

User Manual Risk Assessment & Prioritization Models

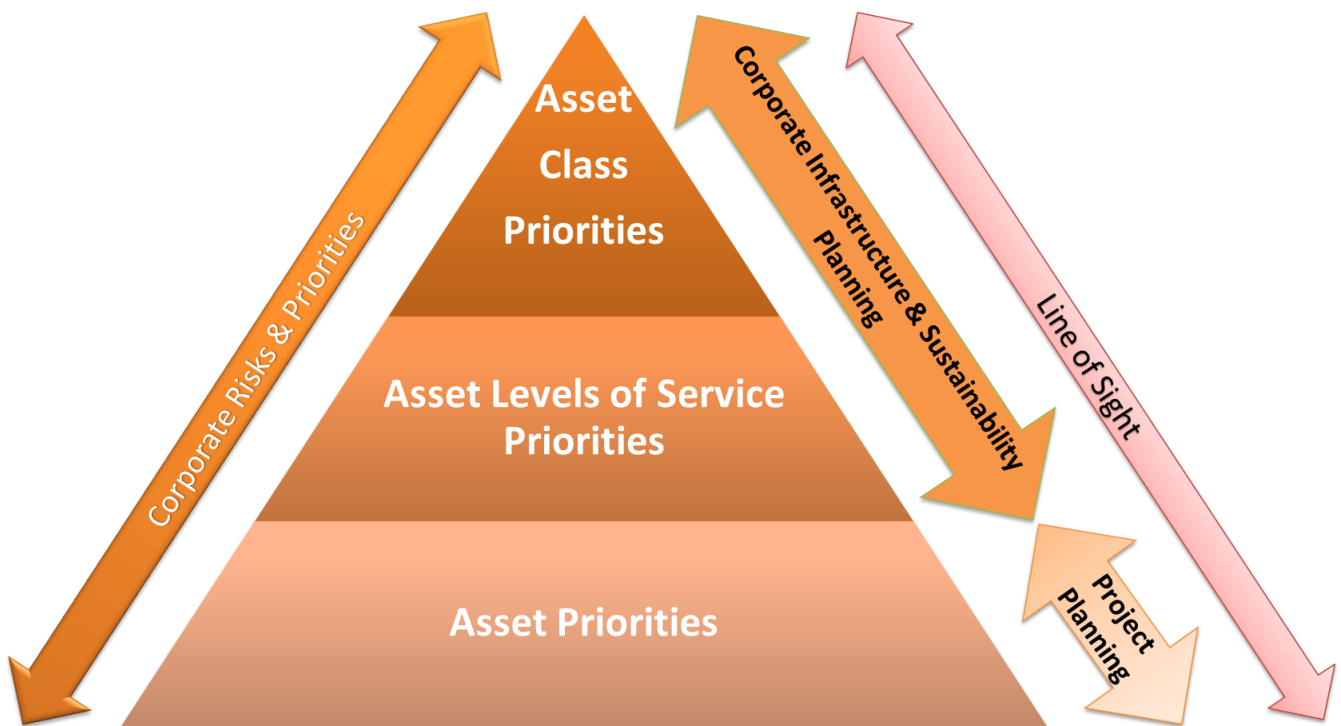
Tab 1 – Asset Level of Service & Asset Class Risk Assessments

Tabs 2 & 3 – Asset Level of Service & Asset Class Prioritization Models

AMONTario Modelling Overview

The AMONTario Risk Assessment and Prioritization Models use an Enterprise Risk Management approach to assess organizational asset risks and priorities across Asset Classes, Asset Levels of Service and individual assets.

