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DUKE ENERGY

REMEDY SELECTION FINAL REPORT - ASH STORAGE/DISPOSAL AREA

Crystal River Energy Complex
15485 W Power Line Street
Crystal River, Citrus County, Florida

Prepared for
Duke Energy Florida, LLC

Prepared by
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Project Number: FR7786

April 2021

Final Remedy Selection Certification
Crystal River Energy Complex
Ash Storage/Disposal Area Landfill
[40 C.F.R. § 257.97]

Pursuant to 40 C.F.R. § 257.97(a) of The Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) From Electric Utilities; Final Rule, the owner or operator of a CCR unit required to initiate an assessment of corrective measures in accordance with 40 C.F.R. § 257.96(a) must prepare a final report describing the selected remedy and how it meets the standards specified in 40 C.F.R. § 257.97(b). The owner or operator must obtain a certification from a qualified professional engineer that the remedy meets the requirements of 40 C.F.R. § 257.97. In accordance therewith, this certification is provided to document that the remedy selected for the above-referenced CCR unit meets the requirements of 40 C.F.R. § 257.97.

LIMITATIONS

The signature of Consultant's authorized representative on this document represents that to the best of Consultant's knowledge, information, and belief in the exercise of its professional judgment, it is Consultant's professional opinion that the aforementioned information is accurate as of the date of such signature. Any opinion or decisions by Consultant are made on the basis of Consultant's experience, qualifications, and professional judgment and are not to be construed as warranties or guaranties. Opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data, and actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

CONSULTANT'S CERTIFICATION

I, Kwasi Badu-Tweneboah, Ph.D., P.E., being a Registered Professional Engineer, in accordance with the Florida Professional Engineer's Registration, do hereby certify to the best of my knowledge, information, and belief, that the remedy selected meets the requirements of 40 C.F.R. § 257.97.

SIGNATURE Kwasi Badu-Tweneboah Digitally signed by Kwasi Badu-Tweneboah Date: 2021.04.19 14:42:04 -04'00'

DATE _____

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM Assessment of corrective measures

AS/DA Ash Storage/Disposal Area

ASD Alternative source demonstration

CCR Coal combustion residuals

CREC Crystal River Energy Complex

DEF Duke Energy Florida

FDEP Florida Department of Environmental Protection

GCL Geosynthetic clay liner

GWPS Groundwater protection standards

MNA Monitored natural attenuation

PRB Permeable reactive barrier

N&E Nature and extent

O&M Operation and maintenance

RCRA Resource Conservation and Recovery Act

SSI Statistically significant increase

USEPA United States Environmental Protection Agency

1. INTRODUCTION

The United States Environmental Protection Agency's (USEPA) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) From Electric Utilities; Final Rule ("CCR Rule" or "Rule") is contained in 40 C.F.R. § 257 and 261. The CCR Rule requires certain steps to be taken upon detecting, in the groundwater, one or more constituents in Appendix IV of the Rule above the groundwater protection standards. One of the steps is to conduct an assessment of corrective measures (ACM) to determine what remedies may be effective at correcting the groundwater contamination. Prior to selection of a remedy, or remedies, a public meeting must be held to discuss the results of the ACM. Based on the results of the ACM, the owner or operator must select a remedy and prepare a final report describing the selected remedy and how it meets the standards specified in the CCR Rule.

Geosyntec Consultants, Inc. (Geosyntec) has prepared this remedy selection final report (report) on behalf of Duke Energy Florida (DEF) for the Ash Storage/Disposal Area (AS/DA) at the Crystal River Energy Complex (CREC) located in Crystal River, Florida (**Figure 1**). The report meets the general requirements of the CCR Rule contained in 40 C.F.R. § 257.97.

2. SITE HISTORY

The CREC is an electrical power generation facility owned by DEF, located on a 4,730-acre parcel in west central Florida on W. Powerline Street in Crystal River, Florida (**Figure 1**). Plant operations began at the Site in 1966 (Unit 1), and additional units were added in 1969 (Unit 2), 1977 (Unit 3), 1982 (Unit 4), and 1984 (Unit 5). CREC currently consists of two coal-fired steam units (Units 4 and 5). Units 1 and 2 were retired in 2018 and the former nuclear plant (Unit 3) was retired in 2013. In the early 1970s, Units 1 and 2 converted from coal burning operations to oil fired operations and reverted to coal burning operations in 1976 and 1979, respectively. Throughout its operational history, ash generated from coal combustion has typically been sent directly off-site for beneficial use, stored on site awaiting beneficial use, or disposed on site in the permitted AS/DA **(Figure 2)**. Ash generated from coal combustion at the CREC has been stored in the permitted, on-site, AS/DA landfill since 1982. The permitted footprint of the AS/DA is approximately 100 acres, although only approximately 62 acres are used and maintained for the storage of CCR material. About 5.5 acres are lined with a geosynthetic clay liner (GCL) without a leachate collection system. Currently, the ash landfill's north, south, and east slopes are closed with a GCL and a 2-foot thick vegetative soil cover. The remaining slopes of the ash landfill are generally covered with vegetation with the center of the ash landfill available for additional ash disposal.

DEF has owned the Site property since 2012 when it was purchased from Progress Energy Florida (Progress). Progress was formed in 2000 when Carolina Power and Light merged with Florida Power Corporation and changed its name.

3. PROJECT MILESTONES

The following is a list of project milestones completed at the AS/DA since the CCR Rule became effective on October 19, 2015:

- **December 2015 – February 2016**: Installed certified monitoring well network around the AS/DA;
- **January 2016 - September 2017**: Conducted groundwater monitoring (9 events) from all CCR wells at the AS/DA for Appendix III and Appendix IV constituents;
- **September 2017**: Initiated detection monitoring and associated data evaluation;
- **January 2018**: Conducted statistical analyses of Appendix III constituents and identified statistically significant increases (SSIs) for Appendix III constituents in CCR wells around the AS/DA;
- **March 2018**: Transitioned to assessment monitoring;
- **July 2018**: Evaluated groundwater monitoring data for SSLs of Appendix IV constituents that exceeded the groundwater protection standards (GWPS);
- **October 2018 – December 2019**: Conducted nature and extent characterization that included the installation and sampling of 11 additional monitoring wells;
- **January 2019**: Completed alternative source demonstration (ASD) for radium 226 and 228.
- **June 2019**: Completed an ACM;
- **July 2019 - Present**: Evaluation and design of selected remedy(s);
- **March 2020**: Initiated implementation of interim source control measures: and
- **October 2020**: Virtual/online public meeting conducted via Cisco WebEx Video Conferencing software.

3.1 Completion of Required Reports

On behalf of DEF, Geosyntec has completed the following required reports since compliance activities were initiated:

- CCR Rule Groundwater Monitoring Plan, Crystal River Energy Complex, August 2016.
- Groundwater Monitoring System Design and Construction Report, Crystal River Energy Complex, October 2017.
- Groundwater Monitoring Well Design, Installation, Development, and Decommissioning Report, Crystal River Energy Complex, October 2017.
- Statistical Analysis Plan, October 2017.
- CCR Annual Groundwater Monitoring and Corrective Action Report, Crystal River Ash Landfill, Crystal River Energy Complex, January 2018.

