CITY OF LEWISTON
PLANNING BOARD MEETING
Monday, October 26, 2015 – 5:30 P.M.
City Council Chambers – First Floor
Lewiston City Building
27 Pine Street, Lewiston, ME

AGENDA

I. ROLL CALL

II. ADJUSTMENTS TO THE AGENDA

III. CORRESPONDENCE

IV. PUBLIC HEARINGS:

a) An application submitted by Burns & McDonnell, Engineering on behalf of Central Maine Power Company to build a new substation in the vicinity of Middle, Lowell, and Chapel Streets to serve two transmission lines between Lewiston Lower and Gulf Island Substation.

b) Request by the Lewiston School Department for a capital expenditure not included in the 2016 Lewiston Capital Improvement Program of an estimated $1.7 million for the addition and equipping of six new classrooms at Farwell Elementary School.

V. OTHER BUSINESS:

a) Acquisition of 119 Walnut Street/Drouin Field.
b) New elementary school discussion.
c) Acquisition/Donation of 35 Ellis Street Rear.
d) Review of Comprehensive Plan.
e) Any other business Planning Board Members may have relating to the duties of the Lewiston Planning Board.

VI. READING OF THE MINUTES: Motion to adopt the August 24, 2015, September 14, 2015 and September 28, 2015 draft minutes

VII. ADJOURNMENT

The City of Lewiston is an EOE. For more information please visit our website @ www.lewistonmaine.gov and click on the Non-Discrimination Policy.

CITY OF LEWISTON

Department of Planning & Code Enforcement

TO: **Planning Board**
FROM: **David Hediger, City Planner**
DATE: **October 22, 2015**
RE: **October 26, 2015 Planning Board Agenda Item IV(A)**

An application submitted by Burns & McDonnell, Engineering on behalf of Central Maine Power Company to build a new substation in the vicinity of Middle, Lowell, and Chapel Streets to serve two transmission lines between Lewiston Lower and Gulf Island Substation.

Burns & McDonnell, TRC Engineering, Inc. on behalf of Central Maine Power (CMP) has submitted an application to construct a new substation at 51-53 Middle Street. This substation will serve two transmission lines between Lewiston Lower and Gulf Island substations. This property of 2.83 acres currently contains foundations for former industrial buildings and is located in the centreville (CV) district in which substations are permitted as a conditional use. Therefore, the project is being reviewed pursuant to Article X, Conditional Uses and Article XIII, Development Review and Standards. The application speaks specifically to these sections of the ordinance.

It should be noted that the Planning Board previously granted approval to CMP on March 28, 2011 for this same project with the following conditions:

1. Noise levels must not exceed the 60dBA at the property lines of the site.
2. A landscape plan is provided showing plantings and other vegetation as deemed necessary by the Planning Board to provide visual screening of the site prior to any construction activity or permits being issued.

At this time, the applicant has submitted an amended application with the following changes proposed:

- A 27 percent increase in the footprint of the control house to include the switchgear, which was originally located within a separate enclosure.
- A redesign of the Stormwater Management Plan.
- Rebuilding of the existing retaining walls instead of the use of riprap, which will be extended to the northwest corner of the site.
- A change in security fence design from chain link/barbed wire to a non-conductive composite material.
- A detailed landscaping plan.

The applicant has submitted a revised application and responses addressing comments provided by city staff. Staff notes the following at this time:

- The project abuts the Androscoggin River and is subject to a 25'general development shoreland zoning setback. All site activity is proposed to fall outside this setback with the exception of one area of grading and bank stabilization along the river. DEP has approved of this activity.
- Once completed, the site will consist of .99 acres of impervious acres. Drainage has been designed to infiltration and sheet flow toward the river. The design has been reviewed to the satisfaction of staff.
- The project disturbs over one acre of area and is located in an urbanized area, and therefore is subject to the standards of Article XIII, Section 15 Post Construction Stormwater Management and the performance guarantee requirements of said section. Central Maine Power has provided a Letter of Commitment with this Application with regards to Option 1 in Article XIII, Section 15 and has requested that a performance Guarantee be drafted for review by the City prior to the start of construction.
- As a remaining condition of the Board's previous approval, the applicant has been directed to provide a landscaping plan to provide screening of the substation along Lowell Street, Middle Street, and the river sides of the project to lessen the visual impact to abutting properties. A detailed landscaping plan and specifications on security fencing have been provided in effort to provide some level of buffering.
- The existing sidewalk on Middle Street adjacent to proposed substation has at least three existing curb cuts that must be eliminated given the proposed development will have no access from Middle Street. The applicant has indicated that drawing 973-03-02 SH02 will be revised when issued for construction to include removal and replacement of the paved sidewalk and granite curb, with no curb cuts, east of the Middle Street substation along Middle Street.

Planning and Code Enforcement recommend approval of the above referenced project, with the following conditions:

1. A performance guarantee pursuant to Article XIII, Section 15 Post Construction Stormwater Management is provided prior to the start of construction.
2. Noise levels must not to exceed the 60dBA at the property lines of the site.
3. A revised grading plan must be provided prior to the start of construction to include removal and replacement of the paved sidewalk and granite curb, with no curb cuts, east of the Middle Street substation along Middle Street.

ACTIONS NECESSARY:

Make a motion finding that the application meets all of the necessary criteria contained in the Zoning and Land Use Code, including Article X, Conditional Uses; Article XI, District Regulations; Article XII, Performance Standards; Article XIII, Development Review and Standards and to grant approval to Burns & McDonnell, Engineering on behalf of Central Maine Power Company to construct a new substation at 51-53 Middle Street to serve two transmission lines between Lewiston Lower and Gulf Island Substation (including, if any, specific conditions raised by the Planning Board).

CENTRAL MAINE POWER

October 21, 2015

David Hediger, City Planner
City of Lewiston
27 Pine Street
Lewiston, Maine 04240

RE: **Central Maine Power Company, Lewiston Loop Project**
Response to City Staff Review Comments - Middle Street Substation Application

Dear David,

Below are responses to the City of Lewiston staff review comments submitted to Burns & McDonnell on October 16, 2015 on the Middle Street Substation application (Application).

Lewiston Public Works:

1. Q: The proposed plans include a stormdrain with a rip rap apron extending into the Sewer Easement. Will this change the cover above the sewer main? Also please note that the extents of the rip rap apron are different in the Stormwater Plan and on Sheet 2 of the plans.
   A: The stormdrain with rip rap apron will change the cover above the sewer main. Please see attached Drawing 973-03-02 S04 showing the Storm Sewer Profile, Storm Sewer Outlet Plan, and Storm Sewer Outlet Sections. Note that the Storm Sewer Profile and Catch Basin #1 Detail do not show the future Solid 4" HDPE Pipe from the sump pumps in the basement of powerhouse to Catch Basin #1. As indicated, this information will be provided at a later date.

   The extents of the rip rap apron included in the Stormwater Plan was revised to match the extents of the rip rap apron on Sheet 2 of the plans (see Exhibit 5 of the Application).

2. Q: The proposed plans include a large amount of landscaping above the sewer main. Have these planting been reviewed for suitability to be planted above an RCP sewer main, specifically are the selected plans likely to cause issues with root intrusions at the joints?
   A: Due to the expansive nature of the root systems associated with willows (Salix spp.) CMP revised the landscaping plan (included in the Application) by eliminating the planting of willows near or over the sewer easement. The remaining plantings proposed have somewhat shallow, non-taprooted root systems that are unlikely to penetrate a pipe.

3. Q: The stormwater management plan indicates that the basement will be pumped via an oil detector pump. Where will this be discharged to?
   A: As a preventative measure, two (2) oil minder pumps will be installed with inline petro plugs on the upstream side of the pumps, such that only stormwater will be discharged from the basement. The oil minder pumps and petro plugs are part of the Spill Prevention Control and Countermeasures Plan (SPCC) for the site. The sump will discharge any stormwater accumulating in the control room basement to Catch Basin #1.

Lewiston Planning and Code Enforcement:

1. Q: Please confirm that with vegetation removed and the new landscaping plan that a vegetated buffer of at least 25' in width will be maintained along the river.
   A. In-so-far as conditions permit (i.e. existing paved or non-vegetated surfaces), the project will allow all disturbed areas to revegetate. The 25' buffer along the river will be maintained.

2. Q: Exhibit 2: grading plan notes existing sidewalk adjacent to proposed substation. Sidewalk adjacent to site has at least three existing curb cuts that must be eliminated given the proposed development will have no access from Middle Street. Granite curbing and sidewalk repairs to match existing conditions must be shown and made.
   A: Drawing 973-03-02 SH02 will be revised when issued for construction to include removal and replacement of the paved sidewalk and granite curb, with no curb cuts, east of the Middle Street S/S along Middle Street.

3i: Q. Exhibit 6: Landscaping plan shows proposed plantings on abutting lots. Do you have their permission?
   A All abutters to the landscape plan have been contacted and field meetings have been conducted. No plantings on private property will occur without written permission.

3ii. Q: As discussed, new projects are required to plant street trees where possible. Staff realizes space is limited and concerns of tree height adjacent to a substation. Landscaping plan shows trees being planted on opposite side of the street on land owned by CMMC and LL Bean. This is welcomed. Please confirm owner's approval of plantings.
   A. See response above.

4. Q: Exhibit 12: are you proposing medium or maximum security design for fencing?
   A: Maximum security fence is proposed with a 1.75" x 1.75" diamond shaped mesh opening.

5. Q: Since the project disturbs 1 acre or more and is located in an urbanized area, the project is subject to the standards of Article XIII, Section 15 and the performance guarantee requirements of said section, of which there are five options.
   A: Central Maine Power has provided a Letter of Commitment with this Application with regards to Option 1 in Article XIII, Section 15 (Post Construction Stormwater Management). A Performance Guarantee will be drafted for review by the City prior to the start of construction. The Application has been amended to include this standard (see page 23).

6. Q: Application from March 2011 referenced changes to the floodway. What's the status of this? More info and detail on plans may be needed.
   A: The 2011 application proposed rip rap along the northwest corner of the site, a portion of which was within the regulated floodway. The 2015 application proposes to install a retaining wall at this location instead of rip rap, with the wall to be located just outside the floodway boundary (flood hazard zone) as depicted on the site plan drawings.

If I can help clarify any questions prior to the Planning Board meeting on October 26, please feel free to contact me at 207-624-2448, or at jtitus@burnsmcd.com.

Respectfully,

John Titus

John Titus
Community Relations Field Specialist
Burns & McDonnell

CENTRAL MAINE POWER

October 21, 2015

David Hediger, City Planner
City of Lewiston
27 Pine Street
Lewiston, Maine 04240

RE: **Central Maine Power Company, Lewiston Loop Project**
Performance Guarantee for Post Construction Stormwater Facilities – Letter of Intent

Dear David,

Central Maine Power Company (CMP) has reviewed the requirements under Section 15 (Post Construction Stormwater Management) of the City of Lewiston's Development Review Standards, and will provide a Performance Guarantee as outlined under Option 1 of the Standard for the stormwater facilities constructed within the Middle Street Substation project area.

Burns & McDonnell Engineering will assist in this matter and provide you with the necessary documentation to the satisfaction of the City of Lewiston prior to the start of construction, scheduled for March or April of 2016.

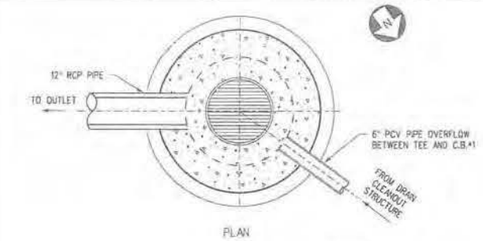
If you have any questions please feel free to contact me at 207-624-2448, or at jtitus@burnsmcd.com.

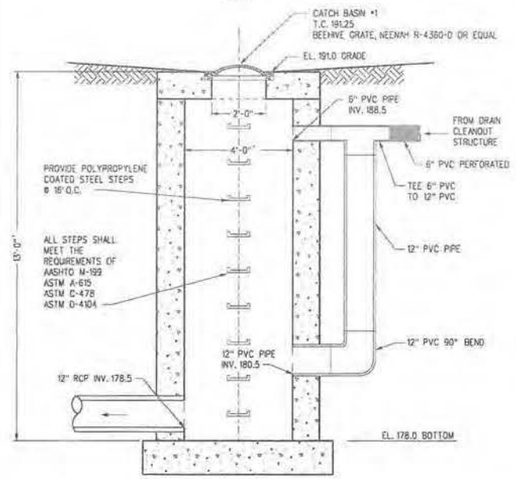
Respectfully,

John Titus

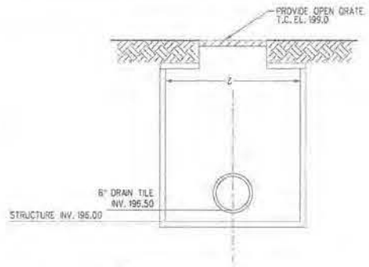
John Titus, Community Relations Specialist
Burns & McDonnell

cc: Drew McMullin, Katryn Mitchell (BMcD); Gerry Mirabile (CMP)

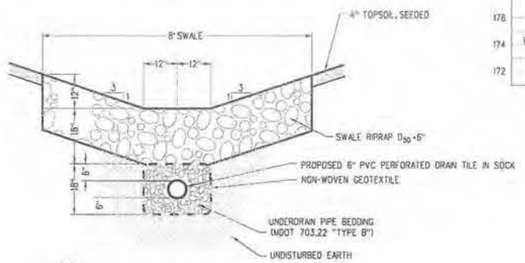




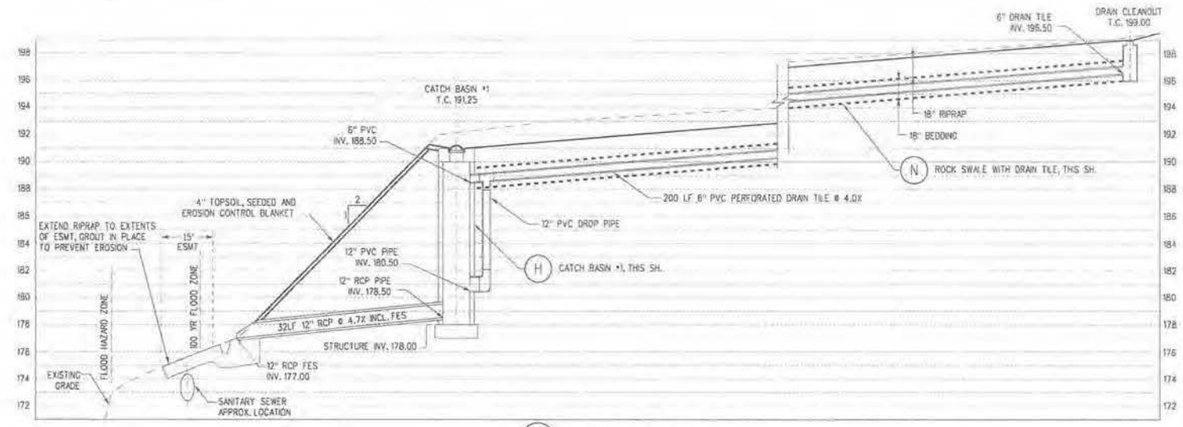
H CATCH BASIN #1



M DRAIN CLEANOUT STRUCTURE

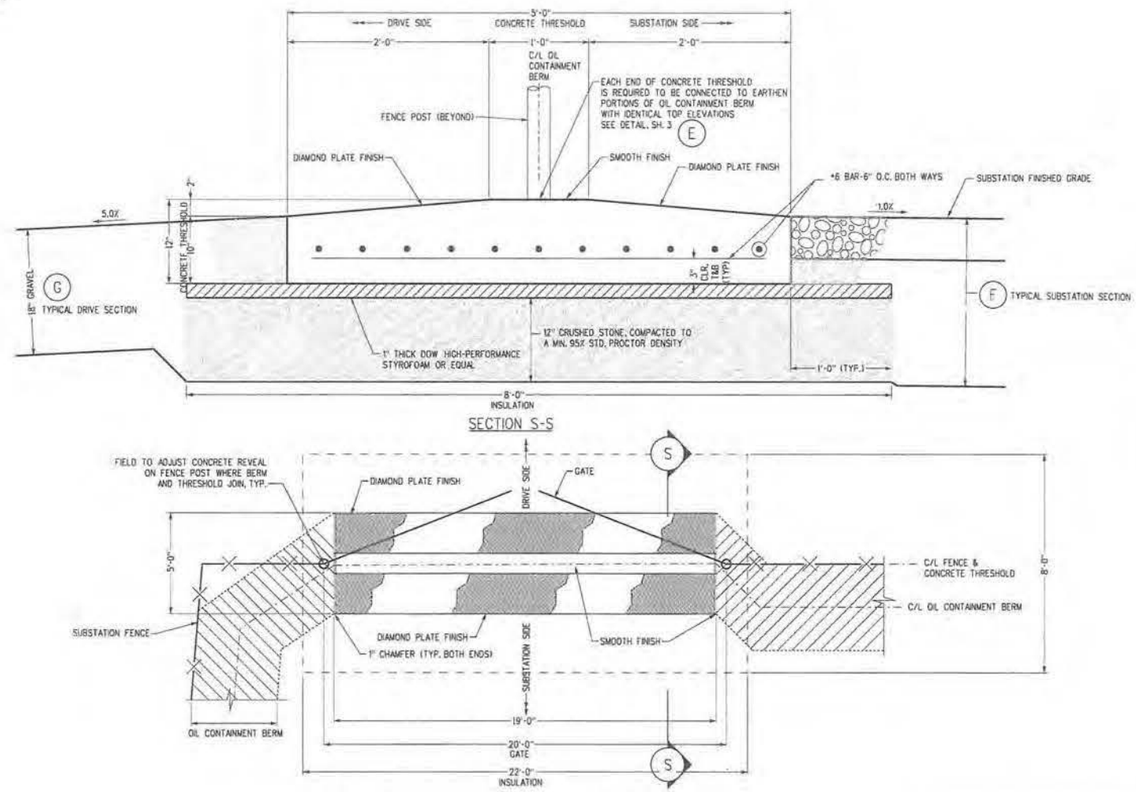


N ROCK SWALE W/DRAIN TILE

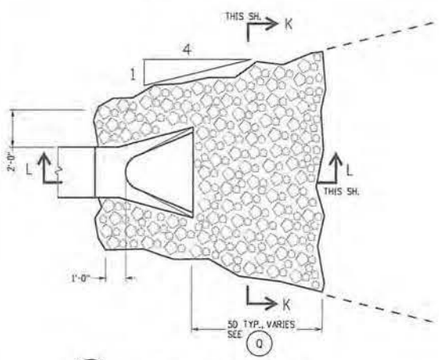


O STORM SEWER PROFILE

DRAIN CLEANOUT, CATCH BASIN #1 & STORM SEWER OUTLET

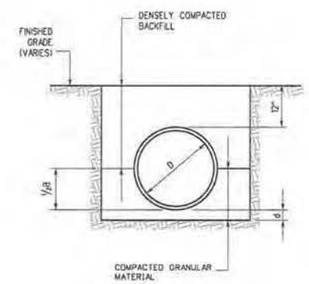


R CONCRETE THRESHOLD AT SUBSTATION GATE



J FLARED END SECTION DETAIL

SCALE: NONE



DEPTH OF BEDDING MATERIAL BELOW PIPE

D	d (MIN)
27" & SMALLER	3"
30" TO 60"	4"
66" & LARGER	5"

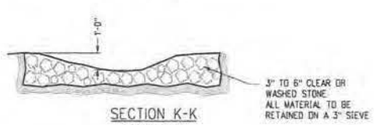
B OUTSIDE DIAMETER

D INSIDE DIAMETER

d DEPTH OF BEDDING MATERIAL BELOW PIPE

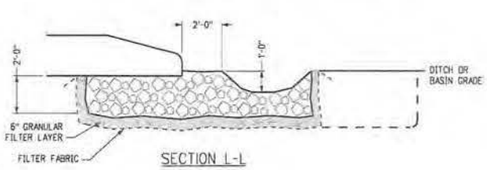
P TYPICAL PIPE BEDDING

SCALE: NONE



SECTION K-K

SCALE: NONE



SECTION L-L

SCALE: NONE

PRELIMINARY
IFB-ISSUE FOR BID
NOT FOR CONSTRUCTION

This document and any attachments are considered:
BUSINESS CONFIDENTIAL
PROTECTED CRITICAL INFRASTRUCTURE INFORMATION

Ulteig
Bismarck - Denver - Detroit Lakes - Fargo - Sioux Falls - St. Paul
4285 Lexington Avenue N
St. Paul, MN 55126
Phone: 651.415.3800 Fax: 651.415.2001
Web: www.ulteig.com
Ulteig Project Number: 13.02179

PE Stamp: STATE OF MINNESOTA, SRIRAM KALAGA, No. 9979, LICENSED PROFESSIONAL ENGINEER, 8/6/2015

IUSA ENGINEERING
CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION
Property of Iberdrola, USA

CMP IBERDROLA - USA

REV.	DATE	BY	DESCRIPTION	APP.
D	8/06/15	UEI/AMG	ADDED 100 YR FLOOD	UEI/MEV
C	7/13/15	UEI/AMG	ISSUED FOR B/O	UEI/MEV
B	5/12/15	UEI/AMG	IFR ISSUE FOR REVIEW 95%	UEI/MEV
A	4/01/15	UEI/AMG	IFR ISSUE FOR REVIEW 60%	UEI/MEV

GRADING DETAILS

MIDDLE STREET SUBSTATION LEWISTON, ME

DR.	UEI/AMG	SCALE: AS SHOWN	FILE: 973-03-02 804.dgn
CK.	UEI/MEV	NO.:	REV.
APP.	UEI/SK	973-03-02 SH. 04	D
DATE	8/05/2015		

ARCH D CADD Drawing, DO NOT REVISE MANUALLY

CENTRAL MAINE POWER

October 21, 2015

David Hediger, City Planner
City of Lewiston
27 Pine Street
Lewiston, Maine 04240

RE: **Central Maine Power Company, Lewiston Loop Project**
Middle Street Substation Application for Amended Conditional Use Permit

Dear David,

Please find, on behalf of Central Maine Power Company (CMP), thirteen copies of the Conditional Use Application for amending the Middle Street Substation permit approved by the Planning Board on March 28, 2011. The request for the amended permit is the result of scope changes to the Site Plan submitted in 2011. These changes include:

- A 27 percent increase in the footprint of the control house to include the switchgear, which was originally located within a separate enclosure (see Exhibit 4)
- A redesign of the Stormwater Management Plan (see Exhibit 5)
- Rebuilding of the existing retaining walls instead of the use of riprap, which will be extended to the northwest corner of the site (see Exhibit 12)
- A change in security fence design from chain link/barbed wire to a non-conductive composite material (see Exhibit 12)

A copy of the Landscape Plan, which includes plantings along the Androscoggin River is also included, addressing conditions of approval stipulated in both the Middle Street permit granted in March 2011, and the Section 144/148 realignment permit granted in August 2015.

As discussed earlier, please note that the project also involves the installation of a sump pump in the control house, the specifics of which are not available at this time. Any discharge from the pump however, will be incorporated into the existing Stormwater Plan as outlined in this application. We will provide you with the information on the pump once it becomes available.

It is our understanding the Planning Board will review the application at its next scheduled meeting on October 26, 2015. Representatives from the project will be in attendance at that meeting.

If you have any questions in the meantime, please feel free to contact me at 207-624-2448, or at jtitus@burnsmcd.com.

Thank you for your time and effort, and we look forward to working with you on this project.

Respectfully,

John Titus
Community Relations Field Specialist
Burns & McDonnell

cc: Katryn Mitchell (BMcD), Dave Libby (BMcD), Drew McMullin (BMcD), Mark Goodwin (BMcD), Gerry Mirabile (CMP)

CENTRAL MAINE POWER

March 9, 2012

Bureau of Land & Water Quality
Division of Land Resource Regulation
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333-0017

Municipalities (various)

Federal Agencies (various)

RE: Central Maine Power Company - Maine Power Reliability Program (MPRP)
Agent Authorization

To Whom It May Concern:

Central Maine Power Company hereby authorizes Burns & McDonnell and Burns & McDonnell staff to act as its agent for all activities associated with the acquisition of Federal, state and local permits related to the above referenced project.

Please contact either Gerry Mirabile at 626-9557 (email me at gerry.mirabile@cmpco.com) or me at 626-9574 (email roy.koster@cmpco.com) with any questions. Thank you.

Sincerely,

Roy A. Koster, P.E.
Manager, Environmental Health & Safety

83 Edison Drive, Augusta, ME 04336
Telephone 207.623.3521

IBERDROLA USA

S:\Compliance\Shared\Environmental\Projects\TLs & Combined TL's & SS's\MPRP\Agent Authorization Letter - BMcD.doc

Development Review Application

City of Auburn Planning and Permitting Department
City of Lewiston Department of Planning and Code Enforcement

PROJECT NAME: Lewiston Loop, Middle St Substation - Revised Project Scope

PROPOSED DEVELOPMENT ADDRESS: _____

PARCEL ID#: 206-2, 206-202, 207-77 (Access), Brookfield Hydro

REVIEW TYPE: Site Plan/Special Exception □ Site Plan Amendment X
Subdivision □ Subdivision Amendment □

PROJECT DESCRIPTION: CMP proposes to build a new substation in the vicinity of Middle, Lowell, and Chapel Streets to serve two transmission lines between Lewiston Lower and Gulf Island Substation. Scope changes include retaining wall/fence, control house, and stormwater design.

CONTACT INFORMATION:

Applicant Central Maine Power Co.
Name: Gerry Mirabile
Address: 83 Edison Dr, Augusta, ME
Zip Code 04336-0002
Work #: 207-626-9557
Cell #:
Fax #: 207-626-4044
Home #:
Email: Gerry.Mirabile@cmpco.com

Property Owner Central Maine Power Co.
Name: Gerry Mirabile
Address: 83 Edison Dr, Augusta, ME
Zip Code 04336-0002
Work #: 207-626-9557
Cell #:
Fax #: 207-626-4044
Home #:
Email: Gerry.Mirabile@cmpco.com

Project Representative
Burns & McDonnell Eng.
Name: John Titus
Address: 52 Farm View Drive
Zip Code New Gloucester, ME 04260
Work #: 207-253-4040 (Chris Marshall)
Cell #: 207-624-2448
Fax #: 207-253-4079
Home #:
Email: jtitus@burnsmcd.com
amcmullin@burnsmcd.com

Other professional representatives for the project (surveyors, engineers, etc.),
Name: Katryn Mitchell (project manager)
Address: 52 Farm View Drive
Zip Code New Gloucester, ME 04260
Work #: 207-253-4020
Cell #: 603-340-0961
Fax #: 207-253-4079
Home #:
Email: kmitchell@burnsmcd.com

PROJECT DATA

The following information is required where applicable, in order to complete the application

IMPERVIOUS SURFACE AREA/RATIO

Existing Total Impervious Area	39,640	sq. ft.
Proposed Total Paved Area		sq. ft.
Proposed Total Impervious Area	43,313	sq. ft.
Proposed Impervious Net Change	3,673	sq. ft.
Impervious surface ratio existing	51	% of lot area
Impervious surface ratio proposed	56	% of lot area

BUILDING AREA/LOT COVERAGE

Existing Building Footprint			sq. ft.
Proposed Building Footprint	(control house)	1,410	sq. ft.
Proposed Building Footprint Net change			sq. ft.
Existing Total Building Floor Area			sq. ft.
Proposed Total Building Floor Area		1,220	sq. ft.
Proposed Building Floor Area Net Change			sq. ft
New Building		yes	(yes or no)
Building Area/Lot coverage existing		0	% of lot area
Building Area/Lot coverage proposed		1	% of lot area

ZONING

Existing	CV/Shoreland
Proposed, if applicable	

LAND USE

Existing	Vacant gravel parking lot
Proposed	Electrical substation

RESIDENTIAL, IF APPLICABLE

Existing Number of Residential Units	N/A
Proposed Number of Residential Units	N/A
Subdivision, Proposed Number of Lots	N/A

PARKING SPACES

Existing Number of Parking Spaces	N/A
Proposed Number of Parking Spaces	N/A
Required Number of Parking Spaces	N/A
Number of Handicapped Parking Spaces	N/A

ESTIMATED COST OF PROJECT

$9,000,000

DELEGATED REVIEW AUTHORITY CHECKLIST

SITE LOCATION OF DEVELOPMENT AND STORMWATER MANAGEMENT

Existing Impervious Area	39,640	sq. ft.
Proposed Disturbed Area	60,419	sq. ft.
Proposed Impervious Area	43,313	sq. ft.

1. ***If the proposed disturbance is greater than one acre, then the applicant shall apply for a Maine Construction General Permit (MCGP) with MDEP.***
2. ***If the proposed impervious area is greater than one acre including any impervious area crated since 11/16/05, then the applicant shall apply for a MDEP Stormwater Management Permit, Chapter 500, with the City.***
3. ***If total impervious area (including structures, pavement, etc) is greater than 3 acres since 1971 but less than 7 acres, then the applicant shall apply for a Site Location of Development Permit with the City. If more than 7 acres then the application shall be made to MDEP unless determined otherwise.***
4. ***If the development is a subdivision of more than 20 acres but less than 100 acres then the applicant shall apply for a Site Location of Development Permit with the City. If more than 100 acres then the application shall be made to MDEP unless determined otherwise.***

TRAFFIC ESTIMATE

Total traffic estimated in the peak hour-existing (Since July 1, 1997) None passenger car equivalents (PCE)

Total traffic estimated in the peak hour-proposed (Since July 1, 1997) None passenger car equivalents (PCE)

If the proposed increase in traffic exceeds 100 one-way trips in the peak hour then a traffic movement permit will be required.

Zoning Summary

1. Property is located in the CV zoning district.
2. Parcel Area: 2.83 acres / 123,275 square feet(sf).

Regulations	Required/Allowed	Provided
Min Lot Area	None	2.83
Street Frontage	25	+200
Min Front Yard		
Min Rear Yard		
Min Side Yard		
Max. Building Height	150	18+/-
Use Designation		
Parking Requirement	1 space/ per square feet of floor area	
Total Parking:	n/a	
Overlay zoning districts (if any):	Shoreland	
Urban impaired stream watershed?	YES/NO If yes, watershed name	

DEVELOPMENT REVIEW APPLICATION SUBMISSION

Submission shall include payment of fee and fifteen (15) complete packets containing the following materials:

1. Full size plans containing the information found in the attached sample plan checklist.
2. Application form that is completed and signed.
3. Cover letter stating the nature of the project.
4. All written submittals including evidence of right, title and interest.
5. Copy of the checklist completed for the proposal listing the material contained in the submitted application.

Refer to the application checklist for a detailed list of submittal requirements.

L/A's development review process and requirements have been made similar for convenience and to encourage development. Each Citys ordinances are available online at their prospective websites:
Auburn: www.auburnmaine.org under City Departments/ Planning and Permitting/Land Use Division/Zoning Ordinance.
Lewiston: http://www.ci.lewiston.me.us/clerk/ordinances.htm. Refer to Appendix A of the Code of Ordinances

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, I certify that the City's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

This application is for development review <u>only</u>; a Performance Guarantee, Inspection Fee, Building Permit Application and other associated fees and permits will be required prior to construction.

