Appendix 5

WESTERN AUSTRALIAN LOCAL GOVERNMENT GRANTS COMMISSION

EQUATIONS USED IN THE ASSET PRESERVATION MODEL 2026-27

NB (non-built up) ROADS ACTUAL STANDARDS

Var.No.	Variable Name	Variable	Equation
118	SLL46ACT	Non-built up Sealed <4.6m Actual AP needs	=Sealed <4.6m length [lane km] x [Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs + pavement reconstruction cost $ per lane km] x 2 / frequency of reconstruction x salt factor x arterial roads factor x inflation factor
119	SLG46ACT	Non-built up Sealed >4.6m Actual AP needs	=Sealed >4.6m length [lane km] x [Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs + pavement reconstruction cost $ per lane km] x 2 / frequency of reconstruction x salt factor x arterial roads factor x inflation factor
120	GRVACT	Non-built up Gravel Actual AP needs	=Gravel paved length [km] x [[annual maintenance cost $ per km x Disability factor for routine maintenance] + [Regravelling cost $ per km / Frequency of regravelling] x [Improvement factor -1 + Disability factor for resheeting]] x salt factor x inflation factor
121	FMDACT	Non-built up Formed Actual AP needs	=Formed length [km] x [annual maintenance cost $ per km + [reformation cost $ per km per year x Improvement factor]] x inflation factor
122	UNFACT	Non-built up Unformed Actual AP needs	=Unformed length [km] x annual maintenance cost $ per km x inflation factor
123	CTLGRD	Cattle grids Actual AP needs	=Total non-built up length [km] x Factor for grids [$ per Km] x inflation factor
124	NBACT	All roads Total actual AP needs	=Non-built up Sealed <4.6m Actual AP needs + Sealed >4.6m Actual AP needs + Gravel Actual AP needs + Formed Actual AP needs + Unformed Actual AP needs + Cattle grids Actual AP needs

NB (non-built up) ROADS MINIMUM STANDARDS

125	SLL46STD	Non-built up Sealed <4.6m minimum standard APN	=[Total non-built up length [km] x % NB roads that are sealed <4.6m (group%) x 4/3.5] x [Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs + pavement reconstruction cost $ per lane km] x 2 / frequency of reconstruction x salt factor x arterial roads factor x inflation factor
126	SLG46STD	Non-built up Sealed >4.6m minimum standard APN	=[Total non-built up length [km] x % NB roads that are sealed >4.6m (group%) x 6.2/3.5] x [Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs + pavement reconstruction cost $ per lane km] x 2 / frequency of reconstruction x salt factor x arterial roads factor x inflation factor
127	GRVSTD	Non-built up Gravel minimum standard APN	=[Total non-built up length [km] x % non- built up roads that are Gravel paved (group%) x [annual maintenance cost $ per km + [Regravelling cost $ per km x Improvement factor / Frequency of regravelling]]] x salt factor x inflation factor
128	FMDSTD	Non-built up Formed minimum standard APN	=[Total non-built up length [km] x % non- built up roads that are formed (group%) x [annual maintenance cost $ per km + [reformation cost $ per km per year x Improvement factor]]] x inflation factor
129	UNFSTD	Non-built up Unformed minimum standard APN	=Total non-built up length [km] x % non- built up roads that are unformed (group%) x annual maintenance cost $ per km x inflation factor
130	CTLGRID	Cattle grids minimum standard APN	=Total non-built up length [km] x Factor for grids [$ per Km] x inflation factor
131	NBSTD	All roads Total minimum standard APN	=Non-built up Sealed <4.6m Min Std AP needs + Sealed >4.6m Min Std AP needs + Gravel Min Std AP needs + Formed Min Std AP needs + Unformed Min Std AP needs + Cattle grids Min Std AP needs

Note that in calculating UNFSTD [129] the length of unformed roads included in NBTKM is limited to x% of the sum of sealed, paved and formed roads.

