

Effective Snow Removal Five Phases



**Chicago Department of Streets
and Sanitation**

April 15, 2011

Average Chicago Winter 38.0 in. of snow

2011 Chicago Winter 57.0 in. of snow



9,500 miles of streets to keep clear

LSD Closed February 2, 2011

"We're Not Perfect Either"



Photo Courtesy of Alex Unice, Chicago Tribune

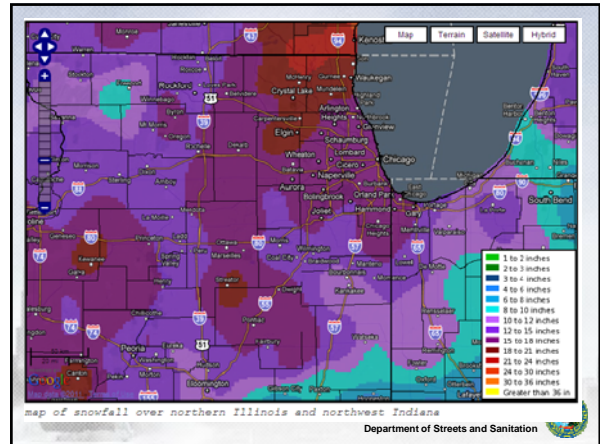

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Keeping Chicago Moving

- Until February 2, 2011 Chicago Public Schools had not had to cancel schools due to winter weather since January 4, 1999
- 276 dedicated snow plows
- 200 contingent plows
 - Quick-hitches; garbage trucks equipped with plows
- 5 Districts + Lake Shore Drive and downtown to keep plowed during winter

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Keeping Chicago Moving


- Department of Streets and Sanitation 2011 winter work budget
 - \$14,800,000
- February 2011 blizzard cost
 - \$9,000,000

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In addition to radar and satellite data used for weather forecasting, the Department of Streets and Sanitation (DSS) *must rely heavily on surface observations and visual data* to respond to other complications that can rapidly deteriorate roadway conditions.


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Other Complications

- Blow-outs/snowdrifts
- Refreeze and/or “Black-ice”
- Rapid frost development on bridge decks and hill routes
- Sub-zero emergencies (broken water mains, fires, or lakeshore flooding)

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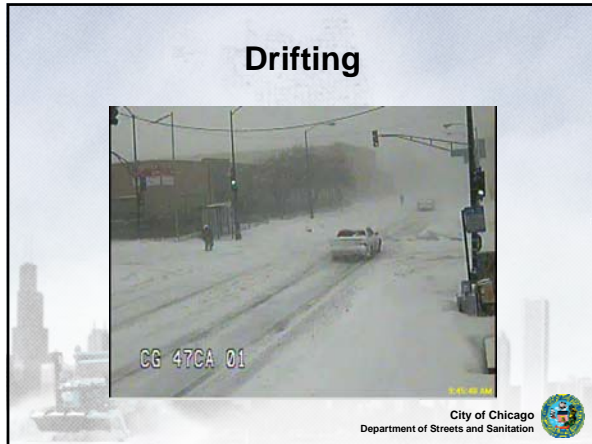


Refreeze



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DSS Winter Snow Removal Planning Process

- Snow cover and winter conditions can constitute an emergency situation just as severe as other natural or man-made disasters and require planning and preparations to deal with the effects
- Chicago plans for the worst
- In February of this year snow covered some portion of the 49 out of 50 states

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DSS Snow Removal Plan Components

- Advanced Weather Forecasting
- 5-phase Operational Plan
- Asset Mobilization
- Mobile Asset Tracking
- Materials Management
- Emergency Communications
- Prioritization

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DSS utilizes a state-of-the-art facility, "Snow Command", within OEMC equipped with the latest technology to monitor winter weather data and the effect it has on our city roads

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Snow Command

- 1,300 city-wide camera feeds for field observations
- Doppler radar control
- National Weather Service hotline
- 8 radio frequencies
- Atmospheric/road data
- Ground Sensors
 - Surface temperature, grip level, water layer, etc.
- Weather Stations placed around the city for real-time data collection
 - Atmospheric data - (temperature, wind direction, snow depth)
 - Video data - PTZ (pan-tilt-zoom) camera
- Manned 24 hours a day during winter months
- Allows for key decision making and mobilization of assets

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Traffic Camera Feed

February 2, 2011: Traffic camera feed showing lake effect snow

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5-Phase Approach

- **Phases are categorized by**
 1. Forecasted and actual snowfall rates,
 2. Effects of associated weather conditions such as wind velocity and temperature, and
 3. Cumulative impact on vehicular traffic flow
- **Phases are declared by the DSS Commissioner**
 - Further defining the level of operations and resource requirements

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Operational Phase I

- **A general call out to active duty during light snow and/or icing**
- **Trucks are split into teams and on standby for operations**
- **Parking bans go into effect**
 - Red and white signs posted throughout city
 - December 1 to April 1: 3AM – 7AM

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Phase I Truck Divisions

- **Partial Frost Team**
 - 24 Plow Trucks
- **Frost Team**
 - 40 Plow Trucks
- **25% Snow Team**
 - 75 Plow Trucks
- **50% Snow Team**
 - 184 Plow Trucks; 25 4x4s for inside plowing and spreading
- **100% Snow Team**
 - All 275 Plow Trucks; 25 4x4s for inside plowing and spreading

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Operational Phase II

- **Defined by snowfall at a rate that requires tandem plowing and salt spreading**
- **Snow Team is activated 100% and 157 additional quick hitches are placed on standby**
- **Salting is suspended until snow subsides and will again be effective**
- **Reduced refuse collection capacity**
- **No Parking in Blue and white sign zones**
 - (2" snowfall) – "Ticket and Tow"

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Operational Phase III

- **Defined by intense, long-term snowfall and/or high winds and drifting conditions;**
- **Streets impassible unless plowed**
- **Phase III triggers additional inter-agency coordination**
 - Mayor's office, Chief of Staff,
 - Bureau of Traffic Services,
 - Rodent Control,
 - Forestry, and area social service agencies' for implementation of their respective emergency community support plans

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Operational Phase III (cont.)

