

MWVG

Midwest Generation, LLC

Waukegan Generating Station

2024 Hazard Potential Classification Assessment for East Ash Pond & West Ash Pond

Revision 0

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55 East Monroe Street
Chicago, IL 60603-5780 USA
312-269-2000

www.sargentlundy.com



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EXECUTIVE SUMMARY

This report presents the 2024 hazard potential classification assessment for the East Ash Pond and West Ash Pond at Midwest Generation, LLC's (MWG) Waukegan Generating Station ("Waukegan" or the "Station"). Pursuant to 35 Ill. Adm. Code 845.440(a)(1), this annual assessment, prepared by Sargent & Lundy (S&L) on behalf of MWG, documents the hazard potential classification for each pond in accordance with the hazard potential classifications defined in 35 Ill. Adm. Code 845.120.

Per last year's hazard potential classification assessment, the East and West Ash Ponds were each designated as a Class 2 CCR surface impoundment pursuant to 35 Ill. Adm. Code 845.440(a)(1), which is the equivalent of a significant hazard potential CCR surface impoundment under 40 CFR 257.53, after it was determined that the bases for the initial federal hazard potential classifications assigned to the two ponds in 2016 in accordance with 40 CFR 257.73(a)(2) were still valid. Accordingly, to complete this assessment, S&L re-evaluated the bases of the initial federal hazard potential classifications assigned to the two ponds to determine (1) if any changes have occurred since the initial assessment was completed and (2) whether identified changes warrant adjusting the ponds' 2023 hazard potential classifications. Where no changes were noted for a given input, or where identified changes were determined to have no impact on the results or conclusions of the initial federal hazard potential classification assessment, the previous evaluation of that input was considered to still be valid for this 2024 hazard potential classification assessment.

In May 2024, the Station completed modifications to its stormwater management system and subsequently ceased placing stormwater run-off into the East Ash Pond and, in June 2024, filed a notice of intent to close the East Ash Pond. In addition, the Station opened the Recycle Water Sump drain gates to lower the water level in the East Ash Pond, and the Station continues to keep these gates open to limit water accumulation in the East and West Ash Ponds, essentially leaving the ponds in a constant dewatering state. Because these drain gates are situated one foot above the bottom of each pond, the normal water level in each pond will be limited to approximately one foot. Currently, the only water entering the East and West Ash Ponds is direct precipitation (i.e., rain or snow) and run-off from the crests of the ponds' dikes. Therefore, the ponds' original design conditions used for the 2016 hypothetical dike breach analyses performed in support of both ponds' initial federal hazard potential classification assessment are very conservative for the ponds' current operating conditions. Otherwise, no other significant changes to the East and West Ash Ponds or to downstream developments were identified in this 2024 hazard potential classification assessment.

Based on the preceding observations, the bases for the initial federal significant hazard potential classification assigned to the East and West Ash Ponds in accordance with 40 CFR 257.73(a)(2) have either not changed or are conservative under current conditions. Per the analyses performed in support of the 2016 federal hazard potential classification assessment, a loss of human life is unlikely to result from a

hypothetical failure under these CCR surface impoundments' original design conditions, but potential offsite damage could occur at Lake Michigan. Because a CCR surface impoundment classified as a significant hazard potential is considered to be an Illinois Class 2 CCR surface impoundment, the East and West Ash Ponds are classified as Class 2 CCR surface impoundments pursuant to 35 Ill. Adm. Code 845.440(a)(1) under their original design capacities. However, MWG is currently updating the 2016 dike breach analysis to account for the ponds' reduced capacities and corresponding reductions in impacts to downstream areas caused by hypothetical dike breaches at the ponds. This evaluation will be provided in a subsequent revision to this hazard potential classification assessment.

The East and West Ash Ponds' classifications as Class 2 CCR surface impoundments are not reflections of the potential for the impoundments to fail. The 2024 annual safety factor assessment conducted pursuant to 35 Ill. Adm. Code 845.460 shows that the East and West Ash Ponds are stable under design operating conditions. Moreover, no visual signs of distress that could be indicative of dike instability were observed during the September 11, 2024, condition assessment performed by S&L in support of the ponds' 2024 annual structural stability assessment under 35 Ill. Adm. Code 845.450.

Table ES-1 presents the 2024 hazard potential classifications assigned to the Waukegan East and West Ash Ponds under their original design capacities in accordance with 35 Ill. Adm. Code 845.440(a)(1).

Table ES-1 – 2024 Illinois Hazard Potential Classifications for East Ash Pond & West Ash Pond at the Waukegan Generating Station

CCR Surface Impoundment	2024 Illinois Hazard Potential Classification
East Ash Pond	Class 2
West Ash Pond	Class 2

1.0 PURPOSE & SCOPE

1.1 PURPOSE

The East Ash Pond and West Ash Pond at Midwest Generation, LLC's (MWG) Waukegan Generating Station ("Waukegan" or the "Station") are existing coal combustion residual (CCR) surface impoundments that are regulated by the Illinois Pollution Control Board's "Standards for the Disposal of Coal Combustion Residuals in CCR Surface Impoundments." These regulations are codified in Part 845 to Title 35 of the Illinois Administrative Code (35 Ill. Adm. Code 845, Ref. 1) and are also referred to herein as the "Illinois CCR Rule." Pursuant to 35 Ill. Adm. Code 845.440(a)(1), MWG must conduct and complete an annual hazard potential classification assessment that documents the hazard potential classifications for the East and West Ash Ponds in accordance with the hazard potential classifications defined in 35 Ill. Adm. Code 845.120.

This report documents the 2024 hazard potential classification assessment conducted and completed in accordance with the Illinois CCR Rule by Sargent & Lundy (S&L) on behalf of MWG for the East and West Ash Ponds at Waukegan. This report:

- Lists the inputs and assumptions used in the 2024 hazard potential classification assessment,
- Lists and compares the definitions for the hazard potential classifications for CCR surface impoundments promulgated by the Illinois CCR Rule and by the U.S. Environmental Protection Agency's regulations for CCR surface impoundments,
- Discusses the methodology used to conduct the 2024 hazard potential classification assessment,
- Provides the 2024 hazard potential classifications for the East and West Ash Ponds in accordance with 35 Ill. Adm. Code 845.440(a)(1).

1.2 SCOPE

In addition to being regulated under the Illinois CCR Rule, the East and West Ash Ponds at Waukegan are also regulated by the U.S. Environmental Protection Agency's (EPA) "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 CFR Part 257 Subpart D (Ref. 2), also referred to herein as the "Federal CCR Rule." Per the 2016 Water Infrastructure Improvements for the Nation (WIIN) Act, the East and West Ash Ponds will continue to be subject to both the Illinois and Federal CCR Rules until the U.S. EPA approves the Illinois EPA's CCR permit program; the Illinois EPA has yet to publish a timeline for submitting its proposed CCR permit program to the U.S. EPA for approval. However, the scope of this 2024 hazard potential classification assessment is strictly limited to demonstrating compliance with the Illinois CCR Rule. Pursuant to 40 CFR 257.73(f)(3), the next hazard potential classification assessment for demonstrating compliance with the Federal CCR Rule will be completed in 2026, five years after the last federal assessment was completed (2021).

2.0 INPUTS

Hazard Potential Classifications

The Illinois CCR Rule (Ref. 1, § 845.120) defines “hazard potential classification” as “the possible adverse incremental consequences that result from the release of water or stored contents due to failure of the diked CCR surface impoundment or mis-operation of the diked CCR surface impoundment or its appurtenances.” The Illinois CCR Rule (Ref. 1, § 845.440(a)(1)) requires a CCR surface impoundment be designated as either a Class 1 CCR surface impoundment or a Class 2 CCR surface impoundment. Per 35 Ill. Adm. Code 845.120, the two Illinois hazard potential classifications are defined as follows:

- *Class 1 CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- *Class 2 CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

The Federal CCR Rule (Ref. 2, § 257.53) has the same definition for “hazard potential classification” as the Illinois CCR Rule. However, the Federal CCR Rule has three hazard potential classifications instead of the two designations promulgated by the Illinois CCR Rule. Per 40 CFR 257.53, the three federal hazard potential classifications are defined as follows:

- *High hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation will probably cause loss of human life.
- *Low hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner’s property.
- *Significant hazard potential CCR surface impoundment* means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns.

