
To:	Tom Harrigan Village of Elm Grove	From:	Richard Klein, PE Aaron Volkening, PE
File:	Underwood Creek Daylighting	Date:	December 8, 2017

Reference: Draft Preliminary Design Memorandum

INTRODUCTION AND PROJECT OVERVIEW

At the Village's request, Stantec has prepared a draft preliminary design memorandum on the Underwood Creek Daylighting design development. Project design is ongoing, and a final design memorandum will be delivered at the completion of the design phase.

The Underwood Creek daylighting project will restore a reach of Underwood Creek in downtown Elm Grove, Wisconsin that currently flows underground in a concrete box culvert. A new stream channel, approximately 1,600 feet long, will be constructed. The existing concrete box culvert will be abandoned. The creek daylighting will provide benefits for fish passage, aquatic and terrestrial ecology, aesthetics, and public open space and recreation.

PROJECT ELEMENTS

New stream alignment and profile

A new stream channel will be constructed from Watertown Plank Road (upstream / north end) to a location 550 feet south of Wall Street at the old railroad spur bridge (downstream / south end). The creek daylighting is made possible by CP Rail's abandonment of a railroad spur line, which will be sold to the Village to provide open space to construct the new stream. North of this railroad corridor, part of the existing parking lot and an existing building (the One Hour Martinizing Building) will be removed to provide space for the new channel. The alignment also includes a new crossing of Wall Street.

The elevation profile and slope of the new channel is constrained by the existing channel bottom elevations at the upstream and downstream ends of the new channel reach. At these upstream and downstream ends, the new channel elevation must match the existing Underwood Creek bed elevation. The upstream match point, just downstream of the Watertown Plank Road bridge, has a bed elevation of 733 feet. The downstream match point, 550 feet south of Wall Street at the old railroad spur bridge, has an elevation of 725 feet. Therefore, the channel will drop approximately 8 feet in a horizontal distance of 1,600 feet, with an average channel slope of 0.5% or 26 feet per mile. The actual channel profile will have local slope variability with a constructed pool and riffle sequence.

Stream cross section and variability

Cross section geometry and material of the new stream will be based on the principles of natural channel design and fluvial geomorphology.

Reference: Draft Preliminary Design Memorandum

The design team is evaluating hydraulic geometry such as bankfull width and bankfull depth in comparison to:

- Watershed area and expected flow rates
- Dimensions of adjacent existing stream segments, such as current Underwood Creek reach downstream of Wall Street
- Regional hydraulic geometry and geomorphic relationships

Channel bed, bank and overbank materials will be selected based on geomorphic, hydraulic and ecological criteria. Channel materials will need to accommodate expected creek depths, velocities and shear stresses. Because of the relatively high velocities and shear stresses, it is anticipated that medium to large rock will be a primary component of channel bed material.

A riffle / pool pattern will be constructed. Riffle / pool spacing and construction details is being developed in accordance with the principles of natural channel design.

Where possible, the higher portions of the stream corridor, outside of the active floodplain, will be constructed with earthen slopes and planted with appropriate native vegetation. Because of space constraints, in some channel locations retaining walls will partly replace earthen side slopes for high areas of the corridor cross section.

New culvert crossing

Because of the change in stream location, a new road crossing under Wall Street for the daylighted creek is needed. The crossing will meet both hydraulic and aquatic organism passage (AOP) design parameters. To balance material cost and construction cost with size and hydraulic requirements, an aluminum box culvert has been selected for the crossing. The preliminary sizing of this culvert has an opening width of 28' 6" and an opening height of 8' 6", which is a standard size available from a culvert manufacturer. The bottom of the culvert will be filled 1 to 2 feet with streambed material to enhance aquatic organism passage.

Interim Parking Lot Modifications

As part of the creek daylighting project, parking lot aisles and parking stalls will be restriped (repainted) to accommodate the new channel corridor. The existing entrance driveway into the parking lot from Watertown Plank Road will be converted to a two-way entrance and exit driveway, and parking lot vehicle circulation will be modified by restriping.

