Linear Civil Final Design

HATCH

OTTAWA CONFEDERATION LINE LRT (OLRT)

RIDEAU TRANSIT GROUP

LOCATION
Ottawa, Ontario, Canada

NAME OF CLIENT
Rideau Transit Group

PROJECT TIMELINE
February 2013 - December 2018

PROJECT COST
$2.1 billion (entire project)

AWARD
Infrastructure Project of the Year | Tunnelling Association of Canada | Confederation Line Ottawa LRT | Canada | 2017

HATCH

PROJECT OVERVIEW

The OLRT is a new Ottawa Transit project involving converting a portion of the existing BRT system into an LRT system. Ottawa's population is projected to grow 30% by 2031 with public transit already at or near capacity. A state-of-the-art light rail transit system was proposed to solve congestion issues and provide expanded ridership.

The project consists of 10 km at grade and 2.5 km underground alignment and includes upgrades at some existing stations, construction of new stations, construction of portions of new track not within the existing BRT infrastructure, tunnelling through the downtown core and construction of a new equipment maintenance and storage facility.

SCOPE OF WORK

This project is being undertaken as a Public-Private-Partnership (PPP) procurement for private finance, delivery and maintenance for a 30-year period of the Ottawa LRT. Hatch, as part of the Rideau Transit Group (RTG), was responsible for bid design of the 2.5 km underground section of the LRT. Hatch prepared the civil and portal designs, structural designs for the tunnels and three underground stations. Hatch managed and coordinated the ventilation, utilities, architectural, property, construction alternatives, and enabling works.

The Rideau Transit Group was the successful proponent for the PPP contract to finance, design, build, operate and maintain the complete LRT system. As a consultant to the engineering joint venture, Hatch is responsible for the civil, structural, mechanical, and electrical design of the double-track tunnels and portals, the structural design of the three underground stations, and the ventilation and smoke dispersion modeling of the entire segment. A differentiator of the RTG design is to use a fully tunneled solution for the stations, as opposed to the reference design's cut-and-cover approach. This approach substantially reduces utility impacts, creating significant cost and schedule benefits to the proponent.

Ground conditions consist primarily of limestone, with glaciofluvial granular deposits in a buried valley and Leda Clay present at the East Portal.

PROJECT HIGHLIGHTS

+ Excavation in rock was by roadheader, and in the buried valley by tunnel excavator.
+ Unique tension tied arch structural solution for station caverns to avoid laterally loading adjacent deep basements.
+ Portion of one station (Rideau) and adjacent running tunnel pass through a buried valley with very soft materials where small increment Sequential Excavation Method was used.
+ SEM was also employed in the rock sections.
+ Eastern half of the tunnel and one of the station designed as tanked structures.
+ Portal constructed beneath sensitive Leda Clay layer.
+ Moderate seismic loading.
+ 1D SES ventilation analysis of the entire segment.
+ 3D CFD analysis of the three stations, including smoke dispersion modeling of street-level vent shaft discharges.

DOMINION STATION (ARTIST'S RENDERING)

OTTAWA CONFEDERATION LINE LRT, STAGE 2

CITY OF OTTAWA

LOCATION
Ottawa, ON

NAME OF CLIENT
City of Ottawa

PROJECT TIMELINE
2019 - East Extension: 2025 | West Extension: 2026 (est.)

PROJECT COST
$2.6 billion

PROJECT OVERVIEW

The Ottawa Light Rail Transit System includes two lines, the Confederation Line (Line 1) which entered revenue service in September 2019, and the Trillium Line (Line 2). Both lines are currently being extended under Stage 2 Ottawa LRT Project. Under Stage 1, the Confederation Line connects Tunney's Pasture in the west, through downtown via a 2.5km tunnel to Blair Station in the east. The high-capacity LRT line was delivered as a Design-Build-Finance-Maintain (DBFM), with the City of Ottawa operating the system.

Confederation Line Stage 2 includes extensions to the existing line to the east and west under a Design-Build-Finance (DBF) contract. The system is fully grade separated and runs in Automatic Train Operation (ATO), with drivers having general safety, door operation, and system recovery responsibilities. The Stage 1 maintainer will be responsible for maintenance of the expanded system.

The West Extension will include three segments totalling 15km of new alignment, and 11 new or converted rapid transit stations will be added. This extension, which includes two small tunnel sections, runs from Tunney's Pasture to Moodie Drive, with a branch that extends north from Lincoln fields to Baseline Road. Revenue service for this extension is planned for 2026.

The East Extension includes a 12.6km extension and five new stations which extends the system from Blair Station to Trim Station. Revenue service for this extension is planned for 2025.

+ Stations on the West Extension will be located at Moodie, Bayshore, Pinecrest, Queensview, Baseline, Iris, Lincoln Fields, New Orchard, Cleary, Dominion and Westboro.
+ Stations on the East Extension will be located at Montreal Road, Jeanne d'Arc, Orléans Boulevard, Place d'Orléans and Trim Road.

Operations for Stage 1 are managed by Transit Operations Control Centre and will be expanded to operate Stage 2, using the same central control and communication systems (SCADA, Networks, CCTV, PID and Telephone).

SCOPE OF WORK

On March 6, 2019, Ottawa City Council approved East-West Connectors to design, build and finance the Stage 2 Confederation Line East and West extensions. EWC is a consortium of design, engineering and construction companies that include Kiewit along with VINCI Group and its affiliates leading the overall project. Design engineering services will be provided by Hatch Ltd and WSP Canada.

As a 50/50 Joint Venture participant, Hatch's design services include track, guideway, cut and cover guideway, utilities, bridges, structures, stations, LMSF, and systems (including OCS and traction power, communications, SCADA, CCTV, Building Services & HVAC, Fire and Life Safety, and Tunnel Ventilation) as well as integration of all design and the extended Train Control System provided by the existing supplier.