Signature of Applicant:	Date:
John Tilton	9/24/15

Development Review Checklist

City of Auburn Planning and Permitting Department
City of Lewiston Department of Planning and Code Enforcement

THE FOLLOWING INFORMATION IS REQUIRED WHERE APPLICABLE TO BE SUBMITTED FOR AN APPLICATION TO BE COMPLETE

PROJECT NAME: Central Maine Power Company Middle Street Substation

PROPOSED DEVELOPMENT ADDRESS and PARCEL #: Parcels 206-2,202; 207-77

Required Information		Check Submitted		Applicable Ordinance	
Site Plan		**Applicant**	**Staff**	**Lewiston**	**Auburn**
	Owner's Names/Address	X			
	Names of Development	X			
	Professionally Prepared Plan	X			
	Tax Map or Street/Parcel Number	X			
	Zoning of Property	X			
	Distance to Property Lines	X			
	Boundaries of Abutting land	X			
	Show Setbacks, Yards and Buffers	X			
	Airport Area of Influence (Auburn only)	n/a			
	Parking Space Calcs	n/a			
	Drive Openings/Locations	X			
	Subdivision Restrictions	n/a			
	Proposed Use	X			
	PB/BOA/Other Restrictions	X			
	Fire Department Review	X			
	Open Space/Lot Coverage	X			
	Lot Layout (Lewiston only)				
	Existing Building (s)	X			
	Existing Streets, etc.	X			
	Existing Driveways, etc.	X			
	Proposed Building(s)	X			
	Proposed Driveways	X			
Landscape Plan					
	Greenspace Requirements	n/a			
	Setbacks to Parking	n/a			
	Buffer Requirements	X			
	Street Tree Requirements	n/a			
	Screened Dumpsters	n/a			
	Additional Design Guidelines	n/a			

	Planting Schedule	X			
Stormwater & Erosion Control Plan					
	Compliance w/ chapter 500	X			
	Show Existing Surface Drainage	X			
	Direction of Flow	X			
	Location of Catch Basins, etc.	X			
	Drainage Calculations	X			
	Erosion Control Measures	X			
	Maine Construction General Permit	X			
	Bonding and Inspection Fees	X			
	Post-Construction Stormwater Plan	X			
	Inspection/monitoring requirements	X			
	Third Party Inspections (Lewiston only)	X			
Lighting Plan					
	Full cut-off fixtures	X			
	Meets Parking Lot Requirements	N/A			
Traffic Information					
	Access Management	n/a			
	Signage	X			
	PCE - Trips in Peak Hour	n/a			
	Vehicular Movements	n/a			
	Safety Concerns	n/a			
	Pedestrian Circulation	n/a			
	Police Traffic	n/a			
	Engineering Traffic	n/a			
Utility Plan					
	Water	n/a			
	Adequacy of Water Supply	n/a			
	Water main extension agreement	n/a			
	Sewer	n/a			
	Available city capacity	n/a			
	Electric	n/a			
	Natural Gas	n/a			
	Cable/Phone	n/a			
Natural Resources					
	Shoreland Zone	X			
	Flood Plain	n/a			
	Wetlands or Streams	n/a			
	Urban Impaired Stream	n/a			
	Phosphorus Check	n/a			
	Aquifer/Groundwater Protection	n/a			
	Applicable State Permits	X			
	No Name Pond Watershed (Lewiston only)	n/a			

	Lake Auburn Watershed (Auburn only)	n/a			
	Taylor Pond Watershed (Auburn only)	n/a			
Right Title or Interest					
	Verify	X			
	Document Existing Easements, Covenants, etc.	X			
Technical & Financial Capacity					
	Cost Est./Financial Capacity	X			
	Performance Guarantee	n/a			
State Subdivision Law					
	Verify/Check	n/a			
	Covenants/Deed Restrictions	n/a			
	Offers of Conveyance to City	n/a			
	Association Documents	n/a			
	Location of Proposed Streets & Sidewalks	n/a			
	Proposed Lot Lines, etc.	n/a			
	Data to Determine Lots, etc.	n/a			
	Subdivision Lots/Blocks	n/a			
	Specified Dedication of Land	n/a			
Additional Subdivision Standards					
	Single-Family Cluster (Lewiston only)	n/a			
	Multi-Unit Residential Development (Lewiston only)	n/a			
	Mobile Home Parks	n/a			
	Private Commercial or Industrial Subdivisions (Lewiston only)	n/a			
	PUD (Auburn only)	n/a			
A jpeg or pdf of the proposed site plan					
Final sets of the approved plans shall be submitted digitally to the City, on a CD or DVD, in AutoCAD format R 14 or greater, along with PDF images of the plans for archiving					

Application for Amended Conditional Use Permit

for the

CMP Lewiston-Loop Project Middle Street Substation, Lewiston, Maine

Prepared for:

Central Maine Power Company
83 Edison Drive
Augusta, ME 04336

Prepared by:

Burns & McDonnell, Eng.
52 Farm View Drive
New Gloucester, ME 04260

September, 2015
(rev. 10/20/15)

AGENT AUTHORIZATION

Lewiston-Loop General Project Description

CMP proposes to increase transmission capacity and reinforce its transmission system in the Lewiston-Auburn area to support current and forecasted electrical demand. To meet this objective CMP will construct a new aboveground 115 kV transmission line (Section 255) from the proposed Middle Street Substation (115/34/12 kV) in downtown Lewiston to the Gulf Island Substation on Switzerland Road in Lewiston. The proposed new Section 255 will connect into the existing Section 64 at Gulf Island Substation. Also to meet this objective a second transmission line (Section 256) will originate from the new Middle Street Substation and follow an underground utility duct beneath Chapel and Canal Streets, terminating at the existing Lewiston Lower Substation. In addition, transmission line Sections 144 and 148, which run from the Lewiston Steam Substation to Monty Hydro and Great Falls Substation, will be rerouted to enter into the Middle Street Substation. This will result in the decommissioning of Lewiston Steam Substation. These six components – transmission line Sections 255, 256, 144/148, Middle Street Substation, decommissioning of Lewiston Steam Substation, and upgrades at Lewiston Lower Substation - make up the "Lewiston Loop" project. Construction of the new Middle Street Substation is proposed at a vacant lot on Middle Street near its intersection of Lowell Street in downtown Lewiston.

CMP has an obligation to ensure electric transmission system reliability and capacity to homes and businesses, including maintaining and upgrading the transmission system. The electric system must continuously be evaluated and upgraded to keep pace with growth and to ensure the reliability and adequacy of electricity supply to homes and businesses. The proposed transmission line and substation upgrades will provide numerous public benefits to the Lewiston-Auburn area. The new facilities will ensure more flexibility and backup systems for providing critical electric transmission to the area and will reduce the potential for extended power outages. The Lewiston Loop project is one of several upgrades as part of the Maine Power Reliability Program that will benefit CMP's customers by bringing the system up to date to meet forecasted electrical demand.

The project meets the Maine Public Utilities Commission (MPUC) requirement for public need by providing improved service to the Lewiston-Auburn area in an economical, safe, and reliable way. The MPUC issued a Certificate of Public Convenience and Necessity approving the project in 2013. The proposed 115 kV lines, substation, and associated improvements are the most cost effective alternative for the area. Furthermore, the project provides economic benefits through improved service supporting the economic redevelopment of the Lewiston-Auburn area.

Project Description for Middle Street Substation

CMP proposes to construct a new 115/34.5/12 kV substation facility on Middle Street, to be located on an approximate 2.83 acres of land (two separate lots) at the intersection of Middle, Lowell, and Chapel Streets. The total developed portion of the lot will be approximately 1.72 acres, with the fenced in yard area being approximately 1.04 acres. The remaining developed area includes improvements to access and stormwater facilities.

The substation will provide switching capacity, a process that involves the transfer or discontinuance of electrical load to other substation equipment or overhead lines for maintenance

work, and during line outages. The new substation will provide a needed electrical supply source and improved voltage regulation to the City of Lewiston.

CMP had obtained Conditional Use approval for this project from the Lewiston Planning Board on March 28, 2011. A Conditions of Approval required CMP to provide a landscape plan for the substation site prior to the start of construction, which is being provided as a part of this submittal. In addition, several project scope changes have taken place since that time, requiring an amendment to the original approval. These scope changes include:

- A 27% increase in the footprint of the control house to include the switchgear, which was originally located within a separate enclosure
- A redesign of the stormwater management plan
- Rebuilding the existing retaining walls instead of using riprap, to be extended to northwest corner of the site
- A change in security fence design from chain link/barbed wire to a non-conductive composite material

The site contains concrete foundations from a former industrial building and is currently used as a seasonal snow dump and over flow parking area. Development of the lot as proposed is consistent with local zoning and planning requirements and is of sufficient size for construction of the substation.

Transmission Line Section 255 will originate from the Middle Street Substation and cross the Pan Am Railways line north to the Gulf Island Substation. Transmission lines Sections 144 and 148 will be rerouted from the Lewiston Steam Substation to the Middle Street Substation. Transmission line Section 256 will originate at the Middle Street Substation and run underground along Canal Street to the Lewiston Lower Substation off from Strawberry Patch Lane.

The tallest structures within the substation will be 55 feet in height, with a 10-foot lightning mast, for a total of 65 feet.

Demolition and removal of obsolete concrete structures and materials will be required to accommodate the proposed grade of the site. This will involve the use of heavy equipment including excavators, bulldozers, and dump trucks. The site will be re-graded to meet the designed elevations. Grading includes preparing stormwater catch basins, swales, and detention facilities, which will be constructed during this phase.

The concrete foundations for the control house and electrical components will then be poured and readied for construction. The existing retaining walls at the site will be rebuilt and a ten-foot non-conductive, non-climbable fence will be installed around the perimeter of the substation yard.

Summary of Applicable Ordinances and Zoning Districts

The proposed project will be located within a Centreville (CV) zoning district. "Power transmission lines, substations, telephone exchanges, microwave towers or other public utility or communication use" are permitted uses in the CV district. As a result, CMP seeks approval from the Planning Board for the project under the Zoning and Land Use Code for the City of Lewiston, Article XI – District Regulations, Article XII – Performance Standards, and Article XIII – Development Review and Standards

Zoning and Land Use Code for the City of Lewiston, Maine, Article X, Conditional Uses

A building, structure or parcel of land may be employed for a conditional use if the us is specifically listed as a conditional use in the regulations governing the zoning district in which the use is proposed and, when the proposed development is a major development as defined in Article XIII, subsection 3(a)(2), if a conditional use permit is approved by the planning board.

Zoning and Land Use Code for the City of Lewiston, Maine, Article XI, District Regulations

Article XI defines and describes the various zoning districts and overlay districts and the respective permitted uses, conditional uses, space and bulk standards, and applicable additional standards for each of the zoning districts.

Zoning and Land Use Code for the City of Lewiston, Maine, Article XII, Performance Standards

The performance standards contained in this article apply to all uses and activities in the City of Lewiston, unless otherwise specified, whether or not specific approval or a permit is required.

Zoning and Land Use Code for the City of Lewiston, Maine, Article XIII, Development Review and Standards

The purpose of development review is to provide for the review and approval of development plans for nonresidential and residential developments including, but not limited to, subdivisions and mobile home parks to insure that the development of both private and public land occurs in a manner which minimizes the adverse impact on public facilities, the natural environment and neighboring uses, and to otherwise protect the health, safety and general welfare of the people.

APPROVAL STANDARDS AND ACCOMPANYING MATERIALS

The remainder of this application package discusses the standards of approval that apply to CMP's proposed Middle Street Substation. Specifically, the following material is divided into five parts:

Part One: Article X: Conditional Uses

Part Two: Article XI: District Regulations

Part Three: Article XII: Performance Standards

Part Four: Article XIII: Development Review Standards

Part Five: Exhibits

Exhibit 1: Project Location

Exhibit 2: Site Plan

Exhibit 3: City of Lewiston Zoning Map

Exhibit 4: Control House Plan and Design Specifications

Exhibit 5: Stormwater Management Plan

Exhibit 6: Landscape Plan

Exhibit 7: Right, Title, and Interest

Exhibit 8: DEP – Natural Resources Protection Act Permit

Exhibit 9: CMP's Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects (2015)

Exhibit 10: Spill Contingency Plan Procedures

Exhibit 11: EMF Information

Exhibit 12: Retaining Wall and Fence Detail

Exhibit 13: Lighting Plan

ARTICLE X. CONDITIONAL USES

SEC. 3: STANDARDS FOR CONDITIONAL USE PERMITS

(1) Neither the proposed use nor the proposed site upon which the use will be located is of such a character that the use will have significant adverse impact upon the value or quiet possession of surrounding properties greater than would normally occur from such a use in the zoning district.

(a) of the proposed use is comparable to surrounding uses:

The land uses surrounding the Middle Street Substation site are industrial and commercial in nature. There will be limited visibility of the substation from the nearby downtown commercial district due to screening by buildings. The highest level of visibility is within 200 feet of the site, and from a portion of Great Falls in Auburn.

(b) The amount and type of traffic to be generated, hours of operation, expanse of pavement, and the number of parking spaces are comparable to surrounding uses.

The substation will not generate regular or periodic traffic. CMP personnel will visit the substation on an occasional basis for inspection, maintenance, and operation purposes. Typically this work involves one or two light duty vehicles or a construction "bucket" truck on an irregular basis.

(c) The generation of noise, dust, odor, vibration, glare, smoke, litter and other nuisances is comparable to surrounding uses.

The substation will not generate dust, odor, vibration, smoke, litter and create any other nuisances. The steel structures are finished with a flat coating and will produce minimal glare. A discussion of the noise generated by the substation is provided in Article XII, Sec. 19 (Performance Standards) later in this application. Generally, noise generated by the equipment within the substation will be within the maximum levels allowed within the Centerville District.

(d) The impact of the use on the quality and quantity of groundwater available to abutting properties is comparable to surrounding uses.

The substation does not require any source of ground or surface water, as such there will be no effects to these resources.

(e) Unusual physical characteristics of the site, including size of lot, shape of lot, topography, and soils, do not aggravate adverse impacts upon surrounding properties:

The substation will be located on a site with a history of industrial use.

(2) Vehicular and pedestrian access to, into and within the site will be safe and will not be overburdened or create hazards because they are inadequate.

(a) Vehicular access to the site will be on roads which have adequate capacity to accommodate the additional traffic generated by the development.

Operation of the substation does not require daily vehicular and pedestrian access to, into and within and from the site. Access is irregular and minimal compared to surrounding businesses and institutional uses. Maintenance and operation of the substation will not infringe upon or affect the general public and adjacent areas. Road improvements are not needed.

(b) The topography of the site shall permit the construction of all driveways, entrances or proposed streets to meet the standards of the City of Lewiston's Policy for the Design and Construction of Streets and Sidewalks.

Development of the site will require excavation, filling, and grading of the lots to provide the necessary grade and substrate for the substation. These topographical alterations will not have any effect on construction of the Chapel Street entrance.

(c) Facilities are present to assure the safety of pedestrians passing by or through the site.

The substation yard will be surrounded by a ten-foot, non-conductive, non-climbable security fence.

(3) Municipal or other facilities serving the proposed use will not be overburdened or create hazards because they are inadequate.

(a) The capacity of sewerage and water supply systems is adequate to accommodate the proposed use.

Development and operation of the substation does not require any municipal facilities, including sewer and water.

(b) The capacity of the storm drainage system is adequate to accommodate the proposed use.

The stormwater management system does not connect to the City's storm drainage system.

(c) The ability of the fire department to provide necessary protection services to the site and development is adequate.

The project has been reviewed by the Lewiston Fire Department.

(4) The soils on the proposed site shall have adequate capacity and stability to support all loadings, including fill, developed by the proposed use and the use will not cause unreasonable soil erosion or reduction in the capacity of the land to hold water to the extent that a dangerous or unhealthy condition may result on the site or upon the land of abutters or the environment. In considering whether this standard is satisfied, the board shall take into account the elevation above sea level of the site and surrounding

properties, its relation to flood plains, the slope and vegetation of the land and their effects on drainage.

Based on an analysis of the Soil Survey Geographic Database compiled by the United States Department of Agriculture – Natural Resources Conservation Service, the soils will accommodate the construction of the substation. The site has been engineered to meet the stability and load bearing requirements of the proposed structures. CMP will remove all unsuitable soils with common fill, place 18 inches of gravel fill on top of the suitable soil, which is then covered by 6 inches of stone topping to provide stability and drainage.

(5) The scale and design of the proposed structures with respect to materials, scale and massing shall be compatible with existing structures within 500 feet of the site in areas where existing structures are of a similar scale and architectural treatment.

Although the components of the substation are of different materials and design as compared to surrounding uses, most of these components are not massive and do not block the view scape.

The tallest structures within the substation will be 55 feet in height, with a 10 foot lightning mast, for a total of 65 feet.

SEC. 4: ADDITIONAL STANDARDS IN SHORELAND AREAS

The proposed use:

(1) Will not result in damage to spawning grounds, fish, aquatic life, bird and other wildlife habitat.

There will be minimal impacts to spawning grounds, fish, aquatic life, birds and other wildlife habitat along the Androscoggin River near the project area. Habitat values in these areas will still be provided to species that use shrub and herbaceous communities. There will be no fill within wetlands and there will be no adverse impacts to aquatic resources. Capable species (species capable of growing tall enough to interfere with the electrical components of the substation) will be removed along the River to address setback and safety standards. Herbaceous and shrub vegetation will remain.

In general, given the existing landscape characteristics of the project area, construction of the project is not expected to create conditions that are not already common within the project area. It is fully anticipated that local wildlife populations will adapt and respond to any alterations much as they already do to ongoing land uses within the vicinity of the proposed project. Therefore, impacts to wildlife are expected to be minimal to non-existent. .

(2) Will conserve shoreland vegetation.

A 60 x 200 square foot area along the river will be cleared of "capable" vegetation. Only vegetation required to be cleared to maintain safe separation between conductor and structures will be removed; all other vegetation will be retained.

(3) Will conserve visual points of access to waters as viewed from public facilities.

Construction of the substation will not block or otherwise significantly affect visual points of access to the River.

(3) Will conserve actual points of public access to waters.

The project will not block or impact actual points of access to the waters.

(4) Will conserve natural beauty.

The construction of the substation will not impact the general aesthetics, as the area along the River has a long history of industrial uses.

(5) Will avoid problems associated with floodplain development or use such as erosion, increased risk of flood damage to upstream properties or increased flood damage.

The substation will be constructed outside the floodplain area.

SEC. 5. Limitations on conditional use permits

No conditional use permit shall be valid for a period longer than six months from the date of issue, or such other time, up to two years, as was fixed when the permit was granted, unless the conditional use has been commenced or construction has actually begun within that period and is thereafter diligently pursued to completion. However, one or more extensions of said time, each not to exceed one year, may be granted by the board of appeals or planning board if the facts which supported the granting of the permit have not materially changed. A conditional use permit shall be deemed to authorize only the particular use for which it was issued and such permit shall automatically expire and cease to be of any force or effect if such use is, for any reason, discontinued for a period of 12 consecutive months. In addition, a conditional use permit authorizes only the activity expressly described in the application. Any additions to buildings or structures, construction of new buildings or structures, or other enlargement, expansion or intensification of the use shall require the issuance of a new conditional use permit.

CMP plans to begin work on this project in March 2016 and expects completion by the first quarter of 2017.

ARTICLE XI. DISTRICT REGULATIONS

The proposed substation will be located within a Centreville district (CV). Each district has specific bulk and space standards that must be met, and some districts have additional standards that must be met for allowable uses within the districts.

SEC. 1. Rural-agricultural district (RA)

Not applicable.

SEC. 2. Low-density residential district (LDR)

Not applicable.

SEC. 3. Suburban residential district (SR)

Not applicable.

SEC. 4. Medium-density residential district (MDR)

Not applicable.

SEC. 5. Riverfront (RF)

Not applicable.

SEC 6. Neighborhood conservation "A" district (NCA)

Not applicable.

SEC. 7. Neighborhood conservation "B" district (NCB)

Not applicable.

SEC. 8. Office-residential district (OR)

Not applicable

SEC. 9. Downtown residential district (DR)

Not applicable.

SEC. 10. Institutional office (IO)

Not applicable.

SEC. 11. Community Business (CB)

Not applicable.

SEC. 12. Highway business district (HB)

Not applicable.

SEC. 13. Centreville district (CV)

Bulk and space standards in this district are:

• *Minimum lot size*	*None*
• *Minimum lot area*	*None*
• *Minimum frontage*	*25 feet*
• *Minimum front setback*	*None*
• *Minimum front yard*	*None*
• *Minimum side and rear setbacks*	*None*
• *Minimum side and rear yards*	*None*
• *Maximum lot coverage ratio*	*100.0*
• *Minimum open space ration*	*None*
• *Maximum building height*	*150 feet*
• *Minimum distance between buildings on same lot*	*BOCA requirements*

The proposed Middle Street Substation is located in a Centreville (CV) district and meets the above standards.

SEC. 14. Office service (OS)

Not applicable.

SEC. 15. Industrial district (I)

Not applicable.

Sec. 16. Urban Enterprise (UE)

Not applicable.

Sec. 17. Mill (M)

Not applicable.

SEC. 18. Resource conservation district (RC)

Not applicable.

SEC. 19. Groundwater conservation overlay district (GC)

Not applicable.

SEC. 20. No Name Pond conservation overlay district (LC)

Not applicable.

SEC. 21. Mobile home park overlay district (MH)

Not applicable.

ARTICLE XII. PERFORMANCE STANDARDS

SEC. 2: Shoreland area standards

(b) Applicability. All lands within 250 feet horizontal distance of the normal high water mark of the Androscoggin River...

The substation project is located within the Shoreland Area.

(c) Land use standards

The proposed substation project is an allowed use within shoreland areas with Conditional Use approval, and otherwise meets the bulk and space requirements of the underlying zoning district.

(d) Principal and accessory structures

Not applicable

(e) Minimum lot size and shore frontage

Not applicable.

(f) Parking areas

Not applicable.

(g) Agriculture

Not applicable.

(h) Archeological Sites

Pre-contact and post-contact archaeological surveys were completed for the site in 2012. No pre-contact or post-contact archaeological resources were found on the substation site.

(i) *Erosion and sedimentation control*

CMP has developed a standard manual, "*Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects" (2015)*, which it uses as standard practice for all transmission line and substation projects. This manual contains erosion and sedimentation control requirements, standards, and methods that will be used to protect soil, water, and sensitive natural resources during construction. The manual was developed in consultation with the Maine Department of Environmental Protection (MDEP) and is based on MDEP's *Maine Erosion and Sediment Control BMPs* and Chapter 500 (Stormwater Management) of DEP's Rules. CMP's guidelines contain specific Best Management Practices for electric transmission line and substation construction. These guidelines will be followed during the construction of this project. Erosion and sedimentation controls are addressed in the stormwater management plan and are provided in Exhibit 9.

(j) Soils, buffers, and wetland alterations

The site has been engineered to meet the stability and load bearing requirements of the proposed structures. CMP will remove all unsuitable soils with common fill, place 18 inches of gravel fill on top of the suitable soil, which is then covered by 6 inches of stone topping to provide stability and drainage. CMP will retain as much vegetation on the undeveloped portion of the site as can safely remain and still provide the necessary safety clearances. A landscape plan has been included as Exhibit 6 of this application, meeting a condition of the original Conditional Use permit granted in March 2011. The plan includes additional plantings along the Androscoggin River.

(k) Mineral exploration and extraction

Not applicable

(l) Roads, driveways and water crossings

The entrance to the substation will be through an abandoned portion of Chapel Street across property owned by LL Bean. A new driveway or road "cut" will not be required.

(m) Subsurface sewage disposal

Not applicable

(n) *Stormwater runoff and water quality:*

A stormwater management plan has been included as Exhibit 5 of this application.

(o) Campgrounds and individual private campsites

Not applicable

(p) Structures related to water bodies

Not applicable

(q) Essential services

The new substation is a component of the essential services network that comprises the Lewiston Loop project in general.

(r) Timber harvesting

There are no portions of the site comprised of natural vegetation. The entire site has been developed for industrial uses over the past two centuries. The soils are largely comprised of fill and altered material. Industrial uses have been documented here, as such vegetation on the site is

largely invasive and early successional species that are adapted to disturbed locations. Development of the site requires trimming and cutting vegetation in a 60 x 200 foot area on the north portion of the lot and the Androscoggin River to address safety clearances from the electrical equipment. Because the area is largely an abandoned industrial site, it has become overgrown with shrubs and other invasive vegetation. The amount of clearing necessary does not qualify as "timber harvesting" as defined in the Lewiston Zoning Ordinance, which defines "timber harvesting" as "the cutting or removal of at least ten (10) cords, or equivalent, of timber on a lot or lots in contiguous ownership during a calendar year for the primary purpose of selling or processing forest products." Art. II, Sec. 2.

(s) Exemptions

Not applicable

(t) General development Areas. For land areas located in the highway business, community business, Centreville, riverfront, mill, urban enterprise, office service, office residential, and industrial districts, which are also located in the shoreland area, setbacks for new principle and accessory structures and parking areas shall be no less than 25 feet. In addition, all land area between the high-water line and the setback line shall be maintained in a natural vegetative state.

All structures are located no less than 25 feet from the Androscoggin River high-water line. Non-capable vegetation will be allowed to remain between the high water line and the setback line.

SEC. 3. Timber harvesting standards

Although construction of the Middle Street Substation will involve some trimming and clearing of vegetation on the site to accommodate the substation and ensure that the project meets federal reliability and safety standards, it will not qualify as "timber harvesting" as defined in the Lewiston Zoning Ordinance. "Timber harvesting" means "the cutting or removal of at least ten (10) cords, or equivalent, of timber on a lot or lots in contiguous ownership during a calendar year for the primary purpose of selling or processing forest products." Art. II, Sec. 2. The primary purpose of clearing the site is for the construction of the Middle Street substation facilities.

SEC. 4. Reserved

Not applicable.

SEC. 5. Earth material removal standards

Not applicable.

SEC. 6. Swimming pool standards

Not applicable.

SEC. 7. Walls and fences

The Middle Street substation yard will be enclosed with a 10-foot non-conductive, non-climbable security fence. This exceeds the front yard fence height standard of 3.5 feet as set forth in Article XII, Section 7(a)(1). However, Article XII, Section 7(e)(5) allows for security fencing to exceed the maximum height permitted if required by a governmental agency.

The National Electrical Safety Code (NESC) requirement 119.A.1, "Rooms and spaces in which electric supply conductors or equipment are installed shall so be arranged with fences, screens, partitions, or walls to form an enclosure as to limit the likelihood of entrance of unauthorized persons or interference by them with equipment inside." The fence enclosure must also meet the requirements of North American Electric Reliability Corporation (NERC) CIP-0006-1 for physical security of Critical Cyber Assets. This ensures that Critical Cyber Assets are also enclosed by a physical security perimeter.

Safety and security of the substation are ensured by designing above minimum requirements to account for changes in grade or winter snow pack. The fencing proposed for the Middle Street Substation complies with NESC, NERC, and CMP substation fence standards.

In addition, a retaining wall, which currently exists around portions of the site, will be rebuilt. When complete, the wall will extend along the entire north and east side of the substation, and along a portion of the south and west sides. Please see Exhibit 12 for details on the retaining wall and fence.

SEC. 8. Wind energy conservation systems

Not applicable.

SEC. 9. Adult business establishment and drinking place standards

Not applicable.

SEC. 10. Frontage right-of-way provisions

Not applicable.

SEC. 11. In-law apartment standards

Not applicable.

SEC. 12. Campground standards

Not applicable.

SEC. 13. Standards for the installation of mobile homes on individual lots

Not applicable.

SEC. 14. Standards for the installation of mobile homes in mobile home parks

Not applicable.

Sec. 15. Erosion and sedimentation control

The Stormwater Management Plan (Exhibit 5) for the Middle Street Substation describes the stormwater controls and best management practices that will be applied during construction. Erosion control techniques will also be consistent with Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects (CMP 2015, Exhibit 9).

SEC. 16. Signs

CMP will install warning signs at the Middle Street Substation. These signs will be installed on the substation fence and gate panels in accordance with NESC requirements as follows:

- A standard "DANGER HIGH VOLTAGE" sign will be placed at each main and secondary gate panel per gate location as well as within ten (10) feet of each fence corner, and not more than 50 feet apart along the fence line.
- A standard "CAUTION ENERGIZED LINES OVERHEAD" sign will be placed at each substation main and secondary gate panel.
- A standard "Substation Information" sign will be placed at each substation main and secondary gate panel containing the Company's name, name of the substation and emergency contact information.

SEC. 17. Off-street parking and loading

The Substation facility will provide limited parking within a secured work area accessible only to authorized personnel. No off-street parking or loading will be required.

SEC. 18. Improvement standards

Not applicable.

SEC. 19. Environmental performance standards

(1) *Smoke*

Not applicable.

(2) *Noise*

Substations produce sound resulting mainly from step-down transformers. The Middle Street Substation will have sound producing equipment, primarily the transformers and fans. Sound levels generated by this equipment are minimal and well below what would be expected in an urban environment. Some standard sound levels that would apply to the downtown Lewiston area are listed below:

- Truck at 100 feet: 85 dBA;
- Noisy urban environment: 75 dBA;

- Average speech at 3 feet: 60 dBA;
- Typical suburban daytime: 50 dBA;
- Quiet suburban nighttime: 35 dBA.

For areas with predominantly commercial, transportation, or industrial uses average sound levels must be limited to 60 dBA per City standards. Noise levels from a comparable, but older transformer with fans running would be approximately 78 dBA as recorded at the transformer. Within 75 feet the sound levels would drop to below 60 dBA and within 150 feet sound levels would drop below 55 dBA. The transformer is greater than 75 feet from the north, east, and south property boundaries. As such the sound levels will not exceed the City's noise standard. The transformer is approximately 60 feet from the west property boundary which is the bank of the Androscoggin River. The nearest commercial building is just over 120 feet from the transformer and, as such, sound levels should be well below noise thresholds at this location. The next closest commercial/industrial building is over 200 feet from the transformer and, as such, the sound levels from the transformer should be below the City's thresholds for urban environments at this location.

(3) *Vibration*

Vibration associated with the proposed Middle Street Substation would only occur during construction of the facilities, and therefore are exempt from this standard.

(4) *Odors*

Not applicable

(5) *Air pollution*

Not applicable.

(6) *Electrical disturbance or interference*

Not applicable.

SEC. 20. Child care facility standards

Not applicable.

SEC. 21. Reserved

Not applicable.

SEC. 22. Residential design standards for the downtown residential and riverfront districts

Not applicable.

ARTICLE XIII. DEVELOPMENT REVIEW AND STANDARDS

The Middle Street Substation project must comply with the Article XIII development and review standards under Sec. 2. (a)(2) for "the construction of any new, nonresidential building or structure."

SEC. 4. Approval criteria

(a) Utilization of the site

The Middle Street site is ideally situated for the development of a new 115/34/12 kV substation as it is comprised of two vacant lots located adjacent to the commercial district of downtown Lewiston. This site is located near the LL Bean parking garage, the Pan Am Railways railroad tracks along Middle, Lowell, and Chapel Streets. To the west is the Androscoggin River and to the north is the railroad.

(b) Traffic movement into and out of the development area

There will be no traffic movement increases associated with this project, other than that associated with construction, which may result in slight increases for that time period. After completion, traffic on Middle Street should return to the preconstruction traffic pattern.

(c) Access into the site

Access to the Middle Street Substation is over an existing public road, Chapel Street. A gravel access road will be constructed from the northeast terminus of the Canal Street Alley to the substation entrance gates on the west side of the substation. A vehicle turnaround area will be provided on CMP property outside the access road security gate.

(d) Internal vehicular circulation

Not applicable.

(e) Pedestrian circulation

Not applicable.

(f) Stormwater management

A stormwater management plan has been designed for the substation yard and access road in accordance with MDEP requirements (Chapter 500) and has been reviewed by the City. The stormwater plan is included as Exhibit 5 of this application. Stormwater from the substation site will not be directed to the municipal storm drainage system. As this project will result in the disturbance on more than one (1) acre, it must meet the requirements of this subsection and the requirements of the Site Location of Development Law, 38 MRSA, 481-490, the Maine Stormwater Management Law, 38 MRSA Section 429-D, and regulations promulgated there under, specifically Rule Chapters 500 and 502, and all subsequent amendments and revisions.

The proposed stormwater control system will be capable of handling a 25-year storm.

(g) Erosion control

The project will conform to CMP's "*Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects" (2015),* located in Exhibit 9, which it uses as standard practice for all transmission and substation projects. This manual contains erosion and sedimentation control requirements, standards, and methods that will be used to protect soil and water resources during construction of the Lewiston Loop project components. The manual was developed in consultation with the MDEP and is based on MDEP's *Maine Erosion and Sediment Contrail BMP's* and MDEP's Chapter 500, and contains specific best management practices appropriate for electric transmission line and substation construction. Erosion and sedimentation control measures will comply with the Maine Erosion and Sedimentation Law and regulations.

No fill material will be stored within 50 feet of the banks of any intermittent or perennial stream, or water body. The top of a cut or the bottom of a fill will not be closer than ten feet from a property line. Concrete will be removed from the area to be developed for the Middle Street Substation yard.

(h) Water supply

A potable water supply is not required.

(i) Sewage disposal

Wastewater disposal is not required.

(j) Utilities

Adequate utility capacity exists to service the proposed Middle Street Substation. Electric and communication facilities currently extend along Chapel and Middle Streets to serve the existing neighborhood and previous users of the site. Upon completion of the substation, the roadside distribution line will be extended to the substation as backup service to the facility. Primary electric service to the substation will be provided directly from transmission line circuits into the substation through step-down transformers that will lower the voltage to a usable voltage. Communications to/from the substation will be provided through fiber optics in the transmission lines.

All components of the Lewiston Loop project must be constructed to comply with all applicable safety codes to minimize potential safety hazards. The substation will be enclosed with a ten-foot high, non-conductive, non-climbable security fence to prevent the public from entering the yard.

(k) Natural features

The substation is proposed to be constructed on a vacant lot that was previously developed for industrial and commercial use, possibly since the early 1800's. None of the property retains any

of its natural components. Some vegetation has become established on portions of the site and along the bank of the Androscoggin River. Clearing of vegetation within the footprint of the substation and side-slopes will be required to accommodate the upgrades and ensure that the project meets federal reliability and safety standards. Some clearing will be needed along the River bank to maintain clearance of trees from the electrical components. The amount of clearing will be limited to that which is necessary for development of the project and to maintain safety setbacks.

(l) Groundwater protection

The multiple methods, plans, and procedures to prevent groundwater degradation during construction, operation, and maintenance of Middle Street Substation are incorporated in CMP's Environmental Control Requirements for Contractors and Subcontractors and CMP's Spill Contingency Plan Procedures (Exhibit 10). These procedures establish a set of minimum requirements for spill prevention and response. The procedures incorporated into the plan have proven successful in preventing spills and addressing spills if they occur. Both CMP and environmental inspectors will ensure that all personnel working on the site follow these procedures.

Employees operating construction vehicles are trained to promptly contain, report, and clean up any spill in accordance with standard procedures. As a standard operating procedure, all operational vehicles carry an oil spill kit that contains materials for conducting initial containment and clean-up of spills. In the event of a spill of oil or hazardous material, on-site personnel will immediately invoke standard spill reporting and clean-up procedures.

Spills that are properly cleaned-up will not pose any risk to groundwater quality. Based on normal operations and the characteristic of a routine spill clean-up, there is no need for any ongoing groundwater monitoring in response to any construction related oil spills.

Transmission line structures do not contain oil, and therefore do not trigger the need for Spill Prevention, Control, and Countermeasure (SPCC) plan (based on 40 CFR Part 112). However, the new Middle Street Substation will contain oil in sufficient quantity to require an SPCC plan, and this plan has been developed for this substation (see Exhibit 10).

Groundwater recharge characteristics will not be permanently affected by the installation of the new transmission line and construction of the substation.

(m) Water and air pollution

There is no air pollution associated with the construction of this project.