Note the 6.2/3.5 converts road km to lane km

Var.No.	Variable Name	Variable	Equation
		BU (built up) ROADS ACTUAL STANDARDS	
132	RESACTSD	Residential Actual AP needs	={[Res. Paved (Gravel) length [km] x [annual maintenance cost $ per km gravel + [Regravelling cost $ per km / Frequency of regravelling]]] +[Res. Aggregate sealed length [lane km] x [annual maintenance cost $ per km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction +[Res. Asphalt sealed length [lane km] x [annual maintenance cost $ per km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction +[Res. Kerb reconstruction cost $ per km x Kerb length [km]/frequency of reconstruction] + [Longitudinal drainage length [km] x [Drainage annual maintenance cost $ per km + Drainage reconstruction cost $ per km / [frequency of reconstruction x 2]]]} x salt factor x inflation factor
133	DISACTSD	Local distributor Actual AP needs	={[Local distributor Paved (Gravel) length [km] x [annual maintenance cost $ per km gravel + [Regravelling cost $ per km / Frequency of regravelling]]] +[Local distributor Aggregate sealed length [lane km] x [annual maintenance cost $ per km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction +[Local distributor Asphalt sealed length [lane km] x [annual maintenance cost $ per km + Asphalt reseal cost $ per lane km per year + [Asphalt reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction +[Local distributor Kerb reconstruction cost $ per km x Kerb length [km]/frequency of reconstruction] + [Longitudinal drainage length [km] x [Drainage annual maintenance cost $ per km + Drainage reconstruction cost $ per km / [frequency of reconstruction x 2]]]} x salt factor x inflation factor
		BU (built up) ROADS MINIMUM STANDARDS	
134	RESMINSD	Residential Min Std AP needs	={[Total residential sealed length [km] x 7.4/3.5] x [[annual maintenance cost $ per lane km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction]] x 0.1 + [Total residential sealed length [km] x 7.4/3.5] x [[annual maintenance cost $ per lane km + [Asphalt reseal cost $ per lane km per year + [Asphalt reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction]] x 0.9 +[[Total residential sealed length [km] x % of all BU roads kerbed x Res. Kerb reconstruction cost $ per km]/frequency of reconstruction] + [Longitudinal drainage length [km] x % of all BU roads with long. drains x [Drainage annual maintenance cost $ per km + Drainage reconstruction cost $ per km / [frequency of reconstruction x 2]]]} x salt factor x inflation factor
135	DISMINSD	Local distributor Min Std AP needs	={[[[Total local distributor sealed length [lane km] + [Local distributor Paved (Gravel) length [km] x 7.4]/3.5] x [[annual maintenance cost $ per lane km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction]] x 0.06 + [Total local distributor sealed length [lane km] + [Local distributor Paved (Gravel) length [km] x 7.4]/3.5] x [[annual maintenance cost $ per lane km + Asphalt reseal cost $ per lane km per year + [Asphalt reconstruction cost (excl pave) $ per lane km + [Pavement reconstruction cost $ per lane km x Pavement factor]]/frequency of reconstruction]] x 0.94

Var.No.	Variable Name	Variable	Equation
			+ [[Total local distributor sealed length [km] x % of all BU roads kerbed x Res. Kerb reconstruction cost $ per km]/frequency of reconstruction] + [Longitudinal drainage length [km] x % of all BU roads with long. drains x [Drainage annual maintenance cost $ per km + Drainage reconstruction cost $ per km / [frequency of reconstruction x 2]]]} x salt factor x inflation factor

