2010 APWA Project of the Year Nomination

Metro Nashville/ Davidson County 2010 Flood Recovery

AMERICAN PUBLIC WORKS ASSOCIATION

APWA

Tennessee Chapter

ESTABLISHED 1954

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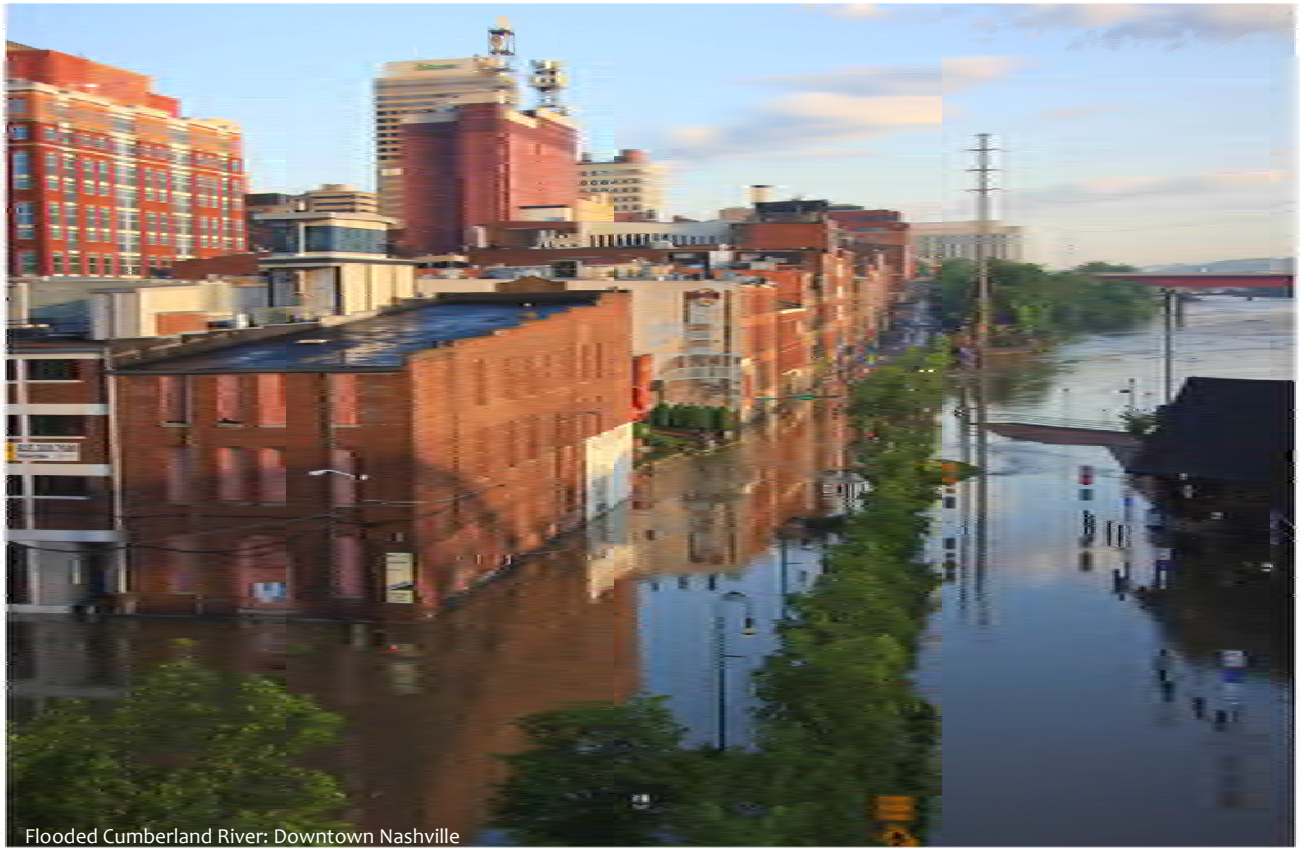
To the American Public Works Association Award Committee,

As President of the Tennessee Chapter of the American Public Works Association, it is with great pride that I nominate the Tennessee Chapter to receive the APWA Public Works Project of the Year Award for the Nashville and Davidson County flood of 2010.

Metro Public Works' flood response is an excellent example of how a public works department can, operating as a team, produce high end results that protect its city's residents, environment, and the community.

Sincerely submitted,

Mark Macy, P.E., Tennessee Chapter President


Flooded Cumberland River: Downtown Nashville

Metro Nashville's Largest Metro Public Works Project

Metro Public Works designs, builds and maintains traffic control devices, sidewalks, bikeways, roads and bridges; we clean the alleys and the streets, educate on and pick up the recycling and solid waste, manage and execute beautification projects and manage a 3-1-1 call center. Every day, our specialized teams work hard all over the City and take great pride in Nashville. However, none of us ever thought that one day we would ALL be called to work together as ONE team on ONE project. We didn't ask for it, but on May 1, 2010, we got that opportunity. It was an overwhelming emergency project that would tax our resources and strengthen our resolve. This is our story...

May 1, 2010 will be a date long remembered in Nashville. On that day, extreme and unprecedented weather conditions began producing large amounts of rainfall resulting in a devastating and record-breaking flood.

Saturday, May 1, 2010, the morning was followed by a night of heavy rain, but nothing seemed extraordinary. The weather service issued tornado warnings, but there were no warnings for what was about to occur.