- Detection Monitoring Results – Crystal River Energy Complex, January 2018.
- Ash Landfill Comparison of Groundwater Protection Standards – Crystal River Energy Complex, March 2018, May 2018, and October 2018.
- Ash Landfill Groundwater Protection Standards, July 2018.
- CCR Annual Groundwater Monitoring and Corrective Action Report, Crystal River Ash Landfill, Crystal River Energy Complex, January 2019.
- Alternative Source Demonstration Ash Storage/Disposal Area, Crystal River Energy Complex, January 2019.
- Assessment Monitoring Results – Crystal River Energy Complex, March 2019.
- CCR Assessment of Corrective Measures Report, Ash Storage/Disposal Area Crystal River Energy Complex, June 2019.
- Ash Landfill Comparison of Groundwater Protection Standards – Crystal River Energy Complex, March 2019 and October 2019.
- Remedy Selection and Design Semiannual Progress Report – Crystal River Energy Complex, December 2019.
- CCR Annual Groundwater Monitoring and Corrective Action Report, Crystal River Ash Landfill, Crystal River Energy Complex, January 2020.
- Remedy Selection and Design Semiannual Progress Report – Crystal River Energy Complex, June 2020.
- Ash Landfill Comparison of Groundwater Protection Standards – Crystal River Energy Complex, March 2020 and October 2020.
- AS/DA Stormwater Feasibility Study – Crystal River Energy Complex, April 2020.
- Remedy Selection and Design Semiannual Progress Report – Crystal River Energy Complex, December 2020.
- CCR Annual Groundwater Monitoring and Corrective Action Report, Crystal River Ash Landfill, Crystal River Energy Complex, January 2021.

4. ASSESSMENT OF CORRECTIVE MEASURES RESULTS

DEF conducted an ACM for the AS/DA in accordance with § 257.96 after detecting Appendix IV constituents in groundwater that exceeded GWPSs. The ACM was performed with the goals of determining effective ways to prevent further CCR releases, to remediate past releases, and to restore affected areas and groundwater to original conditions (e.g., removal of CCR from the environment and no GWPS exceedances). The ACM report was completed in June 2019 and certified by a qualified professional engineer licensed in the state of Florida. A summary of the report is provided below.

4.1 Groundwater Monitoring and Characterization

Detection monitoring was initiated in 2016, as required by § 257.90(b)(1)(iii). Sampling was performed to establish background concentrations of constituents listed in 40 CFR §257, Appendices III and IV. Sampling for detection monitoring was initiated to meet the requirements of § 257.94. Nine groundwater sampling events were performed during detection monitoring activities for Appendix III and Appendix IV constituents between January 2016 and September 2017. Assessment monitoring was initiated in 2018 after SSIs were detected for several Appendix III constituents in groundwater samples collected downgradient of the AS/DA. Assessment monitoring has been ongoing at the AS/DA and will remain ongoing until the applicable CCR groundwater monitoring requirements have been met. An ASD for total radium was successfully completed in accordance with § 257.95(g)(3)(ii), as shown in Section 3.1.

Arsenic, lithium, molybdenum, and total radium were detected at SSLs greater than GWPSs in one or more monitoring wells in the uppermost aquifer below the CCR unit (AS/DA). Arsenic was generally detected along the northern and western portion of the AS/DA. Lithium and molybdenum were both detected along the southwestern portion of the landfill. While the total radium exceeded the GWPS in several monitoring wells around the AS/DA, it is not considered an exceedance of the GWPS at the CREC based on the findings of the ASD (Geosyntec, 2019). CCR monitoring well construction details are listed in **Table 1** and assessment monitoring results from March and October 2020 are summarized in **Table 2**.

Due to the presence of Appendix IV constituents observed at SSLs greater than their applicable GWPS for arsenic, lithium and molybdenum, further characterization of the nature and extent of groundwater was performed according to the CCR Rule in 40 CFR § 257.95(g)(1). Nature and extent (N&E) characterization was conducted from December 2018 to March in 2019 that included the installation of ten additional monitoring wells near the AS/DA and one downgradient monitoring well along the western property boundary of the CREC. Construction details for the N&E assessment wells are summarized in **Table 1** and locations are shown on **Figure 2**. The N&E investigation for these constituents was completed in March 2019 and is documented in the ACM report (Geosyntec, 2019).

4.2 Potential Source Control Measures

As part of the ACM, source control measures were evaluated to prevent further releases from the source (i.e., the AS/DA). Construction and operation requirements for source control alternatives were also considered as part of this evaluation. Source control can limit contaminant plume migration and ensure associated remedial technologies are effective. The final remedy(s) must control the source of the contamination to reduce or eliminate further releases by identifying and

locating the cause of the release. Source control measures can include modification of operational procedures; effective maintenance activities; and/or excavation of deposited wastes for treatment and/ or off-site disposal.

One or more of the following methods were considered for source control at the AS/DA:

- Closure of the AS/DA in accordance with the CCR Rule which would include the installation of a final cover system;
- Construction of new, smaller, lined landfill within the footprint of the current AS/DA;
- Excavation of CCR from the AS/DA for beneficial use;
- Reconstruction of the western stormwater runoff ditch and installation of a liner in the AS/DA sedimentation basin;
- Remediation of CCR from where it has accumulated in the AS/DA stormwater runoff perimeter ditches; and
- Excavation and disposal of CCR in a new, onsite landfill or at an appropriate off-site disposal facility.

A hybrid approach in lieu of full and/or clean closure, including removal of CCR from the landfill for off-site beneficial use (e.g., cement, construction materials, agriculture, etc.) and relocating a portion of the CCR into a smaller landfill constructed on-site within the footprint of the AS/DA was considered. This smaller landfill would have required new construction within the AS/DA, including liner and final cover systems permitted and constructed according to Florida Department of Environmental Protection (FDEP) solid waste disposal and CCR Rule requirements including the appropriate management of stormwater runoff and leachate.

The selected remedy includes a combination of the above described measures. However, regardless of the approach taken, accumulated CCR in the AS/DA stormwater runoff ditches and stormwater pond (i.e., sedimentation basin) must be remediated by removal. This activity was initiated in March 2020 in accordance with § 257.98(a)(3). The final, selected source control measures will substantially reduce the leaching of the constituents of interest (COI) into groundwater from the AS/DA.

4.3 Potential Groundwater Remedial Technologies

The potential remedial technologies to address the inorganic constituents (arsenic, lithium, molybdenum) detected above the GWPS at the AS/DA are limited due to their variable geochemical properties. The following list includes groundwater remedial technologies that were evaluated in the ACM for potential implementation at the AS/DA:

- In-Situ Technologies
    - Groundwater Migration Barriers
    - In-Situ Chemical Immobilization
    - Permeable Reactive Barriers (PRBs)
- Groundwater Extraction

    - Conventional Vertical Well Systems
    - Phytoremediation
- Groundwater Treatment
- Monitored Natural Attenuation (MNA)

A detailed screening matrix of these groundwater remediation technologies is included in **Table 3.** The matrix provides a summary of each technology and includes an analysis of the effectiveness of these potential corrective measures to meet the requirements and objectives of the selected remedy. This information was also provided in the ACM report (Geosyntec, 2019).

As summarized in **Table 3**, in-situ technologies such as groundwater migration barriers, in-situ chemical immobilization and permeable reactive barriers are not viable due to their limited reliability and poor performance in the geologic conditions (e.g., karst) present at the CREC. The effectiveness of these technologies is limited by the presence of subsurface voids and the possibility of exacerbating existing karst features in critical areas around the AS/DA and the CREC. Additionally, these in-situ technologies would be very difficult to implement, present unacceptable safety hazards for workers and the surrounding environment and involve significant and unacceptable costs. Monitored natural attenuation is a viable technology; however, it cannot be implemented until source control measures have been completed.

The performance and reliability of the ex-situ technologies, including groundwater extraction and treatment and phytoremediation, are also limited due to the presences of karst and the presence of salt water (the CREC is located along the Gulf coast). The karst environment would make groundwater extraction very difficult due to the potential subsurface voids that could significantly impede the pumping system and the corrosive effects of salt water (mixed with groundwater) would have significant negative impacts on the groundwater extraction and treatment system equipment. Additionally, the karst geology and presence of salt water would severely limit the reliability and performance of a phytoremediation system. A suitable species of plant that could survive in a saltwater environment and function as needed (sufficient water uptake) could not be identified during the ACM study.

