Water Reuse Strategy

Sydney Metro Western Sydney Airport Station Boxes and Tunnelling Works

Project number	WSA-200-SBT
Document number	SMWSASBT-CPG-1NL-NL000-WA-RPT-000001
Revision date	29/07/2024
Revision	02

Document approval

Rev	Date	Prepared by	Reviewed by
A.01	10/04/2022	[redacted]	[redacted]
00	02/06/2022	[redacted]	[redacted]
01	29/07/2022	[redacted]	[redacted]
02	29/07/2024	[redacted]	[redacted]

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Definitions

Term	Description
BAU	Business as Usual
CEMP	Construction Environmental Management Plan
CoA	Condition of approval
CPB	CPB Contractors Pty Ltd
EMS	Environmental Management System
ER	Environmental Representative
EP&A Act	Environmental Planning and Assessment Act 1979
IC	Independent Certifier
ISCA	Infrastructure Sustainability Council of Australia
IS Rating	Infrastructure Sustainability Rating
ISP	Independent Sustainability Professional
MCA	Multi Criteria Analysis
SDG	United Nations Sustainable Development Goals
SMS	CPB Contractors Sustainability Management System
LGA	Local Government Area
Project	Sydney Metro Western Sydney Airport
REMM	Revised Environmental Mitigation Measure
SBT Works	Station Boxes and Tunnelling Works
TBM	Tunnel Boring Machine
WSI	Western Sydney International

Part A: Overview

1. Introduction

1.1. Purpose and application

The purpose of this Water Reuse Strategy is to describe how the CPB Contractors Ghella Joint Venture (CPBG) will consider and apply the sustainable water use practices during the delivery of the Station Boxes and Tunnelling Works (SBT Works) of the Sydney Metro Western Sydney Airport (the Project)within NSW.

In doing so, this Strategy addresses the relevant requirements of the Project Planning Approval, applicable legislation, and contractual requirements, including the Project Deed and Specifications.

1.2. Project description

The Project forms part of the broader Sydney Metro network. It involves the construction and operation of a new 23km new metro rail line that extends from the existing Sydney Trains suburban T1 Western Line (at St Marys) in the north and the Aerotropolis (at Bringelly) in the south. The alignment includes tunnels and civil structures, including a viaduct, bridges, and surface and open-cut troughs between the two tunnel sections (Figure 1).

The Project will be delivered through several works packages including the Station Boxes and Tunnelling Works (SBT Works), which includes the design and construction of:

- Two sections of twin tunnels with a total combined length of approximately 9.8km, plus associated portal structures, one from Orchard Hills to St Marys and the other under Western Sydney International (WSI) airport to the new Aerotropolis Station in New South Wales (NSW).
- Excavations at either end to enable trains to turn back and stub tunnels to enable future extensions.
- Station box excavations with temporary ground support for four stations at St Marys, Orchard Hills, Airport Terminal and Aerotropolis.
- Excavations for two intermediate service facilities, one in each of the tunnel sections at Claremont and Bringelly.

