# Initial Inflow Design Flood Control System Plan Ash Impoundment

## Iatan Generating Station

Kansas City Power & Light Company
Project No. 87292

Revision 0
4/13/2018

# Initial Inflow Design Flood Control System Plan Ash Impoundment

prepared for

Kansas City Power & Light Company
Iatan Generating Station
Weston, Missouri

Project No. 87292

Revision 0
4/13/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

## INDEX AND CERTIFICATION

**Kansas City Power & Light Company**
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### Certification

I hereby certify, as a Professional Engineer in the State of Missouri, that the information in this document was assembled under my direct supervisory control. This report is not intended or represented to be suitable for reuse by the Kansas City Power & Light Company or others without specific verification or adaptation by the Engineer.


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Date: 04/13/18

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# LIST OF ABBREVIATIONS

| Abbreviation | Term/Phrase/Name |
|---|---|
| ac | acre |
| Burns & McDonnell | Burns & McDonnell Engineering Company, Inc. |
| CCR | Coal Combustion Residual |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| EPA | Environmental Protection Agency |
| ft | feet |
| Iatan | Iatan Generating Station |
| in | inch |
| KCP&L | Kansas City Power & Light Company |
| min | minute |
| NAD 83 | North American Datum of 1983 |
| NOAA | National Oceanic and Atmospheric Administration |
| NRCS | Natural Resources Conservation Service |
| PFDS | Precipitation Frequency Data Server |
| RCRA | Resource Conservations and Recovery Act |
| SCS | Soil Conservation Service |
| U.S.C. | United States Code |
| USDA | US Department of Agriculture |

# 1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the final version of the federal Coal Combustion Residuals Rule (CCR Rule) to regulate the disposal of coal combustion residuals (CCR) generated at coal-fired units. The rule is administered as part of the Resource Conservation and Recovery Act ([RCRA, 42 United States Code [(U.S.C.]) §6901 et seq.)], under Subtitle D.

On August 5, 2016, the EPA published the CCR "Extension Rule" following a United States Court of Appeals settlement between the utility industry and environmental groups. The Extension Rule became effective on October 4, 2016, and it, in part, removed the "early closure" provisions for inactive surface impoundments under the original CCR Rule and extended compliance deadlines for these impoundments. The inactive CCR surface impoundment at Kansas City Power & Light Company's (KCP&L's) Iatan Generating Station (Iatan) is subject to the CCR Rule and as such must meet the hydrologic and hydraulic capacity requirements outlined in 40 Code of Federal Regulations (CFR) §257.82 no later than April 17, 2018. This report serves as the initial inflow design flood control system plan for the Ash Impoundment at Iatan.

# 2.0 PLAN OBJECTIVES

Per 40 CFR §257.82, the inflow design flood control system plan must contain documentation (including supporting engineering calculations) that the inflow design flood control system has been designed and constructed to:

- Adequately manage flow into the CCR unit during and following the peak discharge of the inflow design flood,
- Adequately manage flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood, and
- Handle discharge from the CCR surface impoundment in accordance with the surface water requirements described in 40 CFR §257.3-3.

Per 40 CFR §257.82(c)(5), KCP&L must obtain certification from a qualified professional engineer that the inflow design flood control system plan, and subsequent updates to the plan, meet the requirements of 40 CFR §257.82. This sealed document serves as that certification.

# 3.0 EXISTING CONDITIONS

Iatan is located northwest of Weston in Platte County, Missouri. The Ash Impoundment is an incised impoundment with approximately 1,800 acre-feet of capacity at a water surface elevation of 770 feet (average water surface elevation). A site plan presented as Figure 1 is included in Appendix A. The Ash Impoundment and the Reclamation Pond are connected by a spillway constructed in the shared berm. There is a gate valve-controlled 24" diameter corrugated metal pipe between the Holding Basin and the Reclamation Pond which is normally closed.

The Ash Impoundment closure design began in 2015, with closure construction starting in April of 2016. Closure construction will be ongoing through completion.

# 4.0 DESIGN BASIS / FLOOD CONTROL SYSTEM

## 4.1 Inflow Design Flood System Criteria

### 4.1.1 Capacity Criteria

The CCR Rule requires that CCR surface impoundments have adequate hydrologic and hydraulic capacity to manage flows from the inflow design flood. For this analysis, the criteria were interpreted to mean that the surface impoundment must be able to accept inflows from the design flood event without overtopping.

### 4.1.2 Freeboard Criteria

The CCR documentation further discusses that operating freeboard must be adequate to meet performance standards, but a specific freeboard is not defined. For this analysis, it was assumed a 1-foot minimum freeboard shall be maintained during the inflow design flood event.