4.4 Public Meeting

Prior to the selection of remedy and preparation of this remedy selection report, a public meeting was held on October 15, 2020, as required in § 257.96(e) of the CCR Rule. The public meeting was conducted in a virtual/online format via Cisco WebEx Video Conferencing software where DEF presented information regarding the implementation of the CCR Rule requirements and proposed a remedy to address the GWPS exceedances documented at the AS/DA.

5. SELECTED REMEDY

The selected remedy for the AS/DA will rely primarily on source control and include remediation of CCR from the landfill stormwater runoff ditches, reconfiguration and lining of the western stormwater runoff ditch and sedimentation basin, and continued beneficial use of CCR material.

5.1 Stormwater Ditches

The stormwater runoff ditches surrounding the AS/DA (**Figure 2**) receive contact stormwater and CCR residuals or sediments from the active areas of the landfill. The ditches are not lined and the accumulation of CCR is a potential source of leaching (arsenic, lithium and molybdenum) to groundwater. DEF will remediate (excavate) the residual CCR to mitigate leaching of COIs to groundwater. Additionally, the western stormwater runoff ditch will be reconstructed and lined and DEF will also implement a maintenance plan to remove CCR from the lined western ditch on a regularly scheduled basis. Remediating the ditches by removing accumulated CCR and lining the western ditch represents removal of a source of leaching (arsenic, lithium, molybdenum) to groundwater at the AS/DA.

5.2 Sedimentation Basin

The sedimentation basin on the western portion of the AS/DA, is unlined and receives contact stormwater and CCR or sediments from the active portion of the landfill and western ditch. CCR from the sedimentation basin is periodically removed and placed back in the active portion of the landfill as needed. Contact stormwater from the sedimentation basin discharges to the stormwater drainage pond and perimeter (eastern and northern) ditches for subsequent treatment and percolation to groundwater in accordance with the State's permit requirements. DEF will reconfigure/reconstruct the basin to include a liner system to prevent CCR solids trapped in the basin from coming in contact with groundwater and a discharge control structure to prevent CCR solids from entering the stormwater runoff pond and perimeter ditch system. Lining the sedimentation basin represents the removal of a source of leaching (arsenic, lithium, molybdenum) to groundwater at the AS/DA.

5.3 Beneficial Use

DEF has historically reclaimed CCR from the AS/DA for beneficial use in various industries (cement manufacturing, wall board, construction material, agriculture, etc.). DEF will continue this activity until all reusable CCR has been removed and/or CCR is no longer generated by the CREC. CCR that is not beneficially used will remain in the onsite permitted landfill until it is closed in accordance with the CREC's State permit requirements and in accordance with the CCR Rule.

5.4 Corrective Action Groundwater Monitoring

DEF will establish and implement a corrective action groundwater monitoring program that: (i) meets the requirements of an assessment monitoring program under § 257.95; (ii) documents the effectiveness of the corrective action remedy; and (iii) demonstrates compliance with the GWPSs. DEF will review the corrective action groundwater monitoring data to evaluate the effectiveness of the selected remedy. If it appears that the selected remedy is not meeting the objective of achieving compliance with the GWPS, DEF will consider additional remedies for the AS/DA.

6. REMEDY REQUIREMENTS

§ 257.97(b) states that "*remedies must: (1) Be protective of human health and the environment; (2) Attain the groundwater protection standard as specified pursuant to § 257.95(h); (3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment; (4) Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; (5) Comply with standards for management of wastes as specified in § 257.98(d).*"

As stated in Section 5.5, the selected remedy for the AS/DA will rely primarily on source control and include remediation of CCR from the landfill stormwater runoff (perimeter) ditches and pond, reconfiguration and lining of the western stormwater runoff ditch and sedimentation basin, and continued beneficial use of CCR material.

6.1 Human Health & the Environment

The impacted groundwater identified during the assessment monitoring program is not migrating away from the perimeter of the landfill and is not a threat to any sensitive receptors located upgradient or downgradient of the CREC. This has been confirmed from the results of the sampling conducted in the N&E wells installed as part of the CCR Rule-required contaminant plume delineation process. The selected remedy adequately protects human health and the environment, in both the short- and long-term, from risks posed by the CCR present at the site by eliminating, reducing, and/or controlling exposures.

6.2 Groundwater Protection

CCR from the landfill, contact stormwater runoff ditches and pond, and sedimentation basin are the source of the groundwater impacts around the AS/DA. The selected remedy will minimize any future release of CCR to groundwater and enable DEF to attain the GWPS established at the AS/DA.

6.3 Source Control

The USEPA's "Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action" (USEPA, 2004), states that source control is a critical component of a facility's cleanup strategy for the remediation of groundwater in a reasonable timeframe and is consistent with the USEPA's long-standing pollution prevention goals. Source control measures associated with the remedy will minimize the release of CCR from the landfill to the surrounding stormwater ditches that are hydraulically connected to the groundwater. Additionally, lining of the sedimentation basin and western stormwater runoff ditch will minimize the release of contact stormwater to the groundwater, and the continued beneficial use will, over time, minimize the amount of CCR in the landfill.

6.4 CCR Removal

Source control implementation requires the removal of CCR from the stormwater runoff ditches, stormwater pond, and sedimentation basin associated with the AS/DA. As a means of source control, CCR removal from these features will facilitate the remediation of groundwater.

6.5 Waste Management

All CCR that are managed pursuant to this remedy required under § 257.97, or an interim measure required under paragraph (a)(3) of this section (i.e., § 257.97), shall be managed in a manner that complies with all applicable Resource Conservation and Recovery Act (RCRA) requirements. CCR material removed from the stormwater runoff ditches, stormwater ponds or sedimentation basin will be placed in the permitted AS/DA or disposed offsite as appropriate.

7. REMEDY CONSIDERATIONS

DEF considered the following evaluation factors in selecting the remedy for the AS/DA to meet the standards described in Section 6 of this report.

7.1 Effectiveness and Protectiveness of Remedy

The USEPA's "Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action" (USEPA, 2004) states that source control is a critical component of a facility's cleanup strategy for the remediation of groundwater in a reasonable timeframe and is consistent with the USEPA's long-standing pollution prevention goals. In fact, USEPA states a facility must control sources of groundwater contamination to achieve cleanup goals and GWPS. Therefore, DEF concludes that the selected remedy is appropriate and will provide both short-and long-term effectiveness and protectiveness of groundwater at the AS/DA. The reconstruction of the sedimentation basin to include a liner system will significantly reduce the risk of a CCR release from the AS/DA. CCR material deposited in the sedimentation basin will be removed and placed in the active portion of the landfill as part of the AS/DA operation and maintenance (O&M) plan. Contact stormwater is collected in the lined sedimentation basin to remove solids and CCR. DEF will also implement the O&M plan to remove CCR from the lined sedimentation basin and stormwater ditches surrounding the AS/DA on a regularly scheduled basis. This maintenance will be performed until the AS/DA is closed in accordance with existing State permit and the CCR Rule requirements.

The likelihood of further CCR releases following implementation of the remedy is minimal and virtually no short- or long-term risks are posed to the community or the environment during implementation, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of CCR. However, DEF will consider additional remedies for the AS/DA if the goals (to meet the GWPS) are not achieved.

7.2 Control of Future Potential Releases

Reconstruction of the sedimentation basin to include a liner system will significantly reduce the risk of a CCR release from the AS/DA. CCR material deposited in the sedimentation basin will be removed and placed in the active portion of the landfill. Contact stormwater will be treated in the lined sedimentation basin (after allowing settling to remove solids/CCR) and discharged to the CREC's permitted industrial wastewater system. DEF does not anticipate the need for additional treatment technologies at this time.