By mid-day, **ten inches of rain** had fallen. Thousands were driven from their homes. More than twenty roads were closed and the infamous classroom building floated down I-24. By the evening, more than fifty boat rescues had been carried out and five fatalities across Middle Tennessee had been reported. The rain continued to fall. **Forecasters were predicting another four to five inches in the next thirty-six hours.**

Sunday, May 2, 2010, the rainfall measured an average of **fifteen inches** over large areas of Middle and West Tennessee, the highest rainfall total since records began. To put this in perspective, the Nashville area received more than double the previous two-day rainfall record set in September 1979 – a record of seven inches.[1]

At 11:43 a.m. on May 2nd, Nashville **Mayor Karl Dean declared a countywide state of emergency in Metro.** By later that afternoon, more than 600 water rescues had taken place in Davidson County alone. 22 shelters were opened - and were full by nightfall.[2] More than 50 roads were closed including segments of major interstates - many covered by flood waters. There were over 40,000 power outages in the county. One of Metro's two water treatment plants was inundated with flood water and shut down. Levees along the Cumberland River began to leak and additional homes and businesses were evacuated.

[1] http://www.orn.usace.army.mil/LRN_pdf/AAR/CG_COA2.pdf
[2] http://www.tennessean.com/section/SPECIAL04108

Monday, May 3, 2010 by 6pm in downtown Nashville the swollen Cumberland River crested at 51.9 feet; nearly 12 feet above flood stage[3]. This was 24 hours after the crest was initially predicted and 12 feet above what was expected. This is the highest the Cumberland River had been since 1937 – which was before flood control structures were constructed.

Flooded Cumberland River: Downtown Nashville

As its banks overflow, water covered First and Second Avenues in downtown Nashville and damaged businesses on the opposite side of the river, covering the Titan's LP Stadium field. Opryland Hotel, the Opry House and Opry Mills Shopping Center were inundated as water overflowed the river and levees along Pennington Bend.

The Cumberland River crested over 30 feet above the average flow and nearly 12 feet above flood stage.

Flooded Cumberland River: Opryland Hotel

The Harpeth River floodwaters submerge hundreds of homes in the Bellevue suburb about 15 miles west of Downtown, and homes were also flooded in the Richland Creek area as the river banks overflowed. To the South, Mills Creek, a tributary of the Cumberland River near Antioch, Tennessee, flooded over its banks leaving cars and trucks in its path completely under water. Just North of Nashville, Whites Creek flooded and severely damaged scores of homes and caused hundreds to evacuate. An estimated 2,000 people were in shelters, 9,000 people remained without power and the city had lost 12% of its hotel rooms to the flood. The storm claimed the lives of 24[4] Tennesseans, including 11 in Nashville. Initial damage assessments are in the hundreds of millions.

Adding to the devastating effects of the record-breaking **flood was that it also took many by surprise** leaving insufficient time to prepare.

One of Several Flooded Nashville Neighborhoods

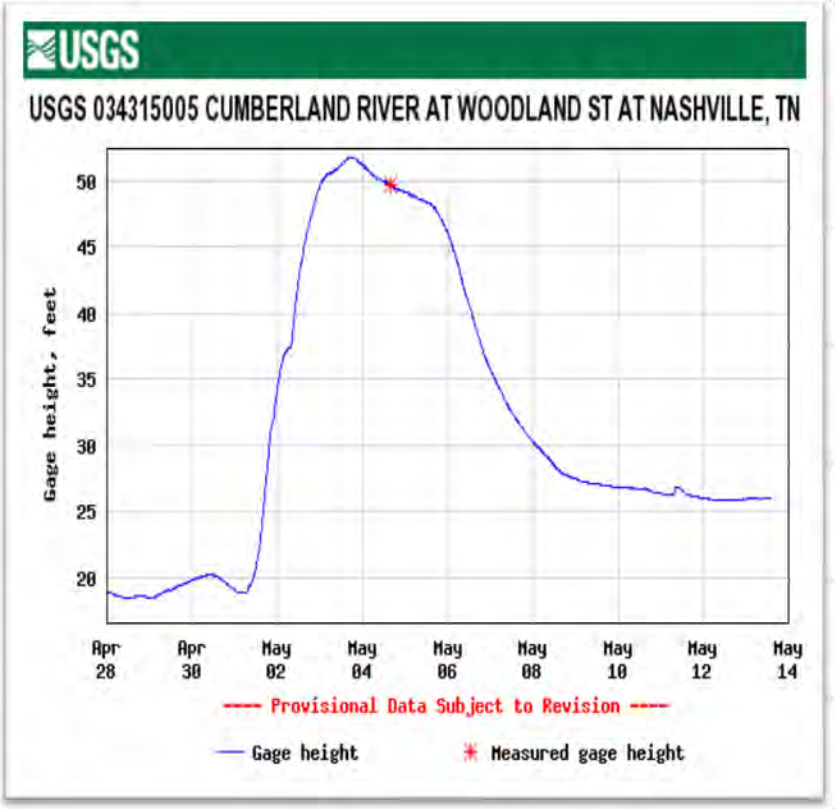
[3] Mark Rose, National Weather Service. www.foxnews.com/us/2010/05/03/tenn-officials-brace-flooding-deaths-weather-thats-killed/

[4] tennessean.com/apps/pbcs.dll/gallery?Site=DN&Date=20101104&Category=NEWS01&ArtNo=11040810&Ref=PH&Para

Tuesday, May 4, 2010 President Obama declared a disaster in four Tennessee counties: Davidson, Williamson, Hickman, and Cheatham.