The project has been designed to prevent water pollution. All contractors and subcontractors working on behalf of CMP are required to comply with CMP's *Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects (2015) and Spill Contingency Plan Procedures* (Exhibit 10). These documents provide for the protection of water quality through the use of erosion and sedimentation control and the storage, transport, and use of oil, hazardous materials and wastes. Handling of any hazardous materials must be in accordance with best management practice and applicable local, state, and federal

regulations; uncontrolled spills or releases to the environment must be avoided; and sufficient spill cleanup and containment supplies must be maintained on-site to control releases of oil, hazardous materials or wastes. The requirements also include specific procedures for spill reporting. All necessary precautions and regulatory standards and requirements will be instituted and followed during all phases of construction to ensure protection and all water sources and water bodies.

(n) Exterior lighting

Substation yard and control house lighting will be installed for security and night maintenance purposes. Several factors are considered in substation yard lighting design, including: public impact, ordinance requirements, security, maintenance, light pollution, spillage, and lighting system control.

When the working lights are off, the center of the yard and associated equipment and bus would be dimly lit. Adequate dusk-to-dawn lighting will be provided to access the control house for accessing substation lighting (as needed), and for supporting normal operations.

Exterior control house lights shall be wall-mounted 100-watt exterior, "full cut off – down luminaire," or an approved equal. One fixture will be mounted above each control house entry. Controls for wall mounted luminaires will be designed such that they may be either manually turned on and off or placed in an "auto" mode via a control switch. The "auto" position would allow CMP continuous "dusk to dawn" operation as controlled by a photo eye. "Auto" may be considered the normal mode of operation, depending on the site and local requirements. The primary function of the control house mounted exterior luminaires is for maintenance (night time visibility to the control house for utility workers) as well as overall station and control house security and to deter vandalism.

As part of the substation yard construction, "full cutoff" perimeter 100-watt luminaires, or an approved equal, will be installed along interior fence lines in areas that are susceptible to vehicular maintenance traffic. These down-lights can also be utilized for security and general lighting. The down light type luminaires will be installed on steel poles, illuminating the area below for maintenance traffic. The luminaires will be installed in serviceable locations and away from live substation conductors and equipment. Light poles will be placed at a minimum of 5 feet inside of the perimeter fence for security reasons. The controls for the perimeter luminaires will be designed such that they may be manually turned on and off or placed in an "auto" mode via a control switch. The "auto" position would allow continuous "dusk to dawn" operation, as controlled by a photo eye. The normal operation would be to place the perimeter lights in an "off" position which would not allow them to operate automatically. Certain operational or security requirements may warrant operating these lights in the "auto" mode.

Outdoor 250-watt "work lights" will be installed on appropriate structures such as dead end structures, as required throughout the substation yard for maintenance and operation purposes. These flood type luminaires will be directed to areas common for maintenance and switching but operated so as not to contribute to light pollution. The luminaires will be installed at a tilt determined by the lighting design such that the aiming point is directed to high voltage equipment at the standard bus heights. The work light controls will be designed such that they

may be manually turned on and off only, with no "auto" mode, as the intended use is for occasional and specific night time use only and not for security or general lighting.

All exterior lighting will be designed and shielded to avoid undue adverse impact on neighboring properties and rights-of-way. Please see Exhibit 13 for more information on the Lighting Plan.

(o) Waste disposal

Waste electrical system and construction process components such as scraps of cable, cable spools, poles, and ceramic insulators will be generated during construction of the Middle Street Substation. Most of these materials will be recycled or reused. Construction equipment will generate small amounts of waste plastic containers for oils and lubricants, broken filters and belts, and damaged tires. Construction and managerial staff will generate some waste such as paper, bottles, cans, plastics, and food scraps. All of these materials will be recycled or shipped to a licensed landfill, transfer station, or incinerator.

Hazardous wastes or materials will be not be generated during construction or operation of the substation.

(p) Lot layout

Not applicable.

(q) Landscaping

Natural vegetation, which is limited on the site in its current condition, will be left on the site except for those areas to be developed for the substation yard, access road, and the associated transmission line corridors extending into and out of the substation. CMP must trim or clear any vegetation that could interfere with any of the electrical and transmission structures. A landscape plan has been included as Exhibit 6, meeting a condition of approval as required by the Conditional Use permit obtained in March 2011. Additional plantings to address vegetation removal along the River are included in that plan.

Shoreland relationship

The project will not adversely affect the water quality or shoreline on any water body. The project does not involve providing access to abutting navigable waters. There are no protected natural resources within the project area. There will be no fill or excavation within 25 feet of the Androscoggin River bank.

(r) Open space

The substation site will not provide any open space.

Technical and financial capability

Central Maine Power Company (CMP) is a subsidiary of Iberdrola USA, Inc. which in turn is a subsidiary of Iberdrola, S.A. Iberdrola is Spain's largest energy company and one of the largest

utility companies in the world. Iberdrola operates in more than 40 countries, employs more than 33,000 people worldwide, and has a stock market capitalization in excess of $45 billion. CMP is a financially strong company with total assets in excess of $2 billion, credit ratings of BBB+ / Baa1 (from Standard & Poor's and Moody's, respectively), strong banking relationships, and access to the investment grade debt capital markets. CMP has short-term revolving credit availability of $200 million through a bank facility ($100 million) and under an agreement with Iberdrola USA ($100 million). CMP has the regulatory authority to have outstanding, at any time, up to $500 million of unsecured, medium-term notes (MTNs), of which there were $293 million outstanding at 9/30/09, and has provisional authority to issue up to $1 billion of first mortgage bonds (FMBs, rated A/A2 by Standard & Poor's and Moody's, respectively), of which there were $150 million outstanding at 9/30/09.

CMP has significant experience in the design, construction, and operation of electric infrastructure projects, and will utilize staff capabilities for this effort. To support the proposed development, CMP has appointed a team of highly qualified and experienced consultants and contractors to supplement CMP's internal staff on the Lewiston Loop project, of which the proposed Middle Street Substation is part. CMP's delivery system includes 2,288 miles of overhead transmission lines and 23,463 pole-miles of distribution line. Facilities also include over 200 substations above 10 million Volt-Amperes capacity for routing energy and regulating voltage.

(s) Buffering

Vegetation will be left on the substation site except for the areas to be developed for the substation yard, access road, and the associated transmission line corridors extending into and out of the substation. A natural vegetative buffer will be retained between the substation site and the adjacent Androscoggin River to the west. A landscape plan for the substation site has been included as Exhibit 6, meeting a condition of approval as required by the Conditional Use permit obtained in March 2011. Additional plantings to address vegetation removal along the River are included in that plan.

(t) Compliance with district regulations

Consistency with the district regulations of Article XI is detailed above on pages 5 through 7.

(u) Design consistent with performance standards

How the project complies with performance standards of Article XII is detailed above on pages 11 through 16.

SEC. 5. Coordination with state subdivision law

Not applicable.

SEC. 6. Design guidelines

CMP will consider site plan review and design guidelines suggested by municipal officials for this project.

SEC. 7. Additional standards for single-family cluster developments

Not applicable.

Sec. 8. Additional standards for multi-unit residential development

Not applicable.

SEC. 9. Additional standards for mobile home parks

Not applicable.

SEC. 10. Additional standards for private commercial or industrial subdivisions

Not applicable.

SEC. 11. Expiration of approval

Construction of the substation is scheduled to begin in March of 2016, well within the two-year start of construction deadline.

SEC. 12. Performance guarantee

Many of the improvements requiring the filing of a performance guarantee (streets/public ways, public water/sewage systems, traffic improvements) are not applicable to this project. The project has been approved by the Independent System Operator New England (ISO-NE) and the Maine Public Utilities Commission (MPUC). This in part ensures the financing for the completion, in compliance with all applicable standards, of the project through their respective rate recovery approvals. Therefore, a performance guarantee is not needed.

SEC. 13. Independent professional review

At the discretion of the planning board, if deemed necessary.

SEC. 14. Additional standards for large-scale retail development

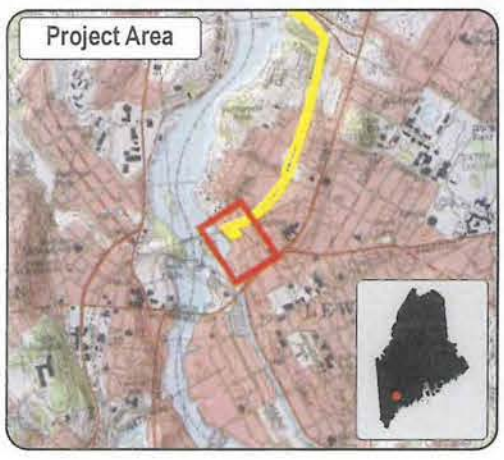
Not applicable.

SEC. 15. Post-construction stormwater management standards

CMP will address this standard by providing to the City a Performance Guarantee for all post construction stormwater facilities resulting from the project as provided in Option 1 under subsection (e)(3)(a). A Letter of Intent has been included as part of this Application.

EXHIBIT 1
Project Location

Spring St
3
4
Proposed Sect. 255 (115kV)
206-2
City of Lewiston
2
1
Middle St
206-202
Central Maine Power
Middle Street S/S
Existing Sec. 148 (34.5)
Proposed Section 256
Lowell St
Chapel St
Chapel Street Aly
Bates St
0
100
Feet



Legend

- Lewiston Loop Project Limits
- Substation Property Boundary
- Approximate Substation Boundary
- Proposed Clearing and Trimming Areas
- City of Lewiston Parcel Boundaries
- Approximate Location of Access Right of Way
- Proposed Section 255
- Proposed Section 256
- Proposed Sec. 255 Structure

Central Maine Power Co.

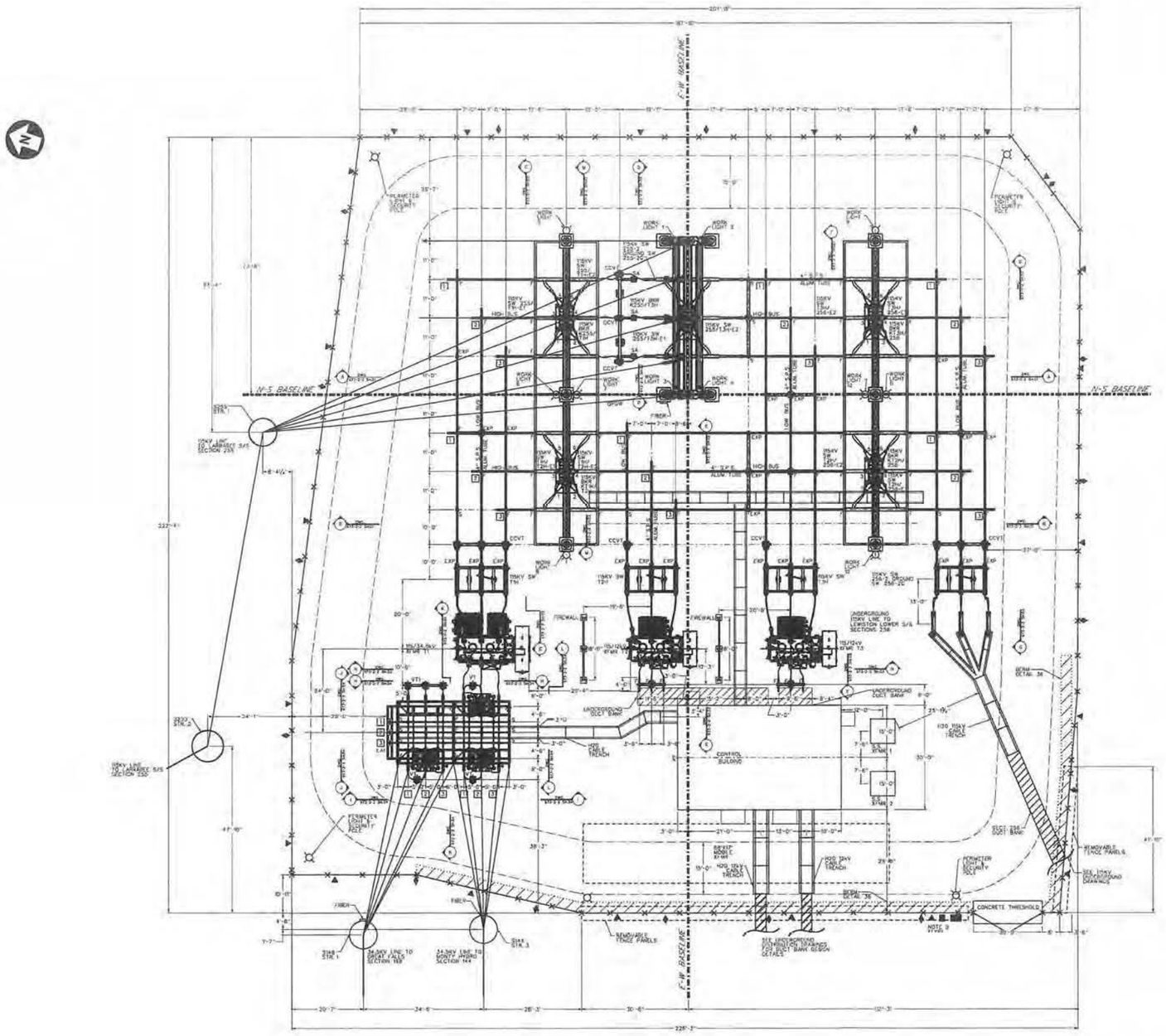
Lewiston Loop
Middle Street Substation

Exhibit 1:
Project Limits

Prepared by: TRC Date: 9/22/2015

Data Sources: Maine Office of GIS (MEGIS), United States Geological Survey (USGS) 24k, Central Maine Power Company (CMP), Powers Engineers, Inc. (PEI), TRC Companies, Inc. (TRC). Projection: NAD83, StatePlane Maine West FIPS 1802 Feet

EXHIBIT 2
Site Plan



NOTES:

1. CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORKSITE, INCLUDING CONTRACTOR'S/INSTALLER'S PERSONNEL (OR THAT OF ITS SUBCONTRACTORS!) PERFORMING THE WORK.
2. F = FIXED, S = SLIP, EXP = EXPANSION.
3. ALL CABLE TRENCH SHALL BE RATED FOR H20 LOADING.
4. FIELD TO INSTALL PRE-STRAIGHTENED 795 AAC DAMPENING CABLE WITHIN ALL 115KV BUS SPANS.
5. FENCE SIGNAGE:
   - ▼ A STANDARD "DANGER HIGH VOLTAGE" SIGN (STOCK #60008256201) SHALL BE PLACED AT EACH SUBSTATION GATE PANEL, AS WELL AS WITHIN 10 FEET FROM EACH SIDE OF EACH FENCE CORNER AND AT NO MORE THAN 50 FEET APART ALONG THE FENCE LINE. TO BE PROVIDED BY CMP AND INSTALLED BY CONTRACTOR.
   - ■ A STANDARD "CAUTION ENERGIZED LINE OVER-HEAD" SIGN (STOCK #60008256151) SHALL BE PLACED AT EACH SUBSTATION GATE PANEL. TO BE PROVIDED BY CMP AND INSTALLED BY CONTRACTOR.
   - ■ A STANDARD "SUBSTATION INFORMATION" SIGN SHALL BE PLACED AT EACH GATE PANEL AND SHALL CONTAIN THE COMPANY'S NAME, SUBSTATION NAME, AND EMERGENCY CONTACT INFORMATION. TO BE PROVIDED BY CMP AND INSTALLED BY CONTRACTOR.
   - ⌑ PERIMETER LIGHTING
   - ♦ A STANDARD "THIS FACILITY IS PROTECTED BY SECURITY ALARMS AND VIDEO EQUIPMENT" SIGN SHALL BE PLACED AT EACH SUBSTATION GATE PANEL AS WELL AS WITHIN 35' FROM EACH SIDE OF EACH FENCE CORNER AND AT NO MORE THAN 100 FEET APART ALONG THE FENCE LINE (CENTERED BETWEEN DANGER HIGH VOLTAGE SIGNS) TO BE PROVIDED BY CMP AND INSTALLED BY CONTRACTOR.

0 5 10 15 30
SCALE (FT)

PRELIMINARY
IFB- ISSUE FOR BID
NOT FOR CONSTRUCTION

Ulteig
Bismarck - Denver - Detroit Lakes - Fargo - Sioux Falls - St. Paul
4285 Lexington Avenue N
St. Paul, MN 55126
Phone: 651.415.3800 Fax: 651.415.2001
Web: www.ulteig.com
Ulteig Project Number: 13.02179

PE Stamp
STATE OF MAINE Thomas Severance 13847 PROFESSIONAL ENGINEER
Signature: Thomas Severance
Date: 2015.07.15 20:49:37-05'00'

IUSA ENGINEERING
CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION
Property of Iberdrola, USA

CMP IBERDROLA - USA

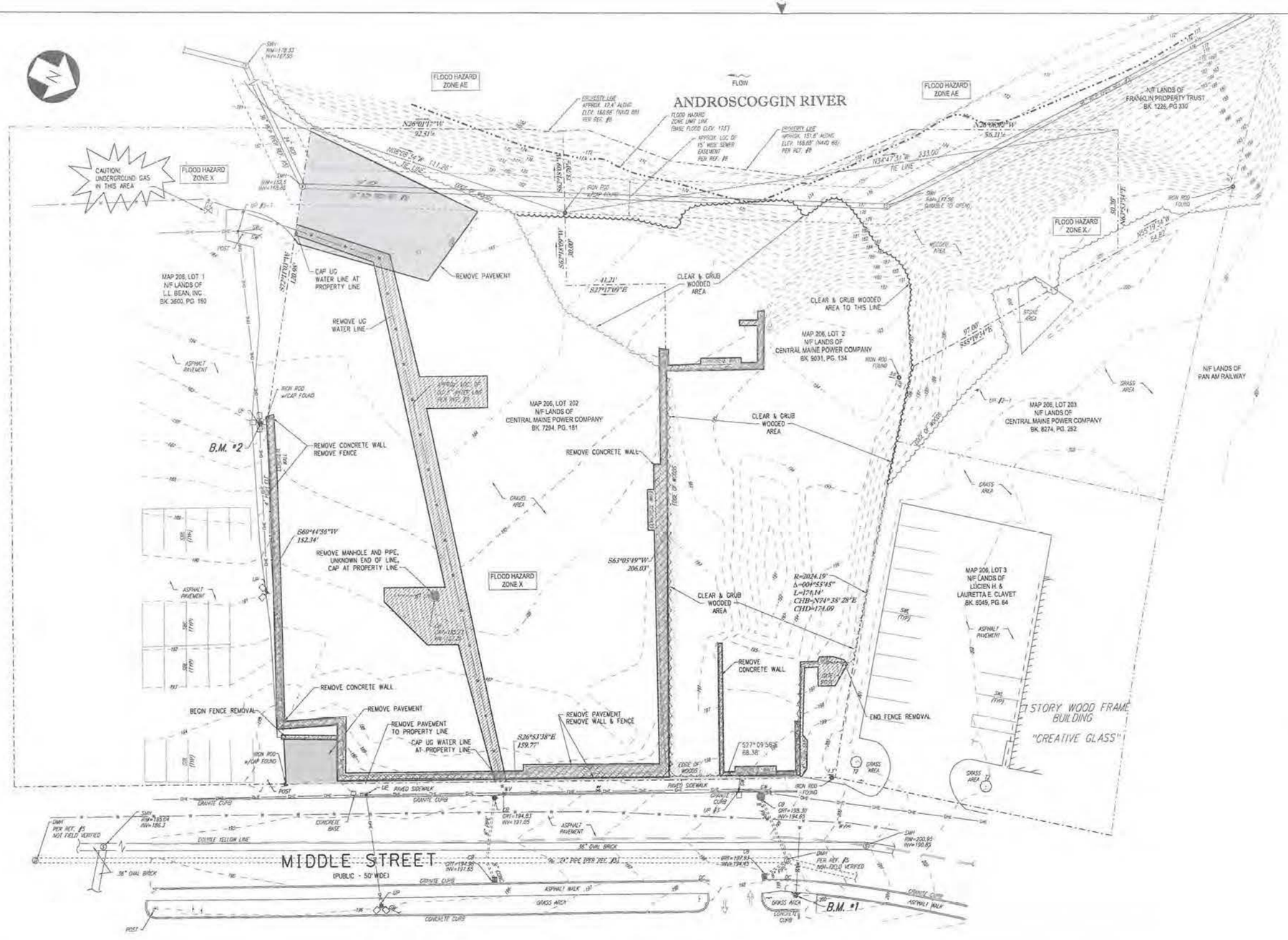
REV.	DATE	BY	DESCRIPTION	APP.
J	7/16/2015	UE/TJS	ISSUE FOR BID	UE/TJS
I	6/5/2015	UE/TJS	IFR 95% REVIEW - REVISE & RESUBMIT	UE/TJS
H	5/12/2015	UE/TJS	IFR 95%	UE/TJS
G	4/1/2015	UE/TJS	IFR 60%	UE/TJS
F	3/13/2015	UE/TJS	IFR 30%	UE/TJS

GENERAL ARRANGEMENT
115/34KV & 115/12KV

MIDDLE STREET SUBSTATION LEWISTON, ME

DR.	UE/VML	SCALE: 1/16"=1'-0"	FILE: 973-02-01.dwg
CK.	UE/ECS	NO. 973-02-01 SH. 01	REV. J
APP.	UE/TJS		
DATE			

ARCH D CADD Drawing, DO NOT REVISE MANUALLY



BENCHMARKS

B.M. #1
CROSS CUT ON HYDRANT
EAST SIDE OF MIDDLE ST.
EL. 201.37

B.M. #2
CROSS CUT ON LIGHT POLE
SOUTH SIDE OF SUBSTATION, NEAR WEST END OF WALL
EL. 186.13

LEGEND

- FLOOD HAZARD ZONE LIMIT LINE
- PROPERTY LINE
- PAVEMENT EDGE
- CURB & GUTTER
- EXISTING CONTOUR
- EXISTING SPOT ELEVATION
- EXISTING TOP OF CURB ELEVATION
- EXISTING GUTTER ELEVATION
- EXISTING TOP OF WALL ELEVATION
- EXISTING BOTTOM OF WALL ELEVATION
- EXISTING FINISHED FLOOR ELEVATION
- HYDRANT
- WATER VALVE
- GAS VALVE
- ELECTRIC METER
- OVERHEAD WIRES
- APPROX. LOC. UNDERGROUND WATER LINE
- UTILITY POLE
- GUY WIRE
- AREA LIGHT
- SIGN
- PAINTED ARROWS
- CHAIN LINK FENCE
- EDGE OF PAVEMENT
- TYPICAL
- SANITARY/SEWER MANHOLE
- UNKNOWN MANHOLE
- STORM DRAIN MANHOLE
- CATCH BASIN OR INLET
- DECIDUOUS TREE & TRUNK SIZE
- TREE/WOODS LINE
- SOLID WHITE LINE
- SOLID BLUE LINE
- DOUBLE YELLOW LINE
- INVERT ELEVATION
- GRATE ELEVATION
- SURVEY DIMENSION
- VERTICAL CONTROL BENCHMARK

UTILITIES:

THE FOLLOWING COMPANIES WERE NOTIFIED BY MAINE ONE-CALL SYSTEM (1-888-344-7233) AND REQUESTED TO MARK OUT UNDERGROUND FACILITIES AFFECTING AND SERVICING THIS SITE. THE UNDERGROUND UTILITY INFORMATION SHOWN HEREON IS BASED UPON THE UTILITY COMPANIES RESPONSE TO THIS REQUEST SERIAL NUMBER(S):

UTILITY COMPANY	PHONE NUMBER
TIME WARNER CABLE - LEWISTON	800-892-2253
LEWISTON DPW	207-784-5753
FAIRPOINT	866-984-4001
UNITIL - NORTHERN UTILITIES - ME - GAS	866-933-3921
CENTRAL MAINE POWER COMPANY	800-565-3181
OXFORD TELEPHONE COMPANY	800-342-7878
ON TARGET LOCATING	800-588-0828

STOP - CALL BEFORE YOU DIG!

THE STATE OF MAINE REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

Ulteig
4285 Lexington Avenue N
St. Paul, MN 55126
Phone: 651.415.3800 Fax: 651.415.2001
Web: www.ulteig.com
Ulteig Project Number: 13.02179

This document and any attachments are considered:
BUSINESS CONFIDENTIAL
PROTECTED CRITICAL INFRASTRUCTURE INFORMATION

PE Stamp

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CMP IBERDROLA - USA

REV.	DATE	BY	DESCRIPTION	APP.
D	06/05/15	UEI/AMG	IFR 95% REVIEW-REVISE AND RESUBMIT	UEI/MEV
C	05/13/15	UEI/AMG	IFR ISSUE FOR REVIEW 95%	UEI/MEV
B	04/01/15	UEI/AMG	IFR ISSUE FOR REVIEW 60%	UEI/MEV
A	02/13/15	UEI/AMG	IFR ISSUE FOR REVIEW 30%	UEI/MEV

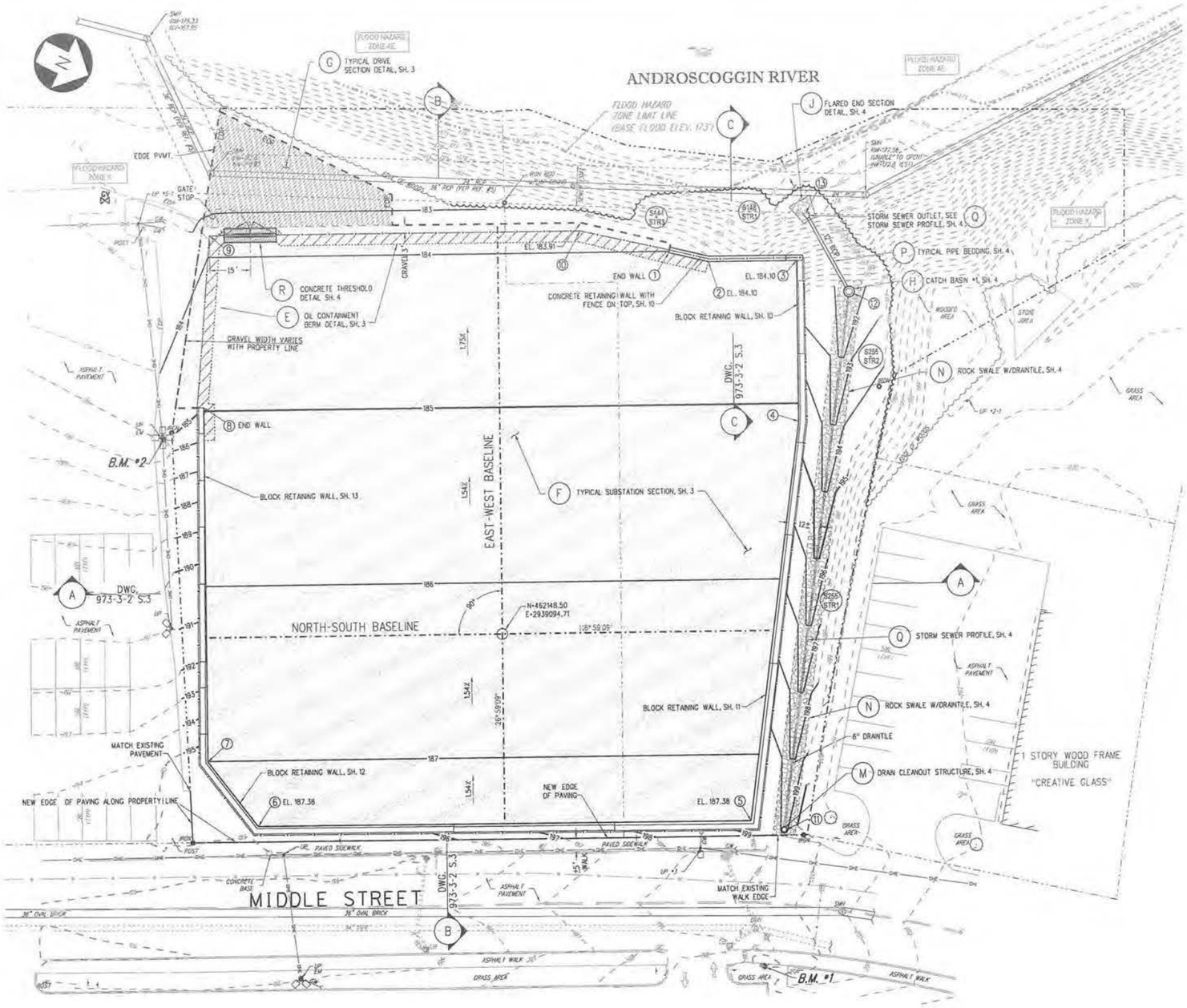
PRELIMINARY
ISSUE FOR REVIEW
NOT FOR CONSTRUCTION

EXISTING CONDITIONS AND REMOVALS

MIDDLE STREET SUBSTATION LEWISTON, ME

DR.	UEI/AMG	SCALE: 1"=20'	FILE: 973-03-02 S01
CK.	UEI/MEV	NO.	REV.
APP.	UEI/XXX	973-03-02 SH. 01	D
DATE:	5/XXX/2015		

ARCHLD - CADD Drawing, DO NOT REVISE MANUALLY



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EAST SIDE OF MIDDLE ST.
EL. 201.37

B.M. #2
CROSS CUT ON LIGHT POLE
SOUTH SIDE OF SUBSTATION, NEAR WEST END OF WALL
EL. 186.13

COORDINATES AT INSIDE OF WALL

PT	NORTH	EAST
1	462141.41	2938940.87
2	462155.89	2938937.41
3	462185.46	2938922.37
4	462212.43	2938975.32
5	462261.90	2939116.16
6	462098.73	2939198.92
7	462071.54	2939185.67
8	462011.26	2939067.29

COORDINATES AT FENCE CORNERS

PT	NORTH	EAST
9	461985.65	2939010.71
10	462108.30	2938948.25

COORDINATES OF STORM STRUCTURES

PT	NORTH	EAST
11	462274.57	2939113.56
12	462207.99	2938924.03
13	462180.81	2938905.20

LEGEND

- VERTICAL CONTROL BENCHMARK
- FLOOD HAZARD ZONE LIMIT LINE
- PROPERTY LINE
- ADJOINING PROPERTY LINE
- EXISTING CURB & GUTTER
- EXISTING CONTOUR
- PROPOSED CONTOUR
- HYDRANT
- WATER VALVE
- GAS VALVE
- ELECTRIC METER
- OVERHEAD WIRES
- WATER LINE
- UTILITY POLE
- GUY WIRE
- AREA LIGHT
- SIGN
- EDGE OF PAVEMENT
- SANITARY MANHOLE & LINE
- STORM MANHOLE & LINE
- CATCH BASIN OR INLET
- DECIDUOUS TREE
- TREE/WOODS LINE
- PROPOSED RETAINING WALL
- PROPOSED FENCE
- PROPOSED EDGE OF GRAVEL PAD
- SUBSTATION BASELINE CONTROL
- PROPOSED TRANSMISSION TOWER, BY OTHERS

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

UTILITIES:

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St. Paul, MN 55126
Phone: 651.415.3800 Fax: 651.415.2001
Web: www.ulteig.com
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C	05/12/15	UEI/AMG	IFR ISSUE FOR REVIEW 95%	UEI/MEV
B	04/01/15	UEI/AMG	IFR ISSUE FOR REVIEW 60%	UEI/MEV
A	02/13/15	UEI/AMG	IFR ISSUE FOR REVIEW 30%	UEI/MEV

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GRADING PLAN

MIDDLE STREET SUBSTATION LEWISTON, ME

DR. UEI/AMG	SCALE: 1"=20'	FILE: 973-03-02 S02	
CK. UEI/MEV	NO.	973-03-02 SH. 02	REV. D
APP. UEI/XXX			
DATE 00/00/2015			

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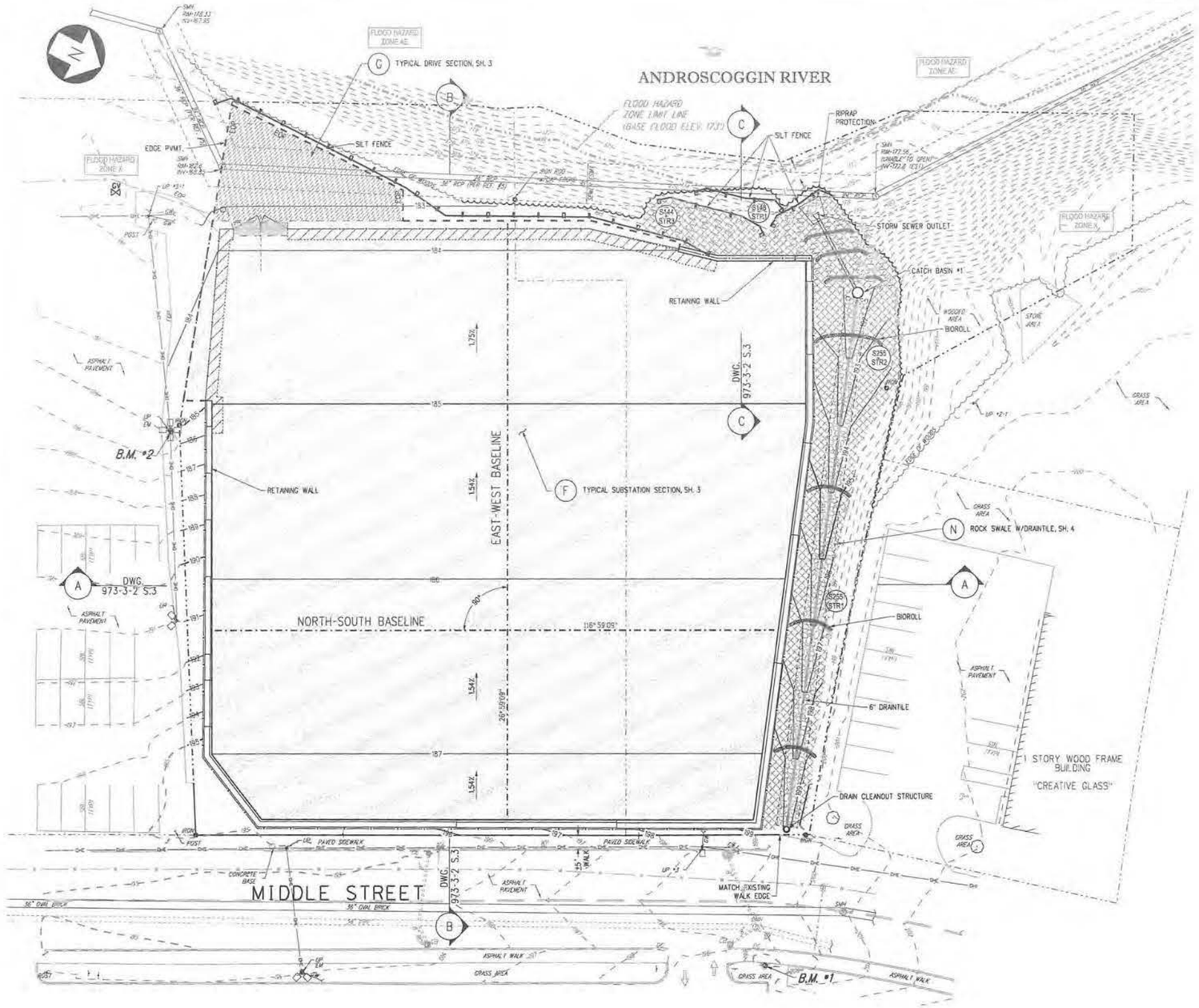

NOTE

SEE LANDSCAPE PLAN (SH. 8) FOR FINAL STABILIZATION.