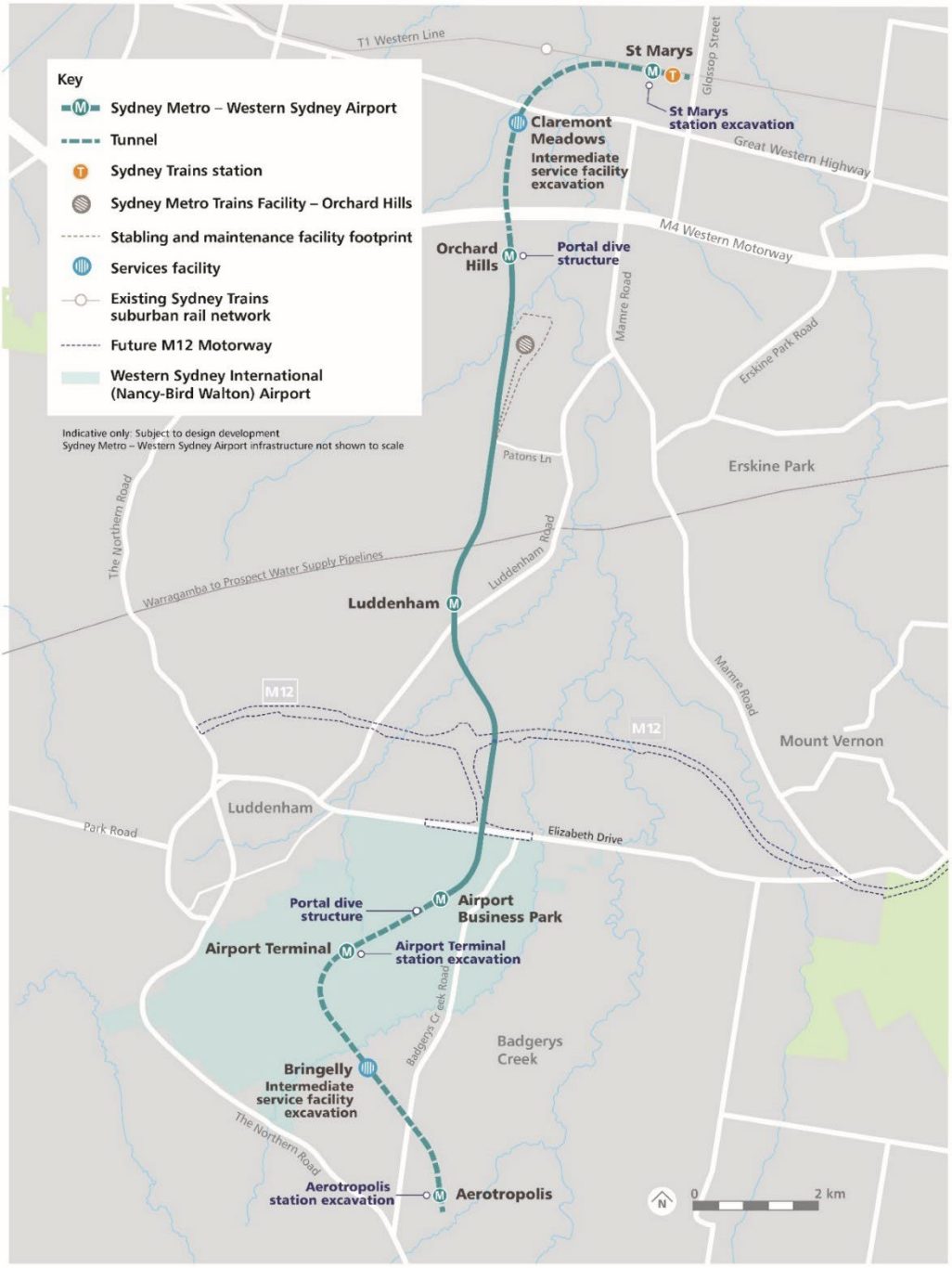

Figure 1: Overview of the Project

1.3. Scope

This Strategy addresses the water use requirements and re-use options for the construction and operation phases of the Station Boxes and Tunnelling Works.

This Strategy addresses and details the following issues:

- Water use requirements for surface and tunnelling works;
- Water minimisation strategies to reduce water consumption; and
- Potential Non-Potable water use, including:
  - Rainwater collection, management and discharge during surface works construction and operation activities,
  - Groundwater management throughout the tunnelling works.

This Strategy does not consider the following:

- Treatment and re-use of sewerage
- Treatment and re-use of leachate 'contaminated groundwater.'

1.4. Project requirements

A Water Reuse Strategy is required by the *CSSI 10051 CoA E102*. A description of the requirement of the Condition of Approval (CoA) is provided in Table 1.

Table 1: CoA E102 requirements

Requirement	Reference
A Water Reuse Strategy must be prepared, which sets out options for the reuse of collected stormwater and groundwater during construction and operation. The Water Reuse Strategy must include, but not be limited to:	This Document
(a) evaluation of reuse options;	Section 2
(b) details of the preferred reuse option(s), including volumes of water to be reused, proposed reuse locations and/or activities, proposed treatment (if required), and any additional licences or approvals that may be required;	Section 4
(c) measures to avoid misuse of recycled water as potable water;	Section 3
(d) consideration of the public health risks from water recycling; and	Section 3
(e) time frame for the implementation of the preferred reuse option(s).	Section 4
The Water Reuse Strategy must be prepared based on best practice and advice sought from relevant agencies, as required. The Strategy must be applied during construction. Justification must be provided to the Planning Secretary if it is concluded that no reuse options prevail. A copy of the Water Reuse Strategy must be made publicly available.	Section 1.7 N/A Section 1.7

1.4.1. General and Particular Specifications

The General and Particular Specification contains the project-specific requirements related to sustainable water consumption and are outlined in Table 2 below.

