



Legislative Department Seattle City Council Memorandum

Date: April 29, 2009
To: All Councilmembers
From: Mike Fong, Central Staff Analyst; Jane Dunkel and Claudia Gross-Shader,
City Auditor's Office
Subject: Seattle Department of Transportation – December Snowstorm Response

BACKGROUND

Central Staff, with the assistance of the Auditor's office, was requested to review Seattle Department of Transportation's (SDOT's) internal documents, interview key staff and gain a better understanding of its operations related to and during its response to last December's snowstorm. More specifically, we were asked to address the following questions:

1. What does the information say (or not say) about SDOT's management of the snow emergency?
2. What does the information suggest about the quality of the After Action Report (AAR)?
3. Should Council retain outside expertise or ensure SDOT retain such expertise for a more in depth review and are there other recommendations for moving forward?

Council requested that this review be completed within three weeks. Roughly an equal amount of time was devoted to each of the following:

- Review of roughly 1,000 internal emails, approximately 700 pages of crew reports, snow and ice operational manuals, weather reports, dispatch logs, the Winter Storm Response Plan, and numerous other internal department documents.
- Interviews with SDOT senior management, operations staff, including crew chiefs and supervisors, and staff from the Office of Emergency Management (OEM) and a tour of the Charles Street maintenance facility.
- Internal review and development of findings, conclusions and options for next steps.

This memo will initially discuss staff's general observations about SDOT's AAR and then outline specific findings with regard to SDOT's preparedness, planning and operations related to snowstorm response. The final section of this report will summarize options for possible next steps. Attached as Appendix A is a full chronology of events related to the snowstorm beginning on December 13 thru December 27, 2009.

Throughout this process, SDOT provided Council staff with timely access to information requests and records while making their staff available upon request. While this review highlights some shortcomings and suggests areas for further evaluation and potential improvement, both our document review and personnel interviews revealed that SDOT staff was committed and worked extremely hard during an extraordinary snowstorm event.

An equal opportunity employer

600 Fourth Avenue, Floor 2, PO Box 34025, Seattle, Washington 98124-4025
Office: (206) 684-8888 Fax: (206) 684-8587 TTY: (206) 233-0025

Ultimately, our conclusion after three weeks of analysis is that additional external review of the department's snowstorm response is necessary in order to identify a comprehensive list of actions to ensure SDOT is prepared to respond more effectively to a future severe snowstorm event.

AFTER ACTION REPORT

SDOT identified eleven areas for improvement in their After Action Report (AAR). They are as follows:

1. Improve snow related coordination with Metro
2. Revised road salt policy
3. Institutionalize the early mobilization of SDOT's Incident Management Team for future winter storm events
4. Develop Winter Weather Response Plan for extreme weather conditions and sustained operations
5. Acquire emergency snow and ice clearing assistance from private contractors
6. Increase Public Information Officer capacity during prolonged events
7. Improve situational awareness; utilize Traffic Management Center resources
8. Reduce crew fatigue during prolonged events
9. Increase public awareness about the need to clear snow from public, business and government owned sidewalks
10. Utilize technology to improve the efficiency of snowplow operations (Global Positioning System)
11. Pursue an agreement with Washington State Department of Transportation (WSDOT) for emergency access to snow and ice clearing supplies when necessary

In general, we concur that these are all areas in need of improvement based on our review. However, we find the AAR incomplete for the following reasons:

- SDOT's narrative and critical analysis of "lessons learned" from the December snowstorm lack depth, especially when compared with the AARs from other jurisdictions that Council staff reviewed. According to the Office of Emergency Management, industry best practice for developing a comprehensive AAR requires 9-12 months of evaluation and review. In 2007, the City Light review by Davies Consulting to identify improvements following the 2006 windstorm was developed over a 4 month period. The SDOT AAR following this past December's snowstorm was drafted and finalized within 3-4 weeks.
- SDOT's AAR was drafted without direct input from line-staff, crew chiefs and supervisors or feedback from other City departments. The report was developed primarily by the department's senior staff. SDOT staff has also acknowledged that their AAR was not an exhaustive review of department operations and intended to identify mostly short term improvements.
- Council staff review has identified several additional items that appear to have been barriers and challenges to SDOT's ability to conduct a more effective snow response effort last December that are not identified in the AAR. The specific issues will be discussed in greater detail later in this memo.

