Central Station Main Works Project

Construction Carbon & Energy Management Plan

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Construction Carbon & Energy Plan

Project name	Central Station Main Works
Client	Sydney Metro City & South West – Sydney Metro
Client contract number	SMC
Laing O'Rourke contract number	K51

Revision history

Rev	Date	Description	Reviewed	INT/Date	Authorised
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Management reviews

Review Date	Reviewed By	Details	Initial	Date
18.04.18	Jeremy Matterson		JWM	

Central Station Main Works Project
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LAING O'ROURKE

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1. Introduction

1.1 Purpose and Application

This Construction Carbon & Energy Plan (CCEP) specifies the sustainability requirements that the Project must meet in order to enhance its construction energy and carbon performance, a description of operational carbon and energy initiatives achieved through design is contained in the Sustainability Management Plan

Consistent with the Projects Sustainability Policy, the intended outcomes of the CCEP concerning sustainability include:

- enhancement of sustainability performance in relation to energy and carbon emissions
- fulfilment of compliance obligations in relation to energy and carbon emissions; and,
- achievement of sustainability objectives in relation to energy and carbon emissions.

The CCEP enables the Sydney Metro City & South West - Central Station Main Works Project (CSM) to manage its Construction Phase Energy and Carbon (emissions) in a systematic manner; it is applicable to the Project, and all of the Project's activities, products and services that the Project determines it can control or influence considering a life cycle perspective.

This CCEP is a sub plan of the Sustainability Management Plan SMCSWSMC-LOR-SMC-SU-PLN-000001 (SMP) and shall be read in conjunction with it.

1.2 Sydney Metro City & South West – CSM

The Sydney Metro City & Southwest project is the second stage of the Sydney Metro program, extending from Chatswood, under Sydney Harbour, through the central business district (CBD) and beyond to Bankstown. It includes seven new metro stations and the upgrade of all eleven existing stations between Sydenham and Bankstown. The Sydney Metro City & South West project is due to open in 2024 with the capacity to run a metro train every two minutes each way through the centre of Sydney.

The CSM project is a core component of the Sydney Metro City & Southwest, the CSM works will enhance and support Central Station as a gateway to the city and the NSW transport network delivering a multi-modal interchange with links between Sydney Metro, the existing suburban and intercity rail network, and light Rail.

The CSM Works comprise Metro Station Works, the Central Station Works, and the Central Walk Works the full scope of which are described in the Scope of Works and Technical Criteria (SWTC).

1.3 Sydney Metro City & Southwest Sustainability Strategy

Sydney Metro is Australia's largest public transport project. Sydney Metro will deliver 31 metro stations and more than 66 kilometres of new metro rail, that intends to increase the capacity of Sydney's passenger rail system by 60% by 2024.

The Sydney Metro City & Southwest Sustainability Strategy 2017-2024 seeks to define sustainability, and as such defines that

"For Sydney metro 'sustainability' means optimising environmental and social outcomes, transport service quality, and cost effectiveness."

Within the context of CSM, this Plan provides the governance framework to assist the delivery of the Sydney Metro Sustainability Strategy as it applies to energy efficiency and associated CO2 emissions.

The related Sydney Metro Sustainability Strategy objectives are outlined below,

Strategic Theme	Strategy Objectives
Governance;	Demonstrate leadership by embedding sustainability objectives into decision-making. Be accountable and report publicly on performance Demonstrate a high level of performance against objectives and appropriate benchmarks.
Carbon and Energy Management;	Improve the shift toward lower carbon transport. Reduce energy use and carbon emissions during operations. Reduce energy use and carbon emissions during construction. Support innovative and cost effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement.

