



Project NameCentral 70 (I-70) Managed Lanes, United States			
			
	 <p>Source: Colorado Department of Transport</p>		
Description	<p>The existing I-70, between I-25 and Chambers Road, is one of Colorado's economic backbones with 1,200 businesses, and a regional connection to Denver International Airport accommodating 200,000 vehicles per day. According to Colorado Department of Transportation, by 2040 the number of people living in the Denver metropolitan region is expected to soar to eight million people, thus making trips taken on the I-70 twice as long as they are now. The Central 70 Project involved upgrades to 10-miles of highway between Brighton Boulevard and Chambers Road, including one toll managed lane in each direction. There will be up to five lanes in each direction and there is the potential to add a further tolled lane at a future date. In addition, an existing ageing viaduct will be removed and the new highway will be constructed in a 'cut and cover' trench, which will allow for the development of a new sports area for a local school, as well as a four acre public park for the community.</p> <p>The project commenced construction in 2018 and is scheduled to be completed in 2022. Revenue risk is retained by the Owner and the payment regime is availability-based.</p>		
Location	Denver, Colorado, USA		
Owner	Colorado High Performance Transportation Enterprise (HPTE) and Colorado Department of Transport (CDOT)	Private Partner	Kiewit-Meridiam Partners, LLC (Meridiam, Kiewit Development Co.)
PPP Model	Design-build-finance-operate-maintain (DBFOM)	Operating Term	5-year construction period which includes operations and maintenance (O&M) plus a 30-year O&M period
Contract Value	USD 1.2 billion		

Project Name	Central 70 (I-70) Managed Lanes, United States
Asset Class	Transportation (Highway and Bridge)
Awards	P3 Bulletin Best Road/Bridge/Tunnel Project 2018 P3 Bulletin Best Project Financial Structure 2018
Output Specifications Development Approach Used	
<p>The design and construction requirements in the specifications take a prescriptive approach and are based on existing CDOT Standards and Specifications, which are used by CDOT on its traditional design-bid-build projects. The output specification then incorporates performance measures, which align with the CDOT Standards and Specifications and reflect the project priorities, in order to administer an availability-based payment regime. The operation and maintenance requirements take more of an output specification approach than the prescriptive approach in the design and construction requirements. Failure to comply with these output specifications is classified as a “defect” which must be remedied to the required standard by the Private Partner within a certain period of time depending on the severity of the defect.</p> <p>The Owner has made several commitments to the local community as part of the Central 70 Project and these are reflected in the output specifications. These cover a range of issues, from mitigating the impacts of construction noise and dust, to contributing funding to affordable housing and fresh food access and local business opportunities. The output specification reflects these commitments, for example, there are performance measures for local business/employment opportunities (small business, disadvantaged business enterprise, emerging small business and on-the-job training) that result in financial deductions if not achieved.</p> <p>The Private Partner is responsible for the operations and maintenance of the asset during the construction period as well as the subsequent operating term. The standard to which the asset must be maintained during construction is based on the existing condition of the asset as detailed in a baseline asset condition report (BACR) which the Private Partner must produce prior to commencement of the work. The BACR is subject to approval by CDOT.</p>	

Alignment to QI Focus Areas		Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset</p> <p>Ability of the asset to address the needs and meet the expectations of end users</p>	<p>By transferring the operations and maintenance of the existing road to the Private Partner during the construction period, the Private Partner was enabled to balance construction phasing and schedules with the need to maintain an operational asset and minimise traffic disruption. The Owner established different performance measures for the construction period and the operating period to reflect the maintenance goals (short-term maintenance vs long-term asset life). This was implemented through the Baseline Asset Condition Report (BACR) methodology described further below. By the end of the construction period the whole asset was required to meet the operating period output specifications. Large amounts of the existing asset were demolished or upgraded as part of the construction work, therefore the Owner did not want the Private Partner undertaking redundant maintenance work during construction on parts of the asset that were identified for removal.</p> <p>Operations and Maintenance During Construction</p> <p>Prior to commencing construction, the Private Partner produced a Baseline Asset Condition Report (BACR). The BACR formed the basis in determining the performance standards to which the existing asset would be maintained during construction and was translated into output specifications in the contract.</p>	<p>Financial deductions (Non-compliance Points): The performance measures are combined with a payment mechanism that assigns non-conformance points for defects to calculate financial deductions for defects. Non-compliance points are only incurred where the defect is not rectified within the remedy period.</p> <p>There are two classifications of output specification defects which have corresponding defect remedy periods depending on how significant or severe the defect is:</p> <ul style="list-style-type: none"> Category 1 Defects – which require “Immediate Action” to 	<p>Large-scale urban transportation PPP projects around the world often have to contend with the best way to transfer operations risk during construction. The risks will depend on the project and whether it is a new asset or extension or replacement of an existing asset. Typically, at a minimum, there would be a requirement to manage traffic during construction. Mechanisms have their trade-offs, for example a maximum queue length could be specified, however this requires a high level of administration. Alternatively work hours could</p>

