

Elgin O'Hare – West Bypass: Drainage Evaluation for System Interchange at York Road

PREPARED FOR: Illinois Department of Transportation
PREPARED BY: Christopher B. Burke Engineering, Ltd.
DATE: June 10, 2009

Purpose

As a result of the coordination meeting held on December 4, 2008 at the O'Hare Airport Building No. 4, CBBEL was directed to prepare a Technical Memorandum presenting drainage alternatives for the proposed Elgin O'Hare-West Bypass interchange at York Road. The purpose is to recommend viable drainage alternatives that can minimize flows of the Willow Creek floodplain (including South Unnamed Creek and North Unnamed Creek) from spreading into the proposed system interchange including underpasses specifically and can drain stormwater runoff efficiently so the system interchange can provide free traffic movement during heavy rain storms.

Existing Drainage Conditions

The area evaluated includes York Road approximately from Sivert Court to Pan Am Boulevard and Thorndale Avenue approximately from Thomas Drive to York Road, which is located within the Willow Creek watershed.

The Flood Insurance Rate Map (Exhibit 1) of DuPage County dated December 16, 2004 considers the area south of Thorndale Avenue as the South Unnamed Creek watershed and the area in the vicinity of Pan Am Boulevard and Supreme Drive as the North Unnamed Creek. Flows from the South Unnamed Creek and the North Unnamed Creek converge on the west side of York Road and drain easterly towards O'Hare Airport via three trapezoidal structures with a respective invert of 652.85', 649.58' and 652.00'. There is a 3-10' (span) x 4' (rise) box culvert carrying Thorndale Avenue over the South Unnamed Creek. Flows on the north side of the triple box culvert turn to the southeast direction towards the intersection of Thorndale Avenue and York Road. Then, the South Unnamed Creek turns northerly to follow the York Road ditch on the west side for approximately 3000' where a trapezoidal structure with the lowest invert of 649.58' exists. Next, the South Unnamed Creek drains easterly via this structure and another trapezoidal structure approximately 2500' from the Thorndale Avenue intersection, which then becomes the main Willow Creek.

Two Waterway Information Tables (Exhibit 2A and Exhibit 2B), Exhibit 3 delineating Willow Creek/South Unnamed Creek 100-year floodplain after the "project" and another exhibit reflecting the Flood Insurance Rate Map before the "project" are included for ready reference and comparison. The "project" is defined as current conditions after installation of the aforementioned structures at York Road and Thorndale Avenue and channel improvements along the South Unnamed Creek and North Unnamed Creek. As indicated

in Exhibit 2A and Exhibit 2B, the “project” reduces the respective flood stages in the range of 1.7’ to 4.4’. Exhibit 3 indicates that the base floodplain boundary has been shrunk significantly due to implementation of the “project”.

Drainage Concerns

The new O’Hare Airport Western Terminal location is a given, as noted in the OMP’s approved FEIS, although it is located near the Willow Creek floodplain. As a result, the proposed system interchange at York Avenue will be located in the Willow Creek/South Unnamed Creek floodplain. The enclosed Exhibit 3 of “Willow Creek/South Unnamed Creek 100-year Floodplain Ultimate Conditions” is superimposed with the proposed system interchange footprint to illustrate relationship between existing hydraulic and proposed geometric elements.

The proposed system interchange will require multilevel highway structures to accommodate traffic movement from one road to another without crossing streams of traffic. Because of the fixed Western Terminal location, there are significant vertical and horizontal design constraints in this area. The vertical constraints relate to height restrictions within the designated runway protection zones (RPZ), which control how high the road can be built so as to not interfere with the runway glide slopes. The system interchange consists of a three-level configuration (including existing ground level). Due to the vertical RPZ constraints, it is not possible to construct two levels above ground level. As such, one above and one below grade are proposed in front of the Western Terminal building to make the needed connections and avoid infringement into FAA airspace restrictions. However, it is impossible to have any level above the existing ground within the runway protection zone.

