

From: [Alcoz, Nate J.](#)
To: [SCQ; Mulkey, Cindy](#)
Cc: [Burrows, Byron T.](#); [Kroh, Stanley M.](#); [Lawrence Curtin](#)
Subject: TECO Big Bend II Solar - Flow Battery Amendment Request
Date: Friday, April 5, 2024 10:24:04 AM
Attachments: [Big Bend II Solar Flow Battery ERP App Section A.pdf](#)
[Big Bend II Solar Flow Battery ERP App Section E.pdf](#)
[Big Bend Flow Battery Location Map.docx](#)
[CS-00046 ESS US 500 kWh Hydrated Electrolyte Safety Data Sheet.pdf](#)
[20-158.002 Big Bend II Battery Storage Proposed Development_SS.pdf](#)

EXTERNAL MESSAGE

This email originated outside of DEP. Please use caution when opening attachments, clicking links, or responding to this email.

Cindy,

Tampa Electric Company (TECO) is submitting this Request for Amendment of the Site Certification for Big Bend Power Station (PA-79-12S) for construction and operation of the flow battery pilot project on the existing Big Bend Power Station in southwestern Hillsborough County, Florida.

TECO is proposing to construct a 0.78MW/7.8MWH (10-hour) flow battery on the existing Big Bend II Solar facility, located in the southeast corner of Big Bend property. The Big Bend II Solar facility was recently completed and received its ERP transfer to operations approval letter from FDEP on April 12, 2023. The flow battery project will consist of eight flow battery modules, a DC/AC inverter and an electrical transformer. Each module consists of a positive electrolyte tank (6,952 gallons in size, containing 6,520 gallons of electrolyte solution) and a negative electrolyte tank (4,417 gallons in size, containing 4,180 gallons of solution). A secondary containment system is in place – the lower container has an electrolyte-compatible containment liner installed to fully contain the fluid volume for the larger of the two tanks. The upper container also has a liner in place to route any significant fluid loss to the lower container. Flow batteries are an emerging alternative energy storage solution utilizing large tanks of liquid electrolyte and pumps to store energy for long durations. As the technology claims to have certain advantages over lithium-ion batteries, this project will serve as a pilot project for TECO to assess and gain experience installing, operating, and maintaining these batteries. If the technology is favorable, lessons learned from this project will apply to larger future flow battery installations throughout TECO's operating jurisdiction.

The 0.63-acre project area, of which 0.44 acres are impervious/semi-impervious, is located within Basin 3 of the Big Bend II Solar site. With this small increase in impervious, the existing Vegetative Natural Buffer is more sufficient to properly treat the additional stormwater generated from the project. The revised drainage report, that demonstrates compliance with applicable stormwater regulations, can be provided with TECO's secure large file transfer system or a link you provide. Construction and commissioning are anticipated to take nine months.

Please let us know if you have any questions or need additional information regarding this request for amendment. We look forward to working with you on this project.

Sincerely,

Adriano "Nate" Alcoz

Manager, Environmental Permitting & Tanks

Environmental Services Department

Office 813-228-4843

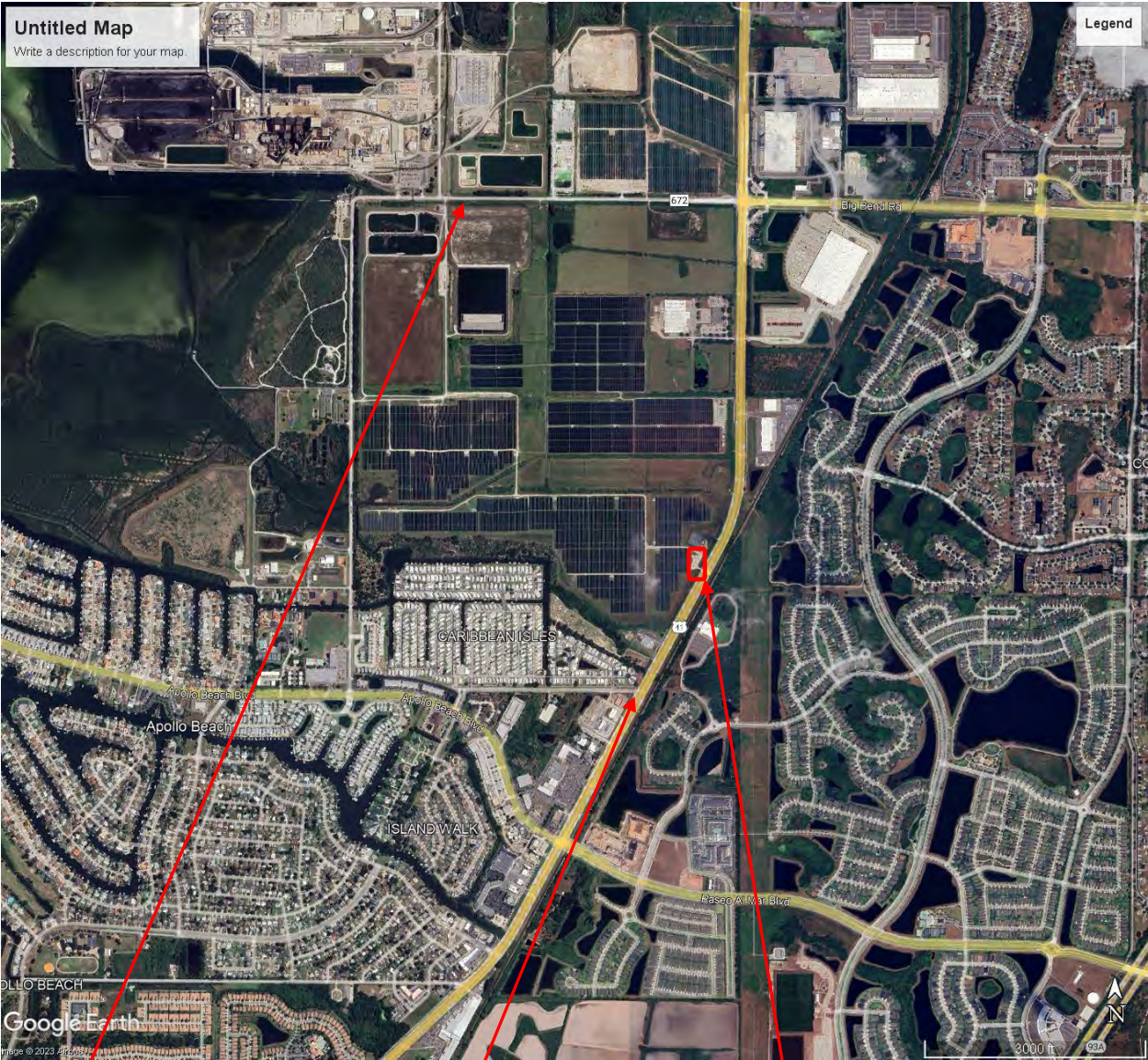
Mobile 813-293-0649

ajalcoz@tecoenergy.com



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Big Bend Flow Battery – Location Map