Per the preceding sets of definitions for the federal and Illinois hazard potential classifications, a high hazard potential CCR surface impoundment per the Federal CCR Rule is the same as a Class 1 CCR surface impoundment per the Illinois CCR Rule. Similarly, a CCR surface impoundment that is classified as a low or significant hazard potential per the Federal CCR Rule is considered to be a Class 2 CCR surface impoundment per the Illinois CCR Rule.

A CCR surface impoundment’s hazard potential classification is not a reflection of the probability of a hypothetical failure event associated with the surface impoundment. Hazard potential classifications are not contingent upon a CCR surface impoundment’s structural stability; they only classify the potential impacts

should a hypothetical failure occur. For example, a well-maintained CCR surface impoundment with appropriate factors of safety may be classified as a Class 1 hazard potential solely because a loss of human life would be probable if a hypothetical failure event did occur. Instead, the structural integrity of a CCR surface impoundment and its potential for failure are evaluated and documented in the structural stability and safety factor assessments prepared pursuant to 35 Ill. Adm. Code 845.450 (Ref. 3) and 35 Ill. Adm. Code 845.460 (Ref. 4).

Site Topography

Two topographic datasets for the East Ash Pond, the West Ash Pond, and the surrounding areas were obtained: one from the U.S. Geological Survey's (USGS) National Elevation Dataset (NED) (Ref. 5) and one from the U.S. Department of Agriculture's (USDA) National Digital Elevation Program (NDEP) (Ref. 6). The USGS dataset was published in 2011 and was utilized in the initial federal hazard potential classification assessment and the 2016 dike breach analysis. The USGS topography reflects elevation data collected in 2007 at a resolution of approximately 3 meters. Based on a review of the USGS NED, the 2007 USGS elevation dataset is the most recent topographic dataset at a 3-meter or better resolution for the Station and surrounding areas. Meanwhile, the USDA topography reflects elevation data collected in 2010 at a 1-meter resolution and was utilized in this 2024 assessment to determine whether the site topography referenced in the initial federal hazard potential classification assessment and the 2016 dike breach analysis should be updated.

Impacted Areas

Areas impacted by a hypothetical failure at either the East Ash Pond or the West Ash Pond were obtained from the ponds' initial federal hazard potential classification assessment (Ref. 7), the dike breach analyses conducted in 2016 for the ponds' northern and southern dikes (Refs. 8 and 9), and the dike breach inundation maps included in the ponds' Emergency Action Plan (Ref. 10). The inputs, assumptions, and methodology utilized to identify areas impacted by failures at each of the ponds' dikes were evaluated to determine whether any updates to these analyses were warranted.

Appendix A provides the initial federal hazard potential classification assessment conducted by Geosyntec Consultants in 2016 for the East and West Ash Ponds.

Aerial Images

Historical and recent aerial images of the Station and surrounding areas were obtained from Google Earth Pro (Ref. 11).

Property Boundaries

Boundaries for the Station's property and adjacent properties were obtained from the geographic information system (GIS) for Lake County, Illinois (Ref. 12).

Ash Pond Conditions

The operating and physical conditions for the East and West Ash Ponds were based on the following inputs:

- Observations made during a site visit by S&L on September 11, 2024.
- Discussions with MWG personnel.
- The annual inspection reports prepared for the CCR surface impoundments in accordance with 40 CFR 257.83(b) and 35 Ill. Adm. Code 845.540(b) (Refs. 13 through 19).
- The weekly inspection reports prepared in accordance with 35 Ill. Adm. Code 845.540(a) since the 2023 hazard potential classification assessment was issued (Ref. 21).

3.0 ASSUMPTIONS

There are no assumptions in this document that require verification.

4.0 METHODOLOGY

As documented in last year's hazard potential classification assessment, the 2023 hazard potential classifications assigned to the East and West Ash Ponds were based on the initial federal hazard potential classifications assigned in 2016 pursuant to the Federal CCR Rule after it was determined that the bases for the initial federal hazard potential classifications were still valid. Accordingly, the bases for the East and West Ash Ponds' initial federal hazard potential classifications as documented within the ponds' initial federal hazard potential classification assessment were re-evaluated to determine if any changes have occurred since the initial assessment was completed. Identified changes were then evaluated to determine if the ponds' 2023 hazard potential classifications warrant adjustments. Where no changes were noted for a given input, or where identified changes were determined to have no impact to the results and conclusions of the initial federal hazard potential classification assessment, the previous evaluation of that input was considered to still be valid for this 2024 assessment.

In instances where changes to one or more factors used as the bases for the 2023 hazard potential classifications were identified (*e.g.*, downstream development that was not present in 2016), hypothetical dike breaches were considered at each of the two CCR surface impoundments to evaluate the impacts that a release of CCR and CCR wastewater would have on the identified factor(s). These hypothetical dike breaches were evaluated regardless of potential causes and/or apparent dike stability. When evaluating a hypothetical dike breach at a subject CCR surface impoundment, the solid waste materials in the CCR surface impoundment were conservatively considered as an equivalent volume of liquid, and the CCR surface impoundment was assumed to be entirely filled with liquid.

When evaluating the downstream impacts from a hypothetical dike breach at a CCR surface impoundment, the primary consideration examined was whether a loss of human life is probable under the given

hypothetical failure scenario. Loss of human life is the critical aspect of the Class 1 hazard potential classification. If a loss of human life is unlikely to occur, then the CCR surface impoundment was not considered to be a Class 1 hazard potential and was instead classified as a Class 2 hazard potential.

5.0 ASSESSMENT

5.1 SUMMARY OF 2023 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The previous hazard potential classification assessment for the East and West Ash Ponds was completed on October 13, 2023. Ultimately, the 2023 hazard potential classifications for the East and West Ash Ponds were based on the initial federal hazard potential classifications that were assigned to the ponds in 2016 after it was determined that the bases for the initial federal hazard potential classifications were still valid. Per the initial federal hazard potential classification assessment for the East and West Ash Ponds, the ponds were classified as significant hazard potential CCR surface impoundments pursuant to 40 CFR 257.53. Based on the comparison between the Federal and Illinois CCR Rules' definitions for hazard potential classifications in Section 2.0, a significant hazard potential CCR surface impoundment under the Federal CCR Rule is the equivalent of a Class 2 CCR surface impoundment under the Illinois CCR Rule. Therefore, the East and West Ash Ponds were classified as Class 2 CCR surface impoundments in the 2023 hazard potential classification assessment.

5.2 SUMMARY OF INITIAL FEDERAL HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

The initial federal hazard potential classification assessment for the East and West Ash Ponds was completed in October 2016 and is included in its entirety in Appendix A. This assessment evaluated the potential consequences of hypothetical dike failures for both ponds. A quantitative dike breach analysis was also conducted for the northern and southern dikes of each pond, which were determined to pose the most risk to human life due to their proximities to occupied buildings and the adjacent topography sloping towards the occupied buildings. Specifically, several Station buildings are downstream of the ponds' northern dikes, and the Waukegan Water Reclamation Facility (WWRF) is downstream of the ponds' southern dikes. The 2016 dike breach analysis also assumed that the East and West Ash Ponds were full at the time of the hypothetical failure. Moreover, the analysis assumed that a hypothetical failure at either pond's southern dike occurred concurrently with the peak flow of stormwater within the unnamed channel south of the ponds during the probable maximum flood event for the area.

5.2.1 SOUTHERN DIKE BREACH ANALYSES

Per Figures 2 through 5 in Appendix A, the 2016 dike breach analysis concluded that the flood released through a hypothetical breach in the East Ash Pond's southern dike could impact eight occupied buildings at

the WWRF. Meanwhile, it was determined that a flood released through a similar breach at the West Ash Pond's southern dike could impact an additional six occupied buildings at the WWRF (14 buildings in total). The 2016 dike breach analysis also concluded that the combination of the estimated flood velocity and depth at each of these occupied buildings is within the U.S. Department of the Interior, Bureau of Reclamation's (USBR) "Low Danger Zone" (see Figure 10 in Appendix A). In its "Downstream Hazard Classification Guidelines" (Ref. 20), the USBR states that if the depth-velocity combination of a hazard (e.g., flood) for a given area plots within the "Low Danger Zone," "the number of lives-in-jeopardy associated with possible downstream hazards is assumed to be zero." In other words, floods plotting within the USBR's "Low Danger Zone" are unlikely to cause a probable loss of human life. Therefore, the initial federal hazard potential classification assessment concluded that a failure at the southern dike of either the East Ash Pond or the West Ash Pond would not result in a probable loss of human life.