Bottom line, SDOT was requested by the Mayor's Office to develop its AAR in a short period of time. This may have been appropriate given the snow and winter season was not yet over

and additional snow response might have been needed in short order. However, as a result, the report and its findings do not appear to be comprehensive. Below are our additional findings related to barriers and challenges faced by SDOT during the snowstorm response period that may require additional attention and further review.

SNOWSTORM RESPONSE FINDINGS

Given that SDOT has already identified a set of improvements necessary to enhance its future response to snowstorms, we found the most useful approach to our review was to:

- identify any issues that may have compromised SDOT’s ability to respond more effectively during the snowstorm event not already outlined in the AAR; and
- determine whether any of the items already outlined in the AAR require further development or refinement.

As a result, the staff findings are intended to surface new issues for additional consideration and do not focus on improvements that have already been widely acknowledged and appear adequately developed as part of the AAR (e.g., coordination with Metro on plow routes, need for improved situational awareness). In no way is this intended to minimize the value of SDOT’s identified issues, but rather, to focus and narrow the scope of Council staff’s review. The following are the key issues we have identified:

1. Inadequate systems for tracking progress and making decisions may have compromised strategic deployment of resources by senior staff and management.

A. Operations Management

SDOT does not have a modern work order tracking system to allow for clear documentation of field assignments. During the snow event, tracking of deployment decisions, route assignments, staffing levels, road conditions and overall operations were conducted on dry-erase boards at the Charles Street and Haller Lake maintenance facilities. The only place where documentation of snow plow deployment decisions can be found is in the hundreds of hand written crew reports filed at the end of each shift. The reporting found on these forms is inconsistent and unclear.

Crew chiefs and supervisors were managing operations according to SDOT’s Winter Storm Response Plan (WSRP) and relying on personal experience and expertise. Senior management (Maintenance Operations Manager, Director of Street Maintenance and SDOT Director’s Office) is ultimately responsible for making “big picture” strategic and policy decisions to modify the plan as conditions require. But the reliance on the memory of individual staffers, archaic systems, and undocumented verbal reports and communication for real-time decision making appeared to present many challenges for orchestrating an organized, cohesive and coordinated snow response effort. As a result, prioritization of plowing efforts were largely left to the discretion of crew chiefs and supervisors. The lack of a more sophisticated tracking system also presents obstacles for achieving accountability during and after the event. Lastly, without a more robust system for tracking information, it was difficult for SDOT to attain complete situational awareness on road conditions and monitor feedback from drivers and crews out in the field.

This issue is not directly addressed in the AAR, but SDOT recognizes that work order tracking improvements are necessary and implementation of a new system is under

development but not expected to be available until some time in 2010. SDOT has also begun an analysis of GPS technology as a way to better monitor field operations. Furthermore, beyond the work order system itself, standard operating procedures should be updated and modified to allow for a more effective and accountable reporting structure to achieve better flow of information from crew supervisors all the way up to senior management. For example, crews in the field have the most direct evidence about road conditions and the situation “on the ground.” A more effective reporting and communications system and protocols could ensure that this critical information is shared up the chain of command.

Given that technology upgrades for work order tracking are not anticipated until 2010 and a decision on investing in the use of GPS has yet to be made, there may be short term or interim operating procedures that could be implemented sooner to improve the flow and tracking of information during a snowstorm or emergency. In addition, a more thorough “lessons learned” review by SDOT could help inform how the proposed technology upgrades are designed and implemented.

