



Pavement Management Systems Capability Statement

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1. Our Company



SMEC is a professional services firm with Australian origins and a global footprint that provides high-quality consultancy services on major infrastructure projects. SMEC has over 4,000 employees and an established network of over 40 offices around the world.

SMEC provides consultancy services for the lifecycle of a project to a broad range of sectors, including: Transport; Water; Natural Resources and Environment; Geotechnical, Mining and Tunnelling Services; Buildings, Urban Development and Local Government; Energy and Renewables; and Social Development.

SMEC's consultancy services include: pre-feasibility and feasibility studies, field investigations, laboratory testing, computer modelling, detailed design, tender and contract management, construction supervision, quality assurance, commissioning, operation and maintenance, training and project management.

SMEC's origins date back to the Snowy Mountains Scheme, Australia's largest infrastructure project. The scheme was a massive multi-purpose project undertaken between 1949 and 1974, which involved the construction of 16 major dams, seven power stations, 145km of tunnels and 2,000km of roads.

Since its creation, SMEC has delivered thousands of civil, transport, water, environment and power projects in more than 80 countries. SMEC's services generate economic wealth and provide essential services that contribute to national development in some of the world's fastest growing economies.

SMEC is committed to fostering the SMEC Spirit in all employees. The SMEC Spirit is the search for new frontiers and project challenges where SMEC can apply passion, innovation and expertise in nation building to deliver outstanding outcomes.

SMEC works closely with clients to deliver cost-effective practical project outcomes. SMEC's Australian and international clients include local and multi-national contractors, government departments, statutory bodies, private sector organisations, utility providers and International Financial Institutions (IFIs) responsible for funding and coordinating major infrastructure projects.

SMEC has experienced strong growth over the last two decades. Since the mid 1990s, SMEC has grown from 200 employees to more than 4,000 employees in 2010. Since 2007, SMEC has achieved a compound annual growth rate of greater than 30%. This growth is attributed to SMEC's reputation for technical excellence, innovative problem solving and SMEC's ability to address the needs of clients and staff in diverse locations.

The capabilities of SMEC's local offices are supported by specialists from around world, providing collaborative project solutions for SMEC's global client base. SMEC leverages its reputation and geographic footprint through the adoption of a localisation model. SMEC invests in local operations and nurtures local talent. This local investment increases the skill level of staff in the communities in which SMEC operates and enhances SMEC's local capacity to deliver quality projects.

2. Our Divisions



SMEC operates in diverse geographic regions implementing challenging projects in some of the world's most demanding operating environments. SMEC uses its global expertise to successfully deliver projects through its five stand-alone divisions: Australia, Africa, the Middle East and North Africa, South Asia and Asia Pacific.

Australia

SMEC has operated in Australia since 1949 (although not in its current form). SMEC's first permanent office in Australia opened in Cooma, New South Wales, in 1970. SMEC is an established player in the Transport sector in Australia, having delivered major projects including EastLink Tollway in Victoria, the Tugun Bypass in Queensland and the Northern Expressway in South Australia. SMEC has a reputation for excellence in the Water sector, having undertaken work on the Adelaide, Sydney and Victoria Desalination Plants.

Africa

SMEC first commenced operations in Africa in 1976. SMEC's first office in the division opened in Maseru, Lesotho, in 1996. SMEC is dominant in the African Water sector, working on major dam projects including the Lotsane Dam in Botswana, the Magwagwa Dam in Kenya and in Mozambique the Chimoio, Gondola and Manica Water Supply Project. SMEC's Energy and Renewables sector experience in Africa is strong. SMEC has delivered feasibility studies for the Karuma Interconnection Project in Uganda and managed the Aboadze-Volta 330kV Transmission Line Project in Ghana.

Middle East and North Africa

SMEC has operated in the Middle East and North African division since 1995. SMEC's first office in the division opened in Dubai, United Arab Emirates (UAE), in 1999. SMEC's outstanding

success in the Buildings, Urban Development and Local Government sector continues to grow with projects including the Qatar State Mosque and Kuwait University City. SMEC is a key consultant in the Natural Resources and Environment sector having designed and managed a large waste management project in Abu Dhabi and a land farm at Dukhan Fields in Qatar for remediation of contaminated soils.