7.3 Implementability

The degree of difficulty associated with constructing and implementing the selected remedy is moderate. The reconstructed sedimentation basin, control of contact stormwater and ditch maintenance is a straightforward and reliable approach to contain CCR within the AS/DA landfill. No special equipment is required to construct or implement the selected remedy. However, a modification to the CREC's conditions of certification (COC) (State of Florida operating permit) will be required.

7.4 Duke Response to Community Concerns

As stated in § 257.97 (c)(4), DEF must consider the degree to which community concerns are addressed by the selected remedy. DEF provided responses to public concerns and questions submitted by online participants during the questions and answers portion of the public meeting on October 15, 2020 via WebEx teleconference. Subsequent concerns and questions were provided in writing to DEF by various public entities and private citizens prior to October 30, 2020. While some of the concerns or questions posed during the public meeting were out of scope of this remedy selection process, many of the concerns were addressed directly with the entities or citizens.

In general, the following responses are provided by DEF to address concerns or questions expressed during the public input process. For the reasons discussed below, DEF has no current plans to perform additional studies at the AS/DA to facilitate the remedy selection process. Supplemental studies or actions may be undertaken in the future once DEF implements the remedy currently selected, and groundwater monitoring data provides feedback regarding the efficacy of the selected remedy. DEF is certain the groundwater dataset, and technology evaluation produced pursuant to the requirements of the CCR Rule, is sufficient to select and implement this remedy as soon as possible. By nature of continued groundwater monitoring (corrective action groundwater monitoring), the performance of the remedy will be evaluated. This makes a delay in implementing the remedy unnecessary. Based on data from the original CCR Rule groundwater monitoring network and the additional nature and extent of plume delineation wells installed in accordance with the CCR Rule, DEF has a sufficient understanding of the groundwater conditions at the AS/DA allowing for implementation of this remedy. Based on currently available information, DEF is reasonably confident that the remedy will restore the groundwater constituents to levels at or below GWPS. In response to questions regarding whether other constituents should be remediated, only constituents determined to be above GWPS by the CCR Rule have been included in this particular remedy selection process as required by the CCR Rule. As discussed herein, those constituents are arsenic, lithium, and molybdenum. Additionally, in relation to concerns regarding potential migration of constituents, current data indicates that GWPS exceedances of arsenic, molybdenum, and lithium associated with CCR from the AS/DA are localized and limited to the vicinity of the AS/DA.

The selected remedy is sufficient based on the following:

- Monitoring data show public and private groundwater resources have not, and will not be impacted by the groundwater impacts identified near the AS/DA;
- Monitoring data show the Gulf of Mexico has not been, and will not be impacted by the groundwater impacts identified near the AS/DA; and
- The source control measures proposed by DEF are proven and effective methods that will minimize the source of groundwater contamination by reducing the leaching of arsenic, molybdenum and lithium from the CCR present in the stormwater ditches and sedimentation basin at the AS/DA landfill.

DEF discussed the presence of naturally occurring levels of CCR constituents (e.g., arsenic) that are present in the soil and groundwater in this area of Citrus County. The presence of arsenic in soil and groundwater in Citrus County has been documented by the FDEP and the Florida Department of Health. DEF will continue to monitor groundwater quality at the CREC and near

the AS/DA to ensure that groundwater impacts associated with the landfill are not migrating (i.e., stable). DEF will also continue to monitor the levels of naturally occurring constituents (e.g., arsenic and lithium) that are not associated with a release of CCR from the landfill.

Source control measures consisting of removal of CCRs from the ditch system and sedimentation basin, coupled with continued off-site beneficial use of CCRs will improve groundwater quality. Corrective action groundwater monitoring will be conducted during and after the implementation of the remedy to assess its effectiveness. If it is determined that the selected remedy is not meeting the ultimate objective of achieving compliance with the GWPS, additional/alternative remedies for the AS/DA will be considered.

8. IMPLEMENTATION SCHEDULE

DEF has developed a schedule (**Table 4)** for implementing and completing remedial activities for the AS/DA based on the following factors.

8.1 Nature and Extent of Groundwater Contamination

The extent of GPWS exceedances are limited to the CCR wells immediately adjacent to the AS/DA. Due to the limited extent of groundwater impacts at the AS/DA, DEF proposes an initial remediation time frame of five years contingent on successful completion of the selected remedy. This time frame was selected based on USEPA's CERCLA process to review the effectiveness of remedies at every five years (USEPA, 2003).

8.2 Remedy Reliability

Based on previous studies performed at the CREC, the detection of COIs in groundwater at the AS/DA is primarily due to leaching from CCR in the stormwater ditches and unlined sedimentation basin. Eliminating these sources will result in the attenuation of current GWPS exceedance and prevent future groundwater impacts associated with CCR which will enhance the remediation time frame.

8.3 Waste Management

All CCR that are managed during remedy implementation will be managed in a manner that complies with all applicable RCRA requirements. Waste management activities will not impede the proposed remediation time frame. The remedy implementation process should not interfere with beneficial use of CCR generated at the CREC.

8.4 Potential Risk to Human Health & the Environment

Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy is extremely limited. The closest residence is approximately three miles east of the CREC and hydraulically upgradient. Therefore, DEF does not anticipate any delays in the remediation time frames from risk to human health and the environment.

8.5 Potential Impacts to Groundwater Resources

There are no public, groundwater supply sources in the vicinity or downgradient from the AS/DA. DEF currently uses groundwater from their industrial supply wells located east of the CREC with no foreseeable impact to other groundwater users in the area. Shallow groundwater in the immediate vicinity of the AS/DA is potable; however, water quality decreases with depth and farther west due to saltwater intrusion which is natural for areas along the Florida Gulf coast. These factors do not present any potential delays to project implementation and completion.

The hydrogeologic characteristics of the CREC, AS/DA, and surrounding area is described as karst. Karst geology is often difficult to assess and requires rigorous investigations to accurately characterize groundwater flow and quality. However, even detailed studies of karst environments can lack sufficient detail to accurately characterize a site's hydrogeology, including groundwater flow and contaminant distribution and attenuation. Therefore, this factor was considered when developing the proposed implementation and remedy completion schedule.

8.6 Other Relevant Factors

Groundwater impacts associated with CCR in and around the AS/DA is limited to the area immediately around the landfill. Additionally, assessment and N&E monitoring data show that groundwater is not migrating away from the landfill and GWPS exceedances have not been reported in the CCR monitoring well downgradient of the landfill, along CREC's western boundary. There is no potential for damage to wildlife, crops, vegetation, and physical structures caused by exposure to CCR constituents and no need for alternative water supplies in the vicinity of the CREC. Therefore, these factors do not represent a potential delay to the project implementation or completion schedule.

9. SUMMARY

- On October 15, 2020, DEF conducted a virtual public meeting to present information regarding the implementation of CCR Rule activities at the CREC and to discuss the proposed remedy for the AS/DA at the CREC as required by § 257.96(e).
- DEF selected a remedy for the AS/DA to meet the requirements of § 257.97(b).
- The remedy was developed to address the GWPS exceedances reported in groundwater for arsenic, lithium, and molybdenum.
- The selected remedy will rely primarily on source control and include remediation of CCR from the landfill stormwater runoff ditches and pond, reconfiguration of the western stormwater runoff ditch and lining of the sedimentation basin, and continued beneficiation of CCR material from the AS/DA.
- DEF concludes that the selected remedy can adequately address both short- and long-term risks to human health and the environment. The selected remedy will also minimize any future release of CCR to the environment and will be protective of groundwater quality at the AS/DA.
- DEF concludes the selected remedy will provide both short-and long-term effectiveness and protectiveness of groundwater at the AS/DA and significantly reduce the risk of a CCR release from the AS/DA and will be straightforward to implement.
- Due to the karst geology at the CREC, characterization of the site's hydrogeology and geochemistry (groundwater flow and contaminant distribution) may require additional time to evaluate. Therefore, the necessary time was added to the schedule to account for this concern.
- DEF will implement a corrective action groundwater monitoring program to evaluate the effectiveness of the selected remedy. If it appears that the selected remedy is not meeting the ultimate objective of achieving compliance with the GWPS, DEF will consider additional/alternative remedies for the AS/DA.
- Corrective action progress and efficacy of the remedy will be documented in the Annual Groundwater Monitoring and Corrective Action Report. This report will be posted to the Duke CCR Rule Compliance Data and Information Internet site no later than March 2 each year.