Table 1. Sydney Metro Sustainability Strategy: Objectives related to CCEP

1.4 Update and Ongoing Development

The CCEP will be updated with the SMP in accordance with the requirements of the contract,

(Management Requirements – Project Administration – Central Station Main Works (MR-PA) Clause 2.4) i.e. as a minimum every 6 months

Updates and development of the CCEP will ensure it remains consistent with Project priorities, risk management, client requirements, and Project objectives, taking into account:

- The status and progress of activities
- Changes in the design, delivery and operations processes and conditions
- Lessons learnt during delivery and operations
- Changes in other related Project Plans
- Requirements and matters not covered by the existing Project Plans
- Changes to Plans resulting from any comments from the Principals Representative

2. Planning

2.1 Sustainability Policy

Achieving sustainability is an integral part of Laing O'Rourke's corporate vision. The Project Sustainability Policy is found in Appendix A of the Sustainability Management Plan.

2.2 Objectives & Targets

Strategic Theme	CSM Targets With construction phase component
Governance	**IS Rating**: • achieve a Leading "Design" rating (score of at least 75, with a target of 79) • achieve a Leading "As Built" rating (score of at least 75, with a target of 79) **Green Star** • achieve a GSDABRT 'Design Review' rating of at least 5 stars for the design of the Works • achieve a GSDABRT 'As Built' rating of at least 5 stars for the delivery of the Works

Carbon and Energy Management	• For those activities where ISCA IS Ratings are required achieve or exceed the following ISCA IS Rating Scheme Version 1.2 credit requirements:
	• Level 2 for credit Ene-1 'Energy and carbon monitoring and reduction target' demonstrating a greenhouse gas emissions reduction of 20 % below a base case footprint; and
	• Level 1 credit Ene-2 'Use of renewable energy' to fully investigate opportunities for use of renewable energy.
	• Achieve at least a 20 % reduction in greenhouse gas emissions associated with the Contractors Activities, measured against the CERT Base Case
	• Use a minimum 5% bio diesel mix for all diesel powered plant and equipment and a minimum 10% blended ethanol mix for all petrol powered plant and equipment wherever possible
	• As a minimum, 25% of the total electricity being used is being offset through either one or a combination of the following:
	  • purchase of Australian Carbon Offset Credits; and
	  • purchase of renewable energy from an Accredited Renewable Energy Supplier
	• Ensure that refrigerants and fire suppression systems within temporary site facilities and permanent infrastructure have zero ozone depletion potential and a low or zero global warming potential.
	• Ensure that all vehicles, plant and equipment, are:
	• Selected and operated for optimum energy efficiency;
	• Not left idling when not in use;
	• Fitted with catalytic converters, diesel particulate filters or equivalent devices where reasonable and feasible; and
	• Well maintained and serviced in accordance with relevant equipment maintenance documentation to reduce emissions due to poor engine performance.
	• Ensure that, the energy efficiency of all new plug-in electrical equipment within any site facilities meets the minimum standards outlined in the NSW Government Resource Efficiency Policy 2014 requirement E3 "Minimum standards for new electrical appliances and equipment"
	• Identify and implement opportunities for using onsite sources of renewable energy during the CSM Contractor's Activities.
	• Develop and Implement a green travel plan to promote cultural shift for commuting to encourage car-pooling, use of public transport and cycling. The travel plan will be developed through a committee by employing the following actions;

	○ Develop a committee and work to define the purpose, scope and key actions & outcomes of the plan; ○ Reviewing workplace accessibility; ○ Surveying employees (and visitors/ clients if appropriate) about how they travel to and from the project office and site; ○ Consulting internal stakeholders about the plan and potential actions; ○ Reviewing good practice in managing work-related travel, including travel plans prepared by other workplaces; ○ Production of a green travel plan; ○ It is expected the green travel will be ready for implementation within 6 months of contract execution.

Table 2. CSM Sustainability Targets for Carbon and Energy Management

2.3 Legal & Other Obligations

This CCEP has been informed by current policy frameworks at both Federal and State level. The Australian Government has committed to reducing Australia's Greenhouse Gas (GHG) emissions by 60% on 2000 levels by 2050, with the intervening short-term targets and trajectory to be determined based upon international agreements during upcoming climate change negotiations. Central to the Australian Government's climate change policy is the Clean Energy Act. The NSW State Government has prepared a Greenhouse Action Plan to meet its commitments outlined above.