The lowest level of the interchange will be a subway/underpass. The pump station for the subway is not avoidable. Compounding the drainage issue is the given location of the proposed Western Terminal of the O’Hare Airport which will require the system interchange at York Road to be placed in the South Unnamed Creek floodplain. The entire tributary area of the South Unnamed Creek watershed on the south side of Thorndale Avenue is estimated to be 1.7 square miles. The base flow of the South Unnamed Creek could potentially generate a high water table in the vicinity of the streambed even during the dry time. Therefore, the pump station may have to pump the ground water besides the surface water. Also, flows from the North Tributary are hydraulically connected to flows from the South Unnamed Creek in the channel along York Road.

In addition to encroachment on the floodplain, the system interchange will potentially be built over the existing detention pond and result in the loss of detention volume.

Drainage Criteria:

- The design frequency for pump stations shall be a 50-year flood frequency.
- The design frequency for storm sewers draining the subway also shall be a 50-year flood frequency.
- The proposed interchange and expressway in the floodplain shall have a minimum of three feet freeboard against the 50-year flood frequency elevation or two feet freeboard against the 100-year flood frequency elevation, whichever is higher shall govern.

- Inlet spacing for the subway shall be determined based on a 50-year rainfall intensity.
- Access Road profile and floor elevation of the proposed pump station shall not be below the 100-year flood elevation.

Conceptual Design Conditions

Drainage concerns due to the proposed multilevel highway interchange at York Road located within the South Unnamed Creek floodplain shall be addressed. According to the existing topographical conditions (Exhibit 3), the ground level and lower level of the interchange would be constructed below the 100-year flood elevation, which would be subject to frequent flooding. Viable design alternatives shall be explored to address drainage deficiencies and comply with the drainage criteria. Following are recommendations to achieve the end.

1. Raise the ground elevation above the 100-year flood elevation for the area to be used by the proposed interchange. Therefore, two levels of the system interchange will be protected for all storm events including and up to the 100-year flood frequency.
2. Adjust the existing York Road profile to establish a summit at the intersection and provide a minimum of 0.3% slope. The existing York Road profile has a zero percent slope for a total length of approximately 2200 feet south of Pan Am Boulevard.
3. Reduce potential tributary area to the subway by creating crests on the profile and summits in the ditch. It is recommended that the tributary area to the proposed subway be minimized to only include the proposed roadway.
4. Remove the existing 3-10' (span) x 4' (rise) culvert under the existing Thorndale Avenue and construct a new 3-10'x4' culvert or larger to line up with the South Unnamed Creek and accommodate the proposed system interchange roadway.
5. Extend the three trapezoidal cross-road structures under the existing York Road to accommodate the proposed widening of York Road, if an updated hydraulic analysis verifies adequacy of the structure openings.
6. Relocate the existing South Unnamed Creek on the north side of Thorndale Avenue to near its original location. The original channel was located on the west side of the commercial building, Miller Fluid Power Corp., which was directly on the downstream side of the South Unnamed Creek. The proposed channel bottom width is suggested to be approximately 30' for providing the required conveyance capacity, as opposed to the range of 10' - 20' for the existing channel bottom along York Road. Slurry seal may be required on the channel bottom and slopes to ensure that seepage does not infiltrate to the system interchange site and the water table at the system interchange will not fluctuate with the South Unnamed Creek flood stages.
7. Enclose the relocated South Unnamed Creek on the west side of the Miller Fluid Power Corp. building with a culvert, heading northerly to minimize the right-of-way take. A drainage structure will be installed at the construction limit to house this culvert and turn it to a northeast direction for a short distance. When right of way permits, the culvert will be converted to an open channel, outletting to the first trapezoidal structure on the west side of York Road approximately 2500' north of existing Thorndale Avenue.