Big Bend Road

US 41

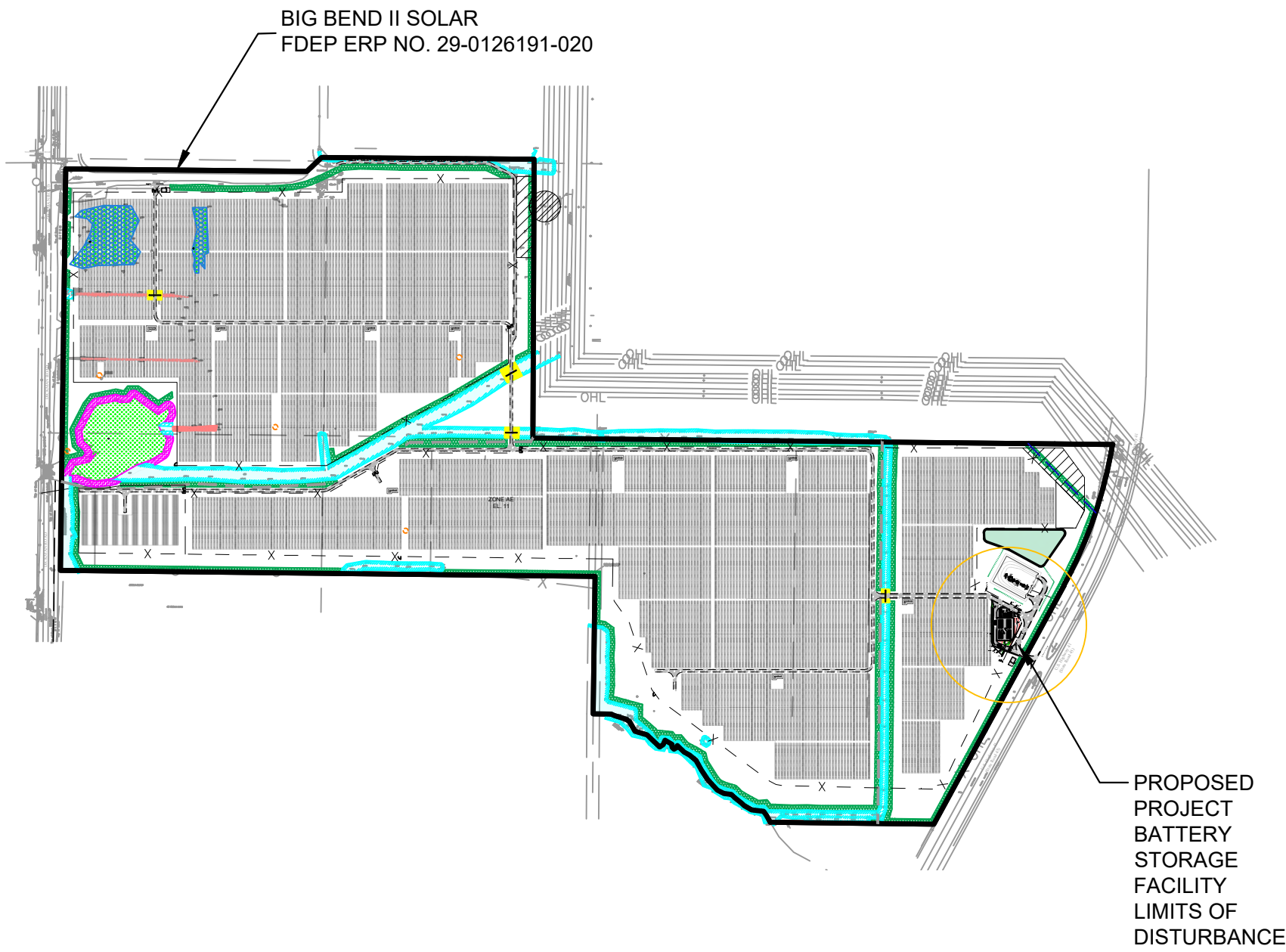
Project Area



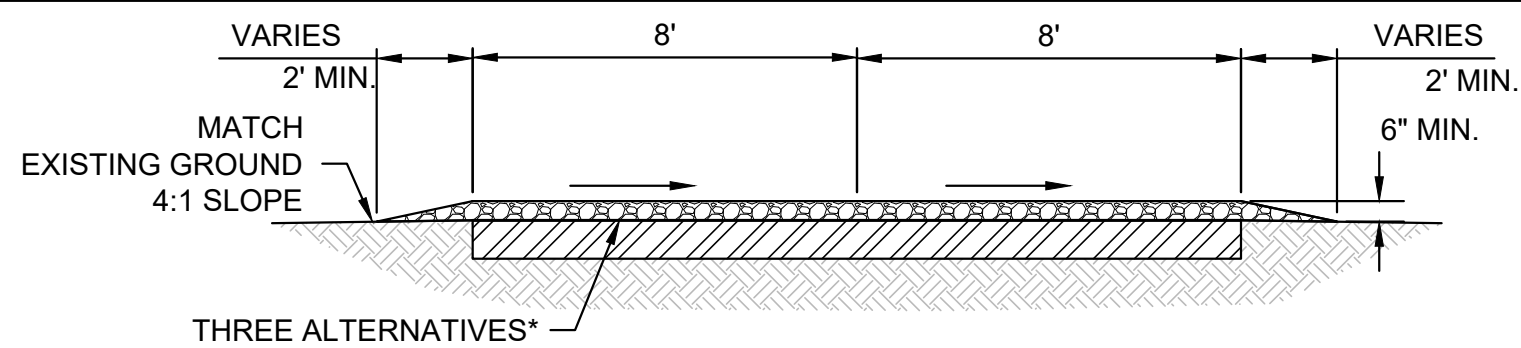
Project Area

US-41

P:\Proj-2020\20-158-100 DEPCOM Big Bend II EPC\Eng\20-158-100 Base-Battery Storage Exhibit.dwg Plotted: 6/26/2023 2:58 PM By: NICOLE DEMERITTE



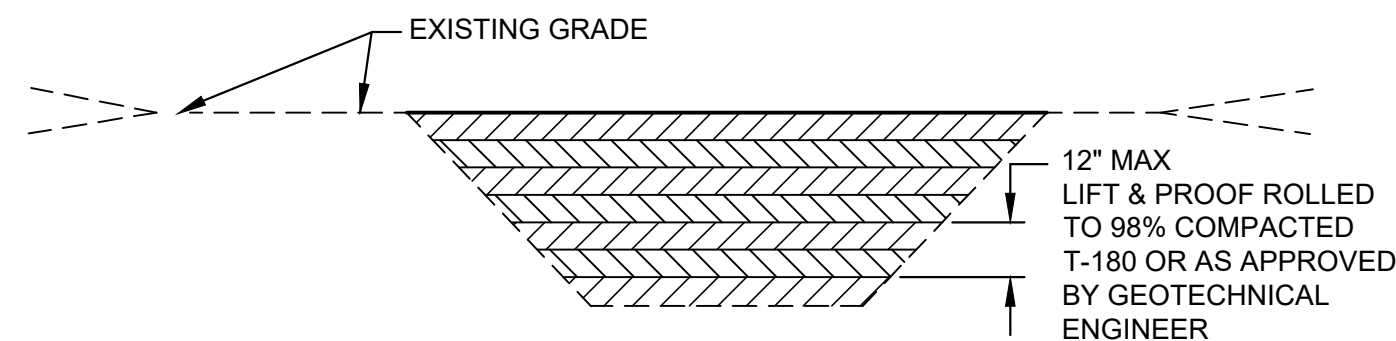
OVERALL SITE PLAN
NOT TO SCALE



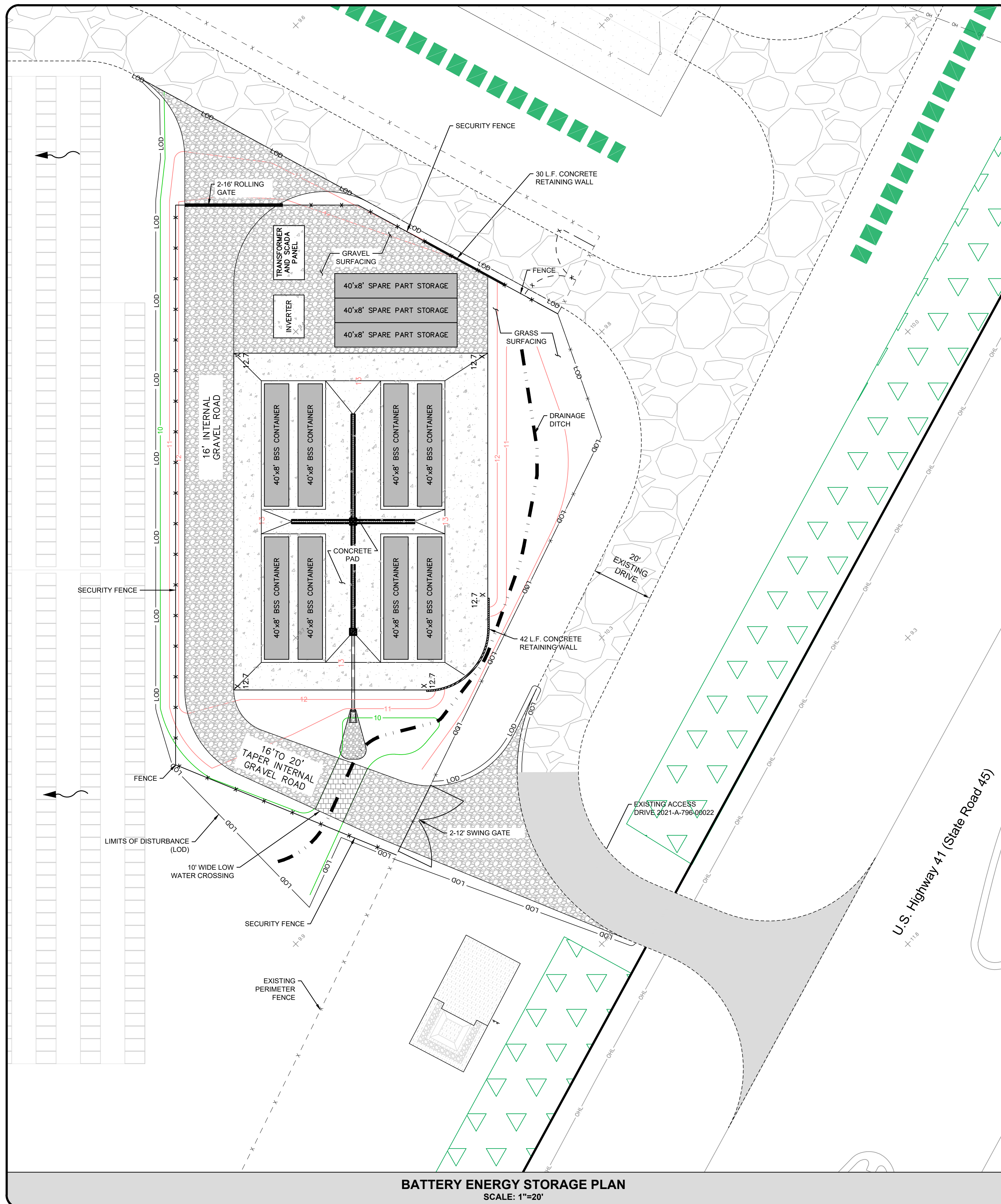
- *A. 8" SHELL OR CRUSHED CONCRETE WITH 12" STABILIZED SUBGRADE
*B. 5" SHELL OR CRUSHED CONCRETE, GEOGRID, AND 12" STABILIZED SUBGRADE
*C. 13" SHELL OR CRUSHED CONCRETE, NO STABILIZED SUBGRADE
- NOTE: 1. SUBGRADE COMPACTED TO AT LEAST 98 PERCENT OF THE MODIFIED PROCTOR (ASTM D1557) AND HAVE A MIN. LBR=40.
2. SHOULDERS ARE NATIVE SOILS COMPACTED TO 98% OF THE MODIFIED PROCTOR (ASTM D1557)

IF THE EXISTING SITE SOILS DO NOT YIELD A LIMEROCK BEARING RATIO (LBR) VALUE OF 40, THEY SHOULD BE STABILIZED TO OBTAIN A MINIMUM LBR VALUE OF 40. WHILE NO SITE LBR TESTING WAS PERFORMED, IT IS EXPECTED THAT THE SITE SOILS WILL HAVE LBR VALUES BETWEEN 20 AND 30. THEREFORE, STABILIZATION WILL LIKELY BE REQUIRED (TYPICALLY BY MIXING LIMEROCK INTO THE EXISTING SITE SOILS). THE AMOUNT OF STABILIZATION MATERIAL REQUIRED WILL NEED TO BE DETERMINED BY THE CONTRACTOR. HOWEVER, IT IS COMMON TO USE 3 TO 6 INCHES OF LIMEROCK MIXED WITH THE EXISTING SITE SOILS TO ACHIEVE THE LBR 40 MATERIAL. A MINIMUM OF 18 INCHES SHOULD BE MAINTAINED BETWEEN THE BOTTOM OF THE BASE COURSE AND THE SEASONAL HIGH WATER LEVEL FOR THE BASE OPTIONS PRESENTED ABOVE. SHELL OR CRUSHED CONCRETE BASE COURSE SHALL BE COMPACTED TO AT LEAST 98 PERCENT OF THE MODIFIED PROCTOR (ASTM D1557) AND HAVE A MIN. LBR = 100.

