STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
APPLICATION OF NTE CONNECTICUT, LLC FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION, MAINTENANCE AND OPERATION OF AN ELECTRIC POWER GENERATING FACILITY OFF LAKE ROAD, KILLINGLY, CONNECTICUT	:	DOCKET NO. 470
	:	DECEMBER 8, 2016

APPLICANT'S SECOND SUPPLEMENTAL RESPONSE TO MEMORANDUM REGARDING REQUESTS, MOTIONS AND THE CONTINUATION OF THE EVIDENTIARY HEARING

In its November 16, 2016 Memorandum Regarding Requests, Motions and the Continuation of the Evidentiary Hearing, the Siting Council (Council) asked the applicant, NTE Connecticut LLC (NTE), to submit an analysis of the feasibility of constructing one electrical switchyard as opposed by two; an analysis of the feasibility of constructing a Gas Insulated Substation/Switchyard; an analysis of the feasibility of an underground 345-kV interconnection; a description of how NTE would access the stormwater basins; identification of the amount of dual-fuel electric generating capacity in the ISO-NE Region; identification of the preservation that is used in the ULSD tank; and submission of CWC's available water supply adequacy analysis.

A. An analysis of the feasibility of constructing one electrical switchyard as opposed by two; an analysis of the feasibility of constructing a Gas Insulated Substation/Switchyard; an analysis of the feasibility of an underground 345-kV interconnection.

NTE has formalized its consideration of several electrical interconnection alternatives herein, based on feedback from the Connecticut Siting Council (CSC) during the November 15, 2016 Evidentiary Hearing. During the Hearing, the CSC requested that NTE more closely evaluate placement of all KEC features (such as the Eversource Switchyard and associated physical tie-in) on and adjacent to the Generating Facility Site, considering alternative equipment arrangements and technologies. Per the request of the CSC, the alternatives considered in this analysis include:

1) Use of a single switchyard (Combined Switchyard) design versus the separate switchyard (KEC Switchyard and Eversource Switchyard) design as proposed by NTE;
2) Use of a sulfur hexafluoride (SF_6) insulated switchyard, a/k/a Gas Insulated Switchyard (GIS) design versus the open-air insulated switchyard (AIS) design as proposed by NTE; and
3) Physical interconnection to Eversource's 345 kV transmission circuit adjacent to the Generating Facility Site using underground cable, versus the overhead interconnection adjacent to the Switchyard Site as proposed by NTE.

This narrative, particularly in discussing Alternatives 2 and 3, is focused on the CSC's request to evaluate the alternatives in the context of locating all switchyard equipment exclusively on the Generating Facility Site. NTE has, over the course of its siting and design effort, considered numerous alternatives, in addition to those discussed here, before settling on the proposed locations and configuration. The following is meant to describe and further evaluate the feasibility of each potential option individually, and cumulatively, in the context described above in order to consolidate KEC-related features on the Generating Facility Site.

An analysis of the feasibility of constructing one electrical switchyard as opposed to two.

As it relates to the feasibility of a Combined Switchyard, NTE has reviewed publicly available information from the CPV Towantic (CSC Docket 192 [CPV], CSC Petition 1226 [Eversource Energy]) and Kleen Energy applications (CSC Docket 225). NTE is aware that subsequent changes may have occurred with Towantic's or Kleen's electrical interconnection designs following the respective CSC Decisions and Orders, but has based its review on the publicly available information in the docket record(s). Because the publically available information regarding Kleen is limited, NTE has relied primarily on information reflected in the Towantic application and subsequent Eversource petition.

The following comparison of the interconnection proposed at KEC and under construction at Towantic help illustrate the advantages of KEC's design.

Comparison of the Combined Switchyard at Towantic to Separate Switchyards at KEC

The Towantic project interconnects with the Eversource 115 kV transmission system via an on-site Eversource AIS switchyard. This switchyard is designed as a breaker-and-one-half configuration, with fourteen circuit breakers for nine positions: three required for the generators, and six required for the in-and-out taps of the three transmission circuits (Attachment A, Towantic 115 kV Yard General Arrangement Plan View - CSC Petition 1226).

The KEC facility will interconnect with the Eversource 345 kV transmission system via an on-site Eversource AIS switchyard and an on-site KEC facility switchyard. The Eversource switchyard is designed as a ring bus, with three circuit breakers for three positions; one for the entire KEC facility and two required for the in-and-out taps of the transmission circuit. The KEC facility switchyard is designed as a radial collector bus, with two circuit breakers; one for each generator. This KEC approach is a simpler, safer, and more reliable design than the Towantic switchyard.

<u>Operations, Maintenance, Safety and Reliability</u>

Because the Combined Switchyard at Towantic is entirely owned and operated by Eversource, Towantic does not have operational control over any of the Eversource circuit breakers. Therefore, to conduct any maintenance on its transformers, bus, protection relays, metering, etc., Towantic must rely on Eversource to isolate the Towantic facility from the transmission system. Not only does this require complicated coordination between the two parties, but each party must rely on the other organization's lock-out / tag-out system in order to protect its personnel.

Towantic must also rely on Eversource's circuit breakers for its critical electrical relaying protection. For example, in the event of a short circuit at the Towantic facility, the Combined Switchyard must provide protection for both Towantic's equipment as well as its own transmission system.

In contrast, KEC proposes to operate and maintain its own circuit breakers and equipment independently of Eversource. The KEC breakers can be opened and controlled at the sole discretion of KEC. This not only eliminates complicated coordination between the two parties, but also allows each party to rely solely on its own lock-out / tag-out system to ensure the safety of their respective personnel.

Because KEC has its own circuit breakers, in the case of a short circuit event at the KEC facility, these circuit breakers will provide primary protection of the KEC equipment, and the Eversource breakers will serve as a back-up. This design allows the Eversource breakers to provide primary protection of the transmission system.

Space Requirements

If KEC had proposed a Combined Switchyard, two connections (one for each generator) between KEC and the Eversource Switchyard would be required. As a result, the Eversource three-breaker ring switchyard would no longer suffice, since a total of four positions would be required. Eversource would likely require a breaker-and-one-half switchyard (similar to Towantic) to facilitate KEC's interconnection to the 345 kV transmission system. A 345 kV breaker-and-one-half switchyard in lieu of a three-breaker ring would take up the majority of acreage that would be gained from eliminating the approximately 1.5 acre KEC Switchyard. NTE estimates that the Combined Switchyard would require 3.5-4 acres, comparable to the total space required for the separate KEC and Eversource Switchyards as proposed.

Given the goal of locating a potential Combined Switchyard, NTE has prepared a conceptual drawing (Attachment B), showing separate KEC and Eversource Switchyards, with both located immediately adjacent to one another on the Generating Facility Site. The footprint of a breaker-and-one-half Combined Switchyard would be similar to this arrangement. As shown in Attachment B, this arrangement of a Combined Switchyard on the Generating Facility Site results in a considerable reduction of open space on the Generating Facility Site that is critical for parking and laydown during construction and major outages.

Summary

Separate Switchyards for KEC and Eversource are preferred because of the obvious benefits to KEC, Eversource, and the ISO-NE grid including the following:

- Improved personnel safety
- Additional operational flexibility for both KEC and Eversource

- Greater level of reliability for KEC, Eversource, and the ISO-NE transmission grid
- Provides considerable amount of open space on the Generating Facility Site, enhancing construction and maintenance of the facility

Although the Combined Switchyard option is technically feasible, it has a number of drawbacks including the following:

- Reduced personnel safety.
- Reduced operational flexibility for both KEC and Eversource.
- Reduced level of reliability for KEC, Eversource and the ISO-NE transmission grid
- Negligible overall space savings.
- Reduced open space on Generating Facility Site, significantly increasing the difficulty in construction and maintenance of the facility.

An analysis of the feasibility of constructing a Gas Insulated Substation/Switchyard; and An analysis of the feasibility of constructing an underground 345 kV interconnection.

The feasibility analysis of utilizing a GIS switchyard or an underground 345 kV interconnection has been combined into a single response due to the common challenges associated with both options. As noted previously, and based on the feedback received from the CSC during the November 15, 2016 Evidentiary Hearing, these analyses focus on the specific consideration of these potential options for the purposes of locating all of KEC's equipment on the Generating Facility Site. While NTE appreciates the reasons for considering these options (e.g., minimizing footprint, eliminating the Lake Road transmission line crossing and potentially reducing visibility), these potential options have significant drawbacks that would outweigh any such benefit.

Background on Utilizing 345 kV Line 3271 for Interconnection of KEC

Prior to performing a detailed analysis of the feasibility of using GIS or an underground interconnection at the KEC site, it is important to understand the technical reasons behind NTE's selection of an overhead tie-in that takes place adjacent to the Switchyard Site (i.e., south of Lake Road), beyond those associated with space constraints. NTE has designed the interconnection to be adjacent to the Switchyard Site largely because of the physical challenges associated with an interconnection to the 345 kV transmission line adjacent to the Generating Facility Site, as discussed in the sections that follow.

