



2011 Earthquake, Hurricane Irene and Tropical Storm Lee:

Summary of Impacts to VDOT Infrastructure

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2011 Earthquake and Hurricane Impacts to VDOT

- **Three major weather events in Aug-Sept 2011**
 - **Earthquake**
 - **Hurricane Irene**
 - **Tropical Storm Lee**
- **Summary of Impact:**
 - **Bridges**
 - **VDOT facilities**
 - **Safety Rest Areas and Welcome Centers**

2011 Earthquake in Virginia

Damage Assessment for Bridges

2011 Earthquake - Field Inspection of Bridges

Field inspection instructions:

- Look for unusual orientation/movement of the structure (looking at the deck joints and sighting down the length of the structure)
- Inspect bridge bearings at the abutment and pier locations.
 - Verify the bearings are in their proper position
- Look for signs of distress to the substructure or superstructure
- Review utilities attached to the structure
- If the initial field inspection indicates further review is required, the Districts performed an in-depth bridge inspection

Results of Inspections:

- 694 inspections completed (686 bridge / 8 tunnel inspections)
- 3 bridges in need of further detailed investigations
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2011 Earthquake - In-Depth Inspection of Bridges

Structures requiring an in-depth inspection:

- **Culpeper District:**
 - **Route 208 (Courthouse Road) over South Anna River**
 - Slight longitudinal movement observed
 - No significant damage
 - **Route 208 (Courthouse Road) over I-64**
 - Slight longitudinal movement observed
 - No significant damage
- **Richmond District:**
 - **Route 683 (Parrish Road) over I-64**
 - Concrete spalling of barrier end wall
 - No significant damage

2011 Earthquake in Virginia

Preliminary Damage Report for VDOT Facilities

2011 Earthquake - Preliminary Damage Report

Preliminary Damage Reports to Buildings:

- **Culpeper**
 - Minor damage to Louisa Truck Shed

- **Fredericksburg**
 - Exterior cracks, ceiling timbers twisted and roof structure issues to Maintenance/Facilities/Shop Buildings
 - Cracks to walls and buckled floors in to Admin/Materials Buildings
 - Cracked walls and floors to Construction/Bridge Buildings and Procurement Trailer

- **Hampton Roads**
 - Minor cracks to Emporia Salt building

- **Lynchburg**
 - Minor damage to Cumberland Area Headquarters

2011 Earthquake - **Preliminary Damage Report**

- **NOVA**
 - Possible beam failure in warehouse section of Traffic Field Operations Building
 - Foundation block cracking to Reston Area Headquarters
 - Roof bowing and floor heaved and distorted to Dale City Headquarters
- **Richmond**
 - Minor cracks to Oilville Truck Shed and Ashland Repair Shop
- **Staunton**
 - Minor cracks to STC/Materials Buildings and Fishersville Area Headquarters
 - Metal Spreader rack flexed and leaning 6”

