

# ASSET MANAGEMENT BEYOND ROADS

Mahbub Hossain <mailto:mahbub.hossain@campbelltown.nsw.gov.au>  
Coordinator, Assets Services, Campbelltown City Council, NSW, Australia

## Abstract

Campbelltown City Council (NSW) is responsible for the management of its assets stock with a replacement cost of approximately \$950 million. Initially Council staff introduced a formal approach to asset management concentrating on road technology between 1991 and 1997. This approach has now been used as the basis for the successful implementation to the effective management of other asset categories such as Buildings, Public Spaces, Stormwater, Bridges, Fleet and Plant etc. Council staff by acting proactively and utilising their comprehensive Asset Management System has implemented a system to minimise the deterioration and optimise the service levels of all assets within the constraint of available funding.

**Key Words: Asset management, lifecycle costing, works programming, risk assessment and benchmarking.**

## Introduction

Campbelltown City Council, NSW (Council) is responsible for the management of its assets stock with a replacement cost of approximately \$950 million. Through its documented Vision and the Corporate Plan, Council has identified a need to develop Long-term Strategic Financial Plans for the effective management of these assets. Council's Management team has actively participated in the development of an articulated corporate strategy statement in relation to managing its asset stock.

Council staff built a comprehensive asset management platform of mainly focussing on road between 1991 and 2001. In 2001, the same concepts and principles have been extended for the effective management of other assets such as Buildings, Public Spaces, Stormwater, Bridges, Fleet and Plant etc.

The required levels of service for asset categories have been identified by linking Council's Vision and Policies with current Legislative requirements. Similar to Roads, Councils staff have also initiated a range of asset management considerations such as

community consultation, condition survey, data management, life cycle costing, project evaluation, works programming and asset performance monitoring etc. in the management of its asset categories.

In doing so, Council has achieved a number of benefits, but not limited to the following:

- Utilised a centralized comprehensive asset management system for storing, analyzing and optimizing works programs for all asset categories.
- Identified and delivered desired levels of service for users of Council's assets.
- Reduced life cycle cost of maintaining asset stock.
- Justified sustainability of asset stock
- Reduced risk of Infrastructure asset failure.
- Provided users with best utilisation opportunities.
- Implemented more effective and efficient procurement opportunities.

The paper provides an overview that Campbelltown Council has adopted to manage its asset categories other than roads

with regard to long term financial planning and management of it's asset base.

### Assets Hierarchy

Council has adopted an asset hierarchy that is mainly based on asset functionality management criteria. The intent of the asset hierarchy is to provide the framework in which data are collected, information is reported and decisions are made. There has been an internal review of Council's asset hierarchy, giving higher importance to risk assessment and the appropriate levels of inspection and maintenance for each classification. The Asset Management Plan has different maintenance interventions, inspection frequencies and response times for each asset hierarchy. Council's Conquest asset management system records asset hierarchy details. These hierarchies were required for accurate Long-Term Financial Modeling of each type of asset.

Issues considered to create asset hierarchy are:

- Information required to manage the assets.
- Type of assets to be managed.
- Accuracy required for the information.
- Component level at which assets were required to be valued.
- Availability of resources to collect and manage the information.
- Modeling capability.

For example Council has approximately 350 km of constructed footpaths. This is made up of 340 km of concrete and 10 km of asphalt pavements.

The footpath assets are classified using the following hierarchy

Table 1: Footpath Hierarchy

Footpath Hierarchy	Description
<b>High Usage Paths (HU)</b>	Central Business Districts of the following major townships – Campbelltown and Ingleburn areas. Areas identified as potential high risk due to the nature and volume of pedestrian traffic associated with particular properties adjacent to Council footpaths. These properties include schools, hospitals, train station, medical precincts and elderly person precincts.
<b>Medium Usage Paths (MU)</b>	These are paths that link minor shopping centres and channel pedestrian traffic from neighbourhoods to community attractions, sporting venues and parklands. Shared bicycle/pedestrian paths are good example for this type.
<b>Low Usage Paths (LU)</b>	These are constructed paths in urban and rural residential areas; including concrete, asphalt, and grave paths.  These paths take the pedestrians from their residential streets to Arterial Links and consist mainly of local pedestrians.