Risk Assessment Hierarchy

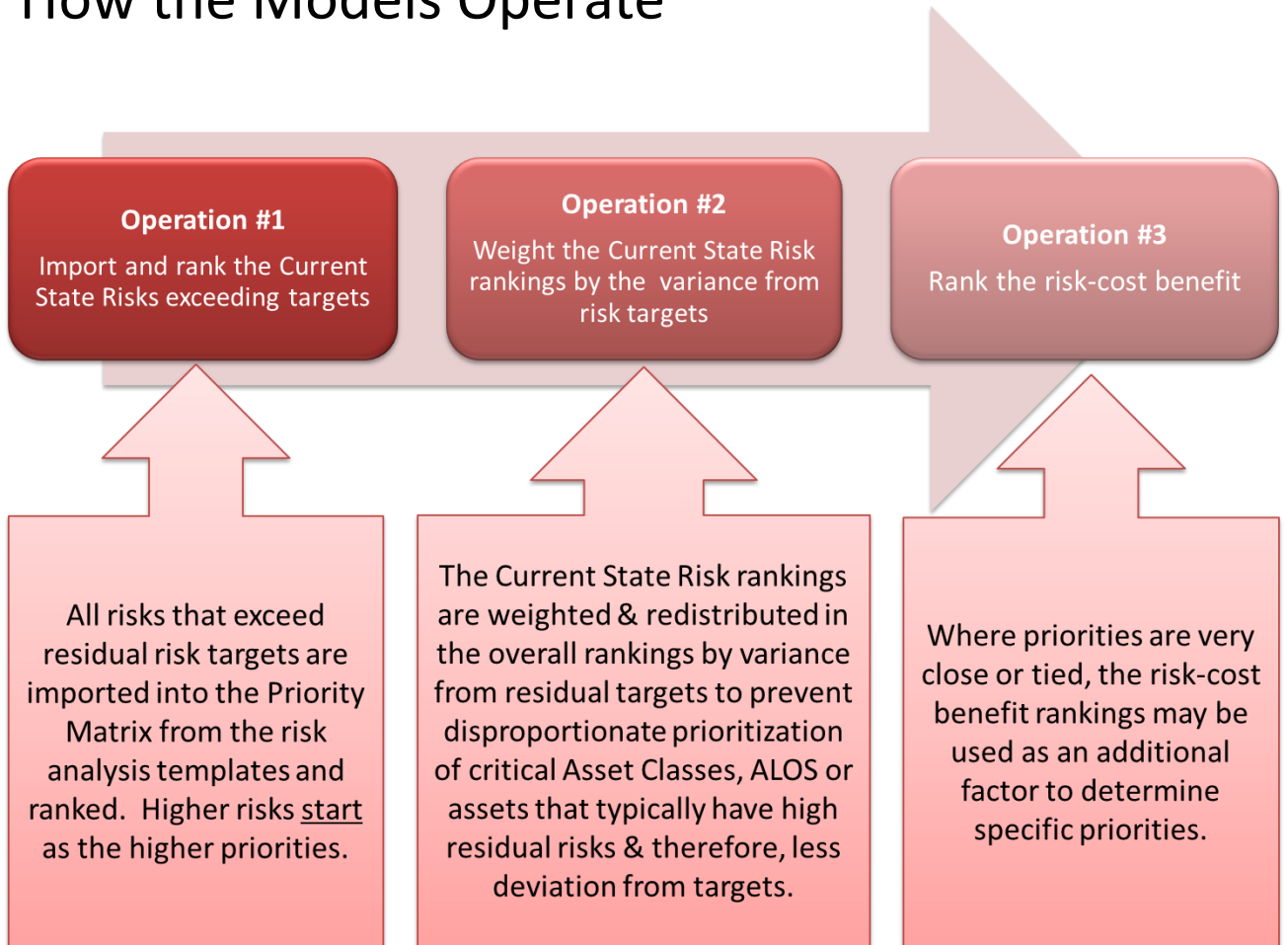


AMONTario Modelling Overview

Priority Modelling

The Prioritization Models rank Asset Class, Asset Levels of Service and asset priorities based on the amount of undesirable risk that is present and how far that risk varies from desired targets.

How the Models Operate



Adding Additional Risk and Priority Templates

A note before you start...

In order to create new template worksheets that maintain the links between the risk assessment models and the priority models, carry out the following steps:

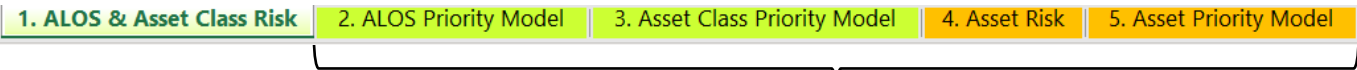
Step A

First select Tab 1



Step B

Then Press the “Control” key and select Tab 2, Tab 3, Tab 4 & Tab 5



Step C

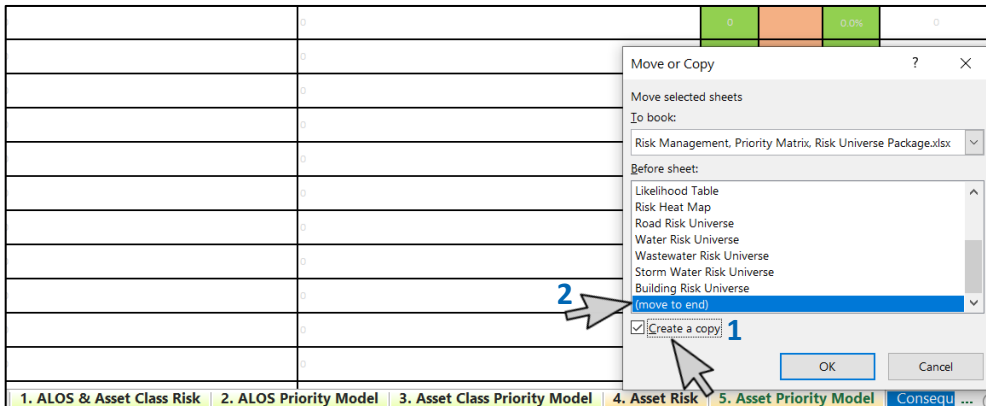
Then right click while all five tabs are selected and click on “Move or Copy”



Step D

Then:

1. Check the box “Create a copy”
2. Select where you would like the tabs to be placed. In this below example the selection is “move to end”.



TAB 1

STEP 1: Enter the Asset Information from the LOS Template

Asset Level of Service Information		Consequences						Risk Targets		Current Status		
Roads Needs		Health & Safety	Community Services	Financial	Environment	Reputation	Total Consequence	Target Likelihood of Failure (Based on ALOS Targets)	Residual (Target) Risk	Current Range of Asset Levels of Service	ALOS Distribution within the Asset Class (%)	Current Likelihood of Failure (Based on Current ALOS)
HCB Collector Roads	Condition ALOS #1	4	4	4	2	3	17					
Step 1a	Pavement Condition Target - PCI = 70							2	34	PCI = 70% - 80%	40.0%	2
	Pavement Condition Target - PCI = 70									PCI = 60% - 70%	50.0%	3
	Pavement Condition Target - PCI = 70									PCI = 50% - 60%	10.0%	4
	Pavement Condition Target - PCI = 70											
Average Condition ALOS #1 Risks and Total Costs									100.0%			

Step 1a

Enter into the "ALOS & Asset Class Risk" template (Tab 1) :

- The Asset Classes to be assessed in the "Asset Class" space
- The Condition and Performance Asset Levels of Service (ALOS) targets in the first rows of the "Condition" and "Performance" areas.

