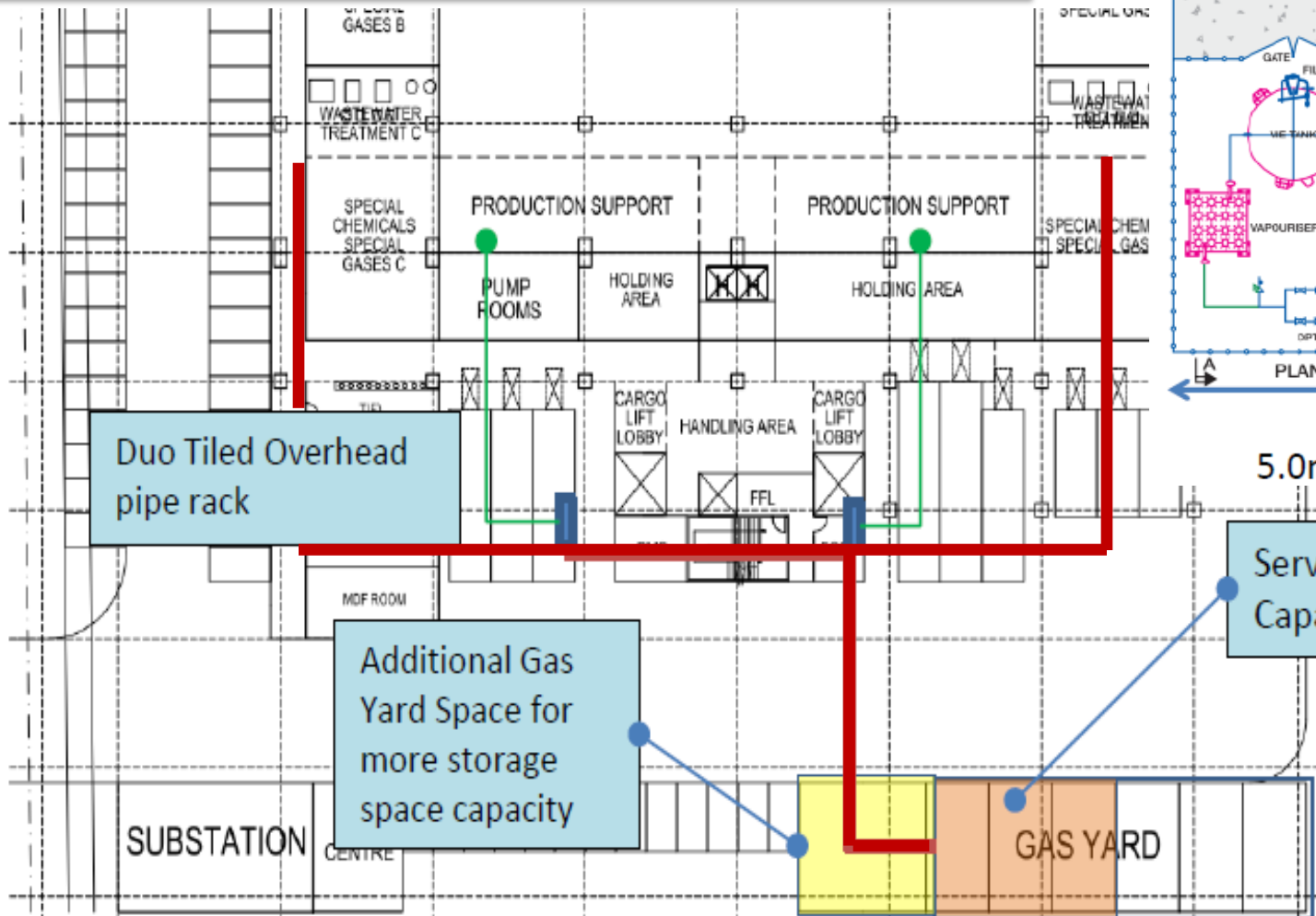
Air Handling Routing



JTC nanoSpace @ Tampines

Centralised Bulk & Specialty Gas

2 types of gases.
 Type 1 – Bulk and Inert gases e.g. Nitrogen, Argon, etc.
 Type 2 - Flammable Gas, e.g. LPG, Hydrogen, etc



