SKYLINE LANDFILL
CITY OF FERRIS
DALLAS AND ELLIS COUNTIES, TEXAS
TCEQ PERMIT APPLICATION NO. MSW 42D

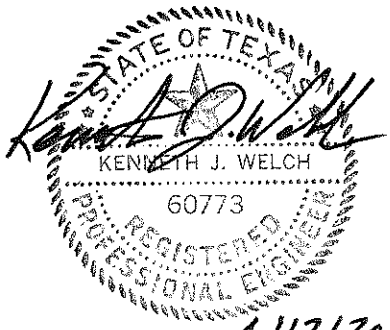
PERMIT AMENDMENT APPLICATION

PART III – FACILITY INVESTIGATION AND DESIGN
ATTACHMENT C2
FLOOD CONTROL ANALYSIS

Prepared for

Waste Management of Texas, Inc.

April 2012



4/12/2012

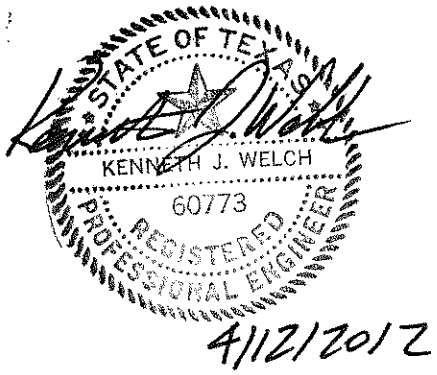
Prepared by

BIGGS & MATHEWS ENVIRONMENTAL
1700 Robert Road, Suite 100 • Mansfield, Texas 76063 • 817-563-1144

TEXAS BOARD OF PROFESSIONAL ENGINEERS
FIRM REGISTRATION NO. F-256

TEXAS BOARD OF PROFESSIONAL GEOSCIENTISTS
FIRM REGISTRATION NO. 50222

CONTENTS



1 INTRODUCTION

30 TAC §§330.63(c) and 330.547

1.1 Purpose

The flood control analysis is prepared as part of a permit amendment application for the Skyline Landfill. This flood control analysis has been prepared and includes the demonstrations consistent with the requirements of §§330.63(c)(2) and 330.547. The report is organized to include a narrative description of the current permitted and postdevelopment conditions and includes a discussion of the various demonstrations. Drainage calculations are included in the appendices to this report. Drainage design plans are included in Attachment C3. The following is a brief description of each of the appendices.

Appendix C2-A – 100-Year Floodplain Analysis

Appendix C2-A includes drawings demonstrating that no waste disposal operations shall be permitted in areas that are located in a 100-year floodway as defined by the Federal Emergency Management Agency (FEMA) and that the municipal solid waste storage and processing facilities shall be located outside of the 100-year floodplain. Appendix C2-A also includes drawings, summary tables, and hydrographs demonstrating that development of the Skyline Landfill shall not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not adversely impact the receiving channel, Ten Mile Creek.

1.2 Regional Hydrologic and Hydraulic Analysis of Ten Mile Creek

To demonstrate that the proposed development of the Skyline Landfill will not impact the 25-year or 100-year flooding condition of Ten Mile Creek, a regional hydrologic analysis and a hydraulic analysis of Ten Mile Creek adjacent to the Skyline Landfill was performed based upon the current permitted final closure configuration. The hydrologic analysis is included in Attachment C1, Appendix C1-B, and begins on page C1-B-48. The hydraulic modeling is included in this attachment in Appendix C2-B described below.

A regional hydrologic analysis and hydraulic analysis of Ten Mile Creek adjacent to the Skyline Landfill was performed based upon the postdeveloped final closure configuration. The hydrologic analysis is included in Attachment C1, Appendix C1-C, and begins on page C1-C-45. The hydraulic modeling is included in this attachment in Appendix C2-C described below.

Appendix C2-B – Current Permitted HEC-RAS Evaluation

The current permitted HEC-RAS results are included in Appendix C2-B and represent the current permitted final closure configuration. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

Appendix C2-C – Postdevelopment HEC-RAS Evaluation

The postdeveloped HEC-RAS results are included in Appendix C2-C and represent the postdeveloped final closure configuration. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

Appendix C2-D – Regulatory Correspondence

The Skyline Landfill is located in both Dallas and Ellis Counties, entirely within the city limits of the City of Ferris. Since the expansion of the Skyline Landfill will encroach into the FEMA defined 100-year floodplain with placement of fill, WMTX has received approval from the City of Ferris, as the FEMA designated Floodplain Administrator, to encroach into the 100-year floodplain.