Hatch is leading structural, mechanical and electrical design for several stations including Pinecrest, Queensview, New Orchard and Cleary stations, and systemwide communications systems design.

Hatch is further responsible for Systems Engineering and Systems Integration including Requirements Management and Verification & Validation services, along with Cybersecurity certification and Safety Certification of the entire system.

Hatch has been a member of the delivery team since the commencement of bid-phase design and will remain an active member through to commissioning into service.

+ ck was by roadheader, and in the buried valley by tunnel excavator.

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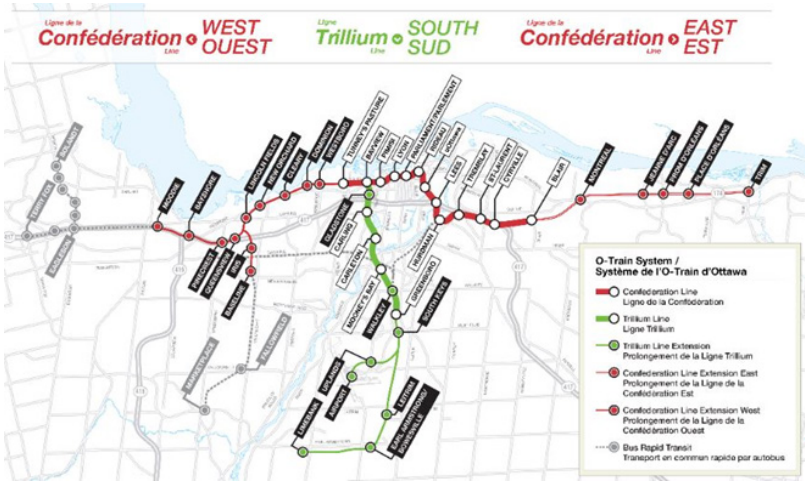
BAYSHORE STATION (ARTIST'S RENDERING)



VALUE ENGINEERING

Value Engineering for the project was undertaken as a collaborative "whole project team" exercise through active workshop sessions during which, Hatch personnel presented design bases, actively participated in brainstorming of options, and provided detailed analyses to allow evaluation of options. These encompassed architectural, structural, electrical and mechanical elements. The key innovations that were adopted included optimized modules for finishes, standardized utility cabinet and door schedules, concourse and slab-on-grade thickness reductions, standardized electrical and mechanical room heating and cooling equipment, optimized branch wiring and lighting control device locations, and optimized lighting types. Significant structures cost savings were achieved via reductions in the station concourse slab thickness, select removals of insulation below on grade platform slabs and substituting rebar with wire mesh for other slab on grade elements. Other structural elements which were investigated for potential savings included shear walls design, service building wall thickness, platform canopy deflection criteria, ground bearing pressure and raft thickness reductions.

PROJECT HIGHLIGHTS

+ Application of a tailored Systems Engineering and Assurance approach to the entire railway ensuring contract compliance and safety certification to facilitate entry into service.
+ Collaborative execution by a collocated core team working hand in hand with the constructor with global design teams seamlessly integrated using number of tools:
+ ProjectWise was used extensively as a common data environment for developing, sharing, review-hosting, and issuing design models, drawings, and documents for contractor and end-client use. This mitigated project risk by ensuring a single source of truth for design information ensuring project team members had access to the right information at the right time for the right purpose.
+ Navisworks was used to identify and highlight interdisciplinary design coordination issues in the 3D model resulting in better insight into interface issues for project team members for earlier and more timely issues resolution.
+ Civil 3D, Revit, and InRoads were used to advanced design development in 3D.
+ Bluebeam was leveraged to facilitate interdisciplinary design reviews, ensuring all project team members accessed, commented, and resolved issues from a single package of files. This streamlined the design review process by eliminating the need to consolidate comments from various sources and provided evidence for quality management processes and traceability.
+ DOORS for requirements management within a standard Systems Engineering Lifecycle model for requirements generation, linking, verification and validation. DOORS NG was critical in supporting systems engineering activities through the management of the thousands of requirements needed to successfully design, build, integrate, test, and commission the system. DOORS NG facilitated end to end traceability of commercial and technical requirements decomposition through to verification and validation activities to provide system assurance, attain system safety certification, and safely close out the works.

BEACON HILL STATION AND TUNNEL

SOUND TRANSIT

LOCATION
Seattle, WA USA

NAME OF CLIENT
Sound Transit

PROJECT TIMELINE
2000 - 2009

PROJECT COST
$313 million

AWARDS
Outstanding Project of 2014, International Federation of Consulting Engineers (FIDIC)

Engineering Excellence Grand Award (2010), American Council of Engineering Companies (ACEC)

National Outstanding Civil Engineering Achievement Award (OCEA) Finalist (2010), American Society of Civil Engineers (ASCE)

Platinum Award (2010) American Council of Engineering Companies (WA)

Engineering Excellence Award (2009), Consulting Engineers of BC

HATCH

PROJECT OVERVIEW

Beacon Hill Station and Tunnels is a segment in the 14-mile Central Link light rail line. This project was the critical initial component in Sound Transit's long-term regional transportation network. The station, one of 12 new stations on the line, is expected to serve approximately 3,000 people a day by 2020.

The twin 4,200-ft. long tunnels, one northbound and one southbound, were excavated using an earth pressure balance tunnel boring machine and lined with one-pass precast segmental linings measuring 18-ft.-10-in. internal diameter. The design included three cross passages to meet the National Fire Protection Association's 130 egress requirements. Tunnel construction was in soft ground that primarily consisted of firm to hard clays, but also included water bearing sand and silt zones.

Operations for Stage 1 are managed by Transit Operations Control Centre and will be expanded to operate Stage 2, using the same central control and communication systems (SCADA, Networks, CCTV, PID and Telephone).