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8. Provide compensatory storage at a ratio of 1.5:1 for the loss of floodplain storage due to the proposed work at the open field between the proposed system interchange and Pan Am Boulevard.
 9. .9. Construct a stormwater detention pond near the potential pump station at Sivert Court if detention is required to compensate for an increase in imperviousness and loss of existing detention storage volume.
 10. Design a pump station and storm sewers to comply with the design criteria. The potential pump station site may be at the open field immediately south of Sivert Court and the open field between Pan Am Drive and Supreme Drive on the west side of York Road.

Exhibit 4 summarizes the proposed conceptual drainage plan in a pictorial format. The ten written items identified in this section are also shown numerically on Exhibit 4 for cross-reference. Exhibit 5A and Exhibit 5B consist of template cross sections to show conceptually how the topographic conditions will be changed to address drainage concerns for the proposed system interchange at York Road.

Future Tasks

1. Review proposed plan and profile of the system interchange in terms of drainage concerns.
2. Review superimposed cross sections to determine proposed drainage system and evaluate right-of-way needs.
3. Perform hydraulic analysis for the proposed drainage structure carrying the system interchange over the South Unnamed Creek.
4. Perform hydraulic analysis for the proposed structures carrying York Road over the Willow Creek (South Unnamed Creek and North Unnamed Creek).
5. Prepare a pump station hydraulic report to determine required pumping capacity and select the pump station site.
6. Calculate cut and fill volume on the potentially encroached floodplain and determine the compensatory storage volume and site.
7. Calculate the required detention volume and determine how to provide the required volume.
8. Design the proposed drainage system including ditches, channels and storm sewers.
9. Evaluate right-of-way requirements for the proposed drainage system.
10. Prepare existing drainage plans to delineate ridge lines and sub-ridge lines and determine the respective tributary areas to all structures.

Coordination

Additional action items are described in the attached minutes of meeting among the Elgin-O'Hare West Bypass team members held on November 6, 2008 at the CH2M Hill offices.

The Elgin-O'Hare West Bypass team met with the OMP team on December 4, 2008 at the O'Hare Airport Building No. 4 to exchange information about drainage improvements at the O'Hare Airport site, Elgin O'Hare-West Bypass System Interchange at York Road and Bensenville Flood Control project.

FINAL MEETING SUMMARY**CH2MHILL**

MEETING SUBJECT: Elgin O'Hare West Bypass (EOWB) – OMP Drainage Meeting **RECORDER:** CBBEL/Chinliang Wang

MEETING DATE & TIME: December 4, 2008 - 10:00 a.m. **PREPARATION DATE:** December 4, 2008

MEETING LOCATION: OMP Offices

ISSUE STATUS: Draft for Review Final

ATTENDEE NAME	ORGANIZATION / PROJECT	E-MAIL
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An Elgin O'Hare – West Bypass coordination meeting was held on December 4, 2008 at the O'Hare Airport Building No. 4, beginning at approximately 10:00 a.m. and ending at approximately 11:30 a.m. The following is a summary of topics and issues discussed at the meeting.

1. Drainage Improvements at the O'Hare Airport Site:

Kay Whitlock started by providing a detailed history of drainage studies and improvements on O'Hare property and west of York Road from the late 1980's to present. Exhibits describing the airport drainage improvements background and identifying completed and ongoing projects were reviewed along with general completion timeframes.

The Touhy Avenue Reservoir and Willow-Higgins Creek Flood Control Reservoirs have been in place since 2007 and are fully operational. Both Touhy Avenue and Willow-Higgins Creek Flood Control Reservoirs were constructed to replace Reservoir #140 originally planned but not implemented/constructed due to conflicts with the airport expansion plans.

Flowage Easements were established between DuPage County and Chicago's Department of Aviation so that flows from the Willow Creek can drain to the Willow-Higgins Flood Control Reservoirs to access flood control storage.

2. Bensenville Flood Control Project:

Don Dressel provided an overview of the Bensenville Flood Control Project, which CBBEL has been involved with since 1987. The purposes are to improve channel conveyance capacity, lower flood stage elevations, and reduce flood boundary limits.