B. Dispatch and Deployment Priorities

SDOT does not have any formal procedures or policies in place for dispatchers to prioritize calls requesting snow plowing. Records also appear to be incomplete as far as documenting the full range of calls and the origins of the requests received by SDOT. The dispatch logs are hand written on forms that do not have a field to write in the origin of the call. Furthermore, in interviews with SDOT staff, requests for assistance were not necessarily all being funneled through the dispatch center (e.g. emails or calls to the Customer Service Bureau and other SDOT phone numbers from the public). Dispatch operations appear to suffer from some of the same technological deficiencies and information flow issues that faced overall operations management during the snowstorm.

The AAR identifies maintaining a list of priority plowing locations and clarifying procedures for requests as a corrective action item for the Office of Emergency Management. But this does not seem to capture the internal issues that confronted SDOT’s ability to manage, track and coordinate their responsiveness to these requests. SDOT may want to review its dispatch operations and develop formal procedures for both dispatchers and crew chiefs and supervisors for prioritizing plowing requests rather than leaving these as entirely discretionary decisions. In addition, SDOT may want to examine whether all requests, including emails and calls to other departments and SDOT staff should be directed to the dispatch center.

The following are some questions that may be an appropriate starting point for further examination of operations management and dispatch:

- What are some simple tracking procedures and data collections systems that SDOT can put in place before the work management system is implemented?
- Will the systems requirements that SDOT has identified for the work management system adequately address their operational and decision making needs?
- Are the systems for tracking progress and making decisions adequate for other operational areas in street maintenance (e.g., paving, potholes, encampments)?
- SDOT identifies improving situational awareness in their AAR, but beyond strategies and technology upgrades, what are the internal policies and communications

protocols necessary to ensure this information is utilized and shared up the chain of command?

- How can SDOT ensure that communication from the public comes through the most efficient channels and is addressed in a timely fashion? How will dispatch prioritize these calls?
- Do internal communications protocols and procedures need to be put in place to achieve greater accountability and documentation of decision making within SDOT's management structure?

2. SDOT's limited experience and exposure to utilizing the Incident Command System (ICS) may have factored into the overall response effort.

A. Incident Management Team

The ICS is a standardized incident management approach recommended by the Federal Government and formally embraced by the City of Seattle through Mayor Nickels' Executive Order 02-05 issued in June of 2005. Within the ICS is a concept for Incident Management Teams (IMT) to coordinate and augment emergency response efforts. SDOT activated its IMT on December 22 and this essentially brought more members of the department's senior management team to the table to coordinate the response effort. It is universally acknowledged by SDOT that the IMT should probably have been assembled and the principles of ICS initiated earlier during the snowstorm event. Freezing rain and icy roads began to develop as early as December 12 and the first snow fell on December 14. However, the IMT and ICS structure was not formally initiated until 11 days into the snowstorm event and over 9 inches of snow had fallen in the greater Seattle area.

In interviews, we learned that SDOT had never previously assembled the IMT in part because the IMT did not formally exist. SDOT staff had not been designated to fill various roles in the IMT structure and were not trained to carry out the specific responsibilities for those positions. During the snowstorm, senior staff communicated with each other on a regular basis, but for the first week and half of the event, SDOT's Street Maintenance Director was managing the response effort largely on his own.

B. Interaction with the Emergency Operations Center (EOC) and Adaptive Management

In our interviews, there was also evidence to suggest some of SDOT's senior staff may not have been fully aware that SDOT could request activation of the EOC. Furthermore, as late as December 22, SDOT email correspondence to the EOC in response to a request for a status update on government services stated:

“SDOT is functioning fully. Bridges are operational. Signals are fully functioning. Snow removal is underway in keeping with SDOT Winter Storm plans...” (Email from SDOT to OEM on 12/22/2008 at 10:15 a.m.)

Though technically accurate, this communication did not seem to reflect the urgency or the actual state of SDOT's field operations. The information the EOC was receiving from SDOT may not have fully captured the road conditions and challenges the department was facing at that time. This could be attributed to a lack of good situational awareness on the part of SDOT, but potentially also because ICS principles were not initiated. ICS is intended to provide the necessary framework for adaptive management and decision making. Repeatedly, we heard SDOT staff say that a major lesson learned was that the

department focused on executing its Winter Storm Response Plan without recognizing early enough that the plan was not working. SDOT has determined that it needs to modify its plan to include procedures and policies for dealing with a severe snowstorm, but equally if not more important may be the ability to recognize when the plan is failing and to adapt to changing conditions.