Step 1b

Under "Target Likelihood of Failure" (Column M), enter the corresponding Likelihood of Failure (LoF) number for the ALOS target per the Milestone #3 ALOS materials and the LoF Table (the target LoF is usually either '2' for 'Unlikely' or '3' for 'Possible').

Step 1c

Under "Current Range of Asset Levels of Service" (Column O) and "Distribution within the Asset Class" (Column P), enter the Current Condition and Performance ALOS for the assets within the Asset Class and the ALOS distribution as a percentage of the Asset Class (must sum to 100%).

Step 1d

Under "Current Likelihood of Failure" (Column Q), enter the corresponding LoF for each of the Current Condition and Performance ALOS per the Milestone #3 ALOS materials and LoF Table.

Where Asset Classes are not meeting their ALOS targets, the Condition ALOS ratings and corresponding Likelihood of Failure reflect a 6 – 10-year, 1 – 5-year or <1-year need for replacement or refurbishment. Performance needs are not necessarily time dependent and are addressed according to a variety of factors such as level of risk, municipal willingness to accept the risk, financial capacity to mitigate the risk, and upcoming opportunities to address performance deficiencies through asset replacements or refurbishments.

Expanding the Spreadsheet: The spreadsheet currently represents one Asset Class. To expand the spreadsheet, copy the rows from 4 to 48 and insert below row 48 to add additional Asset Classes. To make the spreadsheet easier to work with, hide any unnecessary rows as you go.

Go to Step 2 : "Assess the Consequences to Services"

TAB 1 STEP 2:

Assess the Consequences

Refer to the “Consequences Table” as you proceed through the following steps.

Step 2a

Under “Consequences”, (Columns G to L) rate between 1 and 5 the severity of failure of ALOS or assets on the Community and Municipality due to loss of asset function, impairment, malfunction, underperformance or insufficiency with respect to the following:

- Health & Safety
- Community Services
- Finances
- Environment
- Reputation

Step 2b

As you fill in the Consequence ratings, your risk scores will calculate. Does the “Total Consequences” score in Column L and the “Residual (Target) Risk” in Column N accurately and realistically reflect the asset criticality and acceptable level of risk to the Community and the Municipality? Remember that risk cannot be eliminated, only managed.

NO

Risk Ratings		Criticality Ratings	
Level	Range	Level	Range
Low	<21	Low	<11
Medium	21 - 59	Medium	11 - 15
High	60 - 99	High	16 - 20
Very High	> 99	Very High	> 20

YES

YES

Optional Step 2c

Under “Estimated Costs to Meet ALOS Targets” (Column T) enter the estimated costs (if available) to repair, replace, upgrade or install the assets to meet or exceed ALOS targets.

Go to Step 3 : “Assess the 10-year ALOS Priorities”

Assessing the consequences helps to understand the criticality of the Asset Class, ALOS or assets and helps establish the maximum risk boundary (Inherent Risk). In other words, how bad could things get without having adequate risk controls; e.g., proper maintenance, good design or adequate ALOS targets.

When assessing consequences of ALOS or asset failure to health and safety, community services, municipal finances, the environment, and municipal reputation, think of what might reasonably happen and the response needed if the assets in the Asset Class go into a “Very Poor” or failed state or be at a “Very Poor” ALOS; i.e., very poor or loss of functionality, very poor capacity, no back-up systems or back-up capacity etc.. Consider how likely or realistic that these consequences could occur given the type of asset failure or impairment. In other words, the severity of the consequence should reasonably match the likelihood of the event occurring or the circumstances under which the event occurs.

Use the Consequence Table, to determine the severity of a risk event due to asset failure, impairment, malfunction, underperformance, insufficiency or misuse. See the applicable "Risk Universe" for some examples of such failures and potential consequences. Expand or modify these examples through your own municipality’s experiences.

Consequences						Residual (Target) Risk
Health & Safety	Community Services	Financial	Environment	Reputation	Total Consequence	
1	2	3	4	5	15	30

Estimated Costs to Meet ALOS Targets (Risk Mitigation Costs) (\$,000's)
\$ 1,000
\$ 500
Step 2c
\$ 1,500

Reconsider the Consequence scores and/or ALOS targets until there is agreement on the level of asset risk and criticality to Community Services and the Municipality.

In some cases, Performance ALOS may be enhanced with improvements to the Condition ALOS. Where possible and practical, divide the total estimated improvement costs between Condition and Performance.

TABS 1 & 2 – STEP 3: Assess the 10-year ALOS Priorities

B

S

The ALOS Priority Model and Asset Class Priority Model are used to prioritize Asset Levels of Service improvements and Asset Class improvements, respectively.