View illustrating delivery truck and LNG components

9.0m

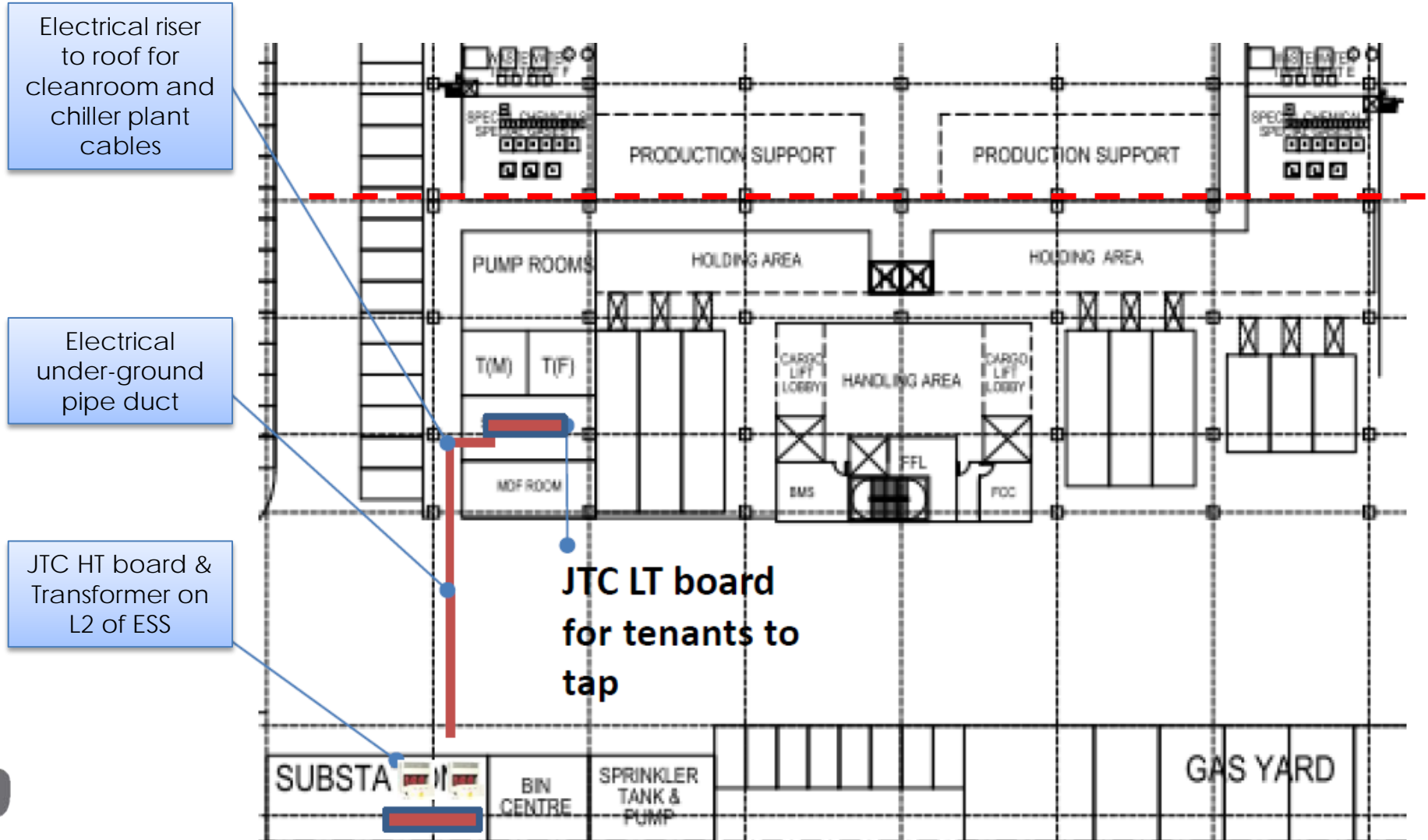
5.0m

Service Provider Capability



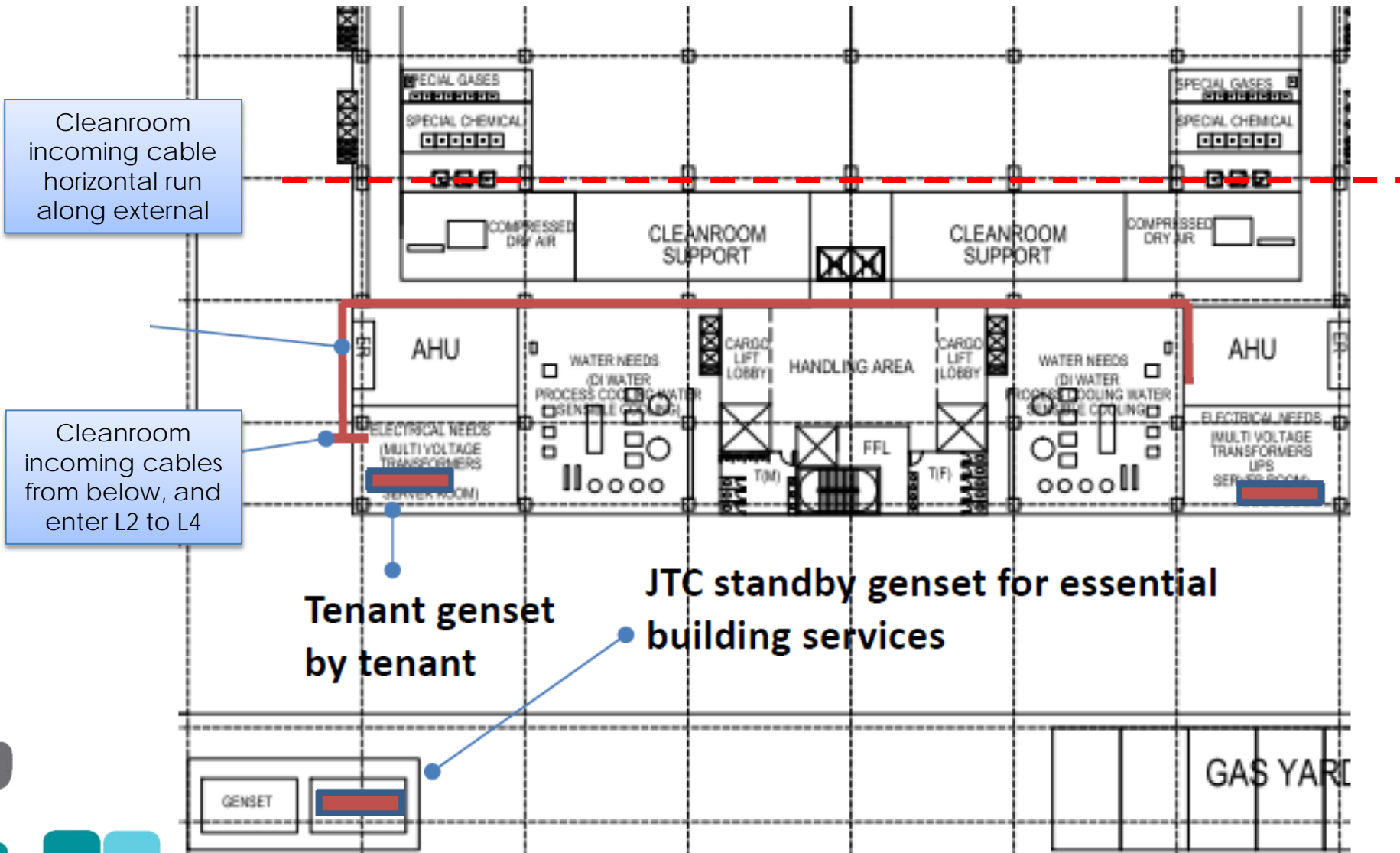
JTC nanoSpace @ Tampines

Electrical Network Routings



JTC nanoSpace @ Tampines

Electrical Network Routings



Integrated Value Chain Systems

An Industrial Developer's Perspective



Systems at Estate Level



Systems at Estate Level

- Understanding the estate level industry value-chain and manufacturing processes
- Translating requirements into infrastructure services and systems