2 100-YEAR FLOODPLAIN

30 TAC §§330.63(c)(2), 330.547(a)

The 100-year floodplain elevations for Ten Mile Creek adjacent to the Skyline Landfill are from the FEMA Flood Insurance Rate Map (FIRM) of Dallas County, Texas and unincorporated areas community panel number 48201C0505L, revised August 23, 2001. However, the hydrologic and hydraulic modeling of Ten Mile Creek to determine the 100-year floodplain elevations was performed in 1979. Subsequent Flood Insurance Studies (FIS) since 1979 have only revised the limits of the 100-year floodplain based upon the topography. Hydrologic and hydraulic calculations have not been performed to revise the 100-year floodplain elevations.

FEMA has defined the limits of the 100-year floodplain in the vicinity of the landfill as Zone AE; base flood elevations have been determined by FEMA. The limits of the floodplain are depicted on Drawing C2-A-2, which is a drawing compiled from the FIRM, Community Panel Number 48201C0505L, with a revision date of August 23, 2001. As depicted on Drawing C2-A-2, portions of the permit boundary along Ten Mile Creek are located within the FEMA defined 100-year floodplain.

The proposed expansion of the Skyline Landfill requires fill within the 100-year floodplain removing approximately 2,500 cubic yards (1.55 acre-feet) of temporary floodplain storage volume. The removed volume will be replaced with approximately 2,600 cubic yards (1.61 acre-feet) of temporary floodplain storage volume. These improvements are not within the 100-year floodway of Ten Mile Creek. Based on these improvements to the 100-year floodplain, the current permitted and postdeveloped landfill footprint will not be located within the limits of the 100-year floodplain and no disposal operations will be conducted within the 100-year floodplain.

As stated on the FEMA publication, *Application Forms for Conditional and Final Letters of Map Amendment and Letters of Map Revision based on Fill*, OMB Control Number 1660-0015, which expires Feb 28, 2014, "The NFIP regulations do not require that a CLOMA or CLOMR-F be requested and issued for a proposed project." Waste Management of Texas, Inc., at the time of development within the 100-year floodplain, will submit certified as-built information to the FEMA through the City of Ferris for a LOMR-F to be issued. Once issued, the LOMR-F will officially modify the National Flood Insurance Program (NFIP) map. Refer to Appendix C2-D – Regulatory Correspondence for approval from the City of Ferris, as the FEMA designated Floodplain Administrator, to encroach into the 100-year floodplain.

Refer to Appendix C2-A – 100-Year Floodplain Analysis for drawings depicting the development of the Skyline Landfill and its relation to the Ten Mile Creek 100-year floodplain.

The Regional Drainage Map, Drawing C2-A-1, shows the location of the Skyline Landfill in relation to Ten Mile Creek. It also delineates the drainage area contributing to Ten Mile Creek adjacent to the Skyline Landfill. The following provides a brief discussion of each of the drawings and tables included in Appendix C2-A.

The Flood Insurance Rate Map (FIRM), Drawing C2-A-2, shows the 100-year floodplain elevations and limits determined by FEMA. The FIRM map delineates this area as Zone AE; base flood elevations have been determined by FEMA.

The 100-year Floodplain Map Current Permitted, Drawing C2-A-3, shows the 100-year floodplain elevations determined by FEMA and the 100-year floodplain limits based upon the existing topography and the current permitted final closure configuration.

The 100-year Floodplain Map Postdeveloped, Drawing C2-A-4, shows the 100-year floodplain elevations determined by FEMA and the 100-year floodplain limits based upon the existing topography and the postdeveloped final closure configuration.

The Current Permitted Flood Stage Analysis Summary, Drawing C2-A-5, shows the limits of the FIRM 100-year floodplain and the limits of the calculated 100-year water surface for the current permitted final closure configuration. Drawing C2-A-5 also includes tables that provide the 25-year and 100-year flow rates, water surface elevations, and velocities at each HEC-RAS cross section for the current permitted final closure configuration.