The existing Eversource transmission line right-of-way (ROW), which runs adjacent to the KEC site, contains four existing transmission circuits. Two 115 kV circuits are on the near side of the ROW and two 345 kV circuits are on the far side of the ROW. NTE completed an electrical injection study to select the least constrained transmission line for its point of interconnection. The results of this analysis concluded that 345 kV circuit 3271, which was installed in 2015 as part of the Interstate Reliability Project (IRP) (CSC Docket No. 424), served as the ideal point of interconnection for KEC. Line 3271 is the nearest 345 kV circuit to the KEC Site, but is separated from KEC by the two 115 kV transmission lines. Therefore, to reach Line 3271, the tap of this line will need to extend over or under the two existing 115 kV circuits.

Existing Transmission Line Constraints Adjacent to the Generating Facility Site

There are significant obstacles associated with an overhead tie-in that currently exist in the ROW adjacent to the Generating Facility Site. The base elevation at the 115 kV towers ranges from approximately 315-320 feet above mean sea level (AMSL), compared to base elevation of the 345 kV Line 3271 towers, which ranges from approximately 290-295 feet AMSL (Attachment C). This natural elevation difference means that the 115 kV towers are at a base elevation that is 20-30 feet higher than the Line 3271 towers. In addition, the towers within each 115 kV line are approximately 500 feet apart, resulting in minimal conductor line sag.

The two interconnecting towers on the Generating Facility Site and the six 345 kV turning structures required to perform the tie-in would have to be considerably taller than the existing 345 kV structures to clear the 115 kV transmission lines and maintain required electrical clearance (*see* Attachment C). This would place these eight structures well above the tree-line and greatly increase visibility throughout the surrounding area. These existing geographic and geometric equipment constraints greatly impede an overhead tie-in adjacent to the Generating Facility Site.

These constraints are greatly reduced in the ROW adjacent to the Switchyard Site. The grade elevations at the 115 kV towers and the Line 3271 towers are approximately equal. In addition, the 115 kV towers in this location are separated by approximately 800 feet, resulting in considerably more conductor line sag. The lower relative base elevation and additional 115 kV conductor sag greatly facilitates an overhead tie-in adjacent to the Switchyard Site. NTE has proposed to perform an overhead tie-in to Line 3271 at the location that coincides with the lowest point (i.e., point of greatest sag) on the 115 kV conductors adjacent to the Switchyard Site, which will reduce the tower heights significantly compared to towers required to tie-in adjacent to the Generating Facility Site.

Underground Tie-in Adjacent to the Generating Facility Site

There are several significant obstacles associated with an underground tap of the existing 345 kV Line 3271 adjacent to the Generating Facility Site. The first, and most notable, is driven by the existing capacity of Line 3271. According to Eversource, this line, installed in 2015 as part of the IRP, consists of two (bundled) 1,950 kcmil aluminum overhead conductors per phase. This corresponds to a long-term emergency (LTE) rating of approximately 3,150 MVA. At 345 kV, this means that the existing Line 3271 can carry approximately 5,200 A.

In order to perform an underground in-and-out tap of the existing Line 3271, the new infrastructure must be capable of preserving existing LTE capacity of the Eversource transmission line. Conductor ampacity is limited by temperature, and underground cables must be insulated and installed in underground duct banks which inhibit the transfer of heat from the cables. Because of this ampacity limiting temperature effect, it is unlikely that a design using underground conductors could meet Eversource's LTE capacity of the existing circuit.

The in-and-out tap using underground cables must be installed in two separate, concrete-encased duct banks. NTE has prepared a conceptual cross-sectional arrangement for these duct banks (Attachment D). In order to install these duct banks, additional blasting, excavation, and imported fill would be required. Furthermore, these duct banks would require a permanently cleared and maintained (~83 ft. wide) ROW through the eastern property boundary of the Generating Facility Site, thereby removing the important vegetative screening otherwise included in the KEC design.

Cost of Underground Interconnection

NTE estimates that the cost of the tie-in as described above, including significant required civil works, duct bank, physical cable (24 to 30 individual 300-500 foot conductor segments), terminations, transition structures and the physical break of Line 3271 to be approximately $7-12 million. Compared with the KEC approach of an overhead tie of the existing Line 3271, this represents an increase in project costs of approximately $5-10 million.

Feasibility of Using GIS

As an alternative to an AIS design, KEC evaluated the feasibility of using a GIS design for the KEC and Eversource Switchyards. Use of a GIS design for the Eversource Switchyard placed on the Generating Facility Site, with interconnection occurring adjacent to the Generating Facility Site would be hindered by the extensive drawbacks discussed above, including the physical challenges and increased visual impact associated with both an overhead and underground tie-in, as well as potential inability of underground cable to preserve the existing capacity of the Eversource transmission line. Further, the size of the GIS design would require an additional underground-to-overhead transition to facilitate termination of several substantial underground conductors.

Due to the significant challenges and drawbacks associated with both an overhead and underground interconnection adjacent to the Generating Facility Site, the use of GIS would not resolve the concerns raised during the November 15, 2016 Evidentiary Hearing.

Emissions Implications Associated with Gas-Insulated Switchyard

The reduction in size achievable with GIS is possible because the bus, disconnect switches, breaker mechanisms, etc. are fully insulated in SF_6, a potent greenhouse gas (GHG). SF_6 leakage is inherent with GIS equipment. According to Siemens, the amount of SF_6 gas required for the three-breaker-ring Eversource Switchyard, if constructed as a GIS, would be approximately 3,600 lbs. The standard leakage rate for GIS is 0.5% per year, and SF_6 has a 22,800 GHG equivalence factor (1 lb of SF_6 = 22,800 lbs of CO_2). Therefore, a GIS Eversource Switchyard would result in 410,400 lbs per year of GHG emissions, which is approximately 300,000 lbs per year greater than emissions associated with the AIS Eversource Switchyard.

Cost of Gas-Insulated Switchyard and Underground Interconnection

NTE estimates that the cost associated with a GIS Eversource Switchyard and underground in-and-out tap of the 345 kV transmission line adjacent to the Generating Facility Site to be approximately $19-26 million. Compared with the KEC approach of an AIS Eversource Switchyard with tie-in adjacent to the Switchyard Site, this represents a cost increase of approximately $11-18 million.

Summary

NTE's proposed interconnection configuration, consisting of AIS and an overhead tie-in adjacent to the Switchyard Site, is preferred because of the benefits to KEC, Eversource, and the community, including the following:

- Reduced height and visual impact of 345 kV structures
- Vegetated visual screening along entire eastern boundary of Generating Facility Site
- Reduced GHG emissions
- Reduced quantities of blasting and civil works

Interconnecting adjacent to the Generating Facility Site, utilizing any combination of AIS, GIS, overhead or underground tie-in, has numerous drawbacks including the following:

- Substantially increased height of 345 kV structures (overhead tie-in) resulting in greater visual impact
- Unlikely to preserve existing capacity of Eversource transmission line (underground tie-in)
- Large gap in visual screen on eastern boundary of Generating Facility Site
- Additional 300,000 lbs per year of GHG emissions

- Increased quantities of blasting and civil works
- Significantly greater cost ($11-18 million additional)

B. <u>A description of how NTE would access the stormwater basins.</u>

NTE proposes to access all stormwater basins via 10-foot wide gravel access driveways. The entrance to the access driveway to Basin No. 1 will be located immediately north of the Facilities building extending from the main driveway and will be gated. Access to Basins Nos. 2 and 3 will extend through the crushed stone surface surrounding the proposed fuel tank and water storage tanks. The drive will continue down gradient toward Basin No. 2 and will continue along the toe of the northwestern fill slope toward Basin No. 3. These driveways are labeled as "Gravel Maintenance Access" on the plan included in <u>Attachment E</u>.

C. <u>Identification of the amount of dual-fuel electric generating capacity in the ISO-NE Region.</u>

According to the ISO-NE 2016 CELT Report, Table 2.1, Generator List, the amount of dual-fuel (natural gas and ULSD) electric generating capacity in the New England region is 5,141 MW (Winter capacity). This is approximately 15.6% of the total ISO-NE capacity.

D. <u>Identification of the preservation that is used in the ULSD tank.</u>

As has been previously stated, ULSD can be stored for up to 3 years with proper maintenance. Initially, the inventory can be maintained with recirculation, water removal, and possible heating. The ULSD will be sampled and analyzed on a regular basis as required to determine whether there has been any deterioration of the product and to help predict the remaining life. If the ULSD inventory is not consumed after approximately 1 year, KEC may consider treating the ULSD with a stabilizers or biocide as necessary to control growth of microbial bacteria.

There are many different additives available from various suppliers. An example would be KATHON™ FP 1.5 Fuel Biocide sold by Dow.

From the Dow website:

Trusted for decades for use in fuels, KATHON FP 1.5 is effective against bacteria and fungi in a wide range of fuel preservation applications. Manufactured exclusively for the fuel market, KATHON FP 1.5 contains the widely used CMIT/MIT active in a solvent of dipropylene glycol (mixed isomers), rather than water. Low product dosages of 0.01% to 0.04% (100 to 400 ppm) product, as supplied, are required for antimicrobial efficacy. A maximum dosage of 400 ppm product delivers only 1.4 ppm sulfur, and the minimum dosage of 100 ppm product delivers 0.3 ppm sulfur.