Don Dressel used a work in progress "Contour Map showing Willow Creek South Tributary 100-year floodplain after proposed conditions" to illustrate the 100-year floodplain boundary after the full implementation of recommended flood control projects from the DuPage County Watershed Plan. It was noted that the FEMA Flood Insurance Rate Map dated 2004 does not accurately reflect drainage improvements of the last 21 years or updated hydrologic/hydraulic models.

Portions of the recommended plan have been constructed by the DuPage DOT. Drainage improvements completed include, but are not limited to, raising York Road profile (which includes an 1,100 foot long land bridge), installing three trapezoidal openings spanned as a bridge under York Road, constructing a 100' wide channel on the west side of York Road and installing three 10' x 4' box culverts under Thorndale Road. The drainage structures were designed for the 100-year frequency event based on ISWS Bulletin 70 rainfall data using the hydrologic and hydraulic model calibrated to the 1987 August flood event observed high water marks. It was noted that the temporary gabion dams installed on the west side of York Road and upstream of Thorndale Avenue to restrict flows from draining to the O'Hare Airport property have been removed since the flowage easements were executed and the Willow-Higgins Creek Flood Control Reservoir were constructed and brought on-line.

DuPage County will process the Letter of Map Revision (LOMR) once the entire recommended plan for the Willow Creek South Tributary watershed, Willow Creek North Tributary watershed and Willow Creek watershed are completed. CBBEL noted that the County did not want to do multiple LOMR's as individual component projects were completed. As a result, it was noted that the FEMA maps that IDOT has in this area do not accurately reflect the current situation.

3. Deliverables & Issues:

Rick Wojcik asked whether the trapezoidal openings under York Road and the U.P. Railroad line could adequately convey water from the west and onto the O'Hare property. Don Dressel informed Rick that the trapezoidal openings already in place are sized for the ultimate configuration (not including the proposed interchange) and can handle the appropriate design storm. Don further stated that the three trapezoidal openings under York Road in conjunction with the culverts under the railroad (Chicago, Milwaukee, St. Paul and Pacific) are adequate to pass the 100-year base flow without any head loss; therefore, no flood storage will occur upstream of York Road apart from the conveyance storage in the channel. Don noted the south tributary could be moved back to its natural/historic location (west side of current Parker Hannifinn Building Property in the northwest corner of Thorndale and York) as part of the Elgin O'Hare – West Bypass project, if necessary.

Rick Wojcik requested a copy of the Bensenville Flood Control documents including hydrologic/hydraulic modeling data and a copy of Willow Creek Relocation exhibit. CBBEL will request information through OMP with Kay Whitlock's assistance. A separate request based on the Freedom of Information Act was processed through DuPage County on November 19, 2008. Don Dressel has received permission from DuPage County to release the information.

Rick Wojcik asked why the proposed airport western terminal was located in a floodplain. Rick stated that a 2-ft freeboard above the 100-year design storm for the Willow Creek South Tributary will be required for all new (interchange) ramps that are proposed to be below grade. This is consistent with the U.S. Army Corps of Engineers freeboard criteria to prevent adjacent properties from the floodplain by constructing berms or levees two feet above the 100-year floodplain. IDOT policy and practice is to provide three foot freeboard above the 50-year design storm in floodplains for new construction (proposed interchange and new expressways) constructed at or above grade. Pat Pechnick indicated that the proposed airport western terminal site has been a "given" element for the Elgin O'Hare – West Bypass Project and IDOT has to accommodate it. In essence, the West Terminal placement was determined by the City of Chicago and is part of the approved federal action (EIS report) which

includes the Airport Layout Plan (ALP). Thus, it cannot be moved by IDOT. It can only be moved by the OMP with a revision to the ALP and approved by the FAA and that is not anticipated.

The EO-WB team will study drainage alternatives to minimize the base floodplain influence spreading into the proposed interchange at York Road/West Bypass/Elgin O'Hare and present viable drainage alternatives to CH2M HILL, SEC Group, Inc. and IDOT by January 15, 2009.