



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
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LISLE, ILLINOIS 60532-4352

August 3, 2023

Terry Brown
Site Vice President
Energy Harbor Nuclear Corp.
Davis-Besse Nuclear Power Station
5501 N. State Rte. 2
Mail Stop A-DB-3080
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION – SPECIAL INSPECTION
REPORT 05000346/2023050

Dear Terry Brown:

On March 23, 2023, the U.S. Nuclear Regulatory Commission (NRC) completed its initial assessment of ground settling, which was identified as the likely cause of a firewater line break resulting in the loss of fire protection function for about 1 hour at Davis-Besse Nuclear Power Station on October 9, 2022. This assessment was initiated after NRC inspectors discovered information regarding numerous ground settling indications around the plant on February 27, 2023, while reviewing the firewater pipe failure. Based on this initial assessment, the NRC sent a Special Inspection Team (SIT) to your site on April 23, 2023, to assess the station's current performance in understanding ground settling occurring at the site and its potential effect on risk-important structures, systems, and components (SSCs).

On June 23, 2023, the NRC completed its special inspection and discussed the results with you and other members of your staff. The results of this inspection are documented in the enclosed report. In summary, the special inspection found that Davis-Besse Nuclear Power Station has documented well over 100 corrective action documents related to ground settlement since initial construction in the 1970s. Despite of the number of ground settling zones around the site, including notable examples, such as settlement of the cooling tower and turbine building portions, as well as recent adverse impacts to the firewater system, the station has not concluded ground settling is a site-wide issue warranting a comprehensive review.

Importantly, the special inspection did not identify any immediate safety concerns to risk-important SSCs.

Two findings of very low safety significance (Green) are documented in this report. One of these findings involved a violation of NRC requirements, as the station failed to evaluate the effects of ground settling on nearby safety-related structures not anchored to bedrock in accordance with the applicable station procedure. We are treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2 of the Enforcement Policy.

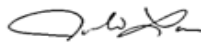
The second issue involves the station's failure to address an adverse condition on a portion of the firewater system piping. Station personnel noted a downward deflection and inadequate support in the fire protection system piping and documented a possible correlation with ground settlement. However, they did not evaluate the potential effects of this condition, as required by the station's Corrective Action Program. This condition led to the firewater line break, causing the loss of fire protection function for about 1 hour on October 9, 2022.

If you contest the violation or the significance or severity of the violation documented in this inspection report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement; and the NRC Resident Inspector at Davis-Besse Nuclear Power Station.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region III; and the NRC Resident Inspector at Davis-Besse Nuclear Power Station.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,



Lara, Julio signing on behalf
of Kozal, Jason
on 08/03/23

Jason W. Kozal, Deputy Director
Region III
Division of Operating Reactor Safety

Docket No. 05000346
License No. NPF-3

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV®

Letter to Terry Brown from Jason W. Kozal dated August 3, 2023.

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION – SPECIAL INSPECTION
REPORT 05000346/2023050

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number: 05000346

License Number: NPF-3

Report Number: 05000346/2023050

Enterprise Identifier: I-2023-050-0000

Licensee: Energy Harbor Nuclear Corp.

Facility: Davis-Besse Nuclear Power Station

Location: Oak Harbor, OH

Inspection Dates: April 23, 2023 to June 23, 2023

Inspectors: L. Bauer, Geologist
M. Domke, Reactor Inspector
T. Hartman, Senior Project Engineer
W. Wang, Senior Geotechnical Engineer
T. Weaver, Seismologist/Geophysicist

Approved By: Néstor J. Félix Adorno, Chief
Engineering and Reactor Projects Branch
Division of Operating Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a special inspection at Davis-Besse Nuclear Power Station, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

Failure to Address External Bending Loads on the Firewater System Due to Ground Settling			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000346/2023050-01 Open/Closed	[P.1] - Identification	93812
The team identified a finding of very low safety significance (Green) for the licensee's failure to address an adverse condition (i.e., external bending loads) on a portion of the firewater system piping. Specifically, on August 10, 2021, the licensee noted a portion of fire protection system piping was deflected downward and no longer supported properly. They considered ground settlement as a likely cause. However, they did not evaluate the potential effects of the condition as required by procedure NOP-LP-2001, "Corrective Action Program."			

Failure to Evaluate Ground Depressions Identified within 15 Feet of Safety-Related Structures Not Bearing in Bedrock			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000346/2023050-02 Open/Closed	[H.1] - Resources	93812
The team identified a finding of very low safety significance (Green) and an associated Non-Cited Violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," when the licensee failed to evaluate the effects of ground settling on safety-related structures in accordance with procedure EN-DP-01511, "Structures Monitoring." Specifically, the licensee failed to perform evaluations of five areas with ground settling identified within 15 feet of safety-related structures not bearing on bedrock as required by procedure step 6.3.8.			

Additional Tracking Items

None.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

93812 - Special Inspection

In accordance with the SIT Charter ([ML23129A606](#)), the inspection team conducted a detailed review of the ground settling that has been occurring since the site's original construction. As detailed in the SIT Charter, the following items were reviewed:

1. Establish a historical sequence of events related to ground settling occurrences since the construction phase of the Davis-Besse Nuclear Power Station. The objective is to provide a comprehensive understanding of the ground settling activity at the site, its effect to risk-important structures, systems, and components (SSCs), and the licensee's actions taken associated with ground settling.
2. Review the licensee's evaluations of the ground settling occurrences and their potential impact to risk-important SSCs. This includes reviewing ongoing and planned monitoring and mitigation activities.
3. Review the reasonableness of the licensee's corrective action program (CAP) at addressing internal and external operating experiences involving ground settling, including determining how the licensee considered any relevant plant-specific operating experience related to ground settling in support of their License Renewal Application.

INSPECTION RESULTS

Assessment	93812
Charter Item 1 - Establish a historical sequence of events related to ground settling occurrences since the construction phase of the Davis-Besse Nuclear Power Station. The objective is to provide a comprehensive understanding of the ground settling activity at the site, its effect to risk-important SSCs, and the licensee's actions taken associated with ground settling.	
During the construction phase in the 1970s, geotechnical investigations revealed the presence of small solution cavities in the explored bedrock. Aerial analysis of the site further identified small surface depressions.	
Surface depressions have been documented in the licensee's CAP since the site's construction. The licensee has attributed most of these depressions to leaking pipes. Prior to 2002, the licensee's records indicate at least 16 instances of underground leaks or ground settling. These leaks involved systems such as fire protection, diesel oil, domestic water, and sanitary and storm sewers.	

Since 2002, enhancements have been made to the CAP database, allowing for a more comprehensive and detailed timeline. The CAP has documented well over 100 corrective action documents related to ground settlement since 2002. Notably, on October 9, 2022, a firewater line break occurred, resulting in the loss of fire protection function for about 1 hour. Subsequent evaluations determined that the likely cause of the pipe break was external stresses caused by ground settling.

The following detailed timeline provides relevant themed chronologies and is not intended to cover all aspects of the topic. An example of ground settling not discussed in detail in this report is the approximately 3-inch settlement of the non-safety-related Low-Level Radiological Waste Building, which is adjacent to the safety-related Auxiliary Building and not directly bearing on bedrock. The team verified that, as of the time of this inspection, it did not adversely impact the Auxiliary Building.