Similar to footpaths, Buildings hierarchy has been created based on Council's policy standard such as:

Table 2: Building Hierarchy

Hierarchy	Policy Standard
A	Exceptional
B	High
C	Standard
D	Minimal
E	Mothball

Sporting Fields have been evaluated to ascertain which of the three standard hierarchies it falls within. These classifications are A, B and C, with A being the highest quality. A further classification, AA, applies to Campbelltown Sports Stadium, which is of an international standard. The category details are in Appendix A.

Similar to the above, parks has been classified as Regional, District, Local and Pocket Parks.

## **Understanding Asset Technology**

Council has introduced a formal approach to asset management with initial focus on road technology and practice. A sound understanding of asset technology and practice was the platform for the successful implementation of the structured approach. Technologies central to Council's successful asset management strategy include community consultation, inventory and condition data collection, data management, life cycle costing, project evaluation, works programming, performance monitoring and asset-reporting etc.

Council found it difficult to retain staff members with expertise in all these areas over a long period, therefore there was the need to develop and implement strategies to ensure that expertise in these areas remains available over the long term. So Council decided to establish a centralised asset management section, which included structured training programs, staff rotation, sharing expertise with other organisations, competitive tendering opportunities and selective outsourcing.

## **Separating planning from operations**

Council's asset management section was coordinated under the Operation section prior to 2001. Asset staff were required to carry out responsibilities for both planning and operational aspects of asset management.

During that period, staff found that operations issues were immediate, whereas life cycle or long term planning issues were of low priority.

It was common for planning to suffer when competing for management attention against the supervision of works and contracts in progress.

Planning decisions (eg, what investments or treatment interventions to make and when) generally have a greater influence on the long-term performance of the asset than the day-to-day operational decisions (eg, assessments about efficiency of site works). The quality of objective decisions about planning will depend on the time available and the knowledge of the asset management staff. For example, experience shows that collecting data to validate assumptions and calibrate models used in life cycle costing is rarely a priority for staff involved in day-to-day operations.

Considering all the above, Council's senior management decided to separate asset management planning section from operational responsibilities in 2001.

## **Why it is important to have levels of services in Asset Management Plan?**

In Council's Asset Management Plan, the levels of service were developed for all type of assets to provide the basis for determining life cycle management strategies and associated works programs. The levels of service supported the Council's strategic goals and were based on customer expectations and statutory requirements, and provided an initial framework for long term financial planning. The level of Service details is shown in Appendix B.

The levels of service were based on:

- Community Research and Expectations
- Social Plans and customer surveys
- Strategic and Corporate Goals
- Addressing legislative requirements
- Meets Legislation, Regulations, Environmental Standards and Industry and Australian Standards that impact on the way assets are managed.

In addition to the above, Council has also developed Technical Levels of Services for each Category of Asset.

The Council endorsed levels of service provides guidance for the scope of current and future services offered. Levels of service have to be continuously monitored through the community consultation process and available technologies.

## **Inspection and Condition Assessment**

Council has the responsibility to ensure that a strategic focus to the management of its infrastructure assets is achieved. Asset Management is a continuous process, covering the full life of the assets. It is the process of managing acquisition, use and disposal of assets to ensure they deliver the required performance in the most cost effective manner.

It is very important for Council to have a clear knowledge of the condition of their assets and how they are performing. All management decisions regarding maintenance, rehabilitation and renewal revolve around these two aspects. Not knowing the current condition or performance level of an asset may lead to premature failure of the asset, which leaves the organization with only one option: to replace the asset (generally the most expensive option).

Council currently performs regular condition and performance monitoring inspections in a sophisticated manner that allows it to better understand the remaining life of its assets. This understanding drives future expenditure patterns.

Significant progress has been made in developing sophisticated condition monitoring methods for Council's mature road and bridge assets by implementing Pavement Management and Bridge Management Systems.