- Sharing of two unique estate systems – Jurong Island and one-north



Jurong Island

An Integrated Petrochemical Ecosystem



Jurong Island

- Created from merger of 7 smaller islands
- Integrated world-class chemical hub comprising oil, petrochemical & specialty chemical industries
- One of the world's largest oil refining hubs & oil trading centres
- One of Asia's largest olefins production centre
- Home to more than 100 companies

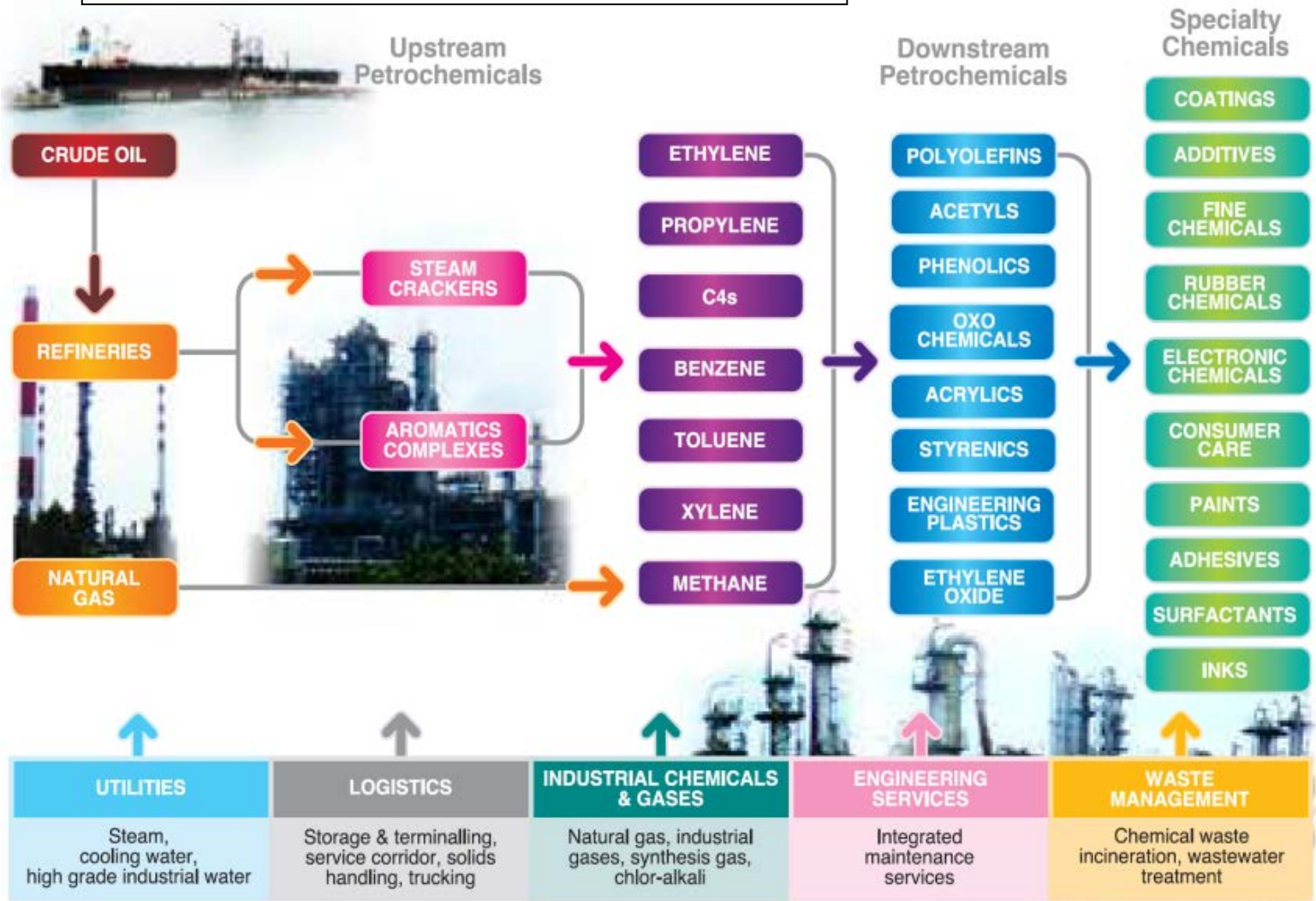
Jurong Island Petrochemical Manufacturing Value Chain