Legislation that is directly applicable to the Project includes:

- National Greenhouse and Energy Reporting Act 2007 (NGER Act)
- Renewable Energy (Electricity) RE Act 2000
- National Construction Code - Section J (Energy Efficiency)

2.4 Relevant guidelines

The following guidelines are relevant to this Carbon and Energy Management Plan:

- AS ISO 14064-2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements (Australian Modification)
- National Greenhouse and Energy Reporting (Measurement) Technical Guidelines - Department of Climate Change and Energy Efficiency- 2012
- Energy Efficiency Opportunities Industry Guidelines – Department of Resources, Energy and Tourism – 2011
- Energy Savings Measurement Guide – Department of Resources, Energy and Tourism – 2011
- National Carbon Offset Standard (NCOS) - Department of Industry, Innovation,
- Climate Change, Science, Research and Tertiary Education
- IS Rating Tool – Infrastructure Sustainability Council of Australia
- World Resources Institute/World Business Council for Sustainable Development's Greenhouse gas protocol corporate accounting and reporting standard.

2.5 Project Roles, Responsibilities and Authorities

All personnel have a role in ensuring the strategies and procedures set out in this plan are implemented. The key roles and their responsibilities critical to the management of Carbon and Energy Management are outlined in Table 3 below.

Role	Responsibilities For Carbon and Energy Management
Project Director	Ensure adequate resources to fulfil sustainability commitments. Managing the delivery of the CMS Works including overseeing implementation of Carbon & Energy Management processes, initiatives, and procedures
Sustainability Manager	Overall responsibility and authority for; Ensuring that the carbon & energy management conforms to the requirements of this Construction CEMP Reporting on the performance of the project with regards to energy and carbon to top management and interested parties
Sustainability Engineer	Monitor and report on carbon and energy performance construction Development of tools for the estimation and onward tracking of scope 1, 2, and 3 carbon emissions resulting from CSM Activities.
Design Manager	For construction delivery: Smart design and consideration of efficient construction methodology which facilities a lean construction methodology and early 'off hire' or deletion of construction plant and equipment- all of which can supports energy efficiency.
ESD Consultant	Facilitate innovation leading to carbon and energy efficiency outcomes in design and delivery strategies. Ensure relevant energy efficiency initiatives are addressed in design development
DJV Sustainability Coordinator	Facilitate innovation of Energy efficiency and carbon management in design and delivery strategies. Ensure relevant Energy and Carbon requirements are addressed in design development
Commercial /Procurement Managers	Procure efficient temporary electric design for construction and consider introduction of renewable technology into temporary site accommodation and construction equipment, lighting, efficient use of transformers and timing switches for charging stations.
Construction Managers & Project Engineer	Facilitation in the development of construction plant and equipment inventory Consider impact on energy and fuel usage resulting from construction methodology – identify how methodology or program acceleration opportunities and work with sustainability team to capture any associated energy usage savings.
Superintendent	Drive site based behavioural aspects of energy saving e.g. non idling etc.

Table 3 Roles & Responsibilities for Carbon & Energy Management.

3. Emission & Consumption Estimates

3.1 Estimate of fuel & Energy consumption and on-site renewable energy generation for the delivery activities

As construction methodology is developed, the table below will be updated to reflect the estimate of fuel and electricity usage associated with construction delivery.

Construction Area	Fuel L			Electricity KwH		
	standard	E10	Bio diesel	Standard Grid	Green power	Renewables
Central Walk						
Metro Works						
Central Station Works						

Table 4 Includes estimates of fuel & Energy

3.2 Project Greenhouse Gas (GHG) Emissions by Emission Scope

In support of meeting the CSM greenhouse gas reduction targets in Table 4, Estimates for energy use (in Contractors Activities i.e. permanent and temporary works) and GHG emissions will be determined for the Project. The estimated footprint will be based on the reference design, across the infrastructure lifecycle using a carbon footprint assessment undertaken in accordance with ISO 14064-1, ISO14064-2, and ISO14064-3 that incorporates direct and indirect emissions.