BENCHMARKS

B.M. #1
CROSS CUT ON HYDRANT
EAST SIDE OF MIDDLE ST.
EL. 201.37

B.M. #2
CROSS CUT ON LIGHT POLE
SOUTH SIDE OF SUBSTATION, NEAR WEST END OF WALL
EL. 186.13

LEGEND

- VERTICAL CONTROL BENCHMARK
- FLOOD HAZARD ZONE LIMIT LINE
- PROPERTY LINE
- ADJOINING PROPERTY LINE
- EXISTING CURB & GUTTER
- EXISTING CONTOUR
- PROPOSED CONTOUR
- HYDRANT
- WATER VALVE
- GAS VALVE
- ELECTRIC METER
- OVERHEAD WIRES
- WATER LINE
- UTILITY POLE
- GUY WIRE
- AREA LIGHT
- SIGN
- EDGE OF PAVEMENT
- SANITARY MANHOLE & LINE
- STORM MANHOLE & LINE
- CATCH BASIN OR INLET
- DECIDUOUS TREE
- TREE/WOODS LINE
- PROPOSED RETAINING WALL
- PROPOSED FENCE
- PROPOSED EDGE OF GRAVEL PAD
- SUBSTATION BASELINE CONTROL
- PROPOSED TRANSMISSION TOWER
- BIOROLLS
- SILT FENCE
- EROSION CONTROL BLANKET
- ROCK SWALE

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

UTILITIES:

THE FOLLOWING COMPANIES WERE NOTIFIED BY MAINE ONE-CALL SYSTEM (1-888-344-7233) AND REQUESTED TO MARK OUT UNDERGROUND FACILITIES AFFECTING AND SERVICING THIS SITE. THE UNDERGROUND UTILITY INFORMATION SHOWN HEREON IS BASED UPON THE UTILITY COMPANIES RESPONSE TO THIS REQUEST.
SERIAL NUMBER(S):

UTILITY COMPANY	PHONE NUMBER
TIME WARNER CABLE - LEWISTON	800-892-2253
LEWISTON DPW	207-784-5763
FAIRPOINT	866-984-4001
UNITIL - NORTHERN UTILITIES - ME - GAS	866-933-3821
CENTRAL MAINE POWER COMPANY	800-565-3181
OXFORD TELEPHONE COMPANY	800-342-7679
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A	05/12/15	UEI/AMG	IFR ISSUE FOR REVIEW 95%	UEI/MSV

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EROSION CONTROL PLAN

MIDDLE STREET SUBSTATION LEWISTON, ME

DR.	UEI/AMG	SCALE: 1"=20'	FILE: 973-03-02 S06.dgn
CK.	UEI/MSV	NO.	REV.
APP.	UEI/XXX	973-03-02 SH. 06	B
DATE	03/30/2015		

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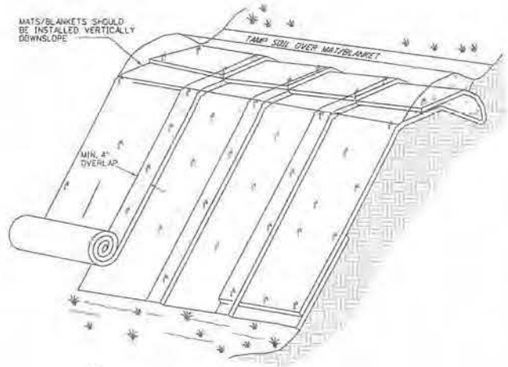
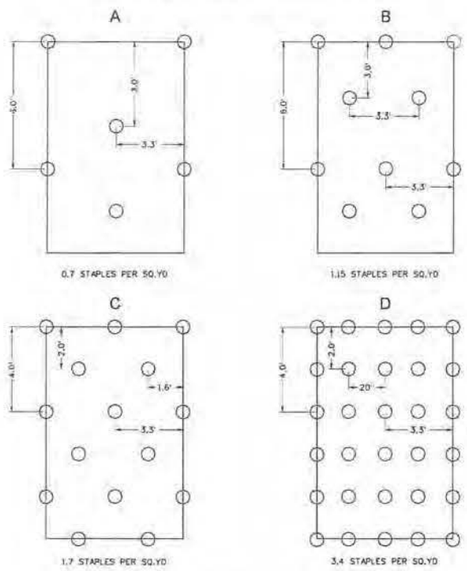


TERMINAL SLOPE AND CHANNEL

STANDARD MATTING OVERLAP

EROSION CONTROL BLANKET INSTALLATION



STAPLE PATTERN GUIDE FOR 6.67' WIDE ROLLS (STANDARD)*

SCALE: NONE

* IF OTHER WIDTH OF ROLLS IS USED CONSULT ENGINEER OF MANUFACTURER FOR STAPLE PATTERN GUIDE.

EROSION CONTROL BLANKET INSTALLATION NOTES

1. PREPARE SOIL (GRADE AND SMOOTH SLOPES) BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP'S), INCLUDING ANY APPLICATION OF LIME, FERTILIZER AND SEED.

2. BEGIN AT TOP OF THE SLOPE BY ANCHORING THE RECP'S IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF RECP'S EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP'S WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF RECP'S BACK OVER SEED AND COMPACTED SOIL. SECURE RECP'S OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WITH OF THE RECP'S.

3. ROLL THE RECP'S DOWN THE SLOPE. RECP'S WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP'S MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN.

4. THE EDGES OF PARALLEL RECP'S MUST BE STAPLED WITH APPROXIMATELY 4"-6" OVERLAP.

5. CONSECUTIVE RECP'S SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH APPROPRIATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE RECP'S WITH.

NOTE: IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

MAINTENANCE

1. INSPECT ALL MULCHES AND EROSION CONTROL FABRICS PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH OR REPAIR FABRIC.

2. CONTINUE INSPECTIONS UNTIL VEGETATION IS ESTABLISHED.

3. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED AND REINSTALL MULCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FIRMLY ESTABLISHED.

EROSION CONTROL BLANKET TYPES

CATEGORY	SERVICE APPLICATION	USE	ACCEPTABLE TYPES
1	VERY TEMPORARY	FLAT AREAS, SHOULDER DRAIN OUTLETS ROADWAY SHOULDERS, LAWNS, MOWED AREAS	STRAW, WOOD FIBER, RAPIDLY DEGRADABLE NETTING ON ONE SIDE
2	ONE SEASON	SLOPES 1:3 AND STEEPER LESS THAN 50 FT LONG, DITCHES WITH GRADIENTS 2X OR LESS, FLOW VELOCITIES LESS THAN 5.0 FPS.	STRAW, WOOD FIBER, NETTING ON ONE SIDE
3	ONE SEASON	SLOPES 1 VERTICAL:3 HORIZONTAL AND STEEPER, MORE THAN 50 FT. LONG, DITCHES WITH GRADIENTS 3X OR LESS, FLOW VELOCITIES LESS THAN 6.5 FPS.	STRAW, WOOD FIBER, NETTING ON TWO SIDES
4	SEMIPERMANENT	DITCHES WITH GRADIENTS 4X OR LESS, FLOW VELOCITIES LESS THAN 8.0 FPS. FLOW DEPTH 6 INCHES OR LESS.	STRAW/COCONUT, WOOD FIBER. NETTING ON TWO SIDES
5	SEMIPERMANENT	DITCHES WITH GRADIENTS 8X OR LESS, FLOW VELOCITIES LESS THAN 15.0 FPS AND FLOW DEPTH LESS THAN 8 INCHES, WATERCOURSE BANKS WITHIN THE NORMAL FLOW ELEVATION	COCONUT FIBER, NETTING ON TWO SIDES

STAPLE PATTERN TYPE	USE
A	4:1 SLOPES
B	3:1 SLOPES
C	2:1 & STEEPER SLOPES
D	MEDIUM/HIGH FLOW CHANNEL

EROSION CONTROL NOTES

1. USE ALL AVAILABLE MEANS TO MINIMIZE THE AMOUNT OF SOIL EROSION CAUSED BY THE WORK OF THE PROJECT. THIS INCLUDES RESPONSIBILITY FOR MAINTENANCE OF ALL SOIL EROSION CONTROL DEVICES INDICATED.

2. PROVIDE AND MAINTAIN EROSION CONTROL DEVICES WHERE SHOWN ON PLANS. EROSION CONTROL TO CONSIST OF RIPRAP, STONE TRACKING PAD, COMPOST TUBE FILTERS & SILT FENCE. THE DEVICES ARE TO REMAIN IN PLACE UNTIL PAVEMENT AND INTAKES ARE CONSTRUCTED AND UNTIL A PERMANENT GROUND COVER IS ESTABLISHED.

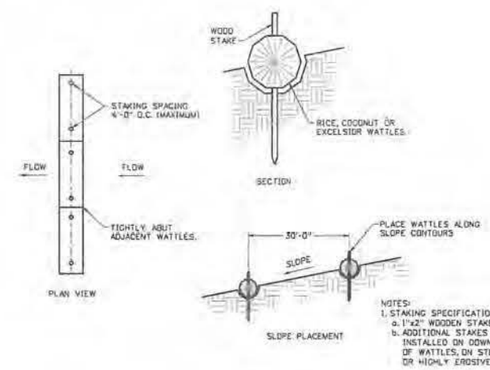
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTROL EROSION ON THE SITE AT ALL TIMES. THE CONTROL MEASURES SHOWN ON THE PLAN ARE MINIMUM. THE CONTRACTOR SHALL PROVIDE ADDITIONAL EROSION CONTROL MEASURES AS NECESSARY TO FULFILL THIS REQUIREMENT.

4. ALL EXPOSED SOIL AREAS MUST BE STABILIZED AS SOON AS POSSIBLE TO LIMIT SOIL EROSION, BUT IN NO CASE LATER THAN 14 DAYS AFTER CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS CEASED.

5. THE CONTRACTOR SHALL USE CONTROL MEASURES AS REQUIRED TO KEEP SOIL FROM LEAVING THE SITE.

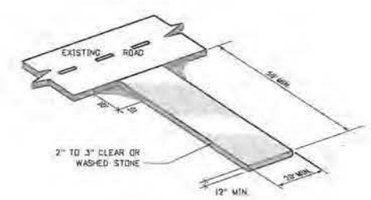
6. CONCRETE WASHOUT SHALL COMPLY WITH IOWA WATER POLLUTION CONTROL ASSOCIATION REQUIREMENTS.

7. ANY WASTE MATERIALS FROM THE SITE ARE TO BE PROPERLY DISPOSED OF.



BIOROLL

SCALE: NONE



STONE TRACKING PAD

SCALE: NONE

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DR.	UEI/AMG	DATE	00/00/2015
CK.	UEI/MEV		
APP.	UEI/XXX		

EROSION CONTROL DETAILS

MIDDLE STREET SUBSTATION LEWISTON, ME

SCALE: AS SHOWN | FILE: 973-03-02 507.dgn

NO: 973-03-02 SH. 07 REV. B

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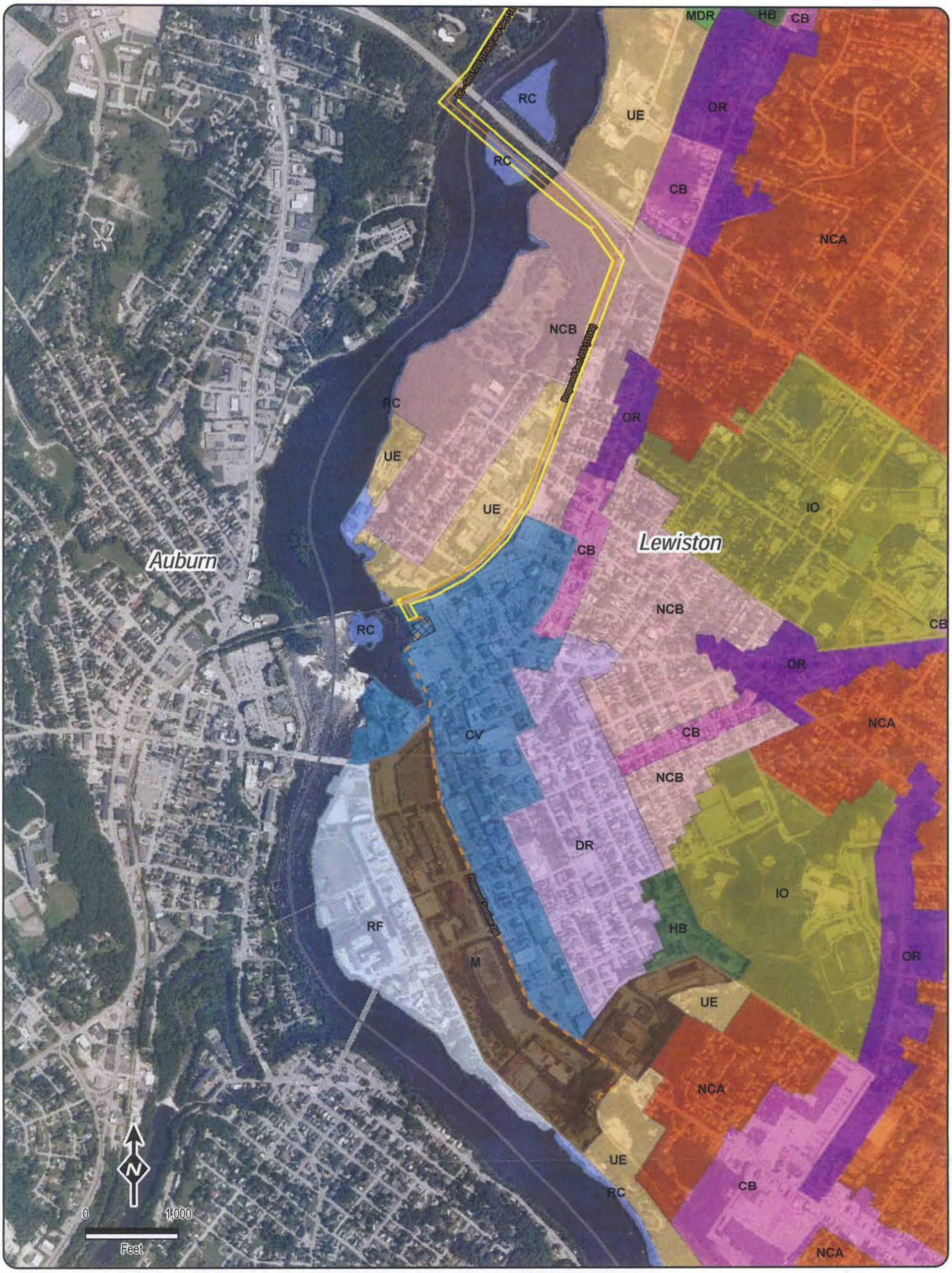
EXHIBIT 3
City of Lewiston Zoning Map



LEGEND

- Lewiston Loop Project Limits
- Proposed Section 255
- Proposed Section 256
- Town Boundary

ZONE NAME

- Centreville (CV)
- Community Business (CB)
- Downtown Residential (DR)
- Highway Business (HB)
- Industrial (I)
- Institutional Office (IO)
- Low Density Residential (LDR)
- Medium Density Residential (MDR)
- Mill (M)
- Neighborhood Conservation "A" (NCA)
- Neighborhood Conservation "B" (NCB)
- Office Residential (OR)
- Office Service (OS)
- Resource Conservation (RC)
- Riverfront (RF)
- Rural Agricultural (R)
- Suburban Residential (SR)
- Urban Enterprise (UE)

Central Maine Power Co.

Lewiston Loop

Exhibit 5:
Project Area Zoning

Map: 2 of 2

Prepared by: TRC Map Created: 11/23/2010

Data Sources: Maine Office of GIS (MEGIS), United States Geological Survey (USGS) 24k, Central Maine Power Company (CMP), Powers Engineers, Inc. (PEI), TRC Companies, Inc. (TRC). Projection: NAD83, StatePlane Maine West FIPS 1802 Feet

EXHIBIT 4
Control House Plan and Design Specifications

CENTRAL MAINE POWER
Maine Power Reliability Program

Control House – Middle Street Substation
Lewiston Loop Project
(as of 10-14-15)

The power house building includes one (1) structure with overall dimensions of 47'-0" x 30'-0", comprised of one (1) control room and two (2) switchgear rooms. The building will house relay panels, control equipment, and other electronic components and equipment necessary for proper operation of an electric substation.

The building shell will be constructed of the following components: cast-in-place concrete foundation, pre-cast concrete ceiling panels, pre-cast concrete exterior wall panels, pre-engineered roof system with gutters, raised panel flooring in the control room, and concrete floor in the switchgear rooms with full basement.

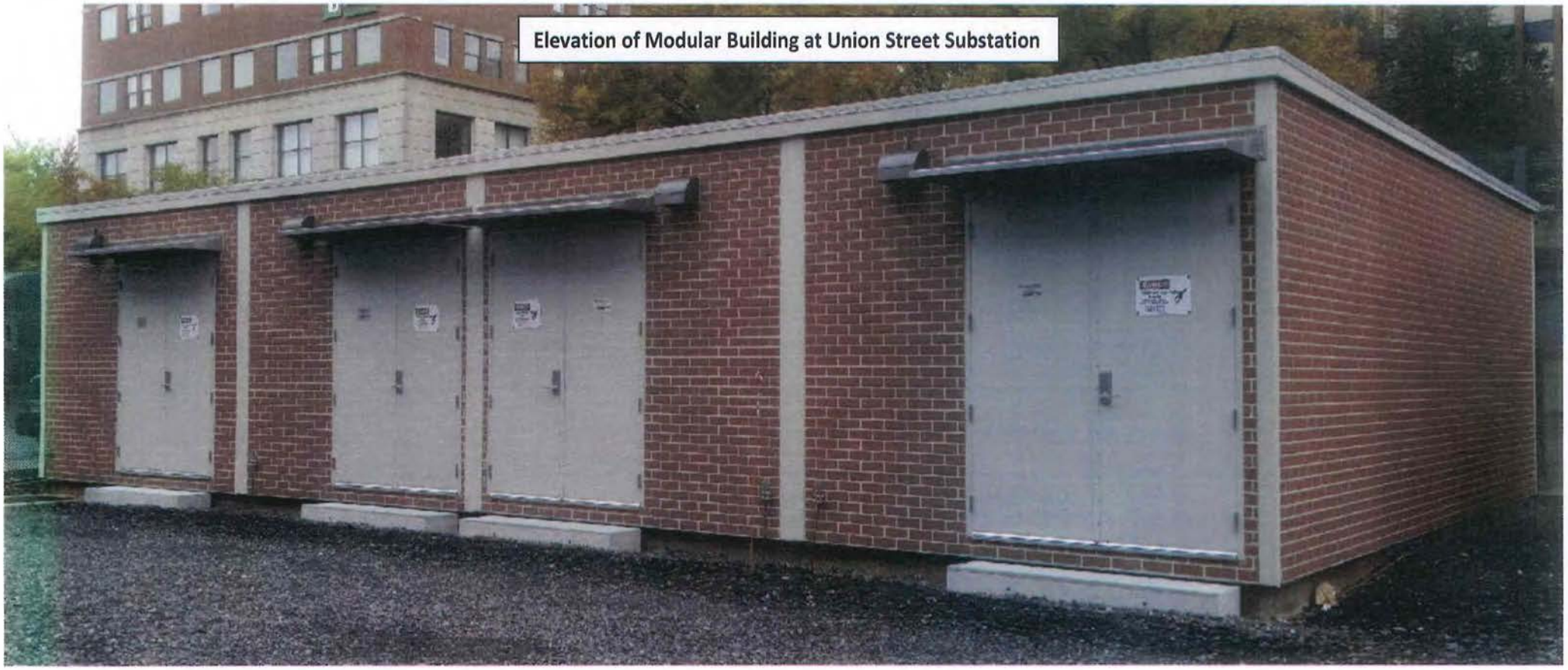
The control room and switchgear rooms are separated by pre-cast concrete interior firewalls. In addition, the interior free height of the control room and the switchgear rooms is 12'-6".

The building is designed to meet all current Federal, State, and Local building codes, including seismic requirements.

Please see attached photo of the Union Street (Portland) power house building, which is similar in size and scale to the proposed Middle Street power house; and a photo illustrating the finish proposed for that structure.

52 Farm View Drive, New Gloucester, ME 04260
Telephone 207.253.4001, Fax 207.253.4079
www.mainepower.com

IBERDROLA USA


Elevation of Modular Building at Union Street Substation

Exposed Aggregate Finish

EXHIBIT 5
Stormwater Management Plan

Submitted to:

CITY OF LEWISTON PLANNING DEPARTMENT

Submitted by:

Central Maine Power Company
83 Edison Drive
Augusta, ME 04336

CMP LEWISTON-LOOP PROJECT, MIDDLE STREET 115/34/12kV SUBSTATION IMPROVEMENT PROJECT STORMWATER MANAGEMENT REPORT

Prepared by:

TRC

Augusta, Maine

February 2011

PROJECT # 155636

Revised by:

Ulteig

September 2015

PROJECT# 13.02119

STATE OF MAINE
SRIRAM KALAGA
No. 9979
LICENSED
PROFESSIONAL ENGINEER
9/28/2015

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Post-Developed Model (HydroCAD Routings) Revision 1

MIDDLE STREET 115/34/12kV SUBSTATIONIMPROVEMENT PROJECT

CMP proposes to increase the capacity and reinforce their transmission system in the Lewiston/Auburn area to support the forecasted electrical load demand. This transmission line project will construct a new 115kV transmission line from the proposed Middle street substation (115/34/12 kV) in downtown Lewiston to the Gulf Island Substation on Switzerland Road in Lewiston. This project also includes a new 115kV underground transmission line. Section 256 from the proposed Middle Street substation to the Lewiston Lower Substation on Lisbon Street in Lewiston. The proposed Middle Street substation is to be built on two parcels located on Middle Street which is the focus of this study.

The purpose of this stormwater report is to describe and quantify the pre- and post-development stormwater characteristics and to demonstrate that the construction of the Middle Street 115/34/12kV Substation will comply with the applicable City of Lewiston and DEP stormwater management requirements in Chapter 500. Per meeting with the City of Lewiston the stormwater management system for this development will meet the Basic Standards, General Standards, and Flooding Standards and other applicable requirements of Chapter 500.

The site of the Middle Street 115/34/12kV Substation is located in the central urban area on parcels 206-202 and 206-2 in the City of Lewiston, Maine. The site is bounded by Middle Street to the east, the Androscoggin River to the West, a L.L. Bean parking lot which is adjacent to Lowell Street to the South, and Creative Glass Company parcel to the North. The two parcels, totaling 1.79 acres, can be described as a vacant gravel parking lot with some remnants of building foundations. This site was developed in the 1980's, and consisted of a former manufacturing building.

The general arrangement plan of the proposed substation is shown on Figure 2, and will consist primarily of new 115/34/12kV substation yard. Approximately 1.44 acres of CMP property will be disturbed as a result of the proposed construction. Following construction, approximately 0.25 acre of the disturbed area will be revegetated, stabilized with riprap or allowed to revert to scrub/brush. Approximately 1.19 acre will remain as new permanently developed area and will contain the substation yard. The substation yard is to be located in an area primarily covered by a gravel surface with a small area of scrub/ shrub and construction debris.

Figure 1 Location Map

Middle Street SS to Lewiston Lower SS

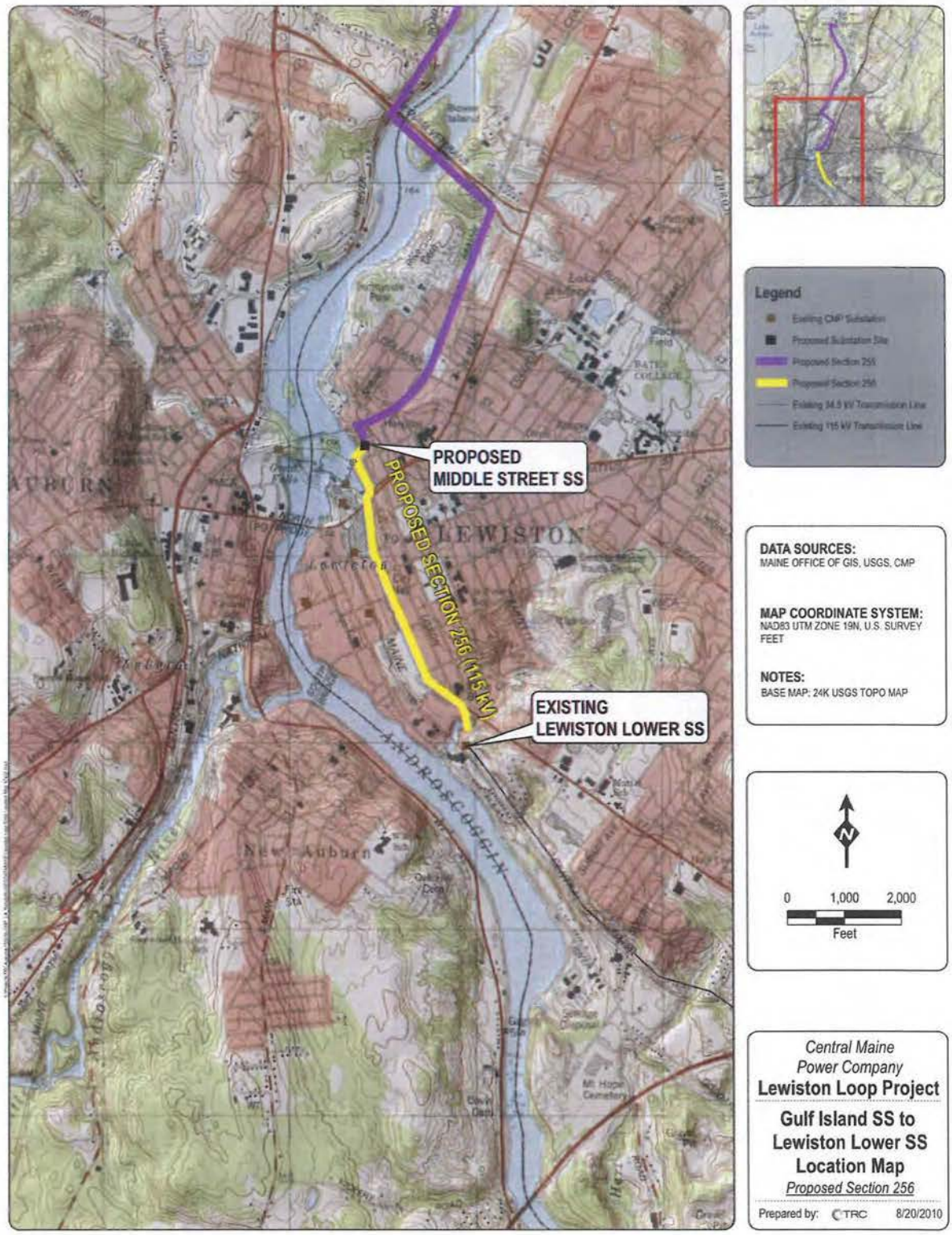
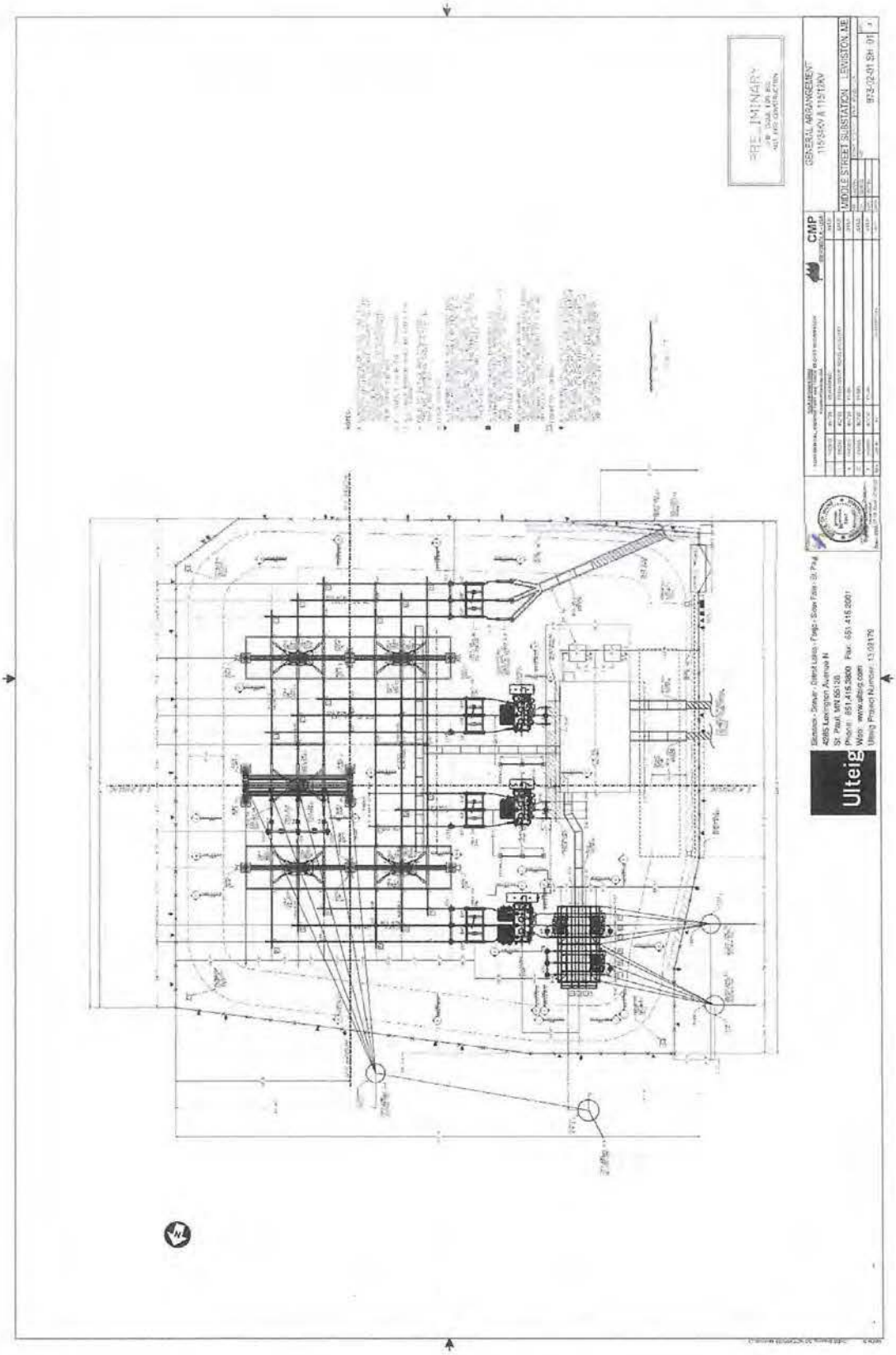

PROPOSED
MIDDLE STREET SS
PROPOSED SECTION 256 (115 kV)
EXISTING
LEWISTON LOWER SS
LEWISTON
AUBURN
New Auburn
ANDROSCOGGIN
Legend
Existing CMP Substation
Proposed Substation Site
Proposed Section 255
Proposed Section 256
Existing 34.5 kV Transmission Line
Existing 115 kV Transmission Line
DATA SOURCES:
MAINE OFFICE OF GIS, USGS, CMP
MAP COORDINATE SYSTEM:
NAD83 UTM ZONE 19N, U.S. SURVEY FEET
NOTES:
BASE MAP: 24K USGS TOPO MAP
N
0 1,000 2,000
Feet
Central Maine Power Company
Lewiston Loop Project
Gulf Island SS to Lewiston Lower SS Location Map
Proposed Section 256
Prepared by: TRC 8/20/2010

Figure 2 General Arrangement

General Arrangement 973-02-01 REV J


PRELIMINARY
GENERAL ARRANGEMENT
115/34.5KV & 115/13KV
CMP
MIDDLE STREET SUBSTATION - LEWISTON, ME
Ulteig

General Topography

The topography of the land surface within the Middle Street site for the most part has a gentle slope from east to west. Retaining walls rim the site on three sides, to the east, north and south. Just outside on the northern retaining wall, the site increases in elevation, rising up a moderately steep embankment to the property boundary. The site drains westerly to the Androscoggin River with additional contributing runoff from a parcel to the north.