Step 3a.2

Type of ALOS	Target Likelihood of Failure (Based on ALOS Targets)	Residual (Target) Risk	Current Range of Asset Levels of Service	ALOS Distribution within the Asset Class (%)	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk
C	2	34	PCI = 70% - 80%	40.0%	2	34	0.0%
C			PCI = 60% - 70%	50.0%	3	51	-33.3%
C			PCI = 50% - 60%	10.0%	4	68	-50.0%
C						0	
C						0	
				100.0%		45.9	-25.9%

TAB 1

Step 3a: Determine the ALOS Priorities

To transfer the ALOS that have a negative (red) number into the “ALOS Priority Model”(Tab 2):

1. First, “Filter” “Variance from Residual (Target) Risk” (Column S) by the colour “Red”
2. Second, “Filter” Column B (Type of ALOS) by selecting “C” and “P” only
3. Third, copy the cells with numbers from Column A of the “Asset Class ALOS Analysis” (Tab 1) and “Paste Values” into Column A of the “ALOS Priority Model” (Tab 2). This step will automatically populate the “ALOS Priority Model”.

A

Step 3a.3

Asset	ALOS Type	Asset Level of Service Statements & Targets	Current ALOS	Current State Risk (Descending)	Current State Risk Ranking (Higher Risk = Higher #) (Descending)	Variance from Residual (Target) Risk
4	HCB Collector Roads	C Pavement Condition Target - PCI = 70	PCI = 50% - 60%	68	5	-50.0%
3	HCB Collector Roads	C Pavement Condition Target - PCI = 70	PCI = 60% - 70%	51	4	-33.3%
31	HCB Collector Roads	P Environmental Resiliency Target = Good	Fair	48	3	-33.3%
10	HCB Collector Roads	C Condition Target = Good	PCI = 60% - 70%	45	2	-33.3%
17	HCB Collector Roads	P Operational Functionality Target = Good	Fair	42	1	-33.3%

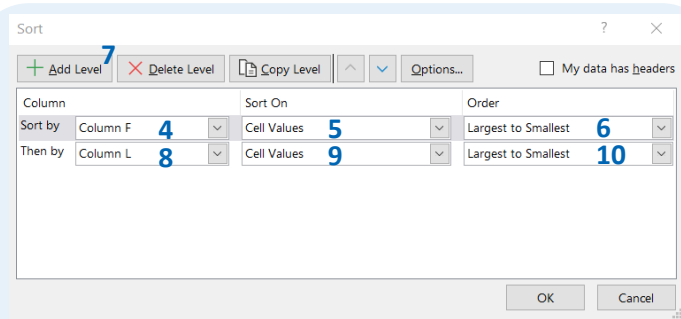
TAB 2

Step 3b (if required)

In the “ALOS Priority Model”, to rank the “Current State Risks” (Column F) and “Weighted Score” (Column L) from highest to lowest:

Note: This step is required only if the Priority Model fails to automatically populate correctly

1. Select all the rows with data
2. Click on “Data” on the Toolbar
3. Select “Sort”
4. Sort by: select “Column F”
5. Sort on: Cell Values
6. Order: Largest to Smallest
7. Click on “Add level”
8. Sort by: select “Column L”
9. Sort on: Cell Values
10. Order: Largest to Smallest



The data you transfer to the Priority Model remains linked to the Risk Model. Changes in the Risk Model will change the Priority Model.

Your overall ALOS risk priorities will be ranked in Column M and if you entered costs for mitigating the risks (Optional Step 2c), the Risk-Cost Benefit will also be ranked in Column O.

Continue to Step 4: “Assess 10-year Asset Class Priorities”

TABS 1 & 3 – STEP 4: Assess the 10-year Asset Class Priorities

TAB 1

Step 4a: Determine the Asset Class Priorities

To transfer the Asset Classes that have a negative (red) number into the “Asset Class Priority Model” (Tab 3):

1. First, “Filter” “Variance from Residual (Target) Risk” (Column S) by the colour “Red”
2. Second, “Filter” Column B (Type of ALOS) by selecting “C&P” only
3. Third, copy the cells with numbers from Column A of the “Asset Class ALOS Analysis” (Tab 1) and “Paste Values” into Column A of the “Asset Class Priority Model” (Tab 3). This step will automatically populate the “Asset Class Priority Model”.

Step 4a.2

Type of ALOS	Target Likelihood of Failure (Based on ALOS Targets)	Residual (Target) Risk	Current Range of Asset Levels of Service	ALOS Distribution within the Asset Class (%)	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk
C	2	34	PCI = 70% - 80%	40.0%	2	34	0.0%
C			PCI = 60% - 70%	50.0%	3	51	-33.3%
C			PCI = 50% - 60%	10.0%	4	68	-50.0%
C						0	
C						0	
AC				100.0%		45.9	-25.9%

Step 4a.1

Step 4a.3

Asset Information	Current State Risk (Descending)	Current State Risk Ranking (Higher Risk = Higher #) (Descending)	Variance from Residual (Target) Risk
45 HCB Collector Roads Combined Average Condition & Performance ALOS Risks and Total Costs	44	1	-29.6%