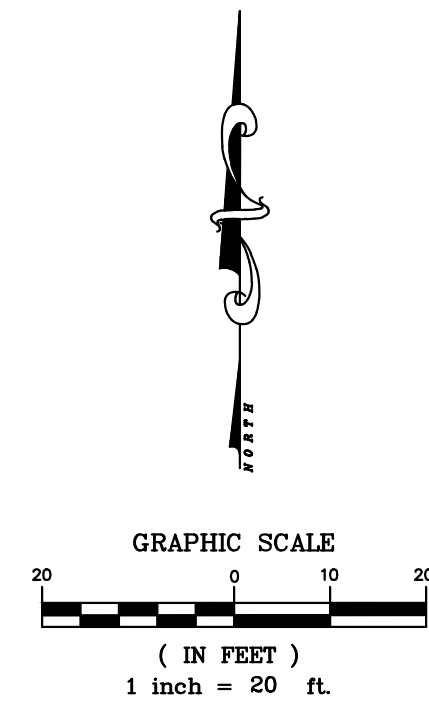
16' WIDE ACCESS PATH
NOT TO SCALE



TYPICAL FILL PLACEMENT & COMPACTION DETAIL
NOT TO SCALE



BATTERY ENERGY STORAGE PLAN
SCALE: 1"=20'



- LEGEND**
- PROPERTY BOUNDARY
 - SHEET FLOW ARROW
 - 25' VEGETATIVE NATURAL BUFFER
 - FENCE
 - EXISTING FENCE
 - EXISTING CONTOURS
 - EXISTING EASEMENT
 - EXISTING PV ARRAY PERIMETER
 - GRAVEL ROAD
 - DRAINAGE DITCH
 - CONVEYANCE SWALE
 - MAJOR CONTOUR
 - MINOR CONTOUR
 - EXISTING GRAVEL ROAD
 - CONCRETE PAD
 - LOW WATER CROSSING
 - LIMITS OF DISTURBANCE (LOD)
 - EXISTING ELEVATION
 - PROPOSED ELEVATION
 - LIMITS OF DISTURBANCE (LOD)

JAMES P. TERPENING JR., P.E. FL REG NO. 24276

COMPUTER FILE REF.	FIELD BK./PG.



**CULPEPPER &
TERPENING INC**
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PHONE 772-464-3537 • FAX 772-464-9487 • www.ct-eng.com
STATE OF FLORIDA BOARD OF PROFESSIONAL
ENGINEERS AUTHORIZATION NO. 4286

- REVISIONS -		BY	DATE

	BY	DATE
DESIGNED	JPT	6/21/2023
CALCS.	N/A	N/A
DRAWN	AND	6/21/2023
DETAILED	N/A	N/A
CHECKED	JPT	6/21/2023
APPROVED	JPT	6/21/2023

BIG BEND II BATTERY STORAGE

PROPOSED-DEVELOPMENT

DATE: 06/22/2023
HORIZ. SCALE: AS SHOWN
VERT. SCALE: NA
JOB No. 22-158.200
SHEET 1 of 1

Application for Individual and Conceptual Approval Environmental Resource Permit and Authorization to Use State-Owned Submerged Lands

Florida Department of Environmental Protection/
Water Management Districts

Effective June 1, 2018



Instructions for Use of This Form:

This form is designed to assist you in submitting a complete application. All applications must include Section A- General Information for All Activities. Sections B through H list typical information that is needed based on the proposed activities and are only required as applicable. Part 1-C of Section A will guide you to the correct sections needed based on your proposed activities. Applicants are advised to consult Chapter 62-330, F.A.C., and the Environmental Resource Permit Applicant's Handbooks Volumes I and II for information regarding the ERP permitting process and requirements while preparing their application. Internet addresses for Chapter 62-330, F.A.C., and the Applicant's Handbook, Agency contact information, and additional instructions for this form can be found in Attachment 1.

What Sections of the Application Must I Fill Out?

Type of Activity	Section A	Section B	Section C	Section D	Section E	Section F	Section G	Section H
Fill in wetlands or waters for a single family residence?	Y	Y	N	N	N	N	N	N
Docks, shoreline stabilization, seawalls associated with a single family residence?	Y	Y	N	N	N	Y, as needed	N	N
Wetland impacts (other than association with an individual residence)?	Y	N	Y	N	N	N	N	N
Boating facilities, a marina, jetty, reef, or dredging?	Y	N	Y	Y	N	Y, as needed	N	N
Any work on state owned submerged land?	Y	N	Y	N	N	Y	N	N
Construction of a stormwater management system?	Y	N	Y, as needed	N	Y	N	N	N
Constructing a mitigation bank?	Y	N	Y	N	Y, as needed	N	Y	N
Creating a mine?	Y	N	Y, as needed	N	N	N	N	Y

Note- if you are required to provide Section B, then you do not have to provide any other Sections, unless the activities are on state-owned submerged lands. In that case, Section F will also be required.

If you have any questions, or would like assistance completing this form, please contact the staff of the nearest office of either the Florida Department of Environmental Protection (DEP) or a Water Management District (WMD) (see Attachment 2).

Section A: General Information for All Activities

Part 1: Name, Application Type, Location, and Description of Activity

A. Name of project, including phase if applicable: **TECO Big Bend II Solar – Flow Batteries**

B. This is for (check all that apply):

- ☐ Construction and operation of **new** works, activities, and/ or a stormwater management system
- ☐ **Conceptual Approval** of proposed works, activities and/ or a stormwater management system
- ☒ Modification or alteration of **existing** works, activities, and/or a stormwater management system. Provide the existing DEP or WMD permit #, if known: **29-0126191-020**. Note: Minor modifications do not require completion of this form, and may instead be requested by letter in accordance with section 6.2 of Applicant's Handbook Volume I.
- ☐ **Maintenance or repair** of works, activities, and/ or a stormwater management system previously permitted by the DEP or WMD. Provide existing permit #, if known:
- ☐ Abandonment or removal of works, activities, and/ or a stormwater management system.
Provide existing DEP or WMD permit #, if known:
- ☐ Operation of an **existing unpermitted** work, activity, and/or stormwater management system.
- ☐ Construction of additional phases of a permitted work, activity, or system.
Provide the existing DEP or WMD permit #, if known:

C. **List the type of activities proposed. Check all that apply, and provide the supplemental information requested in each of the referenced application sections.** Please also reference Applicant's Handbook Volumes I and II for the type of information that may be needed.

- ☐ Activities associated with one single-family residence, duplex, triplex, or quadruplex that do not qualify for an exemption or a General Permit: **Provide the information requested in Section B. Do not complete Section C.**
- ☐ Activities within wetlands or surface waters, or within 25 feet of a wetland or surface water, (not including the activities associated with an individual single-family residence). Examples include dredging, filling, outfall structures, docks, piers, over-water structures, shoreline stabilization, mitigation, reclamation, and restoration/enhancement. **Provide the information requested in Section C.**

- ☐ Activities within navigable or flowing surface waters such as a multi-slip dock or marina, dry storage facility, dredging, bridge, breakwaters, reefs, or other offshore structures: **In addition to Section C, also provide the information requested in Section D.**
- ☐ Activities that are (or may be) located within, on, or over state-owned submerged lands (See Chapter 18-21, F.A.C. <https://www.flrules.org/gateway/ChapterHome.asp?Chapter=18-21>): **In addition to Section B or C, also provide the information requested in Section F.**
- ☒ Construction or alteration of a stormwater management system serving residential, commercial, transportation, industrial, agricultural, or other land uses, or a solid waste facility (excluding mines that are regulated by DEP). **Provide the information requested in Section E.**
- ☐ Creation or modification of a Mitigation Bank (refer to Chapter 62-342, F.A.C. <https://www.flrules.org/gateway/ChapterHome.asp?Chapter=62-342>): **Provide the information requested in Section G.**
- ☐ Mines (as defined in Section 2.0 of Applicant's Handbook Volume I) that are regulated by the DEP: **Provide the information requested in Section H.**
- ☐ Other, describe: Please contact the Agency to determine which additional sections of the application are needed. See Attachment 2 for Agency contacts.

D. Describe in general terms the proposed project, system, works, or other activities. For permit modifications, please briefly describe the changes requested to the permit: **Tampa Electric Company (TEC) proposes to construct an iron solution flow battery electric storage system at the existing Big Bend II Solar facility to optimize the use of renewable solar energy generated by the facility.**

E. Project/Activity Street/Road Address or other location (if applicable): **U.S. Highway 41**
City: *Apollo Beach* County(ies): **Hillsborough** Zip: **33752**

Note: For utility, road, or ditch/canal activities, provide a starting and ending point using street names and nearest house numbers or provide length of project in miles along named streets or highways.

F. Project location map and Section, Township, and Range information (use additional sheets if needed):

Please attach a location map showing the location and boundaries of the proposed activity in relation to major intersections or other landmarks. The map should also contain a north arrow and a graphic scale; show Section(s), Township(s), and Range(s); and must be of sufficient detail to allow a person unfamiliar with the site to find it.