Greenhouse gas assessments will also be undertaken using TfNSW's Carbon Estimate and Reporting Tool (CERT).

An initial scope 1, 2 &3 Carbon footprint assessment was developed in accordance with ISO 14064-1, ISO14064-2, and ISO14064-3 to incorporate direct and indirect emissions associated with:

- On site Electricity and fuel consumption;
- On-site process emissions;
- Transport of materials (Deliveries) – TBC;
- Disposal of waste/excavation materials;
- Estimates of travel (commuting and project associate travel- e.g. flights etc.);
- Embodied carbon emissions – to be further detailed in LCA work in the materials management plan

The Initial GHG assessment is included in appendix A.

4. Carbon and Energy Strategy and Initiatives for Delivery Phase Activities

The CMS Works carbon and energy management strategy has been developed in accordance with carbon management principles.

The main components of this strategy framework are summarised below and described in further detail in subsequent sections of the plan.

Measurement: Understanding the carbon and energy profile will help identify significant energy use and carbon emissions for management and reduction over the project life. The carbon profile estimates presented in Section 3 above have been used to identify savings opportunities. This profile will be improved during delivery.
Set targets/objectives: Once the carbon and energy profiles are understood, ongoing targets are set to manage carbon emissions and energy usage. Objectives have been developed by assessing the carbon and energy risks to the project.
Carbon and energy reduction strategy: The carbon reduction strategy outlines a clear pathway to managing and reducing carbon emissions and energy use throughout delivery. It follows the management hierarchy outlined in the Sydney Metro City & Southwest sustainability strategy.
Monitoring and review: Progress against the objectives and targets, as well as the effectiveness of strategies and initiatives to meet those objectives and targets, will be reviewed and reported through monthly dashboards and during the annual sustainability management review.

4.1 Green Travel Plan

A green travel plan will be developed and implemented to promote cultural shift for commuting to encourage car-pooling, use of public transport and cycling. The travel plan will be developed through a committee by employing the following actions:

- Develop a committee and work to define the purpose, scope and key actions & outcomes of the plan;
- Reviewing workplace accessibility;
- Surveying employees (and visitors/ clients if appropriate) about how they travel to and from the project office and site;
- Consulting internal stakeholders about the plan and potential actions;
- Reviewing good practice in managing work-related travel, including travel plans prepared by other workplaces;
- Production of a green travel plan to be circulated throughout the project team.

It is expected an initial green travel plan will be ready for distribution within 6 months of contract execution, this will be updated over course of the project, taking account of office locations and the mobilisation of contractors to the Central Station Site (Sydney Yard)

4.2 Avoidance Initiatives

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Minimise the absolute quantities of steel and concrete used on the project through design refinements and optimisation.	Materials	High	Low	High	Lead engineer / design manager
Optimise concrete mix for low embodied energy /carbon emissions	Materials	High	Low	High	Lead engineer / design manager
Develop and implement a sustainable procurement strategy to drive purchase of low impact materials	Materials	High	Medium	Medium	Procurement manager
For significant proposed changes of material type at a system wide level an LCA will be carried out between the concept and proposed detailed design material types and quantities to ensure that the material is low impact and consistent with meeting the carbon and energy objectives and targets .	Materials	High	Medium	High	Design manager
Training and awareness to turn off equipment and reduce idling of plant and equipment in construction	Construction fuel use	Medium	Low	Medium	Site supervisor
Review and optimise site processes to reduce energy consumption in construction activities, including any water treatment plant, lighting, and vehicle and plant movement	Construction fuel/energy use	Medium	Low	Medium	Sustainability manager
Recruit contractors and staff who live close to the site to reduce transport related costs. (local industry and workforce participation)	Transport	Unknown	Low	Medium	Human resources manager