Mayor Karl Dean held a press conference at Nashville's Belmont University. Leaders from across Nashville and Davidson County gathered together to provide information to the public. Those that attended included: Nashville Electric Service President and CEO, Decosta Jenkins; Police Chief, Ronald Surpass; Fire Chief, Steve Halford; Superintendent of Metro Nashville Schools, Dr. Jesse Register; Metro Public Works Director, Billy Lynch (pictured in center of photo to the right); Water Services Director, Scott Potter; Metro Transit Authority Director, Paul Ballard; and Metro Nashville Health Department Director, Dr. Bill Paul.

It was time for these leaders to come together as ONE, address the critical needs of their city and begin the process of recovery. The citizens of Nashville needed to see that there was leadership and hope, they needed guidance and they needed information—**and Nashville leaders delivered**.



Even before the Cumberland River had Crested, Recovery Efforts Were Already Organized by City Leaders

The Right People at the Right Time

"I have been with Metro Government over 40 years, and lived in this city all my life, but I have never seen anything like the Flood of 2010. I have never been as proud to be a part of Metro, especially Metro Public Works as when watching how they pitched in as a team to get this city back."

- ***John W. Lynch,*** **Metro Public Works Director**

The project began with assessing the damage to Metro's transportation infrastructure and performing emergency repairs. Metro Public Works was fortunate to have the best possible staff in place to ensure that Nashville would be competently, swiftly, and courageously restored. Metro Public Works Director Billy Lynch has over 30 years of experience managing several departments for the Metropolitan Government of Nashville and Davidson County. Serving as Metro Public Works Director currently, having held prior roles as Fire Chief, Deputy Sherriff and Human Resources Director, and combining those roles with his love for Nashville and natural ability to lead, rendered him the right person at the right time. Metro Public Works Assistant Director, David Himes, has significant emergency management experience as a result of his work as Debris Removal Manager in seven declared disasters in Nashville. David Himes has over 35 years of experience in all facets of Metro Public Works, and has participated and led disaster response/recovery team responses for five prior in-state disasters. Metro Public Works Assistant Director, Mark Macy, P.E., has over 15 years as Metro Public Works Engineering Director; managing the city's roadway and transportation infrastructure program. Donald L. Reid has 15 years experience with the State of Tennessee Department of Transportation and has been with Metro Public Works over 9 years, currently managing Metro's right-of-way program. His extensive experience with contract management and right of way prepared him for the enormous responsibility for flood damage repairs in the right-of-way as well as working through complex processes with FEMA. Veronica Frazier, Metro Public Works Beautification Director, has 15 years with the Metropolitan Government. Her years of experience managing the efforts of volunteers, city departments, business and community groups, and government agencies in providing environmental programs, and beautification projects for the residents and visitors of Nashville and Davidson County proved vital. Together, these Metro Public Works leaders, along with the department's staff of 360 employees worked to ensure that Nashville not only be restored to it's original beauty, but that it would be built back to even greater heights.

When the rain began, Metro Public Works ordered its staff involved with the Office of Emergency Management (OEM) operation to respond to the OEM facility. At this point, staff began assisting in monitoring impacts of the flooding, and sending emergency equipment out to set up detour routes and temporary four-way stops where conditions allowed, and to barricade roads where conditions did not allow, all in order to protect citizens from flood damaged areas.

As the rain began to subside, and Nashvillians watched the Cumberland River continue its return to its banks, giving back famous landmarks, homes, businesses, and streets previously under water, Metro Public Works Emergency Operation Plan went into effect.

Assessing the Damage

115 roads in Nashville and Davidson county are impassable[5], 20 traffic signal cabinets are flooded, 50 bridges are damaged, and there are electricity outages throughout the County. 10,000 people are displaced from their homes.

50 Nashville schools are flood damaged[6], and approximately 2,800 businesses across the city sustained flood damage. Included among them were some of Nashville's most iconic and recognizable. From the Honkey Tonks on lower Broadway, The Country Music Hall of Fame, and Nashville's Schermerhorn Symphony Center to the Pinnacle Building, which houses one of the city's largest, most prestigious law firms and hotels such as the Downtown Hilton – many businesses were left in painful states of limbo as flood damages rendered them unable to open their doors.

Preliminary damages are estimated in the hundreds of millions. Flood damage in Davidson County was estimated at over $1.5 billion.[7] Almost 11,000 Davidson County properties were damaged, 333,000 cubic yards (approximately 60,000 tons) of debris needed removal[8]. The Metro Assessor's Office estimates a $406 million dollar loss in commercial and housing values and $5.6 million loss in property tax collections.

- 115 Impassable Roads in Nashville and Davidson County
- 20 Traffic Signal Cabinets Flooded
- 50 Bridges Damaged
- 333,000 Cubic Yards of Debris

[5] www.nashvillerecovery.com/faq/impacts.asp
[6] www.foxnews.com/us/2010/05/03/tenn-officials-brace
[7] www.nashville.gov/oem/releases/100507a.asp
[8] http://www.nashvillerecovery.com/faq/impacts.asp

There can be no doubt; Nashville suffered a tremendous natural disaster and crisis of historic proportions during the Flood of 2010. There can also be no doubt that the people of Nashville united during the Flood and proved the old adage, "When the going gets tough, the tough get going." Good results don't happen automatically. They require coordination with other agencies, planning, leadership, teamwork and efficient execution.