Section(s): **22** Township: **31** Range: **19 E** Land Grant name, if applicable:
Section(s): Township: Range:

1. Section(s): Township: Range:

G. Latitude (DMS) **27° 46' 45.26"** Longitude (DMS) **81° 23' 10.93"** (Taken from central location of the activity). Explain source for obtaining latitude and longitude (i.e. U.S.G.S. Quadrangle Map, GPS, online resource): **Google Earth**

H. Tax Parcel Identification Number(s): **U-15-31-19-1SF000000-01000.0**

[Number may be obtained from property tax bill or from the county property appraiser's office; if on multiple parcels, provide multiple Tax Parcel Identification Numbers]

I. Directions to Site (from major roads; include distances and landmarks as applicable): **From the city of Tampa, take Interstate (I)-75 south for approximately 14 miles to Apollo Beach, Exit 246. Exit on the ramp heading west onto Big Bend Road. Proceed west for about 1.5 miles to U.S. Highway 41. At the intersection of Big Bend Road and U.S. Highway 41, turn south onto U.S. Highway 41 and proceed for approximately 0.95 miles where the project will be located on the west side of U.S. Highway 41.**

J. Project area or phase area: **0.63 acres**

K. Name of waterbody(ies) (if known) in which activities will occur or into which the system will discharge: **Newman Branch**

The following questions (M-O) are not applicable to activities related to an individual single-family residence, including a dock, pier, and/or seawall associated with that residence.

L. Is it part of a larger plan of development or sale? ☐ yes ☒ no

M. Impervious or semi-impervious area excluding wetlands and other surface waters (if applicable):

0.44 acres

N. Volume of water the system is capable of impounding (if applicable):

N/A, Vegetated Natural Buffers are method of water quality treatment

Normal Pool: acre-feet. Depth ft.
Maximum Pool: acre-feet. Depth ft.

Part 2: Supplemental Information, and Permit History

- A. Is this an application to modify an existing Environmental Resource Permit or to construct or implement part of a multi-phase project, such as a project with a Conceptual Approval permit? ☒ Yes ☐ No (If you answered "yes", please provide permit numbers below):

Agency	Date	Permit/Application No.	Project Name
FDEP	5/21/21	PA 79-12A 29-0126191-020	TEC Big Bend II Solar

- B. Indicate if there have been any **pre-application meeting(s)** with the DEP, WMD, or delegated local government, or other discussions, meetings, or coordination with other stakeholders or agencies about the proposed project, system or activity. If so, please provide the date(s), location(s) of the meeting, and the name(s) of Agency staff that attended the meeting(s):

Agency	Date	Location	Meeting Attendees

- C. **Attach a depiction (plan and section views), which clearly shows the works or other activities proposed to be constructed.** Use multiple sheets, if necessary, a scale sufficient to show the location and type of works, and include a north arrow and a key to any symbols used. **Specific information to be included in the plans is based on the activities proposed and is further described in Sections B-H.** However, supplemental information may be required based on the specific circumstances or location of the proposed works or other activities.

Tampa Electric Company (TEC) is proposing to construct electrolyte solution flow batteries within the boundary of Big Bend Power Station. The flow batteries will be located on the existing Big Bend II Solar facility, located along the western edge, near the entrance. The Big Bend II Solar project covers approximately 191.3 acres and can generate 31 megawatts of AC electricity for transmission on to the power grid. The facility was certified by the Siting Coordination Office on May 21, 2021.

The flow batteries project will provide TEC with key information on optimizing the use of flow batteries for our electrical system and customers. The flow batteries will provide specific information on capital, operation and maintenance costs as well as effective design and operational practices. Also, the flow

batteries project will be used to evaluate its effectiveness for daily load shifting and increasing the monthly peak capacity factor and value of the Big Bend II Solar generating unit. The batteries will consist of a positive electrolyte tank, 6,952 gallons in size, containing 6,520 gallons of solution and a negative electrolyte, 4,417 gallons in size, containing 4,180 gallons of solution. The project will contain secondary containment to fully contain the volume of the larger tank.

The site for the flow batteries is an upland area that as previously been graded and used for construction associated with the Big Bend II Solar facility. The area for the flow batteries is approximately 0.63 acres.

- D. Processing Fee: **Please submit the application processing fee along with this application form and supplemental information.** Processing fees vary based on the size of the activity, the type of permit applied for, and the reviewing Agency. Please reference Appendix D of Applicant's Handbook Volume I to determine the appropriate fee.

Part 3: Applicant and Associated Parties Information

Instructions: Please complete the following sections. For corporations, list a person who is a registered agent or officer of the corporation who has the legal authority to bind the corporation.

A. Applicant (Entity Must Have Sufficient Real Property Interest)

☐ This is a Contact Person for Additional Information

Last Name: Kroh	First Name: Stanley	Middle Initial: M
Title: Manager, Land & Stewardship	Company: Tampa Electric Company	
Address: P.O. Box 111		
City: Tampa	State: FL	Zip: 33601
Home Telephone:	Work Telephone: 813-224-4257	
Cell Phone:		
E-mail Address: smkroh@tecoenergy.com		

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

B. Land Owner(S) (If Different or in Addition to Applicant)

☐ Check here if land owner is also a co-applicant

Last Name:	First Name:	Middle Initial:
Title:	Company:	
Address:		
City:	State:	Zip:
Home Telephone:	Work Telephone:	
Cell Phone:		
E-mail Address:		

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

C. Operation and Maintenance Entity(see Applicant's Handbook I, Section 12.3)

Last Name: Kroh	First Name: Stanley	Middle Initial: M
Title: Manager, Land & Stewardship	Company: Tampa Electric Company	
Address: P.O. Box 111		
City: Tampa	State: FL	Zip: 33601

Form 62-330.060(1) - Application for Individual and Conceptual Approval Environmental Resource Permit and Authorization to Use

State-Owned Submerged Lands

Incorporated by reference in subsection 62-330.060(1), F.A.C. (June 1, 2018)

Section A, Page 7 of 10

Home Telephone: Work Telephone: **813-228-4257**
Cell Phone:
E-mail Address: **smkroh@tecoenergy.com**

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

D. Co-Applicant (If Different or In Addition to Applicant and Owner)

Last Name: First Name: Middle Initial:
Title: Company:
Address:
City: State: Zip:
Home Telephone: Work Telephone:
Cell Phone:
E-mail Address:

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

E. Registered Professional Consultant

☐ This is a contact person for additional information

Last Name: First Name: Middle Initial:
Title: Company:
Address:
City: State: Zip:
Home Telephone: Work Telephone:
Cell Phone:
E-mail Address:

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

F. Environmental Consultant

☐ This is a contact person for additional information

Last Name: First Name: Middle Initial:
Title: Company:
Address:
City: State: Zip:
Home Telephone: Work Telephone:
Cell Phone:
E-mail Address:

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

G. Agent Authorized to Secure Permit (If Different from Consultant)

Last Name: First Name: Middle Initial:
Title: Company:
Address:
City: State: Zip:
Home Telephone: Work Telephone:
Cell Phone:
E-mail Address:

Correspondence will be sent via email, unless you check here to receive it via US Mail: ☐

If necessary, please add additional pages for other contacts and property owners related to this project.

H. Real Property Interest

- a. Permits are only issued to entities having sufficient real property interest as described in Section 4.2.3(d) of Applicant's Handbook Volume I. **Please attach evidence of the applicant's real property interest over the land upon which the activities subject to the application will be conducted, including mitigation areas (if applicable).** Refer to Sections 4.2.3(d)-(e) for sufficient real property interest documentation.
- b. For activities that require a recorded notice in accordance with rule 62-330.090(7), F.A.C., please provide either the complete legal description of the property or a copy of the pages of the document recorded in the public records that contains the complete legal description. If the land upon which the proposed activities are to occur is not owned by the applicant, the applicant must also provide copies of any right-of-way, leases, easements, or other legal agreement which authorizes the applicant to perform the activities on those lands.

Part 4: Signatures and Authorization to Access Property

Instructions: For multiple applicants please provide a separate Part 4 for each applicant. For corporations, the application must be signed by a person authorized to bind the corporation. A person who has sufficient real property interest (see Section 4.2.3(d) of Applicant's Handbook Volume I) is required in (B) to authorize access to the property, except when the applicant has the power of eminent domain.

A. By signing this application form, I am applying for the permit and any proprietary authorizations identified above, according to the supporting data and other incidental information filed with this application. I am familiar with the information contained in this application and represent that such information is true, complete and accurate. I understand this is an application and not a permit, and that work prior to approval is a violation. I understand that this application and any permit issued or proprietary authorization issued pursuant thereto does not relieve me of any obligation for obtaining any other required federal, state, water management district, or local permit prior to commencement of construction. I agree to operate and maintain the permitted system unless the permitting agency authorizes transfer of the permit to a different responsible operation and maintenance entity. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S. and 18 U.S.C. Section 1001.

Stanley M. Kroh
Typed/Printed Name of Applicant or
Applicant's Authorized Agent


Signature of Applicant or Applicant's
Authorized Agent

April 2, 2024
Date

Manager, Land & Stewardship
(Corporate Title if applicable)

B. Certification of Sufficient Real Property Interest And Authorization For Staff To Access The Property:

I certify that:

☒ I possess sufficient real property interest in or control, as defined in Section 4.2.3 (d) of Applicant's Handbook Volume I, over the land upon which the activities described in this application are proposed and I have legal authority to grant permission to access those lands. I hereby grant permission, evidenced by my signature below, for staff of the Agency to access, inspect, and sample the lands and waters of the property as necessary for the review of the proposed works and other activities specified in this application, upon advance notice. I authorize these agents or personnel to enter the property as many times as may be necessary to make such review, inspection, and/ or sampling. Further, if a permit is granted, upon advance notice, I agree to provide entry to the project site for such agents or personnel with proper identification to determine compliance with permit conditions and permitted plans and specifications.