Synergy from cluster development

Concept of a vertically integrated structure

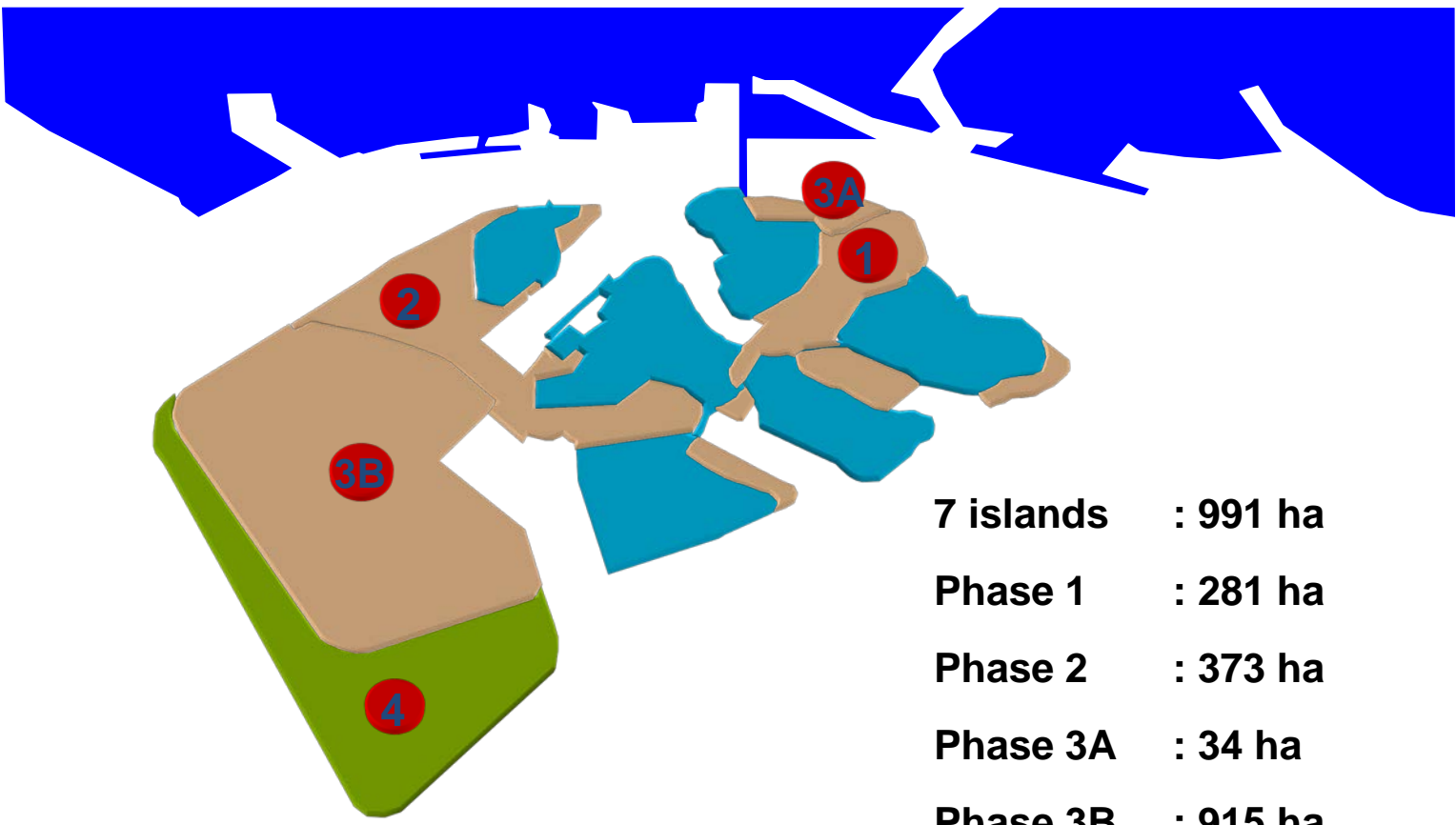
Network of pipelines interlinking companies

Access to feedstock & products



Jurong Island

Linking the value-chain – Create the Land



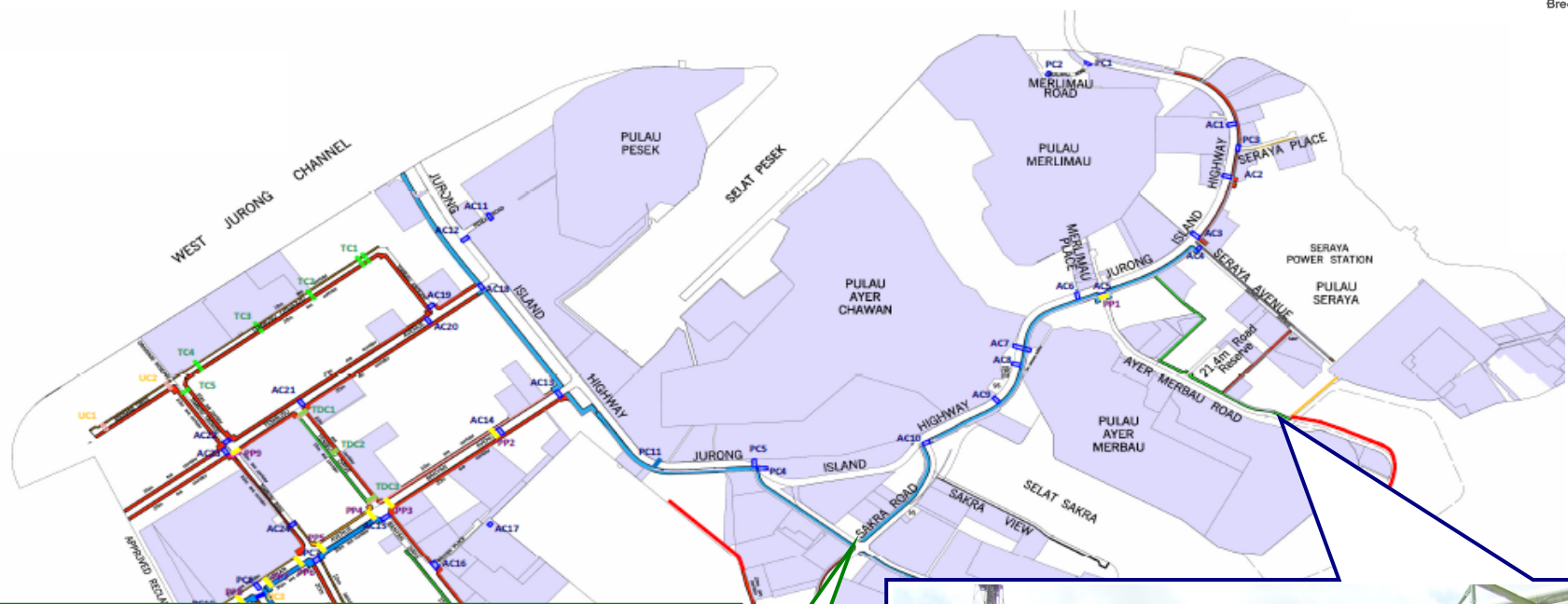
7 islands	: 991 ha
Phase 1	: 281 ha
Phase 2	: 373 ha
Phase 3A	: 34 ha
Phase 3B	: 915 ha
Phase 4	: 360 ha