2011 Earthquake - **Preliminary Damage Report Summary**

Summary of Reported Damage

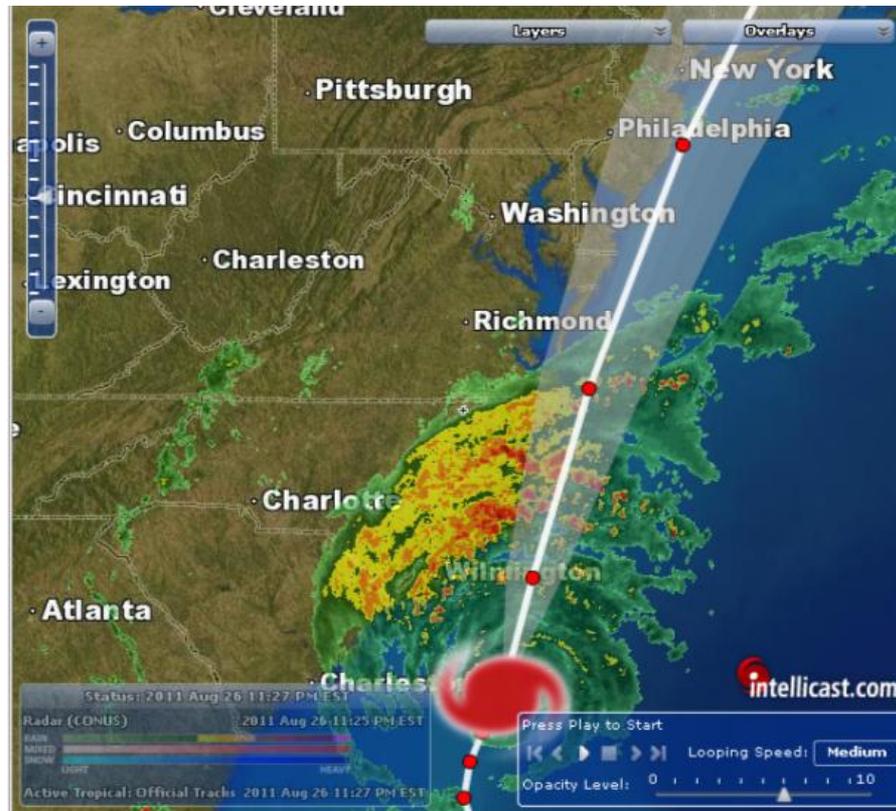
- **Minor damage to district buildings**
- **No reported damage to Central Office, Salem or Bristol Districts**
- **No significant damage to bridges statewide**
- **No reported damage to Safety Rest Areas and Welcome Centers**

Summary of Repair Efforts

- **Repair plans for damaged district facilities are being determined**

Hurricane Irene

- Hurricane Irene strikes Virginia at 11:00pm on August 26th, 2011



Hurricane Irene

Damage/Impact Report for Bridges

Hurricane Irene - Evaluation of Impact on Bridges

Field Evaluation of Impact to Bridges Statewide:

- District S&B personnel assisted in field evaluations of storm impacts
- As a result of the hurricane's course, the focus of structure field evaluations were in the NOVA, Hampton Roads, Richmond and Fredericksburg Districts
- District Bridge Crews had to wait until flood water levels receded to perform field evaluations.
 - Last evaluation completed on 9/6/11

Results of Evaluations

- Little to no structural damage as a result of the storm

Hurricane Irene

Damage Report for VDOT Facilities

Hurricane Irene

Damage Report on VDOT Facilities

Water Damage to CO Buildings:

- **Leaks in Highway/Annex buildings and breezeway between Highway and Hospital building**
 - Will be corrected during scheduled maintenance

Loss of Power to CO Buildings:

- **Command Post lost all cameras, access control monitoring, email communications and database connectivity for approx. 3 hrs**
- **Lost use of security and access control systems, multiple alarms**
- **Temporary AC unit in North Server room failed**
 - **Data Aire AC units and Movin Cool portable units were overloaded and failed**
 - **Response**
 - Arrangements made to have Trane fix AC unit in parking lot.
 - Data Aire and Movin Cool units are scheduled to be replaced

Hurricane Irene

Damage Report for VDOT Facilities

Damage Reports to District Buildings:

- **Fredericksburg**
 - Minor damage (e.g. siding/shingles blown off) to structures district-wide
- **Hampton Roads**
 - Minor damage (e.g. siding/shingles blown off) to structures district-wide
- **Richmond**
 - Minor damage (e.g. siding/shingles blown off) to structures district-wide

Hurricane Irene

Damage/Impact Report for Safety Rest Areas and Welcome Centers

Hurricane Irene - **Impact on Safety Rest Areas (SRA)** **and Welcome Centers (WC)**

Summary of Impacts to SRA/WCs

- **SRA/WCs remained fully staffed and open**
 - **The only exception: New Church SRA/WC on US13 SB Mile 1**
 - closed 8/27/11 at 10:00 a.m. and reopened 8/28/11 at 6:00 a.m.
- **No damage was reported to buildings.**
- **No discharge of untreated water occurred at SRA/WC with Waste Water Treatment Plants**
- **Power was lost at 9 SRA/WC locations**
 - **All located in the Richmond and Hampton Districts**
- **Multiple downed trees were reported at 8 SRA/WC locations**
 - **All located in the Richmond and Hampton Districts**
- **Total damage estimated at \$75,000**
 - **Including equipment rentals, tree removal, and wash out repair**