In 2018, the Village will begin a downtown master planning project which will result in a long-range plan for the shopping / parking lot district. It is expected that the master plan will result in a comprehensive vision and plan that will guide more extensive modifications to the retail and commercial buildings and parking areas adjacent to the new creek corridor. The master plan will also consider the establishment of a recreational corridor adjacent to the daylighted creek, with elements such as pedestrian / bike trails, pocket parks and public landscape architecture and art.

Reference: Draft Preliminary Design Memorandum**Abandonment of Existing Culvert**

The existing concrete box culvert, located under the parking lot and the edge of the Sendik's grocery store, will be properly abandoned. Demolition / removal / abandonment specifications will be developed for this work. Currently, the design calls for filling the culvert segment under Sendik's with flowable fill that will completely fill the culvert interior. North of Sendik's, where the culvert is accessible from the surface, the top portion of the culvert will be removed, the culvert interior will be backfilled from the surface, and surface restoration (paving / landscaping) will be provided.

Storm Sewer

There are numerous pipe connections to the existing box culvert. An interior culvert assessment and survey documented these connections in detail. Some of these are local storm sewers that discharge surface runoff to the box culvert. Other connections appear to be building drains or seepage drains. Since the existing culvert will be filled and abandoned, a new outlet for these existing connections will be provided. New storm sewer segments, parallel to the existing box culvert, will be constructed. Existing subsurface pipes that currently outlet into the box culvert will be instead connected to the new storm sewers. The new storm sewer will range in size from 15 inches to 42 inches in diameter.

Backwater Wetland

The existing Underwood Creek channel, from Wall Street south, will be converted to a backwater wetland area. A weir will be constructed at the outlet of this reach, to temporarily detain stormwater and floodwater in this new backwater area. This backwater wetland area will provide some hydrologic control and water quality benefits. North of Wall Street, the existing channel is proposed to be filled in and converted to a shallow swale for surface drainage.

SUBSURFACE AND ENVIRONMENTAL CONSIDERATIONS

Subsurface data collected for previous projects, such as the Elm Grove flood management project, will be utilized for design. Subsurface data is also available from previous environmental investigations of the One Hour Martinizing property.

The One Hour Martinizing property is an active DNR environmental cleanup site, with subsurface contamination from past site use. Project design will accommodate existing site contamination and the remediation plan for the site. The creek daylighting design will be coordinated with DNR environmental / remediation staff to ensure that environmental protection standards are met.

HYDROLOGIC / HYDRAULIC ANALYSIS

The watershed area of Underwood Creek is approximately 10.4 square miles at Wall Street. Design peak flows for various flood frequencies are shown in the table below. Design peak flows for the 10, 50, and 100-year flood events were obtained from the FEMA regulatory floodplain model. The regulatory floodplain model does not contain a flow value for the 2-year flood, so this flow was estimated based upon ratios between the 2-year event and other flood events in the overall watershed model.

Reference: Draft Preliminary Design Memorandum**Design flows**

Return period	Peak flow (cfs)
2 years	165
10 years	375
50 years	635
100 years	826

A hydraulic analysis of the proposed channel is being conducted using the computer software HEC-RAS, to verify there are no adverse impacts on flood elevations outside of the project limits.

PERMITTING

The creek daylighting project was a permit condition of the previously-constructed Elm Grove flood management project. When the Wisconsin DNR issued a Chapter 30 permit for the flood management project, one of the permit requirements was that the Village of Elm Grove actively pursue the creek daylighting in future years.

As part of the design process, the Village and design team are coordinating with the Wisconsin DNR and U.S. Army Corps of Engineers. A wetland delineation was performed by SEWRPC. It is expected that permits will be required for navigable water impacts (Chapter 30), wetland impacts, floodplain modifications (FEMA CLOMR) and erosion control.

PROPERTY ACQUISITION AND EASEMENTS

To construct the project, the Village will acquire two properties outright: the CP Rail abandoned railroad spur, and the One Hour Martinizing property. Easements will be acquired for several other properties to construct the stream corridor.

SCHEDULE

Design is anticipated to be complete in spring 2018. Permit submittals are anticipated to be made in the future by the Village prior to construction. The schedule for the start of construction is dependent upon the availability of funding and the land acquisition process. Primary construction is estimated to take less than six months, with final restoration and vegetation establishment continuing past that timeframe.

Attachment: Preliminary Design Plans