### 4.1.3 Flood Routing Design Criteria

The inflow design flood for this analysis is a 25-year flood event per 40 CFR §257.82(a)(3)(iv).

## 4.2 Project Mapping

Project mapping for this analysis consisted of an inventory of stormwater assets that contribute to the surface impoundment. Three primary sources of information were utilized: construction record drawings, plant operational information, and survey data.

### 4.2.1 Mapping Sources

Survey data utilized primarily consisted of LIDAR topography from Wilson & Company retrieved in October of 2015. This survey was supplemented by aerial survey data from George Butler Associates retrieved in February of 2017 and aerial survey from Western Air Maps retrieved in 2005.

### 4.2.2 Vertical Datum

Survey elevations are in the plant grid vertical datum.

### 4.2.3 Horizontal Coordinate System

Survey data which was utilized as the basis for mapping and modeling efforts was translated from the Missouri West State Plane, North American Datum of 1983 (NAD 83) coordinate system to the plant grid coordinate system.

# 5.0 HYDROLOGIC AND HYDRAULIC CAPACITY

The United States Army Corps of Engineers Hydrologic Engineering Center developed a Hydrologic Modeling Software (HEC-HMS) which was used to model reservoir characteristics under the design storm event. Inputs to the HEC-HMS model are discussed in more detail in the following sections.

## 5.1 Hydrology

### 5.1.1 Recurrence Interval and Rainfall Duration

Because the Ash Impoundment is incised, the inflow flood design event for this study is a 25-year flood per 40 CFR §257.82(a)(3)(iv). A storm duration is not specified under 40 CFR §257.82 or other pertinent inflow flood design sections within the CCR Rule; therefore, a 24-hour storm duration was assumed since this is typically required by RCRA (40 CFR 258.26).

### 5.1.2 Rainfall Distribution and Depth

The Soil Conservation Service (SCS) Type II rainfall distribution was used for computations associated with this evaluation. Precipitation data was acquired from the National Oceanic and Atmospheric Administration (NOAA) Precipitation Frequency Data Server (PFDS). Precipitation depth for the 25-year, 24-hour storm is 6.28 inches.

### 5.1.3 Subbasin Characteristics

The watershed was delineated using topographic survey from the mapping sources described in Section 4.2.1. For the purposes of this analysis, the watershed area was divided into two separate drainage subbasins which are shown in Figure 2 in Appendix A. Subbasin 1 drains to the Ash Impoundment and Subbasin 2 drains to the Reclamation Pond; however, because the impoundment and pond are hydraulically connected, storage capacity for the Ash Impoundment and Reclamation Pond were modeled together as one unit.

The SCS Runoff Curve Number Method was used to estimate runoff from each subbasin area. The basin curve number is determined based on several site characteristics, including the hydrologic soil group and ground cover type. Typical curve numbers can be found in resources such as SCS Technical Release 55, which was referenced for this analysis. Based on Custom Soils Resource Report from the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey site, soils near the Ash Impoundment are generally silt loam (Hydrologic Soil Group B) and silty clay (Hydrologic Soil Group C/D). For the purposes of this analysis, Hydrologic Soil Group C was assumed. The contributing watersheds consist mainly of flat, undeveloped grassy areas or bare soil. Calculations to determine the

time of concentration for each subbasin were determined with reference to the surface characteristics of the watershed.

Refer to Figure 2 in for a depiction of assumptions made when characterizing the ground cover and assumed flow path for the time of concentration and curve number calculations. Based on the results of these calculations, the watershed parameters shown in Table 5-1 and Table 5-2 were inputted into the HEC-HMS model.

**Table 5-1: Watershed parameters for Subbasin 1 (drains to Ash Impoundment)**

| Component | Value | Unit |
|---|---|---|
| Watershed Area | 119.8 | ac |
| SCS Storm Depth: 25-yr, 24-hr | 6.28 | in |
| Weighted Curve Number | 93 | - |
| Initial Abstraction | 0.151 | In |
| Time of Concentration | 9.28 | Min |

**Table 5-2: Watershed parameters for Subbasin 2 (drains to Reclamation Pond)**

| Component | Value | Unit |
|---|---|---|
| Watershed Area | 83.4 | ac |
| SCS Storm Depth: 25-yr, 24-hr | 6.28 | in |
| Weighted Curve Number | 86 | - |
| Initial Abstraction | 0.326 | in |
| Time of Concentration | 12.50 | min |

### 5.1.4 Storage Capacity

Storage data was only inputted for elevations above the typical pond level (approximately 770 feet) and below the maximum available storage elevation in the pond (approximately 774 feet). There is approximately 470 acre-feet of storage in the overall pond system between these levels.