Bedrock

During the construction phase in the 1970s, geotechnical investigations encountered small solution cavities throughout the bedrock that was explored. The reports highlighted the potential for groundwater to dissolve additional gypsum if it flowed through the bedrock. As a result of solution activity, the soluble material within the Tymochtee formation dissolved, leading to the collapse of the overlying, more resistant dolomite. Aerial analysis of the site area identified small surface depressions, which were interpreted by geotechnical investigators as being related to solution cavity activity. These depressions represented surface bedrock cavities where the overlying soils had slumped.

The Bedrock Verification Program and associated boring program conducted during construction showed no zones of low drill times or sudden drops of the drill steel. Additionally, there was also no evidence of significant solution activity observed in rock cores recovered. However, during geologic mapping for foundation excavation, solution activity was observed at the upper 3 feet of the bedrock near the cooling tower area. To address the bedrock dissolution, a remedial grouting program was implemented.

Turbine Building

Turbine building loads are supported on pier footings with diameter or maximum rectangular dimension ranging from 3 feet to 14 feet. Piers are socketed from 3 feet to 8 feet into bedrock. The piers are designed to resist maximum axial loads and moments resulting from combined static and dynamic loads. A portion of the building at ground level is not supported by piers on bedrock and is referred to as the "slab." There are no safety-related SSCs located on the slab, but it does support SSCs important to safety, such as, motor control center (MCC) E31A, a fire protection deluge pit, and the isophase bus duct cooler. Additionally, a safety-related electrical ductwork routes under the turbine building slab, which supply power to safety-related service water pumps.

2002 - The licensee identified an underground fuel oil break outside the turbine building rollup door near the auxiliary transformer resulting in significant ground settlement and excavation of the area.

2005 - The licensee identified an underground firewater main break outside the turbine building rollup door near the auxiliary transformer. The licensee determined wet backfill used during the 2002 repairs likely contributed to this break.

2013 - In June, the licensee discovered the east condenser pit sump pumps were partially clogged with debris, indicating potential washout from beneath the floor slab. In July, the licensee documented a ground depression increasing in size outside of a door on the northern wall of the turbine building. It was found that a leaning drain catch basin had caused deterioration of the basin structure. The licensee believes the 2002 backfill and excavation activities contributed to this underground drain piping failure.

2015 - In April, the licensee documented a continued increase in ground depression size in the same area as July 2013. The licensee observed washout from underneath a nearby sidewalk.

2015–2016 - The licensee estimated that an auxiliary boiler drain failure occurred between 2015 and 2016 under the turbine building concrete slab. The licensee believes the 2002 backfill and excavation activities contributed to this failure.

2016 - In March, the licensee recorded voiding under the northern turbine building, causing the settlement of an isolated phase electrical bus duct cooling unit by approximately 3 inches. The licensee also documented separation of conduit for motor control center, E31A, as a result from turbine building slab settlement. In April, the licensee identified a strong fuel oil smell around the auxiliary 11 transformer, which is just outside the turbine building, and inside the turbine building at the fire protection deluge pit indicating a possible fuel oil leak. In July, the licensee documented continued increase in size of the ground depression immediately north of the turbine building, like the observations made in July 2013 and April 2015. In December, the licensee completed corrective actions to mitigate further settlement of the turbine building floor slab. This involved the injection of 96 cubic yards of flowable fill under the turbine building floor slab between November 8 and December 2.

2017 - In February, the licensee replaced the sidewalk outside the northern end of the turbine building after injecting flowable fill. The licensee believes that these sidewalk replacement efforts and heavy construction equipment may have applied downward forces on buried piping in this area, which could have contributed to later piping failures.

2018 - In January, the licensee observed that the flowable fill material injected in 2016 was not effective, as a borescope found a larger void beneath the floor. In March, during refueling outage 1R20, operators observed steam rising through the expansion joints in the turbine building slab when operating the auxiliary boiler. The licensee also documented further turbine building slab settlement. In April, a gap was discovered in the drain line piping of the fire protection deluge pit on the inside wall of the turbine building. Subsequent investigation revealed a 12-inch-high void extending in all directions from this drain gap. Furthermore, the licensee detected the presence of diesel fuel oil beneath a core bore in the northern turbine building concrete floor slab. In May, the licensee poured 45 cubic yards of flowable fill into floor drains and core drills in the turbine building slab to stabilize the settlement of the flooring. The total amount of flowable fill utilized to mitigate settlement since 2016 amounted to approximately 140 cubic yards.

2019 - In February, the licensee detected further turbine building slab settlement of 1/8 inch near the isophase bus duct cooler and MCC E31A. In October, the licensee determined through eight monitoring points that no discernible settlement of the concrete slab had occurred in the north turbine building.

2020 - In March, during performance of main transformer deluge test, leakage was detected

from a firewater flange downstream of valve FP129. In April, the licensee observed that the turbine building slab settlement continued, ranging from 1/4 to 3/8 inches. The licensee noted the rate of settlement had been significantly reduced due to the 2018 flowable fill injections. In September, the licensee removed the expansion joint along a portion of the north turbine building wall to enable engineering inspections for potential voiding between the floor and building foundation. In November, the licensee discovered a cracked firewater flange downstream of valve FP130. This flange was situated in the transformer deluge pit, located inside the north wall of the turbine building.

2021 - In August, the licensee replaced flanges in firewater lines FP123, FP129, and FP130 with more flexible "Mega-flanges."

2022 - In July, the licensee determined that the maximum turbine building slab settlement since April 2018 was approximately 1/2 inch, equating to an average annual settlement of 1/8 inch. The total settlement of the turbine building slab reached slightly over 4 inches. Monitoring activities revealed that the settlement rate was lower than the previous rate observed before the fill injections in 2018. However, continued settlement was attributed to the partial filling of voids in 2018. The licensee identified buried drain piping failures as a factor contributing to further ground settlement and voiding beneath the slab. These failures were believed to have played a role in the fire protection flange failures observed inside the turbine building wall from 2016 through 2020, as well as the underground firewater main failure outside the northern turbine building in October. Specifically, a catastrophic failure occurred in the buried 10-inch firewater main line FP123 located immediately north of the turbine building, resulting in the loss of fire protection functionality for approximately 1 hour. The failure of the gray cast-iron pipe, which is a non-ductile material, was attributed to ground settlement. The affected section of the pipe was replaced with ductile iron and backfilled with self-compacting stone. In November, during the investigation of the firewater line break in FP123, it was determined that pipe FP129 had not bottomed out on the wall penetration and did not require re-leveling. However, it was discovered that the piping downstream from FP130 did not have a thrust block at the first change of direction. To prevent future deflection, the licensee installed a thrust block in this location.

Circulating Water System

The condenser circulating water system is designed to accommodate the maximum heat loads of the condenser. It comprises a closed system that utilizes a hyperbolic natural draft cooling tower, along with circulating water pumps, piping, and valves. The fill and makeup water for the system are sourced from Lake Erie through the intake water system and intake structure. The system operates with four circulating water pumps, which draw water from the cooling tower discharge channel, pump it through the condenser, and then return it to the cooling tower.

The circulating water system, including the cooling tower, is classified as non-safety related. Although it does not play a role in supporting any engineered safety features, the loss of circulating water would lead to a transient, disrupting reactor stability.