5.2.2 NORTHERN DIKE BREACH ANALYSES

Per Figures 6 through 9 in Appendix A, the 2016 dike breach analysis concluded that the flood released through a hypothetical breach in the northern dike of either the East Ash Pond or the West Ash Pond could impact several unoccupied buildings and three occupied buildings at the Station. The 2016 dike breach analysis also concluded that the combination of the estimated flood velocity and depth at each of these occupied buildings is within the USBR's "Low Danger Zone" (see Figure 10 in Appendix A). As previously stated, depth-velocity combinations plotting within the "Low Danger Zone" are unlikely to cause a probable loss of human life. Therefore, the initial federal hazard potential classification assessment concluded that a failure at the northern dike of either the East Ash Pond or the West Ash Pond would not result in a probable loss of human life.

5.2.3 HAZARD POTENTIAL CLASSIFICATIONS

Although a hypothetical failure at either the East Ash Pond or the West Ash Pond was determined to not cause a probable loss of human life, it was also determined that wastewater released from a dike breach at either pond had the potential to flow directly into Lake Michigan and cause offsite environmental impacts. Therefore, the East and West Ash Ponds were both classified as significant hazard potential CCR surface impoundments.

5.3 CHANGES IN BASES FOR INITIAL FEDERAL HAZARD POTENTIAL CLASSIFICATIONS

5.3.1 CHANGES IN ASH POND OPERATIONS & EMBANKMENT GEOMETRY

In June 2020, Waukegan took the West Ash Pond out of service for routine cleaning. In April 2021, MWG filed a notice of intent to close the West Ash Pond in accordance with the Federal CCR Rule's closure criteria

(Ref. § 257.102). Following the retirements of Units 7 and 8 in June 2022, Waukegan ceased placing CCR wastestreams into the East Ash Pond but continued to use the pond to manage stormwater run-off from the Station property. After implementing modifications to its stormwater management system in May 2024, the Station ceased placing stormwater run-off into the East Ash Pond, and MWG filed a notice of intent to close the East Ash Pond in June 2024. Closure construction activities will commence at both ponds upon receipt of closure construction permits from the Illinois EPA in accordance with Subpart B of the Illinois CCR Rule.

As a part of the modifications made in 2024 to the Station's stormwater management system, the Station opened the Recycle Water Sump drain gates to lower the water level in the East Ash Pond, and the Station continues to keep these gates open to limit water accumulation in the East and West Ash Ponds, essentially leaving the ponds in a constant dewatering state. Because these drain gates are situated one foot above the bottom of each pond, the normal water level in each pond will be limited to approximately one foot (Ref. 21). Indeed, S&L did not observe appreciable surface water in either pond during our site visit on September 11, 2024.

As previously mentioned in Section 5.1, the 2016 federal hazard potential classification assessment for the East and West Ash Ponds examined hypothetical breach scenarios assuming both ponds were operating and at their original design capacities. Currently, the only water entering the East and West Ash Ponds is direct precipitation (i.e., rain or snow) and run-off from the crests of the ponds' dikes. Moreover, the opened Recycle Water Sump drain gates limit the amount of stormwater that can accumulate in the ponds. Therefore, the assumed operating conditions used for the initial assessment are very conservative for the ponds' current operating conditions.

Based on reviews of the annual inspection reports (Refs. 13 through 19) and Google Earth aerial images (Ref. 11), there have been no significant physical modifications to the East and West Ash Ponds (mass excavations, major embankment modifications, *etc.*) since the initial federal hazard potential classification assessment was completed. It should be noted that the lowering of the East Ash Pond's eastern dike in the fall of 2016, as noted in the 2017 annual inspection report (Ref. 13), was incorporated into the initial federal hazard potential classification assessment and 2016 dike breach analysis. Therefore, there is no basis to re-evaluate the embankment geometry for this 2024 assessment.

5.3.2 CHANGES IN SITE TOPOGRAPHY

When comparing the 2007 USGS topography (Ref. 5) used in the initial federal hazard potential classification assessment and the 2010 USDA elevation dataset for the area (Ref. 6), no significant differences in the topography adjacent to the ash ponds and within the dike breach impact areas were identified. Moreover, Google Earth aerial images (Ref. 11) indicated that there have been no significant modifications to the ground surfaces (mass excavations, mass fill placement, *etc.*) adjacent to the East and West Ash Ponds or

within the dike breach impact areas since 2010, the source date for the USDA elevation dataset. Based on these observations, the topographic data used by the initial federal hazard potential classification assessment remains valid for this 2024 assessment.

5.3.3 CHANGES IN DOWNSTREAM PROPERTY DEVELOPMENTS

Based on reviews of Google Earth aerial images (Ref. 11) and the Lake County, Illinois GIS (Ref. 12), no new buildings or transport corridors (roads, rail lines, *etc.*) have been constructed in the past eight years within the dike breach impact areas identified in the initial federal hazard potential classification assessment. However, due to the retirement of Waukegan Units 7 and 8 in June 2022, the main power block and the rail car dumper building, identified as Building 7 in the 2016 analysis, are now classified as unoccupied buildings. Therefore, the Station currently has only two occupied buildings, identified as Buildings 3 and 10 on the updated Site Building Occupancy Map in Appendix B. However, because none of these changes include the addition of occupied buildings within the delineated dike breach impact areas shown in Appendix A, it is not necessary to reevaluate the potential impacts to the areas downstream of the East and West Ash Ponds for this 2024 assessment.

5.3.4 CHANGES IN USBR DEPTH-VELOCITY FLOOD DANGER LEVELS

The USBR has not updated the depth-velocity flood danger level relationships presented in its “Downstream Hazard Classification Guidelines” (Ref. 20) since the initial federal hazard potential classification assessment for the East and West Ash Ponds was completed in 2016. Therefore, there is no basis to re-evaluate the danger levels assigned to the occupied buildings identified within the inundation areas downstream of the northern and southern dikes for the East and West Ash Ponds.

5.4 2024 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

Per the preceding evaluation, there have been no significant modifications to the East and West Ash Ponds’ embankments and no significant modifications to the topography adjacent to and downstream of these CCR surface impoundments since the initial federal hazard potential classification assessment was completed in 2016. Since then, as a result of Units 7 and 8 being retired, only two buildings at the Station remain occupied. However, no occupied buildings within the delineated dike breach areas for the ponds have been added since the 2016 analysis. There have also been no changes to the USBR’s depth-velocity flood danger level relationships, which were used in the 2016 federal hazard potential classification assessment. In addition, the 2016 dike breach analyses for the ponds’ northern and southern dikes still represent the worst-case failure scenarios for each pond since these dikes are the closest to occupied Station and WWRF buildings. However, the Station has implemented operational changes that reduce the ponds’ storage capacities to volumes substantially less than their original design capacities, which reduces the potential

impacts to downstream areas during a hypothetical dike breach. Therefore, the results of the 2016 dike breach analysis are conservative for the ponds' current operating conditions.

Based on the preceding observations, the bases for the initial federal significant hazard potential classifications assigned to the East and West Ash Ponds in accordance with 40 CFR 257.73(a)(2) have either not changed since 2016 or are conservative under current conditions. At their original design capacities, a loss of human life is unlikely to result from a hypothetical failure at these CCR surface impoundments, but potential offsite environmental damage could occur to Lake Michigan. As discussed in Section 2.0, a CCR surface impoundment classified as a significant hazard potential per the Federal CCR Rule is considered to be an Illinois Class 2 CCR surface impoundment. Therefore, the East and West Ash Ponds are classified as Class 2 CCR surface impoundments pursuant to 35 Ill. Adm. Code 845.440(a)(1) under their original design capacities. However, MWG is currently updating the 2016 dike breach analysis to account for the ponds' reduced operating capacities and corresponding reductions in impacts to downstream areas caused by hypothetical dike breaches at the ponds. This evaluation will be provided in a subsequent revision to this hazard potential classification assessment.