10. REFERENCES

Geosyntec Consultants, 2019. *CCR Assessment of Corrective Measures Report, Ash Storage/Disposal Area Crystal River Energy Complex*.

United States Environmental Protection Agency. 2003. *Five-Year Review Process in the Superfund Program.* EPA 540-F-02-004.

United States Environmental Protection Agency. 2004. *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action*. EPA 530-R-04-030.

TABLES

Table 1: Monitoring Well Construction Details

Crystal River Energy Complex
Crystal River, FL

Well ID	Diameter (in)	Designation	CCR Unit Monitored	Northing	Easting	Ground Surface Elevation	TOC Elevation	Total Depth (ft bls)	Screen Interval (ft bls)	Top of Screen Elevation	Bottom of Screen Elevation
CCRBW-2	2	Background	AS/DA Landfill	1684327.487	437004.706	8.48	8.57	20	10-20	-1.52	-11.52
CCRW-5	2	Assessment	AS/DA Landfill	1685764.352	435524.800	6.00	8.98	20	10-20	-4.00	-14.00
CCRW-6	2	Assessment	AS/DA Landfill	1685762.561	436167.540	6.10	8.83	20	10-20	-3.90	-13.90
CCRW-7	2	Assessment	AS/DA Landfill	1685760.703	436481.554	6.19	9.45	20	10-20	-3.81	-13.81
CCRW-8	2	Assessment	AS/DA Landfill	1685712.995	436901.453	9.36	12.59	20	10-20	-0.64	-10.64
CCRW-9	2	Assessment	AS/DA Landfill	1685201.772	435632.332	8.54	11.76	20	10-20	-1.46	-11.46
CCRW-10	2	Assessment	AS/DA Landfill	1684831.307	435841.956	7.35	10.62	20	10-20	-2.65	-12.65
CCRW-10R	2	Assessment	AS/DA Landfill	1684831.546	435829.248	9.25	9.15	21	11-21	-1.75	-11.75
CCRW-11	2	Assessment	AS/DA Landfill	1684055.690	435869.500	5.72	8.55	20	10-20	-4.28	-14.28
CCRW-12	2	Assessment	AS/DA Landfill	1683815.262	435864.677	5.91	9.08	20	10-20	-4.09	-14.09
CCRW-13	2	Assessment	AS/DA Landfill	1683546.974	436109.647	5.36	8.49	20	10-20	-4.64	-14.64
CCRW-14	2	Assessment	AS/DA Landfill	1683225.250	436598.381	6.60	9.74	20	10-20	-3.40	-13.40
CCRW-15	2	Assessment	AS/DA Landfill	1683243.794	436896.326	5.78	8.99	20	10-20	-4.22	-14.22
CCRW-16	2	Assessment	AS/DA Landfill	1685511.490	435436.050	9.42	12.25	20	10-20	-0.58	-10.58
CCRW-17	2	Assessment	AS/DA Landfill	1684659.390	435791.870	8.92	8.70	20	10-20	-1.08	-11.08
CCRW-18	2	Assessment	AS/DA Landfill	1684259.560	435793.770	9.12	8.84	20	10-20	-0.88	-10.88
CCRW-20	2	N & E	AS/DA Landfill	1682140.828	436689.782	4.87	8.04	20	10-20	-5.13	-15.13
CCRW-21	2	N & E	AS/DA Landfill	1682142.844	436674.949	4.85	7.87	50	40-50	-35.15	-45.15
CCRW-22	2	N & E	AS/DA Landfill	1683440.519	434457.474	6.75	9.92	50	40-50	-33.25	-43.25
CCRW-23	2	N & E	AS/DA Landfill	1684918.923	434891.301	8.15	11.39	20	10-20	-1.86	-11.86
CCRW-24	2	N & E	AS/DA Landfill	1685922.669	435202.194	8.60	8.28	20	10-20	-1.40	-11.40
CCRW-25	2	N & E	AS/DA Landfill	1685913.607	436223.836	8.66	8.32	20	10-20	-1.34	-11.34
CCRW-26	2	N & E	AS/DA Landfill	1685913.767	436207.719	8.63	8.28	50	40-50	-31.37	-41.37
CCRW-27	2	N & E	AS/DA Landfill	1684067.448	431481.619	4.22	7.04	20	10-20	-5.78	-15.78
CCRW-28	2	N & E	AS/DA Landfill	1685913.760	436216.110	8.65	8.21	100	90-100	-81.35	8.65
CCRW-29	2	N & E	AS/DA Landfill	1682833.810	436689.650	5.72	8.37	50	40-50	-34.28	-44.28
CCRW-30	2	N & E	AS/DA Landfill	1682834.900	436678.730	5.65	8.14	20	10-20	-4.35	-14.35

Notes

1. in indicates inches
2. TOC indicates Top of Casing
3. ft bls indicates Feet Below Land Surface
4. Horizontal datum surveyed to the North American Datum (NAD) of 1983.
5. Vertical datum surveyed to the National Geodetic Vertical Datum (NGVD) of 1929.
6. AS/DA Landfill indicates Ash Storage/Disposal Area Landfill
7. CCRW-10 was abandoned and replaced by CCRW-10R on December 7, 2020
8. N & E - CCR Nature and Extent Assessment Well