The Postdeveloped Flood Stage Analysis Summary, Drawing C2-A-6, shows the limits of the FIRM 100-year floodplain and the limits of the calculated 100-year water surface for the postdeveloped final closure configuration. Drawing C2-A-6 also includes tables that provide the 25-year and 100-year flow rates, water surface elevations, and velocities at each HEC-RAS cross section for the postdeveloped final closure configuration.

The tables on pages C2-A-7 and C2-A-8 compare the current permitted and postdeveloped conditions for the 25-year and 100-year storm events, respectively. These tables demonstrate that the proposed development of the Skyline Landfill will not impact the flooding condition of Ten Mile Creek.

The proposed expansion of the Skyline Landfill has been designed consistent with the requirements of TCEQ regulations 30 TAC §330.63(c)(2). This section and Drawings C2-A-2 through C2-A-4 provide the information required by 30 TAC §330.63(c)(2).

In accordance with §330.547(a), the Skyline Landfill's waste disposal operations will not be located in the 100-year floodway as defined by FEMA. In accordance with §330.547(b), the Skyline Landfill's new and existing municipal solid waste units will not be located in the 100-year floodplain and, if expanded as proposed, will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not result in the washout of solid waste. In accordance with §330.547(c), the Skyline Landfill's municipal solid waste storage and processing facilities shall be located outside of the 100-year floodplain.

3 FLOOD CONTROL ANALYSIS

30 TAC §330.547(b)

To demonstrate that the proposed development of the Skyline Landfill will not impact the 100-year flooding condition of Ten Mile Creek, a regional hydrologic analysis and a hydraulic analysis of Ten Mile Creek adjacent to the Skyline Landfill was performed based upon the current permitted condition of the Skyline Landfill. The hydrologic modeling for the current permitted condition is included in Appendix C1-B. The hydraulic modeling for the current permitted condition is included in Appendix C2-B.

The Current Permitted Flood Stage Analysis Summary, Drawing C2-B-1 shows the 25-year and 100-year calculated water surface elevations and the limits of the 100-year water surface for the current permitted condition based upon the current permitted hydraulic analysis. The current permitted HEC-RAS results are included in Appendix C2-B and represent the current permitted final closure configuration. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

A regional hydrologic analysis and a hydraulic analysis of Ten Mile Creek adjacent to the Skyline Landfill was performed based upon the postdeveloped condition of the Skyline Landfill. The hydrologic modeling for the postdeveloped condition is included in Appendix C1-C. The hydraulic modeling for the postdeveloped condition is included in Appendix C2-C.

The Postdeveloped Flood Stage Analysis Summary, Drawing C2-C-1 shows the 25-year and 100-year calculated water surface elevations and the limits of the 100-year water surface for the postdeveloped condition based upon the postdeveloped hydraulic analysis. The postdeveloped HEC-RAS results are included in Appendix C and represent the postdeveloped final closure configuration. A summary table shows the results of the hydraulic analysis. The water surface elevation and energy grade line are graphically shown for each cross section.

The tables on pages C2-A-7 and C2-A-8 compare the current permitted and postdeveloped conditions for the 25-year and 100-year storm events, respectively. These tables demonstrate that the proposed development of the Skyline Landfill will not impact the flooding condition of Ten Mile Creek.

4 METHODOLOGY

30 TAC §330.305(f)(2)

4.1 Concepts and Methods

The hydraulic methods employed in this study are consistent with the TCEQ regulations. The United States Army Corps of Engineers (COE) HEC-RAS computer program was used to determine the 100-year water surface for both current permitted and postdeveloped landfill conditions.

1. Surface water runoff hydrographs at each comparison point for the current permitted condition were developed in HEC-HMS. Each runoff hydrograph was then input into the HEC-RAS model at the appropriate cross section. The HEC-HMS evaluation for the current permitted condition is in Appendix C1-B.

2. Hydraulic models for the current permitted condition were developed to evaluate water surface elevations for Ten Mile Creek, which generally coincides with the northern permit boundary as shown on Drawing C2-B-1, under peak flow conditions using HEC-RAS.