The ponds' classifications as Class 2 CCR surface impoundments are not reflections of the potential for the impoundments to fail. The 2024 annual safety factor assessment conducted pursuant to 35 Ill. Adm. Code 845.460 (Ref. 4) shows that the East and West Ash Ponds are stable under design operating conditions. Moreover, no visual signs of distress that could be indicative of dike instability were observed during the September 11, 2024, condition assessment performed by S&L in support of the ponds' 2024 annual structural stability assessment under 35 Ill. Adm. Code 845.450 (Ref. 3).

6.0 CONCLUSIONS

This assessment re-evaluated the factors and design inputs used as the bases for the initial federal hazard potential classification assessment completed in 2016 in accordance with the Federal CCR Rule for Waukegan's East and West Ash Ponds. It was determined that no significant physical changes to these CCR surface impoundments and no new downstream developments within the dike breach inundation areas have occurred within the last eight years that would necessitate changing either pond's initial federal hazard potential classification. However, the Station has implemented water level controls that reduce the ponds' operating capacities to volumes substantially less than their original design capacities, which reduces the potential impacts to downstream areas during hypothetical dike breaches at the ponds' north and south dikes. MWG is currently updating the 2016 dike breach analysis to account for these reductions in the ponds' operating capacities. This evaluation will be provided in a subsequent revision to this hazard potential classification assessment.

Based on the results of this hazard potential classification assessment, the bases for the initial federal significant hazard potential classifications assigned to the East and West Ash Ponds under their original design operating capacities in accordance with 40 CFR 257.73(a)(2) have either not changed since 2016 or are conservative under current conditions. At their original design capacities, a loss of human life is unlikely to result from a hypothetical failure at these CCR surface impoundments, but potential offsite environmental damage could occur to Lake Michigan. Therefore, because the 2023 Illinois hazard potential classifications for the East and West Ash Ponds were based on their respective 2016 federal hazard potential classifications, the 2023 Illinois hazard potential classifications assigned to the East and West Ash Ponds under their original design capacities, and the bases for these assignments, remain valid for 2024.

Table 6-1 presents the 2024 hazard potential classifications assigned to the Waukegan East and West Ash Ponds under their original design capacities in accordance with 35 Ill. Adm. Code 845.440(a)(1).

Table 6-1 – 2024 Illinois Hazard Potential Classifications for East Ash Pond & West Ash Pond at the Waukegan Generating Station

CCR Surface Impoundment	2024 Illinois Hazard Potential Classification
East Ash Pond	Class 2
West Ash Pond	Class 2

However, as noted above, the 2024 hazard potential classifications for the East and West Ash Ponds do not reflect the probability of a hypothetical failure event associated with the ponds and are not contingent upon the ponds' structural stabilities. Indeed, the 2024 annual safety factor assessment conducted pursuant to 35 Ill. Adm. Code 845.460 (Ref. 4) shows that the East and West Ash Ponds are structurally stable under design operating conditions. Moreover, no visual signs of distress that could be indicative of dike instability were observed during S&L's September 11, 2024, condition assessment performed in support of the ponds' 2024 annual structural stability assessment under 35 Ill. Adm. Code 845.450 (Ref. 3).

7.0 CERTIFICATION

I certify that:

- This hazard potential classification assessment was prepared by me or under my direct supervision.
- The work was conducted in accordance with the requirements of 35 Ill. Adm. Code 845.440.
- I am a registered professional engineer under the laws of the State of Illinois.

Certified By: Thomas Dehlin

Date: October 13, 2024

Seal:



8.0 REFERENCES

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**APPENDIX A: 2016 FEDERAL HAZARD POTENTIAL
CLASSIFICATION ASSESSMENT FOR
EAST & WEST ASH PONDS**

**HAZARD POTENTIAL CLASSIFICATION ASSESSMENT
EAST AND WEST ASH BASINS
WAUKEGAN STATION
OCTOBER 2016**

This initial hazard potential classification assessment (HPCA) addresses the requirements of §257.73(a)(2) of the Coal Combustion Residuals (CCR) regulations, Code of Federal Regulations Title 40, Part 257 for the East and West Ash Basins (the Basins) at the Waukegan Station (Site) in Waukegan, Illinois. The CCR regulations were published in the Federal Register on 17 April 2015 and became effective as of 19 October 2015. The Site is a coal-fired power station, owned and operated by Midwest Generation, LLC (Midwest Generation).

Ms. Jane Soule, P.E., of Geosyntec, prepared this HPCA in accordance with §257.73(a)(2). Mr. Robert White reviewed this report in accordance with Geosyntec's peer review policy.

Summary

Based on the results of the analyses provided in this report, the East and West Ash Basins are classified as significant hazard potential CCR surface impoundments because their failure would not result in probable loss of life, but could result in economic and environmental losses.

1. Regulation Requirements - §257.73(a)(2)

According to the Preamble of the CCR regulations (page 21377), "a hazard potential classification provides an indication of the potential for danger to life, development, or the environment in the event of a release of CCR from a surface impoundment." This classification is not an assessment of the likelihood of a release or failure, but rather an evaluation of the potential impacts if one were to occur. Per §257.73(a)(2), "the owner or operator must document the hazard potential of each CCR unit as either a high hazard potential CCR surface impoundment, a significant hazard potential CCR surface impoundment, or a low hazard potential surface impoundment." The assessment must include certification from a qualified professional engineer stating that the initial hazard potential classification (and each subsequent periodic classification) was conducted in accordance with these requirements. Section 257.53 provides the following definitions for hazard potential classifications:

- A high hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation will probably cause loss of human life;
- A significant hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life,

- A significant hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life, but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns; and
- A low hazard potential CCR surface impoundment means a diked surface impoundment where failure or mis-operation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the surface impoundment owner's property.

Based on the definitions contained in §257.53, a demonstration that an impoundment does not qualify for either a low or high hazard potential classification results in a hazard classification of significant by default.

2. Site Plan

The Site is bounded on the north by East Greenwood Avenue, on the east by Lake Michigan, and on the south by the Waukegan Water Reclamation Facility (WWRF). The Basins are located in the southeastern portion of the Site. A Site Plan identifying the Basins and key Site elements, including buildings, is shown in Figure 1.

The Basins are formed by embankments on the southern, eastern, and northern perimeters and a broad area of fill on the western perimeter. A berm is located west of the West Ash Basin which diverts stormwater from areas west of the Basins toward the south. Due to these topographic constraints, run-on to the Basins is generally limited to the embankment crests. The capacity and maximum depth of the Basins, as reported in the History of Construction Report (Geosyntec, 2016a), are shown in Table 1 below:

Table 1: Estimated Capacity and Maximum Depth

	East Ash Basin	West Ash Basin
Estimated Capacity (acre-feet)	113.7	138.5
Estimated Maximum Depth (feet)	14.5	17.5

3. Basin Failure Impact Evaluation

In order to classify the hazard potential of the Basins, impacts of a potential failure must be evaluated. Due to the proximity of the Basins to Lake Michigan, potential failure of the embankments could result in environmental losses resulting from discharge of CCR and

The next step in classification is to evaluate the potential for failure or mis-operation to cause loss of human life by modeling critical breach scenarios. Figure 1 identifies the location of buildings in the vicinity of the Basins, including both occupied and unoccupied buildings.¹ Potential failure modes were evaluated to determine the location of a breach with the greatest potential impact on human life. Based on visual observation of site topographic conditions and the location of nearby occupied buildings, potential failure of either the southern or northern embankments of the Basins could result in a potential impact on human life. As such, embankment breach scenarios were modeled for both the southern and northern embankments. These analyses assume that potential failure of the West and East Ash Basins do not occur concurrently. Detailed modeling, discussed below, was used to assess the impact of potential embankment failures.