TABLE 2
ASSESSMENT MONITORING RESULTS
APPENDIX IV CONSTITUENTS
CRYSTAL RIVER ENERGY COMPLEX
CRYSTAL RIVER, FL

		Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride	Lead	Lithium	Mercury	Molybdenum	Total Radium	Selenium	Thallium
Units		**mg/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**mg/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**pCi/L**	**ug/L**	**ug/L**
Groundwater Protection Standard[1]		**6**	**10**	**2000**	**4**	**5**	**100**	**6***	**4**	**15***	**40***	**2**	**100***	**5**	**50**	**2**
Well ID	**Sample Date**	**2020 Assessment Monitoring Results**														
CCRW-5	3/9/2020	0.0005 U	4.3	23.6	1.6U	0.33U	1.7U	0.96U	0.068	0.50U	29.8U	0.10U	14.1	3.79	0.50U	0.11U
	10/14/2020	0.0005 U	5.3	24.2	0.17U	0.33U	1.7U	1.5 I	0.061	0.22U	29.8U	0.090U	11.7	5.57	1.2U	0.11U
CCRW-6	3/9/2020	0.0005 U	3.1	7.5 I	1.6U	0.33U	1.7U	0.96U	0.094	0.50U	29.8U	0.10U	28.6	2.28	2.1	0.31 I
	10/14/2020	0.0005 U	0.55 I	8.3 I	0.17U	0.33U	1.7U	0.96U	0.059	0.22U	29.8U	0.090U	26.6	3.57	4.1	0.24 I
CCRW-7	3/9/2020	0.0005 U	31.5	16.9	1.6U	0.33U	1.7U	2.5 I	0.092	0.50U	29.8U	0.10U	9.4 I	13.4	0.50U	0.11U
	10/14/2020	0.0005 U	84	25.5	0.17U	0.33U	1.7U	3.4 I	0.076	0.22U	29.8U	0.090U	11.1	20.5	1.2U	0.11U
CCRW-8	3/9/2020	0.0005 U	28.5	15.4	1.6U	0.33U	1.7U	2.2 I	0.069	0.50U	29.8U	0.10U	14.7	4.98	0.50U	0.11U
	10/14/2020	0.0005 U	29.2	14.6	0.17U	0.33U	1.7U	2.5 I	0.084	0.22U	29.8U	0.090U	17	3.81	1.2U	0.11U
CCRW-9	3/9/2020	0.0005 U	1.7	60.8	1.6U	0.33U	1.7U	0.96U	0.086	0.50U	29.8U	0.10U	5.3 I	8.05	0.50U	0.11U
	10/14/2020	0.0005 U	1.7	65.7	0.17U	0.33U	1.7U	1.4 I	0.059	0.22U	29.8U	0.090U	16.3	9.4	1.2U	0.11U
CCRW-10	3/9/2020	0.0005 U	7	52.2	1.6U	0.33U	1.7U	0.96U	0.38	0.50U	29.8U	0.10U	73.2	5.01	0.50U	0.11U
	10/14/2020	0.0005 U	11	49.6	0.17U	0.33U	1.7U	1.2 I	0.23 I	0.22U	29.8U	0.090U	66.2	6.86	1.2U	0.11U
CCRW-11	3/9/2020	0.0005 U	37.9	62	1.6U	0.33U	1.7U	0.96U	0.4	0.50U	171	0.10U	215	10.2	0.50U	0.11U
	10/14/2020	0.0005 U	33.7	60.7	0.17U	0.33U	1.7U	0.96U	0.36	0.22U	89.2	0.090U	141	10.8	1.2U	0.11U
CCRW-12	3/9/2020	0.0005 U	33.5	126	1.6U	0.33U	1.7U	0.96U	0.26	0.50U	29.8U	0.10U	124	8.92	0.50U	0.11U
	10/14/2020	0.0005 U	66.1	126	0.17U	0.33U	1.7U	0.96U	0.41	0.22U	49.7 I	0.090U	249	7.83	1.2U	0.11U
CCRW-13	3/9/2020	0.0005 U	14.9	20.7	1.6U	0.33U	1.7U	0.96U	0.082 I	0.50U	29.8U	0.10U	84.8	6.11	0.50U	0.11U
	10/14/2020	0.0005 U	18.4	20	0.17U	0.33U	1.7U	0.96U	0.074 I	0.22U	29.8U	0.090U	68.7	4.65	1.2U	0.11U
CCRW-14	3/10/2020	0.0005 U	5.1	42.1	1.6U	0.33U	1.7U	0.96U	0.044 I	0.50U	350	0.10U	297	5.51	0.65 I	0.11U
	10/14/2020	0.0005 U	4.3	39.4	0.17U	0.33U	1.7U	0.96U	0.066	0.22U	134	0.090U	326	3.72	1.2U	0.11U
CCRW-15	3/10/2020	0.0005 U	1.0 I	28.1	1.6U	0.33U	1.7U	0.96U	0.11	0.50U	29.8U	0.10U	12.9	5.93	0.50U	0.11U
	10/14/2020	0.0005 U	1.1	34.2	0.17U	0.33U	1.7U	0.96U	0.077	0.22U	29.8U	0.090U	13.4	5.72	1.2U	0.11U
CCRW-16	3/9/2020	0.0005 U	9	53.1	1.6U	0.33U	1.7U	0.96U	0.13	0.50U	29.8U	0.10U	20.7	15.7	0.50U	0.11U
	10/14/2020	0.0005 U	8.9	63.5	0.17U	0.33U	1.7U	0.96U	0.12 I	0.22U	29.8U	0.090U	31.6	18.2	2.3	0.11U
CCRW-17	3/9/2020	0.0011	34.1	46.8	1.6U	0.33U	1.7U	1.9 I	0.7	0.50U	29.8U	0.10U	65	4.49	0.50U	0.50 I
	10/15/2020	0.00072 I	24.3	65.7	0.17U	0.33U	1.7U	2.2 I	0.56	0.22U	42.1 I	0.090U	53.4	6.57	1.2U	0.38 I
CCRW-18	3/9/2020	0.0005 U	41.8	46.2	1.6U	0.33U	1.7U	1.9 I	0.12	0.50U	138	0.10U	413	12.9	0.50U	0.11U
	10/15/2020	0.0005 U	50.4	49.1	0.17U	0.33U	1.7U	1.8 I	0.14	0.22U	94.3	0.090U	259	16.6	1.2U	0.11U

Notes:

[1] Groundwater protection standard represents USEPA Maximum Contaminant Level unless specified otherwise.

µg/L - micrograms per litre

mg/L - milligrams per litre

pCi/L - picoCuries per liter

Total Radium - the sum of radium-226 + radium-228

STD - standard units

- highlighted text indicates concentration above groundwater protection standard

TABLE 3
REMEDIAL TECHNOLOGIES SCREENING MATRIX
40 CFR § 257.96(c) REQUIREMENTS

Crystal River Energy Complex
Crystal River, FL

	In-Situ Strategies				Ex-Situ Strategies		
	Permeable Reactive Barriers	**Groundwater Flow Barriers**	**Chemical Immobilization**	**Monitored Natural Attenuation**	**Conventional Groundwater Extraction**	**Phytoremediation**	**Groundwater Treatment**
40 CFR § 257.96(c)(1)							
Performance	Low to Moderate - commercially-available media for lithium treatment are not well documented; groundwater may migrate around or beneath reactive zones in karst features	Low to Moderate - groundwater may migrate around or beneath low permeability zones in karst features	Low to Moderate - commercially-available reagents for lithium treatment are not well documented; karst features present reagent delivery challenges	Moderate to High - physical processes including dilution, dispersion, and sorption will reduce concentrations in conjunction with source control	Moderate to High - established technology; karst features could impact hydraulic control	Moderate to High - growing conditions conducive; self-sustaining and predictable after root network forms; challenges with high concentrations of TDS and chloride and high transmissivity of the aquifer	Moderate to High - established technology with adaptability for treatment; high concentrations of dissolved ions likely to generate concentrated secondary waste streams
Reliability	Low to Moderate - karst features will require extensive grouting of voids; absence of low permeability zone at barrier base may increase flow beneath; bench-scale studies will be required to evaluate lithium removal	Low to Moderate - karst features will require extensive grouting of voids; absence of low permeability zone at barrier base may increase flow beneath	Low to Moderate - lithium treatment is not well documented and would require bench-scale studies to evaluate removal; karst features can minimize the effective distribution of chemical agents that limits treatment effectiveness	High - inherent porous nature of limestone and karst features at shallow depths readily promote physical attenuation mechanisms; groundwater flow regime is predictable and reliable	Moderate to High - designed to capture and contained dissolved plume; dependent on consistent O&M to mitigate mechanical fouling; potential corrosion issues from high chloride concentrations across Site	Moderate to High - trees able to grow most of the year in Florida; performance is reliable after establishing root network; limited O&M activities that include pruning and vegetation maintenance	High - wide variety of adaptable treatment options; the use of multiple technologies is likely to treat COI

TABLE 3
REMEDIAL TECHNOLOGIES SCREENING MATRIX
40 CFR § 257.96(c) REQUIREMENTS
Crystal River Energy Complex
Crystal River, FL