BRIDGES, TRAFFIC CONTROL DEVICES, DUAL USE PATHS AND RIVER CROSSINGS

139	BRIDGSTD	Bridges Actual (and min Std) AP needs	=[[Concrete bridges [sq. m] x Concrete bridges annual maintenance $ per square metre] + [Foot bridges [sq. m] x Concrete bridges annual maintenance $ per square metre] + [Timber bridges [sq. m] x Timber bridges annual maintenance $ per square metre]] x inflation factor
140	NBTRFSTD	Non-built up roads Traffic Control Devices Actual and min Std AP needs [Annual maintenance]	=[[20.48 x Non-built up sealed length [km]] + [10.24 x agricultural shires Non-built up sealed length [km]] + [2.05 x pastoral shires Non-built up sealed length [km]] x inflation factor
141	BUTCDSTD	Built up roads Traffic Control Devices Actual and min Std AP needs [Annual maintenance]	=All built-up sealed roads length [lane km] x Traffic control devices maintenance cost $ per lane km of sealed roads x inflation factor
142	RIVERCROS	River crossings Actual and min Std AP needs	=River crossings [square metres] x annual maintenance cost $ per sq m x inflation factor
103	DUALUSACT	Dual use paths actual and minimum standard	=Dual use paths length [km] x annual maintenance cost $ per km x inflation factor

APM VALUES

143	NBACT	Non-Built up Actual AP needs	=Non-built up Sealed <4.6m Actual AP needs + Non-built up Sealed >4.6m Actual AP needs + Non-built up Gravel Actual AP needs + Non-built up Formed Actual AP needs + Non-built up Unformed Actual AP needs + Cattle grids Actual AP needs
144	NBSTD	Non-Built up Min Std AP needs	=Non-built up Sealed <4.6m Min Std AP needs + Non-built up Sealed >4.6m Min Std AP needs + Non-built up Gravel Min Std AP needs + Non-built up Formed Min Std AP needs + Non-built up Unformed Min Std AP needs + Cattle grids Actual AP needs
145	RESACT	Built up Actual Residential AP needs	=Residential Actual AP needs
146	RESTD	Built up Min Std Residential AP needs	=Residential Min Std AP needs
147	DISACT	Built up Actual Local distributor AP needs	=Local distributor Actual AP needs
148	DISSTD	Built up Min Std Local distributor AP needs	=Local distributor Min Std AP needs
149	NBMSTD	Non-Built up Asset Preservation Needs (greater of Actual and Min Std)	=greater of Non-Built up Actual Asset Preservation Needs and Non-Built up Min Std Asset Preservation Needs
150	RESMSTD	Built up Residential Asset Preservation Needs (greater of Actual and Min Std)	=greater of Built up Actual Residential Asset Preservation Needs and Residential Min Std Residential Asset Preservation Needs
151	DISMSTD	Built up Local distributor Asset Preservation Needs (greater of Actual and Min Std)	=greater of Built up Actual Local distributor Asset Preservation Needs and Built up Min Std Local distributor Asset Preservation Needs
152	APVALUE	Total Asset Preservation Needs	=Non-Built up Asset Preservation Needs (greater) + [Built up Residential Asset Preservation Needs (greater) + Built up Local distributor Asset Preservation Needs (greater)]*Adjustment factor for country towns + Bridges AP needs + Non-built up roads Traffic Control Devices AP needs + Built up roads Traffic Control Devices AP needs + River crossings AP needs

TRANSPORT

Var.No.	Variable Name	Variable	Equation
153	STLSTD	Street lighting AP needs	Cost regions 1 & 2: = [Residential Aggregate sealed length [lane km] + Residential Asphalt sealed length [lane km] + local distributor Aggregate sealed length [lane km] + local distributor Asphalt sealed length [lane km]] x 1792 x inflation factor Cost regions 3 to 16: = [Residential Aggregate sealed length [lane km] + Residential Asphalt sealed length [lane km] + local distributor Aggregate sealed length [lane km] + local distributor Asphalt sealed length [lane km]] x 2049 x inflation factor Cost regions 17,18,19,20,21: = [Residential Aggregate sealed length [lane km] + Residential Asphalt sealed length [lane km] + local distributor Aggregate sealed length [lane km] + local distributor Asphalt sealed length [lane km]] x 1292 x inflation factor
155	FOOTPATH	Footpaths AP needs	=Footpaths length [km] x [Footpaths annual maintenance $ per km] x inflation factor
156	LANSTD	Lanes AP needs	= [[Lanes sealed area [sq m] x Lanes sealed annual maintenance $ per sq m] + [Lanes unsealed area [sq m] x Lanes unsealed annual maintenance $ per sq m] + Lanes lighting annual allowance] x inflation factor
157	TRANSSTD	Asset Preservation Needs for Preliminary Transpo	=Total Asset Preservation Needs + Street lighting AP needs + Footpaths AP needs + Lanes AP needs
193	FBTRNEEDS	Factored back Asset Preservation Needs	= Asset Preservation Needs x [State Total Asset Preservation Expenditure / State Total Asset Preservation Needs]
194	AEROTOT	Aerodromes Asset Preservation Needs	=Commercial aerodromes allowance + Non-Commercial aerodromes allowance + Pastoral station airstrips allowance + Aboriginal communities airstrips allowance [surface area x maintenance cost $ per sq m for each type]
195	PRESGRTS	Average preservation grants	=Federal Preservation Grants + State Preservation Grants + (63%) Roads To Recovery Grants
196	TRNS STD	Transport standard	= [Factored back Asset Preservation Needs + Aerodromes Asset Preservation Needs] - Average preservation grants