South Asia

SMEC's South Asia experience dates back to 1968. SMEC's first office in the division opened in Dhaka, Bangladesh, in 1978. In the Social Development sector, SMEC has provided technical assistance for projects such as the Emergency Cyclone Recovery and Restoration Project in Bangladesh. In the Buildings, Urban Development and Local Government sector, SMEC managed the design of the chancery building for the Australian High Commission in Sri Lanka.

Asia Pacific

In 1962, SMEC commenced operations in Asia Pacific. SMEC's first office in the division opened in Kuala Lumpur, Malaysia, in 1972. SMEC's successful project delivery has secured numerous projects in the Social Development sector including the Indonesia Infrastructure Initiative and the Transport Sector Support Program in Papua New Guinea. SMEC provides cost-effective Geotechnical, Mining and Tunnelling services including civil engineering services for the Shenzhen Quarry in China and the South Island Line rail project in Hong Kong.

Our Divisions (continued)



• SMEC Offices

- Africa
- Middle East and North Africa
- South Asia
- Asia Pacific
- Australia

3. Our Sectors



SMEC provides high-quality consultancy services from project inception to completion worldwide to private sector organisations, Government agencies and International Financial Institutions. SMEC provides innovative project solutions across seven industry sectors.

Transport

SMEC is one of the world's leading Transport consultants, providing innovative solutions for transport infrastructure projects worldwide. SMEC provides services in roads and highways (in both construction supervision and planning and design), bridges and structures, traffic and transport planning, rail infrastructure, ports, airports and Pavement Management Systems.

Water

SMEC is experienced in the provision of services to effectively manage dams, water resources, water supply and wastewater, drainage, irrigation, river structures and hydrogeology projects worldwide. SMEC has undertaken more than 2,000 Water sector projects, ranging from inception studies for rural water supply to construction supervision of desalination plants.

Natural Resources and Environment

SMEC provides environmentally sustainable solutions for infrastructure projects that balance the competing demands of the community, the environment and economic viability. SMEC delivers services in the areas of environment, waste management, land management, coastal, sustainability and contamination.

Energy and Renewables

SMEC's expertise in the Energy and Renewables sector is derived from the Snowy Mountains Hydroelectric Scheme. SMEC provides services in transmission and distribution, renewables, hydropower, industrial and generation.

Geotechnical, Mining and Tunnelling Services

SMEC has a proven track record in the provision of tunnelling and geotechnical engineering services for large infrastructure projects worldwide. SMEC also provides mining and underground consultancy services for underground works and tunnels for water supply, irrigation, transport, underground storage and power generation projects.

Buildings, Urban Development and Local Government

SMEC has expertise in the provision of integrated services for major buildings and urban development projects, ranging from high-density towers for private sector clients to low-density residential projects for government bodies. SMEC has a long-standing reputation for design quality and functional efficiency. SMEC provides services in: architecture and building engineering, local government, urban development, landscape architecture, survey and planning.

Social Development

SMEC's Social Development Group operates internationally, delivering aid-funded projects on behalf of Government clients. SMEC's services deliver immediate benefits to local communities in the areas of community development, health, education and training, gender development, human resources, government and institutional strengthening, public sector reform and finance and economic development.

4. Our Transport Sector



SMEC's Transport sector capabilities extend through all stages of project delivery from inception to completion including: feasibility studies, field investigations, computer modelling, survey and design, tender evaluation, proof engineering, contract management, construction supervision, quality assurance, commissioning, operation and maintenance.

SMEC manages all forms of project delivery including institutionally funded projects, direct appointments from road and transport authorities, Design and Construct projects, Build-Own-Operate-Transfer projects and Alliance contracts.

SMEC's Transport sector capabilities extend through all stages of project delivery from inception to completion. SMEC's capabilities include pre-feasibility and feasibility studies, field investigations, laboratory testing, computer modelling, survey and design, preparation of tender and contract documents, tender evaluation, proof engineering, contract management, construction supervision, quality assurance, commissioning, operation and maintenance, training and overall project management.