The Beacon Hill station was mined from two shafts: one 46-ft. in diameter, the other 26-ft. in diameter. The shafts are 185-ft. deep and act as both entrance and exit, as well as ventilation structures. The 380-ft. long platform tunnels, the connector tunnels, concourse adit, ventilation adits and cross-passage tunnels were constructed using the sequential excavation method (SEM) using shotcrete initial linings that take advantage of ground relaxation to reduce loading. The large diameter concourse adits measure 45-ft. in diameter. Stage-grouted barrel vault pipes and grouted pipe spiles formed the pre support for the SEM tunnel. Additional tool box support items were used where necessary. The support method was selected onsite after ground conditions were assessed. The project included multistage excavation sequences, including twin sidewall drifts and single sidewall drifts.

SCOPE OF WORK

As the lead JV partner, Hatch was responsible for overall project management and controls, as well as detailed design of all tunnels and portals, shafts, and mined station tunnels, including final linings and waterproofing. The scope of work included scheduling, cost estimating, and contract drawings and specifications. Hatch also provided design support during construction, including the engineering oversight of the critical SEM excavation and support activities.

PROJECT HIGHLIGHTS

+ Design completed on time and within budget.
+ Earth pressure balance TBM, sequential excavation method construction.
+ One-pass precast segmental tunnel linings.
+ Deep mined station in soft ground.
+ Soil improvement by jet grouting and dewatering using deep wells.
+ Noise was one of the primary environmental concerns, particularly noise at night due to a 24-hour construction schedule. Multiple noise control measures were taken. These included the installation of soundproof walls, and scheduling of trucking activities during day time hours to prevent disturbance to the community.

CSX HOWARD STREET TUNNEL PROJECT

SKANSKA-FAY JOINT VENTURE

LOCATION
Baltimore, MD

NAME OF CLIENT
Skanska-Fay Joint Venture

PROJECT TIMELINE
May 2022 - October 2025

PROJECT COST
US $200,000,000

AWARDS
The Howard Street Tunnel Clearance Project (HST) was submitted for consideration for the 2026 Design-Build Project/Team Awards in the following category:

- Category : Infrastructure
- Subcategory : Transportation (other than Aviation)

HATCH

PROJECT OVERVIEW

The 125-year-old Howard Street Tunnel is centrally positioned in Baltimore City on CSXT's I-95 Rail Corridor, which runs from Florida to New England and connects all the major population centers on the East Coast. Additionally, the CSXT I-95 Rail Corridor through Baltimore provides a critical connection from the Port of Baltimore's Seagirt Marine Terminal Intermodal Container Transfer Facility (ICTF) to consumer markets in the Midwest.

The Howard Street Tunnel (HST) required various forms of improvement to gain clearance to enable the passage of double-stack trains (DSTs). Specifically, the Project involved a mixture of track-lowering and tunnel enlargement techniques. The 1.7-mile HST consists of three main tunnel sections based on the original construction methods: a concrete box section; a cut-and-cover section; and a mined tunnel section. The design approach optimized the profile and alignment of the track in the HST to achieve the maximum horizontal and vertical clearances within the existing structure. The Project also includes track lowering between the HST east portal and the North Avenue Bridge.

SCOPE OF WORK

The project was delivered as Progressive Design-Build (PDB). This contract model allowed for close collaboration between the owner, contractor and designer to use preferred construction means and methods, while meeting the owner's needs. As a result, the project was able to accommodate changes to the design basis easily as the project evolved with input from CSX operations and maintenance (O&M), subcontractors and suppliers. One example was a change from steel track ties to wooden ties in detailed design; which required increased track lowering but will result in reduced O&M costs. Hatch was the prime designer for Skanska-Fay Joint Venture (SFJV). Hatch provided design services for Phase 1 (60% Design) and Phase 2 (Final Design) and engineering services during construction.

The scope of work for Hatch included the design of:

- Geotechnical Investigations
- Track alignment & profile design for mainline and siding tracks
- Structural modifications to enlarge the tunnel (3D Geo-Structural Interaction Analysis)
- Structural underpinning
- Support of Excavation
- Grading & Drainage
- Tunnel Drainage
- Drainage structures & pump station
- Geotechnical instrumentation & monitoring
- Approvals & Permitting
- Utility Investigations
- Survey (topographic + lidar survey)

Due to the nature of the existing structure, a sequential approach was taken for HST invert replacement. Hatch used 2D and 3D geo-structural interaction finite element modelling tools to estimate the existing liner stresses and assess the maximum length Due to the nature of the existing structure, a sequential approach was taken for HST invert replacement. Hatch used 2D and 3D geo-structural interaction finite element modelling tools to estimate the existing liner stresses and assess the maximum length of invert excavation achievable, while maintaining liner stresses within allowable limits. One of the main project challenges was CSX's requirement to complete all HST invert lowering within a 9 month track outage period. Hatch worked with the contractor to develop construction sequences that would be repeatable, and efficient to meet their required $^{24}/_{7}$ production schedule, while limiting the risk of tunnel movements.

During construction, Hatch worked with the contractor to revise the sequence of construction, to remove cast-in-place concrete placement from the critical path, greatly improving productivity. As a result of the close collaboration between Hatch, SFJV and CSX, invert lowering was completed ahead of schedule and the enlarged HST was turned over to CSX more than one month ahead of schedule.

PROJECT HIGHLIGHTS

Key challenges to the completion of the project included:

- The tunnel's age, limited documentation, and complex geometry.
- Achieving vertical clearance without compromising structural integrity.
- Working beneath the MTA Light Rail and above the Metro Subway, with utilities crossing over and under the tunnel.
- Managing groundwater and ground movement in a constrained urban setting.
- Confined access requires a single, efficiently sequenced work front.
- Minimizing disruption to CSXT's 20,000-mile network while performing major reconstruction.