All SRA/WC's Statewide were fully operational as of 9/6/11

Hurricane Irene – Summary of Impact

Hurricane Irene's Summarized Impact on Virginia

- Road wash out was minimal
- Roads temporarily out due to downed trees and power lines
- Projected cost of storm in excess of \$39 million
 - Cost primarily associated with debris removal
- Repair plans for damaged district facilities are being determined at this time

Tropical Storm Lee – September 8th, 2011

Damage/Impact Report for Bridges

Tropical Storm Lee – Impacts to Bridges

Preliminary Damage Reports for Bridges:

- **Flood waters washed out 3 bridges and several culverts in NOVA**
 - **Beach Mill Road (Rt. 603) over Nichols Branch**
 - Temporary culvert will be installed
 - Temporary bridge replacement within 6 weeks
 - Construction of permanent replacement scheduled to begin CY2012
 - **Towlston Road (Rt. 676) over Rocky Run**
 - Temporary culvert will be installed
 - Temporary bridge replacement within 6 weeks
 - Construction of permanent replacement scheduled to begin CY2012
 - **Lorton Road (Rt. 642) over Giles Run**
 - Temporarily will rebuild wing walls/approaches, replace superstructure
 - Temporary bridge replacement within 8 weeks
 - Construction of permanent replacement scheduled to begin CY2013

Tropical Storm Lee – Impacts to Bridges Statewide

Preliminary Damage Reports for Bridges (cont'd):

- **Flood waters washed out 5 structures in Fredericksburg**
 - **3 pipe culvert displaced**
 - Emergency contract being prepared
 - **Single box culvert damaged beyond repair**
 - Requesting new design consultant for replacement
 - **1 of 4 pipes in a culvert displaced**
 - Repairing with state forces
 - **Single 96” pipe displaced**
 - Repairing with state forces, replacement structure will be added to inventory
 - **Single pipe displaced**
 - Repairing with state forces, replacement structure will be added to inventory
- **Richmond District reported several pipe washouts**
- **No other Districts reported serious damage to structures**

Tropical Storm Lee

Damage Report for District and Central Office Buildings

Tropical Storm Lee – District Damage Report

Damage Reports to Buildings:

- **NOVA**
 - **Newington AH: extensive flood damage to structures and equipment**
 - **Minor roof leaks in various District/Residency/AH buildings**
- **Richmond**
 - **Minor flooding/leaking to District Office and Materials buildings**
 - **Washout/pipe damage on 6 routes**
- **Fredericksburg**
 - **Minor damage (e.g. lost siding/shingles, leaking) to structures district-wide**
- **Hampton Roads**
 - **Minor damage (e.g. lost siding/shingles, leaking) to structures district-wide**

Tropical Storm Lee - Newington AH



Tropical Storm Lee – Summary of Impact

Tropical Storm Lee's Summarized Impact on Virginia

- 3 bridges and multiple other structures washed out due to flood waters
- 93 state maintained routes closed due to flooding, downed trees and washouts
 - I-495 closed due to flooding at Cameron Run
- Extensive flood damage to Newington AH, otherwise only minor damage reported to district facilities
- Repair plans for damaged district facilities are being determined at the district
- No reported damage to Safety Rest Areas and Welcome Centers
- Projected storm cost in excess of \$13M
 - Includes damages to Newington AH

2011 Earthquake, Hurricane Irene and Tropical Storm Lee

Overall Impact of the Three Events to VDOT Infrastructure

Earthquake, Hurricane Irene and TS Lee – Summary of Impact

Earthquake Impact

- Minimal impact to VDOT infrastructure

Hurricane Irene Impact

- Minor damage to facilities, bridges and other structures
- Minimal road washout
- Temporary road closures due to downed trees and power lines
- Total cost of \$39M (primarily associated with debris removal)

Tropical Storm Lee Impact

- Primarily impacted NOVA and Fredericksburg Districts
- Lost 3 bridges and various other structures flooding
- Severe flood damage to Newington AH
- 93 state maintained routes closed due to flooding, downed trees and washouts
- Total cost of \$13M

Less than a dozen routes remain closed at this time – temporary measures are underway to open them to traffic as soon as possible.



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