Cooling Tower

The cooling tower consists of a reinforced concrete shell at its base, standing at a height of 493 feet above the basin sill. The shell is supported by a 13-feet-wide ring footing, which rests on compacted granular fill ranging from 6 to 8 feet in thickness. This compacted

granular fill is underlain by a layer of till deposit, which in turn sits on bedrock. To mitigate potential excessive settlements, remedial grouting has been carried out on the cooling tower basin.

2006–2010 - Survey data for the cooling tower did not reveal any significant settling of the cooling tower structure.

2010 - The licensee identified and repaired cracks in the cooling tower basin slab and its liner.

2011 - The licensee repaired the basin slab near the canal interface and near the desilting trench.

2014 - The licensee identified and repaired cracks in the basin near loop two bypass. The licensee identified seal degradation between the piping and the basin wall which resulted in ground erosion from under the piping.

2016 - The licensee repaired sections of the basin slab and liner. The licensee injected grout into the subgrade during these repairs.

2020 - The licensee repaired a section of basin slab near mouth of canal.

2022 - The licensee identified settlement of the ring foundation and voiding beneath it. They repaired a separated basin-to-canal membrane and injected flowable fill. The licensee also established the Cooling Tower Restoration Project, which is discussed in more detail in the assessment for Charter Item 3.

Ground Between the Lake Erie Intake and the Main Plant Facility

Since 1988 - The licensee observed underground leaks between the lake intake structure and main plant facility as early as 1988. The licensee attributed most of these underground leaks to significant plant construction activities like building additions and asphalt installation over previously grassed areas. The underground leaks originated from systems like fire protection, backwash sump discharge, domestic water, storm and sanitary sewers, and condenser pit drains.

1987–1995 - The licensee determined surface loading and excavation activities caused or significantly contributed to underground leaks and ground settlement.

2007 - The licensee determined that the condensate sump and backwash pipeline experienced internal corrosion, necessitating piping replacement.

2008–2011 - Replacement of the condensate sump and backwash pipeline led to substantial excavations from 2008 through 2011. This excavation work led to additional ground settlement in the area between the intake and the main plant facility.

2012 - The licensee excavated a surface depression at the southeast corner of the turbine building and discovered a broken sanitary drainage pipe and a ground void approximately 50 feet long, 30 feet wide, and 4 feet high. The licensee hired a contractor to address the void. The resolution process spanned across 2013.

Circulating Water 108-Inch Concrete Pipe Section Seals

The circulating water 108-inch lines transfer circulating water between the cooling tower and the main condenser. They are routed between the pump house at the northwest corner of the turbine building, across the northern end of the protected area, to the cooling tower.

Since 2008, the licensee observed degraded grout at the joints of the 108-inch circulating water concrete pipe section. This degradation allowed water to leak and created areas of ground settling above these leaks. The licensee documented 31 condition reports associated with ground settlement related to circulating water pipe joints.

In 2020, the licensee completed repairs for all pipe joint leaks at the completion of refueling cycle 21. As part of their ongoing efforts, the licensee continues to regularly monitor pipeline repairs with walkdowns of top surface conditions.

Fire Suppression Systems

The fire suppression systems serve several important functions, including providing water for automatic and manual fire suppression systems, confining fires for extinguishment, protecting structural steel associated with fire barriers, and maintaining fire barrier integrity.

Over the years, there have been multiple instances of buried fire suppression system leaks within the owner-controlled area, spanning from the late 1980s to the present. Among the events occurring within the risk-significant protected area of the plant, most of the underground fire suppression leaks have taken place between the intake and main plant facility.

Approximately 30 percent of notable underground leak events reported between the lake intake and main plant facility are associated with the buried fire suppression systems. Noteworthy instances of fire suppression leaks began in 1988, shortly after the completion of the personnel support facility addition to the turbine building. Subsequent occurrences took place in 2007, 2008, 2015, 2016, 2018, 2021, and 2023.

Safety-Related Structures

The foundations of safety-related structures mostly bear on bedrock. No instances of settlements in structures directly bearing on bedrock have been observed. Safety-related structures not bearing directly on bedrock, such as underground electrical duct banks, service water tunnels, and borated water storage tanks, according to the licensee's Structures Monitoring Program procedure, could be affected by ground settlement.

The safety-related duct banks, which are routed beneath the settling turbine building concrete flooring slab, carry power cabling for motor control center F12C in the intake structure. The duct bank supplies power to the safety-related service water pumps, cooling tower makeup pump, the auxiliary transformer, and nonessential unit substation EF4.

The safety-related service water tunnel is located between the Auxiliary Building and intake structure. This reinforced concrete tunnel is buried underground and serves as a protective enclosure for service water pipes and other minor pipes. The service water pipe tunnel structure measures 12 feet in height, 11 feet in width, and spans a length of 360 feet. It connects service water valve room No. 1 in the turbine building with service water valve

room No. 2, adjacent to the intake structures.

1986 - The licensee documented a fire protection pipe break and subsequent repair located south of the service water tunnel. However, the available records did not provide details regarding the proximity of the pipe break to the safety-related tunnel.

1988 - The licensee documented the identification and repair of a 1-foot-diameter void beneath the buried electrical duct bank adjacent to the diesel oil storage tank.

2008 - The licensee discovered an underground firewater leak between the lake intake and main plant facility, necessitating the addition of structural backfill in the service water tunnel areas. During the excavation to repair this firewater leak, the licensee discovered a 3-inch condensate demineralizer backwash pipe leaking nearby. The condensate pipe was routed at a height of 9 inches to 2 feet above the service water tunnel. The licensee replaced the pipe and backfilled the areas above the service water tunnel.

2016 - The licensee evaluations of voiding beneath the turbine building flooring determined that areas of voiding, situated approximately 4 to 5 feet below grade, were not low enough to impact the design function of the duct bank and their associated cabling. The duct bank was 10 feet below grade.

2018 - The licensee expanded the scope of repair for the voiding beneath the turbine building slab. During this scope expansion, the licensee determined the safety-related duct bank, a 3-inch-thick concrete structure, was not impacted by the floor slab because it was not "gross" settlement, and it was reasonable to conclude no change to the loading on the duct bank from the slab, or slab loads.

2022 - After the buried firewater main FP123 ruptured, the licensee did not assess the impact of the failure and the resulting ground settling on the safety-related duct bank situated beneath the turbine building floor slab. Despite the failure occurring within a proximity of 15 feet from the duct bank, which should have triggered an evaluation as per procedure EN-DP-01511, step 6.3.8, the licensee did not conduct an evaluation of the safety-related duct bank. The reason for this omission was the lack of any indication that the washed-out area had affected either the turbine building slab or the duct bank when the excavation took place.

Prior NRC Activities Related to Ground Settling at Davis-Besse Nuclear Power Station

2010 - On August 27, 2010, the NRC received the station's License Renewal Application. The application included a discussion concerning structure settlement, asserting that the need for managing structure settling was not warranted.

2016 - On April 30, 2016, the NRC issued its approval of the License Renewal Application, without an explicit provision specifically addressing the management of structure or ground settling.

2019 - The NRC conducted a Problem Identification and Resolution inspection that noted the licensee was not addressing ground settlement holistically. This observation was documented in NRC Inspection Report 2019010 (ML19252A853).

2022 - NRC inspectors review the CAP for potential adverse trends related to ground settling.

Inspection Report 2022004 (ML23038A204) stated the inspector determined that the ground settling examples reviewed may indicate a potential weakness when viewed in aggregate.