Elevations within the drainage area range from approximately 199.0 to 169.5 feet above mean sea level. One foot contour information is based on a topographic survey conducted *by Control Point Associates in November 2014.*[Rev1] The additional contour data for the area surrounding the project site were obtained from the City of Lewiston GIS data.

Shore Land Zone

As indicated on the site plan, the site is located within the shore land zone. Per Appendix A Article 12 Section 2T, the project must meet shore land zoning criteria for the maximum impervious ratio within the General Development Area. The total property area is 1.79 acres, so

70 percent of the overall property area is 1.25 acres. The total impervious area for the Middle Street Substation Project cannot exceed 1.25 acres within the shore land zone. The proposed site plan, including the substation yard surface, will yield a total impervious area of *1.19 acres, or approximately 66 percent of the total site and less than the maximum allowable impervious area.*[Rev1]

Flood Zone

The majority of the Middle Street substation is not located within the 100-year flood zone, based on Q3 Flood Data derived from the Department of Housing and Urban Development Federal Insurance Administration (FIA) Flood Hazard Boundary Map for the for the City of Lewiston (Community-Panel Number 230004 0010 B, dated September 28, 1979). According to the 100– year flood zone line *the substation grading will not be within the flood zone.*[Rev1]

Alterations to Land Cover Within the Watershed

The Middle Street Substation watershed is expected to consist of approximately 0.78 acre of impervious areas (foundations, concrete pads, building structures and roadways). The crushed stone substation yard *will cover approximately 1.12 acre. Within the area disturbed by construction, approximately 0.05 acres will be*

stabilized with riprap, revegetated with grass or will be allowed to revert to scrub/brush resulting in a total of approximately 1.18 acres of vegetated area within in the watershed; an increase of approximately 0.02 acre.[Rev1] A summary of the property's pre-development and post-development cover types is presented in Table 12-1.

Table 12-1. Watershed Cover Types

Cover Type	Pre-development Area, acres	Post-development Area, acres	Net Change Area, acres
Fdn/Roof	0.07	0.09	0.02
Stone Yard (crush stone)	0.00	*1.03*[Rev1]	*1.03*[Rev1]
Woods	0.53	0.36	(-)0.17
Brush	0.56	0.75	0.19
Gravel	1.35	*0.6*[Rev1]	*(-)0.75*[Rev1]
Pavement	0.32	*0*[Rev1]	*(-)0.32*[Rev1]
Total Area	**2.83**	**2.83**	**0.00**

Modeling Assumptions

The Stormwater runoff was estimated using HydroCAD, Version 10.0. HydroCAD is based on methodologies developed by the U.S. Department of Agriculture Soil Conservation Service (SCS), namely TR-55 and TR-20, in combination with other hydraulic and hydrologic calculations. Based on site specific information and rainfall data, the program estimates inflow and outflow hydrographs for a watershed. The SCS is now called the Natural Resources Conservation Service (NRCS).

The Pre- and Post-development watershed boundaries and hydrologic flow lines used to determine the time of concentration are indicated on the Pre- and Post-Development Drainage Plans located in Appendix

1. Within the area proposed to be developed, the watershed boundaries were determined from the surveyed one-foot contours. Watershed boundaries outside areas proposed for development were determined from one-foot contours extrapolated from the USGS Middle Street topographic quadrangle map. The times of concentration were determined from the surveyed contour information.

The Pre-Development Stormwater model consists of one subwatershed (1S) totaling approximately 2.83 acres in size. Control point 1R is the boundary node to which the subwatershed drains and at which the pre-development analysis is taken. Control points are the down slope intersection of the Tc hydrologic flow line and the subwatershed boundary.

The Post-Development Stormwater model also consists of the same subwatershed (1S) totaling approximately 2.83 acres in size. The control point for the post-development analysis is 1R, and the results of the site outflow are shown in Table 12-2.

Storm events modeled for the Pre- and Post-development analyses assumed precipitation events with a 24-hour duration having a Type III distribution and rainfall amounts of 3.0, 4.6, and 5.4 inches, with return frequencies of 2-, 10-, and 25-years, respectively. The storm type and rainfall amounts are based on the SCS County Rainfall Data for the State of Maine, Androscoggin County and "24 Hour Storm Duration Rainfalls for Various Return Periods" from the DEP *Maine Stormwater Best Management Practices Manual Volume III.*

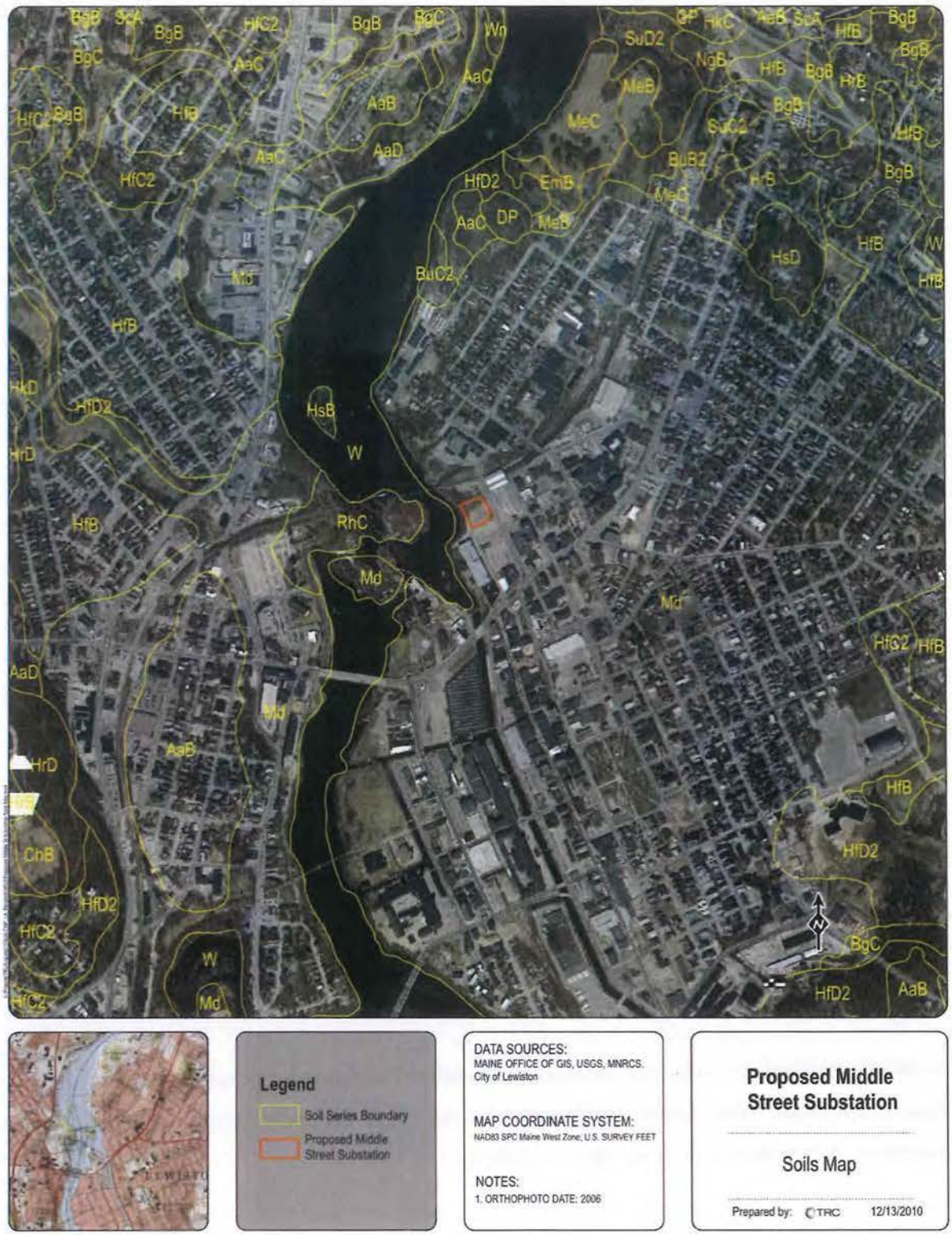
SCS Soils Map with Site Boundaries (Figure 3)

An excerpt from the SCS Soils Survey Map with the site boundaries shown is provided as Figure 3. The Androscoggin County USDA soil survey information dated January 2009 is used for the areas within the mapped watershed.

Drainage Plans

The Pre-Development Drainage Plan and the Post-Development Drainage Plan for the proposed project are provided in Appendix 1. Both plans include contours, cover types, subwatershed boundaries and control points, hydrologic flow lines, time of concentration flow lines, existing features, and drainage ways where applicable. The Post Development Drainage Plan includes the locations of proposed buildings, roads, other above ground structures and stormwater management features.

Figure 3 Soils Map



Runoff Analysis

The pre- and post-development stormwater analysis calculations are provided in Appendix 2. The analyses include computations for determining the curve numbers for the pre-development watersheds and the HydroCAD output, which includes time of concentration calculations, travel time calculations, peak discharge calculations for the 24-hour storms of the 2-, 10-, and 25-year frequencies, and routing calculations.

A summary of the pre- and post-development peak runoff at the control points is provided in Table 12-2.

Table 12-2. Summary of Pre- and Post-Development Peak Runoff

Storm Frequency	Peak Runoff Discharge Rates, cfs (Node 1R:Total Site)		
	Pre-Development	Post-no berm	*Post with berm**Rev1*
2-Year	3.96	1.8	*0*
10-Year	7.88	4.91	*0*
25-Year	9.91	6.68	*0*
6" event	11.4	8.07	*0.22*

***No surface water will leave the site for events less than 6".*

, The water collected inside the control building basement will be pumped through a redundant system to eliminate the possibility of any oil discharge .Rev1

The calculations show a minimal decrease from the total peak outflow from the post-developed site following a 25-year, 24-hour storm event. This can be attributed mostly to the to the curve number assigned to the substation yard surface. A description of Node 1R is as follows:

The calculations show a minimal decrease from the total peak outflow from the post-developed site following a 25-year, 24-hour storm event. This can be attributed mostly to the to the curve number assigned to the substation yard surface. A description of Node 1R is as follows:

Node 1R

Node 1R represents the western property line along the Androscoggin River and is the most downstream point of subwatershed 1S. Subwatershed 1S was modeled with the land cover present within the existing and proposed drainage area. The peak runoff rate from the post- development site is 27 percent less than that from the Pre-development site following a 25-year,
24-hour storm event. The net change is primarily a result of the lower weighted average curve number for the watershed area that is due to the overall reduction in impervious area and the addition of the gravel/crushed stone topping surface placed on the substation yard.

Curve Number Computations

A summary of the cover types, hydrologic soil groups ("HSG"), and curve numbers for the pre- and post-development watershed is provided in the stormwater calculation package in Appendix 2. Cover types for the affected area were determined from the topographic survey and site visits which are indicated on the Pre- and Post-Development Drainage Plans.

The soils and hydrologic soil groups within the study area are based on the medium intensity soil survey mapping obtained from the SCS *Soil Survey of Androscoggin County, Maine*. The soils and hydrologic soil groups within the watershed analysis areas are shown on the Pre- and Post- Development Drainage Plans.

The runoff curve numbers were developed from Appendix A-12: "Runoff Curve Numbers for use in TR-55 and TR-20" of the DEP *Maine Stormwater Best Management Practices Manual, Volume III* and HydroCAD, based on the observed cover types and hydrologic soil groups. The only curve number that is not referenced directly from the TR55 and TR20 was the one used for the substation yard. An engineering study was conducted by TRC detailing the "typical" cross section and surface materials of a substation yard covered with gravel and crushed stone to calculate its permeability rate. The study was reviewed by John Simon, a Maine NRCS engineer. The conclusions of this report were used as the basis of an agreement with CMP and Maine DEP that a CN value of 55 may be used for substations and switchyards that are mapped as HSG "A", "B", "C", and a CN value of 60 must be used when the area is mapped as HSG "D". A copy of the letter agreement is included at the back of the stormwater calculations (Appendix 2).

Time of Concentration Calculations

Time of concentration was calculated using NRCS TR-55 methodologies for the watershed considering the

hydrologic flow lengths, slope, vegetative cover, surface roughness, and each stage-storage relationship. The type and length of each hydrologic flow line for determining time of concentration and travel times in the area to be developed are indicated on the Pre- and Post-Development Drainage Plans. The maximum sheet flow length used for this analysis was 150 feet. Flow lengths beyond 150 feet were assumed to be either shallow concentrated flows o channel flows. Shallow concentrated flow lengths, if encountered, were extended until they reached a concentrated flow channel. A summary of the input data used to estimate the time of concentration is provided in the calculation package.

Travel Time Calculations

The travel time for each sub-watershed was calculated using a spreadsheet based on equations prepared by the NRCS. These times were then inputted directly into HydroCAD. The spreadsheet is included with the calculations in Appendix 2.

Peak Discharge Calculations

Peak discharge calculations are included in the HydroCAD output. A summary comparison of pre- and post-development peak discharge calculations for each subwatershed affected by the proposed development is presented in Table 12-2, above.

Sizing of Storm Drains and Culverts

No storm water culverts are proposed for this site. A calculation is included for the under drain piping and conveyance swale along the north side of the yard.

STORMWATER QUALITY TREATMENT PLAN

Basic Stabilization Submissions

In accordance with the Basic Stabilization Standards, the site will be maintained to prevent or correct erosion problems. During and after construction at the Middle Street Substation, *CMP's Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects* (the E&S Plan) will be utilized to prevent erosion from occurring, as well as to correct any problems that may develop. The E&S Plan contains the details and specifications for general stabilization measures to be used during

construction and stabilization of the substation. These measures will be used to protect exposed soils during construction and during the service life of the project.

The stabilization measures for the site will include temporary and permanent E&S controls; appropriate erosion protection for earthen cut and fill slopes; and provisions for future maintenance of the site.

General Standard Submissions

The proposed project does not occur within the watershed of an Urban Impaired Stream and will have more than one acre of impervious area and more than one acre of developed area. Therefore, General Standards are required. Conversations with DEP staff have indicated that as long as the substation yard is built to the specifications shown on the plans, which is based on the approved materials as specified in the CMP/Maine DEP agreement letter, the General Standard requirements will be assumed to be met and no further treatment of runoff is required. For this site a 95% treatment has been achieved.

Runoff Treatment Measures

The proposed Substation site will drain south-west with 1.5% slope and ponded at the west side by a one foot high oil containment berm. Water will infiltrate and evaporate for small storms, for a larger storm (6"inches higher than the 5.4" for 25year event) it will overflow over the concrete driveway. To prevent water inside the control enclosure building, a drain tile system around the perimeter will direct the water to the basement and be pumped out via an oil detector system pump.
Runoff water from the northern property will be intercepted and convey with curtain drain (gravel-filled trench with a 6" drain tile) to a drop manhole structure where the energy will dissipate before discharge.
Due to the makeup of the substation yard materials, the quantity of runoff leaving the site will not increase from existing to proposed conditions. In addition, the substation yard will provide water quality treatment. The substation surface material will be a minimum of 6" crushed stone on top of 18" of MDOT 703.06 Type A gravel fill. The cross section and materials in this design exceed the specifications as outlined in the CMP/Maine DEP agreement letter.[Rev1]

Engineering Inspection of Stormwater Management Facilities

CMP will ensure that a qualified design engineer will inspect the construction site periodically to verify that

the expanded substation yard and stormwater conveyance swales are constructed in accordance with the plans and specifications shown on the design drawings, and are functioning properly. These inspections will commence with the initial earth moving activities on the site and will continue, as needed, during any period when construction activity affecting the stormwater management system occurs until the site is permanently stabilized.

Additional inspections of the site during and after construction to evaluate and maintain the condition and effectiveness of stormwater management structures and erosion and sedimentation control measures will be conducted. BMPs for erosion control and stormwater pollution prevention during construction will include weekly or more frequent inspection and maintenance of items such as temporary and permanent erosion control measures; stabilization of the substation site, road ditches, and the ROW; and signs of erosion or sedimentation.

COMPONENTS OF THE MIDDLE STREET 115/34/12KV SUBSTATION POST-CONSTRUCTION STORMWATER MAINTENANCE PLAN

The Middle Street 115/34/12kV Substation will be solely-owned, operated, and maintained by CMP.

Facilities to be maintained

The stormwater management facilities to be maintained at the Middle Street 115/34/12kV Substation include:

- Substation yard (crushed stone) and revegetated areas
- Perimeter drainage swale
- *Perimeter oil containment berm*[Rev1]
- Driveway

General Inspection and Maintenance Requirements

Generally, the proposed facilities will be operated and maintained in a manner consistent with good utility practices, including monthly on-site substation inspections and transmission line helicopter inspections three times per year. A post-construction maintenance and inspection log is provided in Appendix 3

Maintenance issues associated with specific areas and facilities at the substation are identified in the following paragraphs.

Substation Yard (crushed Stone) and oil containment berm

The substation yard and berm will be inspected monthly. Any signs of existing or developing erosion, rutting, trash, or unwanted vegetation within the substation yard will be removed/repaired as needed.

Drainage Conveyance Systems

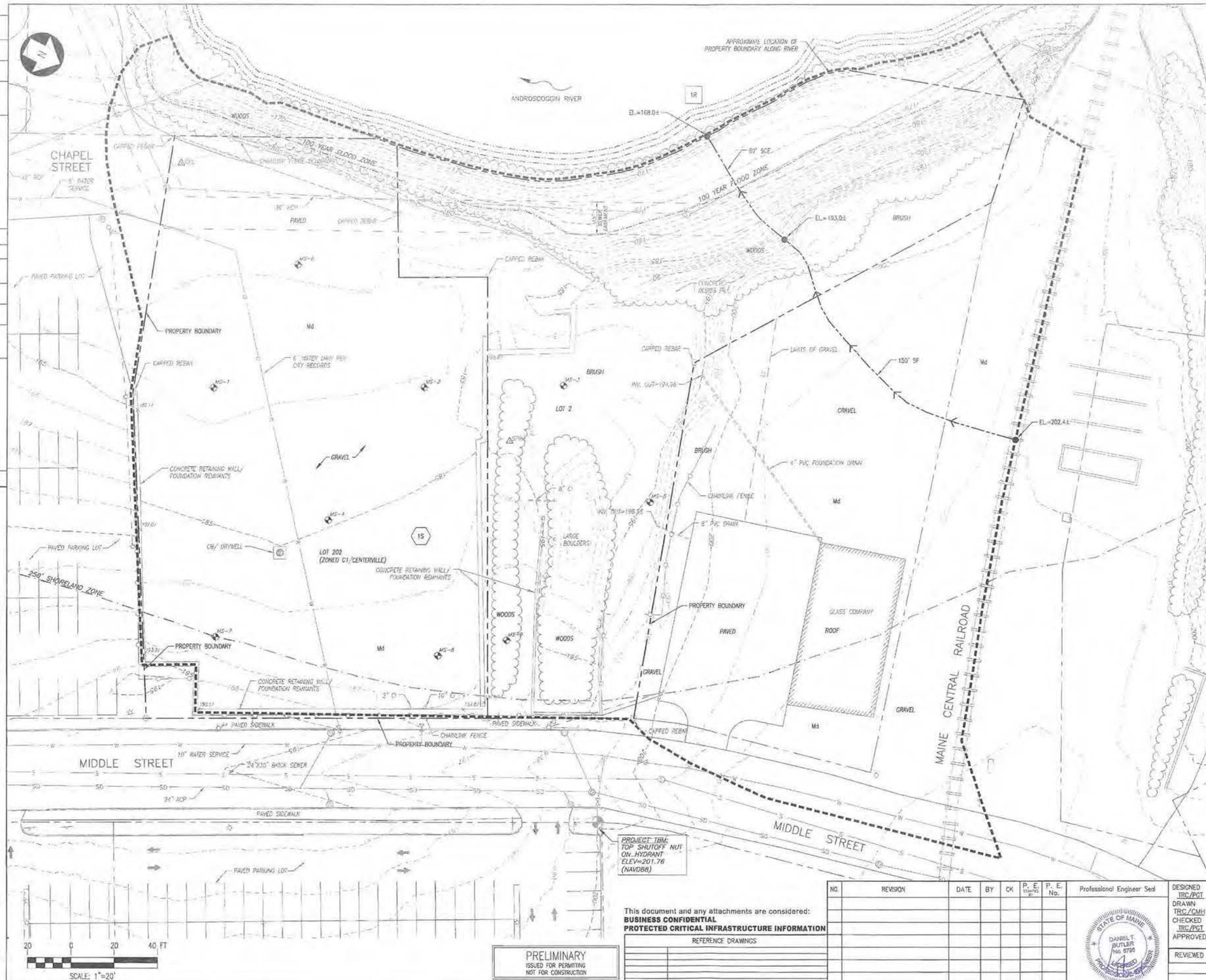
The perimeter drainage swale along the north side of the substation yard is to be inspected on a semi-annual basis. Any signs of existing or developing blockage of flow, trash, erosion, channeling or excessive buildup of sediment will be removed/repaired, as needed. Perimeter drainage swale and other vegetated structures will be mowed or otherwise maintained to control the growth of woody vegetation within the channel, but no more than once per year.[Rev1]

Driveway

No new driveway is being proposed. Access to the site will be from an existing driveway off of Chapel Street. These areas will be inspected semi-annually and signs of existing or developing erosion, rutting, trash or unwanted vegetation will be removed/repaired as needed.

APPENDIX 1-Pre and post Development Plans

Pre-Development Drainage Plans SW-1
Post-Development Drainage Plan



LEGEND

EXISTING		PROPOSED
	REMOVALS	
	PROPERTY/ROW LINE	
	EASEMENT LINE	
	EDGE OF PAVEMENT	
	CURBING	
	EDGE OF GRAVEL	
	EDGE OF CONCRETE	
	SUBSTATION YARD	
	SUBSTATION BASELINE	
172	CONTOUR	172
	BUILDING	
	TREELINE	
	CHAIN LINK FENCE	
	STOCKADE FENCE	
	RETAINING WALL	
	GUARDRAIL	
S	SEWER	S
G	GAS	G
W	WATER	W
SD	STORM DRAIN	SD
UD	UNDERDRAIN	UD
12" CMP	CULVERT	12" CMP
UGE	UNDERGROUND ELECTRIC	UGE
	OVERHEAD TRANSMISSION	
	IRON PIPE/REBAR	
	MONUMENT	
	SURVEY CONTROL POINT	
201.5	SPOT ELEVATION	x(122.50)
	SEWER MANHOLE	
	DRAINAGE MANHOLE	
	CATCH BASIN	
	ELECTRIC MANHOLE	
	SHUTOFF VALVE	
	HYDRANT	
	UTILITY POLE	
	LIGHT POLE	
	MATCHLINE	
	LIMIT OF WORK	
	SILT FENCE	SF
	RIPRAP	
	EDGE OF WATER	
	DRAINAGE FLOW	
	DRAINAGE SWALE	
	SIGN	
	TEMPORARY BENCH MARK	
P-4	TEST PROBE	
TP-2	TEST PIT	
B-2	TEST BORING	
	RAILROAD	
1R	REACH/STUDY POINT	
1S	SUBCATCHMENT ID	
	Tc FLOWLINE	
SF	SHEET FLOW	
SCF	SHALLOW CONCENTRATED FLOW	
CF	CHANNEL FLOW	
	WATERSHED	

PRE-DEVELOPMENT CONDITIONS

WATERSHED	BRUSH	ROOF/FDN	GRAVEL	PAVEMENT	SUBSTATION	WOODS	TOTAL
ID	C	98	C	98	55	C	AREA
1S	0.56	0.07	1.35	0.32	0.00	0.53	2.83
TOTAL							

GENERAL NOTES

1. ONE FOOT CONTOURS ARE BASED UPON A FIELD SURVEY BY TRC CONDUCTED APRIL 2008.
2. PLANIMETRIC INFORMATION AS SHOWN IN MAINE STATE PLANE, WEST ZONE, NORTH AMERICAN VERTICAL DATUM 1988.
3. NRCS SOIL SURVEY DATA FOR ANDROSCOGGIN COUNTY MAINE.
4. REFER TO THE TRC GEOTECHNICAL REPORT DATED JAN 2011 FOR BORING LOGS AND INFORMATION.

SOILS LEGEND

ABBREV	SOIL TYPE	SLOPE %	HYDROLOGIC SOIL GROUP	VEGETATED PERMISSIBLE VELOCITY (FT/S)
Md	MADE LAND	0 TO 35	C	3.0-3.5

NO.	REVISION	DATE	BY	CK	P. E. STAMP REQ.	P. E. No.
A	Issue For Permitting	02/04/11	CMH	PGT	DTB	

THIS DRAWING SHALL BE REVISED ON THE CADD SYSTEM ONLY

ENGINEERING CONSULTANT - 1000 - ADDRESS
TRC
245 WESTERN AVENUE
AUGUSTA, ME 04330
PROJECT NO: 155636

This document and any attachments are considered:
BUSINESS CONFIDENTIAL
PROTECTED CRITICAL INFRASTRUCTURE INFORMATION

REFERENCE DRAWINGS

PRELIMINARY
ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

Professional Engineer Seal

STATE OF MAINE
DANIEL T. BUTLER
No. 5795
PROFESSIONAL ENGINEER

DESIGNED TRC/PGT
DRAWN TRC/CMH
CHECKED TRC/PGT
APPROVED
REVIEWED

PRE-DEVELOPMENT WATERSHED PLAN

MIDDLE STREET S/S

LEWISTON MAINE

CENTRAL MAINE POWER COMPANY
IBERDROLA USA
Central Maine Power
SYSTEM ENGINEERING
DATE: 11/26/2010
SCALE: AS NOTED

SW-1
REV A

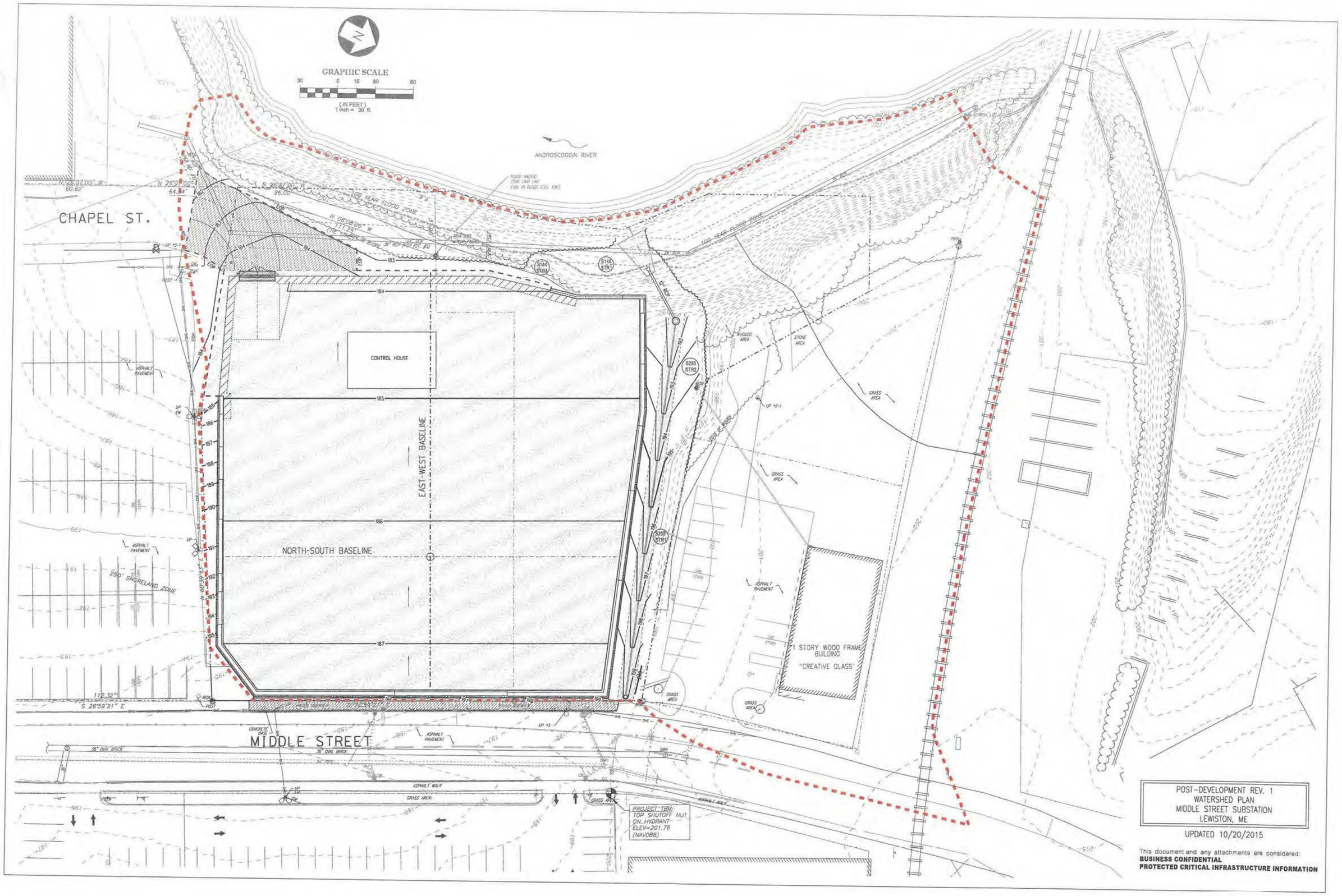
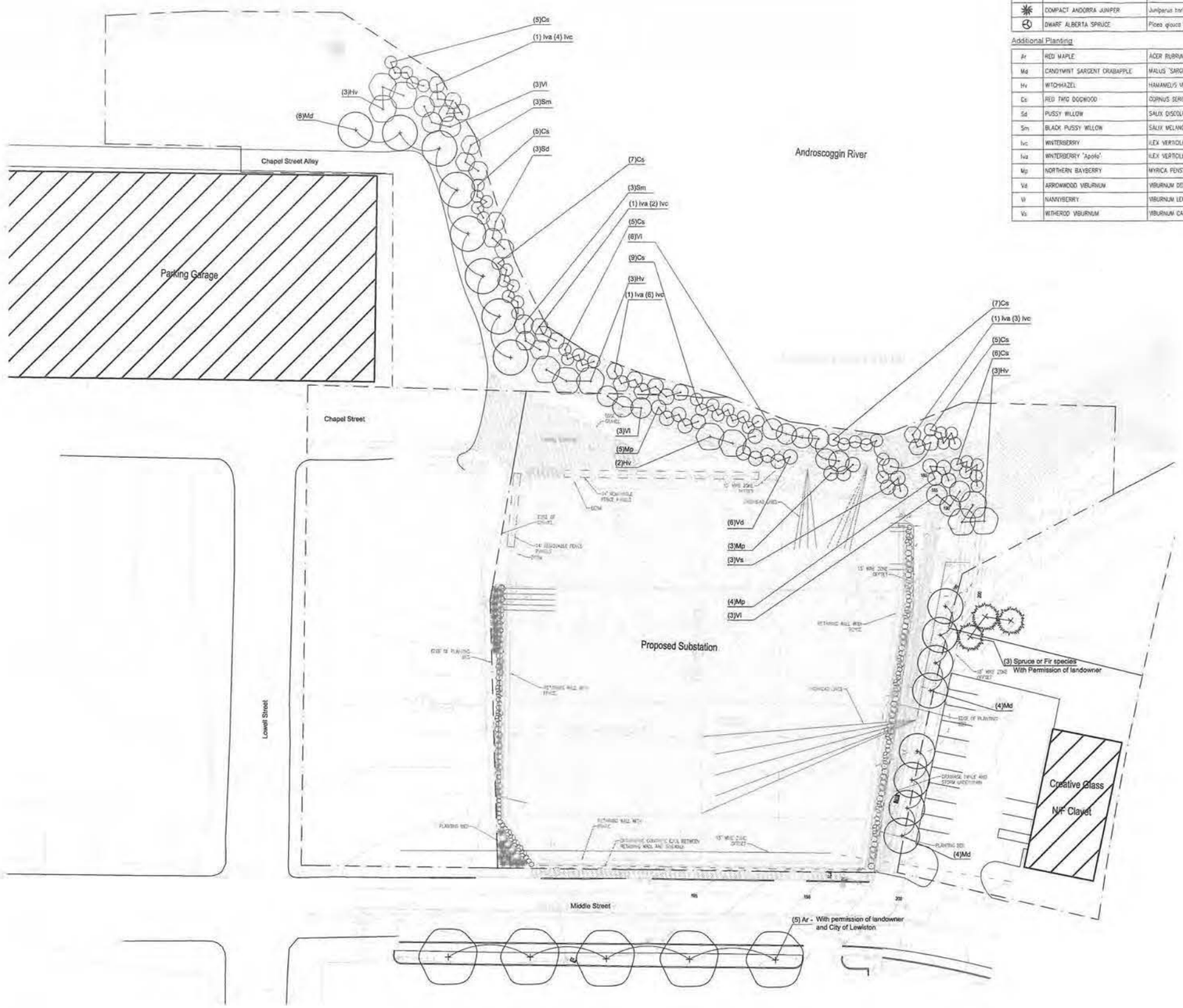