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<p>Although the BACR was developed by the Private Partner, it was subject to Owner review. Here is an example of the measurable O&M requirements during construction and how they relate to the BACR:</p> <ul style="list-style-type: none"> “Element: Pavement - All roadways, including ramps, detours, and shoulders (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes) <ul style="list-style-type: none"> General Requirement: Smooth and quiet surface course with adequate skid resistance and free from Defects. Category 1 Defect Remedy Period: 2 hours. Category 2 Defect Remedy Period: 12 hours Measurement Criteria: a) Localized deficiencies: Physical measurement, [...] d) Instances of pavement failures: Visual Inspection of roadway surfacing, e) Edge drop-offs: Physical measurement of edge drop-off level to adjacent surface Target: Maintain or exceed condition as identified in the BACR; No instances of drop-off greater than 1.0 inch; No instances of failure, including potholes, greater than 1.0 sq-ft and 1.5 inch in depth; No instances of base failures, punch-out's and jointed concrete pavement failures; Maintained roadway (including shoulder) free from instances greater than 2". <p>Operating Period Output Specification</p> <p>The output specification requirements for the operating period require a higher standard of maintenance to maintain the longevity of the asset. It is also a new asset being maintained, so instead of referring to the BACR, industry recognised standards are used as the baseline.</p> <ul style="list-style-type: none"> Element: Pavement - All roadways, including ramps, detours, and shoulders (mainline including the bridge deck, covers, gratings, frames, expansion joints and boxes) <ul style="list-style-type: none"> General Requirement: Smooth and quiet surface course with adequate skid resistance and free from Defects. Category 1 Defect Remedy Period: 2 hours. Category 2 Defect Remedy Period: 12 months. Measurement Criteria: a) Ruts: Percentage of wheel path length with ruts greater than 0.40 inches in depth. Depth of rut at any spot location b) Ride quality: Measured International Roughness Index (IRI) calculated according to ASTM E-1926 using equipment meeting AASHTO M-328 and operated in accordance with AASHTO R-57 using equipment verified and operators certified according to AASHTO R-56. Localized roughness [...] c) Instances of Pavement Failures: Visual Inspection of roadway surface. Specific Defects are defined in Publication No. FHWA-RD-03- 	<p>address an immediate hazard, risk and/or nuisance.</p> <ul style="list-style-type: none"> Category 2 Defects – which require “Permanent Repair” which relates to rehabilitation work and has a longer response time, however must not progress to a Category 1 Defect 	<p>be limited, resulting in less disruption and lane closures, which can increase cost and impact on the schedule. Project-specific requirements should be considered during the planning phase and included in the cost estimate.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>031, Long-Term Pavement Performance Program's Distress Identification Manual.</p> <ul style="list-style-type: none"> <i>Target: 80% of project has ruts less than 0.40 inches; Not greater than 0.55 inches; Throughout 80% of maintained roadway area less than or equal to 95 inches per mile on a contiguous 1/10th mile basis; [...];No instances of failure including potholes, base failures, delamination of pavement layers, blow-ups, faulting (> 0.12"), punchouts; [...]."</i> <p>Handback and Inspections</p> <p>The Private Partner is required to handback the asset to the Owner on the expiry of the contract such that the applicable output specification for each respective part of the asset is met or exceeded; the residual life for the various elements within the asset must meet or exceed their residual life minimum requirement; all renewal work identified as needing to be performed in accordance with the most recently accepted renewal work plan has been completed; and all associated inspections have been completed to verify the asset meets the various performance requirements.</p> <p>For example, specific handback requirements for bridge decks include a prediction of deterioration due to reinforcement corrosion over time based on the various regularly scheduled mandatory bridge inspections undertaken over the course of the contract. Such inspections are undertaken by independent consultants who must be approved by the Owner.</p>		
<p>Social impacts and inclusiveness</p> <p>The project applied lessons learned identified through audits of two previous PPP projects (the US 36 P3 Project and the Eagle P3 Rail Project) to improve community engagement through project delivery. The Owner of this project aimed to reconnect communities by removing the viaducts and replacing it with a community park, and promote corridor-wide economic and community vitality. To achieve these benefits, the output specification requires the Private Partner to deliver community development programs.</p> <p><u>Community development program requirements:</u></p> <ul style="list-style-type: none"> <i>"establish a college scholarship program that will benefit students enrolled during the Construction Period as students of good-standing at Swansea Elementary school. The scholarship program shall be designed for students who go on to successfully obtain a high school degree or equivalent, and who subsequently are accepted to and enrol in a two or four year associates or bachelors degree program. The Developer may partner with a foundation or other non-profit in the management and allocation of such scholarships;</i> <i>in partnership with Swansea Elementary school, develop and/or fund a construction education curriculum for the school designed to impart math and engineering concepts relevant to the construction of the Project; and</i> 	<p>Financial deductions (Non-compliance Points): The Private Partner is required to develop plans that detail how the work will be delivered in compliance with the output specifications. They are then required to implement the works in accordance with the plans. Failure to do so would result in a Non-compliance Event (with associated Non-compliance Points). For example, the Non-compliance Event for communications does not specifically mention the requirement for the "Spanish/English bilingual Community Liaison", however the Communications Plan is specifically mentioned and the "Community Liaison" requirement is included in this plan. Therefore this requirement is captured in the following non-compliance event:</p>	<p>The National Environmental Policy Act (NEPA) in the United States typically requires a comprehensive assessment of the project development be conducted with respect to its environmental and social impact on the local community. This also can include a public engagement exercise which can result in particularly prescriptive commitments being generated which need to be adhered to. This is not always the case and will largely depend on the location and scale of the project.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis											
<ul style="list-style-type: none">establish any other programs that it considers appropriate for the purposes of achieving the community development objective referred to above in relation to such neighbourhoods.” <p>In addition, the Private Partner shall “provide a full-time Spanish/English bilingual Community Liaison with experience in and knowledge of the Swansea-Elyria neighborhoods [...] and be responsible throughout the CC Term for ensuring that local residents, businesses and non-profit groups are informed about the Project and have a single point of contact for all questions and concerns.”</p>	<ul style="list-style-type: none">“Prepare, maintain and implement the Construction Period Communications Plan (the requirements for which are detailed in Section 5 of Schedule 14 (Strategic Communications) or the Crisis Communications Plan (the requirements for which are detailed in Section 7 of Schedule 14 (Strategic Communications)).”												
<p>Job creation, capacity building and transfer of knowledge and expertise</p>	<p>As part of the community development program (refer to ‘Social impacts and inclusiveness’), the Private Partner is required to “establish an organized program to assist businesses in taking advantage of the significant business opportunity provided by the local workforce during the Construction Period.” This is in part due to the lessons learned from previous projects, and the need to improve community engagement.</p> <ul style="list-style-type: none"><u>Community development program:</u> The program includes “a commitment to work with restaurants, food vendors and catering businesses that are located within such neighbourhoods and are likely to be impacted by the Construction Work. (The) program may include the following elements:Business investment revolving loans and/or grant programs;Property access agreements for food carts and food trucks;Coupon programs;Advertisements; and/orPartnerships with food-access non-profits.” <p>The State of Colorado also wanted to use the project to improve job opportunities in the area, which historically has had low-income levels and high unemployment. To achieve this, the Owner specified measurable local business targets for both the construction and operations phases.</p> <ul style="list-style-type: none"><u>Local business targets:</u> The percentages identified in the table below are a percentage of the total value of the work associated with the project under the particular Work Category. <table><tr><th>Work Category</th><th>Disadvantaged Business Enterprise</th><th>Emerging Small Business</th><th>On-the-Job-Training</th><th>Local Hiring</th></tr><tr><td colspan="5">Construction Period</td></tr></table>	Work Category	Disadvantaged Business Enterprise	Emerging Small Business	On-the-Job-Training	Local Hiring	Construction Period					<p>Financial deductions: The Private Partner is exposed to financial deductions if the local business targets are not met. The deductions are calculated per Work Category and are different for the construction period and operating term to reflect the relative value of the opportunity lost. During the operating period, the deduction refers to an independent source of labour rates to determine the value of the deduction.</p> <p><u>Construction Period</u></p> <ul style="list-style-type: none">Failure to Achieve Construction Work Small Business Goals “Relevant Construction Work Small Business Goal Percentage less Actual Percentage of Relevant Participation Achieved) x (Total Dollar Value of, as applicable to the relevant goal [...]”Failure to Achieve Construction Period On-The-Job-Training (OJT) Goal deduction = (Construction Period OJT Goal less Actual OJT Employment Hours on Other Construction Work during the Construction Period) x \$28.50 <p><u>Operating Term</u></p>	<p>Quantifiable performance measures are the typical way for projects with job creation objectives to align the Owner and Private Partner priorities. There are similarities in approach between this project and the Gautrain Rapid Rail Link project case study, found below. Good practice is to include requirements for both the construction and operating term.</p>
Work Category	Disadvantaged Business Enterprise	Emerging Small Business	On-the-Job-Training	Local Hiring									
Construction Period													

Alignment to QI Focus Areas						Mechanisms used to achieve QI alignment	Market Comparison Analysis
	Design Services	11.6%	3%	N/A	760,000 total employment hours with 380,000 employment hours performed by new hires	<ul style="list-style-type: none">Failure to Achieve Routine O&M Work Emerging Small Business (ESB) GoalFailure to Achieve Renewal Work Disadvantaged Business Enterprise (DBE) GoalFailure to Achieve Renewal Work OJT Goal = <i>(Renewal Work OJT Goal less Actual OJT Employment Hours on Renewal Work during applicable Contract Year) x ((the then-current <u>Davis-Bacon Minimum Wage</u> (Basic Hourly Wage + Fringe Benefit) for a "Power Equipment Operator, Backhoe/Loader combination" in Denver County)))</i>	
	Other Construction Work	12.5%	3%	200,000 employment hours			
	Routine O&M Work	N/A		N/A			
	Operating Period						
	Routine O&M Work	N/A	\$[.] (indexed) for each five Contract Year period	N/A	N/A		
	Renewal Work	% to be established for each five Contract Year period	N/A	Number of employment hours to be established	N/A		
Ability of the asset to respond to changes in resource availability, population levels, demographics and disruptive technology	<p>During the planning phase, the Owner recognised that the requirements, and what is considered good practice, will likely change over the operating term. There is a mechanism in the contract for either the Private Partner or Owner to propose changes to the performance requirements.</p> <ul style="list-style-type: none"><u>Updates to the performance requirements:</u><ul style="list-style-type: none">“Developer may submit to the Department for Approval proposed updates, if any, to the Performance and Measurement Table no later than 90 Calendar Days before the then anticipated Substantial Completion Date to reflect Good Industry Practice and specific attributes of Developer's final plan set (for example, where the final plan set incorporates a feature that is not included as an Element in such Performance and Measurement Table). Developer may thereafter submit to Department for Approval any proposed updates no later than 60 Calendar Days before the start of each subsequent Contract Year to reflect Good Industry Practice.The Department shall be entitled at any time to require Developer to adopt amendments to any of the Performance Requirements in such Performance and Measurement Table where such amendments are required to comply with then-current Good Industry Practice and under the following conditions:<ul style="list-style-type: none">the measurement scale associated with the original Measurement Criteria is superseded and no longer complies with Good Industry Practice; and					<p>There is no performance measure associated with this requirement. However, the contractual process is time-bound and specifies when and how often (no later than 60 days before the end of the contract year) the changes can be considered.</p>	<p>Incorporating a mechanism to review and update the performance requirements over the operating term is good practice. The first review is typically done during the operational readiness phase where the requirements are updated to reflect the constructed asset, then updates are typically done annually or because of a change.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
	<ul style="list-style-type: none">the new Target shall be determined using the principle that compliance with the new Target shall achieve the same standard of performance, frequency of O&M Work and User satisfaction as would have been achieved through Developer's compliance with the original Measurement Criteria and Target."	