	In-Situ Strategies				Ex-Situ Strategies		
	Permeable Reactive Barriers	**Groundwater Flow Barriers**	**Chemical Immobilization**	**Monitored Natural Attenuation**	**Conventional Groundwater Extraction**	**Phytoremediation**	**Groundwater Treatment**
Ease of Implementation	Difficult - extensive geological and geotechnical investigations required prior to construction due to karst features; extensive grouting and/or other ground improvement to fills detected voids; significant construction timelines, costs, and effort	Difficult - extensive geological and geotechnical investigations required prior to construction due to karst features; extensive grouting and/or other ground improvement to fills detected voids; significant construction timelines, costs, and effort	Moderate - less extensive geological investigations to identify karst features prior to installation of permanent injection wells compared to installing barriers; less construction timelines, costs, and efforts required to install injection wells	Easy - periodic groundwater sampling in existing well network; results may dictate the addition of more wells to support lines of evidence	Moderate - aquifer testing and modeling required prior to implementation for well network design; implementation involves installing extraction and injection well network and associated plumbing, pumps, and wiring; routine O&M and cleaning requirements	Moderate - aquifer testing and modeling required prior to implementation for well network design; implementation involves installing wells and planting trees; routine landscape maintenance requirements such as pruning and fertilizing	Moderate - aquifer testing and modeling required prior to implementation for well network design; implementation involves installing extraction and injection well network and associated treatment train; routine O&M and cleaning requirements
Potential Safety Impacts	High - construction hazards for workers including deep, open trenches and heavy construction equipment	High - construction hazards for workers including deep, open trenches and heavy construction equipment	Low - potential for chemical exposure during injection events; potential worker risks with long-term storage of on-Site chemicals	Low - potential worker safety issues during drilling, installation, and construction of wells; minimal safety risks compared to other strategies during groundwater sampling	Moderate - potential worker safety issues during drilling, installation, and construction of wells; potential physical and/or electrical safety concerns during routine O&M	Low - potential worker safety issues during drilling, installation, and construction of wells; reduced maintenance requirements with fewer physical risks compared to groundwater extraction	Moderate - potential worker safety issues during drilling, installation, and construction of wells and treatment train; potential physical, chemical, and/or electrical safety concerns during routine O&M
Potential Cross-Media Impacts	Moderate - potential for groundwater to flow beneath or around barriers	Moderate - potential for groundwater to flow beneath or around barriers	Low - potential for unintended chemical releases aboveground that do not pose adverse environmental impacts for uncontaminated surficial soils	Low - potential for contaminant storage in aquifer matrix through sorption	Low - potential associated with unintended releases in aboveground plumbing or pumps to uncontaminated surficial soils	Low - potential associated with vegetation maintenance	Low - potential associated with unintended releases in aboveground plumbing or pumps to uncontaminated surficial soils

TABLE 3
REMEDIAL TECHNOLOGIES SCREENING MATRIX
40 CFR § 257.96(c) REQUIREMENTS

Crystal River Energy Complex
Crystal River, FL

	In-Situ Strategies				Ex-Situ Strategies		
	Permeable Reactive Barriers	**Groundwater Flow Barriers**	**Chemical Immobilization**	**Monitored Natural Attenuation**	**Conventional Groundwater Extraction**	**Phytoremediation**	**Groundwater Treatment**
Potential Exposure to Residual Contamination	Low - potential for exposure during the installation and construction phase; additional potential during reactive media replacement	Low - potential for exposure during the installation and construction phase	Low - potential for exposure during the installation and construction phase	Low - potential for exposure during the installation and construction phase of monitoring wells (as needed); possible exposure pathways if the aquifer's capacity to attenuate is exceeded over time	Low - potential human exposure to contaminated groundwater during routine O&M and unintended releases	Low - potential for environmental receptors to consume edible portions of trees that may accumulate COI	Low - potential human exposure to contaminated groundwater during routine O&M and unintended releases
40 CFR § 257.96(c)(2)							
Time Required to Begin Remedy	12 to 18 months	1 to 2 years	6 to 12 months	3 to 6 months	1 to 2 years	6 to 18 months	1 to 2 years
Time Required to Complete Remedy	greater than 30 years - does not specifically address source removal	greater than 30 years - does not specifically address source removal	5 to 10 years	greater than 30 years - does not specifically address source removal	greater than 30 years - does not specifically address source removal	greater than 30 years - does not specifically address source removal	5 to 10 years
40 CFR § 257.96(c)(3)							
State, Local, or Other Environmental Permit Requirements That May Substantially Affect Implementation	State and local permitting of construction activities may be required	State and local permitting of construction activities may be required	SWFWMD permitting for injection wells; FDEP UIC permit	SWFWMD permitting for monitoring wells (as needed)	State and local permitting of construction activities may be required; SWFWMD permitting for injection wells; FDEP UIC permit	SWFWMD permitting for wells to plant trees	State and local permitting of construction activities may be required; SWFWMD permitting for injection wells; FDEP UIC permit

Notes

COI - constituents of interest
FDEP - Florida Department of Environmental Protection
O&M - operations and maintenance
SWFWMD - Southwest Florida Water Management District
TDS - total dissolved solids
UIC - underground injection control

Table 4. Implementation and Cleanup Timeframe Schedule

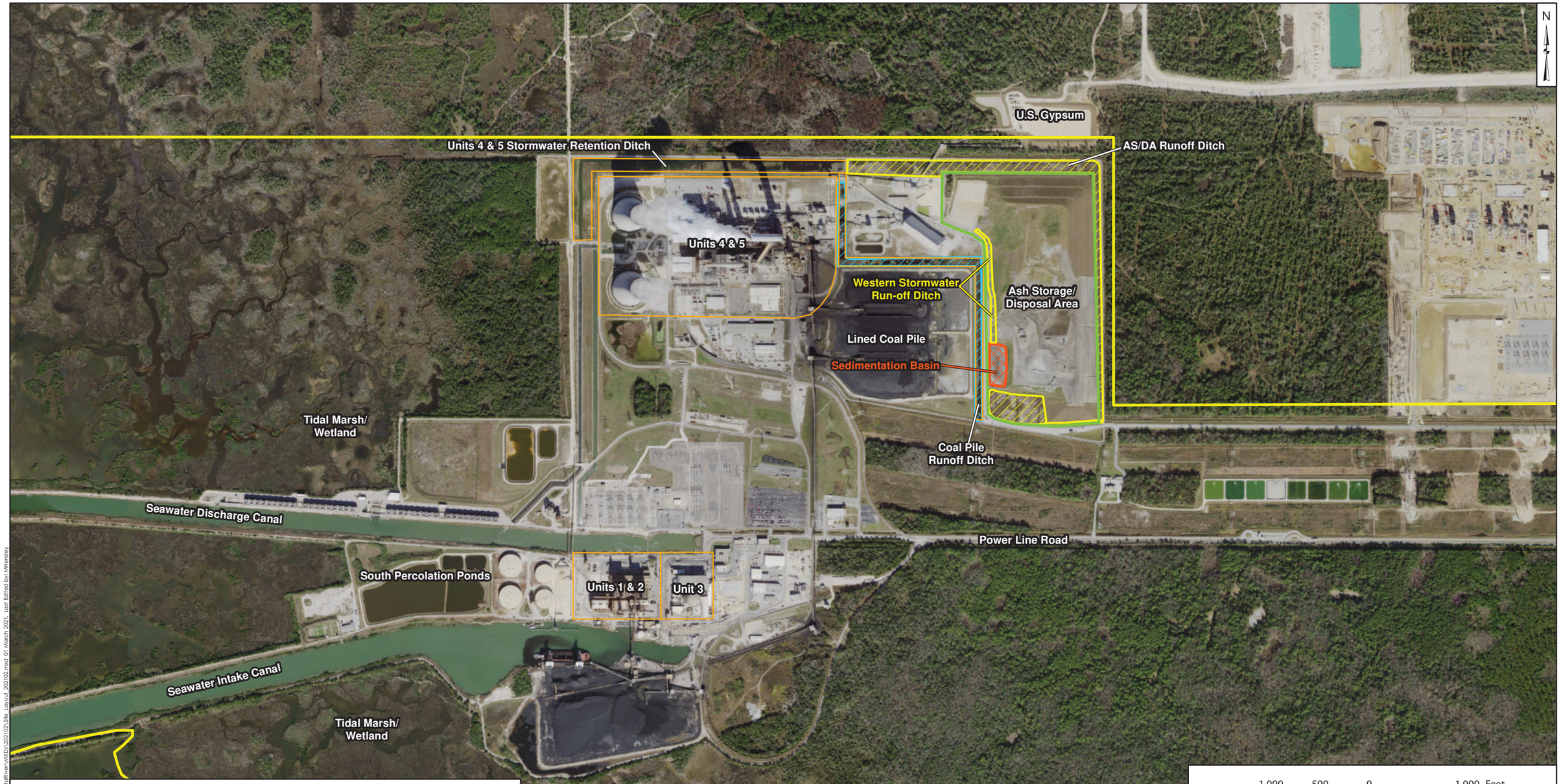
Anticipated Source Control Activities	Anticipated Timeframe for Initiation/Implementation	Approximate Duration
CCR Beneficial Use	Ongoing	5 - 15 years[1]
Ditch Remediation by Removal of CCR	2020	3 - 6 months
West Perimeter Ditch Lining	2020 - Q2 2021	12 months
Sedimentation Basin Liner Installation	2020 - Q2 2021	12 months
Corrective Action Groundwater Monitoring	Ongoing[2]	Per CCR rule requirements
Remedy Performance Evaluation	5 Years after Remedy Implementation Completion - 2026[3]	N/A