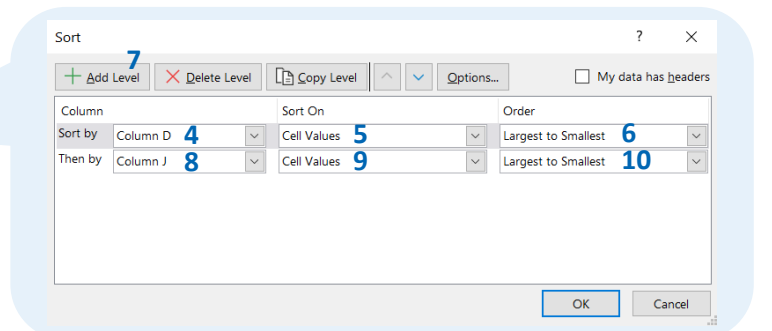
TAB 3

Step 4b (if required)

In the “Asset Class Priority Model”, to rank the “Current State Risks” (Column D) and “Weighted Score” (Column J) from highest to lowest:

1. Select all the rows with data
2. Click on “Data” on the Toolbar
3. Select “Sort”
4. Sort by: select “Column D”
5. Sort on: Cell Values
6. Order: Largest to Smallest
7. Click on “Add level”
8. Sort by: select “Column J”
9. Sort on: Cell Values
10. Order: Largest to Smallest

Note: This step is required only if the Priority Model fails to automatically populate correctly



The data you transfer to the Priority Model remains linked to the Risk Model. Changes in the Risk Model will change the Priority Model.

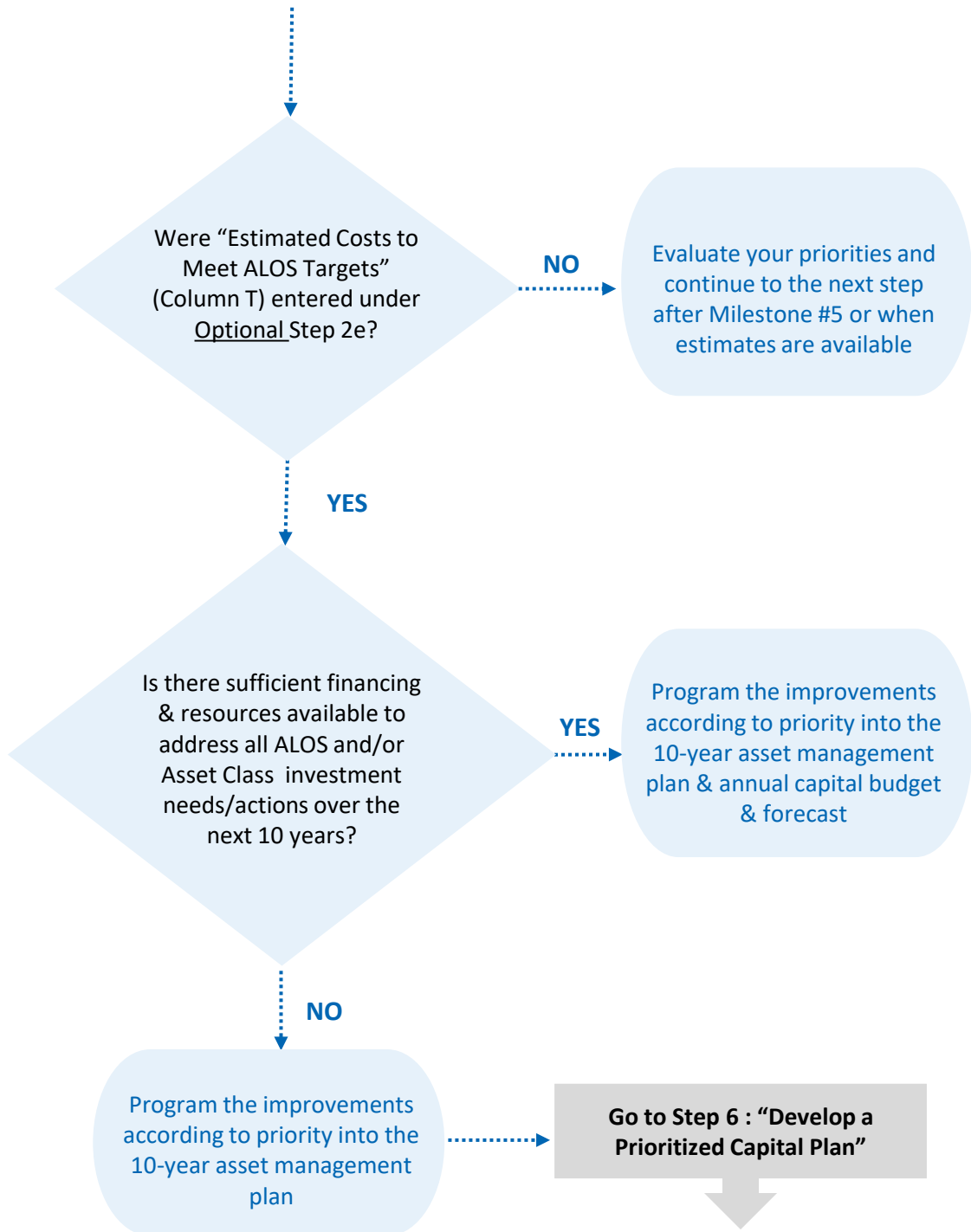
Your overall Asset Class risk priorities will be ranked in Column K and if you entered costs for mitigating the risks (Optional Step 2c), the Risk-Cost Benefit will also be ranked in Column N.

Continue to Step 5: “Develop an Asset Management Plan”

TABS 2 & 3

STEP 5: Develop an Asset Management Plan

Use the results from the “ALOS Priority Model” and “Asset Class Priority Model” to determine asset management priorities.