Project Name		Presidio Parkway, United States	
Description	<p>The Presidio Parkway project is a replacement of Doyle Drive, a 1.6-mile segment of Route 101 in San Francisco that is the southern access to the Golden Gate Bridge. The road connects Marin County on the north with San Francisco County on the south and provides a major regional traffic link between the peninsula and North Bay Area counties. Originally built in 1936, the asset no longer met highway standards and was seismically deficient. Thus, the replacement was not only critical for seismic and public safety, but also provided an opportunity for major design improvements. The Presidio Parkway is a six-lane facility with a southbound auxiliary lane between the Presidio Park Interchange and the new Presidio access at Girard Road.</p> <p>The project was developed in two phases. California Department of Transportation (or “Caltrans”) is responsible for the design, financing, and construction of Phase I, which was delivered through a traditional design-bid-build process. Through a competitive procurement process, Caltrans selected a private consortium, the Golden Link Concessionaire, to deliver Phase II as a design, build, finance, operate, and maintain availability-payment concession. This case study focuses on the Phase II project only.</p> <p>Construction of Phase 1 began in late 2009 and was completed in 2012. In April of 2012, traffic was shifted onto a seismically-safe temporary bypass that carried traffic until the final roadway was opened on July 12, 2015. Construction activity continued through 2017 and included the removal of the temporary bypass, reconstructing Halleck Street, covering the tunnels and landscaping.</p> <p>Particular features of the project:</p> <ul style="list-style-type: none">• California's first PPP transaction under its new (2009) legislation;• California's first availability payment contract for transportation infrastructure;• First U.S. project with direct Federal-aid participation in availability payments;• First Transportation Infrastructure Finance and Innovation Act (TIFIA) loan to be repaid in part with a milestone payment following substantial completion;• Incorporation of numerous Context Sensitive Design features to minimize traffic impacts and to protect and enhance environmental and cultural resources.		
Location	San Francisco, California, USA		
Owner	California Department of Transportation (Caltrans) and the San Francisco County Transportation Authority (SFCTA)	Private Partner	Golden Link Partners, LLC (GLP) (Hochtief PPP Solutions North America, Meridiam Infrastructure, Flatiron West, Inc., Kiewit Infrastructure West, Co.)
PPP Model	Design-build-finance-operate-maintain (DBFOM)	Operating Term	30 years
Contract value	USD 856.6 million (Phase I of USD 496.3 million and Phase II of USD 360.3 million)		
Asset Class	Transportation (Highways)		
Awards ⁱ	<p>Geotechnical Project of the Year Award 2011, and Outstanding Structural Engineering Project of the Year Award 2015, American Society of Civil Engineers San Francisco Section</p> <p>P3 Project of the Year 2012, American Roads and Transportation Builder Association</p> <p>Structural Project of the Year 2013, 24th Annual California Transportation Foundation Transportation Awards</p> <p>Infrastructure Project Award 2016, National Council for Public-Private Partnership (NCPPP)</p>		
Output Specifications Development Approach Used			
<p>This case study focuses on the seismic performance requirements to compliment the content of the Central 70 project case study.</p> <p>The output specification adopts industry and Owner standards, and project specific requirements, to define design requirements. The output specification defines a performance-based design approach for the seismic design of the structures. Performance is based on two levels: Safety and Functionality, (referred to as the Safety Evaluation Earthquake or ‘SEE’ and the Functionality Evaluation Earthquake or ‘FEE’), corresponding to the ‘upper’ and ‘lower’ level earthquake events.</p>			

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Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Ability of the asset to withstand natural and other disasters, including climate change</p> <p>The seismic requirements in the output specification refer to location-specific industry standards. By adopting a performance-based design approach, the Private Partner has the flexibility to design a solution that best mitigates the risk. The output specification requirements are informed by:</p> <ul style="list-style-type: none"> • <u>Industry requirements</u>: American Association of State Highway and Transportation Officials Load and Resistance Factor Design (AASHTO-LRFD) Standard; • <u>Owner requirements</u>: Caltrans Seismic Design Criteriaⁱⁱ (SDC); and • <u>Project requirements</u>: detailed below. <p>The output specification describes the required level of performance, depending on the defined seismic event. The general seismic performance parameters are:</p> <ul style="list-style-type: none"> • <u>Serviceable Performance</u> after a seismic event requires immediate full traffic access after a short period of inspection or minor repairs. A maximum delay of seventy-two (72) hours is permitted. See Functionality Evaluation Earthquake (FEE) performance level below; • <u>Repairable Performance</u> after a seismic event requires limited immediate access for emergency vehicles, with only repairable damage. The asset shall be repaired within seven days to full capacity. "Repairable Damage" can be defined as allowing moderate inelastic response to occur. Concrete cracking, reinforcement yield, and spalling of cover concrete is expected at this level of inelastic response. The extent of damage should be sufficiently limited to permit restoration of the structure to essentially the pre-earthquake condition without replacement of any portion of the structures. See FEE performance level below; and • <u>No-Collapse Performance</u> three days after the seismic event, the structure shall be stable for public safety in accordance with ductility demand and capacity values documented in the SDC. See Safety Evaluation Earthquake (SEE) performance level below. <p>There are two levels of seismic event:</p> <ul style="list-style-type: none"> • <u>Functionality Evaluation Earthquake (FEE)</u>: Damage is repairable and the asset and return to service, with or without traffic restrictions. Immediate access to emergency vehicles following inspection. • <u>Safety Evaluation Earthquake (SEE)</u>: Although there may be significant damage, there is no-collapse and life safety assured. Limited service post event. 	<p>Management plans</p> <p>The Private Partner is required to design and construct the project in accordance with their Project Management Plan. The Project Management Plan includes a Quality Management Plan, which is required to be approved by the Owner, which documents the systems and processes to manage the quality of the project scope. The plan details the process for the Private Partner to submit design packages to the Owner for review and approval. In addition, the Owner shall have the right to perform oversight and auditing of the work to determine that it is performed in accordance with the contract documents. The intent of these measures is to monitor and manage the risk throughout design development, when changes are easy to make, rather than waiting until completion inspections to identify non-compliances.</p> <p>Seismic event deductible</p> <p>The Private Partner is responsible for the first USD10,000,000 of extra work and delay costs (in aggregate during the project term) incurred to repair or replace tangible property damage caused by seismic events. All uninsured costs above this will be borne by the Owner. By sharing the risk the Private Partner is incentivised to develop a design that mitigates repairs for a minor (and more likely) event.</p> <p>A seismic event would be considered a Force Majeure Event and thereby a Permitted Closure which would not be subject to an Unavailability Deduction. Typically, it would be a combination of the Owner, third parties (police) and the Private Partner working together to close the road. It would then depend on the reason for the closure as to whether the Private Partner would be eligible for relief.</p>	<p>Performance-based design is a common approach across sectors (for example, refer to the John Hart Generating Station case study in the Energy Case Study section).</p> <p>The 'seismic event deductible' (or similar) is also a common way of sharing the seismic risk. The value of the threshold depends on the project value.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
	<p>Per the guidelines adopted by the Owner and the return period risk determined for the project, site-specific hazard analyses shall be performed to establish the design response spectra and ground motions for the FEE and SEE as follows:</p> <ul style="list-style-type: none">• <u>Functionality Evaluation Earthquake (FEE)</u> – The lower level event to be used for the design shall be based on a probabilistic hazard acceleration response spectrum (ARS) for an event with a mean return period of one hundred and eight (108) years (i.e., 50% probability of exceedance in seventy-five years); and• <u>Safety Evaluation Earthquake (SEE)</u> – The upper level event to be used for the design shall be based on the ARS derived from the envelope of the median (50th percentile) deterministic Maximum Credible Earthquake (MCE) ARS and a probabilistic hazard ARS for an event with a mean return period of one thousand years (i.e., 7.5% probability of exceedance in seventy-five years). <p>The output specification also considered the required level of performance during construction. Seismic performance requirements of structures under construction shall meet the SDC requirements for temporary bridges or bridges under temporary conditions carrying public vehicular traffic. The Owner also has existing requirements for temporary structures ('Division of Engineering Services (DES) Memo to Designer 20-12 Site Seismicity for Existing and Temporary Bridges carrying Public Vehicular Traffic').</p>	

Project Name Gautrain Rapid Rail Link, South Africa

Source: South African Tourism

Description

The Gautrain is a dedicated medium to high-speed rail transport service linking the cities of Johannesburg Tshwane and the International Airport at OR Tambo in South Africa. There are two main routes on the system: a north-south line from Hatfield to Park Station and an east-west line from Sandton Station (via Marlboro) to Johannesburg International Airport. The transport system operates from 10 stations along 80 kilometres (km) of rail and the service operates at a top speed of 160km/hr.

The project was conceptualised to essentially reduce the dependency on private vehicles, create a safe dedicated public transport service and therefore reduce congestion on the main corridors in Gauteng. The service was not intended as a low-income commuter service but rather an alternative means of business travel to private vehicle usage to achieve the project's three main objectives:

- **Stimulate:** economic growth; investment; new development; job creation.
- **Promote:** public transport; small, medium and micro enterprises (SMME) and broad-based black economic empowerment (BBBEE) development; tourism; business development.
- **Design to:** reduce travel distances, time and cost; restructure urban areas; improve city sustainability.

Construction started in 2006 with works taking place on both routes with the aim of commercial services starting in 2011. Gautrain started operations between Or Tambo International Airport and Sandton in June 2010 and between Rosebank station in Johannesburg and Hatfield in August 2011.

This PPP is run through the Bombela Consortium (the "Private Partner") which has held a 19.5-year concession (including construction) since 2006. This project is a design-build-finance-operate-maintain (DBFOM) project in accordance with the regulations prescribed by South African Public Finance Management Act Regulations (TR 16). The scope also included the supply of rolling stock. The Owner retained most of the demand risk by guaranteeing

Project Name	Gautrain Rapid Rail Link, South Africa		
	a minimum ridership, and the Private Partner was required to provide a service that was on time and to specified headways (time between trains, 10 minutes during peak hours and 20 minutes in the off-peak periods), while taking some demand risk.		
Location	Gauteng Province, South Africa		
Owner	Gautrain Management Agency (GMA)	Private Partner	Bombela Consortium (Bombardier, Bouygues Travaux Publics, Murray & Roberts, Strategic Partners Group)
PPP Model	Design-build-finance-operate-maintain (DBFOM)	Operating Term	15-years
Contract Value	ZAR 25.4 billion / USD 1.8 billion ⁱⁱⁱ		
Asset Class	Transportation (Rapid Rail Passenger System)		
Awards	<p>This is a list of some of the project Awards achieved:</p> <ul style="list-style-type: none">• Best Global Project to Sign – PPFA Awards in 2008 (London)• 2007 SAICE Photographic Award (South Africa)• 2007 International Association for Public Transport – UITP Youth Project Award• SAACE Glenrand MIB Excellence Award• 2007 IABC Gold Quill Award• 2008 Bentley Empowered Award• 2008 PRISA PRISM Award• 2010 Media Liaison Officer of the Year Award• 2011 CineRail Award (Paris)• 2018 Internal Audit Award• 2018 Africa Silver Quill• 2019 Africa Gold Quill		
Output Specification Development Approach Used			

The project was the first South African transportation PPP to use the South African National Treasury guidance on output specification development. There were limited reference specifications to use as a basis for the output specification, so the Owner used the South African National Treasury guidance and guidance from the United Kingdom (UK) on the principles for developing an output specification, to develop the output specification from first principles.