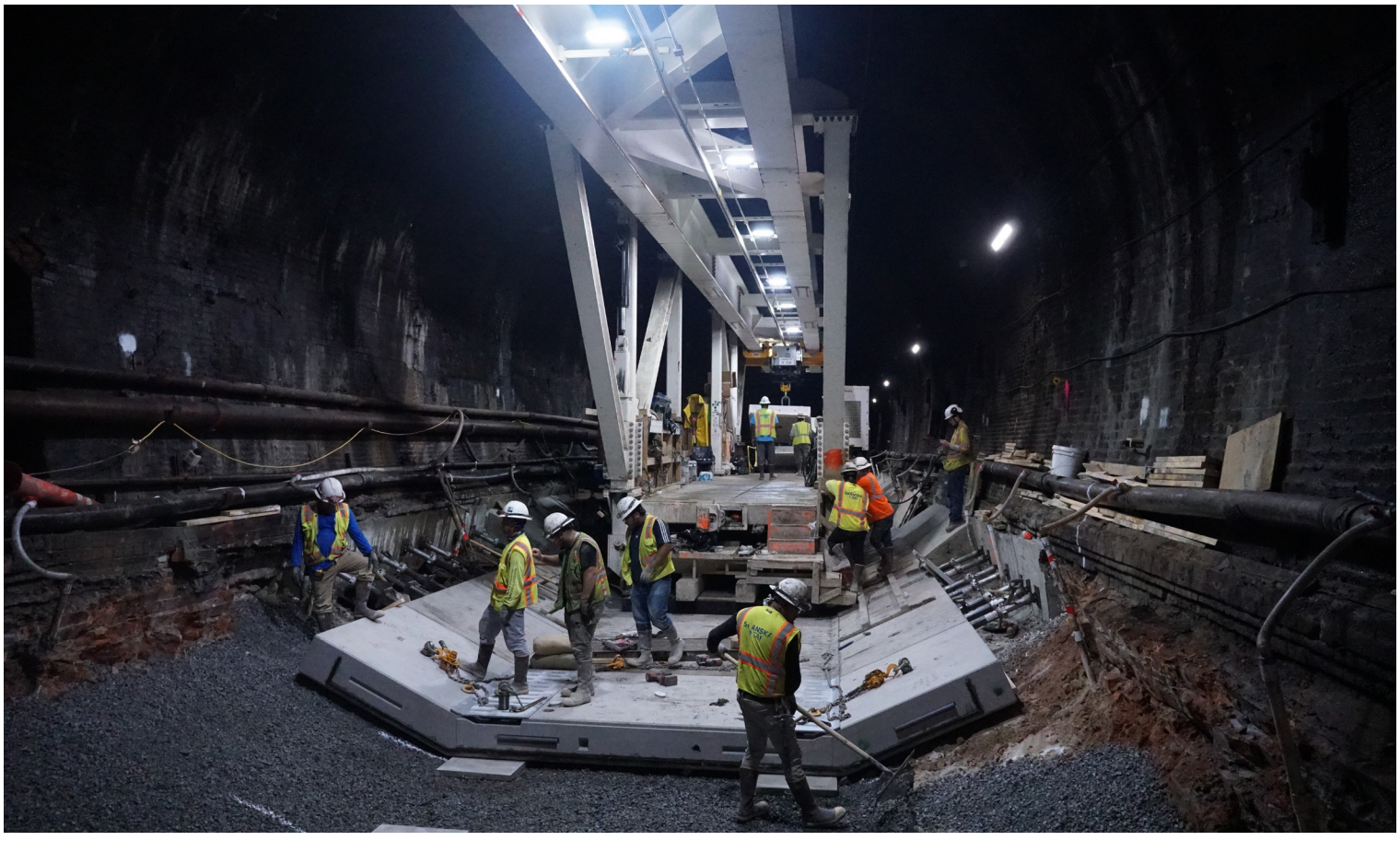
The team met these challenges through the implementation of the following solutions:

Progressive Design-Build Collaboration: The PDB model enabled early alignment on scope, cost, and risk. Phase 1 investigations and design development created shared certainty, allowing Phase 2 to proceed under a GMP. CSXT shaped incentives, penalties, and outage commitments around operational priorities, reinforcing schedule discipline.

Innovative Engineering: The team eliminated high-risk methods such as pressure grouting, tiebacks, and crown notching. Iterative track-profile refinements removed the need for crown notching entirely while improving track geometry and train speeds. Advanced Plaxis3D modeling defined safe excavation limits, confirmed the need for dewatering, and allowed the elimination of traditional support-of-excavation systems, accelerating production without compromising safety.

Construction Innovations: Track outage planning evolved from weekend closures to a 12-hour daily window and ultimately to a continuous nine-month outage. This enabled 24⁄7 operations, use of precast invert segments, and streamlined logistics. A purpose-built gantry improved material handling, while the temporary jacking system removed concrete placement from the critical path and nearly doubled production rates.

The project was completed an extraordinary 20 months ahead of schedule and approximately $93 million under budget.



PROJECT SAFETY

Risk Management: A comprehensive monitoring program—including drilled instruments, GeoLidar scanning, and precision tunnel sensors—validated modeling predictions and ensured safe progress. Logistics were optimized by delivering precast segments from the east and removing spoils to the west, maintaining a single efficient work front.

These combined strategies reduced risk, accelerated delivery, and ensured safe, high-quality construction in one of the most constrained rail environments in the country.

Safety Management: The project team incorporated safety into the design from the outset and implemented redundant systems to ensure continuous protection throughout construction. Temporary construction power was established using new utility feeds supported by backup generators (outside the tunnel), guaranteeing uninterrupted operation of the dewatering system. The dewatering wells were designed with two primary pumps and a third standby pump to automatically engage if either main pump failed.

To improve air quality, a bulkhead fan was installed at the East Portal to supplement the existing CSXT ventilation fan at the West end. The gantry system operated on temporary construction power and included its own backup generator to ensure clean, reliable power at all times.