Table 2: General specification related to water consumption

Requirement	Reference
2.8.1 General (a) The SBT Contractor must ensure that sustainability is addressed throughout the performance of the SBT Contractor's Activities and that sustainability is embedded into the design and construction of the Project Works.	This Strategy
(b) The SBT Contractor must meet the following sustainability targets:	N/A
(iv) ensure a minimum of 50% of water used in the performance of the SBT Contractor's Activities is sourced from non-potable sources	Section 4
2.8.2 (d) In achieving the "design" rating, the SBT Contractor must, as a minimum, achieve the following levels using the ISCA IS rating tool version 1.2 (iv) Level 1.5 for credit Wat-2 'Replace potable water', demonstrating that at least 50% of water used is from non-potable sources;	Section 4
2.8.2 (f) In achieving the "as built" rating, the SBT Contractor must, as a minimum, achieve the following levels using the ISCA IS Rating Scheme version 1.2: (iv) Level 1.5 for credit Wat-2 'Replace potable water', demonstrating that at least 50% of water used is from non-potable sources;	Section 4

1.4.2. Particular Specification

The Particular Specification contains the project-specific targets related to sustainable water consumption and are outlined in Table 3 below.

Table 3: Particular specification water consumption related requirements

Requirement	Reference
3.4.5.2 Water Sensitive Urban Design	-
(a) The SBT Contractor must adopt an integrated approach to urban water cycle management and design to minimise construction phase impacts on stormwater quality. This includes consideration of stormwater management within site facilities. [SM-WSA-SBT-PS-671]	Sections 3, 4.2 & 4.3
(b) The SBT Contractor's integrated approach must achieve: [SM-WSA-SBT-PS-672]	-
(i) a reduction in potable water demand through: [SM-WSA-SBT-PS-673]	-
A. the use of rainwater or greywater where a reticulated reuse system is not available; and [SM-WSA-SBT-PS-674]	Sections 3 & 4.3
(ii) a reduction in wastewater generation; [SM-WSA-SBT-PS-676]	Sections 3 & 4.4
(iii) stormwater quality targets which are suitable for either reuse or discharge into local streams and waterways; [SM-WSA-SBT-PS-677]	Section 1.4.3
(iv) a maximum use of stormwater in the urban landscape; and [SM-WSA-SBT-PS-2841]	Sections 3, 4.2 & 4.3
(v) the water quality targets identified in section 3.4.5.3 (Stormwater Quality). [SM-WSA-SBT-PS-2842]	Section 1.4.3
3.4.4.1 (d) The SBT Contractor must not use potable water as a substitute for non-potable water where on-site or local sources of non-potable water are suitable for the SBT Contractor's Activities and are available.	Section 4

3.4.4.1 (g) The SBT Contractor must meter the water supplied for the SBT Contractor's Activities from both recycled water networks and potable sources in order to report against the targets set out in the General Specification and in the Particular Specification.	Section 5

1.4.3. Project Environmental Protection Licence

CPBG hold an Environmental Protection Licence (EPL), which prescribes water discharge requirements. Discharge will be carried out in accordance with approvals under the EPL or Trade Waste Agreement with Sydney Water. During Stage 1 Preliminary Construction, refer to the Water Reuse and Discharge Management Procedure (SMWSASBT-CPG-SWD-SW000-WA-PRO-000003) for further information regarding water discharge measures. This Strategy will be updated to include any relevant details associated with the EPL or any Trade Waste Agreement.

1.4.4. Infrastructure Sustainability targets

CPBG is required to achieve a leading IS Rating of 75 or higher using the Infrastructure Sustainability (IS) Rating v1.2. CPBG is targeting the below requirements for the Water category credits.