Assessment

93812

Charter Item 2 - Review the licensee's evaluations of the ground settling occurrences and their potential impact to risk-important SSCs. This includes reviewing ongoing and planned monitoring and mitigation activities.

The team identified several observations related to the licensee's assessment and response to ground settling. Importantly, the team did not identify any immediate safety concerns with risk-important SSCs.

1. The team determined the licensee has not undertaken a comprehensive assessment of the widespread ground settling across the site and its potential effects on risk-important SSCs. The licensee has historically attributed ground settling to various factors on a case-by-case basis, including backfill dissolution, backfill washout, heavy loads, backfill quality, and construction activities, as well as soil natural settlement. While most instances of ground settling were attributed to backfill washout caused by non-radioactive underground pipe leaks, the licensee did not provide information demonstrating that the leaks preceded ground settling. Furthermore, the team noted examples of backfill settlement without evidence of washout, such as from pipe leaks. The direct causes for these examples remain uncertain. Also, initial construction photos show surface depressions caused by ground dissolution.
2. The licensee indicated that their number of underground piping failures aligned with the industry trend. However, the team noted the industry data gathered by the licensee did not support this. According to the data, the average failure rate over a 5 to 10-year period was 0.48 failures per year, with a median failure rate of 0.3 failures per year. Over a 15-year period, the licensee had a failure rate of 0.53 failures per year. Notably, they encountered five failures within a 5-year period, resulting in an elevated rate of 1.0 failure per year.
3. The team noted the possibility of bedrock dissolution based on the site's susceptibility, and historical instances of bedrock dissolution beneath the cooling tower. However, the team did not have any immediate safety concerns because they did not observe any bedrock dissolution or settling of structures directly anchored on bedrock. The licensee believes bedrock has remained unchanged due to the absence of observed solution activity in nearby quarries, the Bedrock Verification Program conducted during initial construction, and the equilibrium of groundwater chemistry with gypsum at that time. However, the team noted these factors regarding bedrock dissolution:
 - a. The licensee's geotechnical evaluation for initial construction stated that there was no hydraulic gradient across the site, and that the ground water regime must be maintained to avoid bedrock dissolution. However, the Updated Final Safety Analysis Report mentioned intermittent reversals in groundwater flow towards Lake Erie due to lake level changes and the licensee's groundwater data showed there is a hydraulic gradient at the site that changes with time.
 - b. During construction, the licensee discovered dissolution of the bedrock beneath the cooling tower and addressed it by grouting the affected areas. The effectiveness of this mitigation remains unverified, and the licensee did not provide information to rule out bedrock dissolution as a contributor of the cooling tower backfill settlement.

- c. The team observed 45-degree cracks on multiple Auxiliary Building walls anchored in bedrock. The licensee is monitoring crack growth and has determined no further action is currently required based on the American Concrete Institute's guidance. The licensee has not considered differential settlement as a potential cause, and the reason for their presence remains uncertain.
- 4. The licensee determined the cooling tower settlement was caused by a combination of age-related degradation of the membrane surrounding the cooling tower basin, resulting in water flowing into the ground below and causing backfill washout. Signs of washout and settling were observed as early as spring 2014. On April 12, 2023, the licensee initiated a causal evaluation of the cooling tower settlement.
- 5. The licensee's procedure EN-DP-01511, "Structures Monitoring," established to implement, in part, provisions of the Maintenance Rule and License Renewal Programs, included instructions for monitoring settlement. As discussed in the NCV within this report, the licensee introduced these instructions in response to an earlier NRC inspection observation that they were not addressing ground settlement holistically. The team noted the following:
 - a. Portions of the procedure addressing ground settling were not being implemented. Step 6.3.8.a required evaluations of ground settling within 15 feet of safety-related structures not bearing on bedrock. However, the licensee did not have records of evaluations of five out of six ground depressions documented within 15 feet of such structures, which were identified since the introduction of this step in the procedure. The team determined this was a finding with an associated NCV, as described later in this report.
 - b. The procedure did not address ground settling near non-safety-related structures. Although both the Maintenance Rule and License Renewal Programs covered safety and risk-important non-safety-related structures, step 6.3.8.a of the procedure solely focused on safety-related structures. The licensee's position is that step 6.3.8 provided general instructions for addressing areas exhibiting ground settling, while step 6.3.8.a emphasized the importance of safety-related structures. However, the team noted that step 6.3.8 did not provide any instructions or directed actions. It simply stated "Settlement: Apparent excessive total or differential settlement based on visual inspection." Thus, the procedure only required evaluations of ground settling within 15 feet of safety-related structures. Moreover, the licensee did not provide any evaluations for non-safety related but risk-important structures. The licensee's position is that evaluations were performed but not documented because there is no requirement to document them.

Assessment	93812
<p>Charter Item 3 - Review the reasonableness of the licensee's CAP at addressing internal and external operating experiences involving ground settling, including determining how the licensee considered any relevant plant-specific operating experience related to ground settling in support of their License Renewal Application.</p> <p><u>General Ground Settling Response</u></p> <p>The licensee's CAP has documented well over 100 corrective action documents related to ground settlement, with most of them occurring since 2002. However, despite of the number of ground settling zones around the site and notable examples such as settlement of the cooling tower and turbine building portions, as well as recent adverse impacts to the firewater system, the licensee has not recognized ground settling as a site-wide issue warranting a comprehensive review.</p> <p>The NRC conducted a Problem Identification and Resolution inspection in 2019, which noted that the licensee was not addressing ground settlement holistically. This observation was documented in NRC Inspection Report 2019050 (ML19252A853). In response, the licensee revised procedure EN-DP-01511, "Structures Monitoring," by adding an instruction to evaluate safety-related structures not bearing directly on bedrock whenever a ground depression is identified within 15 feet of such structures. However, this instruction was limited to safety-related structures and did not extend to all structures important to safety. In addition, the licensee did not have records of evaluations of five out of six ground depressions documented within 15 feet of such structures, which were identified since the introduction of this step in the procedure, as outlined in the NCV documented in this inspection report.</p> <p>The NRC identified a finding of very low safety significance (Green) for the licensee's failure to address an identified adverse condition on a portion of piping in the firewater system. This finding is discussed elsewhere in the Results section of this report.</p> <p><u>Turbine Building Settlement Response</u></p> <p>As per the timeline included in Charter Item 1, a specific instance highlighting the licensee's response to ground settling is associated with the turbine building. A portion of this building, which is not supported by bedrock, and the surrounding ground, experienced settlement. The licensee attempted to halt the settling by injecting approximately 140 cubic yards of flowable fill into an underground void in 2016 and 2018, after the turbine building slab had already settled by approximately 4 inches. Following the flowable fill injection, the building continued to experience settlement at a slower rate, with an additional settlement of approximately 5/8 inches recorded as of this inspection.</p> <p><u>Cooling Tower Settlement Response</u></p> <p>As discussed in the timeline included in Charter Item 1, the non-safety-related cooling tower, which is supported by backfill, has experienced settlement. Over the last 15 years, the structure has undergone multiple repairs, but degradation continues to persist. In 2022, the licensee identified settlement of the ring foundation and voiding beneath it. In response, they repaired a separated basin-to-canal membrane and injected flowable fill. In the same year, the licensee also established the Cooling Tower Restoration Project with plans to address the settling by: 1) installing micropilings in areas where the support piers have settled; 2) restore full support to the circulating water and bypass piping; 3) extend the basin walls back to</p>	

original elevation height; 4) remove and restore the slab, membrane, and subgrade near the canal; and 5) perform ground-penetrating radar to identify and address any other voiding areas. The licensee expects to complete these activities by spring 2024.