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Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Identify local recycling facilities, landfills, and construction materials suppliers to reduce emissions associated with materials transport	Transport	Unknown	Low	Medium	Procurement manager
Prioritise suppliers/contractors who provide energy efficient and low emissions services through contractual incentives: including site vehicles which are well maintained and serviced in accordance with relevant equipment maintenance	Construction fuel use/transport/ materials	High	Medium	Medium	Procurement manager
Documentation to reduce emissions due to poor engine performance.	Construction fuel use	Medium	Low	Medium	Site supervisor
Identify landfills with gas capture and compost facilities for managing waste	Waste	High	Medium	Medium	Procurement manager
Daylight and motion sensors on temporary lighting	Electricity use	Medium	Medium	Medium	Site supervisor
High performance thermal insulation in all walls, glazing, ceilings and floors to optimise thermal performance	Electricity use	Medium	Medium	Medium	Lead engineer / design manager

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Avoid import or export of fill on site.	Transport	High	Low	High	Design manager
Induction to include carbon and energy protocols and awareness training to highlight the requirements and actions outlined in this plan.	All	Unknown	Low	High	Sustainability manager

4.3 Initiatives to Improve Efficiency

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Identify and maximise efficiencies in construction equipment	Construction fuel use	High	Medium	Medium	Construction manager
Purchase fuel efficient fleet for light vehicles	Construction fuel use/transport	High	Low	High	Procurement manager
Use energy efficient lighting in temporary facilities, site lighting and on cranes. This includes the use of low voltage LEDs (i.e. Smart safety light).	Electricity use	High	Low	High	Construction manager
Variable speed drive, high efficiency fans and pumps	Electricity use	Medium	Medium	Medium	Design/ Procurement manager

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
HVAC equipment to use air conditioning refrigerants with low or zero global warming potential	Materials	Low	Medium	Low	Design/ Procurement manager

4.4 Initiatives to Source 'Low Carbon'

Initiatives	Focus Area	Reduction Potential	Potential Cost	Priority	Responsibility
Identify Opportunities For Implementation Of Photovoltaic Systems During Delivery	Electricity Use	Low	Medium	Medium	Procurement / Construction Manager

4.5 Offset Initiatives

Initiatives	Focus area	Reduction potential	Potential cost	Priority	Responsibility
Investigate the feasibility of procuring local carbon credits to offset carbon emissions from energy consumption	All	High	High	Low	Commercial manager

4.6 Carbon and Energy Opportunities for Delivery Activities

In line with project requirements and the Project Sustainability Management Plan Section 4.10, the Project will maintain an initiatives register of opportunities, which will be identified for further investigation and refinement during the project development phase. This will include all delivery stage carbon and energy opportunities.

The Opportunities Register will be developed such that initiatives can be added to over the course of the project but in particular those significant issues that have the potential to benefit the project. A decision making process will be in place to determine and provide evidence of which opportunities were taken forward to implementation and which were abandoned.

The Project will ensure that decision making in relation to significant issues will be characterised by:

- A consideration of options including business-as-usual and other proven approaches taken in comparable situations;
- An evaluation of options that considers environmental, social and economic aspects through multi-criteria analysis or other scored means;
- An evaluation of options based on the useful forecast life of the infrastructure asset (i.e. 100-year design life);
- The opportunity is consistent with the tender offer.

Generally, when determining what opportunities to include, the following question applies:

- Will undertaking the opportunity reduce capital expenditure and comply with applicable requirements?

Where the answer is 'yes', the opportunity will typically be included automatically. Other opportunities that may require additional expenditure or modification/relaxation of applicable requirements are considered for inclusion based on the following questions.

- Will undertaking the opportunity reduce whole-of-life cost or impacts?
- Will undertaking the opportunity attend to a material risk or opportunity for the Project, the client or other stakeholders?

Once decision making in relation to opportunities has occurred, the opportunities' status will be updated in the Opportunity Register as either 'Included' or 'Abandoned'. If the answers to the relevant questions are unclear, the opportunity status will remain 'Under consideration' and further information will be sought.