SMEC has provided services for more than 125,000km of roads and highways worldwide ranging from eight lane dual carriageway highways with grade-separated interchanges to village access tracks. SMEC has also developed in-house software systems for pavement, road, bridge and asset management to improve client outcomes.

SMEC has extensive experience in the investigation, planning, design, documentation, verification and proof engineering of all types of steel, composite, reinforced concrete pre-stressed and cable-stayed bridges plus all associated retaining walls and other structures for transport projects.

SMEC assesses existing bridges, review structural design life and design and manage bridge rehabilitation programs.

SMEC's transport planners and traffic engineers have experience in major corridor studies, strategic master planning, municipal structure plans, traffic impact assessments and intersection functional layout design.

SMEC has experience in high-capacity suburban railways, heavy haul railways, freight railway systems and low-density provincial railways. SMEC's rail projects have ranged from the design of new routes, to the rehabilitation and maintenance of existing routes. SMEC provides services for perway alignments, rail embankments, cutting slope stability, geotechnical designs, tunnels, culverts, trackside drainage and rail stations.

SMEC has broad-based capabilities in ports and maritime infrastructure engineering based on the completion of container, multi-purpose, coastal and inland port facilities projects.

SMEC's experience in aviation infrastructure development encompasses planning, design, construction supervision and maintenance of airports and associated facilities for major urban international airports and pioneer regional airports in developing countries. SMEC also provides procurement services for airport communication and navigation equipment.

5. Pavement Management Systems

5.1 Introduction

SMEC is one of the leading providers of Advanced Asset Management solutions. These solutions are used by Australian and international government authorities to optimise utilisation and performance of road networks and road inventory assets in both urban and rural environments.

The SMEC Pavement Management System (PMS) offers road custodians the ability to select the most appropriate works program to maximise the long-term performance of the network under a range of user-defined funding and treatment strategies. Supporting SQL Server and Oracle technology, Geographical Information Systems (GIS) integration allows thematic mapping capability and Highway Design and Maintenance (HDM) modelling. SMEC's PMS combines advanced technology with a user-friendly interface.

SMEC's PMS is a powerful database designed to store and easily access a large range of information related to roads, footpaths and roadside inventory items. The PMS is a planning tool that is able to model pavement and surface deterioration due to the effects of traffic and environmental ageing. It can be used to determine long-term maintenance funding requirements and to examine the consequences on network condition if insufficient funding is available.

5.2 Mapping and Modelling

SMEC's PMS provides road mapping, road modelling, spatial data revision, enhancement of road GIS databases using authoritative map data as well as a range of GIS and GPS services. SMEC uses GPS Control and airborne GPS to geo-reference SMEC's aerial photography and photogrammetric mapping services. SMEC also conducts hydrology and drainage mapping for councils, utilities, catchment management and water authorities. SMEC customises the digital drainage and hydrology data to directly insert into an existing client GIS.

5.2.1 Road Mapping Interface

SMEC's PMS integrates with existing GIS; users do not need any other GIS products installed on their computer and only need access to the local council's 'roads' map layer. Users have the ability to display any other map layers or raster images as appropriate. SMEC's PMS allows users to perform standard map functionality such as pan and zoom. The PMS also has more sophisticated functionality such as the generation of maps predicting future layout to provide the user with a graphical representation of how maintenance strategies will affect the future condition of the road network. SMEC's PMS generates thematic maps based on condition and geometric data including:

- cracking
- pavement age and type
- surface age and type
- road hierarchy
- width
- Pavement Condition Index (PCI)
- potholes
- raveling and stripping
- rutting
- roughness
- texture
- skid resistance
- treatment type
- any other user defined criteria

5.2.2 Footpath Mapping Interface

The footpath module of SMEC's PMS interfaces directly with a MapXtreme frontend. This allows users to represent any footpath hazard and its severity or risk. Hazards include:

- surface damage
- cracking
- deformation
- slipperiness
- trip hazard
- utility pits

Pavement Management Systems (continued)

5.2.3 Road Side Inventory

The SMEC PMS can be used to identify the location, condition and value of road side inventory items. This part of the PMS can be customised easily and quickly by the user to include almost any type of inventory item including signage, lighting and line markings. Depreciation can be calculated based on age or condition, depending on Council's valuation policy.

