

**RESPONSES TO QUESTIONS AND CONCERNS RAISED AT DUPAGE
MAYOR AND MANAGERS CONFERENCE INTERGOVERNMENTAL
RELATIONS COMMITTEE ON MARCH 20, 2007**

Black and Veatch Report states that implementation of the recommended plan that includes the construction of four basins, the optimization of reservoir operation, channel modifications and buyouts could virtually eliminate the damages along mainstem Salt Creek. This reduction in damages can only be achieved if all components of the plan are implemented. The watershed plan clearly states that not all damages are eliminated with the recommended plan. The goal was a 90% reduction in damages caused by the 1987 flood event. In addition, the alternatives analysis used during watershed plan development included the Busse Woods Dam project, since application for state funding of projects required that this project be included in the analysis. Including this project in the analysis inflates the benefits somewhat to the Salt Creek Watershed. The recommended plan included the buyout of 62 properties, however, only 31 properties have been purchased to date. The reduction in flood damages assumes that all 62 properties be purchased.

Question regarding whether or not compensatory storage and 0.1 cfs/acre release rate have been incorporated into the Salt Creek model. The FEQ hydraulic model for Salt Creek was originally developed in the late 1980's/early 1990's and has undergone several updates/enhancements over the last several years. As we have updated our hydrologic time series of events and enhanced the modeling capabilities and features in the FEQ hydraulic model, so have we enhanced the original model developed for Salt Creek. The model includes all significant storage areas and estimates of future land use within the watershed.

The September 7, 2007 maps reflect higher 100 year flood stages and larger floodways in many locations compared to the 2004 maps that do not include the benefits of the \$100 million dollars of flood control improvements. The original FEMA flood profiles from the 1970's (still reflected on the 2004 maps, aside from FEMA approved revisions) are based on a traditional design storm approach using steady state hydraulic models. Differences in land use conditions (e.g., less impervious area) and 100-year rainfall estimates (i.e., 5.8 inches vs. 7.58 inches) are quite significant between the FEMA studies and the County's study for Salt Creek. The County's models include the effects of hydrologic and hydraulic conditions that steady state models cannot, including:

- The spatial and temporal patterns of rainfall,
- Soil moisture conditions prior to a storm event,
- Operation of flood control structures, and
- Backwater effects at bridges and stream confluences.

Traditional flood frequency analysis techniques used in the FEMA studies were never intended for flows regulated by flood control structures, floodplain storage, or extensive urban development. It is for these reasons that the County developed an alternative

statistical approach to determine flood frequencies for all watersheds in DuPage County, including Salt Creek. This alternative approach, PVSTATS, has been approved by both the IDNR-OWR and FEMA for use in the County's floodplain mapping efforts.

Why was the past practice of conveyance floodway mapping changed to storage mapping? The floodway analysis performed on Salt Creek is a conveyance floodway. The fact that some areas have wider floodways is a result of the more up-to-date hydraulic conditions in the watershed. Some areas within the Salt Creek watershed generate a lot more runoff, which, in turn, will require a wider conveyance path.

The transition from a narrow floodway area to a wide floodway area is being reexamined to better reflect the expansion and contraction of the floodway. The specific example used was North Avenue and this area is being remapped based upon the IDNR-OWR regulatory transition sections.

There are 33 extra rainfall events (many of which did not occur in DuPage County, the Chicago metro area, or even Illinois) yet are factored into the PVStats statistical determination of the 100 year floodplain for Salt Creek. How do these non-Salt Creek watershed rainfall events affect the 100 year projected water level of Salt Creek? Is it necessary to utilize non-Salt Creek rainfall events? As part of the hydrologic and hydraulic analysis on Salt Creek two different sets of storm events are simulated. The first set of storms includes 115 events over the period from 1949 through 1993 (45 years). These storms are historical rainfall events measured at NOAA rainfall gages located at the Morton Arboretum in Wheaton and at O'Hare Airport in Chicago. The second set of events includes 28 extreme storm events that occurred in Illinois or bordering states. These storm events are simulated three times using dry, average and wet initial moisture conditions. Lacking 100 years of historical data, these additional events are used in the County's analysis to augment the number of storms used to develop the relationship between flood peaks and flood volumes. The probability distribution is fitted to the flood volumes associated with the largest simulated flood peaks extracted from the historical simulation of events (i.e., partial duration series). The statistical relationship between flood peak and flood volumes is found using both the historical and extreme storm event simulations. The flood volume distribution is then integrated with the peak-to-volume relationship to derive the distribution of flood peaks.

What is the effect of the 33 extra rainfall event used in the PVSTATS analysis? The extreme storms contained in the PVSTATS analysis are not used to determine the 100-year recurrence interval flow or elevation. The extreme storms are only used to improve the extrapolation of the rating curve once the 100-year elevation and flow have been determined.

A total of 115 local storms are used in the model. Some of the storms did not calibrate well but were left in the PVSTATS analysis anyway. Why? The calibration was actually performed on a subset of the 115 storms because the land use was assumed to be relatively constant during the period of interest. The calibration period was selected to have both large and small storm events. The calibration results indicate that the Simulated

to Recorded (S/R) for the gages at Rolling Meadows was 0.94, 0.91 for Elmhurst and 1.0 for Western Springs. The results indicate a slight under-simulation of flows at the upper watershed, not an over-simulation. The use of all of the storm events is common when historical data is being used.