Condition assessment for assets such as buildings, parks, drainage and plant etc. are still on a simple approach mode. The development of similar sophisticated methods

that have been used in roads and bridges is now used for all other category of assets utilising more parameters to predict future condition of the asset more accurately.

Council acknowledges that a fundamental basis of demonstrating reasonable due care is to prove that its inspection method is robust, reliable and documented.

- Robustness relates to practicality, rigor, and method of recording data and subsequent use of this data in prioritising maintenance.
- Reliability is based on the skills and training provided to inspectors in collecting the right type of data and information in line with service level standards.
- Documents relates to the manner or methodology used in the inspection and condition assessment process.

In order to make it easier for inspectors and ensure consistency, the Assets Section has developed an inspection handbook with intervention level definitions and sample photos of defects. Each inspector has already been trained in accordance with this handbook and each inspector carries a copy at all times of inspection. In accordance with Council's continuous improvement policy, this handbook will be reviewed and updated as service level definitions change.

Council also acknowledges that in providing a safe and serviceable asset, there will be times when emergency or non-programmed maintenance works will have to be carried out. These works are likely to be the result of an inspection, resident complaint or an observation made by a Council employee. Emergency works are generally based on the potential of catastrophic failures or very specific defect severities and locations, which may have escalated from the previous inspection.

Council trained staff are inspecting all roads, bridges and footpaths for which Council is responsible. Inspections have been scheduled on a cyclic basis to identify potential safety hazards, and defects, which

do meet, accepted maintenance standards. Inspection defects are logged electronically to identify the nature of the defect, its location, date, the responsible officer, and the appropriate response. Once logged the defect is downloaded into Council's Asset Management System for actioning and monitoring. All defects are then trackable from the point of identification to their completion.

## Inspection Method

Council has documented in its asset management plan for road pavements, kerb and gutter, footpaths, bridges and buildings inspection and assessment for renewal planning. The details are as following:

- Type of data to be collected on sealed roads – cracking, roughness, ravelling, stripping, rutting and potholes etc. for Pavement Management Systems (PMS) modelling. The other information normally collected is shape-loss, oxidisation, patches, and surface defects.
- Type of data to be collected on unsealed roads: gravel depth, surface condition and pavement condition.
- Type of data to be collected on footpaths: vertical displacement cracking and appearance.
- Type of data to be collected on Kerb and Gutter: vertical displacement cracking and appearance.

Adopted measurement scale: i.e. 1-5, Rocond 90 or other.

Criteria for measuring condition: i.e. severity, extent or both.

Method of measuring condition distresses: i.e. length, width, area, and depth.

Council has developed a condition-grading system for all asset types based on the International Infrastructure Management Manual, ARRB Local Road Bridge

Management Manual and Facility Maintenance Planning Manual. An example of Building assessment Matrix is provide in Appendix C.

The data collections process is based on the International Infrastructure Management Manual

## Frequency of Condition Assessment

Condition data is being collected each year for a predetermined portion of the asset network. The current plan is to collect pavement condition information 20% of road network each year. Inspection frequencies for other asset categories are as follows:

Table 3: Inspection Frequency

Asset Type	Frequency
Footpaths (HU)	12 monthly
Footpaths (MU)	24 monthly
Footpaths (LU)	30 monthly
Kerb & Gutter	20% network every
Stormwater Drainage	20% network every
Bridge (Level 1)	6 Monthly
Bridge (Level 2)	2 yearly
Buildings	2 Yearly
Parks	2 Yearly

## Performance Measurement and Benchmarking

The condition rating methodology has been extended to calculate an overall condition index for every asset. It is a composite of conditions of all condition parameters of all components. It is a scale of 0 to 10 with 10 representing an asset in excellent/new condition and 0 representing an asset in a failed condition with no remaining life left. It was useful for benchmarking the condition of the asset against the designated minimum condition level.