The manufacturer's Product Data Sheet for KATHON™ FP 1.5 is included in Attachment F. Any products used would be appropriate for treating ULSD and would be used in accordance with the product manufacturer's recommendations.

E. Submission of CWC's available water supply adequacy analysis.

The CWC has agreed to provide the water supply analysis requested and will be providing that information to NTE shortly. We will pass the analysis along to the Council as soon as it is received.

CERTIFICATION OF SERVICE

I hereby certify that on this 8th day of December 2016, a copy of the foregoing was sent via electronic mail and first class U.S. Mail, to the following:

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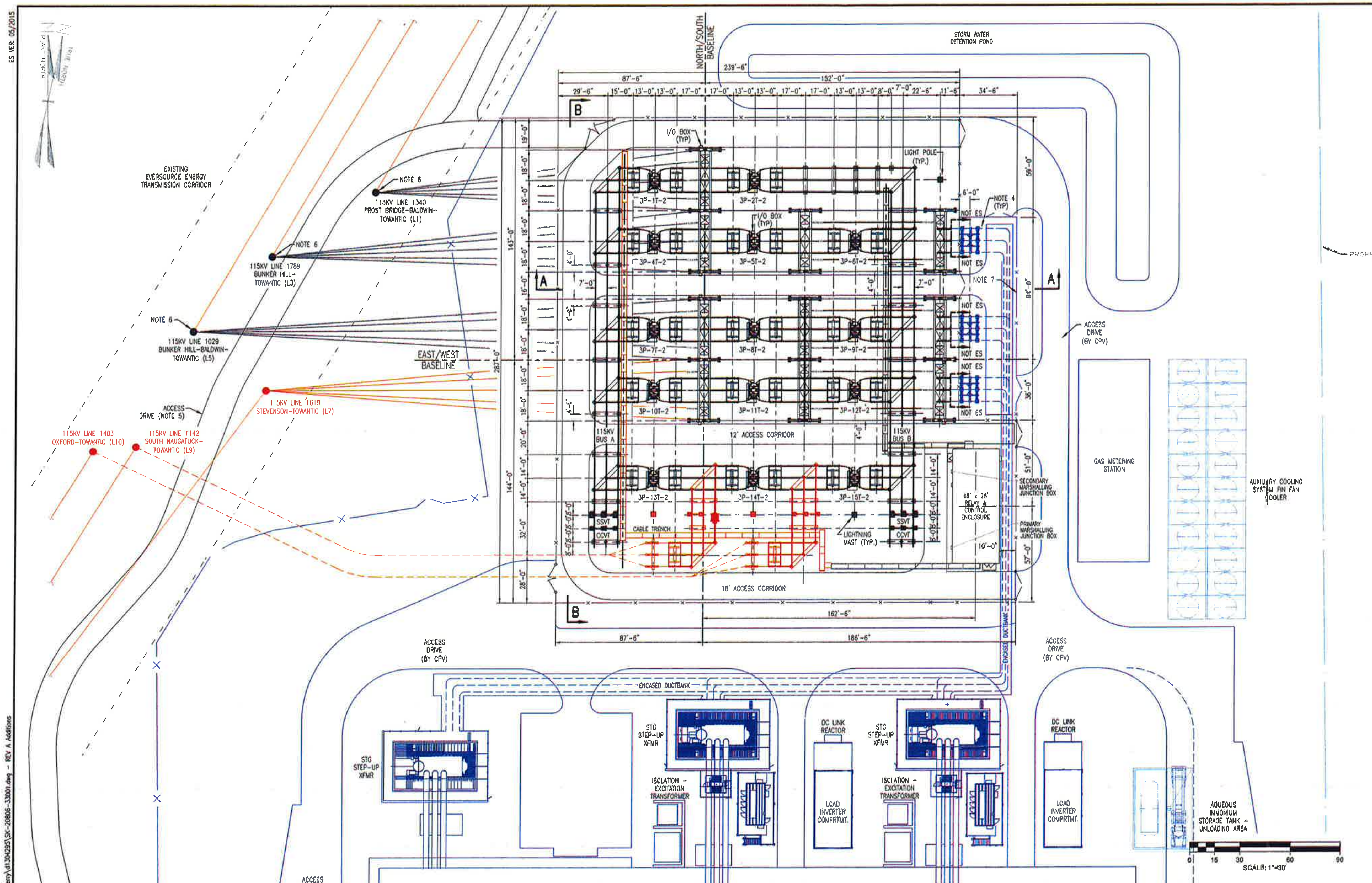
ATTACHMENT A



POLE LOCATION SCHEDULE	
POLE #	POLE LOCATION
L1	N 737776.6 FT E 897645.9 FT
L3	N 737726.3 FT E 897594.7 FT
L5	N 737673.2 FT E 897559.3 FT
L10	N 737591.0 FT E 897517.2 FT
L9	N 737598.8 FT E 897541.1 FT
L7	N 737648.1 FT E 897608.7 FT

LEGEND:

- EPC CONTRACTOR SCOPE (BLACK)
- CPV SCOPE (BLUE)
- ADDENDUM #8 (RED)
- WORK BY OTHERS (ORANGE)
- EXISTING EVERSOURCE RIGHT OF WAY

NOTES:

1. DRAWING IS CONCEPTUAL REPRESENTATION OF THE GENERAL ARRANGEMENT ONLY. DRAWING SHALL BE REFINED DURING DETAILED ENGINEERING.
2. THIS DRAWING IS REFERENCED AND UPDATED FROM CPV STORMWATER MANAGEMENT & GRADING PLAN DRAWING C310.
3. THE ARRANGEMENT AS SHOWN REPRESENTS THE USE OF SINGLE STATION POST INSULATOR BUS SUPPORTS. THE USE OF DUAL TR-287 INSULATORS WILL BE REQUIRED AT SPECIFIC LOCATIONS. THESE LOCATIONS SHALL BE DETERMINED BY THE EPC CONTRACTOR BASED ON THE CONCLUSION OF A BUS LOADING ANALYSIS.
4. CT/PT, LIGHTNING ARRESTER, TERMINATOR, STRUCTURE & FOUNDATION BY CPV.
5. WHERE NOTED, ACCESS DRIVES BY EPC CONTRACTOR. SEE DWG. SK-20808-11002 FOR DETAILS.
6. EPC CONTRACTOR SCOPE SHALL INCLUDE THE MONOPOLES, FOUNDATIONS, AND SUBSTATION SIDE LINE CONDUCTORS/CONNECTIONS. TRANSMISSION LINE SIDE CONDUCTORS/CONNECTIONS BY EVERSOURCE.
7. FENCE SHOWN IN BLUE SHALL BE BY CPV. FENCE GROUNDING FOR THIS PORTION OF THE FENCE SHALL BE BY CPV.
8. LIGHTNING PROTECTION, YARD LIGHTING, AND SECURITY DESIGNS SHALL BE DETERMINED DURING DETAILED ENGINEERING.

REV A NEW DRAWING

REVISIONS DURING CONSTRUCTION					
A	08/15	ESTABLISH NEW TOWANTIC SWITCHING STATION	TRC	TRC	TRC

TRC 249 WESTERN AVENUE AUGUSTA, ME 04330

PROJECT NO: 238440

REV	DESCRIPTION	DATE	DES	CHK	APP
H	RE-IFU RE-ISSUE FOR USE	10/30/15	JMW	REF	
G	RE-IFU RE-ISSUE FOR USE	10/07/15	JMW	REF	
F	IFU ISSUE FOR USE	10/02/15	JMW	DRG	
I	IFR ISSUE FOR REVIEW - ADDENDUM #8	01/08/15	JMW	REF	

NO.	DATE	AS BUILT REVISIONS	BY	CHK	APP	APP

EVERSOURCE ENERGY

TOWANTIC 3P
115KV YARD GENERAL ARRANGEMENT
PLAN VIEW
OXFORD, CT

BY JAB/TRC	CHKD REF/TRC	APP	APP
DATE 08/24/15	DATE 08/24/15	DATE	DATE
H-SCALE 1" = 30'	SIZE D	FIELD BOOK & PAGES	
V-SCALE 1" = 30'	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. SK-20806-33001	

ES VER: 05/2015

1/8/2016 3:47 PM - rferry - C:\pwworkingdocs\rferry\d1304295\SK-20806-33001.dwg - REV A Additions

Notes

1. This alternative will require two 345kV Transmission Line to cross Lake Road.
2. Dose not allow for construction laydown.
3. Significant site grading will be required for the switchyard.