In conversations with staff from the Office of Emergency Management, we learned that effective execution of ICS requires use of this command structure for everyday events. The snowstorm, more than anything, will likely help SDOT embrace this concept of emergency management. But SDOT's only reference to ICS in the AAR is that the department needs to activate the IMT sooner for future snowstorms. Given the brief attention given to ICS by SDOT in the AAR, the fact that the IMT did not exist prior to the snowstorm, and the department's relatively slow strategic response to deteriorating conditions raises questions about SDOT's overall level of emergency preparedness. This is an area that could require more attention from SDOT, and the following questions may be useful for further examination:

- Has SDOT identified the optimal training courses and staff to be trained in ICS and emergency response? How well is SDOT doing on fulfilling their training plan? Is the training plan adequate and does it include all of SDOT's employees that should be trained?
- Are there additional trainings or table-top exercise that could be helpful for fully embracing ICS?
- Has SDOT fully explored the opportunities for help and support from the EOC and other City agencies for incident response?
- Has SDOT identified other triggers (besides snowfall) for the activation of its IMT?
- How will SDOT develop the capacity for effective strategic adaptation of their Winter Storm Response Plan and their other emergency response plans? Is it possible for SDOT to incorporate ICS structure to everyday operations?

3. Several SDOT snow response related policies are unclear and may leave too much discretion to staff.

A. Residential Plowing

Interviews with SDOT staff provided us with vastly different perspectives on the department's policies with regard to plowing residential streets. Some in the department believe after primary and secondary routes have been completed, SDOT may plow accessible residential streets. Others said definitively that SDOT never plows residential streets. The Winter Storm Response Plan states that no streets will be plowed that are not prescribed in the plan itself. While SDOT's website indicates that the department may plow residential streets on a request basis. The inconsistency creates confusion internally and for the public. As noted earlier, record keeping for plowing activity is extremely unclear and limited. How many miles of residential streets and why they were plowed during the snowstorm cannot be confirmed or explained. We are not prepared to recommend what that policy should be, but SDOT should review and clarify its policy rather than risk the appearance of preferential treatment or disproportionate service allocation to different parts of the city.

B. Handwork

In addition to snow plow trucks, SDOT deployed approximately 2300 employee hours to clear stairwells, landings, and sidewalks in front of business districts, schools and bus

shelters (as many as 41 FTE on any given day). This operation suffers from some of the same tracking and information flow issues that we discovered with the overall snow removal operations. Beyond the initial deployment to a stairwell location in the city, the shoveling and sanding activities are largely determined at the discretion of the crews themselves. Our review revealed no clear management level oversight or coordination of handwork across the city. That lack of coordination and a clearly stated policy led to this service being provided to some business districts and neighborhoods and not others without explanation.

A cursory review of handwork crew reports also raises questions about the effectiveness and efficiency of this body of work in general. Hand shoveling and sanding is labor intensive and in some instances as many as half a dozen employees were each working four hour shifts to clear only a few blocks of sidewalks. Given this reality, prioritization of pedestrian needs and coordination is necessary to achieve an effective outcome.

C. Use of Salt

Reviews of SDOT's internal emails suggest that the new policy for application of salt may have been developed over the course of just two days. SDOT requested Seattle Public Utilities (SPU) assistance to research and compare geomelt and other anti and de-icer products on December 29. A draft policy was sent via memo to the Mayor's office on December 30. A press release was issued announcing the new policy on December 31.

SDOT relied heavily on the opinion of its Street Maintenance Director to arrive at the conclusion that if salt had been available during the snowstorm, many of the difficulties experienced would have been avoided. This may very well be the case, however, the absence of meaningful, documented analysis, consultation with any external scientific or environmental experts or a review of other city's best practices raises some questions about the adequacy of the new salt policy.