5. Monitoring & Review

5.1 Monitoring

The Project team shall monitor, measure, analyse, and evaluate its energy and carbon performance and prepare carbon footprint assessments (inclusive of Scope 1, 2 and 3 emissions) at various stages of construction. The Project shall undertake weekly sustainability inspections during construction.

Appropriate records will be retained to assist with monthly reporting and the preparation of carbon footprint (greenhouse gas) assessments

Table 5 Indicates records which will be used to generate project Greenhouse Gas Assessments (but not limited to) that

Data Source	Data Type	Emission scope
Onsite Renewable energy generation	Meters	Scope 1 (saving)
Energy use consumption (onsite use)	Bills and subcontractor fuel reports	Scope 1 & 2
Plant and equipment used onsite Fuel	Bills and subcontractor fuel reports (inventory also used in energy modelling where fuel use not available)	Scope 1
Waste / Spoil disposal	Waste dockets	Scope 3
Water consumption	Bills or dockets from water truck co	Scope 3
Business travel	Records from travel booking system- flights	Scope 3
Workforce commutes	Use of Pegasus system for postcode data and numbers on site	Scope 3
Deliveries and waste removal	Use of Voyager system (Site Logistics Plan SMCSWSMC-LOR-SMC-CM-PLN-000002) to generate CO2 emissions for all domestic delivery's and offsite movements. Estimate of sea freight emission for offshore.	Scope 2

Table 5. Records which will be used to generate project Greenhouse Gas Assessments

5.2 Analysis

Analysis of data to identify trends and further opportunities for reduction will be undertaken through formal reviews as part of ongoing governance. Reviews will include the following:

- Assessment of progress against targets;
- Review of induction and training requirements;
- Effectiveness of action implementation;
- Consideration of monitoring data to identify any significant changes to carbon/ energy profile;
- Compliance with legal and other requirements; and
- Identification of new carbon and energy reduction opportunities.

5.3 Reporting

The Project shall evaluate its energy and carbon management performance within the scope of the Green House Gas assessment of the Works Temporary Works and the CSM Contractors Activities. The Project shall communicate relevant energy and carbon performance information both internally and externally, as identified in its communication processes and as required by its compliance obligations. The Project shall evaluate and document compliance within Project the following reports and take action if needed;

- Inventory of non-road diesel powered vehicles using TfNSW's Air Emission Data Collection Workbook 9TP-FT-439.
- Greenhouse gas inventory report using the TfNSW's Carbon Estimate and Reporting Tool (CERT)
- Monthly Project Reports
- Monthly Sustainability Data Report (MSDR)
- Quarterly Sustainability Report (QSR)
- Annual Sustainability Report (ASR)

5.3.1 CERT Reporting

In support of the target to achieve at least a 20 % reduction in greenhouse gas emissions (demonstrated using the CERT) this will be measured against the CERT Base Case generated using the CERT, at Design Stage 1, Design Stage 3, annually thereafter and again prior to the Date of Construction Completion of the last Portion to reach Construction Completion. CERT reports will be provided to the Principal's Representative for review.

5.3.2 National Greenhouse and Energy Reporting Scheme (NGERS)

The operational control will be determined by NGER legislation. Notwithstanding this, Laing O'Rourke will collect Emissions and Energy data in the same manner as required by the NGER legislation and this will be available to Transport for New South Wales on request.

Emissions and energy data will be provided to the TfNSW representative at such times as may be agreed.

5.4 Audit

The Project shall be audited at planned intervals to provide information on whether the Project:

- is meeting its compliance obligations;
- conforms to the CCEP; and,
- determine if the CCEP is effectively implemented and maintained.

The Project shall establish, implement, and maintain an audit programme for the Project, including the frequency, methods, responsibilities, planning requirements and reporting of its audits. Sustainability audits will be conducted at least quarterly with at least one per year being 'independent'.

The scope of the audits may vary but it is important that the most material issues are audited regularly during the rating period. Sustainability audits should cover the most material environmental, social, and economic issues. 'Regularly' needs to be described and justified for each project. The audit reports must demonstrate that these requirements have been fulfilled.