3.1 Southern Embankment Failure Modeling

Impact analyses were performed for scenarios where the Basins are at full capacity (no freeboard) prior to embankment failure. As discussed in Section 2, run-on to the Basins is limited and inflow is generally limited to direct precipitation. Therefore, direct precipitation into the Basins during the breach scenarios was not included in the modeling as the inflow from the precipitation event is minimal compared to the capacity of the Basin.²

An unnamed channel located between the southern boundary of the Basins and the WWRf serves as the primary drainage for approximately 224 acres of upland area. For this potential failure scenario, potential peak flow within this channel during the Probable Maximum Precipitation (PMP) event is assumed to occur concurrently with the embankment failure peak flow. Modeling of the PMP flow in the channel for the West and East Ash Basins failure modeling is presented in Geosyntec (2016b and 2016c).

HEC-HMS Version 4.1 (HEC-HMS, 2013) modeling software was used to estimate the breach hydrographs which are plots of the rate of flow over time. A FLO-2D model (FLO-2D, 2009) was then used to estimate flow depth and velocity resulting from the selected hydrographs. The results of the modeling are described below. Details of the modeling methods and procedures are provided in Geosyntec (2016b and 2016c) for the West and East Ash Basins, respectively.

¹ Building identification numbers used in this report were generated for reference purposes only and may not correspond to identifications names or numbers utilized at the Site. Buildings are assumed to be occupied if there is at least one human occupant for a minimum of 12 hours per day. As occupation data for buildings located at the WWRf was not available at the time of this study, buildings at the WWRf are assumed to be occupied.

² The total volume of direct precipitation from PMP event during the estimated duration of the failure (less than 36 minutes) is minimal compared with the volume that would be released during a failure.

Calculated maximum flow depth and maximum velocity from the Basins’ southern embankment breach modeling are shown in Figures 2 through 5. The results of the FLO-2D model show that the breach flows from the Basins toward the south, east, and west, with a majority of the flow heading east toward Lake Michigan. Flow is conveyed east and west within the unnamed channel south of the Basin and eventually reaches Lake Michigan to the east. Buildings impacted by potential southern embankment failures are listed in Table 2 which also summarizes the estimated water depths and velocities around buildings.

Table 2: Estimated Water Depths and Velocities near Buildings, Southern Embankment Failure Scenario

Building ¹	East Ash Basin		West Ash Basin	
	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)
WWRF 1 (Occupied)	1.7	2.5	2.1	3.0
WWRF 2 (Occupied)	0.8	3.1	1.2	3.3
WWRF 3 (Occupied)	1.4	3.5	1.6	4.3
WWRF 4 (Occupied)	1.1	4.1	1.4	5.2
WWRF 5 (Occupied)	1.1	3.1	1.4	4.1
WWRF 6 (Occupied)	1.5	4.0	2.2	4.2
WWRF 7 (Occupied)	1.6	3.2	1.6	3.4
WWRF 8 (Occupied)	0.5	1.0	0.8	1.4
WWRF 9 (Occupied)	--	--	0.1	0.1
WWRF 10 (Occupied)	--	--	0.2	0.2
WWRF 12 (Occupied)	--	--	0.5	0.9
WWRF 13 (Occupied)	--	--	0.2	0.1
WWRF 14 (Occupied)	--	--	0.1	0.1

3.2 Northern Embankment Failure Modeling

The area downstream of the northern embankments has limited topographic relief, with the exception of two ponds located near Building 1 and Building 14, and low potential for significant channelized flow. Impact analysis was performed for scenarios where the Basins are at full capacity (no freeboard) prior to embankment failure and downstream depressions or other surface water ponds within the impact area are full and not capable of containing additional flow (flood conditions failure scenario). As discussed in Section 2, run-on to the Basins is limited and inflow is generally limited to direct precipitation. Therefore, direct precipitation into the Basins

during the breach scenarios was not included in the modeling, as the inflow from the precipitation event is minimal compared to the capacity of the Basin.³

HEC-HMS Version 4.1 (HEC-HMS, 2013) modeling software was used to estimate the breach hydrographs which are plots of the rate of flow over time. A FLO-2D model (FLO-2D, 2009) was then used to estimate flow depth and velocity resulting from the selected hydrographs. The results of the modeling are described below. Details of the modeling methods and procedures are provided in Geosyntec (2016b and 2016c) for the West and East Ash Basins, respectively.

Calculated maximum flow depth and maximum velocity from the Basins northern embankment breach modeling are shown in Figures 6 through 9. The results of the FLO-2D model show that flow through the modeled breaches travels from the Basins toward the north and west with a majority of the flow heading west toward the railroad yard and north toward the Intake Canal and eventually Lake Michigan. Buildings impacted by the Basins failure include Buildings 5 and 10 (occupied) and Buildings 1 through 4, 6, and 11 through 14 (unoccupied). Table 3 below summarizes the estimated water depths and velocities for the building impacted by the Basins failure.

Table 3: Estimated Water Depths and Velocities near Buildings - Northern Embankment Failure Scenario

Building	East Ash Basin		West Ash Basin	
	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)
Building 1 (Unoccupied)	1.3	6.2	3.2	4.2
Building 2 (Unoccupied)	2.6	5.2	2.5	5.0
Building 3 (Unoccupied)	2.0	2.2	2.4	4.4
Building 4 (Unoccupied)	2.8	7.4	2.7	3.2
Building 5 (Occupied)	2.0	5.1	2.5	4.6
Building 6 (Unoccupied)	2.2	3.8	2.5	3.4

³ The total volume of direct precipitation from PMP event during the estimated duration of the failure (less than 42 minutes) is minimal compared with the volume that would be released during a failure.

**Table 3: Estimated Water Depths and Velocities near Buildings – (Continued)
Northern Embankment Failure Scenario**

Building	East Ash Basin		West Ash Basin	
	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)	Estimated Maximum Flow Depth (feet)	Estimated Maximum Flow Velocity (fps)
Building 10 (Occupied)	--	--	0.4	1.0
Building 11 (Unoccupied)	1.7	3.3	2.0	3.5
Building 12 (Unoccupied)	1.7	3.3	2.0	3.3
Building 13 (Unoccupied)	--	--	0.3	0.3
Building 14 (Unoccupied)	0.9	2.2	1.6	3.1

Note: In the vicinity of the main power block building, discharge from the potential embankment failure is limited to the intake canal, and does not impact the main power block.

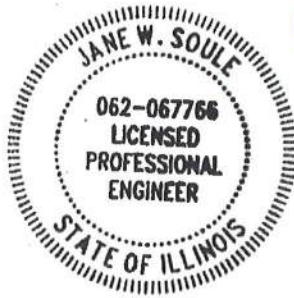
4. Hazard Classification Assessment

A CCR surface impoundment is classified as having a high hazard potential if failure or misoperation will probably cause loss of human life. Guidelines for evaluating potential loss of life during flood conditions are provided in USBR (1988). Figure 10, adapted from USBR (1988), presents a relationship between danger to human life and flood flow depth and velocity for a house-type structure. Figure 10 also presents the modeled depth-velocity combinations for the occupied buildings within the impact zone for the northern and southern embankment failures. As seen on Figure 10, the modeled results indicate that the occupied buildings are considered to be within the ‘low danger zone’ which corresponds to zero lives seriously in danger from that particular scenario (USBR, 1988). Based on the results of the analysis provided in this report, the East and West Ash Basins are classified as significant hazard potential surface impoundments because their failure would not result in probable loss of life, but could result in impacts to Lake Michigan, creating potential economic loss and environmental damage.

East and West Ash Basins, Waukegan Station
Hazard Potential Classification Assessment
October 2016

5. Certification and Limitations

This hazard potential classification assessment report was prepared to comply with §257.73(a)(2) of the Code of Federal Regulations Title 40, Part 257, Subpart D, and was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.



Jane W. Soule

Jane W. Soule, P.E.
Illinois Professional Engineer No. 062-067766
Expiration Date: 11/30/2017

East and West Ash Basins, Waukegan Station
Hazard Potential Classification Assessment
October 2016

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Geosyntec, 2016c. East Ash Basin – Hazard Potential Classification Assessment Embankment Breach Analysis, Waukegan Station, Waukegan, Illinois, October.