 Existing islands
 Reclamation areas completed
 Completed in 2009

Total	: 2,954 ha
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Jurong Island

Linking the value-chain : Feedstock



<u>Capabilities</u>		<u>Services</u>	<u>Companies</u>
Utilities	➔	steam, cooling water & high grade industrial water	SembCorp Utilities, Keppel Energy, Power Seraya
Logistics	➔	storage & terminalling service corridor solids handling trucking	Vopak, Oiltanking, Universal, Helios Horizon Terminals SembCorp Utilities, Keppel Pipenet Katoen Natie Poh Tiong Choon, SH Cogent
Industrial chemicals & gases	➔	natural gas industrial gases synthesis gas chlor-alkali	PowerGas, SembGas, Gas Supply Air Products, SOXAL, IPG Linde, SembAP, SOXAL Chemical Industries Far East
Engineering services	➔	integrated maintenance services	Rotary Engineering, PEC
Waste management	➔	chemical waste incineration wastewater treatment	SembCorp Utilities, SembCorp Utilities, Keppel Integrated Engineering

Jurong Island

Linking the value-chain : Terminals & Storage

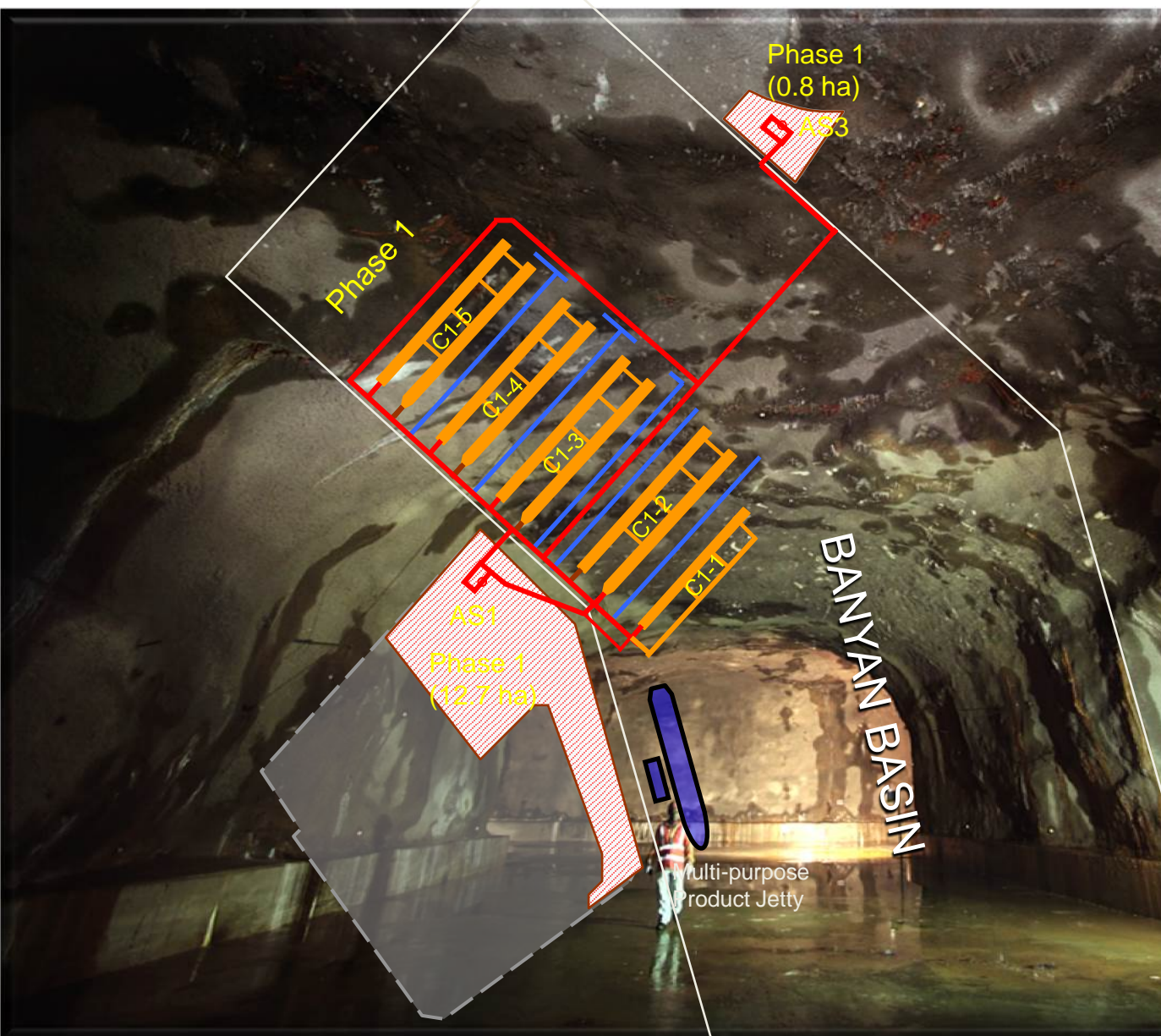


Storage Facilities of raw and finished products, e.g Vopak Terminals, Poh Tiong Choon Logistics, Oil tanking