When conducting the hydraulic analysis, it was conservatively assumed that the impoundment water surface is at an elevation of 772.3 feet prior to the storm event. This is the maximum recorded pond level in recent years (recorded in Spring of 2017), and is 2.3 feet above the typical impoundment level. All runoff into the Ash Impoundment and Reclamation Pond is considered additional flow above this initial water surface elevation.

## 5.2 Impoundment Outflows

Stage-discharge information was not included in this model. Instead, a conservative approach was taken that assumes the Ash Impoundment and Reclamation Pond will maintain all inflows within the impoundments for the duration of the storm event control period.

# 6.0 RESULTS

The impoundment/pond system was modeled for a 25-year, 24-hour storm event with the initial water surface elevation set at a high water level (772.3 ft) and assuming no discharge from the impoundment/pond system. The resulting runoff volume represents the amount of rain water over the watershed area, reduced by the amount of infiltration that would be expected to occur for the types of soils and vegetation present. The results of the modeled storm event are as follows:

**Table 6-1: Modeled Impoundment Design**

| Component | Property | Value | Unit |
|---|---|---|---|
| **Subbasin 1** (Ash Impoundment) | Peak Discharge | 793.5 | cfs |
| | Runoff Volume | 54.4 | ac-ft |
| **Subbasin 2** (Reclamation Pond) | Peak Discharge | 471.6 | cfs |
| | Runoff Volume | 32.4 | ac-ft |
| **Reservoir** (Ash Impoundment + Reclamation Pond) | Initial EL | 772.3 | ft |
| | Peak Inflow | 1265.2 | cfs |
| | Peak Discharge | 0.0 | cfs |
| | Peak Elevation | 773.0 | ft |
| | Peak Storage above EL 770 (typical pond level) | 344.4 | ac-ft |

Under the assumed conditions, the impoundment/pond system was able to contain runoff from the 25-year, 24-hour storm event while maintaining at least 1-foot of freeboard; no discharge from the impoundment/pond system occurs as a result of the 25-year, 24-hour storm. It was therefore concluded that the inflow design flood control system of the Iatan Ash Impoundment both adequately manages flow into the CCR unit during and following the peak discharge of the inflow design flood, and adequately manages flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood.

In the event a storm event(s) in excess of the inflow design flood occurs, water can be directed to a permitted NPDES outfall. As per the current NPDES permit, all discharged water is tested for pollutants and the discharge meets the minimum regulatory requirements of the permit. Therefore, the facility does not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the NPDES under Section 402 of the Clean Water Act and thereby meets the requirements in §257.82 (b). Discharge from the Ash Impoundment is handled in accordance with the surface water requirements of §257.3 – 3 during the 25-year, 24-hour flood event. Therefore, the Ash Impoundment meets the requirements for certification under the CCR Rule.

# 7.0 REVISIONS AND AMENDMENTS

KCP&L must place this initial inflow design flood control system plan in the CCR Operating Record by April 17, 2018. KCP&L may amend the plan at any time and is required to do so whenever there is a change in conditions which would substantially affect the written plan in effect. KCP&L must prepare a periodic inflow design flood control system plan every five years. Each periodic plan or amendment to the written plan shall be certified by a qualified professional engineer in the State of Missouri. All amendments and revisions must be placed on the CCR public website. A record of revisions made to this document is included in Section 8.0.