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Attachments

Figure 1 – Site Map

Figure 2 – East Ash Basin – South Breach Flood Conditions – Maximum Flow Depth

Figure 3 – East Ash Basin – South Breach Flood Conditions – Maximum Velocity

Figure 4 – West Ash Basin – South Breach Flood Conditions – Maximum Flow Depth

Figure 5 – West Ash Basin – South Breach Flood Conditions – Maximum Velocity

Figure 6 – East Ash Basin – North Breach Flood Conditions – Maximum Flow Depth

Figure 7 – East Ash Basin – North Breach Flood Conditions – Maximum Velocity

Figure 8 – West Ash Basin – North Breach Flood Conditions – Maximum Flow Depth

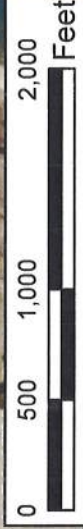
Figure 9 – West Ash Basin – North Breach Flood Conditions – Maximum Velocity

Figure 10 – Estimated Flood Danger Levels



Legend

- Unnamed Channel
- CCR Boundary
- Buildings**
- Occupied
- Unoccupied

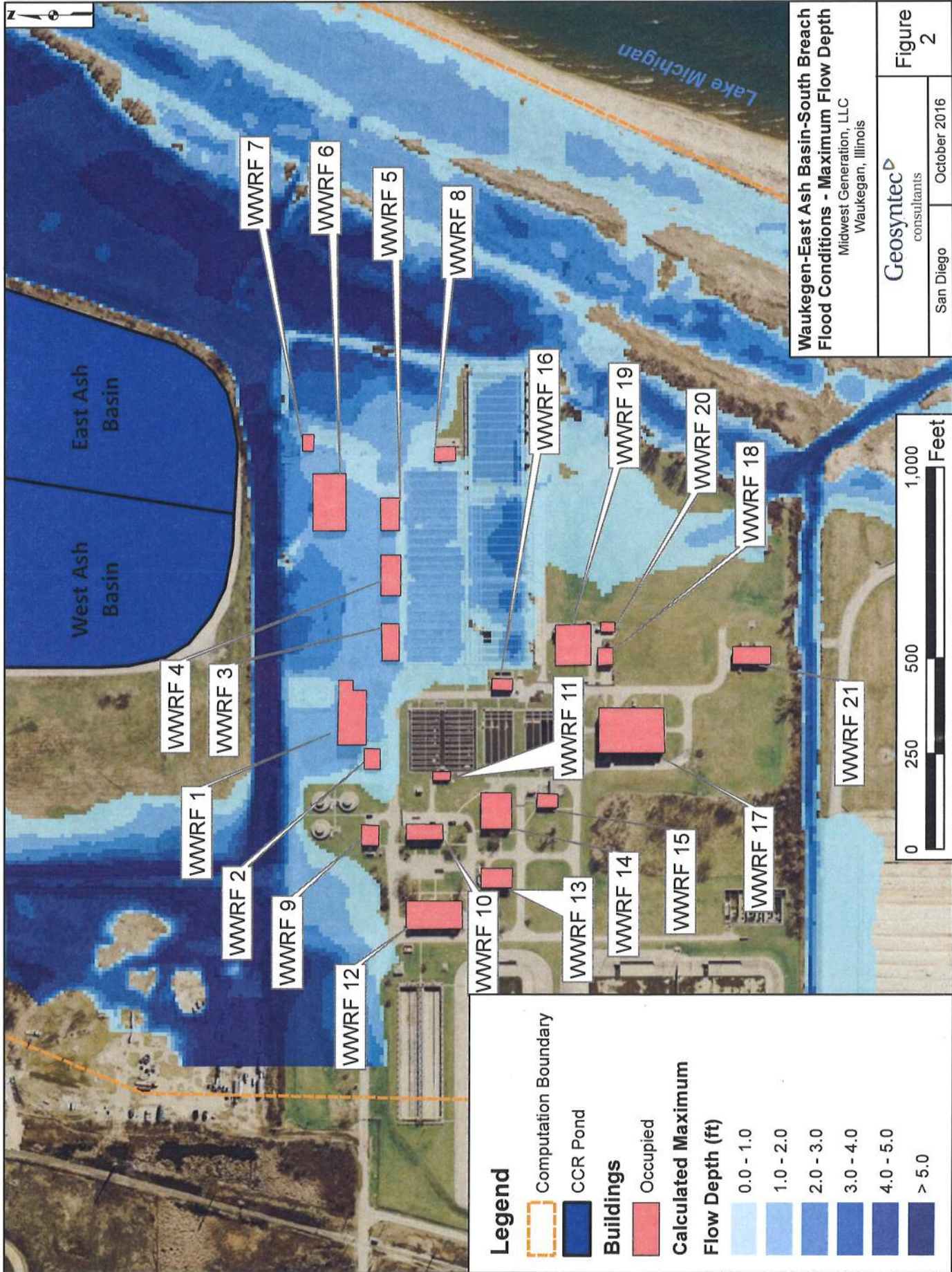


Site Map
Waukegan Station
 Midwest Generation, LLC
 Waukegan, Illinois

Geosyntec
 consultants

San Diego October 2016

Figure 1



Waukegen-East Ash Basin-South Breach
 Flood Conditions - Maximum Flow Depth

Midwest Generation, LLC
 Waukegan, Illinois

Geosyntec
 consultants

San Diego October 2016

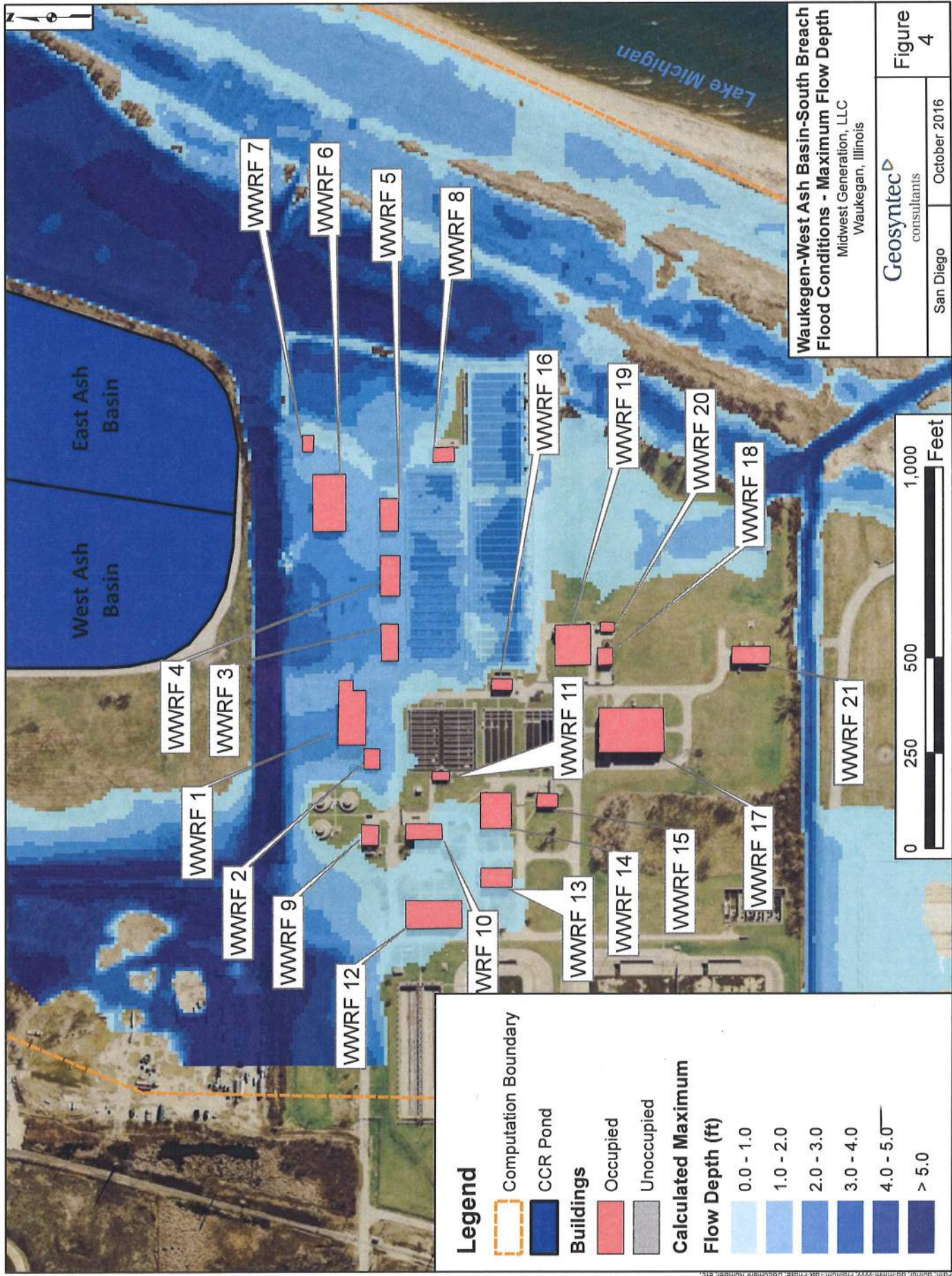
Figure
 2

Legend

- Computation Boundary
- CCR Pond
- Buildings**
- Occupied
- Calculated Maximum Flow Depth (ft)**
- 0.0 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- > 5.0



