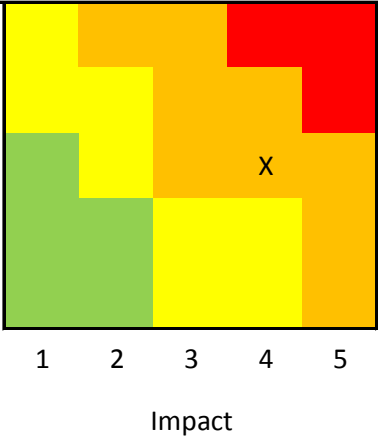
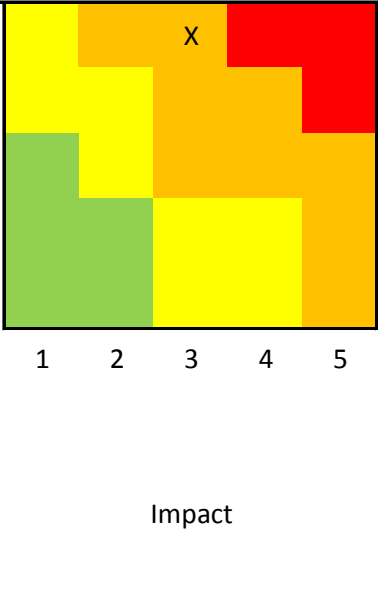
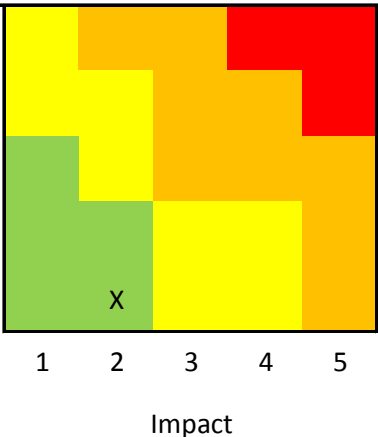
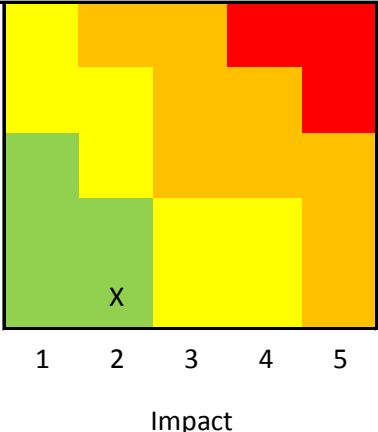
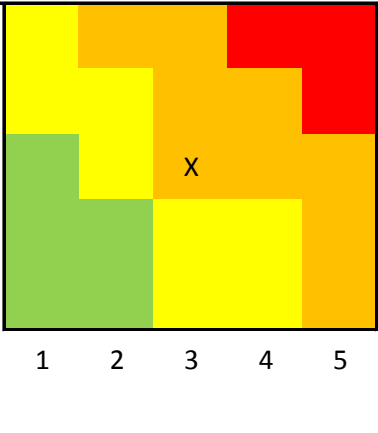


Category	Failure Cause	Effect	Threat or Opportunity	Probability	Impact	Risk Matrix	Response	Risk Contingency Response Plan	Actions	Responsibility	Resources
	Sample Data	Sample Data	Sample Data	3	2	<p>A 5x5 Risk Matrix with Probability on the y-axis (1-5) and Impact on the x-axis (1-5). The color scale ranges from green (low risk) to red (high risk). A green cell is at (3,2) with an 'X'.</p>	Sample Data	Sample Data	Sample Data	Sample Data	
Funding	funding shortfall	Fewer projects, less optimal treatments, decreased pavement condition ratings, reduction in personnel, RPO's funding decreased, MPO's funding decreased	Threat	5	4	<p>A 5x5 Risk Matrix with Probability on the y-axis (1-5) and Impact on the x-axis (1-5). The color scale ranges from green (low risk) to red (high risk). A red cell is at (5,4) with an 'X'.</p>	evaluate impacts	Alternate funding sources, track impacts on system and report to Legislature, educate decision makers about MAP21 requirements, move roads to local jurisdiction, adjust our targets.	Monitor budget and evaluate contingencies for -10% and -20% budgets. Analyze impact on roadway condition.	Program Development Unit, Pavement Management Unit. Guidance from Chief Engineers office.	AMP, PMS
Hurricanes or flooding	Major event hits NC	washouts, drainage or pipe failures, weakened pavement structure, heavy loads immediately after event, diversion of personnel and equipment, lack of connectivity for citizens and freight, potential diversion of funds (up to 25% out of pocket)	Threat	3	4	<p>A 5x5 Risk Matrix with Probability on the y-axis (1-5) and Impact on the x-axis (1-5). The color scale ranges from green (low risk) to red (high risk). A yellow cell is at (3,4) with an 'X'.</p>	Preplan and evaluate	Hurricane planning, move personnel to affected area, preposition equipment and materials, TIMS to inform citizens, preplanned detours, hurricane evacuation routes	Table top hurricane planning exercise. Conference calls before, during and after event. Review issues to improve plan.	State Maintenance and Operations Unit, Division offices and local maintenance yards.	AMP, FEMA records, SAP