There are numerous chemical products that are used to melt ice and each have varying degrees of effectiveness and consequences. Conversations with SDOT staff also yielded a range of opinions about salt and its perceived effectiveness. SDOT apparently used road salt in conjunction with sand and geomelt during this past snowstorm with limited effectiveness. But SDOT staff explains that the new policy refers to the use of "rock salt" and not "road salt". With that said, this appears to be a complicated and technical issue that may require more thoughtful review and analysis.

D. Use of Carbide Blades

SDOT has purchased carbide blades to supplement the rubber edged steel blades already on hand for snow removal. During the snowstorm, SDOT's rubber edged blades were unable to remove the thick layer of ice that formed over the city's roadways. The carbide blades are more effective for ice removal, however, they also remove roadway reflectors, other markings and may create additional street maintenance work. At present, SDOT does not appear to have a written or stated policy for when carbide blades should be used. There may be value in determine the criteria and the policy for switching blades now rather than leaving this to the discretion of crews and supervisors during an event.

E. Terminology for Road Conditions

Throughout the period of the snowstorm, SDOT staff would use a range of terminology to describe plowing status and road conditions internally and to the public. Words and phrases such as “clear”, “passable”, “plowed”, and “primaries are done” mean different things to different people and may have unnecessarily created confusion. Winter road conditions have common terminology used by transportation departments all across the country. It may be useful for this terminology to be included in the Winter Storm Response Plan and utilized by all staff, including Public Information Officers (PIOs). For example, if roadways have “compact snow and ice”, that is probably how the City should describe conditions rather than indicating the roads are “passable”. The inclusion of a definitions and terminology section in the plan may be appropriate. Standardized definitions would also increase the value of the critical field-level observations that the crews can share with supervisors and ultimately to inform SDOT’s senior management.

None of these items are identified in SDOT’s AAR. More thorough review and discussions are recommended as well as a review of other jurisdictions and best practices related to these five policy areas. Below are some questions that may be useful as part of a continuing examination of these policies:

- How will SDOT clarify its policy on plowing residential streets within the layers of its organization?
- How will SDOT clarify its policy on sites for handwork within the layers of its organization?
- Has SDOT adequately studied the science and effectiveness of salt? Has SDOT adequately studied the environmental implications and the effects on public infrastructure and personal property? Has the policy on the use of salt been sufficiently developed?
- Has SDOT adequately studied the potential effects and costs of using carbide blades including potential damage to street surfaces? Has the policy for use of carbide blades been sufficiently developed?
- Does SDOT agree with the need for common terminology to describe snow related efforts? If so, what are conditions and terms that need clarifying?
- How will SDOT clearly communicate any and all of these policies to stakeholders and the public?

4. Organizational structure and personnel related issues may have contributed to some of the operational challenges.

A. Management Structure

SDOT’s Street Maintenance division is divided into two sections: 1) street cleaning and 2) surface repair. Snow removal operations are managed by the street cleaning section. This means the manager, crew chiefs and supervisors in this section are responsible for executing the Winter Storm Response Plan. The plow truck drivers all work in the surface repair section and normally report to an entirely different set of supervisors and crew chiefs. In our interviews with staff, we found that the supervisors and crew chiefs responsible for executing snow removal efforts were unfamiliar each other and did not normally work with the drivers in the field. A similar scenario was found with regard to handwork, although with this body of work, there may have also been internal confusion as to which section was ultimately responsible for supervising this work at all.

There may be many reasons why SDOT's snow response efforts are organized in this manner. But at minimum, this raises questions about whether the fact that drivers and supervisors during a snowstorm event do not work together normally and are unfamiliar with each others' management and working style may inadvertently create some communications and operational issues.

B. Training

Our interviews and research confirmed what we have heard consistently during and after the snowstorm event about the hard work of SDOT's crew chiefs, supervisors and drivers. Crews were working around the clock, but recognized the road conditions were not up to the standards that they set for themselves. Our impression from discussions is that there was a genuine commitment to doing their best under very challenging circumstances.