GRAPHIC SCALE
30 0 15 30 60
(IN FEET)
1 inch = 30 ft.
ANDROSCOGGIN RIVER
CHAPEL ST.
100 YEAR FLOOD ZONE
CONTROL HOUSE
EAST-WEST BASELINE
NORTH-SOUTH BASELINE
250' SHORELAND ZONE
ASPHALT PAVEMENT
WOODED AREA
STONE AREA
GRASS AREA
1 STORY WOOD FRAME BUILDING
"CREATIVE GLASS"
S 26°59'21" E
MIDDLE STREET
16" DUAL BRICK
ASPHALT WALK
PROJECT TBM:
TOP SHUTOFF NUT
ON HYDRANT
ELEV=201.76
(NAVD88)
POST-DEVELOPMENT REV. 1
WATERSHED PLAN
MIDDLE STREET SUBSTATION
LEWISTON, ME
UPDATED 10/20/2015
This document and any attachments are considered:
BUSINESS CONFIDENTIAL
PROTECTED CRITICAL INFRASTRUCTURE INFORMATION

EXHIBIT 6
Landscape Plan

SYMBOL	COMMON NAME	BOTANICAL NAME	MATURE SIZE (HEIGHT X WIDTH)	SIZE & TYPE	QTY
	COMPACT FERNSPRAY FALSECYPRESS	Chamaecyparis obtusa 'Filicoides Compacta'	6' X 4'	3 GAL. CONT.	23
	IVORY HALO DOGWOOD	Cornus alba 'Bailhalo'	5'-6' X 5'-6'	5 GAL. CONT.	4
	BLUE PFITZER JUNIPER	Juniperus chinensis 'Pfitzer Glauca Compacta'	4' X 4'	3 GAL. CONT.	30
	BLUE POINT JUNIPER	Juniperus chinensis 'Blue Point'	10' X 3'	10 GAL. CONT.	35
	COMPACT ANDORRA JUNIPER	Juniperus horizontalis plumosa compacta	1' X 6'	3 GAL. CONT.	19
	DWARF ALBERTA SPRUCE	Picea glauca 'Conica'	8' X 4'	10 GAL. CONT.	35

Additional Planting

Ar	RED MAPLE	ACER RUBRUM	50' X 30'	2" CAL.	5
Md	CANDYMINT SARGENT CRABAPPLE	MALUS 'SARGENTII' 'CANDYMINT'	10' X 10'	2" CAL.	16
Hv	WITCHHAZEL	HAMAMELIS VERNALIS 'PURPUREA'	10' X 10'	5-6' HT.	11
Cs	RED TWIG DOGWOOD	CORNUS SERICEA 'BAILEYII'	8' X 8'	3-4' HT.	49
Sd	PUSSY WILLOW	SALIX DISCOLOR	10' X 10'	3 GAL.	4
Sm	BLACK PUSSY WILLOW	SALIX MELANOSTACHYS	10' X 10'	3 GAL.	6
Ivc	WINTERBERRY	ILEX VERTICILLATA 'CHRYSOCARPA'	8' X 8'	3 GAL.	15
Iva	WINTERBERRY 'Apollo'	ILEX VERTICILLATA 'APOLLO'	8' X 10'	3 GAL.	4
Mp	NORTHERN BAYBERRY	MYRICA PENSYLVANICA	8' X 8'	7 GAL.	12
Vd	ARROWWOOD VIBURNUM	VIBURNUM DENTATUM	8' X 8'	5 GAL.	6
Vl	NANNYBERRY	VIBURNUM LENTAGO	10' X 10'	2-3' HT.	15
Vs	WITHEROD VIBURNUM	VIBURNUM CASSINOIDES	6' X 6'	2 GAL.	3



NO.	DATE	REVISION DESCRIPTION	Drawn By	Checked By
2	10/20/15	REVISED PLANT TYPES & COUNT	ST	ABC
1	10/16/15	REVISED PLANT TYPES	ST	ABS

Landscape Plan

tjd&a

Terrence J. Dillon & Associates, Landscape Architects & Planners
123 West Main Street, Kennebunk, ME 04043
Telephone: (207) 985-7700 / Fax: (207) 985-2400

MAINE POWER RELIABILITY PROGRAM
A Central Maine Power Company Project

BUFFER PLANTINGS

MIDDLE STREET SUBSTATION

Lewiston, ME

September 11, 2015

Sheet 1 of 1

EXHIBIT 7
Right, Title, and Interest

CMP Deed Reference Table for Middle Street Substation – City of Lewiston

Map/Lot	Municipality	County	Grantor	Grantee	Date	Book/Page	Type
206-202	Lewiston	Androscoggin	LL Bean Incorporated	CMP	10/30/07	7294/181	Fee Land
207-77	Lewiston	Androscoggin	City of Lewiston	CMP	10/23/14	9031/134	Fee Land
206-2	Lewiston	Androscoggin	City of Lewiston	CMP	10/23/14	9031/134	Access Rights
NA	Lewiston	Androscoggin	Brookfield Renewable	CMP	4/3/15	9111/92	Access Rights

Bk 7294 Pg181 $24136
10-31-2007 @ 03:31p

WARRANTY DEED
STATUTORY SHORT FORM
TITLE 33, §775

L. L. BEAN, INC., a Maine corporation, with a mailing address of Casco Street, Freeport, Maine 04033, for consideration paid, grants to **CENTRAL MAINE POWER COMPANY**, a Maine corporation with a mailing address of 83 Edison Drive, Augusta, Maine 04330, **with Warranty Covenants**, a certain lot or parcel of land, situated in the City of Lewiston, County of Androscoggin, and State of Maine, more fully described in Exhibit A, attached hereto and made a part hereof.

MAINE REAL ESTATE
TRANSFER TAX PAID

DATED: October 30, 2007

L. L. BEAN, INC.

By: _____
Name: Robert V. Peixotto
Title: Chief Operations Officer

STATE OF MAINE
COUNTY OF CUMBERLAND

October 30, 2007

Personally appeared the above-named Robert V. Peixotto, Chief Operations Officer of L. L. Bean, Inc. and acknowledged the above instrument to be his free act and deed in his said capacity and the free act and deed of L. L. Bean, Inc.

Before me,

_____
Notary Public/Attorney-at-Law

_____
(Print Name)

DIANE M. CAMPBELL
NOTARY PUBLIC
State of Maine
My Commission Expires Apr. 8, 2013

SEAL

EXHIBIT A

A portion of Parcel II described in a deed to the grantor from the City of Lewiston recorded in the Androscoggin County Registry of Deeds in Book 3600 Page 180, which portion contains approximately 40,646 square feet, and is located to the north and west of the boundary line (described below), to the west and south of Middle Street, and generally to northeast and southeast of the line described in the exception and reservation to the City of Lewiston contained in the description of said Parcel II (hereinafter the "Premises"):

Boundary Line (dividing Parcel II)

The point of beginning of the Boundary Line is located a distance of 112.32 feet N 26° 59' 21" W, by and along the westerly side of Middle Street, from a 5/8 inch rebar capped with AL&H 492 found at the intersection of the westerly line of Middle Street with the northerly line of Lowell Street to a 5/8 inch capped rebar to be set where the westerly side of Middle Street would intersect an extension of the southerly side of a concrete wall if it was extended;

Thence S 60° 39' 13" W, by and along the extension of the southerly side of a concrete wall and said wall, a distance of 152.34 feet to a 5/8 inch capped rebar to be set;

Thence S 72° 05' 20" W, a distance of 120.98 feet to a 5/8 inch capped rebar to be set at the westerly side of the former Chapel Street.

Also conveying, with Quitclaim Covenants as to the description:

The Premises are further described as being a certain lot or parcel of land situated on the westerly side of Middle Street in the City of Lewiston, County of Androscoggin and State of Maine as shown on a Lot Division Plan of L.L. Bean Property, Chapel St., Lowell St., and Middle St. Lewiston Maine for L.L. Bean, Inc. by Sebago Technics, Inc. dated September 5, 2007, Project Number 93282, recorded in the Androscoggin Registry of Deeds ("Registry") on or near the date hereof (the "Plan"), and depicted therein as the "Proposed Lot." Said "Premises" being further bounded and described as follows:

The point of beginning is a 5/8-inch capped rebar to be set at the intersection of the westerly side of Middle Street with a best fit extension of the northwesterly line of a concrete foundation wall at the southeasterly corner of land now or formerly of the City of Lewiston as described in Deed Book 3600, Page 180, and located N 26°-59'-21" W, by and along the westerly side of Middle Street a distance of 272.10 feet from a 5/8-inch rebar capped with AL&H 492 found at the intersection of the westerly line of Middle Street with the northerly line of Lowell Street;

Thence S 63°-00'-06" W, by and along a best fit of the northwesterly line of a concrete foundation wall and an extension of said wall, a distance of 206.02 feet to a 5/8-inch capped rebar to be set;

Thence S 27°-22'-52" E, by and along an extension of the northeasterly line of a second concrete wall and said second concrete wall, a distance of 41.21 feet to the corner of the second concrete wall;

Thence S 62°-12'-26" W, by and along the southeasterly line of the second concrete wall and an extension of said wall, a distance of 30.00 feet to a 5/8-inch capped rebar to be set;

Thence continuing along an extension of said second wall approximately 31 feet to a point on the bank of, but not abutting, the Androscoggin River described as the water in said river when standing at an elevation of five feet above the top of the stone dam also described as the 75.00' elevation as defined in accordance with the datum established by the Union Water Power Company, said 75.00' elevation on the Union Water Power Company datum is stated as being equivalent to 169.50' as measured on the North American Datum of 1929 (NGVD1929) on Subdivision Plan of PJM Realty Corp., Chapel and Main Street, by AL&H Surveyors & Engineers, dated February 15, 1989 and recorded at the Androscoggin County Registry of Deeds in Plan Book 34, Pages 157 and 158;

Thence southerly along the 169.50 foot elevation line near the Androscoggin River approximately 9 feet to the northwesterly extension of the westerly line of the former location of Chapel Street;

Thence S 26°-07'-00" E, by and along the westerly side of the former Chapel Street, a distance of approximately 96 feet to a 5/8-inch capped rebar to be set, said rebar being S 08°-08'-26" E, a distance of 111.25 feet from the last mentioned 5/8-inch capped rebar to be set;

Thence N 72°-05'-20" E, a distance of 120.98 feet to a 5/8-inch capped rebar to be set near the southwesterly end of a concrete wall;

Thence N 60°-39'-13" E, by and along the southerly side of a concrete wall and extensions of said wall a distance of 152.34 feet to the westerly side of Middle Street and a 5/8-inch capped rebar to be set;

Thence N 26°-59'-21" W, by and along the westerly side of Middle Street, a distance of 159.77 feet to the Point of Beginning.

Subject to an easement to the City of Lewiston, Maine for a 15 foot wide sewer easement, Numbered 6-3, and dated February 22, 1974 and recorded in Deed Book 1093, Page 135;

Subject to easement rights reserved by the Franklin Company to build a sewer and flow water across the parcel described above as referenced in Deed Book 199, Page 490;

Subject to public easements and public utility easements which may remain from the City of Lewiston City Council order discontinuing and vacating the northerly portion of

Chapel Street on February 4, 1986, as recorded in Deed Book 1900, Page 122 ("City Easements";

Subject to the riparian rights of others to the Androscoggin River;

Meaning and intending to describe a proposed lot as shown on said Plan and containing approximately 40,646 square feet as shown on said Plan, being a portion of the land conveyed to this grantor in Deed Book 3600, Page 180. Further, in so far as the Plan depicts the boundary line running along the concrete walls which are now located along the line described in the exception and reservation to the City of Lewiston contained in the description of said Parcel II, said depiction is a best fit alignment in the Plan as referenced in Note 10 of the Plan. Grantor therefore hereby releases and quitclaims to Grantee any and all right, title and interest in and to any property which may be located northwesterly of said concrete walls.

Bearing are based upon Grid North.

Also conveying a perpetual twenty-five foot wide easement or right of way across that portion of Grantor's remaining land lying within the discontinued portion of Chapel Street, so called, which discontinued portion is described in the Registry at Book 1900, Page 122 and is identified under surveyor's note 7 (c) in the Plan (the "Discontinued Chapel Street Area"), for ingress, egress and underground transmission and distribution utilities to and from the Premises and land adjoining land currently designated as Tax Map 207, Lot 13 ("City Lot'), upon which lands Grantee intends to build an electrical substation and appurtenant transmission and distribution lines, along with the right to construct, install, maintain, repair, replace, grade, excavate, and fill with respect to said underground utilities, such easement or right of way being further described as beginning at, or near, a capped ¾ inch iron rod, numbered 492, set in the ground at the northwesterly corner of the northerly terminus of Chapel Street, so called, said iron rod also being generally at or near the easterly line of land conveyed to the City of Lewiston by PJM Realty Corp. by deed dated May 23, 1989 and recorded in the Registry of Deeds in Book 2413, Page 67, thence said twenty five foot right of way extending generally north and parallel to the easterly line of said City land but within said Discontinued Chapel Street Area to the westerly side of the Premises. The easement granted herein shall include, without limiting the foregoing, such rights as are necessary and sufficient to meet the municipal requirements for access to the Premises. Without limiting the foregoing, the access easement granted herein across the Discontinued Chapel Street Area is intended, among other things, to give Grantee access from the Premises and the City Lot to Chapel Street and allow Grantee to connect transmission line and distribution lines to its substation to be located on the Premises and/or the City Lot. Grantor shall have the right to reasonably designate the precise location of the easement right of way within the Discontinued Chapel Street Area provided that such location is not inconsistent with the intended purpose of this easement. Grantee shall use reasonable efforts not to unreasonably interfere with Grantor's use of the remaining land, provided that such steps do not defeat the purpose of this easement. The easement granted herein shall be appurtenant to the Premises and the City Lot.

Grantor acknowledges that Grantee may construct an electric substation on the Premises. Grantor hereby covenants and agrees that in the event that it becomes necessary as a part of said construction and at the request of Grantee for the City of Lewiston to relocate certain sewer lines or water lines located in the Discontinued Chapel Street Area, pursuant to the City Easements, Grantor shall not object to said relocation of the sewer lines or water lines within the Discontinued Chapel Street Area.

ANDROSCOGGIN COUNTY
Tina R. Chaunard
REGISTER OF DEEDS

EASEMENT DEED

(Transmission Corridor and associated Utility Services Easement
for the Maine Power Reliability Program – Lewiston Loop)

This EASEMENT DEED (this "Easement"), by and between, **BROOKFIELD WHITE PINE HYDRO LLC**, f/k/a FPL Energy Maine Hydro LLC, a Delaware limited liability company with offices located at 26 Katherine Drive, Hallowell, Maine 04347, ("Brookfield") and **CENTRAL MAINE POWER COMPANY**, a Maine corporation with a mailing address of 83 Edison Drive, Kennebec County, Maine 04336 ("CMP"). Brookfield and CMP are sometimes hereinafter referred to individually as a "Party" and together as the "Parties."

WITNESS

Whereas, a Continuing Site/Interconnect Agreement dated January 6, 1998, as amended June 16, 1998 (a Notice of which is dated March 30, 1999 and recorded at the Androscoggin County Registry of Deeds in Book 4202, Page 267) and July 24, 2002 (a Notice of which is dated June 1, 2007 and recorded in Book 7157, Page 286 of the Androscoggin County Registry of Deeds), and as subsequently supplemented and amended effective December 23, 2003, and amended and restated effective as of May 6, 2011 (as assigned and further amended from time to time, the "CSIA"), was originally entered into by and between CMP and NextEra Energy Maine, LLC (fka FPL Energy Maine, Inc., "FPL"),. Brookfield is a party to the CSIA pursuant to a partial assignment of the same by FPL to Brookfield.

Whereas, CMP conveyed to Brookfield (when it was known as FPL Energy Maine Hydro LLC) certain lands and easements located in the City of Lewiston and the City of Auburn by deeds dated April 7, 1999 and recorded in the Androscoggin County Registry of Deeds in Book 4207, Page 1 (the "Lewiston Falls Deed"), and Book 4206, Page 317 (the "Gulf Island Deed") (collectively, the Lewiston Falls Deed and the Gulf Island Deed, being referred to herein as the "Deeds"), CMP having reserved certain easement rights in the Deeds and said conveyances being subject to the provisions of said CSIA; and

Whereas, on January 14, 2013, Brookfield (when it was known as FPL Energy Maine Hydro LLC) and Brookfield Power US Holdings America Co. filed an application with the Federal Energy Regulatory Commission ("FERC") seeking authorization under section 203(a)(1) and (a)(2) of the Federal Power Act (FPA) for the indirect acquisition and disposition of all of the outstanding membership interests of White Pine Hydro Investments, LLC, which indirectly owns FPL Energy Maine Hydro LLC. On February 25, 2013, FERC issued an order authorizing the transaction. *See FPL Energy Maine Hydro LLC, 142 FERC¶ 62,150 (2013)*; and

Whereas, on May 1, 2013, Brookfield filed formal notification with FERC that, effective May 1, 2013, FPL Energy Maine Hydro LLC changed its name to Brookfield White Pine Hydro LLC; and

Bk 9031 Pg134 #19465
11-07-2014 @ 12:14p

QUITCLAIM DEED WITH COVENANTS

THE CITY OF LEWISTON, a body politic and corporate situated in Androscoggin County, Maine, with a mailing address is 27 Pine Street, Lewiston, Maine 04240 FOR CONSIDERATION PAID, grants to **CENTRAL MAINE POWER COMPANY**, a corporation organized under the laws of the State of Maine, with a mailing address of 83 Edison Drive, Augusta, Maine 04336, WITH QUITCLAIM COVENANTS the following described real property located in the City of Lewiston, County of Androscoggin, State of Maine

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

MAINE REAL ESTATE
TRANSFER TAX PAID

IN WITNESS WHEREOF, the City of Lewiston has caused this instrument to be executed by Edward A. Barrett, its duly authorized City Administrator this 23rd day of October, 2014.

CITY OF LEWISTON

By: _____
Edward A. Barrett
Its: City Administrator

State of Maine
County of Androscoggin, ss

October 23, 2014

The above-named Edward A. Barrett, City Administrator of the City of Lewiston, personally appeared before me and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of the City of Lewiston.

Before me, _____
Notary Public/Attorney
Name:
My Commission Expires: _____

CATHERINE L. LEKBERG
Notary Public, Maine
My Commission Expires February 5, 2018

SEAL

EXHIBIT A

A certain lot or parcel of land situated on the westerly side of Middle Street in the City of Lewiston, County of Androscoggin and State of Maine, bounded and described as follows to wit:

Beginning on the westerly sideline of Middle Street at a point marked by a ¾" iron rebar found at the southeasterly corner of land conveyed to Lucien H. Clavet and Lauretta E. Clavet by a deed dated July 9, 2002, and recorded in the Androscoggin County Registry of Deeds in Book 5049 Page 064;

Thence, southerly on a course of S 26°-24'-49" E along the westerly sideline of Middle Street a distance of sixty-eight and thirty-eight hundredths (68.38) feet to a point marked by a 5/8" iron rebar with survey cap #2117 found at the northeasterly corner of land conveyed to Central Maine Power Company by a deed dated October 30, 2007, and recorded in the Androscoggin County Registry of Deeds in Book 7294 Page 181;

Thence, westerly on a course of S 63°-50'-40" W along the northerly line of land of Central Maine Power a distance of two hundred six and three hundredths (206.03) feet to a point marked by a 5/8" iron rebar found;

Thence, southerly on a course of S 26°-09'-20" E along the westerly line of land of Central Maine Power a distance of forty-one and twenty-one hundredths (41.21) feet to an unmonumented point;

Thence, westerly on a course of S 63°-06'-10" W along the northerly line of land of Central Maine Power a distance of fifty-seven and forty-three hundredths (57.43) feet to an unmonumented point located at the 169.5' contour (NGVD29 Datum), being the easterly line of land conveyed to Brookfield White Pine Hydro (reference a deed dated April 5, 1999, and recorded in the Androscoggin County Registry of Deeds in Book 4207 Page 001);

Thence, northerly along the 169.5' contour, being the easterly line of land of Brookfield, a distance of one hundred fifty-one and sixteen hundredths (151.16) feet, having a chord distance of one hundred forty-five and eight hundredths (145.08) feet on a course of N 28°-08'-12" W, to an unmonumented point located on the easterly line of land conveyed to Franklin Property Trust by a deed dated September 10, 1976, and recorded in the Androscoggin County Registry of Deeds in Book 1226 Page 330;

Thence, northerly on a course of N 25°-23'-35" W along the easterly line of land of Franklin Property Trust a distance of eighty-six and twenty-one hundredths (86.21) feet to an unmonumented point;

Thence, easterly on a course of N 64°-38'-41" E along the southerly line of land of Franklin Property Trust a distance of fifty and thirty hundredths (50.30) feet to an unmonumented point located on the southwesterly line of land conveyed to CMP by a deed dated November 2, 2011, and recorded in the Androscoggin County Registry of Deeds in Book 8274 Page 262;

Poor Copy At Time Of Recording
Will Not Reproduce Clearly

Thence, southeasterly on a course of S 54°-34'-27" E along the southwesterly line of land of CMP a distance of ninety-seven and zero hundredths (97.00) feet to a point marked by a ¾" iron rebar with survey cap #482 found;

Thence, easterly on a counterclockwise curve to the left having a radius of two thousand twenty-four and nineteen hundredths (2,024.19) feet and having a chord distance of one hundred seventy-four and nine hundredths (174.09) feet on a course of N 75°-23'-35" E and an arc length of one hundred seventy-four and fourteen hundredths (174.14) feet to the point and place of beginning. Containing 31,417.79 square feet (0.721 acres) of land, more or less.

Reserving a utility easement 15' in width for the purpose of maintaining, repairing or replacing an existing sewer line leading over the westerly portion of the herein conveyed parcel of land, the centerline of the said easement is more particularly described as follows to wit:

Beginning at an unmonumented point depicted as Point A on the referenced plat below, located on the easterly line of land as conveyed to Franklin Property Trust by a deed dated September 10, 1976, and recorded in the Androscoggin County Registry of Deeds in Book 1226 Page 330, said point being located on a course of S 25°-23'-35" E from an unmonumented point located at northwesterly corner of the herein described parcel of land;

Thence, southeasterly and southerly on the following two courses:

S 53°-42'-17" E sixty-six and eleven hundredths (66.11) feet;

S 23°-42'-03" E one hundred thirty-four and seventy-one hundredths (134.71) feet to a point located on the northerly line of land conveyed to CMP by a deed dated October 30, 2007, and recorded in the Androscoggin County Registry of Deeds in Book 7294 Page 181, said point depicted as Point B on reference plat below, being on a course of S 63°-06'-10" W along the northerly line of land of CMP a distance of seven and one hundredth (7.01) feet from a ¾" iron rebar with survey cap #2117 found;

Bearings are referenced to Grid North.

Reference can be made to a plat entitled "Boundary Survey Prepared For the Acquisition of Land By: Central Maine Power Company from: City of Lewiston", dated October 15, 2014, as prepared by Sackett & Brake Survey, Inc., Project Number 2014182, to be recorded in the Androscoggin County Registry of Deeds.

ANDROSCOGGIN COUNTY
TINA M CHOUINARD
REGISTER OF DEEDS

Bk 9031 Pg137 #19466
11-07-2014 @ 12:14p

Standard Easement
Aerial Rights Only

Form 1199, Rev. 2005

THE CITY OF LEWISTON, a body politic and corporate situated in Androscoggin County, Maine, with a mailing address of 27 Pine Street, Lewiston, Maine 04240 ('Grantor'), for consideration given, grants to **CENTRAL MAINE POWER COMPANY**, a Maine Corporation with an office at 83 Edison Drive, Augusta, Maine 04336, and its respective successors and assigns (collectively 'Grantees'), with quitclaim covenants, the right and easement to erect, maintain, rebuild, respace, patrol, operate, and remove and do all other actions involving electric and communication distribution equipment and facilities, consisting of wires, cables, together with all necessary fixtures and appurtenances over a portion of the surface of the land of the Grantor in the City of Lewiston, Androscoggin County, Maine. This easement affects land conveyed to the Grantor, in a deed from PJM Realty Corp., dated April 7, 1994, and recorded in the Androscoggin County Registry of Deeds in Book 3246 Page 78. This easement is an easement in gross and is not for the sole purpose of serving the Grantor or Grantor's lands. The location of said easement is more particularly described as follows:

See EXHIBIT A attached hereto and incorporated herein.

The rights granted herein include the right to cut down and trim trees and other vegetation and to use formulations registered with the Environmental Protection Agency or its successor to eliminate vegetation, and modify the growth of trees, which vegetation or growth, in the judgement of Grantees, may interfere with the operation and maintenance of its equipment or facilities; and the right to restrict the construction of buildings, structures and improvements within 15 feet of its equipment and facilities; and the right to enter upon the land of the Grantor for any and all of the foregoing purposes.

IN WITNESS WHEREOF, the City of Lewiston has caused this instrument to be executed by Edward A. Barrett, its duly authorized City Administrator this 23rd day of October, 2014.

CITY OF LEWISTON

By: Edward A. Barrett
Edward A. Barrett
Its: City Administrator

State of Maine
County of Androscoggin, ss

October 23, 2014

The above-named Edward A. Barrett, City Administrator of the City of Lewiston, personally appeared before me and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of the City of Lewiston.

Before me, Catherine L. Lekberg
Notary Public/Attorney
Name:
My Commission Expires: _____

SEAL

CATHERINE L. LEKBERG
Notary Public, Maine
My Commission Expires February 5, 2018

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EXHIBIT A

A certain lot or parcel of land situated in the City of Lewiston, County of Androscoggin, State of Maine, bounded and described as follows:

Beginning at a point marked by a ¾" capped iron rebar with survey cap #492 found at the northwesterly corner of land conveyed to L.L. Bean, Inc. by a deed dated October 19, 1998 recorded in the Androscoggin County Registry of Deeds in Book 4089 Page 236;

Thence, southerly on a course of S 26°-14'-53" E along the westerly line of land of said L.L. Bean, Inc. a distance of forty-six and eighty-two hundredths (46.82) feet to an unmonumented point;

Thence, continuing southerly on a course of S 16°-48'-41" W through land conveyed to the City of Lewiston by a deed dated April 7, 1994 recorded in the Androscoggin County Registry of Deeds in Book 3246 Page 078 a distance of one hundred twenty-eight and thirty-nine hundredths (128.39) feet to a point located at the 169.5 foot contour (NGVD 1929 Datum), being the easterly line of land of Brookfield White Pine Hydro;

Thence, northerly and northeasterly along the 169.5 foot contour line, being the easterly line of land of Brookfield White Pine Hydro an approximate distance of four hundred eleven and two hundredths (411.02) feet to an unmonumented point located on the westerly line of land conveyed to Central Maine Power Company by a deed dated October 30, 2007 recorded in the Androscoggin County Registry of Deeds in Book 7294 Page 181;

Thence, southerly on a course of S 25°-23'-35" E along the westerly line of land of said Central Maine Power Company a distance of sixty-three and eighty-nine hundredths (63.89) feet to an unmonumented point;

Thence, continuing southerly on a course of S 16°-48'-41" W through land conveyed to the City of Lewiston by a deed dated April 7, 1994 recorded in the Androscoggin County Registry of Deeds in Book 3246 Page 078 a distance of one hundred seventeen and fifty-five hundredths (117.55) feet to an unmonumented point located on the northerly line of land of said L.L. Bean, Inc.;

Thence, westerly on a course of S 63°-59'-21" W along the northerly line of land of said L.L. Bean, Inc. a distance of forty-three and fifty-eight hundredths (43.58) feet to the point and place of beginning. Containing 12,891.21 square feet (0.296 acres of land), more or less. Reference may be had to the attached Exhibit A-1 for a sketch of the above-described easement area.

Bearings are referenced to Grid North.

This conveyance is made subject to the rights granted to Central Maine Power Company in an easement deed from J&M Realty Associates dated May 11, 1987 and recorded in the Androscoggin Registry of deeds in Book 2101, Page 173.

limit of river approximate

Brookfield White Pine Hydro
reference 4207/001 September 5, 1999
(land located at an elevation
below the contour line of 169.5 (NGVD29)

12,891.21 sq. ft.
0.296 acres

PROPOSED
'AIRSPACE' EASEMENT
TO BE ACQUIRED BY
CENTRAL MAINE POWER COMPANY

S 25°23'35" W
63.89'

n/f
CMP
7294/181 10-30-07
Lewiston Map 206
Lot 203

Lewiston

L.L. BEAN, INC.
3500/180 05-08-96
Lewiston Map 206 Lot 01

117.55'
S 16°48'41" W

± 411.02' along
169.5' contour(NGVD29)

P.O.B.
3/4" iron rebar
with aluminum survey cap #492
found flush

97.9'

L3

L2

L1

outside edge of building

parking garage

L.L. BEAN, INC.
4089/236 October 19, 1998
Lewiston Map 207 Lot 22
L.L. BEAN
parking garage

CITY OF LEWISTON
3246/078 04-07-94
Lewiston Map 207 Lot 77

68.77'
S 62°33'09" W
baseline

T-2

Proposed location
of transmission line

128.39'
S 16°48'41" W

GRAPHIC SCALE
0 25 50
(IN FEET)
1 inch = 50 ft.

50'

LINE TABLE		
LINE	LENGTH	BEARING
L1	46.82	S26°14'53"E
L2	63.83	N16°48'41"E
L3	43.58	S63°59'21"W

STATE OF MAINE
STEPHEN W. GOULD
No.2318
PROFESSIONAL LAND SURVEYOR

Stephen W. Gould

STEPHEN W. GOULD
PLS 2318

PREPARED BY: SACKETT & BRAKE SURVEY, INC.
INVALID - UNLESS SIGNED, SEALED AND/OR EMBOSSED

MAINE POWER RELIABILITY PROGRAM
SECTION 144
CITY OF LEWISTON -TAX MAP 207 LOT 77
AIRSPACE EASEMENT

LOCATION: westerly of LOWELL ROAD
LEWISTON, ANDROSCOGGIN COUNTY, MAINE

SCALE 1" = 50'
OCTOBER 9, 2014

LEWISTON LOOP

2014202

C:\Land Projects 3\201305\dwg\2014202.dwg, 10/9/2014 3:23:34 PM, 1:1

ANDROSCOGGIN COUNTY
TINA M CHOUINARD
REGISTER OF DEEDS

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Will Not Reproduce Clearly

Bk 7348 Pg207 #924
01-15-2008 @ 04:01p

QUITCLAIM RELEASE DEED
STATUTORY SHORT FORM
TITLE 33, §775

CENTRAL MAINE POWER COMPANY ("CMP"), a Maine corporation, having a mailing address of 83 Edison Drive, Augusta, Maine 04336, for consideration paid, releases to **CITY OF LEWISTON**, a body corporate and politic in Androscoggin County, Maine, having a mailing address of 27 Pine Street, Lewiston, Maine 04240, all its right, title, and interest in and to certain lots or parcels of land currently known as Island Avenue and the "Passage Way" located northerly of Mill Street, situated in the City of Lewiston, County of Androscoggin, and State of Maine, as more fully described in Exhibit A attached hereto and made a part hereof (the "Property").

CMP excepts and reserves from this release (i) the right and easement to erect, bury, maintain, repair, relocate, replace, modify, operate, and patrol electric, transmission, distribution, and communications wires and/or cables, consisting of suitable and sufficient poles with wires across the land conveyed herein where such CMP facilities are currently located; and (ii) any and all rights of ingress and egress over and across that portion of the Property described as "Parcel One" in Exhibit A hereto, in order to have access from property now owned by Central Maine Power Company and described in a deed recorded at the Androscoggin County Registry of Deeds in Book 6067, Page 187 to Mill Street. CMP shall have the duty and obligation to restore any disturbed areas on the Property resulting from such erection, burying, maintenance, repairs, operation, and patrols to its former condition prior to the disturbance.

DATED: January 9, 2008

CENTRAL MAINE POWER COMPANY

By: Kenneth Freye
Name: Kenneth H. Freye
Title: Manager, Real Estate Services

STATE OF MAINE
KENNEBEC COUNTY

January 9, 2008

Personally appeared before me the above-named Kenneth H. Freye, the Manager, Real Estate Services of Central Maine Power Company, and acknowledged the above instrument to be his free act and deed in his said capacity, and the free act and deed of Central Maine Power Company.

Before me,

Paul Facteau

Notary Public/Attorney-at-Law

Paul Facteau, Notary Public
State of Maine
My Commission Expires 1/24/2012
(Print Name)

SEAL

EXHIBIT A

"Passage Way or Mill Street"
Parcel One

A certain lot or parcel of land situated on the northerly side of, but not adjacent to Main Street, in the City of Lewiston, County of Androscoggin, State of Maine, said parcel being more particularly bounded and described as follows:

Beginning at a point in the westerly line of land now or formerly of Central Maine Power Company, as described in a deed recorded at the Androscoggin County Registry of Deeds in Book 6067, Page 187, on the easterly side line of Mill Street as accepted as a street by the City of Lewiston, on File in the City Clerk's Office Book 2, Page 162;

Thence S 81° 28' 53" W, by and along Mill Street, a distance of 60.00 feet to a drill hole;

Thence S 81° 28' 53" W, by and along land now or formerly of Miracle of Living Waters as described in a deed recorded in Book 3810, Page 43, as corrected in Book 3832, Page 343, a distance of 4.22 feet to a drill hole in concrete;

Thence N 09° 13' 01" W, by and along land of Miracle of Living Waters, a distance of 68.59 feet to an aluminum capped 5/8 inch iron rebar;

Thence N 42° 03' 45" W, by and along land of Miracle of Living Waters, a distance of 48.65 feet to a point;

Thence N 56° 26' 21" W, by and along land of Miracle of Living Waters, a distance of 56.56 feet to a point;

Thence N 30° 41' 27" W, by and along land of Miracle of Living Waters a distance of 60.61 feet to the southerly line of land now or formerly on FPL Energy Maine Hydro LLC (hereinafter "FPL,") so-called "Cowan Pond", as described in a deed recorded in the Androscoggin County Registry of Deeds in Book 4207, Page 001;

Thence N58° 38' 28" E, by and along land of FPL a distance of 26.24 feet to other land of The Miracle of Living Waters, Lincoln Mill Site;

Thence S 30° 41' 27" E, by and along land of the Miracle of Living Waters a distance of 55.36 feet to a an aluminum capped iron rebar;

Thence S 58° 04' 27" E, by and along land of Miracle of Living Waters, a distance of 146.74 feet to a point and land of the aforementioned Central Maine Power Company;

Thence S 08° 32' 27" E, by and along land of Central Maine Power Company, a distance of 66.88 feet to the point of beginning.