Jurong Island

Linking the value-chain : Jurong Rock Caverns



Jurong Island

Building the Supporting Infrastructure



Causeway link between mainland and JI



*Marine facilities such as jetties, berths, slipways, and other loading and unloading facilities
Roads and drains*



Jl Checkpoint

Jurong Island

Building the Supporting Infrastructure



Amenity Facility - Sakra Oasis with Carparks

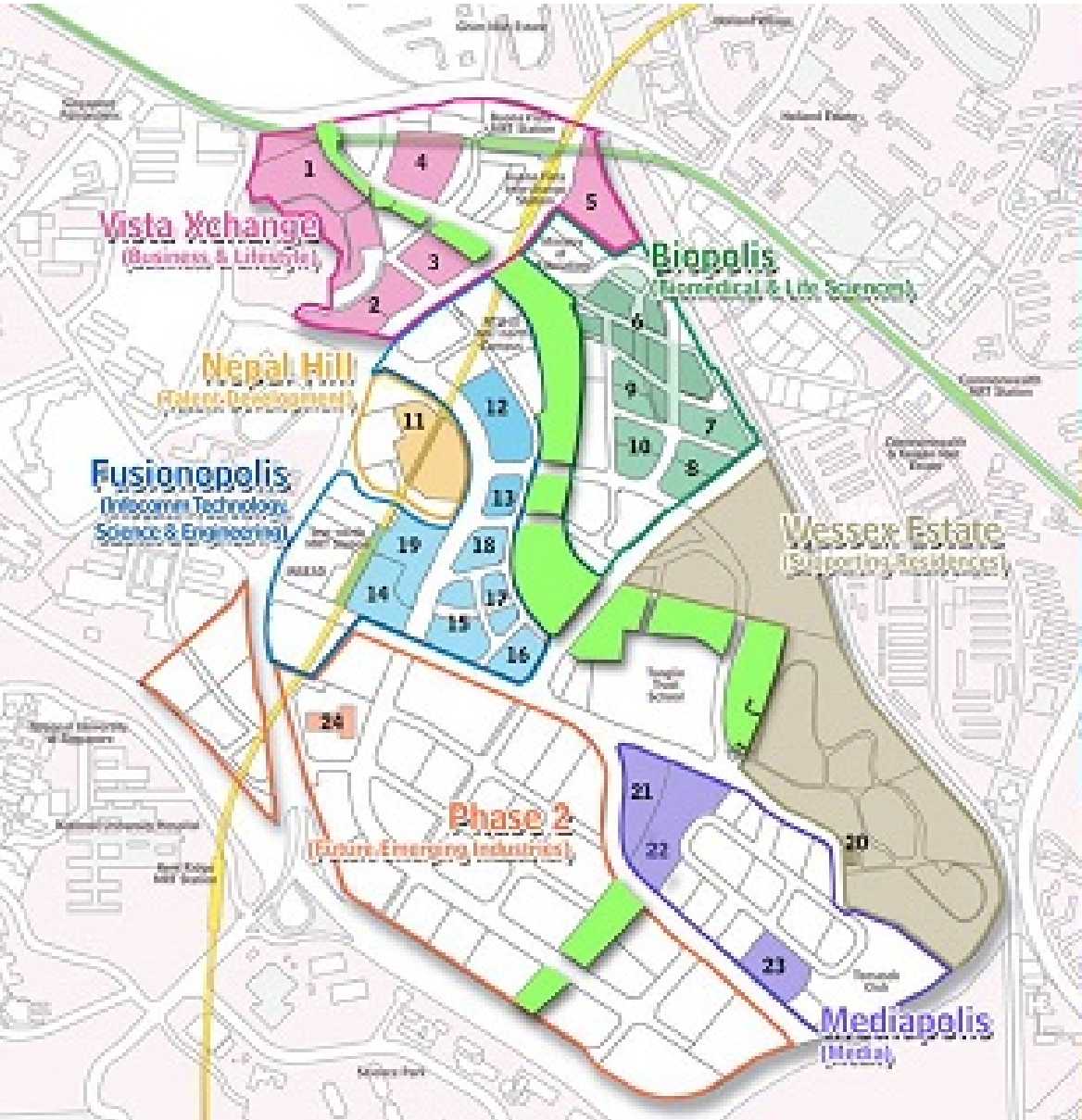


Waste treatment and sewer systems

electricity, water and telecommunications services



Fire fighting services, e.g Jurong Island Fire Station built by JTC, Banyan Fire Station recently completed by SCDF