Table 4: Indicative IS targes

Requirement	Required Target Level	Reference
Wat-1 Water Use Monitoring and Reduction	Level 2 (10% reduction compared to base case footprint)	Section 4
Wat-2 Replace Potable Water	Level 1.5: (50% non-potable replacement)	Section 4

1.5. Objectives and targets

CPBG will ensure all requirements in this strategy will be adopted to support sustainable consumption of water during delivery and operations of the Project. They are based on the following four principles:

1. Understand the project water demand, including identification aspects with high demand;
2. Reduce the volume of water required during project delivery and operations, to the greatest extent practicable;
3. Replace potable water with sustainable non-potable sources, where feasible; and
4. Monitor and measure water consumption during project delivery.

This approach will ensure a holistic approach to water management and best practice environment and sustainability outcomes.

CPBG water targets based on the General and Particular Specifications and are outlined in Table 2 and Table 3.

1.6. Strategy Structure

This strategy structure is detailed below.

Part A: Overview	• Introduction • Project water sources • Consideration to suitability • Evaluation and selection of preferred water re-use options • Measuring and Reporting • Evaluation and improvement

1.6.1. Interactions with other Project Plans

This Strategy is part of an integrated set of Project documents. Table 5 below outlines key sustainability items/content addressed within other relevant Plans.

Table 5: Project Plan Interfacing

Management Plan	Sustainability items/content addressed
Construction Environmental Management Plan (SMWSASBT-CPG-1NL-EV-PLN-000002)	Sets out governance, monitoring, reporting, auditing and corrective action processes applicable to sustainability and environment management practices in relation to water management
Sustainability Management Plan (SMWSASBT-CPG-1NL-EV-PLN-000001)	Sets of governance, monitoring, reporting, auditing and corrective action processes applicable to sustainability Identities water minimisation measures
Soil and Water CEMP Sub-plan (SMWSASBT-CPG-1NL-NL000-WA-PLN-000002)	Details strategies to be applied to minimise water usage and manage groundwater resources during the WSA SBT Works
Construction Waste and Recycling Management Plan SMWSASBT-CPG-1NL-NL000-WM-PLN-000001	Details strategies to be applied to minimise and manage waste during the WSA SBT Works

2. Project Water Sources

Over the course of the project, a number of water sources will be utilised. CPBG will adopt the water use and sourcing hierarchy illustrated in Figure 2 during the construction and operation of the project.

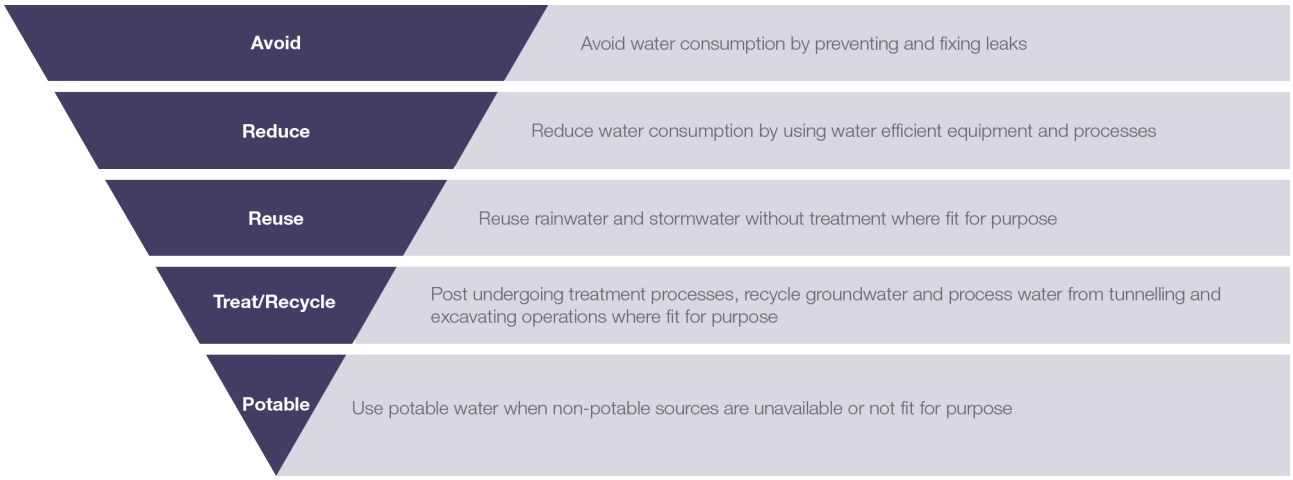

Figure 2: Water Use and Sourcing Hierarchy

There is a range of water sources available during the construction phases, including:

- Connection to mains supply (potable water);
- Rainwater harvest and surface water;
- Treated tunnel water; and
- Recycled water;

3. Consideration of suitability

All water sources will be evaluated for suitability. The use of non-potable water will be prioritised over the use of potable where suitable quality and supply is available and practical. CPBG notes the following considerations for water re-use suitability. Table 6 highlights the consideration and measure to deem a water source suitable within the evaluation process.

Table 6: Consideration to suitability

Aspect	Risk	Mitigation	Suitability Measure
Health and safety (Project)	Personnel contact with bacteria during reuse of partially treated grey water. Personnel contact with contaminants including chlorinated hydrocarbons during reuse Personnel consuming recycled water due to poor identification of recycled water lines	Adequate treatment including disinfection/chlorination and carbon filtration of treated water Clear labelling and colour coding of recycled water lines. Separate potable water and recycled water lines to work areas	Regular sampling and analysis of recycled water to determine compliance with Australian guideline for recycled water. Where appropriate a risk assessment will be conducted
Specification	Non-potable water does not meet required quality standards for construction specifications e.g. grout production.	Initial and ongoing laboratory analysis of non-potable water to determine suitability for reuse.	Limits detailed in relevant specification.
Demand and reliability	Water demand (quantities of water) and reliability (constant supply and quality of water) from source is not able to be met for the proposed water use.	Detailed water balance study to be developed prior to commencing reuse of non-potable water	Water Balance Study
Financial feasibility	The economics of the proposed water source is not viable due to initial capital costs or ongoing operations costs.	Detailed cost estimates during procurement to include capital costs including additional equipment used for treatment and reticulation of treated water. Ongoing operating costs including chemicals and laboratory analysis to be assessed. Cost benefit analysis to be completed	Where appropriate a cost benefit analysis will be conducted
Environmental	Use of non-potable water containing elevated levels of salinity or other contaminants result in impact on (but not limited to) soils, groundwater, vegetation, or surface waters.	Treatment of water prior to reuse Completion of a risk assessment to determine	Regular sampling and analysis on non-potable water to determine

Aspect	Risk	Mitigation	Suitability Measure
		maximum salinity levels for recycled water reuse Ongoing analysis of recycled water to meet environment requirements	compliance with regulations.

4. Evaluation and selection of preferred water options

CPBG completed an evaluation for water re-use opportunities during the tender phase of the Project. The use of non-potable water will be prioritised over the use of potable water on all sites where suitable quality and quantity is available.

Table 7 outlines water minimisation and replacement initiatives to minimise water consumption on the Project.

Table 7 - Water minimisation and replacement initiatives

Initiative type	Initiative
Minimisation	Use of efficient water practices during construction activities, tunnelling, and site establishment, including efficient misting systems (conveyors, station box excavation, shaft excavation), cannons, efficient hoses (e.g. trigger nozzles)
	Maintaining hardstand and installing acoustic sheds reducing the requirement for dust suppression
	Installation of water-efficient fixtures and fittings in the showers, basins and waterless urinals
	Installation of wheel wash systems
	Inclusion of water minimisation practices into the construction methodology statements
	Procure sustainable site facilities to reduce water consumption
Replacement	Procurement of TBM's which allow recirculation and reuse of non-potable water
	Ensure the reuse at least 80% of concrete production operation water into concrete production at onsite or offsite batching plants
	Installation of infrastructure to allow water treatment plant water to be reused for tunnelling support activities and site facilities to use rainwater, where feasible

The sub-sections below highlight the evaluation process in determining a preferred water source, including non-potable water. Water consumption estimates are calculated in the Project's Water Balance Study and will be updated during construction. The supply of non-potable water will be dependent on rainfall, groundwater inflow, construction activities, water quality and availability of storage at each site.