Just as soon as the flood waters began to recede, Nashville was again flooded—this time with volunteers. Within days of the flood, tens of thousands of volunteers poured into Nashville to help anyone and everyone that was in need and Metro Public Works bore the responsibility of cleaning the rapidly growing mountains of debris as quickly as possible. Almost immediately the streets of countless neighborhoods were filled with belongings piled roof high in front of flooded homes.

Metro Public Works Responds

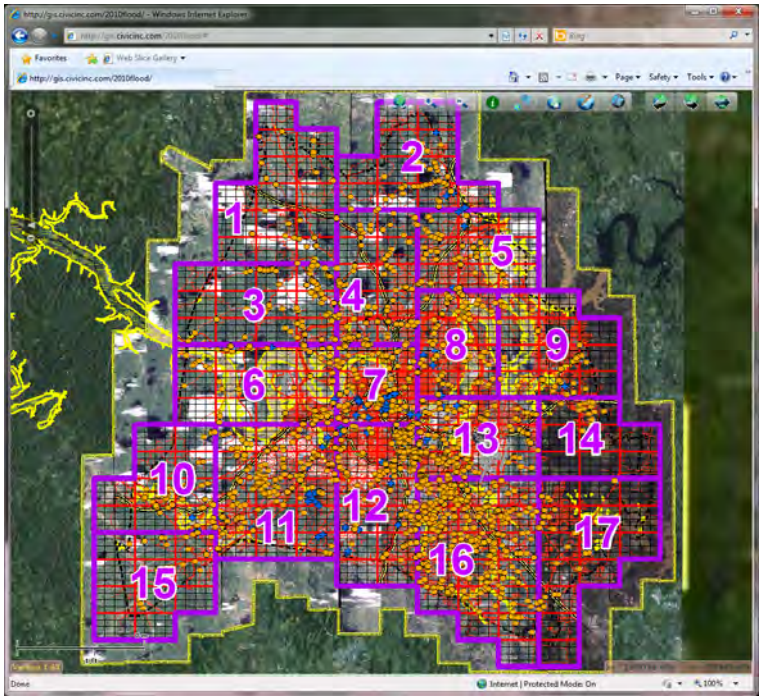
> "It was extremely important for Metro Public Works to get the mountains of debris picked up and all the roads back open quickly for safety and for our community to start repair and healing. "

- ***Mark Macy,*** **Metro Public Works Director of Engineering**

Starting the process of cleaning up Nashville; the plan began with assessing the damage to Metro's Transportation Infrastructure and performing emergency repairs.

Activating Public Information Call Center

Metro Public Works Engineering placed a team of inspectors on 12-hour shifts, 7 days-a-week, to visit, photograph, and establish documentation suitable for engineering estimates for over **1,100 damaged roadway, sidewalk, and bridge locations** across the County. Ruggedized GPS-enabled cameras were used to capture the geographic coordinates of each damaged site with the appropriate inspection records, photos, and damage assessment documentation. Zones and sectors were used to systematically complete the damage assessments. The resulting inspection data was loaded into the Department's GIS-based work management system several times a day. As the flood of calls were coming in from the public, the Metro Public Works 3-1-1 call center could quickly determine if damage reports from the public had already been investigated by inspectors. The use of the department's centralized database eliminated redundancy in field visits due to public damage reports.



Zone and Sector GIS Map

The overall assessment process took approximately two weeks. At the end of the second week, Metro Public Works was able to deliver to FEMA representatives a location-based report of all damages in the format required by FEMA's reimbursement guidelines. These assessments translated into five hundred geographically separate flood-damage projects which consisted of 50 bridge projects and 450 roadway projects.

Activating Public Information Call Center

Metro Public Works 3-1-1 Customer Service Call Center was activated with staff placed on ten hour shifts, seven days a week. The call center provided residents a central place to turn to for reporting issues throughout the county as well as a place to get trusted information. Their role was to assist citizens with information about disaster services, locations of temporary shelters and other emergency services, communicate road closures, and also to take caller information on problem areas and needs for services. Service requests were then forwarded to Metro Public Works operations personnel for response and action. Call volume during the Month of May 2010 was nearly double that of May 2009. Metro Public Works' Customer Call Center served to spare the 911 call center thousands of non-emergency calls enabling them to focus resources where most needed.

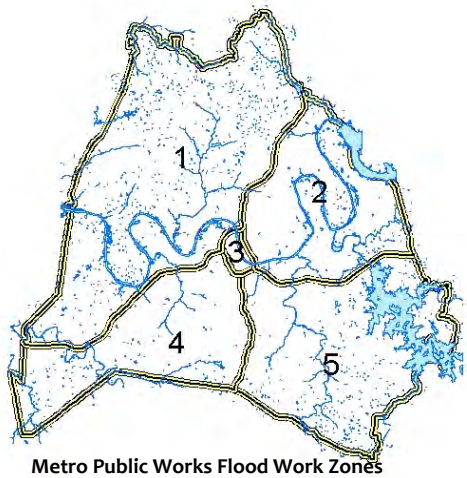
Securing Emergency Contracts

Metro Public Works Finance section, in the face of the enormous volume of clean up and repair work to be completed, mobilized to finalize emergency contracts that would enable assistance to Metro Public Works staff. Contractors would bring in additional manpower as well as equipment and extensive emergency operations experience.