Vista Xchange (Business & Lifestyle)	
1	Rochester 20
2	Rochester Park
3	The Rochester
4	The Star
5	Metropolis
BIOPOLIS (Biomedical & Life Sciences)	
6	Biopolis Phase 1 (Chronos, Helios, Nanos, Centros, Matrix, Proteas, Consens)
7	Biopolis Phase 2 (Neuro & Immuni)
8	Biopolis Phase 3 (Synapse & Amicus)
9	Biopolis Phase 4 (P&G Singapore Innovation Centre)
10	Biopolis Phase 5 (Nucleos)
NEPAL HILL (Talent Development)	
11	Unilever Four Acres Singapore
FUSIONOPOLIS (Infocomm Technology, Science & Engineering)	
12	one-north Residences
13	PIXEL
14	Fusionopolis Phase 1 (Connectis & Symbiosis)
15	Fusionopolis Phase 2A (Synthesis, Fluxis, Kinetic)
16	Fusionopolis Phase 2B (Salaris)
17	Fusionopolis Phase 3 (Nexus)
18	Fusionopolis Phase 4 (Sandcrawler)
19	Fusionopolis Phase 5
WESSEX ESTATE (Supporting Residences)	
20	Wessex Village Square
MEDIAPOLIS (Interactive Digital Media)	
21	Mediacorp
22	Event Park & Multi-Utility Hub
23	Infinite Studios
PHASE 2 (Future Emerging Industries)	
24	Launchpad @ BLK 71

one-north Creating the Biomedical Ecosystem



Biopolis -
1st group of 7 buildings that was planned and built with an **integrated District Cooling System & Pneumatic Waste Conveyance System** which was able to serve all the developments

one-north

Creating the Infocomm Ecosystem



Fusionopolis One – **largest steel building** project for JTC during its conception. Its unique design consists of 3 high-rise towers (Symbiosis 22 storeys, Connexis North 24 storeys and Connexis South 21 storeys) linked by sky bridges alongside an Experimental Theatre supported at six stories above ground perched above a single column support.



Fusionopolis Two – comprising 3 towers of total 103,635 sqm space, features Singapore's largest multi-storey R&D clean room facility and is designed with **stringent micro-vibration requirement of VC-E** at Tower C.

one-north

Creating the Media Ecosystem



Mediapolis –

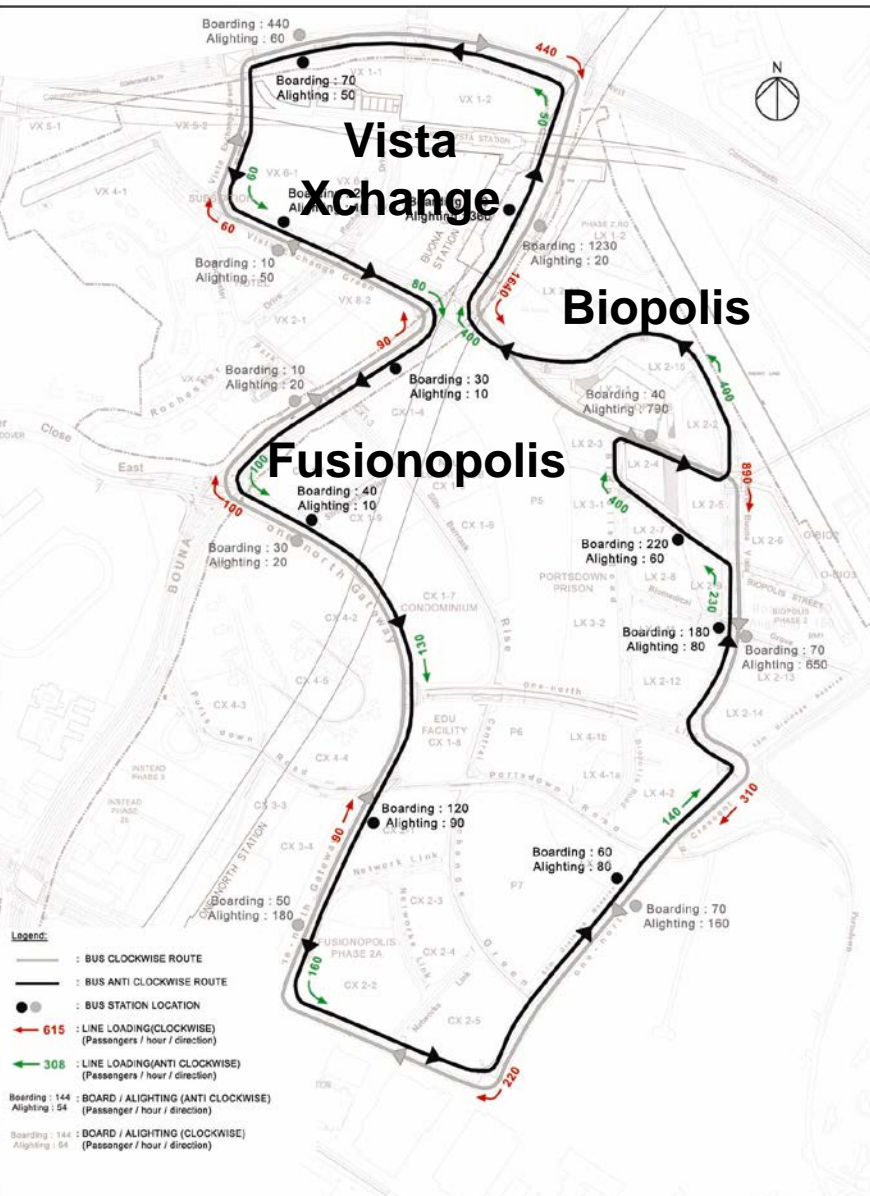
A 19 ha land development of high-quality media content, as well as R&D in interactive digital media, supported by a **strong and robust IT infrastructure** and a synergistic business environment.

one-north

People connectivity

- Connection and integration of public and private transportation
- Personal Mobile Device