1 - Activity will continue while the AS/DA is in service and/or CCR with beneficial use value can be removed

2 - Groundwater monitoring will continue until GWPS are no longer exceeded

3 - Remedy performance evaluations will be completed every five years to determine if additional action is required.

FIGURES



Legend

- Sedimentation Basin
- CCR Unit Ash Storage/Disposal Area
- Coal Pile Run Off Ditch
- AS/DA Storm Water Runoff Ditches and Storm Water Pond
- Property Boundary

Notes:
1. AS/DA stormwater ditch on northern portion of site extends further west as shown on figure 2 revision.
2. Property boundary obtained from the Citrus County Property appraiser's office.
3. 2017 World Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

1,000 500 0 1,000 Feet

Site Layout

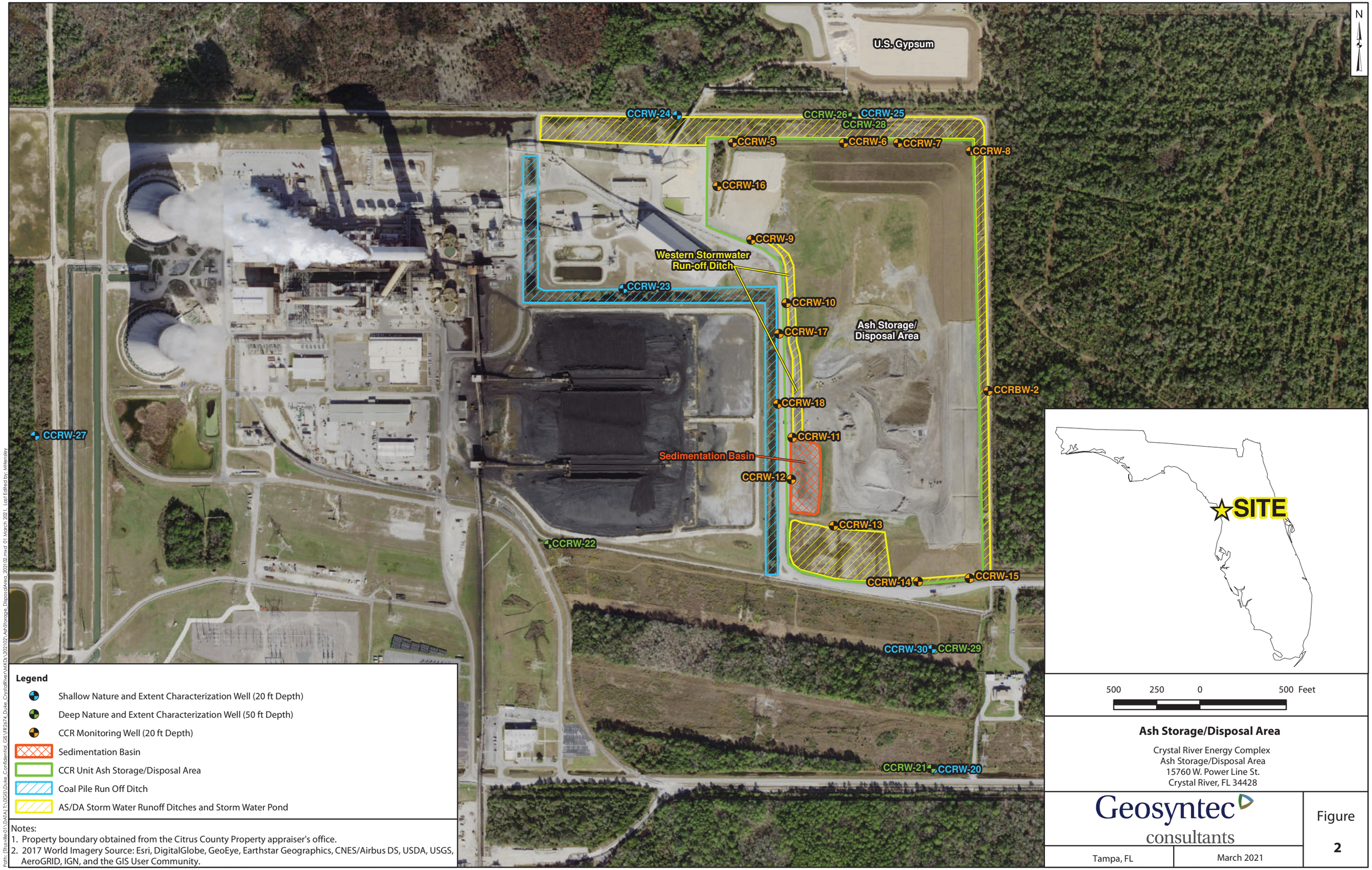
Crystal River Energy Complex
Ash Storage/Disposal Area
15760 W. Power Line St.
Crystal River, FL 34428

Geosyntec consultants

Tampa, FL | March 2021

Figure 1

Path: [Tlusville-01\DATA] T:\GIS\Duke_Confidential_GIS\FR2674_Duke_CrystalRiverMXDs\2021021\Site_Layout_20210202.mxd 01 March 2021. Last Edited by: MHensley



Legend

- Shallow Nature and Extent Characterization Well (20 ft Depth)
- Deep Nature and Extent Characterization Well (50 ft Depth)
- CCR Monitoring Well (20 ft Depth)
- Sedimentation Basin
- CCR Unit Ash Storage/Disposal Area
- Coal Pile Run Off Ditch
- AS/DA Storm Water Runoff Ditches and Storm Water Pond

Notes:
1. Property boundary obtained from the Citrus County Property appraiser's office.
2. 2017 World Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Ash Storage/Disposal Area

Crystal River Energy Complex
Ash Storage/Disposal Area
15760 W. Power Line St.
Crystal River, FL 34428

Geosyntec consultants

Tampa, FL | March 2021

Figure 2

Path: [Tfluxville-01\DATA] T:\GIS\Duke_Confidential_GIS\FR2674.Duke_CrystalRiver\MXDs\2021021_AshStorage_DisposalArea_20210203.mxd 01 March 2021 | Last Edited by: MHensley