How does the County operate flood control projects – to what objective and area the 100-year flood level reductions maximized? DuPage County runs a real-time simulation of the Salt Creek watershed and then applies the predicted rainfall events to the watershed to determine the best operating scheme to reduce flood heights. There are target flood elevations used at Harger and Irving Park Road that assist in determining the most effective flood reduction that can be achieved for each individual storm event. The facilities are operated to prevent damages consistent with Stormwater Management Planning Committee directives and are not optimized around the 100-yr event.

It is clear that the Elmhurst Chicago Stone Quarry reservoir is not full at a 100-year storm. It does not appear therefore, that the Quarry and possible other Salt Creek flood control structures are being operated and modeled to provide maximum 100 year flood level reductions in water height and thereby maximizing benefit. If not, why not?

The directive from the Stormwater Management Planning Committee at the time of the adoption of the Lower Salt Creek Watershed Plan adoption was to reduce damages from a recurrence of the 1987 event by 95% and reduce historical damages by 90%. The Lower Salt Creek Watershed plan achieves that directive and the Elmhurst Quarry operates in compliance with the plan. The 1987 event produce more runoff volume than a 100-yr event, which is why the quarry is not full at the 100-yr event. Operation of the quarry could be modified to provide maximum 100-yr protection but not without losing the ability to protect against an event similar to 1987. Questions regarding modifying operational objectives are policy and should be addressed to the Stormwater Management Committee.

How would/could conveyance improvements further reduce floodplain? Can conveyances increase the 100 year flood level benefits? Conveyance projects, without compensatory storage, simply transfer additional volume downstream often increasing flood heights. The intent of watershed planning is to identify areas of flood damage, analyze the effectiveness of certain alternatives and recommend a plan of action. The watershed plans for Salt Creek and its tributaries have already identified the most cost effective and beneficial projects that will help reduce overbank flood damages. Full implementation of these projects would be most beneficial.

Black & Veatch Report states that the Quarry Project implemented within a comprehensive flood control plan will eliminate 90% of the damages with 4 basins that contain 11,000 act-ft of storage. The 100 year rainfall is equal to 7.6 inches of rainfall distributed uniformly over 112 square mile. But the 1987 flood of record event had 9.5 inches of rain in 24 hours and 4 inches of rain in the next 24-48 hours. There is a technical need to reconcile the numbers used to determine the Base Flood Elevation and benefits of the completed flood control projects. Traditional flood frequency

statistics assumes that the statistical measure of the 100-year rainfall (i.e, 7.6 inches) will generate the 100-year peak discharge. The routing of this peak discharge using steady-state hydraulic models in turn produces the 100-year peak stage. In contrast, the County's PVStats approach performs statistics on the flood volumes instead as explained above.

The actual 1987 flood elevation at North Avenue (per County staff) was 671.7. Running the 1987 storm through the new model w/o projects produces an elevation of 673.1, which is an increase of 1.4 feet. Is the model properly calibrated? FEQ hydraulic models are calibrated to storms where high water marks are available and local precipitation data records can be obtained from gages throughout the watershed. Local gages provide the timing and distribution of the rainfall in the watershed. Once a FEQ model is calibrated to a given storm event(s), the period of record (115 storms) is simulated using precipitation gage information using the O'Hare and Wheaton gages. Documentation regarding the County's hydrologic and hydraulic methods can be found in the following documents:

- "Hydrologic and Hydraulic Methods Used for Flood Plain Mapping of DuPage County Watersheds", March, 1994
- "Hydrologic Calibration of HSPF Model for DuPage County: West Branch DuPage River at West Chicago, West Branch DuPage River at Warrenville, East Branch DuPage River at Maple Avenue, Salt Creek at Western Springs, Including Hydraulic Evaluation at: Salt Creek at Western Springs and Salt Creek at Rolling Meadows", March, 1994.

The 673.1 elevation at North Avenue for the 1987 event likely came from the historical series run and not the calibration run and, therefore we do not expect that it would match the high water mark at that location.

There is a concern that the FEQ modeling and PVStats show a larger floodway. Why? Staff has documented how the floodway is mapped on the County's 2-foot topography and has discussed these methods with staff from the IDNR-OWR. There are places in the watershed that show a wider floodway, because the floodway results tell us that it is wider. Recall that updated hydrology and hydraulics has generated flows that are greater than those used in the original FEMA flood plain studies. In order to convey those higher flows, the floodway made need to be wider.

Why should Salt Creek floodplain/floodway be at different standards than the East/West Branches of the DuPage? The methods and standards used for floodplain and floodway mapping in DuPage County are the same throughout. There are not different standards in Salt Creek.

DuPage County adopted a restrictive ordinance in 1992. Have these restrictive design criteria been accounted for in the analysis? Over 50% of the tributary area is located in Cook County which does not have an ordinance that is as restrictive as DuPage County's. The major flood control and detention reservoirs are included in the modeling. A vast

majority of the Salt Creek watershed was fully urbanized prior to the adoption of the DuPage County Ordinance. The tributary models that feed into the Salt Creek model do include the large detention ponds that are located within the watershed.