The Condition Index (CI) value in terms of overall condition of the asset is as follows:

- 0 to 4: Poor Condition
- 4 to 7: Fair Condition
- 7 to 10: Good Condition

Fig 1: Condition Index Calculation

Attribute Label	Value
System User Fields	
GL No for Depreciation	
Current Condition Index (0-10)	2.31
Target Condition Index	6
Asset Class	Fixed Asset
Asset Categories	4941 Buildings
Operation Area	Area 2
Asset Hierarchy	

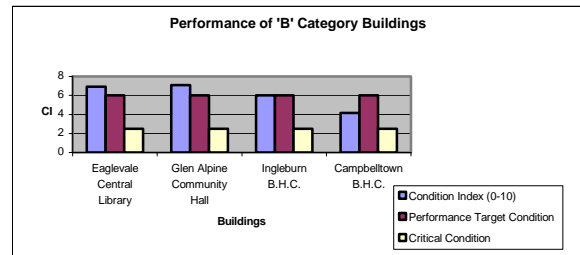
By using Condition Index, Council's asset section developed a method of managing the performance of the Asset as follows:

- No asset shall have a Condition Index less than 3 without special management actions in place to mitigate and reduce the risk.
- Not greater than 5% of the asset shall have a Condition Index less than the target for the particular asset hierarchy as follows:

Table 4: Performance Target for Building Asset

Asset Category	Hierarchy	Target Condition Index
Buildings	A	7
Buildings	B	6
Buildings	C	5
Buildings	D	4
Buildings	E	3.0

Fig 2: Performance Chart for B type Buildings



It is the objective of Council's asset management process to maintain all assets with condition index greater than the target value.

### Prioritisation and Works Program:

Councils Pavement Management System (PMS) is a specialized technical system for road assessment and prioritisation. Results generated by a PMS are technically based and generally do not take into account other issues— eg. political priority, safety, economic benefit, consequence of failure etc.

The approach used in Council's corporate asset management system is a corporate approach that has the capacity to account for non-technical factors such as those mentioned above as well as technical condition assessment in setting works priorities.

After condition assessment, actions are logged for each asset or group of assets requiring maintenance, rehabilitation or reconstruction. Each action is then costed by using Conquest's standard unit cost rate tables.

The next step in the budgeting process is to provide a point rating using the user definable drop down priority lists on the main asset screen. This is done for each asset requiring treatment.

Typical priority parameters are:

- Overall condition
- Political priority (perhaps expressed as “Community Expectation”)
- Asset Utilisation
- Safety (as in Road Safety, Public Liability, OH&S)
- Economic Benefit
- Consequence of Deprivation (Asset Criticality / Consequence of Failure)

Fig 3: Typical Priority Parameters

Parameter	Value	Points
Overall Condition	Poor Condition	3.8
Risk Level	Serious	4
Consequence of Deprivation	Critical	4
Executive Priority	Important	3
Build Quality	Average	
Maintenance Standard	B-High	
Utilisation	Average	
Economic Benefit	Moderate	
Heritage		

Using Prioritiser tool in Council’s asset management system, staff then applied different global weightings factors to test the effect of various budget policy scenarios to rank asset management projects for inclusion in the works program.

Once priorities have been determined for the various classes of assets (Roads, Parks, Buildings etc), then the Prioritiser is run across selected projects from other asset classes to fine tune the budget.