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**Waukegen-West Ash Basin-South Breach
Flood Conditions - Maximum Flow Depth**
Midwest Generation, LLC
Waukegan, Illinois

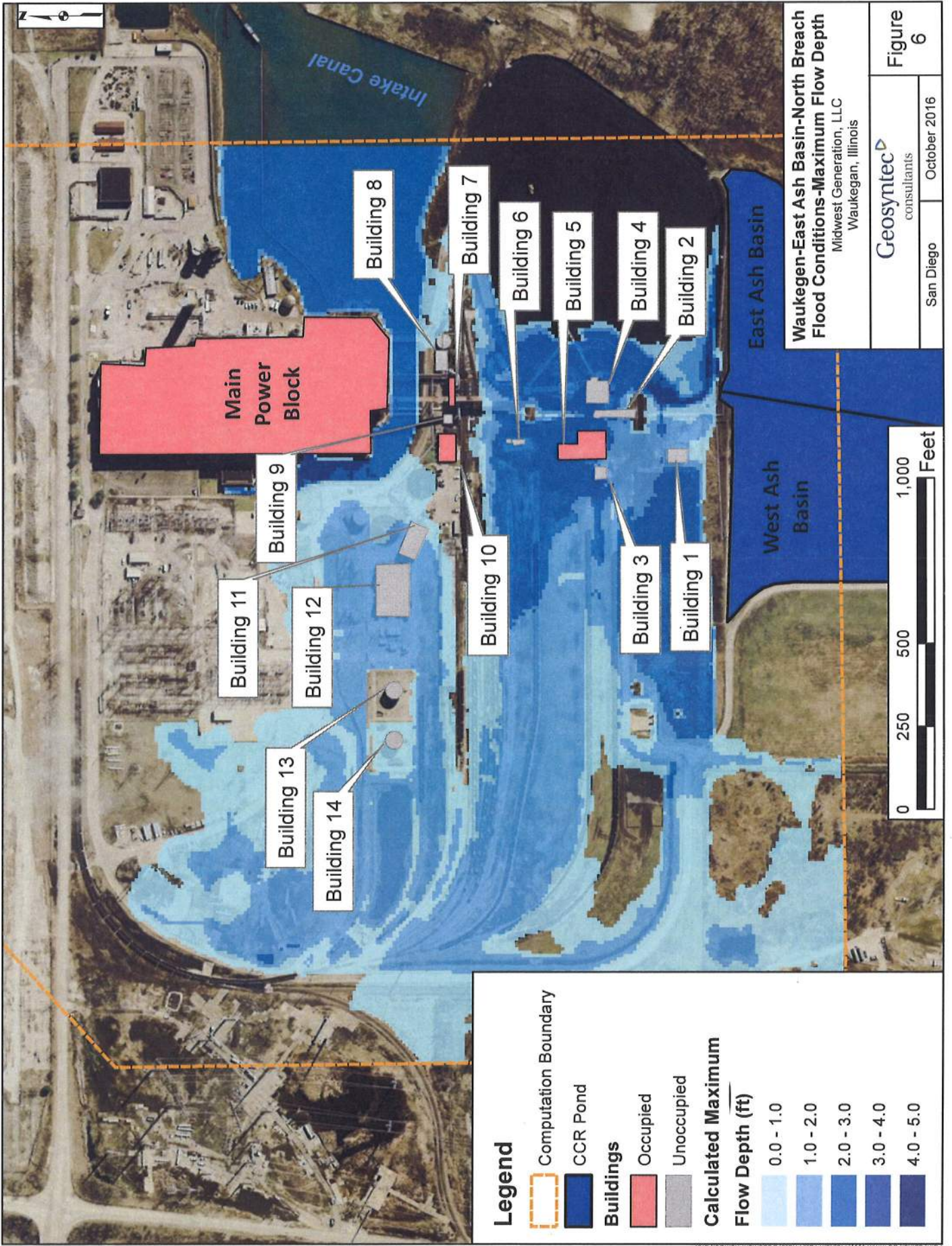
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**Figure
4**

Legend

- Computation Boundary
- CCR Pond
- Buildings**
 - Occupied
 - Unoccupied
- Calculated Maximum Flow Depth (ft)**
 - 0.0 - 1.0
 - 1.0 - 2.0
 - 2.0 - 3.0
 - 3.0 - 4.0
 - 4.0 - 5.0
 - > 5.0

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**Waukegen-East Ash Basin-North Breach
Flood Conditions-Maximum Flow Depth**

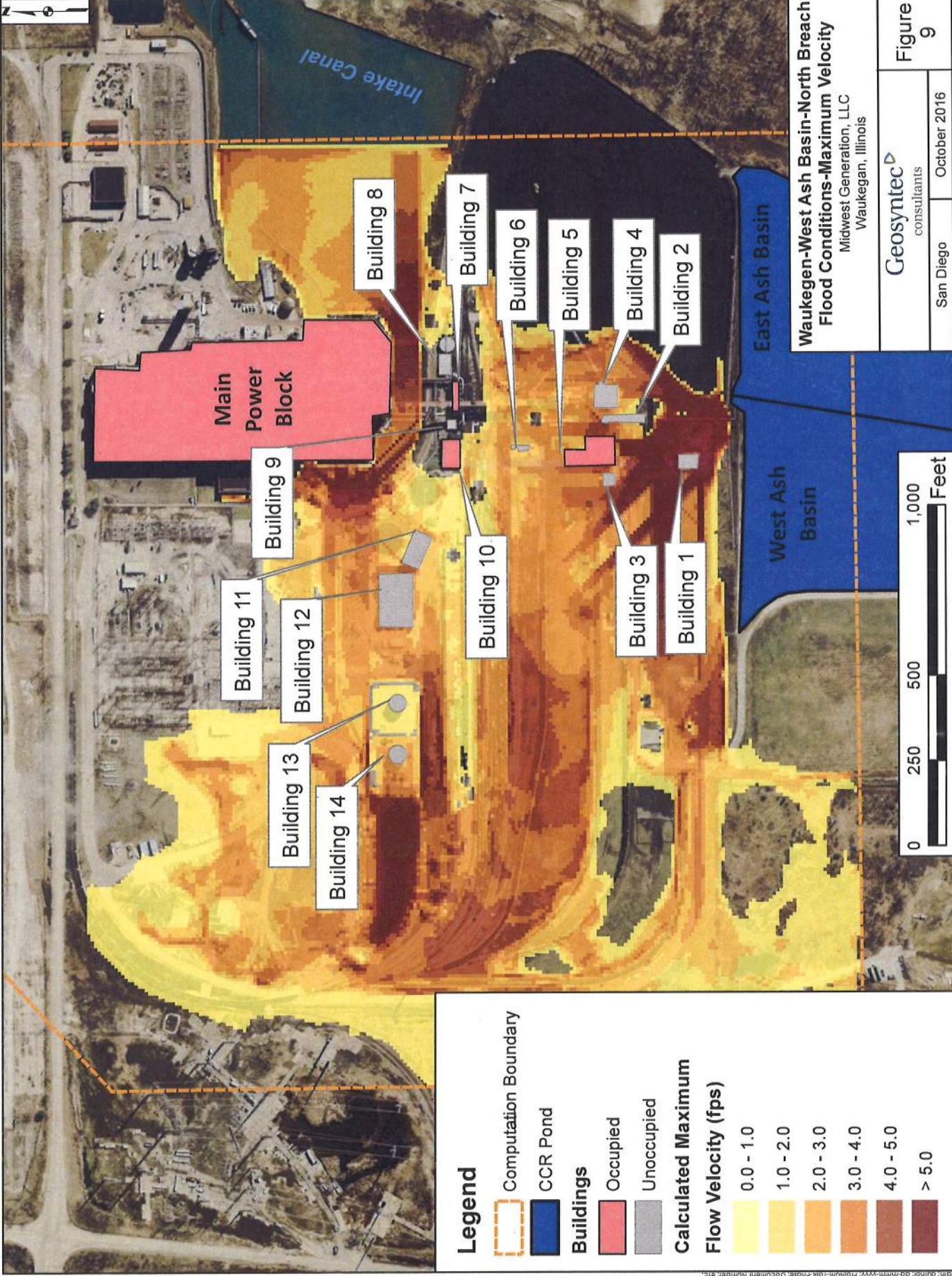
Midwest Generation, LLC
Waukegan, Illinois