TAB 1

STEP 6: Develop a Prioritized Capital Plan

Current State Risk & Financial Analysis						Financial Plan Analysis			
P	Q	S	T			W	X		
ALOS Distribution within the Asset Class (%)	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk	Estimated Costs to Meet ALOS Targets (Risk Mitigation Costs) (\$,000's)	Risk-Cost Benefit (\$,000's per Risk Point Reduced)	Proposed 10-year Capital Plan Investments (\$,000's)	ALOS Distribution within the Asset Class (%)	Post-Financing Likelihood of Failure (After Proposed Investments)	Estimated Post 10-year Capital Plan Risk (After Proposed Investments)
40.0%	2	34	0.0%				40.0%	2	34
50.0%	3	51	-33.3%	\$ 1,000	\$ 59		50.0%	3	51
10.0%	4	68	-50.0%	\$ 1,000	\$ 29		10.0%	4	68
Step 6b							Step 6b		0
		0			\$ -				0
100.0%		45.9	-25.9%	\$ 2,000	\$ 168	\$ -	100.0%		45.9

In order to proceed with Step 6, cost estimates to correct the negative (Red) risk variances (asset deficiencies) must be available and entered under "Estimated Costs to meet ALOS Targets" (Column T).

Step 6a

Returning to the "ALOS & Asset Class Risk" (Tab 1), first "Clear Filter" for "Variance from Residual (Target) Risk" (Column S).



Step 6b

Where information has been entered for the Asset Class under "ALOS Distribution within the Asset Class" (Column P) and under "Current Likelihood of Failure" (Column Q), copy and paste that information to Column W ("ALOS Distribution within the Asset Class") and Column X (Post-Financing Likelihood of Failure).



TAB 1

STEP 6: Develop a Prioritized Capital Plan

S						T					V			W		X	
Current State Risk & Financial Analysis						Financial Plan Analysis											
ALOS Distribution within the Asset Class (%)	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk	Estimated Costs to Meet ALOS Targets (Risk Mitigation Costs) (\$,000's)	Risk-Cost Benefit (\$,000's per Risk Point Reduced)	Proposed 10-year Capital Plan Investments (\$,000's)	ALOS Distribution within the Asset Class (%)	Post-Financing Likelihood of Failure (After Proposed Investments)	Estimated Post 10-year Capital Plan Risk (After Proposed Investments)								
40.0%	2	34	0.0%				40.0%	2	34								
50.0%	3	51	-33.3%	\$ 1,000	\$ 59	\$ 500	25.0%	3	51								
10.0%	4	68	-50.0%	\$ 1,000	\$ 29	\$ 1,000	35.0%	1	17								
		0			\$ -				0								
		0			\$ -	Step 6c	Step 6d		0								
100.0%		45.9	-25.9%	\$ 2,000	\$ 168	\$ 1,500	100.0%		32.3								

Step 6c

Starting with the highest ALOS priorities in the ALOS Priority Model, begin entering into Column V the 10-year funding that can be afforded to address the risk variances in Column S using the amounts entered in Column T as a guide. The amounts entered in Column V can be the full investments needed per Column T, or partial amounts of the investments needed.

Note: Accurate redistribution of the "ALOS Distribution within the Asset Class" (Column W) and "Post-Financing Likelihood of Failure" (Column X) is required to obtain an accurate updated risk profile for the ALOS and Asset Classes.

Step 6d

As the proposed investments are being entered into Column V, adjust the "ALOS Distribution within the Asset Class" (Column W) and "Post-Financing Likelihood of Failure" (Column X) according to the levels of investments made into each ALOS. Partial investments into an ALOS will result in partial improvements of the ALOS. Check that the overall distribution in Column W still totals 100% after the redistribution of ALOS conditions have been made. **Note:** Where investments have been made, the Likelihood of Failure should reflect either a new or excellently performing asset (i.e., LoF = '1') or a nearly new or adequately performing asset (i.e., LoF =2).

Where the estimate for an ALOS improvement includes both Condition and Performance works under one cost (only one cost estimate is provided for all the improvements), ensure that the Condition and Performance Likelihood of Failure scores are adjusted accordingly for the all the related improvements represented by the one cost estimate.

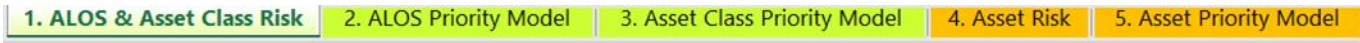
STEP 6: Develop a Prioritized Capital Plan

Reassess the Risk Profile and Asset Management Priorities

The easiest way to analyze the effects of the 10-year investments on the organization's Asset Levels of Service and Asset Classes and to carry out subsequent sensitivity analyses, re-run the Priority Models with the proposed 10-year investments included. To create a separate file, carry out the following steps:

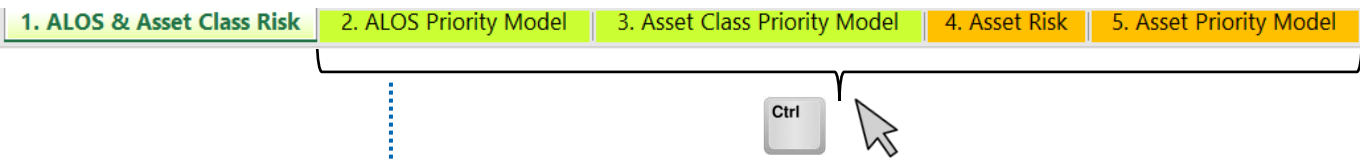
Step A

First select Tab 1



Step B

Then Press the "Control" key and select Tab 2 and Tab 3



Step C

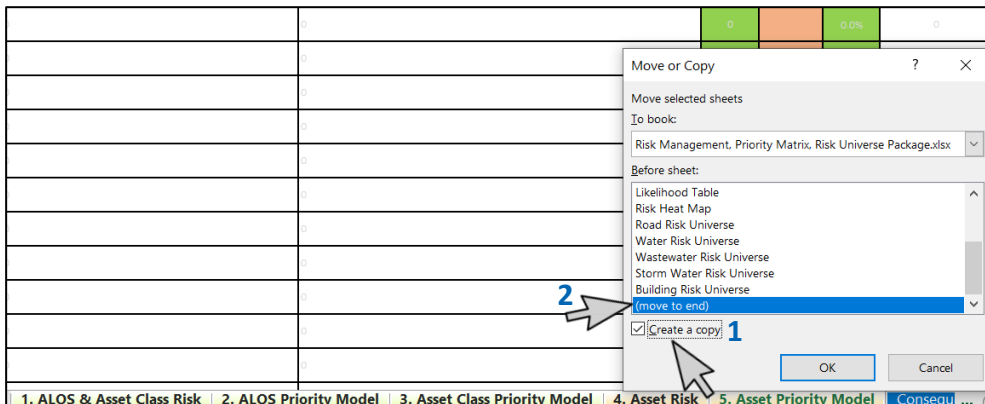
Then right click while all three tabs are selected and click on "Move or Copy"



Step D

Then:

1. Check the box "Create a copy"
2. Select where you would like the tabs to be placed. In this below example the selection is "move to end".



TAB 1

STEP 6: Develop a Prioritized Capital Plan Re-evaluate the Asset Management Risk Profile

Step 6e

Clear the copied ALOS and Asset Class Priority models.

Step 6f

Filter "Net Variance from Residual Risk" (Column AA) by the colour "Red"

Step 6g

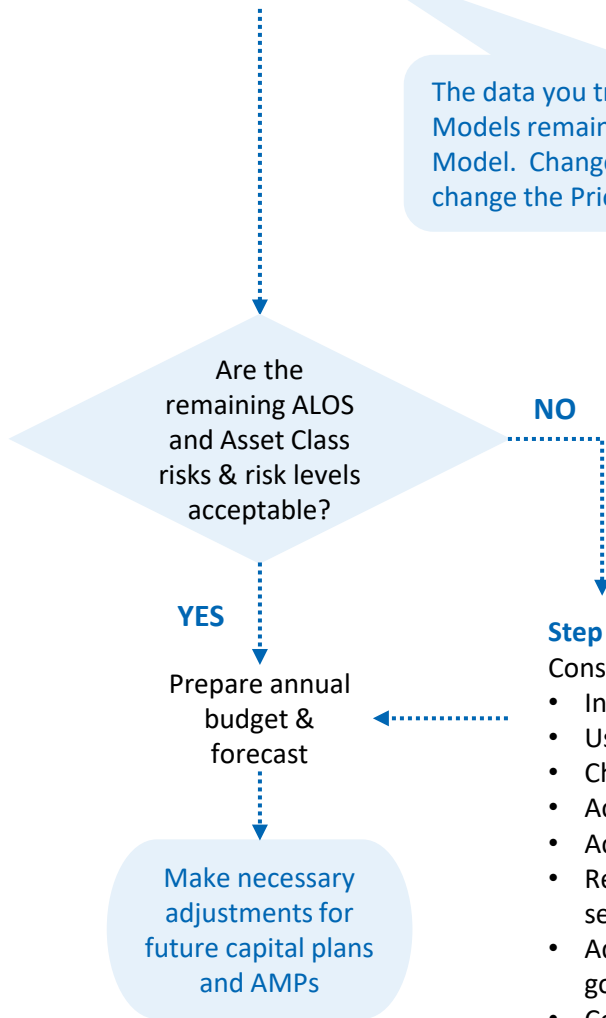
Repeat Steps 3 and 4 on Pages 7 and 8 to reassess the ALOS and Asset Class priorities on the copied ALOS and Asset Class Priority Models. Use the models to evaluate the remaining risks and needs and to make further adjustments funding distribution and risk.



Step 6f

The data you transfer to the Priority Models remains linked to the Risk Model. Changes in the Risk Model will change the Priority Models.

Note: Developing a feasible and affordable Capital Plan that best meets the needs of the community is an iterative process. Since the Priority Models are linked with the Risk Model, different levels of investments to different ALOS and Asset Classes can be tested in the Risk Model, and the results seen in the Priority Models.