The output specification evolved throughout the procurement process. Updates were made after the submission of the request for qualifications, request for proposal, and the best and final offer processes and ultimately the preferred bidder stage to incorporate private sector knowledge and to develop a bankable project. The main components of the output specification are the design and construction requirements, the system service requirements and the socio-economic development (SED) obligations.

Alignment to QI Focus Areas	Mechanisms to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset.</p> <p>Ability of the asset to address the needs and meet the expectations of end-users</p>	<p>Contract breach and deductions</p> <p>Non-reporting, non-compliance and under performance result in a breach of the Concession Agreement. The Owner requires annual reliance statements to support the invoices being raised by the Concessionaire. The Owner also audits both the MIS and the asset reporting system. The Private Partner is then required to close out audit findings. There are deductions that are calculated from the overall Patronage Guarantee (component of the payment that is at risk of deductions) provided by the Owner which is calculated across all of the specifications and performance targets set through the concession agreement</p>	<p>Typical performance metrics include on-time performance (in compliance with a schedule), trip completion (train stops at all stations, and the stations are accessible and safe to use) and ride quality (such as noise and vibration).</p>
<p>End users expect a comfortable, efficient and reliable service. The Gautrain connects to a bus network with approximately 26 bus routes and effective mode integration is required to promote ridership. On-time performance of trains is a key component of this. The Owner also requires the Private Partner to maintain an asset that supports the on-time performance of trains and meets the handback requirements in 20 years. The Owner achieves this by linking payment with train performance and requires measurement and monitoring systems to track performance and asset condition.</p> <p>Measurement and monitoring systems</p> <p>The Management Information System (MIS) is the basis for collecting and collating information on the Private Partner's performance and is self-reported. It is used to determine if deductions should be applied and whether the patronage guarantee limit has been met. The MIS includes information on ridership and financial performance; performance surveys; service performance; and asset management and maintenance.</p> <ul style="list-style-type: none"> • <u>Ridership and passenger experience:</u> <ul style="list-style-type: none"> – Rail ticket sales and patronage report. – Route and trip usage reports. – Reconciliation of booking office machine reports. – Monthly passenger flows. – Trip details and statistics. – Monthly and annual origin-destination matrix of all passenger trips. – Service delivery reports. – Equipment performance reports. – General financial reports. • <u>Service performance:</u> <ul style="list-style-type: none"> – Monthly train operating reports. – Overcrowding report (utilisation during the peak hour shall not exceed the overcrowding threshold by more than 5%). – Continuous monitoring of the system and achievements against the timetable. • <u>Performance surveys:</u> <ul style="list-style-type: none"> – Annual, independent revenue collection survey. – Independent passenger satisfaction surveys. • <u>Asset management and maintenance:</u> 		

Alignment to QI Focus Areas	Mechanisms to achieve QI alignment	Market Comparison Analysis
	<ul style="list-style-type: none"> Annual maintenance, repair and replace report for each asset class and includes conditional assessments, activities carried out, complaints and completed replacements. Annual state of the assets report to manage the condition of the asset once in preparation for handback. 	
Health and safety considerations during both construction and operation of the asset	<p>Although the responsibility for health and safety is transferred to the Private Partner, the Owner takes a proactive interest in monitoring health and safety performance and the implementation of the health and safety management systems. The Private Partner is responsible for health, safety and security during construction and operations.</p> <p>A Safety Management Plan is required to reflect good industry practice. The Private Partner is then required to report on performance against the management plan. The scope of the Safety Management Plan includes <i>"Infrastructure, Facilities, and services for the system shall be provided and operated to ensure sufficient safety and security with respect to:</i></p> <ul style="list-style-type: none"> <i>Passengers and personnel</i> <i>Buildings, facilities and amenities within the specified station precincts</i> <i>Trains and the movements of Train sets</i> <i>Vehicles used for the provision of dedicated feeder and distribution services</i> <i>Cars parked in the parking areas of the specified stations "</i> 	<p>Breach in contract</p> <p>Non-compliance results in a breach in the Concession Agreement. Although a contract breach does not have a financial penalty, it carries the risk of termination, which would have a financial impact.</p> <p>It is typical for Owners to prioritise health and safety planning and performance monitoring. Safety management plans are typically required to be in place within a defined period (depends on the project schedule) after contract signing, and prior to construction commencing. Safety plans are typically subject to Owner review. Performance measures typically link poor health and safety performance to contract default.</p>
Job creation, capacity building, transfer of knowledge and expertise	<p>Socio-economic development (SED) was a main objective of the project. The GMA developed a SED strategy, which identified 22 elements, with targets, for the project and developed a specific schedule to document the requirements. To achieve the targets in the strategy, the Owner used the output specification to align their priorities with the Private Partner's priorities. To do this, measurable requirements were included in the specification and independent reviews were required to determine if the objectives had been achieved.</p> <ul style="list-style-type: none"> <u>SED requirements:</u> The SED objectives included jobs created by the project during construction, and jobs created to operate and maintain the asset of the 15-year concession period. Of the 22 SED targets, nine required contributions from the Private Partner to 	<p>Penalty and reward regime</p> <p>The Owner identified the need for a contractually sound penalty and reward regime to promote the Private Partner to meet, or preferably exceed, the SED requirements. The penalty and reward regime is administered quarterly. Penalties are imposed should the set targets not be met but there is also a benefit should these targets be exceeded. The Private Partner's payment from the Owner was deducted if the SED obligation target was not achieved. If the SED target was</p> <p>Jointly appointing an independent party to administer a contract requirement is a common way to limit disputes. Other instances where an independent party may be engaged include: payment certification during construction, completion and commissioning, asset inspections during the operating period, and asset inspections at handback.</p>


Alignment to QI Focus Areas	Mechanisms to achieve QI alignment	Market Comparison Analysis
<p>be achieved. These targets can be broadly categorised and measured as follows:</p> <ul style="list-style-type: none"> – Job Creation – employment of local people; targets measured in person months. – Capacity Building – BBEEE procurement and subcontracting opportunities; targets specified by project phase and measured in Rand. – Transfer of Knowledge – BBEEE staff secondment opportunities, targets specified by project phase and measured in person months. <p>The SED objectives are a good example of how the project objectives influence the output specification requirements. The output specification requirements are performance based with clearly defined (capitalised terms are defined in the project agreement) and measurable targets. For example</p> <ul style="list-style-type: none"> – <i>Employment of Local People: 3,510 person months during the operating term.</i> <ul style="list-style-type: none"> • <u>Reporting and independent review of SED requirements:</u> The Owner required the Private Partner to implement a comprehensive monitoring process to the report progress and performance against the SED targets. The two main components were: <ul style="list-style-type: none"> – Monthly self-reporting; and – Independent review of results by an Independent Socio-Economic Monitor (ISEM). <p>The ISEM is jointly appointed by the Owner and the Private Partner and is intended to streamline the review process by avoiding disagreements on the SED target performance. The Private Partner is required to develop and submit a monthly report, which is then submitted to the ISEM for review and verification. This approach also minimises the Owner's resource requirements to effectively manage the contract.</p> <p>Although the penalty and reward regime is administered quarterly, monthly reporting allows trends to be identified and an early response to poor performance, benefiting both the Owner and the Private Partner. The monthly SED report not only provides performance against the target, it also identifies positive developments, areas of concern, challenges and interventions introduced and forms the basis of continuous improvement exercises.</p>	<p>exceeded, then the Private Partner received performance credits that could be allocated against future target short-falls.</p> <p>The penalty and reward regime was successfully implemented as the targets were exceeded. For example, 34,800 local jobs created during construction which exceed the target of 16,800 and R3,590m was procured from BEE and SMME suppliers which exceed the target of R1920m.</p>	