OR

☐ I represent an entity having the power of eminent domain and condemnation authority, and I/we shall make appropriate arrangements to enable staff of the Agency to legally access, inspect, and sample the property as described above.

Stanley M. Kroh
Typed/Printed Name


Signature

April 2, 2024
Date

Manager, Land & Stewardship
(Corporate Title if applicable)

C. Designation of Authorized Agent (If Applicable):

I hereby designate and authorize _____ to act on my behalf, or on behalf of my corporation, as the agent in the processing of this application for the permit and/or proprietary authorization indicated above; and to furnish, on request, supplemental information in support of the application. In addition, I authorize the above-listed agent to bind me, or my corporation, to perform any requirements which may be necessary to procure the permit or authorization indicated above. I understand that knowingly making any false statement or representation in this application is a violation of Section 373.430, F.S., and 18 U.S.C. Section 1001.

Typed/Printed Name of Applicant

Signature of Applicant

Date

(Corporate Title if applicable)

Section E: Supplemental Information Required for Works or Other Activities Involving a Stormwater Management System (Other Than a Single-Family Project)

Instructions: The information listed in the checklists below represents the level of information that is usually required to evaluate an application. Information can be provided within reports, plans, and documents. The level of information required for a specific project will vary depending on the nature and location of the site and the activity proposed. Conceptual approvals generally do not require the same level of detail as a construction permit. However, providing a greater level of detail will reduce the need to submit additional information at a later date. If an item does not apply to your project, proceed to the next item. The supplemental information required by this section is in addition to the information required by Section A of the application.



Part 1: Stormwater Management System Summary

Provide drainage calculations, signed and sealed by an appropriate registered professional, and supporting documentation demonstrating that the proposed project meets the conditions for issuance under 62-330.301(1)(a),(b),(c),(e), F.A.C. The drainage calculations should include, but not necessarily be limited to, the following:

See Attachment, Big Bend II Battery Storage Drainage Calculations

1. General Site Information:

- a. ☐ Provide pre-development and post-development drainage map(s), as appropriate, that include drainage patterns and basin boundaries with acreage served by each hydraulically separate system, showing the direction of flows, including any off-site runoff being routed through or around the system; topographic information; and connections between wetlands and other surface waters.
- b. ☐ Provide the results of any percolation tests, where appropriate, and soil borings that are representative of the actual site conditions. Identify the wet season high water table elevations, soil profiles, and hydraulic conductivity. Include dates, datum, and methods used to determine these soil parameters.
- c. ☒ Identify the onsite hydrologic soil classification (e.g. Type A, B/D, D). Reference the source, such as the USDA/NRCS Soil Survey, used in estimating the onsite hydrologic soil classification. Provide maps, as appropriate, with the project limits delineated.
See attachment, Big Bend II Battery Storage Drainage Calculations.
- d. ☐ Identify the seasonal high water or mean high tide elevation for receiving waters/wetlands into which runoff will be discharged. Include dates, datum, and methods used to determine these elevations.
- e. ☒ Identify the name of each receiving waterbody to which the proposed stormwater management system will discharge: **Basin 3 ultimately discharges to Newman Branch which is tidal to Tampa Bay.**
- f. ☒ Indicate the existing land use and land cover. **Utility scale photovoltaic solar power generating station, consisting of at-grade roads, agri-voltaic solar power generating station, electrical substation, ditches and culverts, natural/alterd stream and a small pond.**
- g. ☐ Provide the acreage and percentages of the total project, of the following:
 1. Impervious surfaces (excluding buildings, wetlands, and other surface waters);
See attachment, Big Bend II Battery Storage Drainage Calculations
 2. Buildings;
 3. Pervious surfaces (green areas not including wetlands);
 4. Lakes, canals, retention areas, other open water areas; and
 5. Wetlands (Please compare to Section C to ensure consistency in wetland acreages).
- h. ☐ Provide the location and description of any nearby existing offsite features (such as wetlands and other surface waters, stormwater management ponds, and buildings or other structures) which might be affected by or affect the proposed construction or development.

2. Water Quality Analysis:

See attachment, Big Bend II Battery Storage Drainage Calculations

- a. ☐ Provide a description of the proposed stormwater treatment methodology that addresses the type of treatment, pollution abatement volumes, and recovery analysis.
- b. ☐ Is the receiving waterbody known to be impaired and/or have an established Total Maximum Daily Load (TMDL) or Basin Management Action Plan (BMAP)? If so, please provide specific descriptions of all water quality parameters for which the waterbody is known to be impaired. For more information about water quality, impaired waters, and to determine whether a TMDL has been adopted in your project area, refer to: <https://floridadep.gov/dear/water-quality-evaluation-tmdl/content/final-tmdl-reports>. To determine whether a BMAP exists, or is being developed in your project area, refer to: <https://floridadep.gov/dear/water-quality-restoration/content/basin-management-action-plans-bmaps>.
☐ yes ☐ no ☐ don't know
If yes, provide calculations demonstrating that the proposed project will not contribute to violations of state water quality standards in accordance with the applicable Applicant's Handbook, Vol. II.
- c. ☐ Does the project have a direct discharge to Class I or II waters; Outstanding Florida Waters (OFW); or Class III waters, which are approved, conditionally approved, restricted, or conditionally restricted for shellfish harvesting? *To determine whether your project is within or will discharge to an OFW, or for more information about OFWs in general, refer to: <https://floridadep.gov/dear/water-quality-standards/content/outstanding-florida-waters>.*
☐ yes ☐ no ☐ don't know
If yes, additional treatment in accordance with the applicable Applicant's Handbook, Vol. II, may be required.
- d. ☐ Provide construction plans and calculations that address the required treatment volume and recovery, as well as stage-storage and design elevations, which demonstrate compliance with the appropriate water quality treatment criteria in the applicable Applicant's Handbook, Vol. II.
- e. ☐ Provide a description of the engineering methodology, assumptions, and references for the parameters listed above and a copy of all computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, a description of the program, input and output data, and justification for model selection.

3. Water Quantity Analysis:

See attachment, Big Bend II Battery Storage Drainage Calculations

Provide calculations and documentations demonstrating that the project, as proposed, meets the applicable design criteria as indicated in the applicable Applicant's Handbook, Vol. II. Typically, the information would include, at a minimum, but not necessarily limited to, the following:

- a. ☐ For projects requiring pre-development analysis, provide an analysis of the pre-development peak rate of discharge and/or volume of runoff for all design storm events. Account for all onsite depressional storage and offsite contributing area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) that apply to your project.
- b. ☐ Provide an analysis of the post-development peak rate of discharge and/or volume of runoff for all applicable design storm events. Account for all onsite storage and offsite contributing

area. Please refer to the applicable Applicant's Handbook, Vol. II for the design storm event(s) and criteria that apply to your project.

These analyses should include:

1. ☐ Runoff characteristics, including area, runoff curve number or runoff coefficient, and time of concentration for each drainage basin in the pre-development and post-development condition;
 2. ☐ Design storms used including rainfall depth, duration, frequency, and distribution;
 3. ☐ Runoff hydrograph(s) for each drainage basin for all required design storm event(s);
 4. ☐ Stage-storage computations for any area, such as a reservoir, closed basin, detention area, or channel, used in storage routing;
 5. ☐ Stage-discharge computations for any storage areas at a selected control point, such as control structure or natural restriction;
 6. ☐ Flood routings through on-site conveyance and storage areas;
 7. ☐ Water surface profiles in the primary drainage system for each required design storm event(s);
 8. ☐ Runoff peak rates and volumes discharged from the site for each required design storm event(s);
 9. ☐ Design tailwater elevation(s) for each storm event at all points of discharge (include source or method of estimate); and
 10. ☐ Pump specifications and operating curves for range of possible operating conditions (if used in system).
- c. ☐ Provide a description of the engineering methodology, assumptions, and references for the parameters listed above, and a copy of all such computations, engineering plans, and specifications used to analyze the system. If a computer program is used for the analysis, provide the name of the program, input and output data, justification for model selection, and, if necessary, a description of the program.
4. Floodplain Analysis (where applicable).
- A review of the FEMA Flood Zone Maps was completed. However, the site lies within a tidal area, so no adverse impacts to the floodplain will occur.**
- a. ☐ If the project is in a known floodplain of a stream or other water course, identify the appropriate floodplain boundary and approximate flooding elevations of any lake, stream, or other watercourse located on or adjacent to the site.
 - b. ☐ For traversing works, in accordance with the applicable Applicant's Handbook, Vol. II, provide:
 1. ☐ Hydraulic calculations for all proposed traversing works; and
 2. ☐ Water surface profiles showing upstream impact of traversing works.
 - c. ☐ For impacts to regulated floodplains, in accordance with the applicable Applicant's Handbook, Vol. II, provide:
 1. ☐ Location and volume of encroachment within regulated floodplain(s); and
 2. ☐ Plans and calculations for compensating floodplain storage, if necessary, and calculations required for determining minimum building and road flood elevations.