Two contractors, DRC, Emergency Services LLC; and SRS, Storm Reconstruction Services, Inc. were secured to assist Metro Public Works in debris removal. Due to the systematic coordination between Metro Public Works Finance and Operations with Metro Government purchasing, the process of securing the emergency contracts took place in less than five days. The resulting contracts had a completion date of June 1, 2010. No time extensions were issued.

Emergency Repairs: Getting them Done

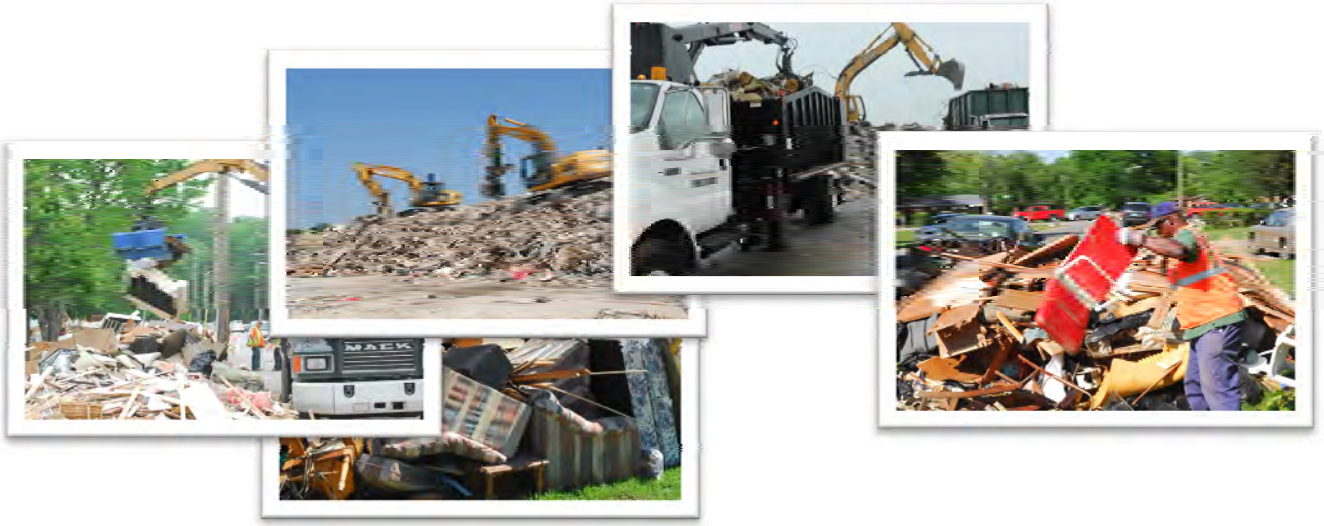
Metro Public Works Operations staff was placed on twelve hour days, seven days a week. The division divided the county into five work zones for the purpose of managing repairs. The five zones allow Metro Public Works to distribute work efforts for quickest completion.



Metro Public Works Flood Work Zones

Once contracted, the successful bidder had to complete construction repair estimates for each site in their zone. Estimates were submitted to Metro Public Works with pictures, drawings, field notes, and itemized repairs. Of the 115 roads closed **Metro Public Works reopened 110 of those roads within one week**. Metro then reviewed and issued purchase orders for completion of repairs for each location. Temporary repairs were completed in 15 days. All permanent repairs were to be completed in 360 days per contract. The contractors who won the emergency repair contracts were Civic Constructors, Inc. (Zones 1,2,4 and 5) and Sessions Paving Company, Inc. (Zone 3).

Residential Debris Removal



A total of **ninety pieces of equipment** assembled to begin collecting the **333,000 cubic yards of debris** resulting from the flood. Regular brush collection service was suspended indefinitely so trucks and employees could focus on flood debris. Three temporary staging sites were established throughout the County; Pulley Road, Metro Center, and Edwin Warner Park. These temporary sites were closed and cleaned up within thirty days from the start of the removal process.

Ensuring the Safety of Those in the Field

Metro Public Works Safety Division coordinated with the Metro Health Department to ensure the safety of crews. Employees were given tetanus shots and Safety Division staff provided gloves, ensured every truck had fully stocked first aid kits, and worked with the over 50 employees who received flood-related injuries.

Environmental Considerations

Metro Public Works worked closely with the Tennessee Department of Environment and Conservation (TDEC) to coordination environmental protection for recovery projects. Because many of the recovery projects were near waters of the state, the potential of environmental impacts had to be and were managed closely.

Together, Cleaning up Nashville

Metro Public Works Beautification Division, working in conjunction with Operations, utilized a staff of six Metro Public Works employees, working seven day a week to supervise crews of Public Service Workers and volunteers to assist with both the removal of debris and the restoration of Nashville. Additionally, crews delivered supplies to volunteers, residents, and neighborhood groups.

This division utilized over 14,000 volunteers logging over 75,000 volunteer hours, over 950 Public Service Workers, coordinated with 39 local civic, business, non-profit, church, and citizen groups, and conducted over 71 cleanup projects.

During the flood cleanup, all three Metro Convenience Centers were open during regular business hours to accept residential debris. Metro Public Works waived its usual fees at the centers, and residents were able to make up to three visits per day for free.