Project Name	Melbourne Metro Rail Tunnel, Australia
	
Description	<p>With the target of freeing up space in the city loop to run more trains to and from the suburbs with a less crowded and more reliable train network, Rail Projects Victoria (RPV) (established by the State government) took charge of the Metro Tunnel project. The project includes the construction of twin 9-kilometre rail tunnels with five new underground stations. The project will allow for the operational separation of various existing lines and increase the capacity of the rail network to metro-style frequencies. The project is part of the Public Transport Victoria (PTV) Network Development Plan.</p> <p>Some of Melbourne's busiest metropolitan train lines – Sunbury, Cranbourne and Pakenham – will run exclusively through the new tunnel. By taking these lines out of the City Loop, other lines will be able to run more services. As a result, capacity will be created on the network to enable 504,000 more passengers to use the rail system during each peak period. The Metro Tunnel is the first step towards a 'metro style' rail network for Melbourne with the 'turn up and go' train services that are the hallmark of the world's great cities such as London, New York, Hong Kong and Singapore, and the largest investment in Melbourne's CBD rail capacity since the City Loop was completed 30 years ago. The project comprises of:</p> <ul style="list-style-type: none">• twin nine-kilometre rail tunnels from the west of the city to the south-east as part of a new Sunbury to Cranbourne/Pakenham line;• new underground stations at Arden, Parkville, Domain and two new CBD stations directly connected to the City Loop at Flinders Street and Melbourne Central stations;• train/tram interchange at Domain;• high capacity signalling to maximise the efficiency of the new fleet of High Capacity Metro Trains;• wider network enhancements with a range of works, including infrastructure to facilitate access to sidings^{iv}, train turn backs, signalling headway improvements, other works to support service frequency across the existing network, and some changes to the operation of the tram network. <p>There are four major works packages associated with the project:</p> <ol style="list-style-type: none">1. an Early Works Managing Contractor arrangement, which includes utility service relocations and works to prepare construction sites;

Project Name	Melbourne Metro Rail Tunnel, Australia		
	<div><div><div><div>2.</div><div>the Tunnel and Stations PPP, which includes the design and construction of the twin nine-kilometre tunnels under the CBD, five underground stations and certain maintenance services;</div></div><div><div>3.</div><div>the Rail Systems Alliance (RSA), which includes design (including conventional signalling, high capacity signalling, train and power control systems and operational control systems), installation works, rail systems integration and commissioning along the Metro Tunnel Project alignment; and</div></div><div><div>4.</div><div>the Rail Infrastructure Alliance (RIA), which includes works at the eastern and western portals, including cut and cover tunnelling, decline structures, turnbacks and local reconfiguration and realignment of existing lines.</div></div></div><div>Early enabling works commenced in late 2016. In late 2017, sections of the Melbourne central business district, including City Square and parts of Swanston Street, were closed to enable construction of the tunnel and stations. The project was originally expected to be completed in 2026, but has now been revised to late 2025.</div></div>		
Location	Melbourne - Australia		
Owner	Rail Projects Victoria (RPV) (previously named Melbourne Metro Rail Authority)	Private Partner	Cross Yarra Partnership (Lendlease Engineering, John Holland, Bouygues Construction and Capella Capital)
PPP Model	Design-build-finance-maintain (DBFM)	Operating Term	25 years
Contract Value	AUD 11 billion		
Asset Class	Transport (Urban Rail)		
Output Specifications Development Approach Used			
<p>Prior to proceeding with procurement, the Owner developed a detailed reference design to provide certainty to the bidders that a solution was achievable. The reference design was then translated into the output specification for the Tunnel and Station Public-Private Partnership (PPP) project.</p> <p>Scheme development was mature and included the preparation of a detailed reference design to provide certainty to bidders. The output specification^v included the main tunnelling works, five underground stations, station fit-out, mechanical and electrical systems and specific maintenance services for the infrastructure delivered by the package, and commercial opportunities at the new stations.</p> <p>The output specification section structure is consistent the structure of documents from other jurisdiction and sectors:</p> <ul style="list-style-type: none">• Vision: Scheme objectives and Authority requirements• Management: General management requirements including quality, environment, sustainability, monitoring• Protocols and procedures: implementation requirements including design life, implementation plan, design standards, design management, communication, code of construction practice, testing and communication, documentation• Technical Requirements (systems, buildings and structures, stations, tunnels, urban design)• Operation and maintenance requirements• Interface management: support to other contract packages• Customer feedback• Traffic management during construction• Environment• Sustainability and climate change			

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset</p> <p>Ability of the asset to meet the needs of end users</p>	<p>Performance requirements align with end user expectations and include: quality of service; customer service; accessibility and interchange; design quality; safety and security; environment and sustainability; and 'good neighbour'.</p> <ul style="list-style-type: none"> • Good neighbour was given emphasis given the potential scale of construction disruption in Melbourne CBD. One aspect was additional safeguards for the public (safe walking routes) and collision avoidance and mitigation measures applied to construction vehicles. • Designs included specific requirements to demonstrate achievement of minimum standards for passenger circulation / capacity through level of service thresholds. <p>The preferred bidder's proposal become part of the output specification, to capture proposed solutions (above minimum requirements) that were used to win the project.</p> <p>For example, the proposed solution included reduction in embedded carbon and a commitment to source at least 20% of energy requirements from sustainable power sources. Other indicators included a 45% reduction in embedded carbon and a 24% reduction in material lifecycle impacts, rainwater capture, LED, solar and use of natural daylighting.</p> <p>The project was required to achieve Green Star and Infrastructure Sustainability Council of Australia (ISCA) ratings. To achieve these ratings, comprehensive sustainability assessments were required. The Owner evaluated the bidder's sustainability assessments to assess whether an ISCA score of over 84 (out of 110) and a 5 Star Green Star rating was achievable.</p>	<p>Bidder proposals became project requirements: The output specification was updated to include proposed solutions from bid stage that exceeded the minimum requirements. The overall project compliance regime (design reviews and completion process) can be used to deliver expected outcomes.</p> <p>Customer surveys: Monthly and annual customer surveys are required including:</p> <ul style="list-style-type: none"> • service reliability and performance; • customer information; • cleanliness and repair; • information provided during disruption; • customer interface; • ease of buying a ticket/ ticketing options; • comments and complaints handling; • security (personal security and Park and Ride security); • use of help point equipment; • comfort; • accessibility and interchange; • customer feedback; • overall satisfaction; and • network extensions. <p>The customer surveys are not specifically subject to financial deductions, however the Private Partner is required to self-monitor performance in accordance with the agreed Performance Monitoring Plan (which is subject to quality failures).</p>
<p>Ability of the asset to withstand natural and other disasters, including climate change</p>	<p>The output specification includes climate resilience requirements that respond to location specific risks. The Private Partner is responsible for delivering a design that <i>"must include measures for all high and extreme climate change risks to ensure the infrastructure, Stations and precincts are resilient to the projected impacts of a changing climate over the relevant asset's Design Life."</i> The Owner has identified and documented projections and scenarios in a <i>Climate Change Risk Assessment and Climate Change Adaptation Plan</i>.</p>	<p>Design Report: The Private Partner is required to produce a Sustainable Design Report at each stage of design that <i>"demonstrates that climate change mitigation and adaptation measures or changes have been implemented in design"</i>.</p> <p>The extent of the climate resilience requirements on the Melbourne Metro Rail Transit project are significantly more detailed than the other case studies. Best practice is constantly evolving, and as regional governments take increasing leadership to identify and respond to the climate change risks, asset owners will</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis	
		be further enabled to identify project specific risks.	
Social impacts and inclusiveness	<p>The output specification refers to the standards and codes to define the access and accessibility requirements for mobility impaired people. There is also a requirement for the inclusion of cultural and community identity infrastructure (CCII). CCII requirements include:</p> <ul style="list-style-type: none">“Stations and public realm must incorporate cultural and community identity infrastructure and enhancements in the public realm that are tailored to the needs of each local area; are coordinated with local public arts programmes; and offer meaningful additions to the precinct.”	<p>Standards and certifications: Compliance with the Disability Discrimination Act (DDA) is required. An Infrastructure Sustainability Council of Australia (ISCA) rating is also required, and the requirements specify the credits for social impacts and inclusiveness: “Achieve a minimum of Level 2 for each of the ISCA Community Health, Wellbeing and Safety Credits and the ISCA Stakeholder Participation Credits</p> <p>Financial deductions: The minimum service requirements also reflect the importance of accessibility. A failure that affects the lifts or escalators (and which is not considered a risk to health and safety) shall be considered a ‘Level B’ failure; the second highest level after health and safety. The level of failure is linked to the value of the potential financial deductions. The failure level also informs the time in which the Private Partner has to respond (in this case 15 to 30 minutes, depending on the time of day).</p>	Refer to the Mersin Integrated Health Campus and the Pan Am Games Athletes’ Village case studies in the Built Environment Section for other examples where codes and standards have been used to define minimum accessibility requirements.
Environmental impacts	<p>Prior to procurement the Owner developed the Living Infrastructure Plan^{vi} for the Metro Tunnel which “sets out design, implementation and applied learning solutions to help ensure the project results in healthy, resilient and biodiverse green urban landscapes to support the future liveability of Melbourne.” The development of the plan included stakeholder engagement and enabled the Owner to clearly articulate their project vision and requirements.</p> <p>The Living Infrastructure Plan was then translated into the output specifications, requiring the Private Partner to:</p> <ul style="list-style-type: none">“Demonstrate excellence in the design, construction and management of urban landscapes and ecosystems by applying the principles outlined in the Living Infrastructure Plan to deliver resilient, climate-proof urban landscapes;deliver a post-construction net increase in vegetated surfaces, whereby Project Co must construct at least one tree plot for every tree removed [...].”	<p>Conditions precedent to completion: By incorporating the Living Infrastructure Plan into the output specification, and identifying specific measurable requirements, the overall project compliance regime (design reviews and completion process) can be used to deliver expected outcomes.</p> <p>Industry standards / financial deductions: The Private Partner is required to maintain and operate an ISO 14001 certified Environmental Management System. Failure to achieve this at any point throughout the contract term could result in financial deductions through the application of quality failures.</p>	Urban design is a key element in delivering successful urban infrastructure projects, but it is subjective and difficult to define using measurable requirements. Another approach is to include a design guide with the procurement documents and specifications, with the intention of showing what would be acceptable solutions (and why they are considered acceptable) to still allow innovation.