4.1. Mains supply potable water

This water source has been implemented on the Project.

All construction sites will have access to potable water supplies through metered connections to the Sydney Water network or other arrangements involving water tanks onsite. During construction, potable water will supply the site offices and amenities and be used to supplement non-potable water supplies as needed. Potable water will be used where required by manufacturers or technical specifications, and/ or where there are concerns related to health and safety.

4.2. Rainwater and Surface water capture

This water source has been implemented on the Project.

The Project will construct sediment basins onsite which enable capture and re-use of surface water and rainwater. Water will be re-used where appropriate for dust suppression, washdown water or for earthworks compaction.

Rainwater is deemed unsuitable for activities requiring a technical specification, i.e. grout production.

CPBG will ensure maximum reuse of rainwater and surface water onsite to contribute to the 50% non-potable replacement target. Table 8 estimates quantity of surface water and rainwater demand per day for above ground support activities. This rate assumes each site to operate one 10,000L water cart to operate under standard construction hours.

Table 8 - Estimated rainwater and surface water demands

Sites	Estimated total demand (kL/day)	Estimated total non-potable demand (kL/Day)	Indicative implementation duration (months)
Orchard Hills	746	11	13
Airport Business Park	502	11	18
Airport Terminal	394	11	17
Spoil Site	394	11	18

4.3. Treated tunnel water

This water source has been implemented on the Project.

Treated tunnel water describes all water that will enter the tunnel from the water table during tunnel excavation and construction. Groundwater and any residual construction-related water will be combined, pumped to the surface as one stream and processed within the construction Water Treatment Plants (WTP). Treated tunnel water from the WTPs will be reused for suitable activities on a case-by-case basis and will be regularly reviewed during construction.

Suitability assessments conducted during construction identified treated tunnel water suitable for reuse in the TBMs, conveyor belt spray systems, and wash down areas. Modifications were made to the TBMs and conveyor belt systems to allow for treated tunnel water to be used in line with the Manufacturer's recommendations regarding potential damage to internal mechanical systems from non-potable water sources.

Table 9 estimates quantities of water demand and estimated treated tunnel water.

Table 9: Estimated treated tunnel water quantities for SBT Worksites

Sites	Estimated total demand kL/day[1]	Estimated non-potable available (kL/day)	Indicative implementation duration (months)
St Marys	125	23.9	5
Claremont Meadows	66	22.4	14
Orchard Hills	746	463	16

[1] Based on summer capacity and 4mm Morton evaporation rates

Sites	Estimated total demand kL/day[1]	Estimated non-potable available (kL/day)	Indicative implementation duration (months)
Airport Dive	502	51.2	10
Airport Terminal Station	394	466	8
Bringelly	81	26.9	18
Aerotropolis	279	31	16

4.4. Recycled Water

This water source has not been implemented on the Project.

Recycled water connections were deemed unfeasible due to cost, limited access to existing networks, and limited end use on the Project.

5. Measuring and Reporting

CPBG will monitor the use of water from both potable and non-potable sources during construction. Water use will be monitored using meter reads, invoices, or estimations. Data will be captured and reported as required. Reporting requirements are further detailed in Section 7.1 of the Sustainability Management Plan (SMWSASBT-CPG-1NL-NL000-EV-PLN-000001).

5.1. Water Balance Study

CPBG have prepared a Water Balance Study as part of the IS Rating v1.2 Design submission (SMWSASBT-CPG-SWD-SW000-SB-RPT-295270).

The Water Balance Study will be updated prior to the IS Rating v1.2 As-Built submission to reflect actual onsite water demands and non-potable replacement quantities for the Project. The Water Balance Study will consider all target requirements and all implemented water sources outlined in this Strategy.

6. Evaluation and improvement

This strategy will be reviewed annually or as required to incorporate water reuse initiatives and assessments. Audits, inspections, and reviews will be undertaken as detailed in Section 8 of the Sustainability Management Plan (SMWSASBT-CPG-1NL-NL000-EV-PLN-000001).

6.1. Availability Review and update of the Strategy

6.1.1. Strategy Availability

A copy of this strategy will be available on the Project website.