But these discussions and our review of documents also anecdotally revealed some possible issues with field operations during the snowstorm event. As mentioned earlier in this memo, there is rather significant inconsistency in the language, format and terminology used in the hand written crew reports. This makes it very challenging to understand what routes were plowed, how often and whether drivers made any discretionary decisions on streets to plow. We also learned that there may have been some issues and confusion with the application of geomelt, sand and salt on roadways. Some drivers may not have been applying the materials correctly, and possibly limited the effectiveness of the products to melt ice. Training may also be necessary related to handwork given some of the policy and efficiency issues that this review has surfaced.

It is entirely understandable that these issues would come up given the infrequency of snowstorms such as this one in Seattle. But there may be value in reviewing training requirements and opportunities to give drivers and crew chiefs and supervisors additional expertise for handling these rare snowstorm events. As with management, issues related to common use of terminology and recording and reporting of information may also need to be address with field staff.

Below are some possible questions for further examination of these issues:

- What is the optimal organizational structure for plow drivers, crew chiefs, and supervisors? What steps can be taken to mitigate operational or reporting issues that might arise from "borrowing" staff from another division for plowing assignments?
- What is the optimal organizational structure for handwork crews and supervisors? How can SDOT ensure that they are deployed as efficiently as possible? What steps can be taken to mitigate operational or reporting issues that might arise from "borrowing" staff from another division for handwork assignments?
- What kind of training would be most beneficial for plowing and handwork crews (first responder training, equipment training, etc.)?
- Should SDOT do a more thorough evaluation of how de-icing materials were applied and whether there could have been a more effective use of existing resources?

POSSIBLE NEXT STEPS FOR COUNCIL

The third question Council asked as part of this effort was whether additional external review should be recommended for SDOT's snow response. Given the number of issues raised in this report, there is value in continuing to examine these areas more closely in

advance of the next winter season. SDOT's updated Winter Storm Response Plan needs to be reviewed in comparison to plans from other jurisdictions. Such a review should not be limited to an examination of the issues identified in this report, but also include industry best practices related to snow removal policies, routes (length and geographic distribution), procedures and protocols. Furthermore, given the difficulties faced by Seattle residents and businesses during last December's severe snowstorm and the issues identified in this report over the past three weeks, the City and SDOT would benefit from a more fully developed corrective action workplan. The participation of independent, external expertise to assist SDOT in this examination is recommended for achieving the best possible outcome. Ultimately, at issue is SDOT's preparedness for future emergencies and disasters, not just snowstorms. The following are some options Council may consider:

Option 1

Have SDOT retain a consultant to develop a new After Action Workplan that includes attention to the issues raised in this report, the department's original AAR and any new items identified and review the adequacy of the department's Winter Storm Response Plan. This effort should also include an examination of SDOT's overall emergency preparedness and readiness to implement an Incident Command System (ICS) when necessary.

This option could be modeled after the Council 2006 effort with City Light where Davies Consulting Inc. was hired to conduct an in-depth review and offer recommendations that were ultimately embraced by both Council and the utility. Full cooperation by City Light enabled this exercise to yield practical and achievable solutions to better preparing the utility for a future severe windstorm. Furthermore, the expertise of Davies in the utility field and understanding of best practices proved invaluable to the process.

Option 2

A less costly alternative may be to request the City Auditor to develop a full scope of work related to the findings from this report and ultimately make specific recommendations for improvements.

Many of the items in this report could be examined in greater detail by the City Auditor's office. Review of other jurisdictions and best practices as well as identifying and recommending systems, procedural and policy changes are well within the purview of the City Auditor. This could be similar to the approach the Council and the Auditor's office took with regard to examining pedestrian and cyclist mobility around construction sites last year.

Both options reflect the value of having an external perspective in helping SDOT move forward with the necessary improvements to better respond to future snowstorms and emergencies.