ATTACHMENT B

Legend

Reference Drawings

Rev	Date	Drawn	Description	Chk'd	App'd
A	10/31/16	KS	FOR CLIENT REVIEW	BK	JW

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NTE ENERGY

KILLINGLY ENERGY CENTER
KILLINGLY CONNECTICUT

Title

345kV INTERCONNECTION STATION GENERAL ARRANGEMENT PLAN ELECTRICAL ARRANGEMENT ALTERNATIVE 1

PRELIMINARY NOT FOR CONSTRUCTION
REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION ISSUE IF REQUIRED BY PROJECT ADMINISTRATION MANUAL

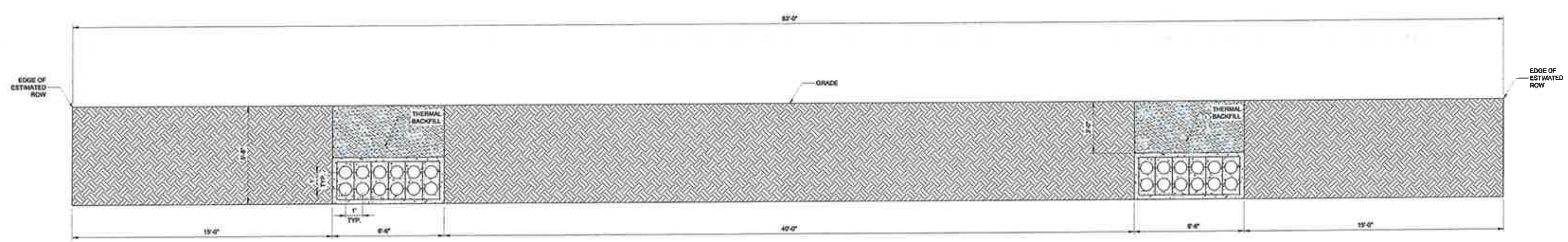
Designed	KS	Eng check	BK
Drawn	KS	Approved	BK
Dwg check	BK	Project Mngr	JW
Scale at ANSI E: 1" = 50'-0"		Date: 10/27/16	Rev: A

Drawing Number
334954CT-GA-301_ALT1

ATTACHMENT C

Notes

ATTACHMENT D



345kV UNDERGROUND DUCT
BANK CROSS SECTION

SCALE: 3/8"=1'-0"

Legend

Reference Drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
A	12/7/2016	HBH	ISSUED TO CLIENT	KS	SK

Mott MacDonald

Client

NTE ENERGY

KILLINGLY ENERGY CENTER
KILLINGLY, CONNECTICUT

Title

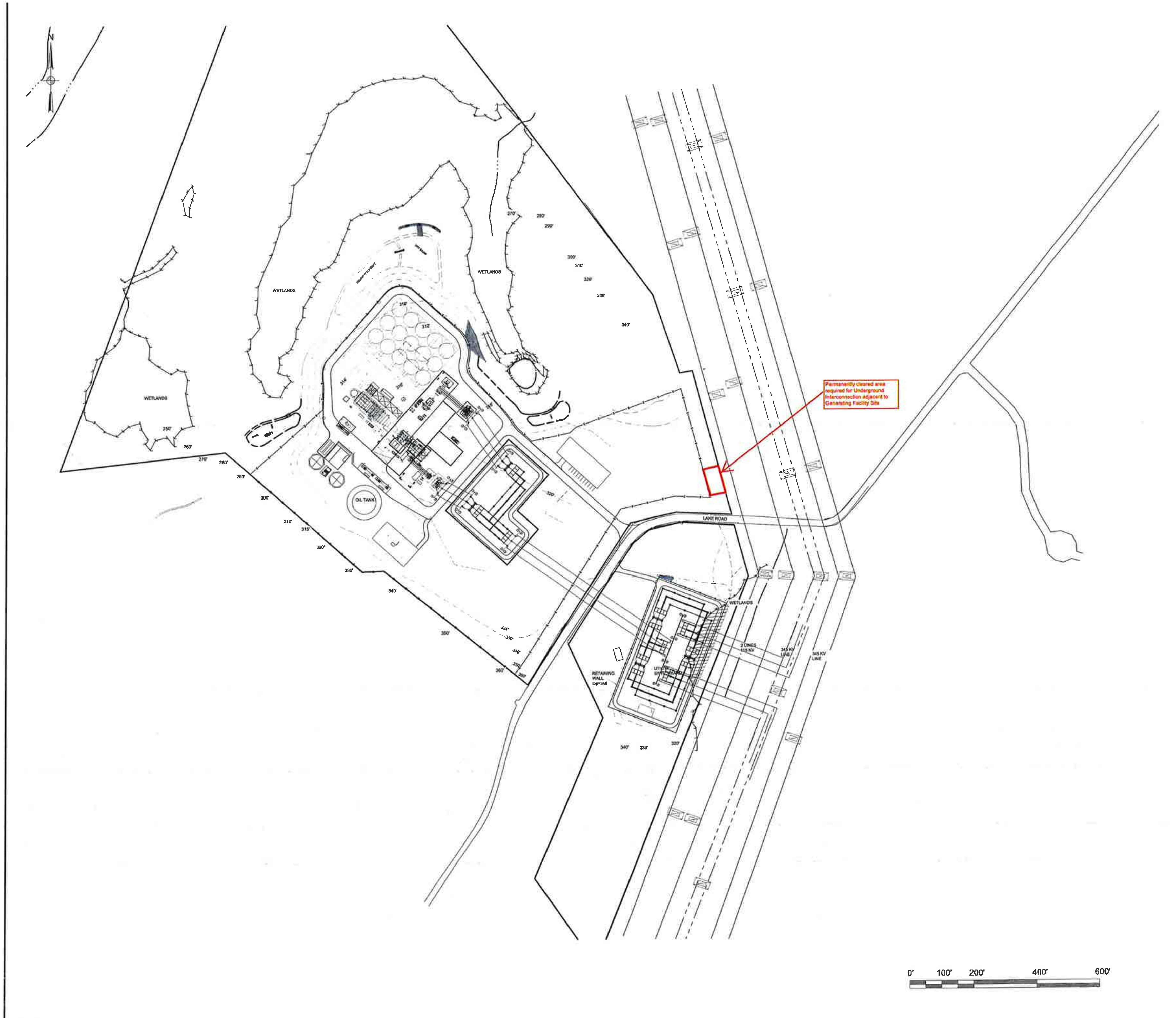
345 kV INTERCONNECTION STATION

UNDERGROUND DUCT BANK
CROSS SECTION

PRELIMINARY
NOT FOR
CONSTRUCTION
REPLACE WITH
ENGINEERS STAMP
AT CONSTRUCTION
AND/OR
FABRICATION

Designed	-	Eng check	KS
Drawn	HBH	Approved	BWK
Dwg check	-	Project Mngr	JW
Scale at ANSI E	3/8" = 1'-0"	Date 12/7/2016	Rev A

Drawing Number
334954CT-GA-301_SK-004



Notes

Legend

Reference Drawings

Rev	Date	Drawn	Description	Ch'k'd	App'd
J	10/27/16	AF	FOR CLIENT REVIEW	KP	JW
I	10/26/16	AF	FOR CLIENT REVIEW	KP	JW
H	09/07/16	AF	FOR CLIENT REVIEW	KP	JW
G	07/14/16	AF	FOR CLIENT REVIEW	KP	JW
F	06/28/16	AF	FOR CLIENT REVIEW	KP	JW
E	05/20/16	AF	FOR CLIENT REVIEW	KP	JW
D	4/27/16	AF	FOR CLIENT REVIEW	KP	JW
C	04/12/16	AF	FOR CLIENT REVIEW	KP	JW
B	04/11/16	AF	FOR CLIENT REVIEW	KP	JW
A	04/07/16	AF	FOR CLIENT REVIEW	KP	JW

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Client

NTE ENERGY

KILLINGLY ENERGY CENTER
KILLINGLY CONNECTICUT

Title

SITE ARRANGEMENT SIEMENS 8000H

PRELIMINARY
NOT FOR
CONSTRUCTION
REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION

Designed	-	Eng check	JW
Drawn	AF	Approved	-
Dwg check	KP	Project Mngr	JW
Scale at ANSI E: 1" = 100'-0"		Date: 04/07/16	Rev: J

Drawing Number
334954CT-SA-203

Single-core Cable for 345/200 (362) kV

with Copper wire screen and Aluminum laminated sheath

XDRCU-ALT

Cable layout

- *Copper* conductor, round stranded or segmented optionally with longitudinal water barrier
- Inner semiconductive layer firmly bonded to the XLPE insulation
- XLPE main insulation, cross-linked
- Outer semiconductive layer firmly bonded to the XLPE insulation
- Copper wire screen as short-circuit current carrying component with semi-conductive swelling tapes above and below as longitudinal water barrier
- Aluminum foil, overlapped as radial diffusion barrier laminated to the oversheath
- Thermoplastic oversheath as mechanical protection optionally with semi-conductive and/or flame-retardant layer

Features of metallic sheath

- Low weight
- Low losses
- Low cost
- Internationally proven design

Production process

The inner semiconductive layer, the XLPE main insulation and the outer semiconductive layer are extruded in a single operation applying a dry curing and a water or nitrogen cooling method.