<p style="text-align: center;">Rock Slides</p>	<p>Route closed by rock slide</p>	<p>Roads blocked, Debris requires removal, lack of connectivity for citizens and freight, economic impacts for blocked businesses, structural integrity of embankment and pavement, injuries or fatalities</p>	<p style="text-align: center;">Threat</p>	<p style="text-align: center;">3</p>	<p style="text-align: center;">4</p>	<p style="text-align: center;">Probability</p>  <p style="text-align: center;">Impact</p>	<p style="text-align: center;">monitor and improve slopes</p>	<p>Rock bolting, wire mesh, flatten slopes, pre-emptive blasting, study impacted corridors, predetermined detours, retaining walls for earth slides.</p>	<p>Review geotechnical analysis of most likely areas.</p>	<p>Geotechnical Engineering Unit, Division 11, 13, 14.</p>	<p>Aerial photos, geotech. Reports.</p>
<p style="text-align: center;">Population growth</p>	<p>Projected population increases occur</p>	<p>Increased traffic, increased freight traffic, increased pavement deterioration, decreased public satisfaction, increased treatment cost, need to increase capital program, increased tax base, more safety concerns, pavements need structural improvement, more lane miles to maintain, potentially increased urban and suburban areas.</p>	<p style="text-align: center;">Threat</p>	<p style="text-align: center;">5</p>	<p style="text-align: center;">3</p>	<p style="text-align: center;">Probability</p>  <p style="text-align: center;">Impact</p>	<p style="text-align: center;">Monitor changes in population and areas of growth</p>	<p>Improve public transit, improve freight rail system, tolls, alternate funding, metered ramps, carpooling lanes, high speed rail, planning strategies, improved growth models, balance between capital program and maintaining existing infrastructure.</p>	<p>Continue working on operational improvements in the I-85 crescent. Include HOV, tolling and metered ramps. Expand "bus on shoulders" routes?</p>	<p>Divisions 5, 7, 8,9,10, with additional increases in Div. 3 and 13. Mobility and Safety Unit and Traffic Services.</p>	<p>Traffic counts, congestion reports, TIMS reports of incidents, Traffic Monitoring Centers, IMAP trucks to identify trouble spots.</p>
<p style="text-align: center;">Information Technology</p>	<p>IT threats to PMS-system ceases to operate</p>	<p>Can't produce reports, can't import data, Also impacts PCS, data collection, MMS and BMS.</p>	<p style="text-align: center;">Threat</p>	<p style="text-align: center;">1</p>	<p style="text-align: center;">2</p>	<p style="text-align: center;">Probability</p>  <p style="text-align: center;">Impact</p>	<p style="text-align: center;">Planned Rollback</p>	<p>Good rollback plan to previous version, on-the-shelf reports, notify tech. support and field users, update hardware and software.</p>	<p>Identify system status and alert IT of need to rollback. Notify system users.</p>	<p>PMU and IT.</p>	<p>System status. Reports from daily users. IT diagnostics. Vendor diagnostics.</p>

	PMS must change to different vendor.	Requires dollars and time to transition to new system, data integrity, users don't know the new system, programs and reports still needed.	Threat	2	2	<p>Probability</p> <p>Impact</p>	Select new vendor and transition	Transition plan and data plan, training, list of most urgent reports.	Write user requirements and system requirements. Identify transition issues. Alert field users. Prepare most urgent reports.	PMU, MMS and IT.	
	Data storage amount and modernization	Loss of historical data (data used less frequently), loss of institutional knowledge	Threat	3	3	<p>Probability</p> <p>Impact</p>	Monitor and upgrade with technology	Multiple backups in multiple locations, data recovery plan, move to cloud	Recover most recent backup. Notify field and office users.	IT and PMU.	Storage requirement records.
	Data collection equipment operating system or file formats go out of date	May lack skid data on road with poor friction	Threat	5	4	<p>Probability</p> <p>Impact</p>	Keep OS up to date.	OS update to existing equipment, equipment replacement, redundant equipment, spare parts for frequent break items.	Evaluate if software can be written to bridge our file format. Look at upgrading equipment to new version.	PMU and Equipment Unit.	Uploaded files.
Pavement Material Shortage	Cement or Asphalt shortage	Delayed Construction, higher cost means less work, pavement condition declines during delay, only lower quality materials available, could change pavement type	Threat	2	2	<p>Probability</p> <p>Impact</p>	Monitor and act if shortage occurs.	Stockpile materials, track material trends, find alternate sources, change materials, adjust project delivery date.	Evaluate impacts of delayed material deliveries to project completion.	Construction Unit, Resident Engineer, PMU, Materials and Tests.	Material Supplier reports to contractors. Construction publications.

Pavement Material Defects	Alkali Silica Reactivity	Pavement failure at Depth, Increased maintenance costs, increased ride roughness	Threat	1	2	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 5px;">Probability</div>  </div>	Prevent construction of new ASR.	Test aggregates, enforce specifications, educate inspectors and resident engineers.	Evaluate aggregate sources and train resident engineers having concrete projects.	Materials and Tests, Construction Unit, Resident Engineers.	Current specifications, best practices.
Climate Change	Climate change raises average temperatures and level of ground water table.	Asphalt used in pavement is not adequate for higher temperatures so rutting develops, higher GWT results in decreased support under pavements, increased frequency of extreme events (see hurricanes and flooding). Some roadways may be flooded in coastal	Threat	3	3	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); margin-right: 5px;">Probability</div>  </div>	Monitor and change as needed.	Track changes in temperature and GWT levels to make design changes.	Evaluate asphalt mixes at "new" temperature ranges to see if action is taken.	Materials and Tests, Geotechnical Engineering.	Laboratory test results, NOAA predictions.