- Includes Phase II level of activation
- Heavy equipment from CSS, CDOT, and DWM is activated for vital service areas (ICP, hospitals, PDs, FDs, etc.)
- Laborers used to hand-shovel crosswalks, bus stops, and fire hydrants
- Operate under two 12-hour shifts

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Clearing a CTA Loading Deck

February 2, 2011: Worker remove snow from a CTA station late into the second day of the storm

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Operational Phase IV

- Phase III may be elevated into Phase IV based on field reports, the projected duration of the storm, and intensification of the winter conditions (wind, temperature, snow, etc.)
- Phase IV may include blizzard conditions, snow drifting, and closing of side streets and alleys
- 24-hour operational periods

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Operational Phase IV

- Includes Phase III level of activation plus:
 - Activation of the emergency snow removal contracts
 - Car towing program in effect to clear side streets
 - Dump trucks may be used to haul snow from vital areas to predetermined dump sites
 - Further coordination with the fire commissioner and press representatives to notify the public
 - Additional City agencies are responsible for providing snow emergency community support to citizen requests for assistance (DOH, DHS, etc.)

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Hauling Snow Out of City Areas

February 2, 2011: Dump trucks line up to carry and unload accumulated snow at a pre-determined city dump site

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Dumping Location

February 3, 2011: A snow dumping location on the South Side of Chicago, a day after the blizzard.

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Operational Phase V

- Operations elevated to Phase V as side streets and alleys become impassible due to high drifting snow that requires heavy equipment to clear
- Phase IV level of activation continues plus:
 - Further coordination with the Department of Aviation and the Building Department for demolition services as needed
 - Emergency spot contracts to excavating/trucking companies
 - Semi-trailers haul snow away and cars are relocated from the streets as needed
 - Snow piled at dump sites
 - Snow melters used to melt snow and allow it to run off into MWRD's deep tunnel shafts pursuant to specific standing discharge permits

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Lake Shore Drive and E. Wacker Drive (Before)

February 2, 2011: Lake Shore Drive closed and used by semi-trucks to haul snow out of city to determined locations for dumping

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Lake Shore Drive and E. Wacker Drive (After)

February 2, 2011: Lake Shore Drive closed and used by semi-trucks to haul snow out of city to determined locations for dumping

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Winter Emergency Priorities

1. Vitals
 - 1,800 vital service areas
2. Mains and CTA bus routes
 - 275 arterial routes
 - 83 mass transit flow arterial routes
3. Side Streets and alleys

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Rescue Snowmobile

The Chicago Fire Department took delivery of 50 snowmobiles on January 31 (one for every two fire stations) to facilitate search and rescue efforts on impassable streets

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Other Considerations

- Coordination with OEMC and other major city departments and other state/local agencies
- Vendors
 - Calcium chloride, salt
- Salt quantity management and forward contracts
- Private contractors


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Other Considerations (cont.)

- **Testing and implementation of new and alternative technologies**
 - sensors, alternative, deicing chemicals, specialized road surfaces, snowmobiles
- **Permitting**
- **Weather classes**
- **Truck maintenance**
- **Driver training**
- **Security**
- **Chain of command**


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Chicago Winter Storm February 1, 2011

- **Challenges**
 - Heavy snowfall (up to 22.5 inches by Feb. 2)
 - Zero visibility
 - Drifting/blowing snow (70mph winds at the lakefront)
 - “Rush hour” traffic

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Photo Courtesy of Bethany Hand, Tetra Tech EM Inc.



Chicago Winter Storm February 1, 2011

- **Special Tactics**
 - 3 days prior to storm
 - 36 emergency contracts, \$250k each
 - Day of storm
 - Memorandum of understanding under the authority of the executive director of OEMC to 16 large construction companies, unlimited \$\$\$
 - Includes 4 standing outside contracts initiated under any Phase IV operation

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Photo Courtesy of Jeff Bierbrodt, Tetra Tech EM Inc.

City Side Street

February 2, 2011: Side street clearance suspended until vitals and arterial routes were cleared

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Chicago Winter Storm February 1, 2011

- **Successes**
 - Advanced warnings to workers and schools to let out early
 - Use of snowmobiles for search and rescue of stranded motorists and emergency medical services

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Photo Courtesy of Bethany Hand, Tetra Tech EM Inc.






Photo Courtesy of Jeff Bierbrodt, Tetra Tech EM Inc.

Alley Snow Drifts

February 2, 2011: Snow drifts in an alley on the City's North side make travel and refuse collection impossible

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Results of Streets and Sanitation's Efforts

- **1999 Winter Expenses**
 - \$77 Million
- **2011 Winter Expenses**
 - \$33 Million

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Photo Courtesy of Barbara Horn, Tetra Tech EM Inc.



Why?

- **Better Planning**
- **Better Forecasting**
- **More Advanced Technology**
- **Faster Response**
 - Pre-setup of quick hitches
 - Advanced testing of communication systems
 - Special union agreements for 12 hour shifts

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