Applicable standards

IEC 62067
AEIC CS9
ANSI / ICEA S-108-720

Technical data

Copper conductor cross-section		Outer diameter (approx.)	Cable weight (approx.)	Capacitance	Impedance (90°C, 50 Hz) •••	Impedance (90°C, 50 Hz) ••	Surge impedance ••	Min. bending radius	Max. pulling force
mm²	kcmil	mm	kg/m	µF/km	Ω/km	Ω/km	Ω	mm	kN
400	800	104	15	0.11	0.24	0,16	58	2300	24
500	1000	104	16	0.12	0.23	0,15	56	2300	30
630	1250	104	17	0.13	0.22	0,14	53	2300	38
800	1600	104	18	0.15	0.20	0,13	48	2300	48
1000	2000	108	21	0.17	0.19	0,12	45	2400	60
1200	2400	108	24	0.19	0.19	0,12	43	2450	72
1400	2750	109	25	0.20	0.18	0,11	41	2450	84
1600	3200	113	28	0.20	0.18	0,11	40	2600	96
2000	4000	123	33	0.21	0.17	0,10	39	2700	120
2500	5000	130	38	0.26	0.17	0,09	35	2700	150

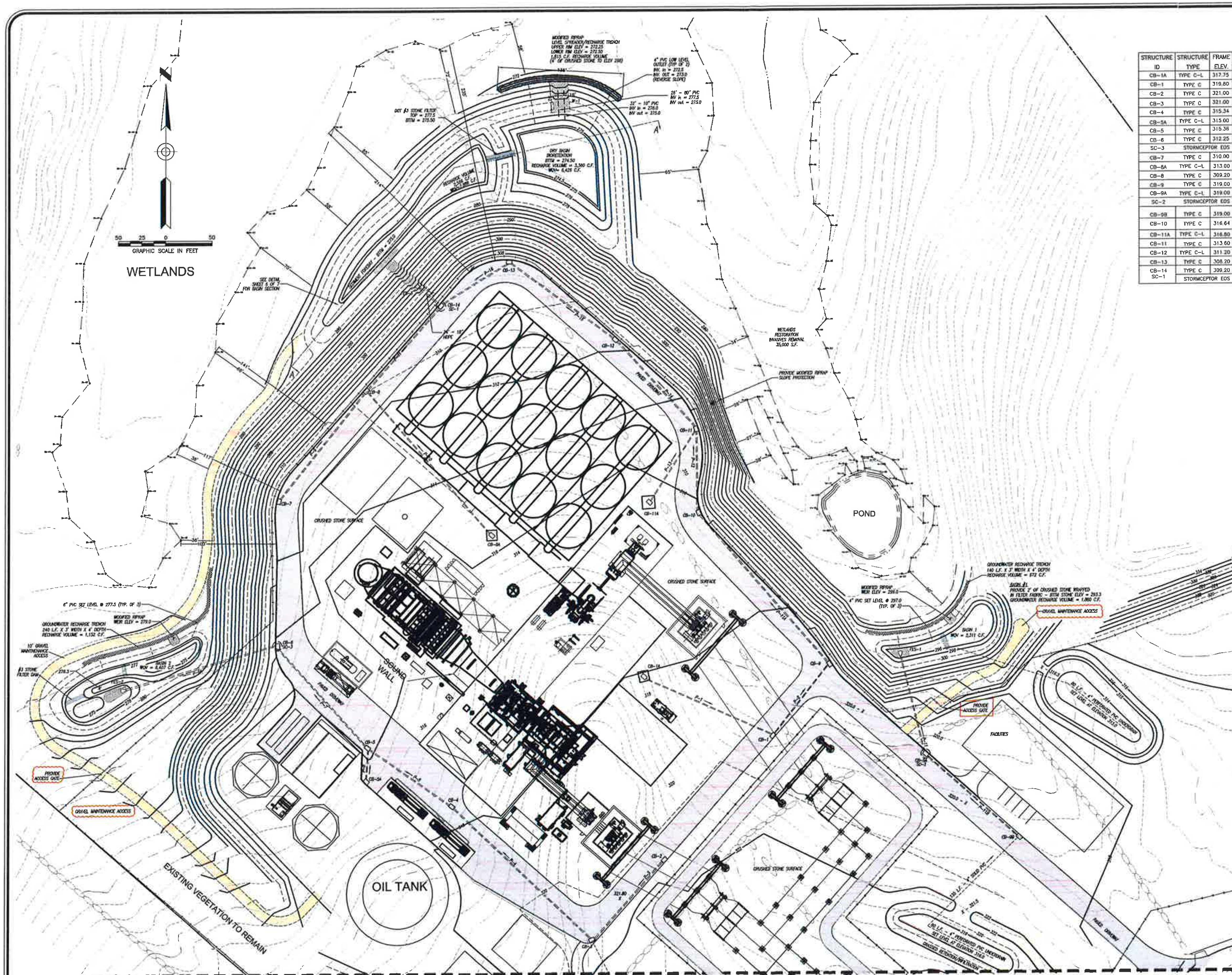
Ampacity

		Diectly buried ••	Diectly buried •••	In ducts ••	In ducts •••	In free air ••	In free air •••	In ductbank •••	Directly buried ••
Ambient temp.		20°C	20°C	20°C	20°C	35°C	35°C	15°C	40°C
Soil resistivity		1.0 Km/W	1.0 Km/W	1.0 Km/W	1.0 Km/W	-	-	0.8/1.0 Km/W	1.4 Km/W
mm²	kcmil	A	A	A	A	A	A	A	A
400	800	667	728	657	688	811	884	733	491
500	1000	757	830	747	784	934	1024	836	555
630	1250	859	953	852	898	1090	1211	960	625
800	1600	962	1077	957	1012	1247	1398	1083	694
1000	2000	1132	1132	1121	1187	1504	1691	1247	810
1200	2400	1216	1372	1210	1286	1648	1870	1381	866
1400	2750	1308	1475	1301	1382	1785	2039	1486	925
1600	3200	1386	1579	1391	1478	1922	2208	1591	979
2000	4000	1532	1626	1572	1655	2165	2513	1788	1083
2500	5000	1673	1673	1753	1832	2408	2817	1971	1177

Calculation basis:
Conductor temperature 90°C, 50 Hz, load factor 1.0, laying depth 1200 mm, phase distance at flat formation 30 cm
Earthing method: Single-Point Bonding or Cross-bonding

Values apply for cables with rated voltages from 330 kV to 345 kV acc. to IEC 62067

Two conductors per phase insufficient to match existing 5,200 A LTE Capacity of Line 3271



STORM DRAINAGE STRUCTURE SCHEDULE

STRUCTURE ID	STRUCTURE TYPE	FRAME ELEV.	PIPE INVERT ELEVATION				SUMP
			N	S	E	W	
CB-1A	TYPE C-L	317.75		OUT: 313.25 (SE)			309.25
CB-1	TYPE C	319.80	IN: 311.71 (NW)		OUT: 311.61 (NE)		307.61
CB-2	TYPE C	321.00		OUT: 316.50 (SW)			312.50
CB-3	TYPE C	321.00			IN: 315.22 (NE)	OUT: 315.12 (NW)	311.12
CB-4	TYPE C	315.34			IN: 310.58 (SE)	OUT: 310.48 (NW)	306.48
CB-5A	TYPE C-L	315.00			OUT: 311.48 (NE)		307.48
CB-5	TYPE C	315.36		IN: 310.00 (SW)		OUT: 309.90 (NW)	305.90
CB-6	TYPE C	312.25	OUT: 307.30		IN: 307.40 (SE)		303.30
SC-3	STORMCEPTOR EOS 15-1000 OIL-GRIT SEPARATOR						
CB-7	TYPE C	310.00		IN: 305.50	OUT: 305.40 (NE)		
CB-8A	TYPE C-L	313.00				OUT: 309.00 (NW)	305.00
CB-8	TYPE C	309.20		IN: 303.50 (SW)	IN: 303.50 (SE)	OUT: 303.40 (NW)	299.40
CB-9	TYPE C	319.00		IN: 310.69 (SE)		OUT: 310.59 (NW)	306.59
CB-9A	TYPE C-L	319.00		IN: 313.59 (SE)		OUT: 313.49 (NW)	309.49
SC-2	STORMCEPTOR EOS 15-1000 OIL-GRIT SEPARATOR						
CB-9B	TYPE C	319.00				OUT: 314.79 (NW)	310.79
CB-10	TYPE C	316.64	OUT: 308.63	IN: 308.73			304.63
CB-11A	TYPE C-L	316.80			OUT: 312.80 (NE)		308.80
CB-11	TYPE C	313.60	OUT: 307.00	IN: 307.10		IN: 307.10	303.00
CB-12	TYPE C-L	311.20	OUT: 305.59	IN: 305.69			301.59
CB-13	TYPE C	308.20	OUT: 303.50 (NW)	IN: 303.60			299.50
CB-14	TYPE C	309.20		IN: 301.00 (SW)	IN: 301.00 (NE)	OUT: 300.90 (NW)	296.90
SC-1	STORMCEPTOR EOS 18-1000 OIL-GRIT SEPARATOR						