A plywood walkway was installed between the gage as work advanced, providing a stable and safe walking surface for personnel. In addition, the precast invert geometry was intentionally designed to create a safe inspection path adjacent to a stopped train, allowing engineers to conduct inspections.
Together, these engineered controls and redundancies created a robust safety environment that protected workers, maintained system reliability, and supported safe, continuous progress within the active rail corridor.

CROSS RIVER RAIL
PULSE CORSORTIUM

LOCATION
Brisbane, Queensland, Australia

NAME OF CLIENT
Pulse Corsortium

PROJECT TIMELINE
July 2019 - November 2024

HATCH

PROJECT OVERVIEW

Cross River Rail (CRR) is a landmark infrastructure project featuring Brisbane's first underground rail line, valued at A$5.4B. The project will unlock the bottleneck at the core of the city's transport network by allowing more trains to run more often and by enabling a turn-up-and-go transport system for the whole of South East Queensland. The 10.2 kilometre north-south rail line includes a 5.9 kilometre twin tunnel under the Brisbane River, as well as four new underground stations.

Hatch was engaged as a primary design consultant to the Design and Construct sub-contractor for the delivery of the Tunnel, Stations and Development (TSD) Public Private Partnership package of the project.

SCOPE OF WORK

Hatch delivered the civil design for the station precincts, the rail alignment and permanent way design, both surface and in tunnel, as well as other services including pedestrian modelling at the stations and providing durability requirements for the whole TSD design team. Our scope of services included:

Civil (beyond perimeter of stations):

+ Roads
+ Drainage and flood analysis
+ Sewer and water
+ Pavement
+ Traffic signals, and
+ Street lighting.

Rail:

+ Alignment
+ Space-proofing (esp. tunnels)
+ Permanent way
+ Track Slab (standard and low attenuation)
+ Combined services trench
+ Overhead Line Equipment (OHLE), and
+ Operational rail modelling.

Other services:

+ Pedestrian modelling
+ Durability compliance assessment
+ Contaminated land, and
+ Design package submissions (Doc. Control Project Wide).

Structures (related to precinct civil works):

+ Retaining walls, and
+ Miscellaneous structures.

Global Capability: As an emerging world-class infrastructure design firm, Hatch deployed expertise from around the world on large scale or technically challenging projects. For this project, Hatch drew upon a rail design team based in South Africa and tunnels expertise in Canada. The risks associated with this – managing coordination and documents remotely – were more than offset by the opportunities afforded in terms of access to new ideas, international best practices and truly world-class staff.

PROJECT HIGHLIGHTS

Digital Project Delivery and Model-based Design: Hatch built a state-of-the-art platform for managing, coordinating and delivering BIM models and construction drawings. The CBGU D&C Joint Venture was committed to full digital delivery of the TSD package. This aligned perfectly with Hatch's own commitment to this approach and the required design tools, and model management and verification workflows have been selected and rolled out.

A particular emphasis was placed on training design staff to ensure consistency and raise 3D competency across the project team.

Innovative Engineering iPasDM2: Hatch's document and workflow management system iPasDM2 was built and rolled out on this project to streamline work sharing amongst the Hatch workforce around the world. Built on the latest SharePoint™ and ProjectWise™ platforms and utilizing local cache servers, this system allowed Hatch to reduce the time required to produce and issue design deliverables. Subconsultants, clients and selected stakeholders were given access to parts of the iPasDM server to permit collaborative, efficient work and to ensure all referenced documents are up to date.

The set-up of this knowledge management system for Cross River Rail was state-of-the art and was designed to reduce rework and increase overall efficiency for the project. Also, it permitted near real-time tracking of progress on deliverables.

Managing risks and opportunities: Hatch understood that in projects of similar scale to CRR, the design team faces multiple challenges to deliver the Detailed Design. CRR was technically a very challenging project and required Hatch to collaborate effectively and continuously with contractors and other design consultants to manage risks and opportunities during the delivery phase. There was a rigorous and regimented external design review and approvals process that had to be managed proactively to meet program deadlines.

WESTERN SYDNEY AIRPORT METRO

CPB - GHELLA JV

LOCATION
Sydney, Australia

NAME OF CLIENT
CPB - Ghella JV

PROJECT TIMELINE
August 2022 - Design completed Jul-2023 (core scope) | Construction phase services: ongoing

PROJECT OVERVIEW

The Western Sydney Airport Metro is a new metro rail line that runs south from the existing Sydney Trains station at St. Mary's to the new Western Sydney Airport (Nancy Bird Walton Airport). The metro is being procured under four main contracts: Early Works (EW) contracts, Surface Civil & Alignment Works (SCAW), Station Boxes & Tunnels (SBT), and Stations, Systems, Trains, Operations & Maintenance (SSTOM)

The SBT is a design-and-construct (design-build) contract that includes two sections (North and South) of twin TBM-bored tunnels, with a combined length of approximately 9.8 km; 20 mined cross passages; four station boxes; two permanent service shafts (Claremont & Bringelly); the Airport Dive Structure for the south tunnels; and a temporary TBM shaft.

Midway through the detailed design, Hatch was asked to take over the design of the TBM tunnels, cross passages, dive structure and TBM shaft from another firm that had become insolvent. We assumed responsibility for completing the delivery of eleven separate design packages.

The main challenge was ensuring continuity of the design team to minimize the risk of delaying construction. We needed to quickly mobilize supplementary technical resources in Australia and Canada to both verify the existing design and to fill gaps in the design team.

In terms of technical challenges, the SBT works are mainly constructed in shale that varies quality from highly weathered to competent. There is some propensity for swelling that needed to be accounted for in the geomechanical modelling, the TBM tunnel design was otherwise straight-forward. Three different cross passage types were designed, the challenge there being to standardize reinforcement design as much as possible to facilitate fabrication and erection. Cross passage types, and the required support of the breakout of the segmental lining, were classified by anticipated rock quality.