If required under the IS Rating Ene-1 the Sustainability Manager shall arrange for the final design CSM energy model (including estimates for construction delivery) to be audited by a suitably qualified person.*(A suitably qualified person for the purposes of the Ene1 credit is someone who has a formal qualification and a minimum of five years' experience in energy or GHG management. Being registered on the NGERS Register of GHG and Energy Auditors meets this requirement (without needing to supply evidence of experience).*

5.5 Non-Conformity and Corrective Actions

When a nonconformity occurs, including in relation to materials, the Project shall:

- react to the nonconformity and, as applicable:
  I. take action to control and correct it;
  II. deal with the consequences, including mitigating adverse sustainability impacts;
- evaluate the need for action to eliminate the causes of the nonconformity, in order that it does not recur or occur elsewhere, by:
  I. reviewing the nonconformity;
  II. determining the causes of the nonconformity;
  III. determining if similar nonconformities exist, or could potentially occur;
- implement any action needed;
- review the effectiveness of any corrective action taken; and,
- make changes to the ECMP, if necessary.

Corrective actions shall be appropriate to the significance of the effects of the nonconformities encountered, including the sustainability outcomes(s).

The Project shall retain documented information as evidence of:

- the nature of the nonconformities and any subsequent actions taken; and,
- the results of any corrective action

5.6 Continual Improvement & Management Review

The review and improvement process for the sustainability management system will be based on those set out in Section 10 of the CMS Quality Management Plan.

The Project Management Team will check the status and adequacy of this plan and its sub plans to ensure that it meets current Sydney Metro, Laing O'Rourke and project requirements (such as those established in the compliance matrix in Appendix F

The Plan will be reviewed during the course of the contract when the following situations arise:

- Client recommendations for changes (particularly following initial review);
- Changes to the Company's standard system; and
- Opportunities for improvement or deficiencies in the project system are identified.

Project Management shall review the implementation of the SMP at Project level, at planned intervals (at least annually), to ensure its continuing suitability, adequacy and effectiveness. Reviews will be performed by the Sustainability Team. Where practicable the management reviews shall incorporate community participation (e.g. record of minutes from community meetings being input to management review).

The Project shall retain documented information as evidence of the results of management reviews.

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Appendix A – Construction Stage Carbon Footprint Estimate

Contractors Activities - Plant and Machinery (Scope 1)	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Diesel Use	4,862	kL		1. Plant & machinery emissions based on diesel consumption per hour for programed plant items; 2. Plant & machine days estimated from construction program; 3. Plant & machine usage diversity ranges from 0.3 - 0.8 depending on plant/machine type; 4. 5% Biodiesel for all diesel plant used on site; 5. 2.3 Tonnes (GHGe) per cubic metre for all excavation.
	187,680	GJ	13,850.8	
Biodiesel Substitute (5%)	243	kL		
	-	GJ		
Diesel Use (total)	4,862	kL	13,850.8	
	187,680	GJ		
Petrol	0.35	kL		
	11.61	GJ	0.7	
Truck movement related to Excavation	467	kL		
	18,040	GJ	13,349.8	
Total Diesel	**5,330**	**kL**	**27,200.6**	
Total Petrol	**0.35**	**kL**	**0.7**	
Estimated Scope 1 Emissions	**205,731.68**	**GJ**	**27,201.3**	

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Contractors Activities - Electricity Consumption Site Wide Plant + Offices (Scope 2)	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Site wide plant	26,769,600	**kWh**	25,698.8	1. Site wide plant includes: lighting, compound power, small tools, medium plant and large plant (tower cranes & hoists), peak consumption 1300kW, 286wks, 12hrs/day;
Off-site yard	2,059,200	**kWh**	1,976.8	2. Off-site yard includes: accommodation for staff and labour for duration of project, peak consumption 100kW, 286wks, 12hrs/day;
DJV office	2,347,488	**kWh**	2,253.6	3. DJV office includes: accommodation for staff for duration of project, peak consumption 114kW, 286wks, 12hrs/day.
Estimated Scope 2 Emissions	**31,176,288**	**kWh**	**29,929.2**	