Volunteers Sandbagging Metro Center Levee

Community support of city recovery efforts proved vital. On Monday, May 3, on top of the city's other overwhelming concerns, crisis loomed in *MetroCenter*, where the rising river now threatened Nashville's supply of drinking water. At his press conference, Mayor Karl Dean asked for emergency volunteers to help with sandbagging. An hour later, 350 Nashvillians reported for duty.[9] From churches and nonprofit organizations, to the philanthropic community, the private sector and residents, Nashvillians rose to the occasion and set the example of what a community can do when working together toward a common goal. Hands on Nashville had 21,000 volunteers who spent over 88,000 hours working on flood cleanup and repairs.

Metro Public Works involvement proved critical during the flood. It is a department of hard working, proud, and dedicated employees who perform diligently without much fan fare on a daily basis. During the flood, the level of efficiency and cooperation that normally exists, flourished to even greater heights, as all divisions of the department worked together as a team to ensure their city's recovery.

[9] (http://www.nashvillescene.com/nashville/cover-story/Content?category=1178082)

Nashville: A City Moving Forward Together

*"… I want to reassure everyone that **Nashville will fully recover** and continue to be the great city that it is; a great place to live and a great place to visit."*

-Mayor Karl Dean

Typical Debris Pickup Efforts Before…

…and After

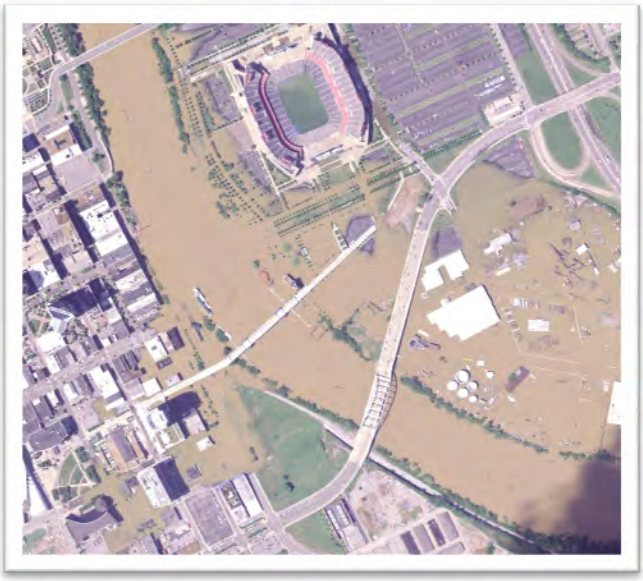
Nashville, Music City, is a city where inspiration strikes and creativity thrives. If perfect harmony can be achieved anywhere, Nashville would be the place. It is a big city that often feels like a small community. It is why, when the flood happened, people responded immediately. A new slogan of pride emerged, "We are Nashville". The phrase began as a simple post on a local Nashville Predators blog that praised the city's self-sufficiency during the flood, observing how neighbors were helping neighbors without the glare of the national media spotlight. The piece concluded, "We now know that it can happen to us . . . but also know that we can handle it . . . because we are Nashville."

The city of Nashville is now poised to move beyond flood repair and into reshaping the community to improve the quality of life for every resident.

Metro government, businesses, community organizations, and individuals are engaged in collaboration to improve Nashville's environment, economy, and the community.

A long term recovery plan is currently under development. The plan process has involved extensive public input. More than 1,000 people have participated in the public meeting process. Additionally there is an interactive website where citizens could provide input. Projects will be selected based on a scorecard that will review public support for project, sustainability, recovery, funding required, civic engagement, and health. The plan is due to be released in the near future.

The leadership from the Mayor's Office, Metro Public Works and Metropolitan Government was invaluable to the coordination between the many non-profits, churches, businesses, and residents that responded so quickly to the needs of the community in crisis. The Nashville flood showed the world what many Nashvillians already knew. Nashville is a community of dedicated and proud people. Metro Public Works exemplifies that every day and constantly reviews and seeks to improve the way it does business. The May 2010 flood response is an excellent example of how a Metro Public Works Department can, operating as a team, produce high end results that protect its city's residents and the community.



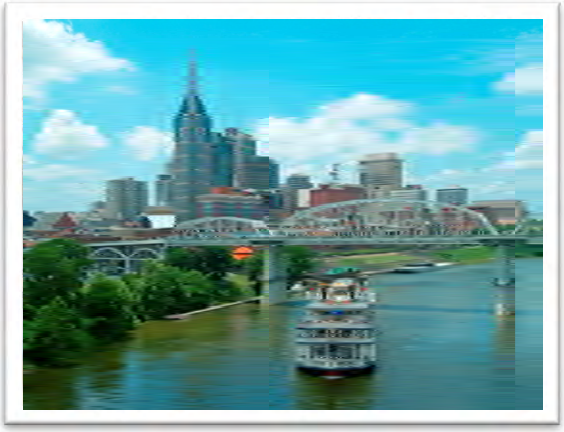
Cumberland River Inundation of Downtown Nashville…

… and back in its banks

About Nashville

Nashville is a major hub for the health care, music, publishing, banking and transportation industries and is home to a large number of colleges and universities. Nashville has a consolidated city-county government and a population of 605,473[10]. By population, Nashville ranks as the 25th largest city in the United States[11]. Nashville is located along the Cumberland River and is the capital city of Tennessee. The Middle Tennessee region includes a rich tapestry of lakes, rivers, and streams. The Cumberland River is the largest. The Metro Public Works department has a staff of 360 employees. The department is responsible for ensuring a safe, clean, and convenient transportation network of public streets and alleys, and for providing an efficient system for managing trash and other waste in Davidson County. Among the assets managed each day by employees are: over 2,200 miles of public roadways; more than 800 signalized intersections; over 6,000 streets; over 350 bridges; 2,000 parking meters, 18,000 parking spaces; 12 community recycle drop-off sites, three recycle convenience centers for waste disposal; and collection of an average one million pounds of refuse annually from 130,000 homes.