# 8.0 RECORD OF REVISIONS AND UPDATES

| Revision Number | Date | Revisions Made | By Whom |
|---|---|---|---|
| 0 | 04/13/2018 | Initial Issue | Burns & McDonnell |
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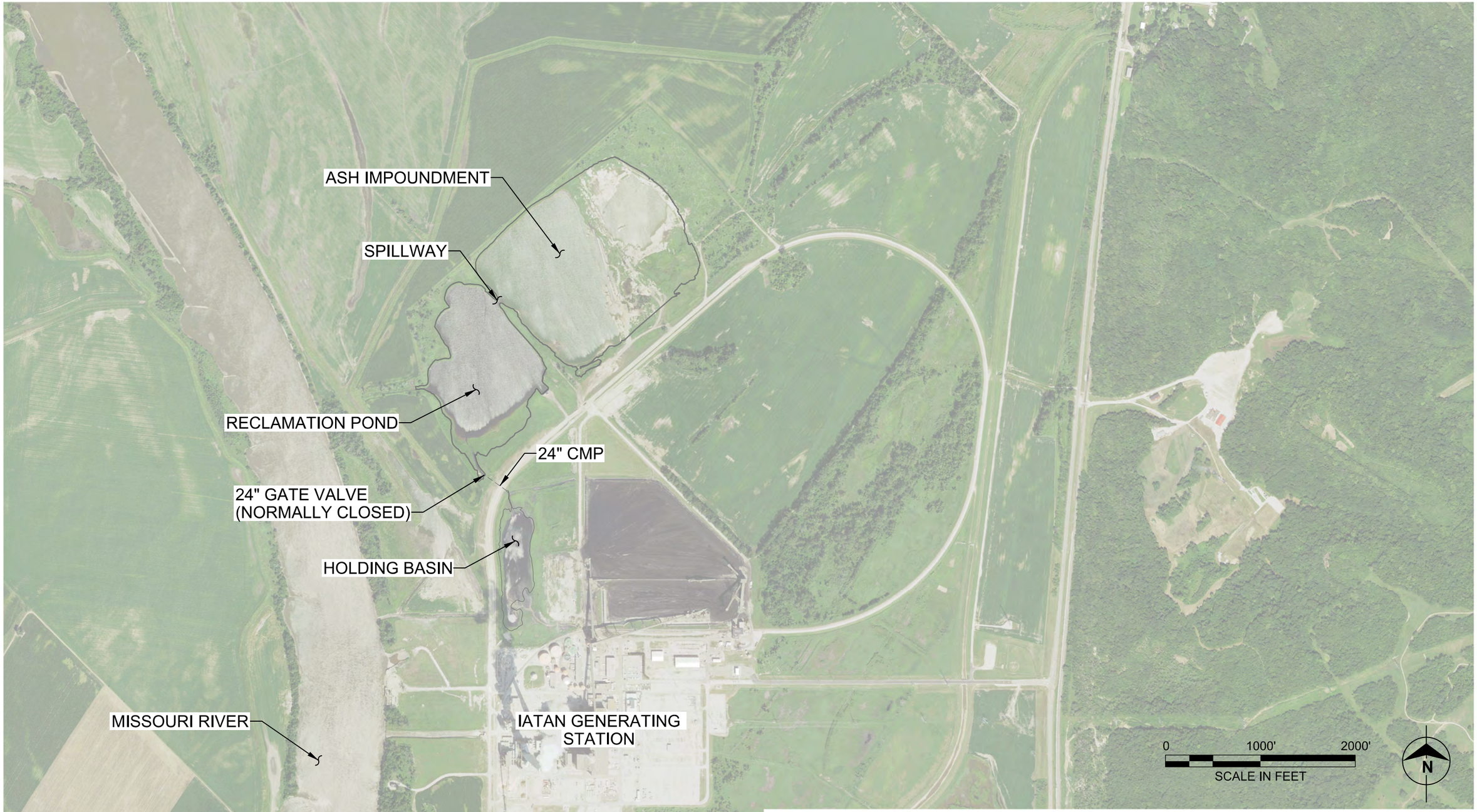
# APPENDIX A – FIGURES






BURNS McDONNELL

date 02/05/2017
designed A. MYERS

**KANSAS CITY POWER & LIGHT CO.**
IATAN GENERATING STATION
INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN - ASH IMPOUNDMENT SITE PLAN

project 87292
contract -
dwg **FIGURE 1**
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4/13/2018

\\bmcd\dfs\Clients\ENR\KCPL\87292_IatanPondClose\Studies\Tech_Consult\Ash Impoundment CCR Reports_2018\Inflow Flood\CAD\Figure 1.dgn

**LEGEND**

- OPEN SPACE, GOOD CONDITION
- DIRT
- GRAVEL
- POND
- WOODS
- FLOW PATH

APPROXIMATE WATERSHED BOUNDARY

FLOW PATH FOR TIME OF CONCENTRATION CALCULATION

SUBBASIN 1

SUBBASIN 2

FLOW PATH FOR TIME OF CONCENTRATION CALCULATION

0 500' 1000'

SCALE IN FEET

N



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date 02/05/2018

designed A. MYERS

**KANSAS CITY POWER & LIGHT CO.**

IATAN GENERATING STATION

INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN - ASH IMPOUNDMENT WATERSHED DATA

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contract -

dwg **FIGURE 2**

rev **0**

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\\bmcd\dfs\Clients\ENR\KCPL\87292_IatanPondClose\Studies\Tech_Consult\Ash Impoundment CCR Reports_2018\Inflow Flood\CAD\Figure 2.dgn

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