5.2.4 Modelling

SMEC's PMS is able to model the changing condition of road sections based on the effects of the environment and traffic loadings. SMEC's pavement models consider various types of pavements and road surfaces and predict the onset of cracking, the rate of crack progression, the development of stripping and potholing, the development of rutting and the change in the ride quality of the road pavement (road roughness). The ability to model allows the PMS to: analyse the long-term funding requirements to preserve the road network; compare how the network would perform under a range of different funding scenarios; and develop long-term works programs that reflect the changing condition of the road.

An additional advantage offered by the modelling component of SMEC's PMS is that the reported condition of the road network is always up-to-date. When new survey data becomes available, this data automatically supersedes the predicted condition for the survey year. For the years between condition surveys the PMS will report on predicted data.

5.3 Software Development

SMEC has been developing asset management software since 1990. SMEC has a wealth of experienced and highly skilled staff dedicated to delivering the best service and tools. SMEC's software development services ensure clients meet existing challenges and forecast for future demands.

5.3.1 Intuitive User-Friendly Interface

The SMEC PMS has a simple, 'easy to use' interface that ensures the comprehensive database can be accessed with little effort. The PMS supports capture of data through video systems. There are two mechanisms that have been built into the system that can be used: an inbuilt player using embedded Microsoft DirectX video/audio classes (this supports standard MPEG format) and a limited number of third-party video players that are available for purchase from specialised data capture companies.

5.3.2 Database Platform

The SMEC PMS supports both Oracle and SQL Server databases. Both of these products represent the latest technology in Relational Database Management Systems. They have virtually no size limit and can 'grow' with clients as the need arises. PMS models predict pavement condition for many years into the future, with multiple treatment options on each road section. This requires a large capacity database.

5.3.3 System Support

In order to provide ongoing support and software development for clients, SMEC has a dedicated business group with technical and programming staff located in offices across Australia. SMEC has also established a support website which allows users to log-on and download standard reports, SQL Scripts, User and Installation Manuals, as well as correspondence from other users of the system.

5.3.4 Optimised Works Programs

The SMEC PMS can optimise a works program within a budget constraint as well as set a yearly 'Target Pavement Condition Index (PCI)' for the network and then determine the budget required to meet this target.

5.3.5 Financial Reporting

The SMEC System has comprehensive capability for generating the Financial Reports required to meet the needs of the Australian Accounting practices. As well as calculating the normal financial

Pavement Management Systems (continued)

information such as written down value, replacement cost, depreciation within the financial year, accumulated depreciation, the PMS includes:

- the ability to track assets on a year to year basis
- the option to automatically revalue an asset class based on condition
- the option to automatically re-evaluate the remaining life of an asset based on its condition
- an additional separate financial report to detail newly constructed discovered or acquired assets
- an additional separate financial report to detail asset disposals (including recovered residual value)
- the ability to quantify asset consumption based on consecutive condition assessments

When calculating the financial reports for the roads, the system determines separate valuations for the earthworks volumes, the base and sub-base pavement layers and the surface layer. The PMS accounts for different types of surface treatments and allows the user to specify treatments as a maintenance treatment or a capital works treatment. The PMS automatically disposes of old layers when a road is resurfaced or a pavement is reconstructed.