Ground Settlement Considerations in License Renewal Application

The team did not find any site-specific operating experience involving ground settling occurring prior to the License Renewal Application submittal that should have been considered during the License Renewal review. License renewal is the process of extending the operating licenses of nuclear power plants beyond their initial expiration dates, with aging management programs and activities to monitor and mitigate the effects of aging on SSCs to provide reasonable assurance they will continue to perform their intended functions for the period of extended operation.

The License Renewal Application was submitted in 2010 and stated that no aging management program was required for structure settlement, based on geotechnical evaluations conducted during the initial construction of Class 1 and 2 structures. These evaluations stated that no long-term settlement of the structures was anticipated after construction. Although the License Renewal Application mentioned a separate instance of settlement-related operating experience, it was unrelated to the ground settlement issues addressed in this inspection. Specifically, it was related to intake canal embankment slope stability.

The team also noted potential limitations in the licensee's approach for managing the effects of aging for the buried portions of the fire protection system. The licensee's methodology, which was endorsed by the NRC during License Renewal review, relies on a form of leak rate monitoring. Conceptually, any unexplained increase in system leakage can identify age-related degradation prior to a loss of intended function. However, the firewater system experienced a rupture in 2022, just 1 day after the last leak rate measurement, despite consistent leakage for the previous 5 weeks leading up to the failure. Based on this information, the leak rate monitoring for the brittle gray cast-iron piping did not appear to provide any indication of system degradation prior to the loss of intended function during the 2022 event.

Failure to Address External Bending Loads on the Firewater System Due to Ground Settling			
Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green FIN 05000346/2023050-01 Open/Closed	[P.1] - Identification	93812
The team identified a finding of very low safety significance (Green) for the licensee's failure to address an adverse condition (i.e., external bending loads) on a portion of the firewater system piping. Specifically, on August 10, 2021, the licensee noted a portion of fire protection system piping was deflected downward and no longer supported properly. They considered ground settlement as a likely cause. However, they did not evaluate the potential effects of the condition as required by procedure NOP-LP-2001, "Corrective Action Program."			
<u>Description:</u>			
On June 30, 2016, the licensee documented a through-wall leak on a flange in the firewater system piping as Condition Report (CR) CR-2016-08333 within their CAP. The affected			

section of piping transverses through the turbine building wall, with portions located inside the building and others outside. The external segments of the pipe are buried underground, while the cracked flange was located inside the building. To address the leak, the licensee isolated the affected section of piping to mitigate the leakage rate. There was no further documentation regarding whether the leak was fully stopped or any information on the initial and final leak rates to assess the success of the isolation. Subsequently, the licensee closed the CR to notification 601048984, which was processed into work order (WO) 200685865.

On August 10, 2021, the licensee initiated repairs on the cracked flange by implementing WO 200685865. To prevent a recurrence of failure, the licensee opted to replace the cracked flange with a more robust alternative known as MegaFlange. During the repair/replacement activity, the licensee documented in the WO that the probable cause of failure was "Abnormal Stress." In addition, they documented that they "believed that the outside pipe is pushed down due to settlement." However, no new CR was initiated for this condition, and it was not further addressed under the existing CR or WO.

On October 10, 2022, the buried portion of the repaired firewater pipe ruptured. Upon evaluating this failure, the licensee documented that the earlier repair had relieved stresses at the repaired location but had not relieved the stresses at the other end of the pipe where the recent failure occurred. In addition, it was documented that the piping had bottomed out against the pipe penetration, causing additional pipe stresses. The final failure mode analysis determined "the combination of external bending loads (caused by soil movement and the subsequent bottoming out of the FP122/FP123 pipe against the bottom of the wall penetration and concentrated by the thrust constraints) and hoop stress (normally present due to internal firewater pressure), resulted in a mixed-mode failure manifested in an approximately 45-degree diagonal fracture." In addition, the licensee documented "the MegaFlange installed 8/2021 accommodated the shifting of the pipe between the building and 1st buried flange, but without the buried pipe being raised back up to its original height, stresses remained at the bolt holes of the first buried flange."

NOP-LP-2001, "Corrective Action Program," Revision 48, Step 4.1.2 states, in part, that "All CAQ [Condition Adverse to Quality] and CARC [Condition Adverse to Regulatory Compliance] issues, regardless of significance level, shall be entered in the condition report process and the associated electronic database unless listed as an exception in Section 2.2." Section 2.2 described the exceptions to the program and are limited to performance management of personnel (i.e., human resources issues) and safeguards and security sensitive conditions. Section 4.3.2 stated, in part, "CRs shall be initiated for any issue, event, defect, characteristic that could credibly impact nuclear safety, personnel safety, plant reliability or compliance with federal, state or local regulations." Section 3.1 of the procedure defined a CARC as "A condition in which the licensee is not in conformance with NRC regulations; a failure to comply with a docketed commitment made to the NRC; a non-compliance with the licensee's Quality Assurance Program that does not consequently affect the safety-related function of a structure, system or component." Attachment 1 of NOP-LP-2001 provided examples of items that met the definition of a CARC. This attachment stated in part, "Conditions Adverse to Regulatory Compliance are addressed within the licensee corrective action program." In addition, Example 5 stated that a CARC includes "A condition adversely affecting performance in Initiating Events, Mitigating Systems or Barrier Integrity. This includes issues involving: ...fire protection..." Section 4.6.3 established the method to evaluate the condition based on the cause uncertainty and risk/consequence to the station. Section 4.9.3 dictated the resolution needed to address the condition identified (i.e., Rework, Repair, or Use-As-Is).

Corrective Actions: The piping was replaced as a result of the failure and the misalignment was corrected to address the stresses. In addition, the licensee planned to perform an extent of condition of the remaining pipes passing through the same wall section to identify any potential instances of unacceptable stresses.

Corrective Action References: CR-2023-05000

Performance Assessment:

Performance Deficiency: The team determined the licensee's failure to address an adverse condition on the fire protection system as required by NOP-LP-2001, "Corrective Action Program," was a performance deficiency. Specifically, on August 10, 2021, the licensee noted a portion of fire protection system piping was deflected downward and no longer supported properly. They considered ground settlement as a likely cause. However, they did not capture the condition in their condition report process, assign an evaluation method, and correct it.

Screening: The inspectors determined the performance deficiency was more than minor because if left uncorrected, it would have the potential to lead to a more significant safety concern. Specifically, not addressing adverse conditions in accordance with the CAP can lead to more significant concerns, such as loss of risk-important functions.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." In consultation with Senior Reactor Analysts, the team determined the performance deficiency was not the proximate cause of the 2022 firewater pipe failure. Specifically, between August 10, 2021, and October 20, 2022, the available time was insufficient to evaluate and implement corrective actions to prevent the subsequent failure in the firewater system. Thus, IMC 0609 Appendix A was applicable. The finding was determined to be of very low safety significance (Green) because the team answered "no" to all the questions in Exhibit 2 - Mitigating Systems Screening Questions.