PIPE SCHEDULE

PIPE ID	OUTLET DIA. (IN.)	MATERIAL	LENGTH (FT.)	SLOPE (%)
P-1	12	HDPE	154	1.0%
P-2	12	HDPE	92	1.0%
P-3	12	HDPE	128	1.0%
P-4	15	HDPE	227	2.0%
P-5	15	HDPE	102	1.0%
P-6	8	D.I.P	50	1.0%
P-7	15	HDPE	165	1.52%
P-8	15	HDPE	153	1.17%
P-9	15	HDPE	156	1.22%
P-10	12	HDPE	211	2.6%
P-11	15	HDPE	106	16.5%
P-11A	15	HDPE	210	2.0%
P-11B	12	HDPE	130	1.0%
P-12	15	HDPE	153	1.0%
P-13	12	HDPE	114	5.0%
P-14	15	HDPE	131	1.0%
P-15	15	HDPE	152	1.3%
P-16	15	HDPE	100	2.5%
P-17	18	HDPE	24	3.8%
P-18	15	RCP	140	TBD

STRUCTURE ID	TYPE	INVERT ELEVATION
FES-1	FLARED END	296.00
W-1	OVERFLOW WEIR	277.00
FES-2	FLARED END	278.00
FES-3	FLARED END	297.00
FES-4	FLARED END	310.50

DATE	DESCRIPTION
11/21/2016	ACCESS TO BASINS ADDED
10/25/2016	PER R&R

REVISIONS

PROPOSED GRADING & DRAINAGE

PREPARED FOR

KILLINGLY ENERGY CENTER
NTE ENERGY PROJECT

LAKE ROAD

KILLINGLY, CONNECTICUT

Killingly Engineering Associates
Civil Engineering & Surveying
114 Westcott Road
P.O. Box 421
Killingly, Connecticut 06241
(860) 779-7299
www.killinglyengineering.com

DATE: 06/30/2016	DRAWN: NET
SCALE: 1"=50'	DESIGN: NET
SHEET: 1 OF 7	CHK BY: ---
DWG. No: CLIENT FILE	JOB No: 16042

KATHON™ FP 1.5 Fuel Biocide

CAS Registry No. 26172-55-4 (CMIT), 2682-20-4 (MIT)
Mixture 3:1: (CMIT/MIT) as registry No.: 55965-84-9
EINECS No. EC 2475007 (CMIT), EC 2202396 (MIT)

General

KATHON™ FP 1.5 contains a 3:1 ratio mixture of 5-chloro-2-methyl-3(2H)isothiazolone and 2-methyl-3(2H)isothiazolone (CAS N°55965-84-9), (abbreviated name CMIT/MIT). KATHON FP 1.5 is a solution of the technical grade of the active ingredient, CMIT/MIT, in dipropylene glycol at a nominal value of 1.5% of active substance. This biocidal substance has been notified under the Biocidal Products Directive (BPD; notification # 408) and is registered with the United States Environmental Protection Agency (US EPA).

KATHON FP 1.5 is effective at low use levels, against microbial species commonly encountered in fuel systems, including bacteria, yeast, and mold. KATHON FP 1.5 is designed to cause inhibition of microbial growth upon contact, and quickly result in cell death. The exact time to kill all microbes in a fuel will vary, but will typically be between 6 and 36 hours.

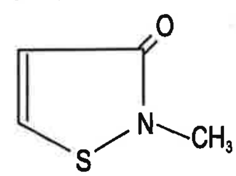
KATHON FP 1.5 is effective in systems containing both fuel and water. Unlike other fuel treatment biocides, the active ingredients in KATHON FP 1.5 are *not* deactivated by water.

Structure

5-chloro-2-methyl-3(2H)isothiazolone

C_4H_4ClNOS (CMIT)

2-methyl-3(2H)isothiazolone



C_4H_5NOS (MIT)

Physical Properties

The following are typical properties of KATHON™ FP 1.5; **they are not to be considered product specifications.**

Molecular weight (g/mol):	149.45 (CMIT), 115.16 (MIT), Average MW for 3:1 Mixture - 140.14.
Appearance/odor:	Yellow liquid with a mild odor
pH:	4-6
Specific gravity:	1.04
Viscosity (@25°C):	97.8 CpS
Solvent:	Dipropylene Glycol
Volatility:	Non-volatile (no contribution to VOC)
Freezing point:	< -20°C (-4°F)
Storage conditions:	Min. ≥ -15°C (≥ 5°F), Max. ≤ 55°C (≤ 131°F)

Applications/Uses

Aviation Fuels

Water and sludge should be removed from fuel tanks before application of the biocide.

100ppm v/v of KATHON™ FP 1.5 as supplied should be used to achieve microbial control, as described by EU BPD and US EPA regulations. To achieve this, the user should treat every 10,000 litres of aviation fuel with 1 litre of KATHON FP 1.5. The biocide should be added in such a manner so as to allow good mixing and distribution across the fuel. Ideally, this should be into a fuel supply line to ensure agitation. A contact time of up to 24 hours is recommended, depending on the severity of infection.

All Other Fuels

Water and sludge should be removed from fuel tanks before application of biocide and again after the retention period.

KATHON™ FP 1.5 has been tested and found effective in a wide range of fuels, including diesel, petrol, ULSD, biodiesel, kerosene, gasoline, and other fuels used in marine, aviation, automotive and home heating applications.

KATHON FP 1.5 is typically dosed at 200 to 300 ppm (200mL to 300mL per 1000L fuel) for curative treatment (i.e. when there is evidence of bacterial contamination). A minimum residence time of 12 hours should be allowed, before the fuel is used, though 24 hours is recommended. The biocide should be added in such a manner so as to allow good mixing uniform distribution of the biocide across the fuel.

KATHON FP 1.5 can also be used as a preventative/maintenance measure (to guard against bacterial contamination) in fuels that lack microbial contamination. For such a use, the recommended dosage is 100 to 150 ppm (100-150mL per 1000L fuel). The biocide should be added in such a manner so as to allow good mixing and uniform distribution of the biocide across the fuel. In such a case the residence time should still be at least 12 hours. *Extreme care must be taken to <u>avoid</u> the addition of a preventative/maintenance level dosage of KATHON FP 1.5 to a heavily contaminated fuel system.*

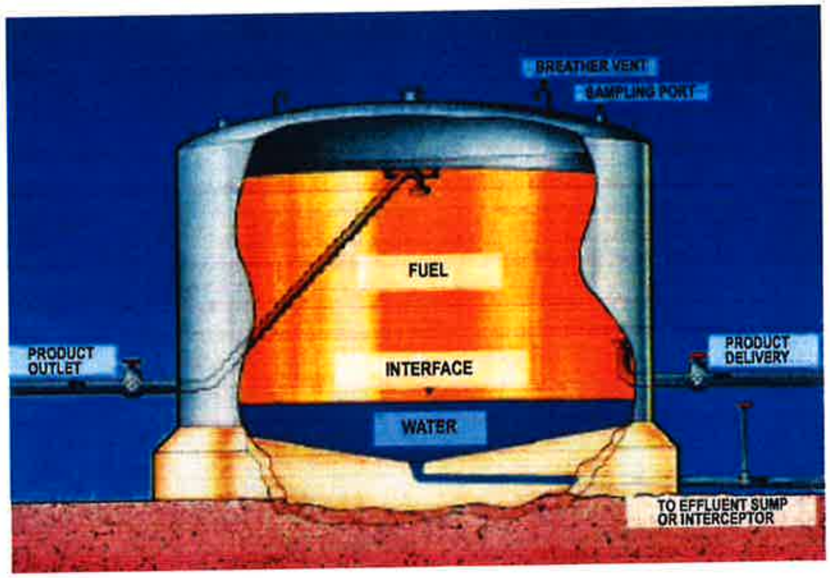
KATHON FP 1.5 can also be used as a shock biocide, for fuels that are heavily contaminated. If this is the case, doses up to 1000 ppm can be administered (1L biocide per 1000L fuel) according to the BPD. The US EPA allows the use of up to 400 ppm KATHON FP 1.5 in heavily contaminated fuel systems (400mL biocide per 1000L fuel). In this case, the residence time is recommended to be a full 24 hours.

Appropriate precautions should be taken for all of the dosing methods described above, which include the following:

- Avoid dermal contact – suitable PPE should be employed, including suitable gloves of butyl rubber or nitrile rubber, safety goggles, and if required, a face shield. Consult the Safety Data Sheet (SDS) for full details
- Fuel tanks being treated should be at least 10% full before treatment. Do not dispense into empty fuel tanks
- Use KATHON FP 1.5 in accordance with local regulatory requirements (ex: BPD or US EPA), and **do not exceed recommended dose levels**
- It is not recommended to dispense KATHON FP 1.5 directly into road vehicle fuel tanks. Road vehicle fuel tanks should be filled with fuel already treated with KATHON FP 1.5
- When treating storage tanks, please note that effective treatment will only be achieved with efficient mixing. Ideally, KATHON FP 1.5 should be dosed into a flowing fuel stream in the storage tank inlet
- Other methods, such as bulk dosing, will not affect the performance of KATHON FP 1.5, but might extend the treatment time required
- KATHON FP 1.5 is not surface active and therefore will not inhibit water separation

Efficacy of KATHON™ FP 1.5 in fuels

Microbial contamination is not specific to any one fuel type – diesel, petrol, ULSD, biodiesel, kerosene, gasoline, and other fuels used in marine, aviation, automotive and home heating applications are all susceptible. Similarly there is no single specific organism that can be identified as being responsible for degradation and spoilage. As a general rule, wherever fuel and water come into contact in a storage or distribution system microbial contamination is likely to occur.