VALUES FOR INDIVIDUAL REPORTS

MINIMUM STANDARD LENGTHS FOR INDIVIDUAL REPORTS

159	NBPAVNT	Non-built up Roads Paved Length adjusted for traffic volume	Non-built up Roads Paved Length adjusted for traffic volume
160	NBSL46NT	Non-built up Roads Sealed <4.6m Length adjusted for traffic volume	Non-built up Roads Sealed <4.6m Length adjusted for traffic volume
161	NBSG46NT	Non-built up Roads Sealed >4.6m Length adjusted for traffic volume	Non-built up Roads Sealed >4.6m Length adjusted for traffic volume
162	NBUNFLM	Non-built up Roads Unformed Min Std length [km]	=Total non-built up length [km) x % non- built up roads that are unformed (group%)
163	NBFMDLM	Non-built up Roads Formed Min Std length [km]	=Total non-built up length [km] x % non- built up roads that are formed (group%)
164	NBPAVLM	Non-built up Roads Paved Min Std length [km]	=Total non-built up length [km] x % non- built up roads that are gravel paved (group%)
165	NBSL46LM	Non-built up Roads Sealed <4.6m Min Std length [Lane km]	=Total non-built up length [km]x % NB roads that are sealed <4.6m (group%) x 4/3.5
166	NBSG46LM	Non-built up Roads Sealed >4.6m Min Std length [Lane km]	=Total non-built up length [km]x % NB roads that are sealed >4.6m (group%) x 6.2/3.5
168	RESASPLM	Residential Asphalt seal Min Std length [Lane km]	=Total residential sealed length [km] x 0.9 x 7.4/3.5]
169	RESDRNLM	Residential Long drains Min Std length [km]	=Total residential sealed length [km] x % of all BU roads with long. drains
170	DISAGGLM	Local Distributor Aggregate seal Min Std length [Lane km]	=Total Local Distributor sealed length [km] x 0.06

Var.No.	Variable Name	Variable	Equation
171	DISASPLM	Local Distributor Asphalt seal Min Std length [Lane km]	=Total Local Distributor sealed length [km] x 0.94
172	DISDRNLM	Local Distributor Long drains Min Std length [km]	=Total Local Distributor sealed length [km] x % of all BU roads with long. drains
190	RESKRBLM	Kerb minimum standard length [km]	=Total residential sealed length [km] x % of all BU roads with kerbs
191	DISKRBLM	Kerb minimum standard length [km]	=Total Local Distributor sealed length [km] x % of all BU roads with kerbs