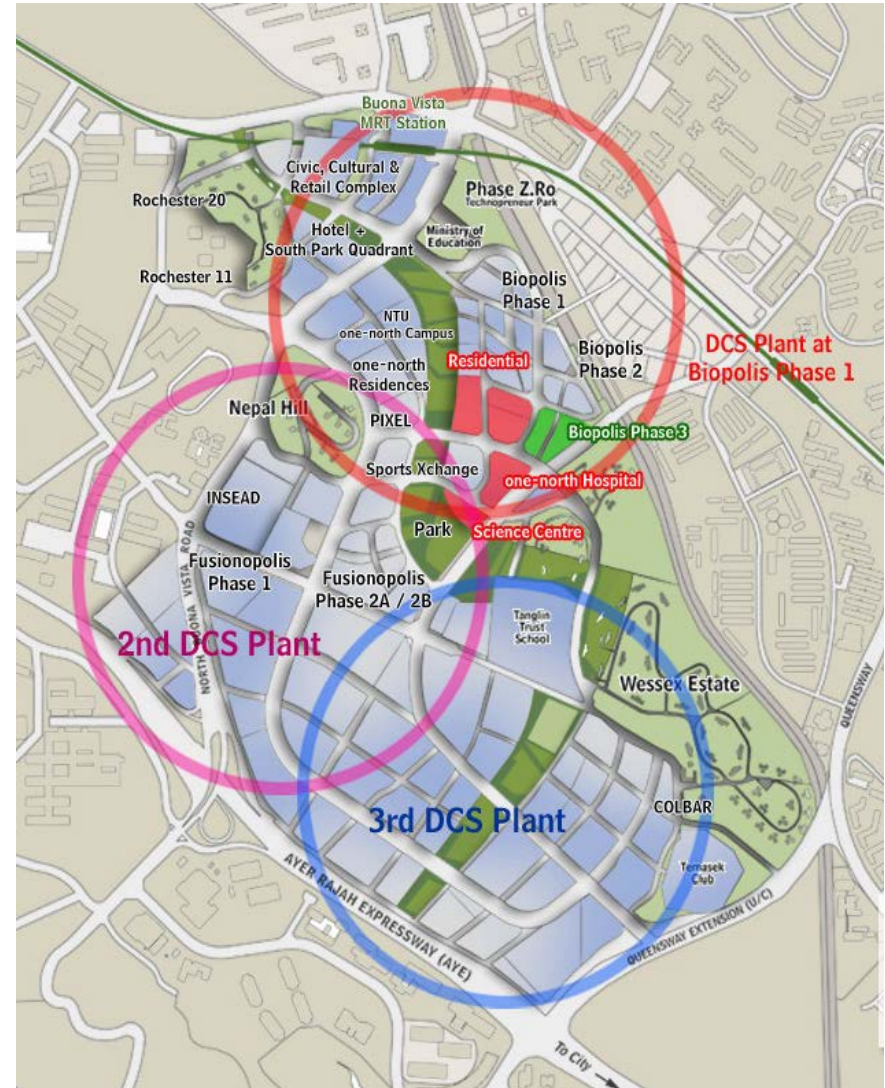




- Pre-laid uPVC Pipes for Telecom Services
- To provide a plug-and-play network
- Reduce road digging and provide a common backbone infrastructure

one-north District Cooling System

- Integrated District Cooling System (DCS) of 40,000 RT capacity in Biopolis to supply chilled water to all the developments within the 1st phase. First large-scale DCS System in Singapore
- 2nd DCS plant housed in Mediapolis's Multi-Utility Hub.



one-north Placemaking and Community Building



one-north Run at
Mediapolis



**Building Communities and
Encouraging Collaboration**

Food Truck Picnic at
Fusionopolis One



Beer & Music Night at
Fusionopolis Two



one-north Placemaking and Community Building

FREE SNACKS & DRINKS

TIME: 7.30PM - 9.00PM

FREE Movie Screening @ one-north Park

Science Jubilee one-north

BROUGHT TO YOU BY jtc Breaking New Ground

FANTASTIC FRIDAYS @ one-north

PRESENTS

BEER AND MUSIC NIGHT

20 NOV 6.00 pm till late

FREE BEER & SNACKS

Stay tuned for the next Fantastic Fridays activity at one-north happening every fortnight!

Download the one-north app for updates on Fantastic Fridays and more!

FANTASTIC FRIDAYS @ one-north

EVERYONE LOVES A PICNIC WITH Kerbside

4 DEC 11AM TO 2PM

FREE ICE CREAM

FUSIONOPOLIS ONE

1 Everyone Day happens 19822 just in the spirit of fun!

Delight your taste buds with the fabulous flavours of Kerbside (Icecream Parlay) and Coffee Stand as their food trucks roll into Fusionopolis One, United in the public spirit, letting us you savour speciality like Coffee Stand's espresso churros and Alan Turkey Smart appetizers, and satisfy your palate (inspired by the movie Chef) and traffic, this. It's one more reason you'll be saying "Yay!"

Stay tuned for the next Fantastic Fridays activity at one-north happening every fortnight!

FANTASTIC FRIDAYS @ one-north

Christmas Jazz Special

18 DEC 5.30pm to 7.30pm

LIVE JAZZ MUSIC

FREE Dinner Box & Drinks

Stay tuned for more Fantastic Fridays at one-north every fortnight!

FANTASTIC FRIDAYS @ one-north

PRESENTS

BEER, BITES & MUSIC @ BODAGIOUS

8 JAN 6.00 pm till late

FREE BEER & BAR BITES

FREE SPECIAL DINNER SET

Stay tuned for more Fantastic Fridays at one-north every fortnight!

FANTASTIC FRIDAYS @ one-north

FREE Admission! OPEN TO PUBLIC!

FREE Popcorn, Candy Floss & Drinks!

22 JAN 7.30pm

Movie Night

JURASSIC WORLD

FREE OUTDOOR MOVIE SCREENING

Join us for our 2nd edition of Movie Night @ one-north, where we will be screening the action-packed blockbuster Jurassic World, starring Chris Pratt! Free seating will be provided so bring your colleagues, friends and family down for an evening of blood pumping action!

Download the one-north app for updates on Fantastic Fridays and more!

Available on the App Store | GET IT ON Google play

Hashtag #onenorth



Thank You