Project Name	Madinah Airport - Prince Mohammad Bin Abdulaziz International Airport (PMIA), Kingdom of Saudi Arabia
	 <p>Source: Tibah Airports Development Co</p>
Description	<p>The Kingdom of Saudi Arabia recognises the importance of the air transport sector and under the direction of the King, the Prince Mohammad Bin Abdul-Aziz Airport in Medina was transformed into an international airport. The airport became one of the two major gateways to Saudi Arabia and the holy city of Madinah for Hajj and Umrah pilgrim and visitors to the Prophet's mosque.</p> <p>The General Authority of Civil Aviation (GACA) of the Kingdom of Saudi Arabia set out a long-term plan to reform and liberalise the country's airport sector. A public-private partnership opportunity arose for the expansion, rehabilitation, modernisation, operation and maintenance of the Madinah Airport, the fourth busiest airport in Saudi Arabia.</p> <p>The project investment was obtained through the Islamic fund from Arab National Bank, National Commercial Bank and the Saudi British Bank. The US \$1.2 billion expansion plan consists of state-of-the-art facilities built in accordance with the highest international standards. The project comprises a three-level terminal covering 156,940 square metres with 16 aircraft stands, 20 remote apron stands, and 31 passenger boarding bridges. The project included the widening and extension of the runway, and construction of new taxiways for accommodating A380-size aircraft. Facilities including construction of a mosque that can accommodate 1,000 worshippers, and 20 ancillary buildings that include Hajj facilities, administrative buildings, a VIP terminal, power station, and a new aircraft rescue and firefighting building.</p> <p>Phase one of the airport can handle eight million passengers per year, with the second and third phases able to handle passengers of 14 million and 27 million respectively. In October 2011, the Build, Transfer and Operate Agreement (BTO), was signed between the General Authority for Civil</p>

Project Name	Madinah Airport - Prince Mohammad Bin Abdulaziz International Airport (PMIA), Kingdom of Saudi Arabia		
	Aviation and Tibah Airports Development Co. to become the first airport project in the Middle East to be fully built under a PPP structure. The project was inaugurated in July 2015 and has been awarded several prestigious awards.		
	The new Madinah Airport is not only a major part of the Holy city's infrastructure, it also plays an eminent role in the socio-economic development of the region by encouraging international commerce and tourism and by generating employment opportunities.		
Location	Madinah, Kingdom of Saudi Arabia		
Owner	General Authority of Civil Aviation (GACA)	Private Partner	Tibah Airports Development Company (TAV Holdings of Turkey, Al Rajhi Holding Group, Saudi Oger)
PPP Model	Build-transfer-operate (BTO)	Operating Term	25 years
Contract Value	USD 1.2 billion		
Asset Class	Transport (Aviation)		
Awards	<ul style="list-style-type: none">World's Top 100 Airports by Skytrax (ranked 96th) – 2018Best Airport in Middle East (5-15 MPPA) – 2017Middle East & Africa Infra Financing Deal of the Year – 2012Best PPP Deal in the Middle East – 2012Best Project Finance Deal of the Year – 2013Best Transport Project MENA – 2013Best Airport in MENA Region (4-20 mil pax) – 2014World's Best Airport Project – 2015		
Output Specifications	Development Approach Used		

The approach taken with the output specifications was to set out technical requirements for operations and maintenance that were based on international best practices and combined with local regulations which are to be updated periodically during the concession term. These requirements included plans, that once developed, the Private Partner had to comply with during implementation. For example:


- Operation and Maintenance Manual: First submission within 360 days of the effective date then updated every three years starting from 2015 ('PMIA Aerodrome Manual' can be found on the official Concessionaire's website).
- Master Plan: First submission within 360 days of the effective date then update every five years starting from 2017.
- Environmental Management Plan: First submission within 360 days of the effective date then updated every five years starting from 2017.
- Emergency Plan: First submission within 360 days of the effective date then updated every five years starting from 2017.
- Strategic Marketing Plan: First submission within 90days of the effective date then updated annually.

A market sector comparison is provided in the Mactan-Cebu International Airport case study.

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset.</p> <p>Ability of the asset to address the needs and meet the expectations of end-users</p> <p>One of the main project objectives is to provide customers and stakeholders with services and facilities that adhere to the highest standards of quality, ethics and corporate behaviour. The quality standards in safety, environment, and operations are achieved through applying best national and international practices based on continuous assessment of satisfaction with passengers and stakeholders.</p> <ul style="list-style-type: none"> The output specifications required the Private Partner to establish an Integrated Management System (IMS) that complies with the ISO 9001, ISO 14001 & ISO 10002 standards. This IMS provides a framework for measuring and improving performance towards quality, environment, operations and end-user satisfaction. <p>Customer satisfaction was also a priority of the Owner. The Private Partner developed the following guiding principles to achieve the goal of customer satisfaction through quality services, processes, facilities, and business decisions:</p> <ul style="list-style-type: none"> Regular collection and analysis of customer feedback; An efficient customer complaints/suggestion handling procedure; Selection of reliable suppliers and regular review of their performance against set criteria; Training and career development for employees; Regular audit program; Measurable quality objectives which reflect business objectives; and Management reviews of audit results, customer feedback and business performance. <p>The internal procedures have been developed and integrated into the operations and are held in the IMS Manual which is made available to all employees.</p> <p>In 2018, Madinah Airport has been named as the Best Airport by Size and Region: Middle East (5–15 MPPA) by Airport Council International (ACI). The ASQ award that ranks Madinah Airport's customer experience among some of the best airports in the world.</p>	<p>Passenger surveys:</p> <ul style="list-style-type: none"> The Passenger Satisfaction Surveyor reports are conducted every four months, including once annually in respect of a peak calendar month with respect to Hajj traffic (either arrival or departure) during the concession term. Airport Service Quality (ASQ) Survey is conducted annually during the concession term. The objective is to achieve a ranking among the top five airports in its category (as defined by ASQ^{vii}). <p>International standards: The Private Partner was required to obtain the (a) ISO 9001 Quality Management System, (b) ISO 10002 Complaints Management System and (c) ISO 14001 Environmental Management System certifications in respect of the airport within two years of the concession term and maintain these certifications throughout the term.</p> <p>Owners right to audit: The ability to review actual versus reported performance is a key tool in promoting the Private Partner to fulfil the output specification requirements. The Private Partner shall <i>“permit the [Owner] or its representatives or advisors, during normal business hours, to inspect the books, plans, financial records and other records and documents belonging to or kept by or on behalf of the [Private Partner] with respect to the Project for the purposes of ensuring compliance by the [Private Partner] with this Agreement. At its own cost and responsibility, the [Private Partner] shall also procure and install an electronic information</i></p>	<p>Most modern greenfield and brownfield airport projects globally are increasingly being required to focus on sustainability. While there is no uniform guidance, the sustainability requirements involve energy efficiency, clean air, noise control, and proper handling of environmental hazards including effluents and fuels handling.</p> <p>The Owner's right to audit is a typical requirement across sectors and jurisdictions. Most payment mechanisms rely on the Private Partner self-reporting performance. The Owner's right to audit creates some tension and promotes accurate self-reporting. The Canadian and United Kingdom PPP models also include additional penalties if the Private Partner does not report issues or does not accurately report performance.</p> <p>The ASQ survey is an industry standard survey used by airports across the globe. The standardised approach allows performance to be benchmarked between airports.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
	<i>network that will permit the [Owner] continual access to key PMIA financial, operational, maintenance, and administrative information."</i>	
Health and safety considerations during both construction and operation of the asset	<p>Industry standards: The Private Partner is required to develop and operate a facility that complies with international standards. During the design phase, detailed engineering packages shall be submitted to the Independent Engineer for approval.</p>	<p>All modern greenfield airport developments are required to adhere to local and international health and safety regulations applicable to construction. The requirements are typically included in the concession contract.</p> <p>During the operation phase of the project, all modern concession contracts adhere to international health and safety standards published by ICAO and ACI as well as local regulations that are generally imposed by the local civil aviation authority.</p>

Alignment to QI Focus Areas		Mechanisms used to achieve QI alignment	Market Comparison Analysis
Environmental impacts	<p>Madinah Airport has been awarded Leadership in Energy and Environmental Design (LEED) Gold Certificate for the recent terminal expansion from the U.S. Green Building Council (USGBC). The award makes Madinah Airport home to the first LEED Gold Certificate for an airport in the Middle East/North Africa region.</p> <p>The output specification requires an Environmental Management System that meets ISO 14001 international standards.</p>	<p>International standards: By adopting LEED and ISO to promote environmental performance, third parties are involved in assessing compliance.</p> <ul style="list-style-type: none">• ISO 14001 Environmental Management System certification• LEED Gold certification	<p>A current airport redevelopment project in North America requires both LEED Silver Certification (for design and construction and the operations and maintenance) and ENVISION Gold certification. The same project also references international standards (ISO14064 and ISO14065) for greenhouse gas quantification, validation and verification.</p>