Cross-Cutting Aspect: P.1 - Identification: The organization implements a corrective action program with a low threshold for identifying issues. Individuals identify issues completely, accurately, and in a timely manner in accordance with the program. In this context, the licensee observed that a portion of the firewater system piping exhibited deflection and inadequate support. However, they failed to fully recognize and identify this issue as an adverse condition that needed to be addressed in accordance with their CAP.

Enforcement: Inspectors did not identify a violation of regulatory requirements associated with this finding.

Failure to Evaluate Ground Depressions Identified within 15 Feet of Safety-Related Structures Not Bearing in Bedrock

Cornerstone	Significance	Cross-Cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000346/2023050-02 Open/Closed	[H.1] - Resources	93812
The team identified a finding of very low safety significance (Green) and an associated Non-Cited Violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and			

Drawings," when the licensee failed to evaluate the effects of ground settling on safety-related structures in accordance with procedure EN-DP-01511, "Structures Monitoring." Specifically, the licensee failed to perform evaluations of five areas with ground settling identified within 15 feet of safety-related structures not bearing on bedrock as required by procedure step 6.3.8.

Description:

In 2019, the NRC conducted a Problem Identification and Resolution inspection that noted the licensee was not addressing ground settlement holistically. This observation was documented in NRC Inspection Report 2019010 (ML19252A853). In response, on November 20, 2019, the licensee revised procedure EN-DP-01511, "Structures Monitoring." This procedure establishes responsibilities, requirements, and guidelines for performing periodic inspections as required by Maintenance Rule and License Renewal. The inspections aim to monitor structural conditions and identifying age-related degradation. Additionally, the procedure includes instructions for inspections not required by the Maintenance Rule and License Renewal, but they are intended to further monitor structural conditions and age-related degradation.

Following this revision, step 6.3.8 was added to the procedure to require the evaluation of safety-related structures not bearing directly on bedrock, as shown on Attachment 8 of the procedure, whenever a ground depression is detected within 15 feet of such structures. Examples of structures described in Attachment 8 include the safety-related service water tunnel, electrical duct banks, borated water storage tank, and dry cask storage pad.

On May 5, 2023, the team requested evaluations completed in accordance with step 6.3.8 of EN-DP-01511, as specified in Revision 14 of the procedure. The licensee responded on May 8, providing a list of condition reports documenting ground depressions within 15 feet of safety-related structures not bearing on bedrock. However, out of six condition reports, only one included an evaluation that met the requirements of procedure EN-DP-01511. On May 16, 2023, the licensee clarified that no formal evaluations had been documented for the remaining five instances. Specifically, the licensee failed to evaluate the effects of ground depressions identified within 15 feet of the safety-related MH3001 electrical duct bank (CR-2023-01677, CR-2022-07575, and CR-2021-05651) and service water tunnel (CR-2023-03114 and CR-2021-05651). Although the licensee asserted that informal evaluations had been conducted but not documented, the team noted that such informal evaluations did not comply with the rigorous quality controls required for safety-related activities by their Quality Assurance Program.

The safety-related service water tunnel is a structure through which service water piping portions are routed among other fluid systems. The safety-related MH3001 duct bank routes safety-related power cabling to motor control center F12C in the intake structure, which powers safety-related service water pumps. The duct bank is located beneath the turbine building floor slab, which is experiencing settling and is in proximity to a ground void. Although the licensee assessed the operability of the MH3001 electrical duct bank in condition reports CR-2016-13526 and CR-2018-03630 in 2016 and 2018, respectively, and the settling rates of the turbine building slab have decreased since the injection of 140 cubic yards of flowable fill in 2016 and 2018, the licensee documented additional ground settling within 15 feet since 2019 without evaluating their impact on the duct bank in accordance with EN-DP-01511.

Corrective Actions: The licensee created an assignment to perform an organizational effectiveness investigation which will include an extent of condition review. In a discussion with the team, the licensee confirmed their intent to develop corrective actions to restore compliance using the results from their investigation.

Corrective Action References: CR-2023-04944

Performance Assessment:

Performance Deficiency: The team determined the licensee's failure to evaluate the effects of ground settling identified within 15 feet of safety-related structures not bearing on bedrock was contrary to licensee procedure EN-DP-01511, "Structure Monitoring," and was a performance deficiency.

Screening: The inspectors determined the performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to evaluate the effects of ground settling on nearby safety-related MH3001 electrical duct bank and service water tunnel does not ensure the availability and reliability of the supported mitigating systems, such as the safety-related service water system.

Significance: The inspectors assessed the significance of the finding using IMC 0609 Appendix A, "The Significance Determination Process (SDP) for Findings At-Power." The finding was determined to be of very low safety significance (Green) because the team answered "no" to all the questions in Exhibit 2 - Mitigating Systems Screening Questions. Specifically, the finding did not involve the loss of operability or functionality.

Cross-Cutting Aspect: H.1 - Resources: Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety. Specifically, the licensee's leaders failed to ensure that personnel performing the ground settling evaluations applied all quality assurance requirements to support nuclear safety.

Enforcement:

Violation: 10 CFR 50 Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires, in part, activities affecting quality to be prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances, and be accomplished in accordance with these instructions, procedures, or drawings.

Contrary to the above, since July 25, 2021, the licensee failed to accomplish activities affecting quality in accordance with instructions, procedures, or drawings. Specifically, on November 20, 2019, the licensee revised procedure EN-DP-01511, "Structures Monitoring," to require the evaluation of safety-related structures not bearing directly on bedrock, as shown on Attachment 8 of the procedure, whenever ground settling is detected within 15 feet of such structures. Since the procedure was revised, the licensee identified five ground depressions within 15 feet of MH3001 electrical duct bank (CR-2023-01677, CR-2022-07575, and CR-2021-05651) and the service water tunnel (CR-2023-03114 and CR-2021-05651). However, the licensee failed to evaluate the effects of these ground depressions on these safety-related structures included in Attachment 8 of procedure EN-DP-01511, which are not bearing on bedrock. The licensee indicated that they conducted informal evaluations, but the team noted these were insufficient to meet the procedural requirement. The evaluations

required by the procedure are activities affecting quality, as they assure that safety-related functions are maintained by confirming ground settling is not adversely affecting safety-related structures or identifying degraded conditions requiring repairs. As such, these evaluations necessitate rigorous quality controls that cannot be applied informally.

Enforcement Action: This violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the Enforcement Policy.