Geosyntec
consultants

San Diego October 2016

Figure 6

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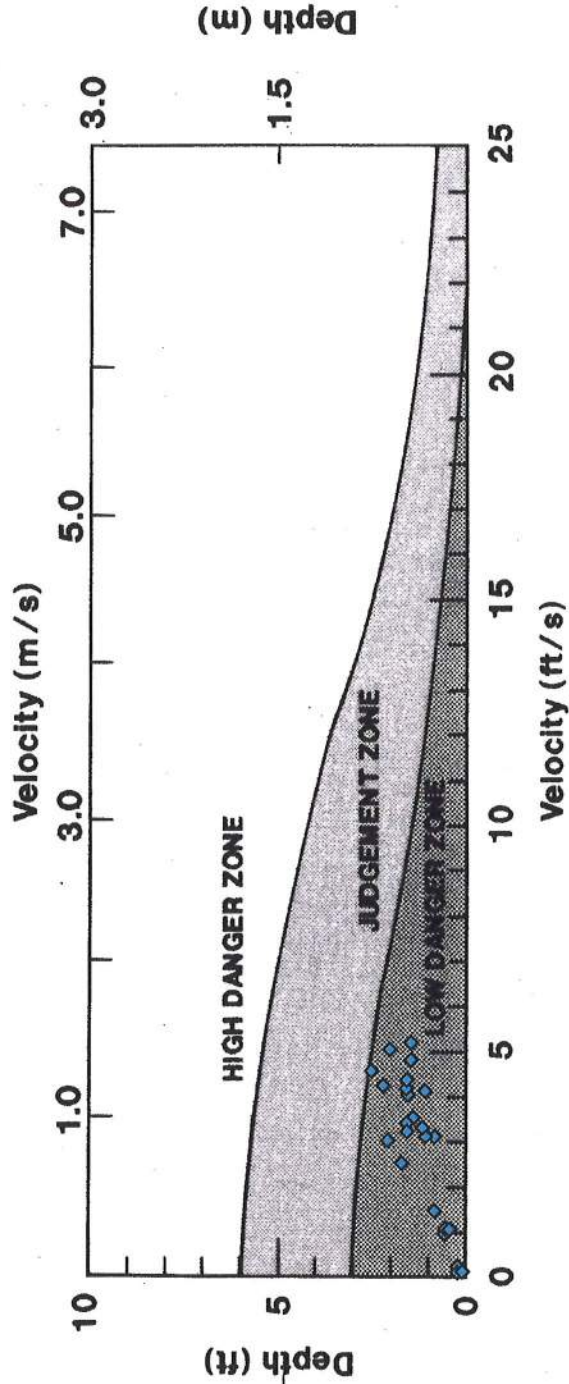
**Waukegen-West Ash Basin-North Breach
Flood Conditions-Maximum Velocity**
Midwest Generation, LLC
Waukegan, Illinois

Geosyntec
consultants
San Diego October 2016

Figure 9

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- HIGH DANGER ZONE** - Occupants of most houses are in danger from floodwater.
- JUDGEMENT ZONE** - Danger level is based upon engineering judgement.
- LOW DANGER ZONE** - Occupants of most houses are not seriously in danger from flood water.



◆ = Predicted maximum velocity and depth of water at occupied buildings resulting from potential failure of the East or West Ash Basins.

Note:
Adapted from Figure 2, USBR (1988),
for house/buildings built on foundations

**Estimated Flood Danger Levels
East and West Ash Basins**

Midwest Generation, LLC
Waukegan, Illinois

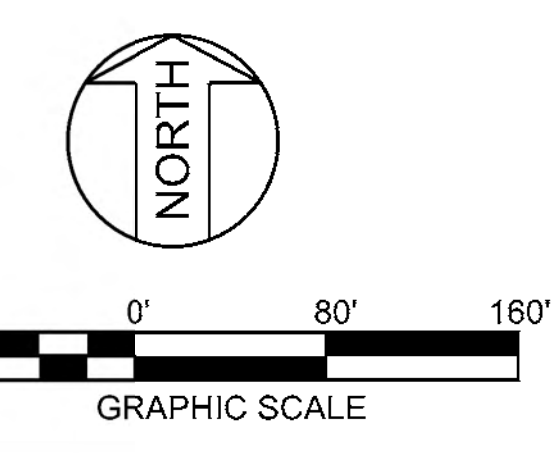
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consultants

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Figure
10

APPENDIX B: 2024 SITE BUILDING OCCUPANCY MAP

PRELIMINARY
NOT FOR CONSTRUCTION



LEGEND

■	OCCUPIED BUILDING
■	UNOCCUPIED BUILDING

- NOTES**
- AERIAL IMAGE IS FROM GOOGLE EARTH PRO V7.3 AND MAY NOT BE REPRESENTATIVE OF CURRENT SITE CONDITIONS.
 - BUILDING NUMBERS ARE FOR REFERENCE PURPOSES ONLY AND MAY NOT CORRESPOND TO THE BUILDING NAMES OR NUMBERS ASSIGNED BY / USED AT THE STATION OR THE NORTH SHORE WATER RECLAMATION DISTRICT.
 - BUILDINGS ARE CONSIDERED TO BE OCCUPIED IF AT LEAST ONE HUMAN OCCUPANT IS PRESENT IN THE BUILDING FOR AT LEAST 12 HOURS PER DAY.

REFERENCE DRAWINGS

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTOR(S)) PERFORMING THE WORK.

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

REFERENCES RELATING TO THE UNDERGROUND OR EMBEDDED UTILITIES ARE PROVIDED TO ASSIST THE CONTRACTOR/INSTALLER IN THE FIELD LOCATING THOSE UTILITIES AND OTHER POSSIBLE UNDERGROUND OR EMBEDDED INTERFERENCES WITH THE WORK.

THE CONTRACTOR/INSTALLER SHALL EXERCISE DUE CAUTION DURING ALL EXCAVATION/FOUNDATION/DEMOLITION WORK.

HOLD INFORMATION	
NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0	10-10-2024	FOR USE

ISSUE PURPOSE: USE
SPECIFICATION: N/A
PROJECT NO.: 12661-187

CAD FILE NAME: WC-EXHIBIT-CSK-002.DGN
PREPARED BY: S. MORALES / J. CHAVEZ
REVIEWED BY: T. DEHLIN
APPROVED BY: ---

ANY MODIFICATION OR ADDITION TO THIS DRAWING BY AN ORGANIZATION OTHER THAN SARGENT & LUNDY, IS NOT THE RESPONSIBILITY OF SARGENT & LUNDY.



PROJECT

WAUKEGAN GENERATING STATION
2024 HAZARD POTENTIAL CLASSIFICATION ASSESSMENT

DRAWING TITLE

SITE BUILDING OCCUPANCY MAP

DRAWING NUMBER	REVISION
12661-187-WK-CSK-001	0
SHEET 1 OF 1	1

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Revision: 11A, Revision Date: 04-30-2010

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