APM COSTS

173	NBUNFCS	Non-built up Unformed Total unit cost per km	=Unformed annual maintenance $ per km x inflation factor
174	NBFMDCS	Non-built up Formed Total unit cost per km	=Formed annual maintenance $ per km x inflation factor
175	NBPAVCS	Non-built up Paved total unit cost per km	=[Gravel paved annual maintenance cost $ per km x Disability factor for routine maintenance] + [Regravelling cost $ per km / Frequency of regravelling] x [Improvement factor -1 + Disability factor for resheeting]] x salt factor x inflation factor
176	NBSL46CS	Non-built up Sealed <4.6m Total unit cost per km	'=[Non-built up Sealed <4.6m Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs plus pavement reconstruction cost $ per lane km] x 2 / frequency of reconstruction] x arterial roads factor x salt factor x inflation factor
177	NBSG46CS	Non-built up Sealed >4.6m Total unit cost per km	'=[Non-built up Sealed >4.6m Annual maintenance cost $ per lane km + reseal cost $ per lane km per year + [[Formation and earthworks cost x terrain factor] + Drainage, surfacing, misc costs plus pavement reconstruction cost $ per lane km] / frequency of reconstruction] x arterial roads factor x salt factor x inflation factor
178	RESPAVCS	Residential Paved total unit cost per km	=[Residential gravel paved Annual maintenance cost $ per km + Regravelling cost $ per km / Frequency of regravelling] x Adjustment factor for country towns x salt factor x inflation factor
179	RESAGGCS	Residential Aggregate seal total unit cost per lane km	= [Residential Aggregate sealed annual maintenance cost $ per lane km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost $ per lane km [Pavement reconstruction $ per lane km x Pavement factor]]/ frequency of reseal x Adjustment factor for country towns x salt factor x inflation factor
180	RESASPCS	Residential Asphalt seal total unit cost per lane km	= [Residential Asphalt sealed annual maintenance cost $ per lane km + Asphalt reseal cost $ per lane km per year + [Asphalt reconstruction cost $ per lane km [Pavement reconstruction $ per lane km x Pavement factor]]/ frequency of reseal x Adjustment factor for country towns x salt factor x inflation factor
181	RESKRBCS	Residential Kerb total unit cost per km	T Roads (Widened sections of main roads in country towns) Min Std AP needs
182	RESDRNCS	Residential Long drains total unit cost per km	= [Drainage annual maintenance cost $ per km + Drainage reconstruction cost $ per km / [frequency of reseal x 2]] x Adjustment factor for country towns x salt factor x inflation factor
183	DISAGGCS	Local Distributor Aggregate seal total unit cost per lane km	= [Local Distributor Aggregate sealed annual maintenance cost $ per lane km + Aggregate reseal cost $ per lane km per year + [Aggregate reconstruction cost $ per lane km [Pavement reconstruction $ per lane km x Pavement factor]]/ frequency of reseal x Adjustment factor for country towns x salt factor x inflation factor
184	DISASPCS	Local Distributor Asphalt seal total unit cost per lane km	= [[Local Distributor Asphalt sealed annual maintenance cost $ per lane km + Asphalt reseal cost $ per lane km per year + [Asphalt reconstruction cost $ per lane km [Pavement reconstruction $ per lane km x Pavement factor]]/ frequency of reseal x Adjustment factor for country towns x salt factor x inflation factor
185	DISKRBCS	Local Distributor Kerb total unit cost per km	=[Res. Kerb reconstruction cost $ per km/Frequency of reseal] x Adjustment factor for country towns x salt factor x inflation factor
186	DISDRNCS	All roads Long drains total unit cost per km	=[Drainage annual maintenance $ per km + Drainage reconstruction $ per km/[Residential road frequency of reconstruction x 2]] x Adjustment factor for country towns x salt factor x inflation factor

Var.No.	Variable Name	Variable	Equation
187	AMTBCS	All roads Timber bridges routine maintenance cost per sq m.	=[Drainage annual maintenance $ per km + Drainage reconstruction $ per km/[Residential road frequency of reconstruction x 2]] x Adjustment factor for country towns x salt factor x inflation factor
188	AMCBCS	All roads Concrete bridges routine maintenance cost per sq m.	=Concrete bridge annual maintenance $ per sq m x inflation factor
189	AMRXCS	All roads Concrete / steel bridges routine maintenance cost per sq m.	=River crossings annual maintenance $ per sq m x inflation factor

Denotes not part of the asset preservation model for road grant determination, but part of the Transport calculation in the Balanced Budget for general purpose grant determinations.