3. Surface water runoff hydrographs at each comparison point for postdeveloped condition were developed in HEC-HMS. Each runoff hydrograph was then input into the HEC-RAS model at the appropriate cross section. The HEC-HMS evaluation for the postdeveloped condition is in Appendix C1-C.

4. Hydraulic models for the postdeveloped condition were developed to evaluate water surface elevations for Ten Mile Creek, which generally coincides with the northern permit boundary as shown on Drawing C2-C-1, under peak flow conditions using HEC-RAS.

4.2 Methodology

4.2.1 HEC-RAS

The COE Hydrologic Engineering Center's River Analysis System (HEC-RAS) program was developed to simulate one-dimensional, steady flow and unsteady flow, water surface profile computations of streams and hydraulic structures. The HEC-RAS model represents drainage systems as a full network of reaches representing river segments, junctions for river confluences and obstructions such as bridges, culverts, and weirs. The program uses the energy and momentum equations to determine water surface profiles.

4.2.2 Water Surface Profiles

The current permitted and postdeveloped hydrologic runoff models were developed using HEC-HMS. Appendix C1-B and C1-C provide the current permitted and postdeveloped hydrologic runoff data used in the water surface profile determination. HEC-RAS was used to determine water surface profiles for Ten Mile Creek.

River Network Schematization

The modeled drainage system is geometrically represented in the HEC-RAS model by a River System Schematic that utilizes information from the drainage system such as connectivity, cross-sectional data, and hydraulic structure parameters. The River System Schematic was developed by dividing the drainage system into reaches between confluences. Each reach is geometrically defined by cross-sectional data input at numerous stations along the reach. Channel obstructions are also entered as cross-sectional data.

Reach Characteristics

Reach characteristics are determined at each reach station. Reach characteristics include the reach length, roughness, cross section, elevation and expansion/contraction coefficient. Channel roughness is estimated using Manning's n values. The n values were determined based on the composition of the existing channels. Expansion and contraction coefficients for abrupt stream cross-sectional variations were determined based on the degree of change.

Flow Data

Storm runoff data generated during the HEC-HMS simulation included in Appendix C1-B and Appendix C1-C was entered into the HEC-RAS model as unsteady flow data. For the HEC-RAS simulation, the peak flow rates generated from the HEC-HMS model were utilized. Flow data for each storm event analyzed was entered at the corresponding reach station to generate the individual stormwater surface profile. Since this analysis involved mixed flow regime, both upstream and downstream boundary conditions were required. At the furthest upstream and downstream locations, the boundary conditions were taken as the normal depth based on the existing stream slope.

For the HEC-RAS analysis, the 25-year, 24-hour and 100-year, 24-hour storms were analyzed, generating two water surface profiles for both the current permitted and postdeveloped evaluations.

HEC-RAS RESULTS

Water surface profiles were evaluated for Ten Mile Creek, which generally follows the northern permit boundary. The HEC-RAS results are included in Appendix C2-B and Appendix C2-C for the current permitted and postdeveloped final closure configurations.

5 CONCLUSIONS

The following conclusions summarize the results of the Flood Control Analysis:

- The proposed expansion of the Skyline Landfill will not adversely alter existing or permitted drainage conditions.

- The proposed expansion of the Skyline Landfill will not adversely impact the receiving channel, Ten Mile Creek.

- The current permitted and postdevelopment landfill footprint is not located within the limits of the 100-year floodplain. No disposal operations will be conducted within the 100-year floodplain.

- The drainage design criteria and analyses used for these drainage calculations meet the requirements of 30 TAC §330.63(c) and §330.305(f)(2).

- In accordance with §330.547(a), the Skyline Landfill's waste disposal operations are not located in the 100-year floodway as defined by FEMA. In accordance with §330.547(b), the Skyline Landfill's new and existing municipal solid waste units are not located in the 100-year floodplain. The Skyline Landfill, if expanded as proposed, will not restrict the flow of the 100-year flood, will not reduce the temporary water storage capacity of the floodplain, and will not result in the washout of solid waste. In accordance with §330.547(c), the Skyline Landfill's municipal solid waste storage and processing facilities shall be located outside of the 100-year floodplain.