"Passage Way or Mill Street"
Parcel Two

A certain lot or parcel of land situated on the northerly side of, but not adjacent to Main Street, in the City of Lewiston, County of Androscoggin, State of Maine, said parcel being more particularly bounded and described as follows:

Beginning at a point on the northerly line of land now or formerly of FPL, Cowan Pond, as described in a deed recorded in Book 4207, Page 1 at its intersection with the westerly side line of a 25 foot wide passage way;

Thence N 16° 03' 27" W, by and along now or formerly of the Franklin Company, a distance of 159.28 feet to a point and the southerly line of other land of FPL; "Monty Station", as described in a deed recorded in Book 4207, Page 1;

Thence N 73° 37' 15" E, by and along land of FPL, a distance of 25.00 feet to a point;

Thence S 16° 03' 27" E, by and along land of FPL, a distance of 24.00 feet to a point;

Thence S 16° 03' 27" E, by and along other land now or formerly other land of Miracle of Living Waters the "Lincoln Mill", a distance of 127.32 feet to a point;

Thence S 30° 41' 27" E, by and along land of Miracle of Living Waters, a distance of 8.19 feet to a point and the northeast corner of the first referenced land of FPL;

Thence S 73° 33' 38" E, by and along land of FPL, a distance of 27.07 feet to a point of beginning;

Meaning and intending to describe a two certain parcels of land containing 13,963 square feet or 0.32 acres, more or less, being depicted as "Passage Way" on a survey prepared by Sebego Technics dated September 26, 2007.

This "Passage Way" is subject to rights and easements of record granted to Paul Finley, FPL, Central Maine Power Company and the City of Lewiston for access and egress and the maintenance of utility lines lying over and under said "Passage Way".

Island Avenue

A certain lot or parcel of land situated on the northerly side of Main Street in the City of Lewiston, County of Androscoggin, State of Maine, said parcel being more particularly bounded and described as follows:

Beginning at a railroad spike found set at the easterly corner of land now or formerly of the City of Lewiston, as described in a deed recorded at the Androscoggin County Registry of Deeds in Book 6475, Page 167, on the northerly sideline on Main Street;

Thence N 33° 49' 49" W, by and along land of City of Lewiston a distance of 126.79 feet to a capped 5/8 inch iron rebar at the easterly corner of land now of formerly of Solo Properties, LLC as described in a deed recorded in the Androscoggin County Registry of Deeds in Book 6067, Page 181;

Thence N 33° 49' 49" W, by and along land of Solo Properties a distance of 50.29 feet to a capped 5/8 inch iron rebar at the easterly corner of land now or formerly of Miracle of Living Waters as described in a deed recorded in the Androscoggin County Registry of Deeds in Book 3810, Page 43 and Book 3832, Page 343;

Thence N 34° 30'31" W, by and along land of Living Waters a distance of 106.84 feet to a 12 inch by 12 inch granite monument at an angle point;

Thence N 57° 06' 156" W, by and along land of Living Waters a distance of 120.63 feet to a drill hole in a concrete bridge deck at an angle point;

Thence N 47° 30' 48" W, by and along land of Living Waters a distance of 63.62 feet to the southerly line of land now or formerly of FPL Energy Maine Hydro LLC (hereinafter "FPL"), additional lands at Monty Station, as described in a deed recorded in the Androscoggin County Registry of Deeds in Book 4207, Page 001 and a rail road spike found set in the pavement;

Thence N 73° 35' 20" E, by and along land of FPL, a distance of 29.20 feet to a point and other land of FPL;

Thence southerly keeping a distance of 25.00 feet from and parallel with the first five previously described courses and by and along lands of FPL on the following courses and distances; S 47° 30' 48" E, 46.44 feet, S 57° 06' 06" E, 123.52 feet, S 34° 30' 31" E, 111.98 feet, S 33° 49' 49" E, 172.74 feet to the northerly side line of Main Street;

Thence S 45° 59' 14" W, by and along said Main Street a distance of 25.40 feet to the Point of Beginning.

Meaning and intending to describe a strip of land, known as Island Avenue, having a width of 25.00 feet running northwesterly from the northerly sideline of Main Street to southerly line of land of FPL containing 11,536 square feet or 0.26 acres.

Island Avenue is subject to any and all rights-of-way or easements of record for purposes of access, egress, and the maintenance of utilities lines over or under the 25 foot strip above described.

ANDROSCOGGIN COUNTY
Tina R. Chaunard
REGISTER OF DEEDS

Bk 7294 Pg181 #24136
10-31-2007 @ 03:31p

WARRANTY DEED
STATUTORY SHORT FORM
TITLE 33, §775

L. L. BEAN, INC., a Maine corporation, with a mailing address of Casco Street, Freeport, Maine 04033, for consideration paid, grants to **CENTRAL MAINE POWER COMPANY**, a Maine corporation with a mailing address of 83 Edison Drive, Augusta, Maine 04330, **with Warranty Covenants**, a certain lot or parcel of land, situated in the City of Lewiston, County of Androscoggin, and State of Maine, more fully described in Exhibit A, attached hereto and made a part hereof.

MAINE REAL ESTATE
TRANSFER TAX PAID

DATED: October 30, 2007

L. L. BEAN, INC.

By: _____
Name: Robert V. Peixotto
Title: Chief Operations Officer

STATE OF MAINE
COUNTY OF CUMBERLAND

October 30, 2007

Personally appeared the above-named Robert V. Peixotto, Chief Operations Officer of L. L. Bean, Inc. and acknowledged the above instrument to be his free act and deed in his said capacity and the free act and deed of L. L. Bean, Inc.

Before me,

Notary Public/Attorney-at-Law

(Print Name)

DIANE M. CAMPBELL
NOTARY PUBLIC
State of Maine
My Commission Expires Apr. 8, 2013

SEAL

EXHIBIT A

A portion of Parcel II described in a deed to the grantor from the City of Lewiston recorded in the Androscoggin County Registry of Deeds in Book 3600 Page 180, which portion contains approximately 40,646 square feet, and is located to the north and west of the boundary line (described below), to the west and south of Middle Street, and generally to northeast and southeast of the line described in the exception and reservation to the City of Lewiston contained in the description of said Parcel II (hereinafter the "Premises"):

Boundary Line (dividing Parcel II)

The point of beginning of the Boundary Line is located a distance of 112.32 feet N 26° 59' 21" W, by and along the westerly side of Middle Street, from a 5/8 inch rebar capped with AL&H 492 found at the intersection of the westerly line of Middle Street with the northerly line of Lowell Street to a 5/8 inch capped rebar to be set where the westerly side of Middle Street would intersect an extension of the southerly side of a concrete wall if it was extended;

Thence S 60° 39' 13" W, by and along the extension of the southerly side of a concrete wall and said wall, a distance of 152.34 feet to a 5/8 inch capped rebar to be set;

Thence S 72° 05' 20" W, a distance of 120.98 feet to a 5/8 inch capped rebar to be set at the westerly side of the former Chapel Street.

Also conveying, with Quitclaim Covenants as to the description:

The Premises are further described as being a certain lot or parcel of land situated on the westerly side of Middle Street in the City of Lewiston, County of Androscoggin and State of Maine as shown on a Lot Division Plan of L.L. Bean Property, Chapel St., Lowell St., and Middle St. Lewiston Maine for L.L. Bean, Inc. by Sebago Technics, Inc. dated September 5, 2007, Project Number 93282, recorded in the Androscoggin Registry of Deeds ("Registry") on or near the date hereof (the "Plan"), and depicted therein as the "Proposed Lot." Said "Premises" being further bounded and described as follows:

The point of beginning is a 5/8-inch capped rebar to be set at the intersection of the westerly side of Middle Street with a best fit extension of the northwesterly line of a concrete foundation wall at the southeasterly corner of land now or formerly of the City of Lewiston as described in Deed Book 3600, Page 180, and located N 26°-59'-21" W, by and along the westerly side of Middle Street a distance of 272.10 feet from a 5/8-inch rebar capped with AL&H 492 found at the intersection of the westerly line of Middle Street with the northerly line of Lowell Street;

Thence S 63°-00'-06" W, by and along a best fit of the northwesterly line of a concrete foundation wall and an extension of said wall, a distance of 206.02 feet to a 5/8-inch capped rebar to be set;

Thence S 27°-22'-52" E, by and along an extension of the northeasterly line of a second concrete wall and said second concrete wall, a distance of 41.21 feet to the corner of the second concrete wall;

Thence S 62°-12'-26" W, by and along the southeasterly line of the second concrete wall and an extension of said wall, a distance of 30.00 feet to a 5/8-inch capped rebar to be set;

Thence continuing along an extension of said second wall approximately 31 feet to a point on the bank of, but not abutting, the Androscoggin River described as the water in said river when standing at an elevation of five feet above the top of the stone dam also described as the 75.00' elevation as defined in accordance with the datum established by the Union Water Power Company, said 75.00' elevation on the Union Water Power Company datum is stated as being equivalent to 169.50' as measured on the North American Datum of 1929 (NGVD1929) on Subdivision Plan of PJM Realty Corp., Chapel and Main Street, by AL&H Surveyors & Engineers, dated February 15, 1989 and recorded at the Androscoggin County Registry of Deeds in Plan Book 34, Pages 157 and 158;

Thence southerly along the 169.50 foot elevation line near the Androscoggin River approximately 9 feet to the northwesterly extension of the westerly line of the former location of Chapel Street;

Thence S 26°-07'-00" E, by and along the westerly side of the former Chapel Street, a distance of approximately 96 feet to a 5/8-inch capped rebar to be set, said rebar being S 08°-08'-26" E, a distance of 111.25 feet from the last mentioned 5/8-inch capped rebar to be set;

Thence N 72°-05'-20" E, a distance of 120.98 feet to a 5/8-inch capped rebar to be set near the southwesterly end of a concrete wall;

Thence N 60°-39'-13" E, by and along the southerly side of a concrete wall and extensions of said wall a distance of 152.34 feet to the westerly side of Middle Street and a 5/8-inch capped rebar to be set;

Thence N 26°-59'-21" W, by and along the westerly side of Middle Street, a distance of 159.77 feet to the Point of Beginning.

Subject to an easement to the City of Lewiston, Maine for a 15 foot wide sewer easement, Numbered 6-3, and dated February 22, 1974 and recorded in Deed Book 1093, Page 135;

Subject to easement rights reserved by the Franklin Company to build a sewer and flow water across the parcel described above as referenced in Deed Book 199, Page 490;

Subject to public easements and public utility easements which may remain from the City of Lewiston City Council order discontinuing and vacating the northerly portion of

Chapel Street on February 4, 1986, as recorded in Deed Book 1900, Page 122 ("City Easements";

Subject to the riparian rights of others to the Androscoggin River;

Meaning and intending to describe a proposed lot as shown on said Plan and containing approximately 40,646 square feet as shown on said Plan, being a portion of the land conveyed to this grantor in Deed Book 3600, Page 180. Further, in so far as the Plan depicts the boundary line running along the concrete walls which are now located along the line described in the exception and reservation to the City of Lewiston contained in the description of said Parcel II, said depiction is a best fit alignment in the Plan as referenced in Note 10 of the Plan. Grantor therefore hereby releases and quitclaims to Grantee any and all right, title and interest in and to any property which may be located northwesterly of said concrete walls.

Bearing are based upon Grid North.

Also conveying a perpetual twenty-five foot wide easement or right of way across that portion of Grantor's remaining land lying within the discontinued portion of Chapel Street, so called, which discontinued portion is described in the Registry at Book 1900, Page 122 and is identified under surveyor's note 7 (c) in the Plan (the "Discontinued Chapel Street Area"), for ingress, egress and underground transmission and distribution utilities to and from the Premises and land adjoining land currently designated as Tax Map 207, Lot 13 ("City Lot'), upon which lands Grantee intends to build an electrical substation and appurtenant transmission and distribution lines, along with the right to construct, install, maintain, repair, replace, grade, excavate, and fill with respect to said underground utilities, such easement or right of way being further described as beginning at, or near, a capped ¾ inch iron rod, numbered 492, set in the ground at the northwesterly corner of the northerly terminus of Chapel Street, so called, said iron rod also being generally at or near the easterly line of land conveyed to the City of Lewiston by PJM Realty Corp. by deed dated May 23, 1989 and recorded in the Registry of Deeds in Book 2413, Page 67, thence said twenty five foot right of way extending generally north and parallel to the easterly line of said City land but within said Discontinued Chapel Street Area to the westerly side of the Premises. The easement granted herein shall include, without limiting the foregoing, such rights as are necessary and sufficient to meet the municipal requirements for access to the Premises. Without limiting the foregoing, the access easement granted herein across the Discontinued Chapel Street Area is intended, among other things, to give Grantee access from the Premises and the City Lot to Chapel Street and allow Grantee to connect transmission line and distribution lines to its substation to be located on the Premises and/or the City Lot. Grantor shall have the right to reasonably designate the precise location of the easement right of way within the Discontinued Chapel Street Area provided that such location is not inconsistent with the intended purpose of this easement. Grantee shall use reasonable efforts not to unreasonably interfere with Grantor's use of the remaining land, provided that such steps do not defeat the purpose of this easement. The easement granted herein shall be appurtenant to the Premises and the City Lot.

Grantor acknowledges that Grantee may construct an electric substation on the Premises. Grantor hereby covenants and agrees that in the event that it becomes necessary as a part of said construction and at the request of Grantee for the City of Lewiston to relocate certain sewer lines or water lines located in the Discontinued Chapel Street Area, pursuant to the City Easements, Grantor shall not object to said relocation of the sewer lines or water lines within the Discontinued Chapel Street Area.

ANDROSCOGGIN COUNTY
Tina R. Charwood
REGISTER OF DEEDS

EASEMENT DEED

(Transmission Corridor and associated Utility Services Easement
for the Maine Power Reliability Program – Lewiston Loop)

This EASEMENT DEED (this "Easement"), by and between, **BROOKFIELD WHITE PINE HYDRO LLC**, f/k/a FPL Energy Maine Hydro LLC, a Delaware limited liability company with offices located at 26 Katherine Drive, Hallowell, Maine 04347, ("Brookfield") and **CENTRAL MAINE POWER COMPANY**, a Maine corporation with a mailing address of 83 Edison Drive, Kennebec County, Maine 04336 ("CMP"). Brookfield and CMP are sometimes hereinafter referred to individually as a "Party" and together as the "Parties."

WITNESS

Whereas, a Continuing Site/Interconnect Agreement dated January 6, 1998, as amended June 16, 1998 (a Notice of which is dated March 30, 1999 and recorded at the Androscoggin County Registry of Deeds in Book 4202, Page 267) and July 24, 2002 (a Notice of which is dated June 1, 2007 and recorded in Book 7157, Page 286 of the Androscoggin County Registry of Deeds), and as subsequently supplemented and amended effective December 23, 2003, and amended and restated effective as of May 6, 2011 (as assigned and further amended from time to time, the "CSIA"), was originally entered into by and between CMP and NextEra Energy Maine, LLC (fka FPL Energy Maine, Inc., "FPL"),. Brookfield is a party to the CSIA pursuant to a partial assignment of the same by FPL to Brookfield.

Whereas, CMP conveyed to Brookfield (when it was known as FPL Energy Maine Hydro LLC) certain lands and easements located in the City of Lewiston and the City of Auburn by deeds dated April 7, 1999 and recorded in the Androscoggin County Registry of Deeds in Book 4207, Page 1 (the "Lewiston Falls Deed"), and Book 4206, Page 317 (the "Gulf Island Deed") (collectively, the Lewiston Falls Deed and the Gulf Island Deed, being referred to herein as the "Deeds"), CMP having reserved certain easement rights in the Deeds and said conveyances being subject to the provisions of said CSIA; and

Whereas, on January 14, 2013, Brookfield (when it was known as FPL Energy Maine Hydro LLC) and Brookfield Power US Holdings America Co. filed an application with the Federal Energy Regulatory Commission ("FERC") seeking authorization under section 203(a)(1) and (a)(2) of the Federal Power Act (FPA) for the indirect acquisition and disposition of all of the outstanding membership interests of White Pine Hydro Investments, LLC, which indirectly owns FPL Energy Maine Hydro LLC. On February 25, 2013, FERC issued an order authorizing the transaction. *See FPL Energy Maine Hydro LLC, 142 FERC ¶ 62,150 (2013)*; and

Whereas, on May 1, 2013, Brookfield filed formal notification with FERC that, effective May 1, 2013, FPL Energy Maine Hydro LLC changed its name to Brookfield White Pine Hydro LLC; and

Whereas, CMP desires additional easement rights for its business as a public utility including with respect to the upgrading, construction and maintenance of its transmission lines along an existing corridor, portions of which are described in the Deeds, such easements being for (i) the Lewiston Loop portion (the "Lewiston Loop Project") of CMP's Maine Power Reliability Program ("MPRP") and (ii) the relocation of the generator lead for Brookfield's Monty hydroelectric project (FERC license no. 2302; the "Monty Hydro Project") that is occurring as a result of MPRP (the "Generator Lead Project"; together with the Lewiston Loop Project, the "Projects");

Whereas, the additional rights are generally depicted for reference purposes on the sketch sheets attached hereto as Exhibit A, pages 1 through 13, and described more particularly below;

Whereas, the additional easement rights granted herein are provided pursuant to Section 3.2.4 of the CSIA; and,

Whereas, Brookfield is agreeable to conveying such rights under the terms and conditions set forth in the Deeds and this Easement.

Now Therefore, Brookfield, for the mutual covenants contained in the CSIA, grants, conveys and assigns to CMP, its successors and assigns, forever, the perpetual right and easement to erect, bury, construct, maintain, repair, rebuild, respace, replace, operate, patrol and remove energy, fuel and communications transmission and distribution lines consisting of suitable and sufficient poles, towers, pipes, ductbanks and conduits, with sufficient foundations together with wires, cables or lines strung upon, within or extending between the same for the transmission of energy, fuel, and intelligence, together with all necessary fixtures, anchors, guys, crossarms, and other equipment and appurtenances, and for all Utility Services defined in accordance with 33 M.R.S.A. Section 458, over, under and across the following described lands situated in the Cities of Auburn and Lewiston, Androscoggin County, Maine, more particularly described as follows (collectively, the "Easement Areas"):

Easement #1 – a strip of land located northerly of but not adjacent to Switzerland Road in the City of Lewiston, beginning at the southwesterly corner of a strip of land over which CMP has reserved easement rights in the Gulf Island Deed as "Easement One: CMP's Transmission Corridor Easement", Item 3;
thence extending northwest on a line parallel to the southwest line of CMP's 115 kV substation yard as shown on "Detail A" on Sheet 2 of 9 of a set of plans titled "Gulf Island and Deer Rips Project Plan" dated 3-26-1999, and recorded in said Registry beginning at Book 40, Page 126 (the "Gulf Island Plan"), to the intersection with a line that is 100 feet southerly, as measured at a right angle, from the southerly line of a strip of land over which CMP has reserved easement rights in Item 2 in said Easement One in the Gulf Island Deed;
thence continuing westerly over the Androscoggin River on a line 100 feet southerly, as measured at a right angle, from the southerly line of said strip of land described in Item 2 of said Easement One in the Gulf Island Deed to the thread of the Androscoggin River and the Auburn city line;

thence northerly along the Auburn city line to the southerly line of said strip of land described in Item 2 of said Easement One in the Gulf Island Deed;
thence easterly and southeasterly along the southerly line of said strip of land described in Item 2 of said Easement One in the Gulf Island Deed to the northwesterly line of CMP's 115 kV substation yard described above;
thence southwesterly and southeasterly along the line of said CMP's 115 kV substation yard to the strip of land over which CMP has reserved easement rights in Item 3 of said Easement One in the Gulf Island Deed;
thence southwesterly along the westerly line of the strip of land over which CMP has reserved easement rights in Item 3 of said Easement One in the Gulf Island Deed to the point of beginning, containing 1.15 acres, more or less, and shown on said Exhibit A, Page 1 attached to this Easement.

The rights granted, conveyed and assigned to CMP in the areas described above as "Easement #1" include and extend to said Easement #1 the same rights reserved by CMP in the Gulf Island Deed in "Easement Two: CMP's Powerhouse Transmission Easement" and said Easement #1 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Gulf Island Deed and the CSIA. The terms and covenants of this Easement are intended to be consistent with the provisions of the Deeds. To the extent that the terms and covenants of this Easement are inconsistent with the terms set forth in the Deeds, the terms and covenants of this Easement shall control.

Easement #2 – a strip of land located northerly of but not adjacent to the North River Road in the City of Auburn beginning at the thread of the Androscoggin River at the northwesterly corner of Easement #1, above;
thence westerly along the southerly line of a strip of land described in Item 2 of said Easement One in the Gulf Island Deed, above, to the westerly line of land of Brookfield and land now or formerly of Bentley Rathbun;
thence southerly along the line of Brookfield and said Rathbun to a point that is 100 feet southerly, as measured at a right angle, of the southerly line of said strip of land described in Item 2 of said Easement One in the Gulf Island Deed;
thence easterly across land of Brookfield and the Androscoggin River to the thread of the river and the Lewiston city line and the southwesterly corner of Easement #1, above;
thence northerly along the thread of the Androscoggin River and the Lewiston city line to the point of beginning, containing .85 acres, more or less, and shown on said Exhibit A, Page 2 attached to this Easement.

Easement #3 – a triangular shaped parcel of land located easterly of but not adjacent to the North River Road in the City of Auburn bounded on the northwest and southwest by lands now or formerly of said Rathbun and Chris Lewis and being so much of the Brookfield land lying westerly of a line that is 50 feet easterly, as measured at a right angle, of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from an angle point (Structure 57) with coordinates of X (Easting) 2940697.172, Y (Northing) 479593.244;

thence to an angle point (Structure 51) with coordinates of X (Easting) 2941722.303, Y (Northing) 477562.640, containing .4 acres, more or less, and shown on said Exhibit A, Page 3 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #4 – a strip of land 100 feet in width located easterly of but not adjacent to the North River Road in the City of Auburn, being so much of the Brookfield flowage rights as defined by the 216.0-foot contour line, being the project boundary substantially as shown on the Gulf Island Plan, lying 50 feet easterly, as measured at a right angle, and 50 feet westerly, as measured at a right angle, of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from an angle point (Structure 57) with coordinates of X (Easting) 2940697.172, Y (Northing) 479593.244;
thence to an angle point (Structure 51) with coordinates of X (Easting) 2941722.303, Y (Northing) 477562.640;
thence to an angle point (Structure 49) with coordinates of X (Easting) 2942276.252, Y (Northing) 477044.305 , containing .2 acres, more or less, and shown on said Exhibit A, Page 4 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

The rights granted, conveyed and assigned to CMP in Easement #2, Easement #3, and Easement #4 are the same rights as reserved by CMP in the Gulf Island Deed in "Easement One: CMP's Transmission Corridor Easement" and said Easement #2, Easement #3, and Easement #4 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Gulf Island Deed and the CSIA. The terms and covenants of this Easement are intended to be consistent with the provisions of the Deeds. To the extent that the terms and covenants of this Easement are inconsistent with the terms set forth in the Deeds, the terms and covenants of this Easement shall control.

Easement #5 – a strip of land located easterly of but not adjacent to the North River Road in the City of Auburn being so much of the Brookfield land bounded easterly by (*i*) the westerly line of a strip of land over which CMP has reserved easement rights in the Gulf Island Deed as "Easement Two: CMP's Transmission Powerhouse Easement", Item 3, (*ii*) by the northerly, westerly and southerly line of the "Deer Rips Substation Yard" as shown on "Detail "A", Sheet 1 of 9 of the Gulf Island Plan, and (*iii*) the westerly line of a strip of land reserved by CMP in the Gulf Island Deed as "Easement Two: CMP's Transmission Powerhouse Easement", Item 4, and bounded westerly, to the extent of the Brookfield ownership, by a line that is at most 50 feet westerly in some locations and in other locations less than 50 feet , as measured at a right angle, of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from an angle point (Structure 49) with coordinates of X (Easting) 2942276.252, Y (Northing) 477044.305;
thence to an angle point (Structure 46) with coordinates of X (Easting) 2942649.777, Y (Northing) 476060.194;
thence to an angle point (Structure 45) with coordinates of X (Easting) 2942767.757, Y (Northing) 475792.207;

thence to an angle point (Structure 42) with coordinates of X (Easting) 2942824.539, Y (Northing) 474641.900;
thence to an angle point (Structure 41) with coordinates of X (Easting) 2942738.272, Y (Northing) 474350.363;
thence to an angle point (Structure 40) with coordinates of X (Easting) 2942716.125, Y (Northing) 474049.145;
thence to the bisect of an angle point (Structure 39) with coordinates of X (Easting) 2942779.111, Y (Northing) 473810.717;
and being bounded on the north by the north line of land of Brookfield and land now or formerly of Joseph Maloney and being bounded on the south by said bisect of the last described point, above, containing 3.5 acres, more or less, and shown on said Exhibit A, Pages 5 and 6 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #6 – a strip of land located easterly of but not adjacent to the North River Road in the City of Auburn, 15 feet, more or less, in width, lying westerly of a 70-foot wide strip of land over which CMP has reserved easement rights in the Gulf Island Deed as "Easement Two: CMP's Transmission Powerhouse Easement", Item 4 (the "Section 149 Easement"), bounded westerly by a line 50 feet westerly, as measured at a right angle, of a centerline beginning at the bisect of an angle (Structure 39) with coordinates of X (Easting) 2942779.111, Y (Northing) 473810.717;
thence through a point (Structure 38) with coordinates of X (Easting) 2942608.830, Y (Northing) 473471.027 and continuing on the same tangent to the line of land of Brookfield;
and bounded easterly by the Section 149 Easement;
northerly by Easement # 5, above;
and on the south by the southerly line of land of Brookfield and land now or formerly of Maurice and Shirley Keene, being .15 acres, more or less, and shown on said Exhibit A, Page 7 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #7 – a strip of land located easterly of but not adjacent to the North River Road in the City of Auburn, 15 feet, more or less, in width, lying easterly of a 70-foot wide strip of land over which CMP has reserved easement rights in the Gulf Island Deed as "Easement Two: CMP's Transmission Powerhouse Easement", Item 4, bounded easterly by a line 50 feet easterly, as measured at a right angle, of a centerline beginning at an angle point (Structure 40) with coordinates of X (Easting) 2942716.125, Y (Northing)474049.145;
thence to an angle point (Structure 39) with coordinates of X (Easting) 2942779.111, Y (Northing) 473810.717;
thence through a point (Structure 38) with coordinates of X (Easting) 2942608.830, Y (Northing) 473471.027 and continuing on the same tangent to the line of land of Brookfield;
and bounded westerly by the Section 149 Easement;
northerly by lands of Brookfield;
and on the south by the southerly line of land of Brookfield and land now or formerly of Maurice and Shirley Keene being .15 acres, more or less, and shown on said Exhibit A, Page

7 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

The rights granted, conveyed and assigned to CMP in the areas described above include and extend to said Easement #5, Easement #6, and Easement #7 the same rights as reserved by CMP in the Gulf Island Deed in Easement Two: CMP's Powerhouse Transmission Easement. Said Easement #5, Easement #6, and Easement #7 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Gulf Island Deed and the CSIA. The terms and covenants of this Easement are intended to be consistent with the provisions of the Deeds. To the extent that the terms and covenants of this Easement are inconsistent with the terms set forth in the Deeds, the terms and covenants of this Easement shall control.

Easement #8 – two parcels of land adjacent to the Androscoggin River and Bobbin Mill Creek located within a strip100 feet in width located easterly of the North River Road in the City of Auburn being so much of the Brookfield flowage rights lying 50 feet, as measured at a right angle, on either side of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from a point (Structure 26) with coordinates of X (Easting) 2940512.657, Y (Northing) 469554.068; thence to a point (Structure 24) with coordinates of X (Easting) 2940222.906, Y (Northing) 469136.190, each parcel being 15 feet, more or less, in width and lying on either side on CMP's existing easement for Transmission Line Section 149 as described in Easement One: CMP's Transmission Corridor Easement, Item 3 in the Lewiston Falls Deed;
bounded on the north and south by the limits of Brookfield's flowage rights being the 169.50 foot contour line substantially as shown on Sheet 2 of 5 of a set of plans titled "Lewiston Falls Project Plan" dated 3-26-1999 and recorded in said Registry beginning at Book 40, Page 135 (the "Lewiston Falls Plan"), being .04 acres of upland, more or less, and shown on said Exhibit A, Page 8 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #9 – a strip of land 125 feet in width located easterly of the River Road in the City of Auburn, being so much of the Brookfield flowage rights lying 75 feet, as measured at a right angle, on the southerly side of the centerline of CMP's proposed Section 255 transmission line and lying 50 feet, as measured at a right angle, on the northerly side of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from an angle point (Structure 19) with coordinates of X (Easting) 2939324.510, Y (Northing) 467821.890;
thence to an angle point (Structure 17) with coordinates of X (Easting) 2940596.800, Y (Northing) 466742.047;
bounded on the west by the limits of Brookfield's flowage rights being the 169.50 foot contour line substantially as shown on Sheet 2 of 5 of said Lewiston Falls Plan and on the east by the thread of the Androscoggin River and the City of Lewiston, containing .05 acres of upland, more or less, and shown on said Exhibit A, Page 9 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #10 - three parcels of land adjacent to the Androscoggin River located in a strip of land of varying width located southerly of the Veterans' Memorial Bridge in the City of Lewiston, being so much of the Brookfield flowage rights lying 75 feet, as measured at a right angle, on the southerly side of the centerline of CMP's proposed Section 255 transmission line and lying up to as much as 75 feet, as measured at a right angle, on the northerly side of the centerline of CMP's proposed Section 255 transmission line, said centerline defined by a line running from an angle point (Structure 19) with coordinates of X (Easting) 2939324.510, Y (Northing) 467821.890;
thence to an angle point (Structure 17) with coordinates of X (Easting) 2940596.800, Y (Northing) 466742.047;
bounded on the west by the thread of the Androscoggin River and the City of Auburn and on the east by the limits of Brookfield's flowage rights being the 169.50 foot contour line substantially as shown on Sheet 2 of 5 of said Lewiston Falls Project Plan, containing .4 acres of upland, more or less, and shown on said Exhibit A, Page 10 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #11A – a strip of land of varying width located southerly of but not adjacent to the Maine Central Railroad bridge across the Androscoggin River in the City of Auburn and the City of Lewiston being up to 50 feet, as measured at a right angle, from either side of a centerline beginning at an angle structure labeled "NEW 3" with coordinates of X (Easting) 2937879.175, Y (Northing) 462065.963 located on the Auburn side of the Androscoggin River in substantially the current location of Structure 617 of CMP's Section 148, Spare Circuit reserved by CMP in "Easement One: CMP's Transmission Corridor Easement", Item 1 in the Lewiston Falls Deed;
thence easterly across the Androscoggin River to an angle structure labeled "NEW 2" with coordinates of X (Easting) 2938429.132, Y (Northing) 462059.796 located on Fox Island, so called, in substantially the current location of Structure 618 of CMP's said Section 148, Spare Circuit;
thence continuing easterly across the Androscoggin River to a point on the Lewiston side of the Androscoggin River to a structure labeled "NEW 1" with coordinates of X (Easting) 2938938.137, Y (Northing) 462168.855, said point being Structure T4 at CMP's proposed Middle Street Substation,
said strip of varying width bounded on the easterly and westerly ends by the 169.5 foot contour line as shown on Sheet 3 of 5 of a the Lewiston Falls Plan. Said Easement #11A subject to CMP's existing easement rights for Section 148 as described in said Easement One: CMP's transmission Corridor Easement, Item 1 in said Lewiston Falls Deed.

Easement #11B – a strip of land of varying width located between Island Avenue, so called, in the City of Lewiston and CMP's proposed Middle Street substation, beginning at a strip of land over which CMP has reserved easement rights in "Easement One: CMP's Transmission Corridor Easement", Item 1 in the Lewiston Falls Deed and extending easterly across the Androscoggin River to the 169.5 foot contour line as shown on Sheet 3 of 5 of Lewiston Falls Plan, the centerline of said strip being up to 50 feet, as measured at a right angle, either side of a centerline beginning at an angle point (Structure T1, Section 144) with

coordinates of X (Easting) 2938736.661, Y (Northing) 461405.197 at the current location of a steel mono-pole structure labeled "T1, Section 144 on said Lewiston Falls Plan; thence easterly across the Androscoggin River to a structure labeled "New T2" on the Lewiston mainland with coordinates of X (Easting) 2938845.943, Y (Northing) 461782.771 and continuing across another portion of the Androscoggin River to a structure labeled "NEW T3" with coordinates of X (Easting) 2938949.727, Y (Northing) 462144.737 located on land of CMP easterly of said 169.5 foot contour line.

Easement #11A and Easement #11B together containing .45 acres of upland, more or less, and shown on said Exhibit A, Page 11 attached to this Easement. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet.