Late in the design, a twelfth design package was added: design of the tunnel base slab upon which the follow-on SSTOM contractor would construct the track slab. This was designated "PAC3" and was designed as a plain concrete in-fill slab with provision for drainage of seepage water.

SCOPE OF WORK

+ Detailed design from Stage 3 to Authorized for Construction (AFC) for 12 design packages (see below)
+ Geomechnical modelling of underground structures using Plaxis, RS2, FLAC 3D and UnWedge
+ Geostructural modelling of the tunnel and cross passage linings using Strand7
+ Construction Phase Services (CPS) tasks to support the client's on-site construction team

PROJECT HIGHLIGHTS

+ Took over design work during the detailed design
+ Maximized continuity of design resources through negotiated secondment agreement with incumbent design firm
+ Rapid mobilization of supplementary design professionals to fill resource gaps

HATCH

Downtown Redmond Link Extension

Redmond, WA

The Downtown Redmond Link Extension is a 3.4-mile Design-Build light rail extension of the East Link corridor, connecting Redmond Town Center to Seattle.

Arcadis, as Lead Design team, collaborated with the Design-Build joint venture to provide architectural design for two light rail stations, a tail track facility, a traction power substation (TPSS), and other service facilities.

The Marymoor Village at-grade station serves as an entry point for the Marymoor Village transit-oriented development and event facilities in Marymoor Park. This station includes a proposed 1,400-stall garage adjacent to the at-grade station, with a ground-floor bus transit center creating a multi-modal hub.

The Downtown Redmond elevated station serves as the line's terminus, straddling 166th Avenue NE between NE 76th Street and the Redmond Central Connector trail. The main entrance features a glazed pavilion at the west end of the platform, with an angled façade and roof designed to act as a beacon for the station and its patrons. West of Downtown Redmond station is a tail track facility that provides temporary train storage and facilities for Sound Transit and City of Redmond operators. The tail tracks, fully screened with aesthetic perforated metal panels, create a visual 'end statement' for the line and serve as a gateway into the plaza from the regional trail and adjacent park. The plaza beneath the tail track guideway is designed as a community space, accommodating pop-up markets and events.

Client
Sound Transit

Services
Station Architecture
Stakeholder Engagement

Delivery Method
Design-Build

Scope
New Construction

Size
3.4 miles

Cost
$1.5 billion (total construction)
$62,000 (net fee final budget)
$730 million (design and construction)

Project Dates
Started: : May 2019
Completion: March 2025

Awards
Envision Platinum Award
LEED Gold

WSDOT Olympic Region Maintenance & Administration Facility

Lacey, WA

Arcadis worked with Graham Construction as a design-build team to create a new, state-of-the-art Maintenance and Administration campus for the Washington State Department of Transportation (WSDOT).

The Marvin Road site includes a 34,000 SF administration building, a 29,000 SF shops building, a 36,000 SF vehicle maintenance building, a 11,000 SF vehicle storage building, a fuel island, vehicle wash bays, and electric vehicle charging stations.

The Administration Building, which supports about 200 employees, features executive and management private offices, open office areas, staff support space, conference rooms, breakrooms, project engineering offices with locker storage and showers, mechanical, electrical, communication systems, Infrastructure systems, and backup generator system.

The Shops Building contains the materials testing lab, management private offices, crew spaces, open office areas, fabrication shops, staff support space, conference rooms, break rooms, locker storage and showers, mechanical, electrical, communication systems, IT infrastructure systems, and backup generator system.

The Vehicle Maintenance Building includes vehicle and heavy equipment repair bays, parts storage, private offices, open office areas, staff support space, conference rooms, break rooms, locker storage and showers, electrical, communication systems, IT infrastructure systems, and backup generator system.

Client
Washington State Department of Transportation (WSDOT)

Services
Master Planning
Architecture
Interior Design
Workplace Strategy
Signage & Wayfinding
Construction Administration

Delivery Method
Design-Build

Scope
New Construction

Size
110,000 sf

Cost
$48 million (construction)
$1.8 million (net fee)

Project Dates
Started: : Feb 2019
Completion: Jun 2021

Our Integrated Approach to Transit

SANDAG

Mid-Coast Corridor, Pepper Canyon and Voigt Drive Stations SAN DIEGO, CA

ZGF designed two elevated light rail transit stations as part of the Mid-Coast Corridor of the San Diego Light Rail system that runs from Old Town San Diego through the UCSD Campus. The stations create **open and inviting public spaces** with unique identities that are designed to integrate with the UCSD campus master plan through both their materials and links to **pedestrian walkways, bicycle paths**, and other at-grade transit.

The design team gave particular consideration to the “last mile problem”—when transit doesn’t take riders exactly to where they need to go—and incorporated options for transporting users from the station to their final destinations, such as electric vehicles and bike share programs. The team also incorporated **pedestrian safety measures** such as crosswalks, an aerial bridge, lighting, and integrated landscaping.

Both stations feature customized canopies to create a sense of place and shield users from the elements, while encouraging visitors to utilize the public open spaces surrounding the stations. Glass elevator hoistways provide **wayfinding beacons** for the stations within their campus context.

The Pepper Canyon station was designed to harmonize with the native canyon landscape that acts as a natural link between the main UCSD campus and student housing. The station’s multiple entries offer opportunities to interact with the canyon through protected views and connections to an adjacent rim walk.