Part 2: Construction Plans

See attachment, Big Bend II Battery Storage Proposed Development Plan

1. Provide clear, construction level detailed plans for the system. The plans must be signed and sealed by an appropriate registered professional as required by law. These plans should include cumulative information from all applicable sections, as well as the following:
 - a. ☐ Project area boundary and total land area (as defined in A.H. Vol. I, subsection 2.0(a)(107), including distances and orientation from roads or other landmarks.
 - b. ☐ Existing topography extending at least 100 feet off the project area. All topography shall include location and description of benchmarks, reference to NGVD 1929 or NAVD 1988 along with the conversion factor.
 - c. ☐ Proposed site plan with acreage, including the following:
 1. ☐ plan view of proposed development, including impervious surfaces and water management areas;
 2. ☐ land cover and natural communities*;
 3. ☐ wetlands and other surface waters*;
 4. ☐ undisturbed uplands*;
 5. ☐ aquatic communities*;
 6. ☐ proposed buffers*;
 7. ☐ proposed impacts to wetlands and other surface waters, and any proposed connections/outfalls to other surface waters or wetlands, (if applicable); and
 8. ☐ onsite wetland mitigation areas*.
 9. ☐ For phased projects, provide a master development plan clearly delineating the limits of each phase of construction.

*Information should reflect that provided in Section C.
 - d. ☐ Paving, Grading, and Drainage Information, which includes, but is not necessarily limited to, the following:
 1. ☐ Existing topography;
 2. ☐ Boundaries of wetlands and other surface waters and upland buffers (see Section C);
 3. ☐ Plan view of proposed development;
 4. ☐ Proposed elevations and/or profiles, including:
 - a) ☐ roadway, parking, and pavement grades;
 - b) ☐ floor slabs, walkways, and other paved surfaces;
 - c) ☐ earthwork grades for pervious landscaped areas; and
 - d) ☐ perimeter site grading, tying back into existing grades.
 5. ☐ Location of all water management areas, including elevations, dimensions, side slopes, and design water depths;
 6. ☐ Location, size, and invert elevations of existing and proposed stormwater conveyance systems;
 7. ☐ Vegetative cover plan for all on-site and off-site earth surfaces disturbed by construction; and
 8. ☐ Rights-of-way and easements for the system, including all on-site and off-site areas to be reserved for water management purposes (including access), and rights-of-way and easements for the existing drainage system, if any.

- e. ☐ Stormwater detail information, including but not necessarily limited to, the following:
1. ☐ Cross section of all stormwater management areas, including elevations, dimensions, side slopes, and proposed stabilization measures (with location of the cross section(s) shown on the corresponding plan view);
 2. ☐ Detail of all proposed control structures, including elevations, dimensions, and skimmer, where applicable; and
 3. ☐ Details of proposed stormwater management systems, such as underdrains, exfiltration trenches, vaults, and other proposed Best Management Practices (BMPs).
- f. ☐ Location and description of any nearby existing offsite features (such as wetland and other surface waters, stormwater management ponds, and building or other structures) which might be affected by or affect the proposed construction or development.

Part 3: Construction Schedule and Techniques

Provide a construction schedule and a description of construction techniques, sequencing, and equipment. This information should include, as applicable, the following. **Tampa Electric Company (TEC) is proposing to construct iron solution flow batteries within the boundary of Big Bend Power Station. The flow batteries will be located on the existing Big Bend II Solar facility, along the western edge, near the entrance. The site for the flow batteries is in an upland area that has previously been graded and used for construction associated with the Big Bend II Solar facility. The area for the flow batteries is approximately 0.63 acres (Limits of Disturbance).**

A.

- a. ☐ Access and staging of equipment;
Existing pathways will be used for access: any needed equipment will be staged within uplands within the footprint of the solar array site.
- b. ☐ Location and details of the erosion, sediment, and turbidity control measures to be implemented during each phase of construction and all permanent control measures to be implemented in post-development conditions.
- c. ☐ The location of disposal site(s) for any excavated material, including temporary and permanent disposal sites. **N/A**
- d. ☐ A demolition plan for any existing structures to be removed. **N/A**
- e. ☐ Dewatering plan details. If dewatering is required, detail the dewatering proposal including the methods that are proposed to contain the discharge, methods of isolating dewatering areas, and indicate the period dewatering structures will be in place. **Note: A Consumptive Use or Water Use permit may be required for dewatering.**
- f. ☐ Methods for transporting equipment and materials to and from the work site. If barges are required for access, provide the low water depths and draft of the fully loaded barge;
Existing roadways will be used for transport.

Part 4: Operation and Maintenance and Legal Documentation:

- a. ☐ Describe the overall maintenance and operation schedule for the proposed system.

Tampa Electric Company will be responsible for inspections, upkeep, and maintenance of the proposed stormwater management system as required to ensure proper operation.

- b. ☐ Identify the entity (or entities) that will be responsible for operating and maintaining the system (or parts of the system) to demonstrate that the entity (or entities) meet(s) the requirements of section 12.3 of the Applicant's Handbook, Vol. I.

Tampa Electric Company will remain the entity responsible for operation and maintenance of the system in perpetuity.

1. ☐ If different from the permittee, provide a draft document enumerating the enforceable affirmative obligations on the entity to properly operate and maintain the system for its expected life and documentation of the entity's financial responsibility for long-term maintenance.
 2. ☐ If the proposed operation and maintenance entity is not a property owner's association, provide proof of the existence of an entity or the future acceptance of the system by an entity which will operate and maintain the system.
- c. ☐ Provide drafts of all proposed conservation easements, stormwater management system easements, draft property owner's association documents, and plats for the property containing the proposed system. **N/A**
- d. ☐ Provide legal reservations for access to the treatment system for maintenance and operation by future maintenance entities for subdivided projects. **N/A**
- e. ☐ Provide indication of how water and wastewater service will be supplied.
- f. ☐ Provide a copy of the boundary survey and/or legal description and acreage of the total land area of contiguous property owned/controlled by the applicant.
- g. ☐ If any associated land agreements are required to implement the proposed activities, such as flowage easements across lands not owned by the applicant, include such documentation. If negotiations are underway, but not yet concluded, regarding such land use agreements, please indicate that and provide an anticipated date for providing that documentation. A permit cannot be issued for an activity to use lands that are not owned by the applicant or for which the applicant does not hold a sufficient real property interest to use those lands.

Part 5: Water Use

- a. ☐ Describe how irrigation will be provided to the project. Will the surface water system be used for water supply, including landscape irrigation, or recreation? **N/A, no irrigation is proposed.**
- b. ☐ If a Consumptive Use or Water Use permit has been issued for the project, state the permit number:
- c. ☐ If a Consumptive Use or Water Use permit has not been issued for the project, indicate if such a permit will be required. ☐ yes ☐ no ☐ don't know
If yes, please indicate when the application for a permit will be submitted:
- d. ☐ Indicate how any existing wells located within the project site will be utilized or abandoned.

Part 6: Special Basin Information

- a. Is your project within a special basin as described in the applicable Applicant's Handbook, Vol. II?
☐ yes ☒ no ☐ don't know
- b. If yes, please demonstrate that the project will meet the applicable special basin criteria.

SECTION 1: Identification

1.1. Identification

Product form	Mixtures
Trade name	ESS Iron Flow Battery Hydrated Electrolyte
Part number	SS2-0037-01

1.2. Other means of identification

No additional information available

1.3. Recommended use of the chemical and restrictions on use

Recommended use : Electrolytes for batteries

1.4. Supplier

ESS Tech Inc.
26440 SW Parkway Ave Bldg 83
Wilsonville, OR 97070. USA
855-423-9920

1.5. Emergency telephone number

Emergency number : 1-800-424-9300

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS US classification

Corrosive to metals, Category 1	H290
Acute toxicity (oral), Category 4	H302
Skin corrosion/irritation, Category 1A	H314
Serious eye damage/eye irritation, Category 1	H318
Reproductive toxicity, Category 1B	H360

2.2. GHS Label elements, including precautionary statements

Hazard pictograms (GHS AU) :



Signal word (GHS AU) :

Danger

Contains

Iron chloride (FeCl₂) (≤ 30 %); Potassium Chloride (≤ 25 %); Ammonium chloride (≤ 25 %); boric acid (< 1 %); Hydrochloric Acid (< 1 %); Manganese Chloride Tetrahydrate (< 1%)

Hazard statements (GHS AU) :

H290 - May be corrosive to metals
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H360 - May damage fertility or the unborn child
H318 - Causes serious eye damage

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Precautionary statements (GHS AU) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P234 - Keep only in original container.
P260 - Do not breathe mist, spray, vapours.
P264 - Wash hands thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear eye protection, protective gloves, protective clothing.
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water .
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER or doctor.
P363 - Wash contaminated clothing before reuse.
P390 - Absorb spillage to prevent material damage.
P405 - Store locked up.
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

2.3. Other hazards which do not result in classification

Other hazards which do not result in classification : No additional information available.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS US classification
Water	CAS-No.: 7732-18-5	≥ 50	Not classified
Iron chloride (FeCl ₂)	CAS-No.: 7758-94-3	10 - 30	Met. Corr. 1, H290 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Potassium chloride	CAS-No.: 7447-40-7	≤ 25	Not classified
Ammonium Chloride	CAS-No.: 12125-02-9	1 – 15	Acute Tox: 4 (Oral), H302 Eye Irrit. 2A, H319
Hydrochloric acid	CAS-No.: 7647-01-0	≤ 1	Met. Corr. 1, H290 Skin Corr. 1A, H314 Eye Dam. 1, H318 STOT SE 3, H335
Boric acid	CAS-No.: 10043-35-3	≤ 1	Repr. 1B, H360
Manganese chloride (MnCl ₂), tetrahydrate	CAS-No.: 13446-34-9	1 - 5	Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319

ESS Iron Flow Battery Hydrated Electrolyte

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SECTION 4: First-aid measures

4.1. Description of necessary first-aid measures

First-aid measures general	: Get medical advice/attention if you feel unwell.
First-aid measures after inhalation	: Remove person to fresh air and keep comfortable for breathing. Call a physician immediately.
First-aid measures after skin contact	: Take off immediately all contaminated clothing. Rinse thoroughly with plenty of water for at least 20 minutes and take medical advice.
First-aid measures after eye contact	: Wash off immediately and plentifully with water for at least 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
First-aid measures after ingestion	: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects	: May damage fertility or the unborn child.
Symptoms/effects after inhalation	: At high concentrations, the vapours can be irritating to the respiratory system.
Symptoms/effects after skin contact	: Causes severe skin burns.
Symptoms/effects after eye contact	: Causes serious eye burns.
Symptoms/effects after ingestion	: Harmful if swallowed. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