Fig 4: Prioritiser report

Asset Description	Action Description	ReferencelD	Weight	Project Cost	Running Cost
BANGALLA AV - AKUNA.KOOLOOONA - LEFT K&G - CHN. 0.73 Standard Lane	Reconstruct 64 m K&G inc 2 laybacks (machine laid)	2005.000497	4.30	\$8,660.00	\$8,660.00
BANGALLA AV - AKUNA.KOOLOOONA - LEFT K&G - CHN. 0.73 Standard Lane	Reconstruct 60.0m K&G	2003.000608	4.30	\$7,800.00	\$16,460.00
BANGALLA AV - AKUNA.KOOLOOONA - RIGHT K&G - CHN. 0.73 Standard Lane	Reconstruct 60 m K&G (machine laid)	2005.000187	4.10	\$6,000.00	\$22,460.00
BANGALLA AV - AKUNA.KOOLOOONA - RIGHT K&G - CHN. 0.73 Standard Lane	Reconstruct 35.0m K&G	2003.000609	4.10	\$4,550.00	\$27,010.00
GLENOUARIE SHOPPING CENTRE PEDESTRIAN BRIDGE NO. 1 - Deck Slabs Rail Top	Replace wooden beams and Asphalt Bridge with metal runners to support spandek - and concrete approx 7m x 1.5m area	2006.001174	4.00	\$5,000.00	\$32,010.00
AKUNA AV - COPPABELLA - KULLAROO - LEFT K&G - CHN. 0.477 CIU	Reconstruct 16 m K&G	2005.001610	3.90	\$2,400.00	\$34,410.00
AKUNA AV - COPPABELLA - KULLAROO - LEFT K&G - CHN. 0.477 CIU	Reconstruct 10 m K&G	2005.001507	3.90	\$1,500.00	\$35,910.00
AKUNA AVENUE (From COPPABELLA To ST JOHNS) Combined	SEAL	2006.004416	3.80	\$3,000.00	\$38,910.00
AKUNA AVENUE (From COPPABELLA To ST JOHNS) Combined	Stabilisation	2005.003062	3.80	\$60,000.00	\$98,910.00
MINTO ROAD (From VICTORIA To SURREY) Combined	Fibredeck with AC Treatment	2004.000069	3.80	\$46,685.40	\$145,595.40
AKUNA AVENUE (From COPPABELLA To ST JOHNS) Combined	AC OVERLAY	2006.001883	3.80	\$40,000.00	\$185,595.40
KENNY PARK - Timber Post & Board Park Name	Replace missing reserve Name Sign Board with new Metal Sign	2004.012354	3.80	\$500.00	\$186,095.40

## Risk Based Works Program Development:

In order to determine the priority of maintenance requirements the defects of all assets are compared in terms of the probability of failure and the consequences of failure. A risk score for every asset for all asset types is automatically generated in Council’s Corporate Asset Management System. By ranking the risk scores, a risk based maintenance schedule is generated.

The risk score for an asset=**Probability of Failure X Consequences of Failure.**

Probability of Failure was assessed on the basis of condition factor, material factor (based on material type) and asset hierarchy factor.

Consequences of Failure was assessed on the basis of following factors:

- Potential damage to the asset
- Potential for loss of life, or personal injury, caused by failure of the asset
- Potential loss of service: probability of service interruption if the asset fails.
- Economic factor: reflects the economic importance of the repair and the increasing cost that could incur if the asset was left untreated.

Fig 5: Asset Risk Score

Probability of Failure	Factor	Consequence of Failure	Factor
Condition: 1.72 Good Condition	2	Damage to Asset: Serious	9
Hierarchy: LU	4	Loss of Life: Minor	2
Material: Concrete Footpath (LU)	8	Loss of Service: Moderate	5
		Economic: Moderate	5
	<b>3.6</b>		<b>4.4</b>
<b>Total Asset Risk Score: 15.84</b>			

## Financial Projections:

Council utilises Moloney Modelling System to obtain information for long-term financial projections for most of the asset categories. The system is integrated with Council's Conquest asset management system and utilise data for future funding predictions.

The Moloney Modelling System is a network-based system that has two separate modelling paths, both of which commence with the present condition distribution of the asset set. One path predicts the capital expenditure requirement necessary to maintain the asset network in a selected condition. The other path predicts the future condition of the asset network based on a proposed capital expenditure profile.

Building assets are modelled with four different major components such as the Structure, Roof, Fitting / Fixtures and Building services. The useful life of each component and the deterioration pattern is not the same of others. To explain this scenario, the following example is provided.

Fig 6: Four Main Components of Building assets.