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On April 28, 2023, the inspectors presented the Onsite Debrief inspection results to Terry Brown, Site Vice President, and other members of the licensee staff.
- On May 19, 2023, the inspectors presented the Interim Exit inspection results to Terry Brown, Site Vice President, and other members of the licensee staff.
- On June 23, 2023, the inspectors presented the special inspection results to Terry Brown, Site Vice President, and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
93812	Corrective Action Documents	CR-2013-10643	Sink Hole Outside Turbine Building North Roll-Up Door 334	07/11/2013
		CR-2019-05840	2019 NRC PI&R: Evaluate Approach to Address Sinkholes	07/10/2019
		CR-2019-05889	2019 NRC PI&R: Minor Violation for Maintenance Rule and Aging Management Evaluations for Sinkholes	07/11/2019
		CR-2021-02350	Sink Hole in Owner Controlled Area	03/29/2021
		CR-2021-04199	Small Sinkhole Identified South of Wellness Center	05/24/2021
		CR-2021-04366	Potential Sinkhole Near Water Treatment Plant	06/01/2021
		CR-2021-04728	Sinkhole Identified in Security Isolation Zone	06/16/2021
		CR-2021-05651	Potential Sinkhole North of Circ Pump House	07/25/2021
		CR-2021-05696	Sink Holes in the Protected Area	07/27/2021
		CR-2021-08529	Sinkhole Under Sidewalk	11/08/2021
		CR-2022-01260	Degraded Storm Drain and Sinkhole Identified in ROCA	02/18/2022
		CR-2022-02401	Cooling Tower Bypass Pipe Support Settlement/Sinkhole	03/19/2022
		CR-2022-03999	Security Zone 9 Sink Holes Continue to Get Worse	05/11/2022
		CR-2022-06310	Sinkhole Training Center Contractor Lot	08/16/2022
		CR-2022-07031	Possible Sink Hole/ Trip Hazard Along Safe Walkway Southwest of the Primary Access Facility	09/15/2022
		CR-2022-07575	North Underground Fire Protection Loop Pipe Rupture	10/10/2022
		CR-2022-07790	Potential Sinkhole Near AC Transformer	10/15/2022
		CR-2022-09856	Potential Sink Hole Identified in Personnel Walkway between PSF and South PAC	12/29/2022
		CR-2023-00052	Sinkhole Near Safe Walkway Zone 5	01/04/2023
		CR-2023-00594	Turbine Building Ground Sinking/Unlevel	01/27/2023
		CR-2023-01041	Sinkhole Degrading Fence in Zone 5	02/15/2023
		CR-2023-01458	Sinkhole Appeared Near the West Gate of the Circ Water Canal	03/01/2023
		CR-2023-01677	Underground Fire Protection Leak Causes Electric Fire Pump to Auto Start	03/07/2023
		CR-2023-02918	108" Potential Sinkholes Summary	04/12/2023
		CR-2023-02948	Conditions Outside of Original Design Tolerance Identified While Mapping the Cooling Tower	04/12/2023

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		CR-2023-03114	Ground Settling Between Old Office Building and Intake Structure	04/16/2023
		CR-G201-2002-04216	East Condenser Pit Has Diesel Fuel Oil Entering from an Unknown Source	08/14/2002
		CR-G201-2002-08323	Water "Gushing" Through the Wall into the Motor Driven Feed Pump Area	10/18/2002
		CR-G201-2003-00494	Potential Fire Protection Piping Leak	01/21/2003
		CR-G201-2005-05713	Electric Fire Pump Auto Start Due to Leak in System	11/23/2005
		CR-G201-2005-05987	Sinkholes Located Near Wooden Walkway by Vault 100	12/28/2005
		CR-G201-2006-02273	Possible Sinkhole Near Fire Hydrant 13	05/12/2006
		CR-G201-2006-02309	Sink Hole Located	05/17/2006
		CR-G201-2006-02346	Sink Hole Located	05/21/2006
		CR-G201-2006-02465	Sink Hole Near Wooden Walkway	06/03/2006
		CR-G201-2006-02699	Sinkhole at Service Building #6	06/29/2006
		CR-G201-2006-02779	Sinkhole Inside the Protected Area	07/11/2006
		CR-G201-2006-11140	Sinkhole East of Old Office Building	12/08/2006
		CR-G201-2007-15989	Sinkhole Found in the Protected Area	03/11/2007
		CR-G201-2007-16214	A New Sinkhole Was Discovered Near the Start-Up Transformers	03/14/2007
		CR-G201-2007-17117	Sinkhole East of PSF	03/29/2007
		CR-G201-2007-20136	Unexpected Auto Start of Electric Fire Pump	05/07/2007

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		CR-G201-2007-20863	Tutorial CR	05/20/2007
		CR-G201-2007-21754	Grounding Wires Outside of LLRW Building Stretched and Clamps Pulled Free	06/07/2007
		CR-G201-2007-22680	A New Sink Hole Has Developed Next the Fire Water Test Header Platform	06/27/2007
		CR-G201-2007-23574	Issue in Analysis of Ground Water Monitoring Sample Results	07/16/2007
		CR-G201-2007-26481	WANO 2007 - AFI ER.3-2, Buried Piping and Cathodic Protection	09/12/2007
		CR-G201-2007-29230	Possible Sink Hole Near Hose House 13	10/26/2007
		CR-G201-2008-32996	108" Circ Water South Pipe Joint Leak	01/09/2008
		CR-G201-2008-34441	Gross Leakage Identified on Circ Water North 108" Cooling Tower Return Line	01/28/2008
		CR-G201-2008-35563	Possible Sinkhole Developing East of PSF	02/19/2008
		CR-G201-2008-39459	Sink Hole	04/30/2008
		CR-G201-2008-41167	Loss of the Turbine Building Domestic Water Header	06/03/2008
		CR-G201-2008-41830	Sink Hole	06/15/2008
		CR-G201-2008-44824	Possible Sinkhole	08/15/2008
		CR-G201-2008-45666	Possible Sinkhole Forming Under Sulfuric Acid Tank, North of Water Treatment	09/02/2008
		CR-G201-2008-47504	Broken Sewer Line Found East Side of PSF	10/07/2008
		CR-G201-2008-47596	Domestic Water Leak Found	10/09/2008
		CR-G201-2008-47835	Electric Fire Pump Start Due to Apparent Leak in Fire Protection System	10/14/2008

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		CR-G201-2008-48288	Leaking Pipe Found	10/22/2008
		CR-G201-2009-53473	Sink Hole Developing East of Plant	02/13/2009
		CR-G201-2009-58566	Sinkhole Inside the Protected Area	05/04/2009
		CR-G201-2009-59505	Water Leaking from Pipe in Grassy Area Near Sewage Treatment Plant	05/21/2009
		CR-G201-2009-62991	Sinkholes Forming North of the Protected Area Fence	08/10/2009
		CR-G201-2009-64067	Thru Wall Hole in Elbow - Underground PVC Domestic Water Line to Circ Pumps	09/04/2009
		CR-G201-2009-68446	Sinkhole at East Side of PSF	12/01/2009
		CR-G201-2009-69100	Sinkhole Forming Inside of PA Perimeter Fence Zone.	12/16/2009
		CR-G201-2010-71890	Sinkhole Found from a Suspected Broken Sewer Force Main	02/22/2010
		CR-G201-2010-72241	Discovered Water Leaking from Ground South of Intake Structure	03/01/2010
		CR-G201-2010-72255	Underground Line Break/Contaminated Leak - Tritium	03/01/2010
		CR-G201-2010-74209	Sinkhole Found from a Suspected Broken Sewer Line	03/25/2010
		CR-G201-2010-76498	Increasing Tritium Trend in Groundwater Well MW-105A	05/06/2010
		CR-G201-2010-77198	Sinkhole Forming in the Protected Area	05/22/2010
		CR-G201-2010-80408	Sinkhole Forming in the NE Corner of the PA	07/28/2010
		CR-G201-2010-80966	Sinkhole Forming North of the Protected Area Fence	08/09/2010
		CR-G201-2010-82006	Sink Hole Developing Outside of the Protected Area Near Pavilion	08/31/2010