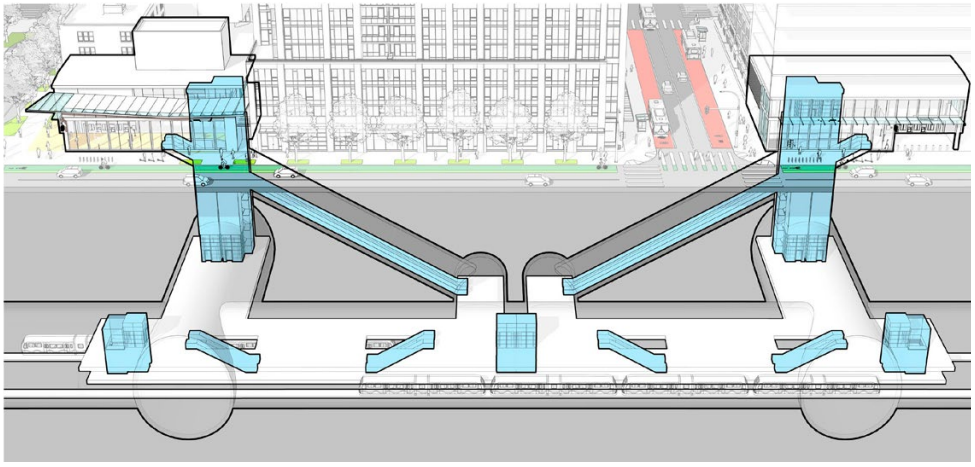
Our Integrated Approach to Transit

SOUND TRANSIT

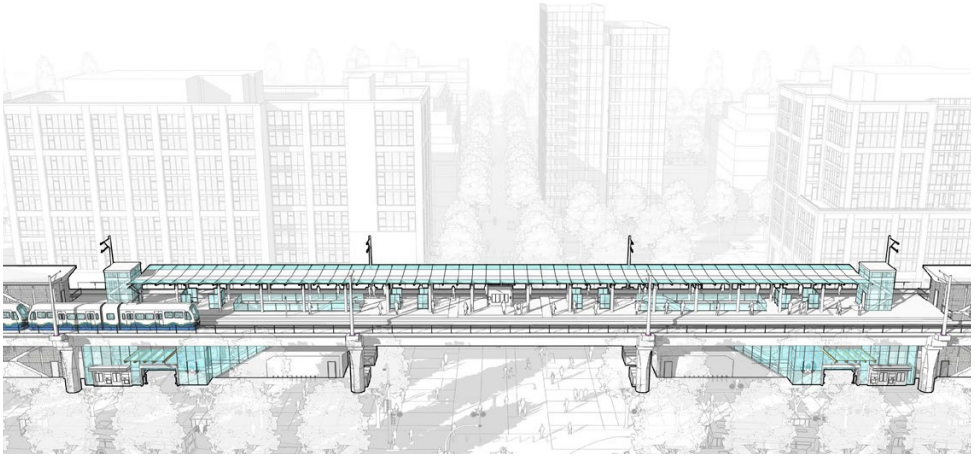
Station Experience Design Guidelines SEATTLE, WA

ZGF partnered with Sound Transit to develop a transformative guide that redefines the agency's approach from merely delivering on-time, on-budget projects to prioritizing **exceptional passenger experiences**. The content of this agency-transforming document governs all existing and future stations with chapters devoted to experience, station design, and **station environs**. The development required the coordination and refinement of contributions from multiple Sound Transit departments. ZGF produced graphics and visuals to communicate ideas, updated standards, and new guidelines that support an intuitive passenger journey.

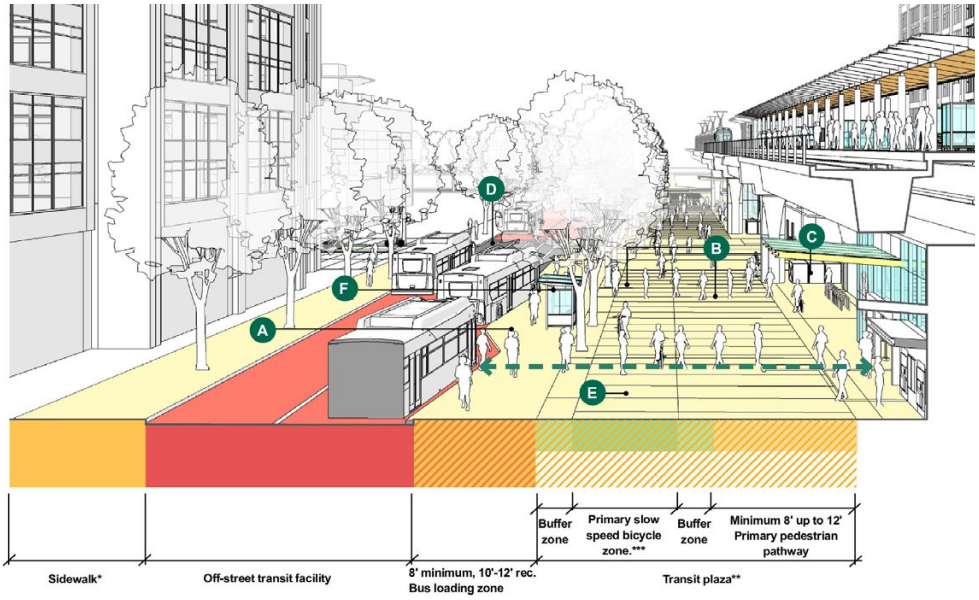
The Station Design chapter looks at **elevated, below-grade, and at-grade station types** and platform configurations; design principles including identity, navigation/wayfinding, and spatial legibility; and various station elements such as **materials, lighting, entrances, canopies, vertical circulation, and transfer concourses**. The Station Environments chapter includes definitions for both Land Use Types and Station Access and Approach Types and coordinates the overlapping guidelines for each. Additionally, it extends the thinking behind station area formation around a Sound Transit Link light rail facility into **guidelines for the Public Realm, Equitable TOD**, Parking Facilities, and Joint Development.