Asset Set No.	15	16	17	18	19
Asset Description	Building Struc-Long Life	Building Struc-Short Life	Building Roof	Building Mechanical Services	Building Fitout
Total Quantity	37	170	207	207	207
Units	Nos	Nos	Nos	Nos	Nos
Asset Group Rehab \$	45,159,108	114,167,856	11,380,497	22,760,996	34,141,492
Condition 10	6.11	0.24	0.19	0.05	0.05
Condition 9	0.49	0.28	0.35	0.00	0.00
Condition 8	0.92	3.33	14.11	0.89	1.27
Condition 7	4.56	4.35	5.01	0.20	0.20
Condition 6	5.88	10.65	19.39	86.64	82.67
Condition 5	0.32	18.37	30.79	0.00	0.00
Condition 4	31.78	49.36	11.47	12.14	15.62
Condition 3	25.93	6.18	11.66	0.08	0.08
Condition 2	0.78	4.18	0.11	0.00	0.11
Condition 1	23.25	3.07	6.92	0.00	0.00
Condition 0	0.00	0.00	0.00	0.00	0.00
	100	100	100	100	100

Fig 7: Prediction with \$500,000 annual program maintenance (Practical Scenario)

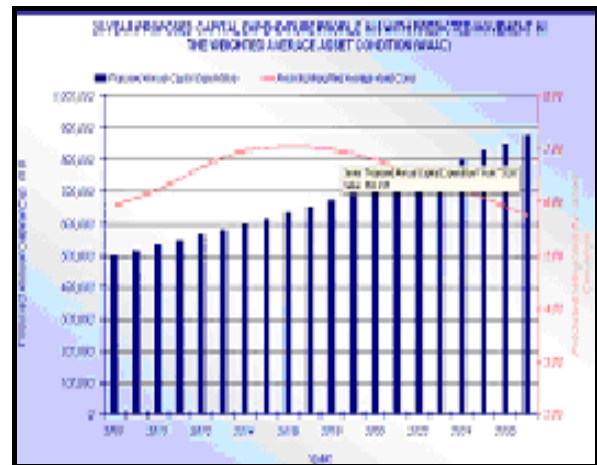
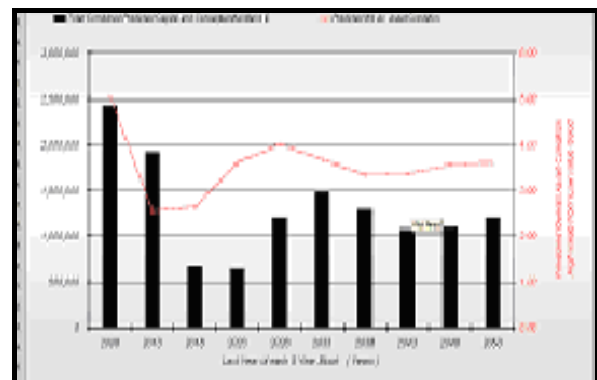


Fig 8: Predictions with no funding Restriction (Ideal Scenario)



## Plant Management:

Council has developed a plant management database within Conquest Asset Management System in accordance with IPWEA plant and vehicle management manual. The optimum replacement point for each individual plant type has been calculated to best estimate the optimum timing for replacement by considering auction results, variable and fixed costs. Using Conquest logbook facility Council has addressed low utilization problem such as plant rationalization or outsourcing etc. Council also developed the following:

- 10 years replacement plan.
- Hourly and yearly hire rates.



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## Appendices

### Appendix A: Sporting Fields Hierarchy

<b>Venue Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
<b>Playing Surface</b>	High standard	Good standard	Basic standard
<b>Playing Field Numbers</b>	More than 4	2-4	1-2
<b>Facility Provision</b>	High level	Good level	Basic level
<b>Sporting Activity</b>	High level of competitive sport. Generally single sport use with potential to generate income, (State/National level)	Possibly a variety of sports. Training and competition venue (District level)	Local level sporting activity. Limited facilities (Local level)