Area Around Shelby Street Bridge During Flood…



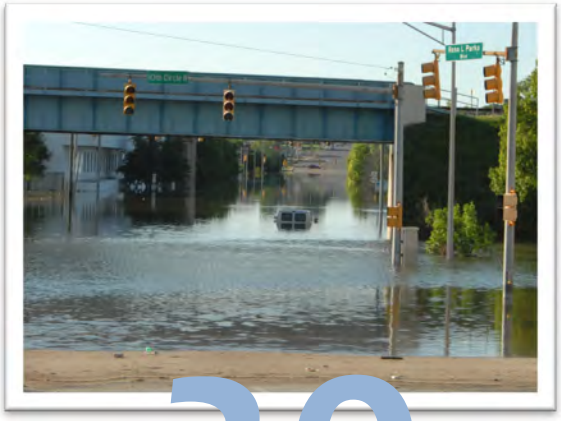
…and Back to Normal

[10] 2009 U.S. Census population estimate for Nashville and Davidson County.
[11] U.S. Census Bureau.

Metro Nashville/ Davidson County Flood Efforts at a Glance

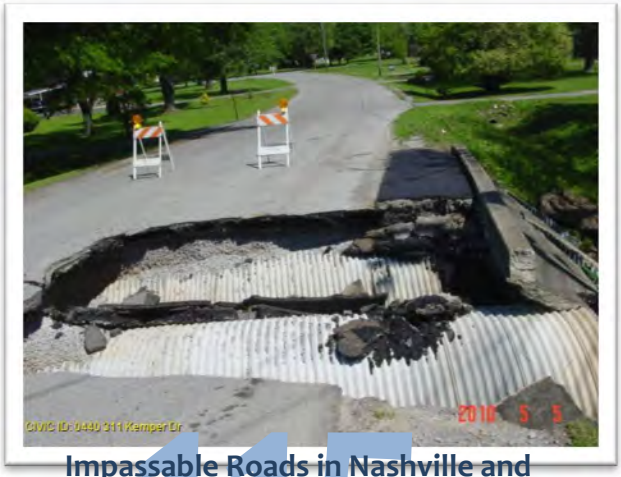
1,100

Infrastructure Repairs Completed



20

Signal Cabinets Underwater



115

Impassable Roads in Nashville and Davidson County, 110 opened within one week.