Vertical circulation optional layout at a below-grade station



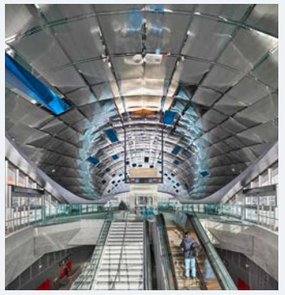
Symmetrical elevated station



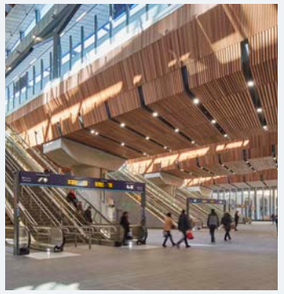
Section perspective diagram depicting characteristics of and guidelines for a multimodal station on a transit street

GRIMSHAW

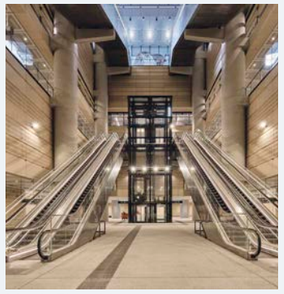
GLOBAL TRANSPORT EXPERTISE


Vaughan Metropolitan Centre Subway Station
Toronto, Canada


Dublin MetroLink
Dublin, Ireland


London Bridge Station
London, UK


La Défense Station, Grand Paris Express Line 15 West
Puteaux, France


Martin Place Metro
Sydney, Australia

We bring a depth of international experience that is directly relevant to the ambitions of Sound Transit MATOC.

Each of our projects is shaped by its specific environmental, social, cultural, operational, and stakeholder context - and our strength lies in creating integrated, design-led solutions that respond to these conditions while supporting a clear and coherent vision.

The map presented here illustrates the breadth of our global portfolio, highlighting major rail, metro, transit systems and industrial design delivered across diverse geographies, climates, and delivery environments. Our proven capability in complex, high-value infrastructure is reflected in the scale and significance of these commissions. From urban metro systems to major interchange environments, line-wide transport design strategies to urban integration, local identity and cultural authorship, our team has designed and delivered some of the most ambitious and transformative mobility projects internationally.

This experience demonstrates not only technical and design excellence, but also our ability to collaborate effectively with clients, authorities, specialist consultants, and wider stakeholders - a capability essential to shaping a unified, high-quality and contextually resonant transport experience for all.

● Grimshaw
Rail + Metro Experience

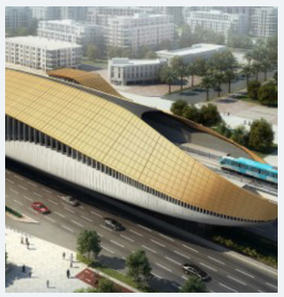

Brightline West High Speed Rail
Las Vegas & California, USA


LAX Metro Transit Center
Los Angeles, USA


Fulton Center
New York, USA


Northern Line Extension
London, UK


Elizabeth line: Line-wide design
London, UK


Dubai Red and Green Line Extension (Blue Line)
Dubai, UAE


CBD & South East Light Rail
Sydney, Australia


Auckland City Rail Link
Auckland, New Zealand

LAX Airport Metro Connector
Los Angeles, US

The LAX/Metro Transit Center Station connects Metro's C and K rail lines, closing the final gap along the K line, marking an important step forward in the city's effort to reduce car traffic at LAX and decrease reliance on more costly options such as taxis, rideshares or private vehicles.

This addition to Los Angeles' transportation network makes it easier to arrive and depart the airport and travel throughout the region using public transportation. Including a bus plaza, bus hub and customer service center, the station spans more than 1,100 feet from north to south across the 9.5-acre site and accommodates bicycle parking and vehicle drop-off. With the widest light rail platform in the Metro system, its two main levels provide a welcoming, convenient and secure connection point offering riders access to destinations throughout LA County.

Connecting the various transit options is integral to the design of the station, creating linked, safe, fluid movement of passengers. Elegant skylights, sweeping canopies, and glazed screens establish a lightweight, spacious environment that reinforces intuitive wayfinding.

This humanized journey extends to the wide above-grade concourses, which are flooded with natural light and connect to the various transit options at multiple levels. At ground level, bus bays integrate into a landscaped public plaza that nestles between the bus canopy structures, with the surrounding landscape forming a public space between canopies.

Occupying a previously industrial site, the LAX/Metro Transit Center Station is designed as an open space that leverages California's coastal climate through passive design strategies including shading by canopies, natural daylighting through skylights, and natural ventilation. Future-proofing the design, the station includes easily maintained PV panels in adjacent landscaping and infrastructure that supports future EV bus charging. The project achieved LEED Gold certification.

The public plaza, mezzanine at concourse level and other public spaces within the station provide moments of respite and comfort in this transitory environment, complemented by integrated artworks. Externally, drought-tolerant native planting increases the biodiversity of this urban, transport-oriented place.

London Bridge
London, UK

London Bridge station is the linchpin of the Thameslink Programme which links Brighton and Ashford to Cambridge, Peterborough, and Bedford through central London. The development is driven by the need to increase the number of through trains accommodated at the station and to meet the anticipated growth in passenger numbers.

In addition to the delivery of a world-class transport interchange, the scheme allows the creation of a grand new street-level concourse providing new entrances on two nearby streets. This gives the station a civic scale and a street presence appropriate for its importance, both within Southwark and London. The new and significantly larger concourse, greater in scale than the pitch at Wembley, is built at street level beneath the tracks, and becomes an integral feature of the site.

This break-through design is top-lit, ensuring that it is filled with natural light, which filters through the canopies that cover the platforms above. Upgrading three terminating platforms into through-platforms enables 18 of the 24 Thameslink services per hour to call at London Bridge, and travel onwards through the city. This renegotiation of space unlocks 80% of Thameslink's capacity by developing connections between the north and south.

The upper-level terminus concourse is provided as part of the Shard development which also creates convenient links out to the bus station and taxi rank. The terminus concourse is linked to the main street level concourse via a dramatic triple-height space, significantly improving the quality of the streetscape and passenger experience.