No matter how well maintained a storage system is, a water bottom is almost invariably present. This results from a number of sources:

- Freshly refined fuel contains some water. This separates out as the fuel cools down
- Atmospheric condensation: humidity in the air in the storage tank condenses out and adds to the water bottom
- Rain or snow may enter the tank via sampling ports, breather vents or ill -fitting seals on floating roofs
- Transport or storage in tankers or barges can result in contamination from ballast Water

In addition certain end use applications – notably marine fuel – naturally lend themselves to allow water ingress into a storage system. Water from all of these sources accumulates in the storage tank to form the water bottom.

Microorganisms can be air or waterborne. Consequently as the water bottom develops a microbial population builds up in it. For many of the species present in the water bottom, liquid hydrocarbon fuels represent an excellent nutrient source. As a result there is a population explosion: the microorganisms proliferate at the fuel/water interface, surviving in the water phase whilst feeding on the fuel. In so doing, they secrete detrimental waste into the fuel and can push the fuel out of specification.

In the initial stages of contamination the organisms present are predominantly aerobic, using the dissolved oxygen in the water for respiration. As this supply of oxygen is depleted, anaerobic organisms, known as sulphate reducing bacteria, develop. These organisms do not require oxygen for respiration and form corrosive waste products such as hydrogen sulphide.

Consequences of Microbial Growth

Once a microbial population becomes established fuel quality rapidly deteriorates. As outlined below problems such as haziness, failure to meet specifications, corrosion, filter plugging and additive degradation can occur. All of these problems are related directly to the presence of microorganisms or their associated by-products.

Fuel Haziness: This is a clear indication that fuel is out of specification. The primary cause of haziness is an increase in the water content of the fuel resulting from the production of biosurfactants. These are by-products of microbial growth and alter the surface tension at the fuel/water interface. As a consequence the solubility of water in the fuel is increased.

Degradation of Additives: Certain additives, especially those rich in nitrogen and/or phosphorous, encourage microbial growth. In the process the additives are degraded and consequently their effect is lost.

Microbially Induced Corrosion: MIC is associated with biofilm growth on surfaces within fuel tanks and pipe lines. In particular, Sulphate Reducing Bacteria can produce H_2S. This is easily soluble, highly corrosive, and will contribute to increased localized corrosion (pitting).

Sludge Formation: Microbial debris is deposited on the tank bottom where it forms a layer of sludge. This sludge creates an environment which favours microbially induced corrosion. It may also become contaminated with viable microorganisms and unless removed will act as a reservoir of infection every time the tank is used.

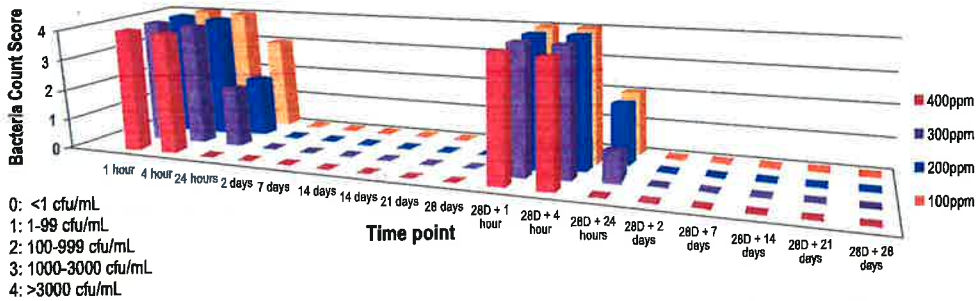
Filter Plugging: Biopolymers are formed during microbial growth. These are viscous, adhesive substances which, along with microbial and other debris, are deposited on filters and pipes leading to reduced flow rates and blockages. At end user level this can have serious consequences causing engine damage and in extreme cases complete failure.

Odor: A problem commonly associated with microbially contaminated fuel is that of foul odor. This is principally as a result of hydrogen sulphide production by sulphate reducing bacteria.

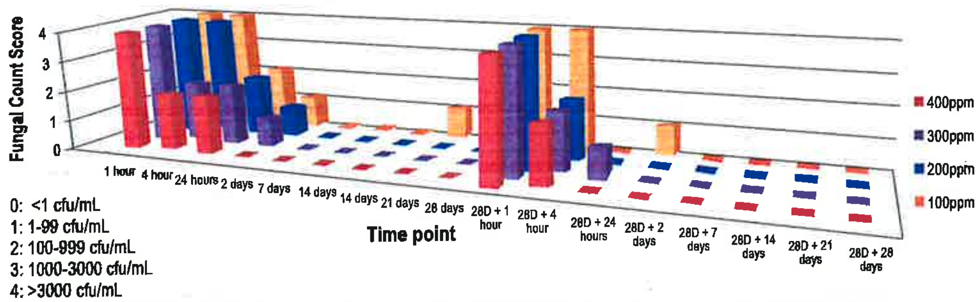
Features and Benefits

Broad Spectrum Activity: KATHON™ FP 1.5 is effective at very low use levels against microbial species (bacteria, fungi, yeasts) commonly encountered in fuel systems. Full details of minimum inhibitory concentration values of KATHON FP 1.5 against a range of microorganisms can be found on page 8 of this technical bulletin.

Rapid Inhibition of Microbial Growth: KATHON FP 1.5 causes immediate inhibition of growth on coming into contact with a microorganism. Growth inhibition rapidly becomes irreversible and results in cell death. The time to achieve eradication varies according to the extent of contamination and the type of microorganisms present. Typically, as the graphs below indicate, within 24 hours of treatment the fuel will again be fit for use.



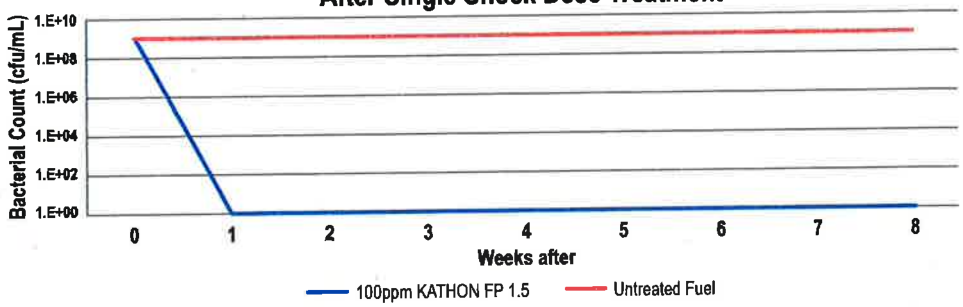
Note: The test was reinoculated with bacteria at 28 days to measure long term protection capability



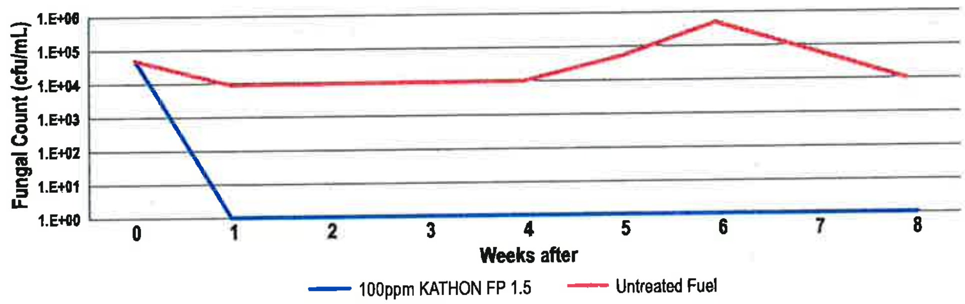
Note: The test was reinoculated with fungi at 28 days to measure long term protection capability

Long Term Preservation: Fuel treated with KATHON FP 1.5 will remain protected from contamination over extended periods of time. It will also resist contamination if reinoculated from another source. In studies conducted over an 8 week period, contaminated fuels were treated with fuel biocides. Once microbial control was established, the fuel was reinoculated with microbes, to measure long term protection capability. KATHON FP 1.5 was not dosed for a second time. The initial dose was still able to protect against bacteria and fungi.

Long Term Preservation Against Bacteria with KATHON™ FP 1.5 After Single Shock Dose Treatment



Long Term Preservation Against Fungi with KATHON™ FP 1.5 After Single Shock Dose Treatment

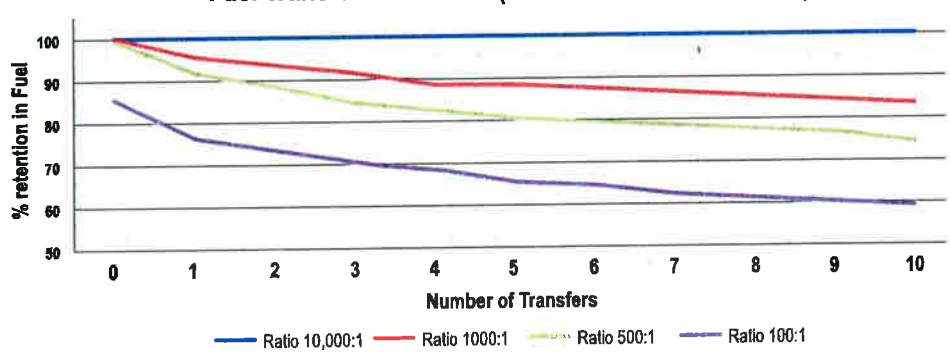


Complete System Protection: The partitioning characteristics of KATHON™ FP 1.5 ensure that it is present in both the fuel and water phases. This facilitates eradication of contamination in the water bottom as well as protection of the fuel as it is transferred through the distribution system.