Contractors Activities - Staff travel (Scope 3)	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Staff travelling by light vehicle (Petrol)	569	kL/yr	1,311.3	
Staff travelling by public transportation			2,166.0	
Total Fuel	**569**	**kL/yr**	**3,477.3**	1. Split of 10% light vehicle use and 90% public transport use for all blue collar and white collar staff, 850 staff, 286wks;
Total Travel Emissions	**3,129**	**kL**	**19,125.4**	2. Average commuting distance assumed to be 30km (return journey).

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Contractors Activities - Embodied (Scope 3)	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Station box				1. Concept Bill of Quantities (BoQ); 2. Maximum cementitious content as defined in SWTC Appendix B01; 3. Concrete emission factors: Portland cement 948kg CO2e/t, Coarse aggregates 5.7kg CO2e/t, Water (potable) 0.86kg CO2e/t, Concrete production process 7.9kg CO2e/m3; 4. Structural steel emissions factor 2500kgCO2e/m3; 5. Brick emissions factor 40kg CO2e/m2.
Concrete	38,906	m^3	17,101	
Structural Steel	4,553	ton	11,382	
Central Walk				
Concrete	5,564	m^3	2,443	
Structural Steel	407	ton	1,017	
Eastern Concourse				
Concrete	2,563	m^3	1,143	
Structural Steel	306	ton	766	
Steel Elements	1,710	ton	18,640	
Brick Elements	1,990	ton	80	
Total Steel & Bricks	**8,967**	**ton**	**31,885**	
Total Concrete	**47,033**	**m^3**	**20,686**	
Total Embodied Emissions (Steel, Brick & Concrete)			**52,572**	

Contractors Activities - Excavation Disposal (Scope 3)	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Total Fuel	**467**	**kL**	**13,349.8**	1. Excavation assumed as, 400sqm, 12m depth; 2. Trucking assumed as, 32t capacity, 410L fuel capacity, 35L/100km.
Total Excavation Emissions			**13,349.8**	

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Contractors Activities - Scope 3	Estimated Quantity	Unit	Tonnes C02e	Assumptions
Estimated Scope 3 Emissions			**85,047**	
Contractors Activities - Totals			**Tonnes C02e**	
		Estimated Total for delivery	**142,177.3**	
		Estimated Target for delivery	**113,741.8**	

* Works, Temporary Works, and Contractors Activities

Notes:

1. Emissions factors for site activities:
    a. Diesel Plant - 73.8 tCO2/GJ; Petrol Plant – 64.3 tCO2/GJ; Electricity – 0.266 tCO2/GJ; Rail Travel – 0.000055 tCO2/GJ; Light Vehicle Travel – 0.0678 tCO2/GJ;
2. This is an initial footprint estimate which will be refined along with design construction methodology,;
3. An updated footprint using CERT will provided during Design Stage 3 and again prior to the Date of Construction Completion of the final Portion to reach Construction Completion;
4. Data will be collected during delivery to improve accuracy further. The 'Monitoring & Review' – section in this plan will help to facilitate continual improvement throughout delivery in relation to this baseline calculation;
5. The initial delivery phase footprint estimate incorporates:
    a. Scope 1 – Fuel used in plant, machinery, vehicles & for onsite electricity generation;
    b. Scope 2 – Purchased electricity;
    c. Scope 3 – Embodied emissions of concrete, steel and brick, excavation disposal & staff travel.
6. Further emissions categories (as indicated in table 5) will be incorporated as information becomes available from relevant project teams;
7. The following hierarchy will be employed when calculating material quantities/impacts in future footprints:
    a. Quantity (mass) directly from BoQ;
    b. Quantity (mass) calculated from dimensional data within BoQ;
    c. Quantity (mass) calculated from design documentation, based on BoQ description; and
    d. Quantity (mass) calculated from manufacturers data, based on BoQ description.