5.4 Construction Management

Effective project implementation relies on a number of factors including: understanding client requirements, clear communication with the contractor and expertise in contract management. SMEC has experience in all these factors. SMEC's services include:

- pre-qualification of tenderers
- planning and programming
- cost estimates
- preparation of tender documents
- preparation of contract documents
- construction supervision
- contract administration and reporting
- contract quality assurance auditing

- safety auditing
- claims managements
- dispute resolution

5.4.1 Road Rehabilitation and Maintenance

SMEC has experience in all aspects of road maintenance in a wide variety of environments including tropical, arid, temperate and alpine. SMEC is experienced in the maintenance and repair of earth, gravel, concrete and bitumen surfaced roads and maintenance of bridges, structures, road furniture, road marking and road drainage. SMEC has expertise in materials investigation, extraction and processing, bitumen surfacing, erosion control and slope stabilisation. In support of road maintenance activities, SMEC has experience in road communication networks, stores management, operation and inventory control management, selection, procurement, operation, servicing and repair of road maintenance plant and equipment and training program development and implementation.

Pavement Management Systems (continued)

5.5 Project Experience



Integrated Road and Path Management System – Australia

SMEC has supplied its Road Asset Management System to the Pittwater City Council in Sydney since 2003. Following the successful implementation of the system, Pittwater City Council requested that SMEC develop a similar asset management system that could be used to manage the council's footpaths. The system that SMEC developed was fully integrated with the existing road software and used a common GIS user interface to map and display path maintenance defects and hazards. As a result of this development, this feature is now available to all SMEC's clients running the SMEC Road Asset Management System. SMEC's services include: software development, asset management, maintenance programming and risk analysis.



Financial Reporting for Local Government – Australia

The Gold Coast City Council has used the SMEC Pavement Management System since 1995. In July 2010, the Council upgraded from version four to version five. This provided a comprehensive capability to satisfy the financial reporting requirements to meet Local Government legislative requirements in Australia. The Gold Coast City Council can generate reports for over 18,000 road sections and over 100,000 road side inventory assets by selecting from the standard reports available within the system. As well as depreciating assets using straight line depreciation, the system also offers the capability to undertake condition based revaluation and reassess the remaining life based on condition surveys or predictive modelling. SMEC's services included: provision of training for Gold Coast Council staff on how to generate financial reports and use the updated version of the software.



Determining Long-term Funding Requirements – Australia

The Wyong Shire Council was having difficulty preserving their road network at a satisfactory condition level with existing road maintenance funds. The Council appointed SMEC to undertake a long-term analysis of their road network to determine the ideal level of road funding required; and also to determine road condition in ten years, if current funding levels were maintained. SMEC's Pavement Management System was used to determine the optimised long-term works program that would achieve the greatest improvement in the road network given the constraint of the annual budget. SMEC was also able to determine the minimum funding required to meet annual target network condition levels. SMEC's services included: strategic analysis to determine the change in the road network condition over time under a range of different funding options.

Pavement Management Systems (continued)



Determination of Annual Optimised Works Program – Australia

The Queanbeyan City Council adopted the SMEC Pavement Management System Companion as the tool to manage their road network. This product is suitable for use by smaller Councils that may wish to outsource some of the work relating to managing their road network. Each year Queanbeyan City Council provides SMEC access to their database so that SMEC can undertake a full analysis of the road network and to help develop the annual optimised works program.



Integrated Road and Path Management System – Australia

SMEC provided and implemented a Road Asset Management System for Cessnock City Council. As part of the project, SMEC also developed an Asset Management Plan for Cessnock City Council's transport infrastructure. This plan was developed in accordance with the International Infrastructure Management Manual. The majority of the information required for the plan was obtained directly from the reports, condition modelling and financial modelling available within the SMEC Road Asset Management System. SMEC's services included: provision and implementation of the SMEC Road Asset Management System and development of an integrated road and path management plan.



Road Asset Management Systems – Australia

Since 1988, SMEC has developed, supplied, implemented and provided on-going support for Road Asset Management Systems to Australian Local Governments. The SMEC software operates in a Microsoft .Net environment and supports both Oracle and Microsoft SQL Server databases. The software utilises a MapXtreme GIS user interface. It is currently being used by over 50 Local Government authorities within Australia to produce long-term optimised works programs for their road networks, to undertake strategic analysis to establish the future maintenance funding requirements for inclusion in their Asset Management Plans and to produce the financial reporting for asset valuation, annual depreciation and gap analysis for the asset renewal program.