50

Bridges Damaged

450

Roadways Damaged

$1.5 Billion

Estimated Overall Damages in Metro Nashville Caused by the Flood

60,000

Tons of Debris Picked-up and Hauled

10,940

Private Properties Damaged

330,000

Cubic Yards of Debris Disposed

30

Number of days to Clear all Flood Debris

$5 Million

Cost of Debris Removal and Disposal/Recycling

360

Metro Public Works Staff Involved in Project

14,000

Volunteers Organized

$2.5 Million

Construction Engineering Inspection & Administration Cost

75,000

Volunteers Hours

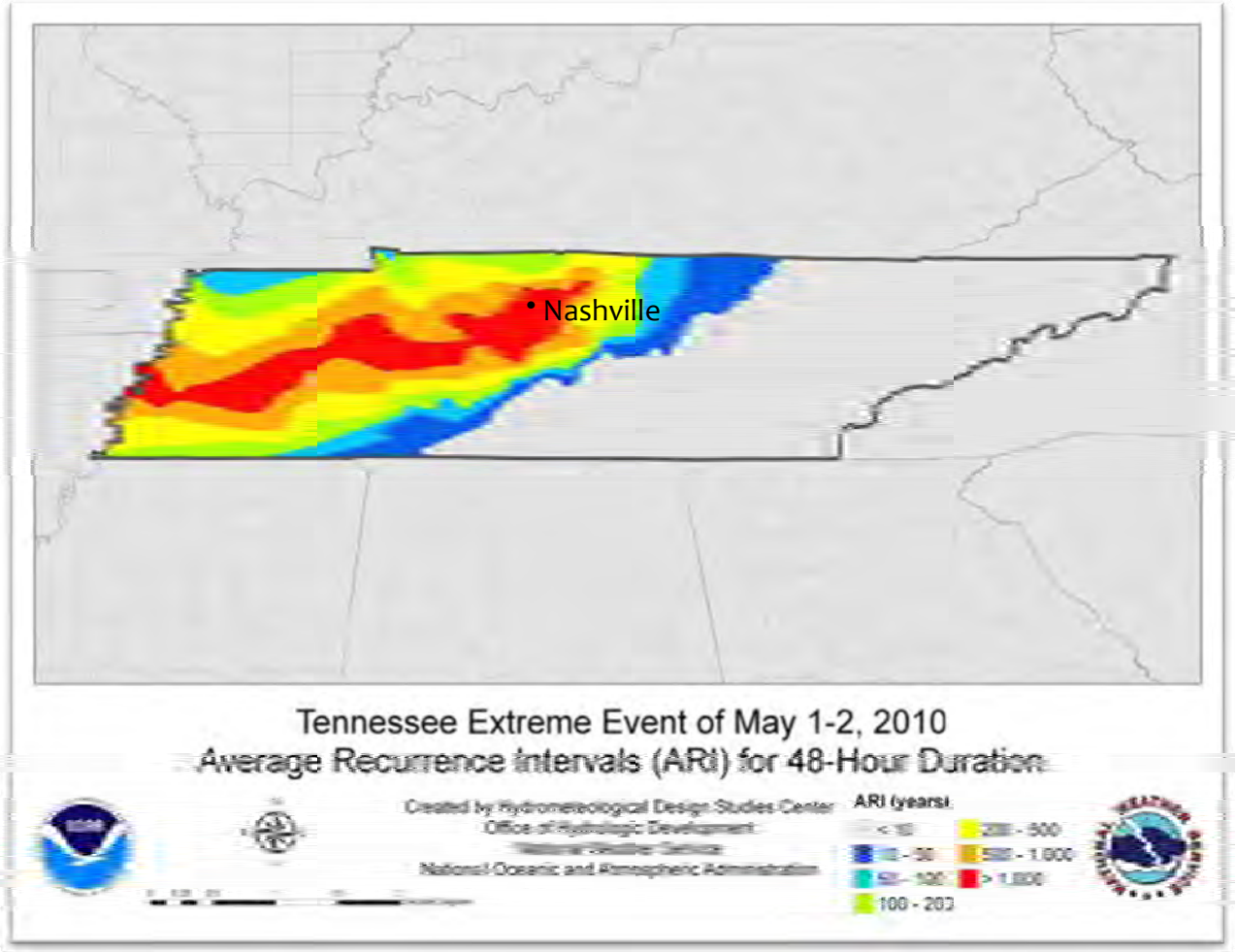
We are Nashville

We are Metro Public Works

This is Our Story!

Appendix: May 2010 Hydrometrological Facts

The National Weather Service Hydrometeorological Design Studies Center computes the average recurrence interval of rainfall events, shown for this flood in Figure below[12].



Areas in red indicate where rainfall totals for this event exceeded a 1 in 1000 probability of happening in a given year.

In the hardest hit locations in Tennessee, the 48 hour rainfall totals measured during this event was greater than a predicted "1000 year" event, which means it has a less than 0.1 percent chance of occurrence in any one year.

[12] http://www.lrn.usace.army.mil/LRN_pdf/AAR_May_2010_Flood_Cumberland_Draft_V7_21.pdf

The chart below from the U.S. Department of Commerce National Oceanic and Atmospheric Administration (NOAA), the federal agency focused on the condition of the oceans and the atmosphere, charts estimated precipitation frequency estimates at various time intervals. As shown below, the 1000 year estimate was 11.65 inches of precipitation in a 48 hour period. The 14-15" of rain the Nashville area received during the flood of 2010, was almost 30% above that estimate. In other words, the two-day event was far greater than a 1,000 year rain event.

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

NASHVILLE WSO AIRPORT, TENNESSEE (40-6402) 36.1253 N 86.6764 W 498 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Mon May 24 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.38	0.61	0.76	1.04	1.30	1.54	1.67	2.00	2.37	2.83	3.37	3.76	4.56	5.24	7.08	8.72	10.86	13.07
2	0.45	0.71	0.90	1.24	1.55	1.83	1.99	2.38	2.82	3.37	4.03	4.48	5.44	6.24	8.39	10.28	12.76	15.34
5	0.51	0.82	1.04	1.48	1.90	2.23	2.41	2.88	3.42	4.11	4.92	5.45	6.62	7.51	9.90	11.99	14.69	17.56
10	0.57	0.91	1.15	1.67	2.17	2.54	2.76	3.31	3.92	4.70	5.65	6.23	7.58	8.53	11.05	13.30	16.16	19.20
25	0.64	1.01	1.28	1.90	2.54	2.97	3.23	3.90	4.62	5.53	6.69	7.29	8.93	9.91	12.56	15.02	18.05	21.25
50	0.69	1.09	1.39	2.09	2.83	3.31	3.61	4.38	5.19	6.20	7.53	8.15	10.01	11.01	13.70	16.32	19.46	22.76
100	0.74	1.17	1.48	2.27	3.12	3.67	4.01	4.88	5.79	6.89	8.41	9.04	11.15	12.13	14.82	17.60	20.81	24.16
200	0.78	1.24	1.57	2.44	3.42	4.03	4.41	5.41	6.41	7.61	9.34	9.94	12.34	13.26	15.91	18.85	22.11	25.46
500	0.84	1.33	1.68	2.67	3.83	4.52	4.97	6.15	7.28	8.60	10.63	11.17	13.99	14.80	17.31	20.46	23.75	27.05
1000	0.89	1.40	1.75	2.84	4.15	4.91	5.41	6.73	7.96	9.37	11.65	12.14	15.31	15.99	18.35	21.66	24.93	28.17

These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

1000 year estimate prior to May flood event: 11.65 inches The amount of rain that fell during the May 2010 event averaged of 15 inches across Davidson County.