4.3. Immediate medical attention and special treatment, if necessary

Note to physician :	: Treat symptomatically.
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SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media	: Foam. Dry powder. Carbon dioxide. Water spray. Sand.
Unsuitable extinguishing media	: Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Fire hazard	: Presents no particular fire or explosion hazard.
Explosion hazard	: No hazard identified.
General measures	: Evacuate unnecessary personnel. Avoid contact with spilled material.
Hazardous decomposition products in case of fire	: Non-combustible, thermal decomposition may produce: Hydrogen Chloride, Iron Oxides, Manganese Oxides, Boron Oxides, Nitrogen Oxides, Ammonia

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	: Exercise caution when fighting any chemical fire. Use water spray or fog for cooling exposed containers. For further information refer to section 8: "Exposure controls/personal protection".
Protective equipment for firefighters	: Do not enter fire area without proper protective equipment, including respiratory protection. Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.
Hazchem Code	: 2X

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SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

- | | |
|----------------------|--|
| Protective equipment | : Do not attempt to take action without suitable protective equipment. Small spills: Wear personal protective equipment. Large amounts: Wear suitable protective clothing, gloves and eye or face protection. For further information refer to section 8: "Exposure controls/personal protection". |
| Emergency procedures | : Evacuate unnecessary personnel. Only qualified personnel equipped with suitable protective equipment may intervene. Ventilate spillage area. |

6.1.2. For emergency responders

- | | |
|----------------------|---|
| Protective equipment | : Do not attempt to take action without suitable protective equipment. Small spills: Wear personal protective equipment. Large amounts: Wear suitable protective clothing, gloves and eye/face protection. For further information refer to section 8: "Exposure controls/personal protection". |
| Emergency procedures | : Only qualified personnel equipped with suitable protective equipment may intervene. Ventilate spillage area. |

6.2. Environmental precautions

Prevent entry to sewers and public waters. Avoid release to the environment. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

- | | |
|-------------------------|--|
| For containment | : Soak up with inert absorbent material (for example sand, sawdust, a universal binder, silica gel). |
| Methods for cleaning up | : Clean up any spills as soon as possible, using an absorbent material to collect it. Collect all waste in suitable and labeled containers and dispose according to local legislation. |
| Other information | : Dispose in a safe manner in accordance with local/national regulations. |

6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For disposal of residues refer to section 13 : "Disposal considerations".

SECTION 7: Handling and storage

7.1. Precautions for safe handling

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|-------------------------------|---|
| Precautions for safe handling | : Provide good ventilation in process area to prevent formation of vapor. Wear personal protective equipment. Avoid all eye and skin contact and do not breathe vapor and mist. Do not handle until all safety precautions have been read and understood. Obtain special instructions before use. |
| Hygiene measures | : Always wash hands after handling the product. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product. Use good personal hygiene practices |

7.2. Conditions for safe storage, including any incompatibilities

- | | |
|------------------------|--|
| Storage conditions | : Store in corrosive resistant container. Store in a well-ventilated place. Store in secure location. Keep cool. Keep only in original container |
| Incompatible materials | : Metals. Oxidizing substances. |

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

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No additional information available

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Potassium chloride (7447-40-7)	
No additional information available	
Ammonium chloride (12125-02-9)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Ammonium chloride
ACGIH OEL TWA	10 mg/m ³ (fume)
ACGIH OEL STEL	20 mg/m ³ (fume)
Remark (ACGIH)	
Regulatory reference	ACGIH: <i>Documentation of the Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)</i> - Ammonium chloride, fume. See annual publication for most recent information.
Boric acid (10043-35-3)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Boric acid
ACGIH OEL TWA	2 mg/m ³ (I - Inhalable particulate matter)
ACGIH OEL STEL	6 mg/m ³ (I - Inhalable particulate matter)
Remark (ACGIH)	TLV® Basis: URT irr. Notations: A4 (Not classifiable as a Human Carcinogen)
Regulatory reference	ACGIH 2022
Iron chloride (FeCl₂) (7758-94-3)	
No additional information available	
Hydrochloric acid (7647-01-0)	
USA - ACGIH - Occupational Exposure Limits	
Local name	Hydrogen chloride
ACGIH OEL Ceiling [ppm]	2 ppm
Remark (ACGIH)	TLV® Basis: URT irr. Notations: A4 (Not classifiable as a Human Carcinogen)
ACGIH chemical category	Not Classifiable as a Human Carcinogen
Regulatory reference	ACGIH 2022
USA - OSHA - Occupational Exposure Limits	
Local name	Hydrogen chloride
OSHA PEL (Ceiling)	7 mg/m ³
OSHA PEL C [ppm]	5 ppm
Regulatory reference (US-OSHA)	OSHA Annotated Table Z-1
USA - IDLH - Occupational Exposure Limits	
IDLH [ppm]	50 ppm
USA - NIOSH - Occupational Exposure Limits	
NIOSH REL (Ceiling)	7 mg/m ³
NIOSH REL C [ppm]	5 ppm

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Manganese chloride (MnCl₂), tetrahydrate (13446-34-9)

No additional information available

8.2. Biological Monitoring

No additional information available

8.3. Engineering controls

Appropriate engineering controls : Ensure good ventilation of the work station. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

8.4. Individual protection measures, such as personal protective equipment (PPE)

Personal protective equipment : Use personal protective equipment as required.

Hand protection : Impermeable protective gloves. Impermeable protective nitrile gloves. Choosing the proper glove is a decision that depends not only on the type of material, but also on other quality features, which differ for each manufacturer

Eye protection : Chemical goggles, close fitting eye protection, or face shield with safety glasses

Skin and body protection : Long sleeved protective clothing. Wear foot protection

Respiratory protection : Where excessive vapour, mist, or dust may result, use approved respiratory protection equipment

Environmental exposure controls : Avoid release to the environment.

Other information : Avoid contact with skin, eyes and clothing. Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : Transparent.

Color : Green

Odor : No data available

Odor threshold : No data available

pH : < 2

pH solution : No data available

Melting point : No data available

Freezing point : No data available

Boiling point : > 100 °C

Flash point : No data available

Relative evaporation rate (butyl acetate=1) : No data available

Flammability (solid, gas) : Not applicable.

Vapor pressure : No data available

Relative vapor density at 20 °C : No data available

Relative density : No data available

Density : 1.2 – 1.35

Solubility : No data available

Partition coefficient n-octanol/water (Log Pow) : No data available

Auto-ignition temperature : No data available

Decomposition temperature : No data available

Viscosity, kinematic : No data available

Viscosity, dynamic : No data available

Explosion limits : No data available

Explosive properties : No data available

Oxidizing properties : No data available

ESS Iron Flow Battery Hydrated Electrolyte

Safety Data Sheet

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

Reactivity	: The product is non-reactive under normal conditions of use, storage and transport.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	: No dangerous reactions known under normal conditions of use.
Conditions to avoid	: None under recommended storage and handling conditions (see section 7).
Incompatible materials	: metals. Oxidizing substances.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced. Thermal decomposition can lead to the release of irritating gases and vapours.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	: Harmful if swallowed.
Acute toxicity (dermal)	: Not classified (Based on available data, the classification criteria are not met)
Acute toxicity (inhalation)	: Not classified (Based on available data, the classification criteria are not met)

ESS Iron Flow Battery Hydrated Electrolyte	
ATE US (oral)	885 mg/kg body weight
Potassium chloride (7447-40-7)	
LD50 oral rat	2600 mg/kg
ATE US (oral)	2600 mg/kg body weight
ATE US (dust, mist)	1.5 mg/l/4h
Ammonium chloride (12125-02-9)	
LD50 oral rat	1,410 mg/kg
LD50 dermal rat	> 2,000 mg/kg (Directive 92/69/EEC, B.3)
Boric acid (10043-35-3)	
LD50 oral rat	> 2600 mg/kg body weight Animal: rat, Animal sex: male, Guideline: OECD Guideline 401 (Acute Oral Toxicity), Guideline: EU Method B.1 (Acute Toxicity (Oral))
LD50 dermal rabbit	> 2000 mg/kg body weight Animal: rabbit, Guideline: other:FIFRA (40 CFR 163)
LC50 Inhalation - Rat	> 2.12 mg/l air Animal: rat, Guideline: OECD Guideline 403 (Acute Inhalation Toxicity), Guideline: other:USEPA FIFRA 40 CFR Part 160
Iron chloride (FeCl ₂) (7758-94-3)	
LD50 oral rat	450 mg/kg
LD50 dermal rat	> 2000 mg/kg
ATE US (oral)	500 mg/kg body weight
Manganese chloride (MnCl ₂), tetrahydrate (13446-34-9)	
LD50 oral rat	1484 mg/kg

Skin corrosion/irritation	: Causes severe skin burns.
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Serious eye damage/irritation	: Causes serious eye damage.
Respiratory or skin sensitization	: Not classified (Based on available data, the classification criteria are not met)
Germ cell mutagenicity	: Not classified (Based on available data, the classification criteria are not met)
Carcinogenicity	: Not classified (Based on available data, the classification criteria are not met)

Potassium chloride (7447-40-7)

NOAEL (chronic,oral,animal/male,2 years)	≈ 1820 mg/kg body weight Animal: rat, Animal sex: male, Remarks on results: other:
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Hydrochloric acid (7647-01-0)

IARC group	3 - Not classifiable
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Reproductive toxicity	: May damage fertility or the unborn child.
STOT-single exposure	: Not classified (Based on available data, the classification criteria are not met)

Hydrochloric acid (7647-01-0)

STOT-single exposure	May cause respiratory irritation.
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STOT-repeated exposure	: Not classified (Based on available data, the classification criteria are not met)
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Potassium chloride (7447-40-7)

NOAEL (oral,rat,90 days)	≈ 1820 mg/kg body weight Animal: rat, Animal sex: male
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Aspiration hazard	: Not classified (Based on available data, the classification criteria are not met)
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Viscosity, kinematic	: No data available
Symptoms/effects after inhalation	: At high concentrations, the vapours can be irritating to the respiratory system
Symptoms/effects after skin contact	: Causes severe skin burns.
Symptoms/effects after eye contact	: Causes serious eye burns.
Symptoms/effects after ingestion	: Harmful if swallowed. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.
Other information	: Likely routes of exposure: ingestion, inhalation, skin and eye.