The extent to which KATHON FP 1.5 partitions between the fuel and water phases varies according to the fuel/water ratio. Results from computer modelling indicate that after a series of 10 transfers, between 60% (fuel/water ratio of 100:1) and 97% (fuel/water ratio of 10,000:1) of the KATHON FP 1.5 originally dosed is retained in the fuel and is then available to subsequently repartition to the water bottom to maintain efficacy.

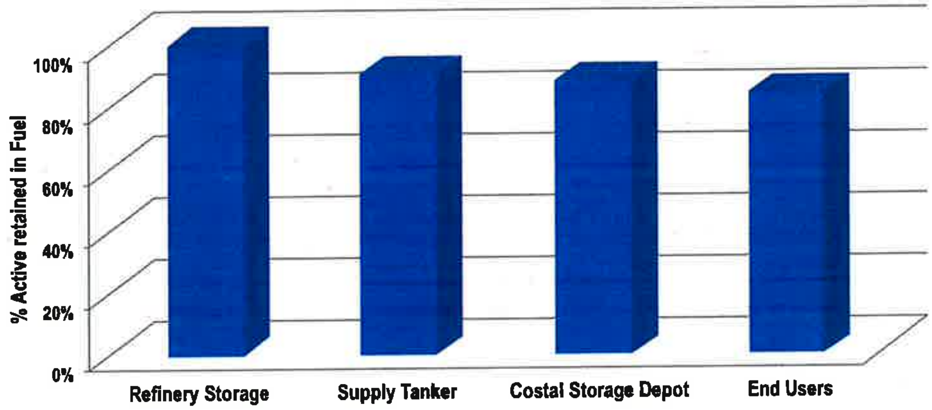
Data generated in the field support this model. Fuel was treated at refinery storage level. It was then transferred through the usual distribution system. Analysis of the fuel was carried out at 3 points in the system. At end user level almost 88% of the original active ingredient dosed was present.

Fuel Transfer Simulation (Various Fuel:Water Ratios)



The above graph shows what happens when fuel is transferred between facilities. Even when high water content of the fuel is maintained (to simulate poor water control) , the partitioning capability of KATHON™ FP 1.5 ensures that even after 10 transfers, at least 60% of the KATHON FP 1.5 is still present in the fuel, and therefore able to inhibit microbial growth.

Multiple Transfers: % Active remaining in Fuel



Fuel:Water Ratios:
Refinery Storage 10,000:1
Supply Tanker 1,000:1
Coastal Storage Depot 1,000:1
End Users 500:1

This shows that fuel treated with KATHON FP 1.5 remains protected as it is transferred through the distribution chain.

Widely Approved: KATHON FP 1.5 Fuel Biocide has wide ranging approvals in aviation, marine, automotive, home heating and military fuels. Approvals have been obtained from:

- Specialist fuel companies
- Customs accredited laboratories
- Global militaries
- Industrial gas turbine manufacturers
- Diesel engine manufacturers
- Commercial airlines
- Filtration equipment manufacturers
- Airframe manufacturers
- Aviation engine manufacturers
- Aviation auxiliary power unit manufacturers

Note: Please consult your Dow representative to confirm approval for your specific application.

Safety and Support: Dow Microbial Control offers customers a comprehensive package of support services and data to promote the safe and effective use of KATHON™ FP 1.5. This includes extensive data on environmental fate, toxicology and materials compatibility and advice and assistance in areas such as disposal, product handling and delivery/dosing systems.

Inhibition of Contaminants

The minimum concentration of KATHON™ FP 1.5 required to inhibit commonly occurring fuel contaminants are given below.

Organism Type	Organism	ATCC #	MIC (ppm AI)
Mold[a]	*Hormoconis resinae*[c]	22712	3
Yeast[b]	*Candida albicans*	16651	1.5
	Candida lipolytica[c]	16617	1.5
Bacteria[b]	*Citrobacter freundii*	6750	1.5
	Enterobacter aerogenes	13048	0.375
	Escherichia coli	11229	1.5
	Proteus mirabilis	4675	1.5
	Pseudomonas aeruginosa[c]	33988	0.375
	Pseudomonas oleoverans	8062	0.375

a – MIC at 7 days
b – MIC at 48 Hours
c – Hydrocarbon utilising microorganism

The data in the table above was achieved under laboratory testing, and under controlled conditions. These data are intended as an indication of the broad spectrum of activity of KATHON FP 1.5, and should not be interpreted as having relevance to the effectiveness or dosing against specific bacteria in formulated products or in process systems. The data cannot be used to predict performance in fuels. Dow Microbial Control always recommends that a microbial study of the fuel is carried out before a treatment strategy is decided.

Disposal of KATHON™ FP 1.5

KATHON™ FP 1.5 will partition into both the fuel and water phase in a fuel system. Although the vast majority of the biocide dosed remains dissolved in the fuel, the actual concentration of biocide in the water is several fold higher due to the partition coefficient of the actives. The exact concentrations in each phase will depend on several factors, including the fuel/water ratio, the initial dose of biocide, length of storage time, rate of fuel replenishment, and environmental conditions within the tank.

As with most biocides, KATHON FP 1.5 can be toxic to aquatic organisms. Water bottoms and effluents must therefore be diluted prior to discharge and discharged in accordance with local environmental and legal regulations.

KATHON FP 1.5 is biodegradable and is non-persistent in the environment. Dilution to below effective levels will facilitate its degradation - the greater the dilution factor the more rapid is the degradation. For guidance on approved discharge procedures, please contact Dow Microbial Control or consult local authorities.

Neutralisation methods will vary depending on the situation the biocide is in. In cases of accidental spill or excess biocide in equipment (or other situations when the product is not being applied), the biocide can be neutralised by the addition of a 5% solution of Sodium Bicarbonate ($NaHCO_3$) and 5% Sodium Hypochlorite (NaOCl) in water. Apply solution to the spill area or product at a ratio of 10 volumes deactivating solution per estimated volume of biocide. After 30 minutes, flush the spill area or equipment with excess amounts of water, to a chemical sewer (if in accordance with local procedures, permits, and regulations). DO NOT add deactivation solution to a waste pail to deactivate adsorbed material.

If the product is to be neutralised *after* application (for example, in tank water bottoms before disposal), a slightly acidic 10% solution of Sodium Metabisulphite (NaS_2O_5) or Sodium Bisulphite ($NaHSO_3$) can be used, in the ratio of 4:1 (Deactivating solution: KATHON™ FP 1.5).

Chemical deactivation of large amounts of KATHON FP 1.5 must not take place in bulk storage tanks. The effluents must be isolated safely before deactivation.

Further information regarding spill procedures can be found in the (SDS).

When used at refinery level, another convenient method of deactivation can be used. Waters containing KATHON FP 1.5 can be passed into waste waters from the hydrodesulphurisation process. The hydrogen sulphide present will rapidly deactivate KATHON FP 1.5.

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner. It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow technical representative for more information.

Compatibility data for KATHON™ FP 1.5

Metals	Plastics	Elastomers	FRP/Coatings
316L SS	HDPE	Viton	Vinyl Ester (Plasite 4300)
Titanium	FI-HDPE		Baked Epoxy (Plasite 9570)
Hastelloy C276	Ryton		Polyester Fumarate Resin (Atlac 382)
	Polypropylene		
	Teflon		

KATHON™ FP 1.5 is not compatible with the following:

Metals	Plastics	Elastomers
Carbon Steel	PVC	EDPM-Nordel
316 SS		Butyl Rubber
316 Ti-SS*		Buna N
304L SS		Buna S
304 SS		Neoprene

*Titanium stabilised 316 SS can have variable metallurgy and some versions *are* compatible with Kathon formulations.

Safety Hazards and Handling

Before using this product, consult the Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Technical Assistance

Dow Microbial Control Laboratories are available to provide specialised technical support to all of our customers.

Services available include:

- Identification of sources of contamination.
- Design of treatment programs to meet specific needs.
- Monitoring of KATHON™ FP 1.5 levels in fuel samples.
- Advice and assistance on procedures to avoid the recurrence of microbial growth.

Specific or particularly heavy service requirements should be discussed with Dow Microbial Control in advance. In the event that high levels of routine testing or a permanent presence on site are required, Dow Microbial Control will be pleased to recommend a company specialised in the provision of these services.

Product Stewardship

When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet (SDS) and country-specific product label to ensure the intended use is within the scope of approved uses. Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including Safety Data Sheets (SDS), should be consulted prior to use of Dow products. Current Safety Data Sheets are available from Dow.

For further information visit our website:
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