Step 6f

Consider options:

- Increase revenues
- Use debt to finance improvements
- Change project scope, reduce or defer expenditures
- Acquire more human or technical resources
- Accept higher risks/less service in the short term
- Reduce ALOS targets and accept higher risks/lower services over the long term
- Advocate for funding support from senior levels of government
- Combination of above

User Manual Risk Assessment & Prioritization Models

Tab 4 – Asset Risk Assessments

Tab 5 – Asset Prioritization Model

TAB 4

STEP 1: Enter the Asset Information

Service and Asset Information		Consequences					Risk Targets		Current State Risk & Financial Analysis						
Water Project Prioritization		Health & Safety	Community Services	Financial	Environment	Reputation	Total Consequence	Target Likelihood of Failure (Based on ALOS Targets)	Residual (Targets) Risk	Current Range of Asset Levels of Service	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk	Estimated Costs to Meet ALOS Targets (Risk Mitigation Costs) (\$,000's)	Risk-Cost Benefit (\$,000's per Risk point Reduced)
Pumping Station #1 Pump System A	Condition ALOS #1 Target = Good	3	4	3	1	3	14	2	28	Fair	3	42	-33.3%	\$ 277	\$ 20
Step 1a		Step 1a					Step 1b	Step 1c	Step 1d	Step 1f					

Step 1a

Enter into the "Asset Risk" template (Tab 4):

- The assets to be assessed in the "Asset" space.
- The Condition and Performance Asset Levels of Service (ALOS) targets in the "Condition" and "Performance" spaces.

Step 1b

Under "Target Likelihood of Failure" (Column L), enter the corresponding Likelihood of Failure (LoF) number for the ALOS target per the LoF Table (the target LoF is usually either '2' for 'Unlikely' or '3' for 'Possible'). Most often the asset LoF target is consistent with the targets for the "parent" Asset Class.

Step 1c

Under "Current Range of Asset Levels of Service" (Column N), enter the Current Condition and Performance ALOS. **Use Tab 8 or 9 in the ALOS packages to calculate Current Performance of the assets.**

Step 1d

Under "Current Likelihood of Failure" (Column O), enter the corresponding LoF for the Current Condition and Performance ALOS per the LoF Table.

Step 1e

Under "Consequences", (Columns F to K), rate between 1 and 5 the severity of asset failure. Use the same process described under Step 2a of "Assess the Consequences" on Page 6 of the manual. Often the asset consequences are the same as the "parent" Asset Class consequences.

Step 1f

Under "Estimated Costs to Meet ALOS Targets" (Column R), enter the estimated costs (if available) to replace, rehabilitate or upgrade the assets to meet or exceed ALOS targets.

Go to Step 2 : "Assess the Asset Priorities"

The Asset Risk Model allows municipalities to prioritize asset replacements, rehabilitations or upgrades at the "asset" level of the hierarchy.

Expand the spreadsheet to suit the number of assets being analyzed. The spreadsheet currently represents one asset type. To expand the spreadsheet, copy the rows from 4 to 18 and insert below row 18 to add additional asset types. To make the spreadsheet easier to work with, hide any unnecessary rows as you go.

Because of the uniqueness and specific service requirements of discrete assets, the consequences of a specific asset failure may be differ at times from the consequences of the parent Asset Class.

TABS 4 & 5 – STEP 2: Assess the Asset Priorities

The Asset Priority Model can be used to carry out organizational-wide prioritizations at the “asset” level of the hierarchy.

TAB 4 Step 2a

To transfer the ALOS that have a negative (red) number into the “Asset Priority Model” (Tab 5):

1. First, “Filter” “Variance from Residual (Target) Risk” (Column Q) by the colour “Red”
2. Second, “Filter” Column A by the cell colour “Blue”
3. Third, copy the numbers from Column A of the “Asset Risk” Model (Tab 4) and “Paste Values” in the “Asset Priority Model” (Tab 5) in Column A. This step will automatically populate the “Asset Priority Model”.

A **Step 2a.2**

Water Project Prioritization	Health & Safety	Community Services	Financial	Environment	Reputation	Total Consequence	Target Likelihood of Failure (Based on ALOS Targets)	Residual (Target) Risk	Current Asset Level of Service	Current Likelihood of Failure (Based on Current ALOS)	Current State Risk	Variance from Residual (Target) Risk
Combined Average Condition and Performance ALOS Risks								35			42	-18.0%

Step 2a.1

Note: This step is required only if the Priority Model fails to automatically populate correctly.

TAB 5 Step 2b (if required)

In the “Asset Priority Model”, to rank the “Current State Risk” (Column D) and “Total Score” (Column J) from highest to lowest:

1. Select all the rows with data
2. Click on “Data” on the Toolbar
3. Select “Sort”
4. Sort by: select “Column D”
5. Sort on: Cell Values
6. Order: Largest to Smallest
7. Click on “Add level”
8. Sort by: select “Column J”
9. Sort on: Cell Values
10. Order: Largest to Smallest

D **Step 2a.3**

Asset Information	Current State Risk (Descending)	Current State Risk Ranking (Higher Risk = Higher #) (Descending)	Variance from Residual (Target) Risk
15 Pumping Station #1 Pump System A	57	1	-43.0%

7

Sort

+ Add Level X Delete Level Copy Level Options... My data has headers

Column	Sort On	Order
Sort by Column D 4	Cell Values 5	Largest to Smallest 6
Then by Column J 8	Cell Values 9	Largest to Smallest 10

OK Cancel

Your overall asset risk priorities will be ranked in Column K and if you entered costs for mitigating the risks (Step 1f), the Risk-Cost Benefit will also be ranked in Column N.

The data you transfer to the Priority Matrix remains linked to the Risk Matrix. Changes in the Risk Matrix will change the Priority Matrix.

Evaluate priorities and prepare Capital Plan