SECTION 12: Ecological information

12.1. Ecotoxicity

Ecology - general	: The product has not been tested.
Other information	: Avoid release to the environment.

Potassium chloride (7447-40-7)

LC50 - Fish [1]	1060 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 - Fish [2]	750 – 1020 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 - Crustacea [1]	825 mg/l (Exposure time: 48 h - Species: Daphnia magna)
EC50 - Crustacea [2]	83 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
EC50 - Other aquatic organisms [1]	660 mg/l waterflea
EC50 - Other aquatic organisms [2]	> 100 mg/l
Partition coefficient n-octanol/water (Log Pow)	-0.46 Source: OECD Screening Information Data Set

Ammonium chloride (12125-02-9)

LC50 - Fish [1]	209 mg/l (Exposure time: 96 h - Species: Cyprinus carpio [static])
EC50 - Crustacea [1]	136.6 mg/l Test organisms (species): Daphnia magna
EC50 - Other aquatic organisms [1]	0.39 mg/l waterflea

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Ammonium chloride (12125-02-9)	
EC50 - Other aquatic organisms [2]	7.16 mg/l
Partition coefficient n-octanol/water (Log Pow)	-4.37

boric acid (10043-35-3)	
LC50 - Fish [1]	456 mg/l Pimephales promelas
EC50 - Crustacea [1]	760 mg/l
NOEC chronic fish	6.4 mg/l Test organisms (species): Danio rerio (previous name: Brachydanio rerio) Duration: '34 d'
BCF - Fish [1]	0.7
Partition coefficient n-octanol/water (Log Pow)	-0.76

12.2. Persistence and degradability

Potassium chloride (7447-40-7)	
Not rapidly degradable	

12.3. Bioaccumulative potential

Potassium chloride (7447-40-7)	
Partition coefficient n-octanol/water (Log Pow)	-0.46 Source: OECD Screening Information Data Set
Ammonium chloride (12125-02-9)	
Partition coefficient n-octanol/water (Log Pow)	-4.37
boric acid (10043-35-3)	
BCF - Fish [1]	0.7
Partition coefficient n-octanol/water (Log Pow)	-0.76

12.4. Mobility in soil

Potassium chloride (7447-40-7)	
Partition coefficient n-octanol/water (Log Pow)	-0.46 Source: OECD Screening Information Data Set
Ammonium chloride (12125-02-9)	
Partition coefficient n-octanol/water (Log Pow)	-4.37
boric acid (10043-35-3)	
Partition coefficient n-octanol/water (Log Pow)	-0.76

12.5. Other adverse effects

Other adverse effects : No additional information available
Effect on the ozone layer : No additional information available.

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Effect on the ozone layer	No additional information available
Fluorinated greenhouse gases	False

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Iron chloride (FeCl₂) (7758-94-3)	
Fluorinated greenhouse gases	False
Hydrochloric acid (7647-01-0)	
Fluorinated greenhouse gases	False
Manganese chloride (MnCl₂), tetrahydrate (13446-34-9)	
Fluorinated greenhouse gases	False
Potassium chloride (7447-40-7)	
Fluorinated greenhouse gases	False
Ammonium chloride (12125-02-9)	
Fluorinated greenhouse gases	False
boric acid (10043-35-3)	
Fluorinated greenhouse gases	False

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste treatment methods	: Dispose of contents/container in accordance with licensed collector's sorting instructions.
Product/Packaging disposal recommendations	: Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials	: Avoid release to the environment.

SECTION 14: Transport information

ADG	IMDG	IATA
14.1. UN number		
3264	3264	3264
14.2. UN Proper Shipping Name		
CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Iron chloride (FeCl ₂))	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Iron chloride (FeCl ₂))	Corrosive liquid, acidic, inorganic, n.o.s. (Iron chloride (FeCl ₂))
Transport document description		
Not applicable	UN 3264 CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (Iron chloride (FeCl ₂)), 8, III	UN 3264 Corrosive liquid, acidic, inorganic, n.o.s. (Iron chloride (FeCl ₂)), 8, III
14.3. Transport hazard class(es)		
8	8	8
		
14.4. Packing group		
III - Substances presenting low danger	III	III

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ADG	IMDG	IATA
14.5. Environmental hazards		
Dangerous for the environment: No	Dangerous for the environment: No Marine pollutant: No	Dangerous for the environment: No

14.6. Special precautions for user

Specific storage requirement : No data available
Shock sensitivity : No data available

14.7. Additional information

Other information : Consult the associated transport regulations for available and applicable exceptions or exemptions.

The suitable shipping classification must be evaluated at the time of shipment due to the possibility for variations in regard to the transportation of this material considering the requirements, modes of transport, packaging, packaging configuration, quantity etc. Please consult the appropriate regulation for specific shipping information and requirements.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation information can be obtained through the authorized transporting corporation. It is the responsibility of the transporting corporation to follow all applicable laws, regulations and rules relating to the transportation of this product.

Transport by road and rail

UN-No. (ADG) : 3264
Special provision (ADG) : 223, 274
Limited quantities (ADG) : 5L
Excepted quantities (ADG) : E1
Packing instructions (ADG) : P001, IBC03, LP01
Portable tank and bulk container instructions (ADG) : T7
Portable tank and bulk container special provisions (ADG) : TP1, TP28

Transport by sea

UN-No. (IMDG) : 3264
Special provisions (IMDG) : 223, 274
Limited quantities (IMDG) : 5 L
Excepted quantities (IMDG) : E1
Packing instructions (IMDG) : P001, LP01
IBC packing instructions (IMDG) : IBC03
Tank instructions (IMDG) : T7
Tank special provisions (IMDG) : TP1, TP28
EmS-No. (Fire) : F-A - FIRE SCHEDULE Alfa - GENERAL FIRE SCHEDULE
EmS-No. (Spillage) : S-B - SPILLAGE SCHEDULE Bravo - CORROSIVE SUBSTANCES
Stowage category (IMDG) : A
Stowage and handling (IMDG) : SW2
Segregation (IMDG) : SGG1, SG36, SG49
Properties and observations (IMDG) : Causes burns to skin, eyes and mucous membranes.

Air transport

UN-No. (IATA) : 3264
PCA Excepted quantities (IATA) : E1
PCA Limited quantities (IATA) : Y841

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PCA limited quantity max net quantity (IATA)	: 1L
PCA packing instructions (IATA)	: 852
PCA max net quantity (IATA)	: 5L
CAO packing instructions (IATA)	: 856
CAO max net quantity (IATA)	: 60L
Special provisions (IATA)	: A3, A803
ERG code (IATA)	: 8L

14.8. Hazchem or Emergency Action Code

Hazchem Code	: 2X
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SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are present and listed as Active on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory, except for:

Manganese chloride (MnCl ₂), tetrahydrate	CAS-No. 13446-34-9	≤ 5%
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Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Hydrochloric acid	CAS-No. 7647-01-0	≤ 5%
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Ammonium chloride (12125-02-9)

CERCLA RQ	5000 lb
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Iron chloride (FeCl₂) (7758-94-3)

CERCLA RQ	100 lb
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Hydrochloric acid (7647-01-0)

Listed on EPA Hazardous Air Pollutant (HAPS)

CERCLA RQ	5000 lb
RQ (Reportable quantity, section 304 of EPA's List of Lists)	5000 lb
Section 302 EPCRA Reportable Quantity (RQ)	5000 lb gas only
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb (gas only)

15.2. International regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

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Component	State or local regulations
Iron chloride (FeCl ₂)(7758-94-3)	U.S. - New Jersey - Right to Know Hazardous Substance List; U.S. - Pennsylvania - RTK (Right to Know) List; U.S. - Massachusetts - Right To Know List; U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
Hydrochloric acid(7647-01-0)	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List U.S. - Minnesota - Hazardous Substance List U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

SECTION 16: Other information

according to US HazCom 2012

Other information

: None.

Issue Date

21 Nov 2022

NFPA health hazard

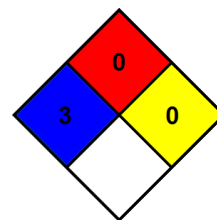
: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard

: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity

: 0 - Material that in themselves are normally stable, even under fire conditions.



Classification	
Met. Corr. 1	H290
Acute Tox. 4 (Oral)	H302
Skin Corr. 1	H314
Eye Dam. 1	H318
Repr. 1B	H360

Full text of H-statements	
Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation, Category 2A
Met. Corr. 1	Corrosive to metals, Category 1
Repr. 1B	Reproductive toxicity, Category 1B
Skin Corr. 1	Skin corrosion/irritation, Category 1
Skin Corr. 1A	Skin corrosion/irritation, Category 1A
STOT RE 2	Specific target organ toxicity – Repeated exposure, Category 2
STOT SE 3	Specific target organ toxicity – Single exposure, Category 3, Respiratory tract irritation

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Full text of H-statements	
H290	May be corrosive to metals
H301	Toxic if swallowed
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure

Safety Data Sheet (SDS), USA

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal, and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, process, and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.