Project Name		Mactan-Cebu International Airport (MCIA), the Philippines	
			
		Source: Mott MacDonald	
Description		<p>Mactan-Cebu International Airport Authority (MCIAA) and Department of Transport (DOTr) proposed the construction of a new world-class international passenger terminal, including all related facilities, to efficiently handle the increasing air traffic demand, ensure convenience of passengers, and promote aircraft operational efficiency. The project aimed to increase the level of convenience and service to passengers in the existing passenger terminal and decongest the terminal facility to allow future growth.</p> <p>This airport was tendered to the private sector in a PPP arrangement based on the Philippines Build-Operate-Transfer (BOT) Law. The scope of the project included operation of the apron^{viii}, existing terminal and the landside/commercial facilities, as well as the design, construction and operation of a new international passenger terminal. The current airport operator MCIAA continued to operate the remaining airport facilities (such as the runway and taxiways) and also acts as the joint grantor of the project together with DOTr (formally the Department of Transport and Communications).</p> <p>In 2014, a Filipino-Indian consortium consisting of Megawide Construction Corporation and GMR Infrastructure Limited forming the Special Purpose Vehicle (SPV) (called GMR-Megawide Cebu Airport Corporation (GMCAC)) was awarded the concession and this project reached financial close in January 2015 with Banco de Oro (BDO) as the lead arranger. The lender group included other Filipino banks, as well as the Asian Development Bank (ADB).</p> <p>Shortly after the handover of the project assets in 2015, GMCAC commenced the renovation of the existing mixed use (domestic and international) terminal to provide enhanced facilities and increased service standards. The first phase of the new international terminal was opened in July 2018. The design of the new terminal features timber structures and striking arches in reference to local Filipino buildings in response to the requirement to “capture the aesthetics and spirit of traditional architecture of the Philippines”^{ix}</p>	
Location		Cebu, Philippines	
Owner		Mactan-Cebu International Airport Authority (MCIAA) and Department of Transport (DOTr)	Private Partner GMR-Megawide Cebu Airport Corporation (GMCAC) (GMR Infrastructure Ltd, Megawide Construction Corporation)
PPP Model		Design-build-finance-operate-maintain (DBFOM)	Operating Term 25 years
Contract Value		USD 390 million	
Asset Class		Transport (Airport)	

Project Name	Mactan-Cebu International Airport (MCIA), the Philippines
Awards	Best Transport Deal for Asia Pacific in the 2015 Partnership Finance International (PFI) Awards CAPA's 2016 Best Regional Airport in Asia Pacific award
Output Specifications Development Approach Used	

The output specifications are mainly contained in the contract schedule relating to the Minimum Performance Specifications and Standards (MPSS). There is one schedule of 24 pages that covers the operation and maintenance standards of the assets. The MPSS includes both objective (asset availability, queue times and customer service) and subjective (passenger surveys) performance parameters, both of which can lead to financial deductions if not achieved.

A different schedule to the contract covers the design requirements for the new terminal, airside and landside facilities. The requirements refer to an international standard to specify the level of service. The International Air Transport Association (IATA) publishes the Airport Development Reference Manual (ADRM), which includes detailed guidelines around the design and operation of key airport facilities including passenger terminals. IATA Level of Service C is specified in the contract, which relates to guidelines on space per passenger for each process and acceptable waiting times at these processes. The Owner considered Level of Service C to provide a balance between providing economical facilities and a comfortable service level for the majority of passengers. It should be noted that Level of Service C was changed to Level of Service Optimum in the updated versions of the ADRM and the number of service levels was reduced from six (A-F) to 3 (Over-Design, Optimum and Sub-Optimum). Additional specifications are provided for the apron, terminal and landside facilities.

Since the Private Partner will only operate and expand the assets linked to the passenger terminal, there is a key interface with the current airport operator (MCIAA) who continues to operate the remaining airport facilities. MCIAA are required to operate the facilities under its control according to the required standards, to mitigate negative impacts to the Private Partner (e.g. the runway is not properly maintained which results in flight cancellations which have commercial impacts for the Private Partner). To respond to this, the contract also contains MPSS related to the Owner's performance, such as the requirement to provide air traffic control services or undertake frequent inspections of runway pavements. The Private Partner would be eligible for compensation where the Owner does not meet the performance requirements.

Market comparison

The MCIA project has been compared to Japanese airport transactions for the purpose of highlighting differences and similarities. Starting in 2014 with the Sendai and Kansai Airports transactions, Japan has brought 10 airport deals to market and more are to follow. This is driven by the Japanese Government and the "Act on Operation of National Airports Utilising Skills of the Private Sector" which was passed in 2013 to respond to the need to increase the efficiency of national airport management due to population decline and minimal growth in domestic passengers. The format and structure of each transaction is very similar as in most cases the Operating Right Holder (Private Partner) will operate the terminal, airfield and some ancillary facilities and is able to expand facilities based on demand.

There are considerable differences between the overall framework and contracting structure of the MCIA project and the Japanese transactions, from the scope of the projects to the level of prescriptiveness in the specifications.

For example, most Japanese airport transactions resemble operations and maintenance contracts that focus on efficiency improvements, with no significant new development (either new terminals or runways). In contrast the MCIA project required the construction of a new terminal at the start of the concession, prior to an ongoing O&M term.

In the context of output specifications, the Owner in the Philippines specified very prescriptive, detailed and extensive list of performance indicators and targets which are linked to non-performance penalties during the operations period. Whereas for the Japanese transactions, the Owner puts less emphasis on including specific performance targets and penalties into the project agreements. The different approaches typically stem from the level of PPP maturity and the culture of contract administration- a trend also observed on 'built environment' projects (refer to the Mersin Integrated Health Campus project).