## Appendix B

*Current and Desired Levels of Service (Common):*

<b>Asset Category</b>	<b>Performance Criteria</b>	<b>Current Service Level</b>	<b>Performance Measures</b>	<b>Desired/Policy Service Level</b>
All	Cost Effectiveness	To ensure the most efficient management of assets.  Major Works Programs (project wise) publicly tendered	Monitor Program Maintenance Cost <b>monthly</b>  Works undertaken in accordance with established annual <b>works Program</b>	To be reviewed as part of Council's continuous <b>improvement program.</b>
<b>All</b>	Legislative Requirements	To ensure all infrastructure assets complies with the Local <b>Government Act</b>	Activities undertaken in accordance with <b>Asset Management Plan</b>	100% compliance
<b>All</b>	Customer <b>Satisfaction</b>	Current customer <b>satisfaction</b>	Number of complaints regarding <b>Assets condition</b>	10% reduction in complaints by <b>2005</b>

AppendixC: Building Condition Grading

	Very Good Condition	Good Condition	Moderate Condition	Poor Condition	Very Poor Condition
Estimated Proportion of Life Consumed	Up to 45%	Between 45%to 90%			Up to 90%
Structure	Sound structure	Functionally sound structure	Adequate structure some evidence of foundation movement minor cracking	Structure functioning but with problems due to foundation movement. Some significant cracking	Structure has serious problems and concern is held for the integrity of the structure
External	Fabric constructed with sound materials, true to line and level. No evidence of deterioration or discolouration	Showing minor wear and tear and minor deterioration of surfaces	Appearance affected by minor cracking, staining or minor leakage. Indications of breaches of weatherproofing. Minor damage to coatings	Fabric damaged, weakened or displaced. Appearance affected by cracking, staining, overflows or breakages. Breaches of weatherproofing evident. Coatings in need of heavy maintenance or renewal	Fabric is badly damaged or weakened. Appearance affected by cracking, staining, overflows, leakage or damage. Breaches of waterproofing. Coatings badly damaged or non-existent.
Internal			Appearance affected by minor cracking, staining, or minor leakage, some dampness or mildew. Minor damage to wall / ceiling finishes.	Fabric damaged, weakened or displaced. Appearance affected by cracking, staining, dampness, leakage or breakages. Breaches of waterproofing evident. Finishes of poor quality and in need of replacement	Fabric badly damaged or wakened. Appearance affected by cracking, staining, leakage or wilful damage. Breaches of waterproofing. Finishes badly damaged marked and in need of replacement
Services	All components operable and well maintained	All components operable	Occasional outages breakdowns or blockages. Increased maintenance required	Failures of plumbing electrical and mechanical components common place	Plumbing electrical and mechanical components are unsafe or inoperable

	Very Good Condition	Good Condition	Moderate Condition	Poor Condition	Very Poor Condition
Fittings	Well secured and operational, sound of function and appearance	Operational and functional, minor wear and tear	Generally operational. Minor breakage	Fittings of poor quality and appearance often inoperable and damaged	Most are inoperable or damaged
Maintenance	Well maintained and clean	Increased maintenance inspection required	Regular and programmed maintenance inspections essential	Frequent maintenance inspections essential. Short term element replacement/rehabilitation	Minimum life expectancy, requiring urgent rehabilitation or replacement
Customers	No customer concerns	Deterioration causes minimal influence on occupational users. Occasional customer concerns	Some deterioration beginning to be reflected in minor restrictions on operational uses. Customer concerns	Regular customer complaints	Generally not suitable for use by customers

## Author Biography



**Mahbub Hossain** has 10 years of local government experience, gained at Campbelltown City, and for last five years as Coordinator of Asset services section. Mahbub holds a Degree in Civil Engineering with a Masters in Engineering Management. Particular areas of interest are asset management, pavement management and forward planning of infrastructure maintenance and improvement. Mahbub is been a key member of Council's Asset Management Team, in the introduction and promotion of Asset Management Systems and Strategies.

**Postal Address:** PO Box 57, Campbelltown, NSW 2560

**Tel:** 02 4645 4642

**Fax:** 02 4645 4381

**Mobile:** 0407 703 225

**E-mail:** [mahbub.hossain@campbelltown.nsw.gov.au](mailto:mahbub.hossain@campbelltown.nsw.gov.au)

**Website:** <http://www.campbelltown.nsw.gov.au/>