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		CR-G201-2010-82850	Sinkhole Forming Near Junction of Old Office Building and Circ. Pump House	09/19/2010
		CR-G201-2010-83147	Underground Piping and Tanks Integrity Initiative	09/24/2010
		CR-G201-2010-86434	Sinkhole Forming on the Southeast Corner of the Protected Area	11/30/2010
		CR-G201-2010-87632	Site Protection Officer Had Incident/Near Miss	12/31/2010
		CR-G201-2011-90244	Sinkhole Forming in the Protected Area	03/01/2011
		CR-G201-2011-91803	Sink Hole Located in Security Zone East of the Circ. Water Canal	03/26/2011
		CR-G201-2011-95260	Sink Hole Identified on the East Side of the PA Near the Delay Fencing	05/21/2011
		CR-G201-2011-95615	Sinkhole Forming in the Protected Area	05/28/2011
		CR-G201-2011-95854	Possible Sink Hole on the West Side of the Plant Near S/U XFMR 02	06/02/2011
		PCAQ-86-0094	Evaluate Potential for 30 Day Report	07/09/1986
		PCAQ-88-0469	Grout Used as Backfill Is Not Allowed	06/24/1988
		PCAQ-94-0232	Domestic Water Pipe Failure	02/29/1994
		PCAQ-94-0855	Sinkhole at the Beach Station Caused by Pipe Leaking	10/01/1994
		PCAQ-95-0529	A Discharge Line Leak at Sanitary Lift Station Causing Sink Hole	06/21/1995
		PCAQ-95-0636	Sink Hole Observed on the West Side of the Wet Wash Facility	08/01/1995
		PCAQ-95-0692	Sink Hole Discovered North and West of the Collection Box	08/18/1995
		PCAQ-95-0964	A Sink Hole Was "Noted" West of BD Transformer	11/16/1995
		PCAQ-96-0015	There Are Possible Voids Underneath the Roadway Pavement Adjacent to Door 300	01/05/1996
		PCAQ-96-0206	Fork Lift Wheel Went Through the Blacktop	02/27/1996
		PCAQ-96-0208	A Sink Hole Was Noted About 30' Northwest of the #2 SU Xfmr Just Outside the Vehicle Barrier	02/27/1996
		PCAQ-96-0243	A Small Sink Hole Developing Between Inner and Outer	03/04/1996

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
			Security Fences	
		PCAQ-97-0093	A Sink Hole Was Observed Behind the Wet Wash Facility (WWF)	01/24/1997
		PCAQ-97-0856	The 4" Sanitary Force Main Near Lift Station #7 May Have a Break Which Has Caused a Sink Hole to Form	06/23/1997
		PCAQ-97-0877	A Sink Hole Has Formed Just North of the Aux Boiler Room Roll-up Door Around Connection Box 13	06/25/1997
		PCAQ-97-1020	Several Sink Hole Have Appeared Within the Protected Area, Due to the Intense Thunderstorm of 7/26/97	07/26/1997
	Corrective Action Documents Resulting from Inspection	CR-2023-03456	North Switch Yard Gate Damaged Hardware and Found Unlocked	04/24/2023
		CR-2023-04944	Insufficient Documentation of Evaluations for Sink Holes/Areas of Settlement within 15 Feet of Safety-Related Structures	06/21/2023
		CR-2023-05000	Failure to Address Adverse Condition (Fire Protection Piping Misalignment) in Corrective Action Program	06/22/2023
	Drawings	ATL-2023-0343-ATA-02	Turbine Building Foundation Drawings	04/25/2023
		ATL-2023-0343-ATA-11	Foundation Drawings for the Low-Level Radwaste (LLRW) Building and Auxiliary Building	04/27/2023
	Miscellaneous		CR Disposition Final	05/16/2023
			Operating Experience White Paper Final	05/12/2023
		ATL-2023-0343-ATA-01	Turbine Building Floor Settling Monitoring	04/25/2023
		ATL-2023-0343-ATA-03	Gypsum Transport in Bedrock	04/24/2023
		ATL-2023-0343-ATA-05	List of CRs/Evaluations Associated with North Turbine Building Floor Settling	04/26/2023
		ATL-2023-0343-ATA-06	Flowable Fill Composition	04/25/2023
		ATL-2023-0343-ATA-08	Cooling Tower Plan of Action	04/26/2023
		ATL-2023-0343-ATA-13	LLRW Building Impact on Auxiliary Building	05/02/2023

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		ATL-2023-0343-ATA-15	Phase I Report - Geology, Seismology, Subsurface Conditions, and Preliminary Foundation Recommendations for Proposed Davis-Besse Nuclear Power Station, Locust Point, Ottawa County, Ohio Prepared for The Toledo Edison Company Under the General Direction of Bechtel Associates by Woodward-Clyde & Associates, Inc.	07/18/1969
		ATL-2023-0343-ATA-21	Evaluation of Deficiencies in Structures Monitoring Program	05/08/2023
		ATL-2023-0343-ATA-28	Crack on EDG Room Wall Exterior	05/09/2023
		ATL-2023-0343-ATA-32	Groundwater Data	05/11/2023
		ATL-2023-0343-ATA-33	Lake Level Changes	05/10/2023
		ATL-2023-0343-ATA-34	Maximum TB Settlement	05/10/2023
		ATL-2023-0343-ATA-35	BMI Cooling Tower Report	05/09/2023
		ATL-2023-0343-ATA-36	Q-Class 1 Fill	05/10/2023
		ATL-2023-0343-ATA-40	Settlement Deflection Limits	05/10/2023
		ATL-2023-0343-ATA-44	Cooling Tower Causes	05/12/2023
	Procedures	EN-DP-01511	Structures Monitoring	14
		EN-DP-01511	Structures Monitoring	11
		MRPM 42	Maintenance Rule Program Manual	42
		NOP-ER-3004	Maintenance Rule Program	6
		NOP-OP-1009	Operability Determinations and Functionality Assessments	9
		NORM-OP-1009	SRO Review of Condition Reports	11
	Work Orders	MWO-1-88-1401	Two Sink Holes Have Developed on the East Side of the PSF Near Hydrant #3 and Sanitary Lift Station #7	05/31/1988

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		MWO-1-88-2312	There is a Sink Hole That Needs Backfilling	07/01/1988
		MWO-1-89-0225	A Sink Hole has Developed in the Area of FP0059	01/25/1989
		MWO-1-89-0391	Sinkhole has Developed Near the South Entrance of the Water Treatment Building	04/26/1989
		MWO-1-90-1351-00	An Area East of the Old Maintenance Shop's Overhead Door is Sinking	06/14/1990
		MWO-1-90-2175-00	A Sink Hole Has Again Developed East of the Old Maintenance Shop	10/18/1990
		MWO-1-91-0764	Investigate the Sink Hole That Has Appeared Outside the Old Maintenance Shop	05/21/1991
		MWO-1-92-1073	A Sink Hole has Developed East of the PSF/Office Building	08/28/1992
		MWO-1-93-1053	Sink Hole Areas Have Developed East of the Old Office Building	08/13/1993
		MWO-1-95-0753	A Sink Hole West of the Wet Wash Facility Appears to be Growing	07/31/1995
		MWO-7-95-0692	A Sink Hole Was Discovered North and West of the Collection Box	11/06/1995
		MWO-80-2776	Excavate Test Pit in Depression Area on Northwest Side of Aux Building	07/02/1980
		MWO-80-3047	Ground Subsidence in the Vicinity of Storm Sewer Line Between Catch Basin #23 and Catch Basin #7	08/24/1980