Alignment to QI Focus Areas		Mechanisms used to achieve QI alignment	Market Comparison Analysis
<p>Sustainability and longevity of an infrastructure asset</p> <p>Ability of the asset to address the needs and meet the expectations of end users</p>	<p>As the Private Partner operates the facility over 25 years, there is an inherent incentive to minimise maintenance costs. The availability targets act as a driver to ensure appropriate quality of systems and equipment to avoid financial penalty. Once the contract period is over the assets will transfer back to the Owner, or an extension of up to 25 years can be negotiated.</p> <p>Asset availability targets promote proactive maintenance</p> <p>The KPIs in the MPSS include availability targets defined in percentage terms for key airport facilities. Availability targets have been set for passenger boarding bridges, flight information display systems, lifts/escalators, automated services (including the baggage handling system), internet and Wi-Fi services. The target is set at 95% availability for these facilities. The target considers any planned maintenance that may have to take place by specifying the calculation method which consists of actual operational hours and planned operational hours excluding scheduled downtimes. While not specified in the contract, to measure this target accurately, appropriate systems should be in place that automatically record and log the actual hours of operation.</p> <p>Performance reflects end user priorities and are linked to demand and capacity</p> <p>Airport terminals are usually designed to accommodate the demand that is slightly below the absolute peak to balance an acceptable service level to the majority of passengers and project costs. Since there are instances where the facility is expected to be under capacity for the passenger numbers, the KPIs related to waiting times are not applicable to 100% of passengers but to 90% or 95% of passengers (depends on the process). As a result, a low proportion of passengers may experience waiting times that exceed the specified waiting time standards but the intention of these KPIs is to ensure that this proportion remains low and does not increase as the airport traffic grows. The following examples demonstrate how the KPIs relate to the Owner (and end user) priorities:</p>	<p>Owner audits: Both the Owner and the Independent Consultant appointed by the Owner can undertake audits of project assets to inspect and test any facility or process. The Owner has to give reasonable notice to the Private Partner in advance of such audits.</p> <p>Performance indicators are linked to financial deductions: The performance indicators are part of the MPSS sections in the contract. The MPSS specifies subjective performance parameters for end user surveys and 24 objective performance parameters which have been split into two categories: primary and secondary, which have different deductions (primary are double the deductions of secondary). The deduction regime consists of two broad categories:</p> <ul style="list-style-type: none"> passenger survey rating (calculated quarterly); and waiting times and facility availability (calculated monthly). <p>The majority of KPIs are in the primary category. These KPIs cover a range of aspects such as waiting times at particular passenger processes, availability targets of key airport equipment, terminal ambiance and customer service. The KPIs are prescriptive and detailed but involve performing measurements in fluent and dynamic environments, such as a queue at a passenger process. The Private Partner is required to submit a measurement plan for the KPIs which is subject to Owner's approval. An Independent Consultant is appointed to measure the KPIs and monitor performance.</p>	<p>Typical concession terms in the Japanese airport industry range between 20 to 30 years. The concession period for Japanese Airport Concessions is typically 30 years but longer or shorter terms have also been implemented. The shortest is 15 years (Takamatsu Airport) and the longest 44 years (Kansai Airports). The difference in concession terms is driven by a number of factors such as the assumed return of investment and required time to implement the proposed efficiency measures.</p> <p>Requirements are specified in the form of Required Standards (RS). There are standards for environment, building facilities, airfield, security etc. Examples of standards include for the Operating Right Holder (ORH) to follow particular security regulations in order to prevent mixing of screened and unscreened passengers and ensure the screening of passengers and their bags.</p> <p>The RS do not tend to contain numerical KPIs. Instead, the RS prescribes the way in which the operation and maintenance should be undertaken such as daily inspections of key equipment to ensure they are safe to use and fully functional. These inspections should be undertaken following the guidelines provided by the State. The RS are formulated by the Owner, who in the case of the national airports, is the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) or in the case of regional airports is either the prefectural or city government.</p> <p>The Owner undertakes their own compliance monitoring to ensure that the ORH adheres to the requirements. The Civil Aeronautics Act and Airport Act are the principle acts to be complied with but also include a large number of other legislation including environmental laws (on noise regulation, vibration, soil contamination etc.) and general standards for the airport's civil engineering facilities.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
<ul style="list-style-type: none"> • Wait times: There are specific wait time targets applicable to passenger processes (e.g. check-in, security, immigration). The maximum waiting time in the queue is specified for each of these processes and varies between 5 to 15 minutes depending on the type of process. • Baggage delivery: The time that the first bag should be delivered to the reclaim belt as well as the maximum time the last bag should have been delivered to the reclaim belt are specified. Different targets are defined depending on the type of flight (domestic or international) and type of aircraft (narrow or wide-body). • Customer service: Targets include availability of customer information desks, availability of services for handicapped and special needs passengers as well as maximum response time for any complaints that the Private Partner receives from users. <p>Industry standard surveys to measure end user satisfaction</p> <p>The Private Partner is required to undertake a passenger satisfaction survey every quarter. The industry benchmark for customer satisfaction surveys is the Airport Service Quality (ASQ) survey which has been developed by Airports Council International (ACI). It is a standardised survey which is completed by passengers at the airport once they have completed their journey through the terminal. According to the ACI website, the ASQ survey is currently undertaken at 388 airports worldwide⁴. The contract specifies a requirement to participate in the ASQ survey but on the condition that the Private Partner is not admitted as an ACI member, the Independent Consultant is required to develop a similar questionnaire to measure customer satisfaction. According to the ACI website^{xi}, the full survey consists of 34 key service areas and includes eight major categories, such as access, check-in, security, airport facilities, food and beverage providers and more that align the customer experience.</p>	<p>A minimum satisfaction score must be obtained in the survey. The contract specifies a slightly lower minimum rating for the existing domestic terminal compared to the new international terminal. This is in recognition to the domestic terminal being an existing facility with some inherent inefficiencies.</p>	<p>In addition, the ORH is required to propose service quality performance indicators for airport users. In one particular concession agreement, short (5 years) and long-term (end of concession period) targets had to be set by the ORH. These targets do not constitute an obligation on the ORH i.e. they are not linked to penalties or events of default. However, in order to encourage setting of efficient targets, the proposed targets were evaluated as part of the overall bid evaluation process by the Owner. Self-reporting of performance is required in periodic intervals. In addition, the Owner will monitor if the ORH complies with the RS and all applicable regulations and standards.</p> <p>If the Owner determines that the project is not implemented in line with the requirements, the ORH needs to submit an improvement plan. If the ORH does not provide this plan or improves its performance in the case that it is found it does not comply with the RS, the Owner may cancel the concession contract.</p> <p>RS specify that a customer satisfaction must be undertaken once a year, but no specific guidance is given on the categories or a minimum score. The results should be published on the airport's website. There is no specific instruction as to the format of the survey or the its content and no requirement to adopt the industry standard ASQ survey.</p>

Alignment to QI Focus Areas	Mechanisms used to achieve QI alignment	Market Comparison Analysis
Health and safety (H&S) considerations during both construction and operation of the asset	<p>Contract termination/default: Failure to meet the operation and maintenance obligations which result in a material risk to the health of passengers is considered a reason for Private Partner default.</p> <p>The contract mentions the Private Partner shall direct special attention to the safety of passengers. Any action or inaction of the Private Partner that affects the safety of the facilities may constitute a breach of the agreement.</p> <p>Review and audit: During construction, the Independent Consultant reviewed the construction and operational plans and completed site visits to monitor compliance. The Owner has also the ability to undertake audits during operations.</p>	<p>In Japan, at the bid stage, the Private Partner is expected to provide its proposals for implementing safety and security as well as measures on dealing with emergencies. Compliance is, in principle, based on self-reporting but audits may also be undertaken by the Owner.</p>
Social impacts and inclusiveness	<p>Performance indicator: There is a KPI for the percentage of time assistance for Passenger with Disabilities is available. The KPI requires the Private Partner to provide assistance to all disabled passengers within a specified timeframe (measured in minutes).</p>	<p>In Japan, the RS mandates that facilities for the handicapped, elderly or mobility impaired users should be carefully considered when undertaken modification or expansion works.</p> <p>The ORH is required to collaborate with stakeholders and local communities throughout the concession period and participate in local community meetings etc.</p>
Environmental impacts	<p>There is a design requirement for the new terminal to aim to be carbon neutral and minimise water and energy consumption as well as carbon emissions through the use of efficient technologies.</p>	<p>In Japan, there is a set of RS on environmental impacts. One key aspect is noise, where the Private Partner is typically expected to fund or contribute to the sound proofing of residential properties or other mitigation measures. In one example, the total amount that the ORH has to contribute to support noise mitigation measures over the concession period is explicitly stated in the contract.</p>

Alignment to QI Focus Areas		Mechanisms used to achieve QI alignment	Market Comparison Analysis
	developed by the International Finance Corporation (IFC) and Building Research Establishment Environmental Assessment Method (BREEAM) developed by the Building Research Establishment (BRE) ^{xiv} .		
<p>Alignment of the project with economic and development strategies. (SDGs, national policy etc)</p> <p>Ability of the asset to respond to changes in resource availability, population levels, demographics and disruptive technology</p>	<p>The design specifications state that the development should be modular and scalable to provide flexibility to accommodate future changes in the demand profile. It is further stated that the facilities should be efficient to handle fluctuations in passenger demand. It should be noted that this requirement is not easily achieved with regards to some facilities and equipment such as the baggage handling system or other centralised systems. These systems are not modular and would need to be reconfigured to be expanded.</p>	<p>Independent design review: The Preliminary and Detailed Design was reviewed by an Independent Consultant. The scope of this review was to determine whether the designs substantially follow the tender design developed in line with the output specification requirements and whether the agreed changes have been incorporated following discussion with stakeholders.</p>	<p>The requirement for innovation does not tend to be directly stated but it is expected that the Private Partner will employ its experience and 'know-how' to improve the existing facilities and operate the assets more efficiently through employing the latest technologies etc.</p>

Transportation: Summary of End Notes

Presidio Parkway

ⁱ A detailed list of awards can be found at: <http://www.presidioparkway.org/about/awards.aspx>

ⁱⁱ The Owner's Seismic Design Criteria: <http://www.dot.ca.gov/des/techpubs/sdc.html>

Gautrain Rapid Rail Link

ⁱⁱⁱ Assumed conversion rate of ZAR/USD = 14.1 as at May 15, 2019

Melbourne Metro Rail Tunnel

^{iv} A short section of track that allows trains to pass or to store rolling stock.

^v The project agreement including output specifications is publicly available at:

[https://www.tenders.vic.gov.au/tenders/contract/view.do?id=28571&returnUrl=%252Fcontract%252Flist.do%253F%2524%257Brequest.queryString%257D](https://www.tenders.vic.gov.au/tenders/contract/view.do?id=28571&returnUrl=%252Fcontract%252Flist.do%253F%2524%257Brequest.queryString%257Dhttps://www.tenders.vic.gov.au/tenders/contract/view.do?id=28571&returnUrl=%252Fcontract%252Flist.do%253F%2524%257Brequest.queryString%257D)

^{vi} Available at: https://metrotunnel.vic.gov.au/_data/assets/pdf_file/0016/111832/Metro-Tunnel-Living-Infrastructure-Plan.pdf

^{vii} Information available at: <https://aci.aero/customer-experience-asq/asq-awards/asq-awards-categories/>

^{viii} Aprons are the areas at the airport which permit the parking of aircraft for the purpose of on- and off-loading passengers, cargo or mail as well as the servicing of aircraft without interfering with the airport traffic.

Mactan-Cebu International Airport

^{ix} ANNEX TP-5: Conceptual Architectural Design for the Project in Instruction to Bidders, 29 May 2013

^x Information available at: <https://aci.aero/customer-experience-asq/asq-participants/>

^{xi} Information available at: <https://aci.aero/customer-experience-asq/services/asq-departure-survey/methodology/>

^{xii} Information available at: <https://www.airportcarbonaccreditation.org/airport/4-levels-of-accreditation/neutrality.html>

^{xiii} EDGE is a green building standard and a certification system which helps to determine the most cost-effective options for designing a 'green' facility within a local climate context: <https://www.edgebuildings.com>

^{xiv} BREEAM is an international scheme that provides independent third-party certification of the assessment of the sustainability performance of individual buildings, communities and infrastructure projects: <https://www.breeam.com>