Easement #12 – A parcel of land located in the City of Lewiston at intersection of Chapel Street Alley and Main Street, bounded on the south by Main Street, on the east by Chapel Street Alley and on the west and north by the project limits of the Lewiston Fall Project as shown on the said Lewiston Falls Plan, containing .1 acres, more or less, and shown on Exhibit A, Page 12 attached to this Easement.

The rights granted, conveyed and assigned to CMP in the areas described above include and extend to said Easement #8, Easement #9, Easement #10, Easement #11A, Easement #11B and Easement #12 the same rights as reserved by CMP in the Lewiston Falls Deed in Easement One: CMP's Transmission Corridor Easement and said Easement #8, Easement #9, Easement #10, Easement #11A, Easement #11B and Easement #12 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Lewiston Falls Deed and the CSIA. The terms and covenants of this Easement are intended to be consistent with the provisions of the Deeds. To the extent that the terms and covenants of this Easement are inconsistent with the terms set forth in the Deeds, the terms and covenants of this Easement shall control.

Easement # 13 – A fifty-foot wide easement for ingress and egress over land of Brookfield located northerly of, but not adjacent to, the Deer Rips Access Road in the City of Auburn, being so much of Brookfield's land lying within twenty-five feet of a centerline described as follows: Beginning at a point on the western line of Brookfield land, said point being twenty-five feet southerly of a stone bound marking an angle in said westerly line and also being one-hundred and seventy feet, more or less, easterly of Structure 47 described herein; thence easterly one-hundred and fifty feet, more or less, to a curve to the right; thence southwesterly and southerly five-hundred and forty feet, more or less, to the easterly line of CMP's existing transmission line easement for Section 45 and 46, containing 0.9 acres, more or less, and being as shown on Exhibit A, Page 13, attached to this Easement. The rights granted in this Easement #13 shall be the same rights reserved by CMP in the Gulf Island Deed in Easement 8: Access Ways Easement and said Easement #13 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Gulf Island Deed and the CSIA except that Brookfield shall have no obligation to maintain (including snow removal), repair or replace any roadway or improvements of

any kind or nature made by or through CMP within the limits of said Easement #13. CMP shall have the responsibility, but not the obligation, to maintain, repair or replace any roadway or improvement of any kind or nature made by or through CMP within the limits of said Easement #13.

Easement #14 – A strip of land of varying width located easterly of the North River Road in the City of Auburn being up to 12.5 feet, as measured at a right angle, from either side of a centerline beginning at CMP's Deer Rips Substation and extending northerly and westerly to North River Road, said centerline described as follows: Beginning at CMP's Deer Rips Substation; thence to Structure 1 located within CMP's easement for Section 255 with coordinates of X (Easting) 2942751.506, Y (Northing) 474535.785; thence northerly to Structure 2 with coordinates of X (Easting) 2942750.574, Y (Northing) 474680.930; thence northerly to Structure 3 with coordinates of X (Easting) 2942712.502, Y (Northing) 474812.539; thence northerly to Structure 4 with coordinates of X (Easting) 2942716.540, Y (Northing) 474901.521; thence westerly to Structure 5 with coordinates of X (Easting) 2942638.180, Y (Northing) 474946.237; thence northwesterly along the southerly side of the Deer Rips Access Road to Structure 14 near North River Road with coordinates of X (Easting) 2941373.886, Y (Northing) 475384.311; thence northerly across Deer Rips Access Road to Structure 14S located on land of others with coordinates of X (Easting) 2941360.795, Y (Northing) 475451.150; also the following two areas, both being up to 12.5 feet wide, as measured at a right angle, from either side of their respective centerlines; (i) Beginning at Structure 4, described above; thence northeasterly to the Section 255 easement, said centerline passing through Structure 4S with coordinates of X (Easting) 2942751.944, Y (Northing) 474946.185; and (ii) Beginning at Structure 14, described above, and continuing northwesterly to North River Road, the centerline being a continuation of the line from Structure 5, described above, to said Structure 14, all being as shown on Exhibit A, Page 14, attached to this Easement and having a total area of 1.4 acres, more or less. Coordinates in Maine State Plane West, NAD 83 Coordinate System, US Survey Feet. The rights granted in this Easement # 14 shall be the same rights reserved by CMP in the Gulf Island Deed in Easement Three: Utility Easement and said Easement #14 shall be subject to all of the terms, conditions and covenants by and between Brookfield and CMP as set forth in the Gulf Island Deed and the CSIA. Notwithstanding any of the foregoing, CMP agrees that the maintenance, repair, and replacement of buildings, structures and improvements to the extent currently existing and substantially as currently located as of the date of this Easement shall not be prohibited under this paragraph.

Brookfield also grants, conveys and assigns to CMP (A) the same rights in Easement # 1 to Easement #7 and Easement #14 as reserved by CMP in the Gulf Island Deed in Easement Four: Vegetation Control, in Easement Eight: Access Ways Easement, and in Easement Nine: Stormwater Drainage, and (B) the same rights in Easement # 8 to Easement #12 as reserved by CMP in the Lewiston Falls Deed in Easement Four: Vegetation Control, Easement Eleven: Access Ways Easement, and Easement Thirteen: Stormwater Drainage, said rights and easements also being set forth in the Deeds and are herein extended to the additional Easement Areas described above. The terms and covenants of this Easement are intended to be consistent with the provisions of the Deeds. To the extent that the terms and covenants of this Easement

are inconsistent with the terms set forth in the Deeds, the terms and covenants of this Easement shall control.

Brookfield makes no representation or warranties to CMP as to the ownership or state of title of the Easement Areas and the easement rights conveyed herein are only to the extent of Brookfield's interest in the Easement Areas. CMP shall perform its own due diligence to determine whether the consent of any additional Parties are necessary to obtain the easement rights over the Easement Areas.

Brookfield reserves the right to use the Easement Areas for any use not inconsistent with this Easement including, without limitation, any use in connection with the operation, maintenance, and repair of the Projects.

In the event of an inconsistency in the Easement Areas legally described in this Easement and the Easement Areas depicted as cross hatched on Exhibit A attached to this Easement, the location of the Easement Areas as shown on Exhibit A shall control and the Parties agree to execute such corrective documents as necessary to ensure the legal descriptions of the Easement Areas conform with the location of the Easement Areas as shown on Exhibit A.

COVENANTS

CMP and Brookfield, acknowledge that the Easement Areas are a portion of the land subject to a license issued by FERC for the Lewiston Falls Project No. 2302 and Gulf Island, Deer Rips, and Androscoggin 3 Project No. 2283 (hereinafter the "Projects" or "Project"), which Projects are subject to the terms and conditions of the licenses for such Projects (collectively, the "FERC License"), any amendments thereto or renewals and to such orders as may be issued by FERC from time to time. CMP and Brookfield agree that the Easement Areas conveyed herein are subject to the terms and conditions of the FERC License and the following covenants:

i. That the use of the Easement Areas shall not endanger health, create a nuisance, or otherwise be incompatible with overall FERC Project No. 2302 and FERC Project No. 2283 recreational use;
ii. That CMP shall take all reasonable precautions to insure that the construction, operation and maintenance of the structures or facilities permitted under this Easement will occur in a manner that will protect the scenic, recreational and environmental values of the Projects and further shall assume full responsibility for any discharges into the Project system; and
iii. That CMP shall not unduly restrict public access to Project Waters (as defined in the FERC License).

The Parties hereby acknowledge, covenant and agree that (i) the terms and limitations of the CSIA define certain continuing responsibilities and obligations of the Parties with respect to the use of and access to the other Party's property, assets and facilities, including but not limited to, the Easement Areas, (ii) to the extent applicable, the terms and

conditions of the CSIA are incorporated by reference and shall be given full force and effect and intended to apply to all easements granted herein notwithstanding any provision to the contrary in this Easement, and (iii) the terms of the CSIA and this Easement shall be construed such that all of the terms of the CSIA and this Easement shall be given full force and effect to the greatest extent possible.

Except as otherwise specifically provided in this Easement, to the extent that any of the terms of the CSIA are directly inconsistent with any of the terms of this Easement, the terms of the CSIA shall control. For the purposes of this Easement, terms of the CSIA and this Easement shall be deemed "directly inconsistent" if giving full effect to such terms would be impossible, illogical, or absurd.

In addition to the above covenants and agreements, CMP further covenants and agrees as follows:

CMP shall keep the Easement Areas free of any and all mechanics', material suppliers', and other liens arising out of any work, labor done, services performed, or materials furnished for CMP or its contractors or consultants or claimed to have been furnished for CMP or its contractors or consultants;

As soon as practicable, CMP shall notify Brookfield and be responsible for the cleanup of any spills or discharges of any toxic, special or hazardous, substances, wastes or materials onto Project Lands or Waters (as defined in the FERC License) as a result of activities associated with the construction, removal, reconstruction or maintenance of the facilities, slope and drainage easements, and any other facilities installed by or on behalf of CMP within the Easement Areas,

Except as expressly permitted and in accordance with the CSIA, that CMP will not, in the exercise of its rights under this Easement, interfere with Project operations nor interfere with or claim any damages associated with CMP's use of any of Brookfield's rights, including without limitation water and flowage rights; and

Notwithstanding any provision contained in this Easement, Brookfield, its successors and assigns, shall have the right to perform any and all acts required by an order or other directive of FERC or its successor affecting the Projects, without the prior approval of any Party to this Easement or any other person.

References to Brookfield and CMP herein shall include their respective successors, executors, affiliates or assigns.

[Signature Page Follows]

IN WITNESS WHEREOF, the said BROOKFIELD WHITE PINE HYDRO LLC has caused its duly authorized representative to sign this Easement and affix its corporate seal hereto this 6th day of November, 2014.

BROOKFIELD WHITE PINE HYDRO LLC,
a Delaware limited liability company

By: C. Todd Wynn
C. Todd Wynn
Vice President – Northeast Operations

STATE OF MAINE

November 6th, 2014

Kennebec County, ss:

The above named C. Todd Wynn, Vice President – Northeast Operations personally appeared before me and acknowledged the above instrument to be his free act and deed in his said capacity and the free act and deed of said corporation.

Tonya Robert
Notary Public/Maine Attorney at Law
Printed Name
My commission expires:

TONYA ROBERT
Notary Public-Maine
My Commission Expires
December 21, 2019

SEAL

CMP'S ACCEPTANCE

The said Central Maine Power Company hereby acknowledges its acceptance of the Easement Deed and its agreement to the terms, conditions and provisions set forth therein and has caused this instrument to be executed by Eric N. Stinneford, Vice President – Treasurer, Controller & Clerk, this 14th day of November, 2014.

CENTRAL MAINE POWER COMPANY

By: _____
Eric N. Stinneford
Vice President – Treasurer, Controller & Clerk

STATE OF MAINE
Kennebec, ss:

November 14, 2014

The above named Eric N. Stinneford, Vice President – Treasurer, Controller & Clerk, personally appeared before me and acknowledged the above instrument to be his/her free act and deed in his/her said capacity and the free act and deed of said corporation.

Rhonda C. Gillespie
Notary Public
Printed Name: Rhonda C. Gillespie

SEAL

RHONDA C. GILLESPIE
NOTARY PUBLIC
State of Maine
My Commission Expires June 6, 2019

CMP'S ACCEPTANCE

The said Central Maine Power Company hereby acknowledges its acceptance of the Easement Deed and its agreement to the terms, conditions and provisions set forth therein and has caused this instrument to be executed by Douglas Herling, Vice President – Special Projects, this 17th day of November, 2014.

CENTRAL MAINE POWER COMPANY

By: _____
Douglas Herling
Vice President – Special Projects

STATE OF MAINE
Kennebec, ss:

November 17, 2014

The above named Douglas Herling, Vice President – Special Projects, personally appeared before me and acknowledged the above instrument to be his/her free act and deed in his/her said capacity and the free act and deed of said corporation.

_____
Notary Public
Printed Name: Rhonda C. Gillespie

RHONDA C. GILLESPIE
NOTARY PUBLIC
State of Maine
My Commission Expires June 6, 2019

SEAL

7193153.1

Bk 9031 Pg134 #19465
11-07-2014 @ 12:14p

QUITCLAIM DEED WITH COVENANTS

THE CITY OF LEWISTON, a body politic and corporate situated in Androscoggin County, Maine, with a mailing address is 27 Pine Street, Lewiston, Maine 04240 FOR CONSIDERATION PAID, grants to **CENTRAL MAINE POWER COMPANY,** a corporation organized under the laws of the State of Maine, with a mailing address of 83 Edison Drive, Augusta, Maine 04336, WITH QUITCLAIM COVENANTS the following described real property located in the City of Lewiston, County of Androscoggin, State of Maine

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

MAINE REAL ESTATE
TRANSFER TAX PAID

IN WITNESS WHEREOF, the City of Lewiston has caused this instrument to be executed by Edward A. Barrett, its duly authorized City Administrator this 23rd day of October, 2014.

CITY OF LEWISTON

By: _____
Edward A. Barrett
Its: City Administrator

State of Maine
County of Androscoggin, ss

October 23, 2014

The above-named Edward A. Barrett, City Administrator of the City of Lewiston, personally appeared before me and acknowledged the foregoing instrument to be his free act and deed and the free act and deed of the City of Lewiston.

Before me, _____
Notary Public/Attorney
Name:
My Commission Expires: _____

CATHERINE L. LEKBERG
Notary Public, Maine
My Commission Expires February 5, 2018

SEAL

EXHIBIT A

A certain lot or parcel of land situated on the westerly side of Middle Street in the City of Lewiston, County of Androscoggin and State of Maine, bounded and described as follows to wit:

Beginning on the westerly sideline of Middle Street at a point marked by a ¾" iron rebar found at the southeasterly corner of land conveyed to Lucien H. Clavet and Lauretta E. Clavet by a deed dated July 9, 2002, and recorded in the Androscoggin County Registry of Deeds in Book 5049 Page 064;

Thence, southerly on a course of S 26°-24'-49" E along the westerly sideline of Middle Street a distance of sixty-eight and thirty-eight hundredths (68.38) feet to a point marked by a 5/8" iron rebar with survey cap #2117 found at the northeasterly corner of land conveyed to Central Maine Power Company by a deed dated October 30, 2007, and recorded in the Androscoggin County Registry of Deeds in Book 7294 Page 181;

Thence, westerly on a course of S 63°-50'-40" W along the northerly line of land of Central Maine Power a distance of two hundred six and three hundredths (206.03) feet to a point marked by a 5/8" iron rebar found;

Thence, southerly on a course of S 26°-09'-20" E along the westerly line of land of Central Maine Power a distance of forty-one and twenty-one hundredths (41.21) feet to an unmonumented point;

Thence, westerly on a course of S 63°-06'-10" W along the northerly line of land of Central Maine Power a distance of fifty-seven and forty-three hundredths (57.43) feet to an unmonumented point located at the 169.5' contour (NGVD29 Datum), being the easterly line of land conveyed to Brookfield White Pine Hydro (reference a deed dated April 5, 1999, and recorded in the Androscoggin County Registry of Deeds in Book 4207 Page 001);

Thence, northerly along the 169.5' contour, being the easterly line of land of Brookfield, a distance of one hundred fifty-one and sixteen hundredths (151.16) feet, having a chord distance of one hundred forty-five and eight hundredths (145.08) feet on a course of N 28°-08'-12" W, to an unmonumented point located on the easterly line of land conveyed to Franklin Property Trust by a deed dated September 10, 1976, and recorded in the Androscoggin County Registry of Deeds in Book 1226 Page 330;

Thence, northerly on a course of N 25°-23'-35" W along the easterly line of land of Franklin Property Trust a distance of eighty-six and twenty-one hundredths (86.21) feet to an unmonumented point;

Thence, easterly on a course of N 64°-38'-41" E along the southerly line of land of Franklin Property Trust a distance of fifty and thirty hundredths (50.30) feet to an unmonumented point located on the southwesterly line of land conveyed to CMP by a deed dated November 2, 2011, and recorded in the Androscoggin County Registry of Deeds in Book 8274 Page 262;

Poor Copy At Time Of Recording
Will Not Reproduce Clearly

Thence, southeasterly on a course of S 54°-34'-27" E along the southwesterly line of land of CMP a distance of ninety-seven and zero hundredths (97.00) feet to a point marked by a ¾" iron rebar with survey cap #482 found;

Thence, easterly on a counterclockwise curve to the left having a radius of two thousand twenty-four and nineteen hundredths (2,024.19) feet and having a chord distance of one hundred seventy-four and nine hundredths (174.09) feet on a course of N 75°-23'-35" E and an arc length of one hundred seventy-four and fourteen hundredths (174.14) feet to the point and place of beginning. Containing 31,417.79 square feet (0.721 acres) of land, more or less.

Reserving a utility easement 15' in width for the purpose of maintaining, repairing or replacing an existing sewer line leading over the westerly portion of the herein conveyed parcel of land, the centerline of the said easement is more particularly described as follows to wit:

Beginning at an unmonumented point depicted as Point A on the referenced plat below, located on the easterly line of land as conveyed to Franklin Property Trust by a deed dated September 10, 1976, and recorded in the Androscoggin County Registry of Deeds in Book 1226 Page 330, said point being located on a course of S 25°-23'-35" E from an unmonumented point located at northwesterly corner of the herein described parcel of land;

Thence, southeasterly and southerly on the following two courses:

S 53°-42'-17" E sixty-six and eleven hundredths (66.11) feet;

S 23°-42'-03" E one hundred thirty-four and seventy-one hundredths (134.71) feet to a point located on the northerly line of land conveyed to CMP by a deed dated October 30, 2007, and recorded in the Androscoggin County Registry of Deeds in Book 7294 Page 181, said point depicted as Point B on reference plat below, being on a course of S 63°-06'-10" W along the northerly line of land of CMP a distance of seven and one hundredth (7.01) feet from a ¾" iron rebar with survey cap #2117 found;

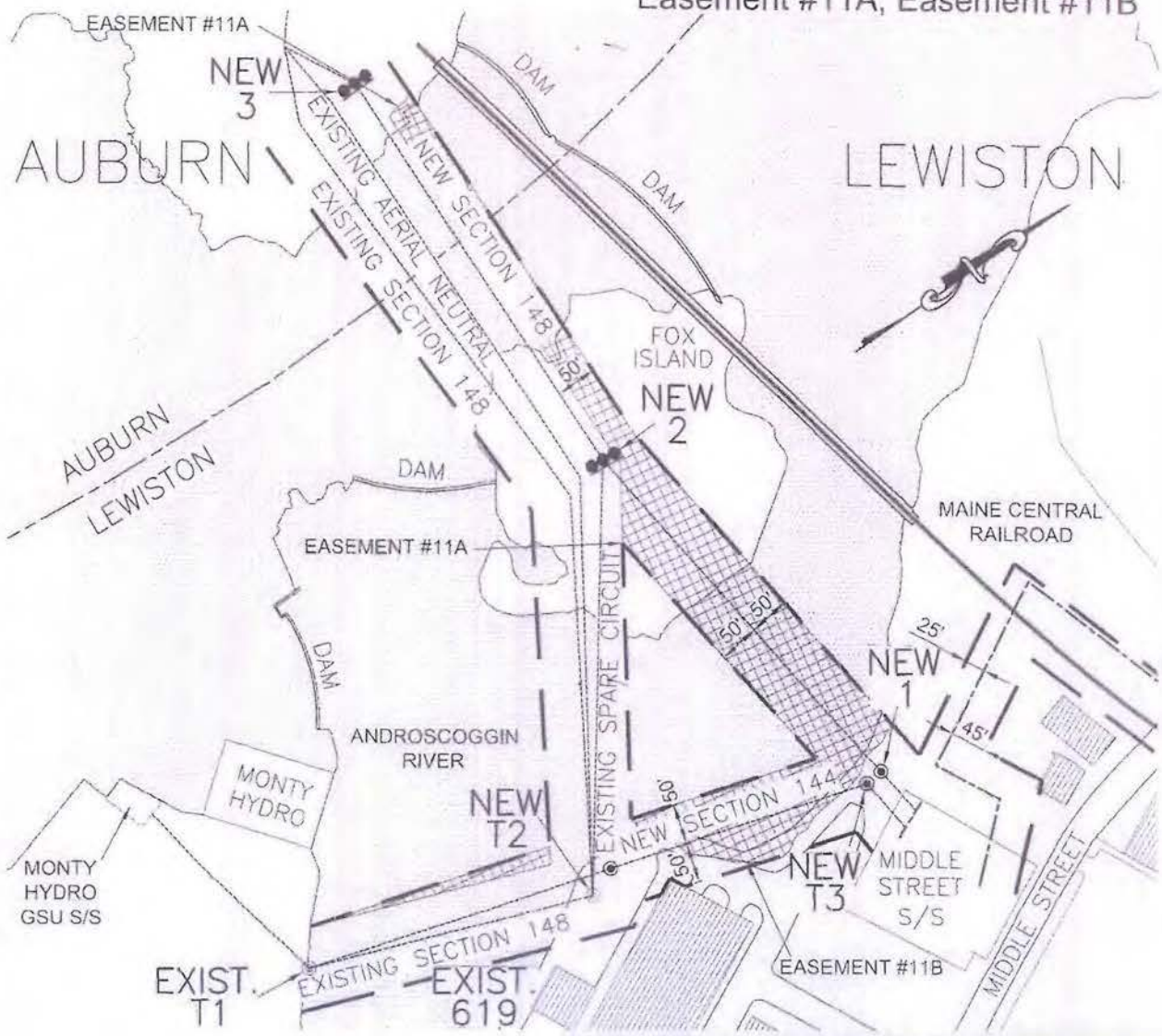
Bearings are referenced to Grid North.

Reference can be made to a plat entitled "Boundary Survey Prepared For the Acquisition of Land By: Central Maine Power Company from: City of Lewiston", dated October 15, 2014, as prepared by Sackett & Brake Survey, Inc., Project Number 2014182, to be recorded in the Androscoggin County Registry of Deeds.

ANDROSCOGGIN COUNTY
TINA M CHOUINARD
REGISTER OF DEEDS

Exhibit A, Page 11

Easement #11A, Easement #11B



STR. #	X EASTING (FT.)	Y NORTHING (FT.)
EXIST. T1	2938736.661	461405.197
NEW T2	2938845.943	461782.771
NEW T3	2938949.727	462144.737
NEW 1	2938938.137	462168.855
NEW 2	2938429.132	462059.796
NEW 3	2937879.175	462065.963

EASEMENT #11 INFORMATION

APPROX. 0.45 ACRES +/-

EASEMENT #11 INCLUDES ALL AREAS ON MAINLAND BELOW BROOKEFIELD FLOWAGE RIGHTS OF ELEV. 169.5' EASEMENT AREA EXTENDS ACROSS ANDROSCOGGIN RIVER.

SKETCH DOES NOT REPRESENT A SURVEY.

SKETCH TO ACCOMPANY DESCRIPTIONS OF EASEMENTS.

EXISTING EASEMENT WIDTH OVER RIVER NOT SHOWN ON PLANS OR MENTIONED IN DEEDS.

EXISTING EASEMENT WIDTH OVER RIVER ASSUMED 50' EITHER DIRECTION FROM CENTER CONDUCTOR PER CMP T-56 STANDARDS.

CADD Drawing, DO NOT REVISE MANUALLY.

REFERENCE DRAWING	DESCRIPTION

CENTRAL MAINE POWER CO.
IBERDROLA USA

IUSA ENGINEERING

SECTIONS 144 & 148
EASEMENT #11 SKETCH
LARRABEE ROAD S/S TO MIDDLE STREET S/S

REV.	DATE	BY	DESCRIPTION	APP.
8	8/01/14	TRC	Re-Issued Final	TRC
7	4/02/14	TRC	Re-Issued Final	TRC
6	3/26/14	TRC	Re-Issued For Review	TRC

DR. BAF/TRC
CK. CRP/TRC
APP.
DATE: 11/13/12
FILE:
NO. 155636-SK29-SH11
SCALE: 1"=200'
REV. 8

EXHIBIT 8
DEP - Natural Resources Protection Act Permit

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

July 2015

Central Maine Power Company
Attn: Gerry Mirabile
83 Edison Drive
Augusta, ME 04336

RE: Natural Resources Protection Act Application, Lewiston, DEP #L-25129-2F-G-N

Dear Mr. Mirabile:

Please find enclosed a signed copy of your Department of Environmental Protection land use permit. You will note that the permit includes a description of your project, findings of fact that relate to the approval criteria the Department used in evaluating your project, and conditions that are based on those findings and the particulars of your project. Please take several moments to read your permit carefully, paying particular attention to the conditions of the approval. The Department reviews every application thoroughly and strives to formulate reasonable conditions of approval within the context of the Department's environmental laws. You will also find attached some materials that describe the Department's appeal procedures for your information.

If you have any questions about the permit or thoughts on how the Department processed this application please get in touch with me directly. I can be reached at (207) 446-1586 or at beth.callahan@maine.gov.

Sincerely,

Beth Callahan

Beth Callahan, Project Manager
Division of Land Resource Regulation
Bureau of Land & Water Quality

Pc: File

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

web site: www.maine.gov/dep

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY	) NATURAL RESOURCES PROTECTION ACT
Lewiston, Androscoggin County	) ADJACENCY TO PROTECTED RESOURCE
LEWISTON LOOP MODIFICATIONS	) WATER QUALITY CERTIFICATION
L-25129-2F-G-N (approval)	) FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S.A. Sections 480-A et seq. and Section 401 of the Federal Water Pollution Control Act, the Department of Environmental Protection has considered the application of CENTRAL MAINE POWER COMPANY with the supportive data and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. History of Project: In Department Order #L-25129-TF-A-N/L-25129-VP-B-N, dated March 2, 2011, the Department approved the construction of a new 115 kV transmission line in two sections, known as Section 255 and Section 256, and the construction of a new substation, known as Middle Street Substation. Construction of the transmission lines and the substation is collectively known as the Lewiston Loop project. Subsequent to original issuance, the Department approved several other modifications, which include modification of the applicant's compensation plan from preservation of land to a contribution into the In-lieu-fee Program for impacts to a Significant Vernal Pool habitat, realignment of a portion of Section 255, construction of additional off-site access to pole structures, construction of in-corridor access to pole structures, and vegetation removal within the transmission line corridor. Section 255 originates at the Middle Street Substation in the City of Lewiston, passes through the City of Auburn, and terminates at the Gulf Island Substation in the City of Lewiston. Section 256 originates at the Middle Street Substation and terminates at the Lewiston Lower Substation, all within the City of Lewiston.

B. Summary: The applicant proposes to incorporate and re-align two transmission lines, Sections 144 and 148, into the Lewiston Loop project, modify the Middle Street Substation yard footprint, re-locate two Section 255 pole structures, re-design two Section 255 pole structures, and widen the Section 255 transmission line corridor. The proposed project can be seen on a set of plans, the first of which is entitled "Grading Plan", prepared by TRC and dated October 13, 2010. The proposed modifications are located in the City of Lewiston. The specific components of the proposed project are discussed in more detail as follows:

Section 144. The applicant proposes to re-align Section 144 to connect the Monty Hydro facility with Middle Street Substation, rather than its current origination point at Lewiston Steam Substation. To achieve the proposed re-alignment, one single pole

structure will be re-located (144-2) and one new single pole structure (144-3) will be constructed to bring the transmission conductors into the Middle Street Substation at right angles. The pole structures will be constructed approximately 40 feet and 27 feet, respectively, from the Androscoggin River.

Section 148. The applicant proposes to re-align Section 148 to connect Great Falls Substation with Middle Street Substation, rather than its current origination point at Lewiston Steam Substation. To achieve the proposed re-alignment, one new single pole structure (148-1) will be constructed and one H-frame pole structure will be re-located (148-2) to direct the transmission conductor between substations. The pole structures will be constructed approximately 25 feet from the Androscoggin River, and approximately 10,740-square feet of capable upland vegetation within 75 feet of the river will be cleared as a result of the Section 148 re-alignment.

Middle Street Substation. The applicant proposes to modify the previously permitted design of the substation yard by replacing riprap along the substation sideslopes with retaining walls. This modification will occur within the previously permitted substation footprint and cause no direct impact to a protected natural resource.

Section 255. The applicant proposes to alter the location and design of the four pole structures. Single pole structures 1 and 2 will be re-located to accommodate dead end structures within Middle Street Substation and single pole structures 7 and 8 will be replaced with shorter, wider H-frame structures to accommodate medical helicopter flights from a nearby hospital. The applicant further proposes to expand the transmission line corridor between Structures 6 and 12 an additional 150 feet in width to provide a safety setback for the new, wider Structures 7 and 8 and for the trimming of overhanging trees and removal of danger trees. The proposed modifications to Section 255 will cause no direct impact to a protected natural resource and the closest pole structure (2) will be located approximately 90 feet from the river.

The applicant does not propose any modifications to the Section 256 transmission line.

C. Current Use of the Site: The proposed project is co-located within an existing transmission corridor. Portions of the transmission line corridor are surrounded by a mix of urban development and rural residential areas. Other portions of the corridor are wooded or follow an existing railroad corridor.

2. EXISTING SCENIC, AESTHETIC, RECREATIONAL OR NAVIGATIONAL USES:

In accordance with Chapter 315, Assessing and Mitigating Impacts to Scenic and Aesthetic Uses, the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix A to the application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project and aerial photographs of the project site. Department staff previously visited the project site on January 31, 2011 during its original review of the project.

The proposed project is located adjacent to the Androscoggin River, which is a scenic resource visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities. Some upland vegetation adjacent to the river will be removed. The proposed project will be located within portions of an existing transmission line corridor and substation yard. The proposed project is primarily surrounded by a mix of industrial development and urban residential areas, and a portion of the project is parallel to a railroad corridor. Large stands of vegetation will remain in these areas to obscure views of the corridor from roads and protected natural resources.

The proposed project was evaluated using the Department's Visual Impact Assessment Matrix and was found to have an acceptable potential visual impact rating. Based on the information submitted in the application, the site visit, and the visual impact rating, the Department determined that the location and scale of the proposed activity is compatible with the existing visual quality and landscape characteristics found within the viewshed of the scenic resource in the project area.

The Department did not identify any issues involving existing recreational and navigational uses.

The Department finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the protected natural resource.

3. SOIL EROSION:

The proposed project will be constructed utilizing the same previously permitted erosion and sedimentation control plan which will be implemented for the construction of the overall Lewiston Loop project. This plan is detailed in a document titled, "Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects," which was developed by the applicant and is based on the Department's Best Management Practices manual titled, "Maine Erosion and Sediment Control BMPs," (March 2003). The erosion and sediment control plan includes measures to minimize the extent and duration of soil disturbance, preserve the integrity of environmentally sensitive areas, and maintain existing water quality. This is primarily achieved through sediment barriers, water diversions, seeding of exposed areas, mulching and slope stabilization, routine inspections during construction, and post-construction restoration monitoring.

The Department's Division of Land Resource Regulation previously reviewed the applicant's erosion and sedimentation control plan and construction plan and did not identify any issues or concerns with the applicant's plan.

The Department finds that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

4. HABITAT CONSIDERATIONS:

According to the Department's Geographic Information System database, there are no mapped Essential or Significant Wildlife Habitats located at the site. As part of the proposed project, some upland vegetation adjacent to the Androscoggin River will be removed.

As described in Department Order #L-25129-TF-A-N/L-25129-VP-B-N, the applicant states that a 25-foot riparian buffer shall remain undisturbed on all waterbodies. Herbicide treatment, mixing, and storage along with vehicle maintenance, refueling, and storage will be strictly prohibited within the buffer.

The Department finds that the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

5. WATER QUALITY CONSIDERATIONS:

The erosion control plan referenced in Finding 3 includes measures to protect water quality during project construction. The applicant does not propose any in-water work or direct impact to a waterbody.

The Department does not anticipate that the proposed project will violate any state water quality law, including those governing the classification of the State's waters.

6. WETLANDS AND WATERBODIES PROTECTION RULES:

The applicant proposes to place transmission line pole structures and clear 10,740-square feet of capable upland vegetation within 75 feet of the Androscoggin River.

The Wetland and Waterbodies Protection Rules, 06-096 CMR 310, interpret and elaborate on the Natural Resources Protection Act (NRPA) criteria for obtaining a permit. The rules guide the Department in its determination of whether a project's impacts would be unreasonable. A proposed project would generally be found to be unreasonable if it would cause a loss in wetland area, functions and values and there is a practicable alternative to the project that would be less damaging to the environment. Each application for a NRPA permit that involves an activity adjacent to a protected natural resource must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist.

A. Avoidance. No activity may be permitted if there is a practicable alternative to the project that would be less damaging to the environment. The applicant submitted an alternatives analysis for the proposed project completed by TRC and dated June 22, 2014. The purpose of the project is to eliminate the need for the Lewiston Steam Substation by transferring electrical service to the Middle Street Substation, to address electrical safety

issues concerns, and to provide a safe flight path for medical helicopters. The applicant considered several alternatives to the proposed project including a no-action approach and creation of a double circuit between Section 144 and Section 148. The applicant stated that a no-action approach would not achieve the overall purpose of the project and would not allow the applicant to maintain connection from the Monty Hydro facility and Great Falls substation to its transmission system. Further, creation of a double circuit would require an increase of pole structure height resulting in potential safety hazards for helicopter flight paths to a nearby hospital. In light of these considerations, the applicant stated that there is no other practicable alternative to the proposed project.

B. Minimal Alteration. The amount of natural resource to be altered must be kept to the minimum amount necessary for meeting the overall purpose of the project. The applicant designed the proposed project to avoid direct impact to the Androscoggin River and to minimize soil disturbance adjacent to the river to areas necessary to reduce safety and stability risks and for widening of the existing corridor. As discussed in Finding 3, the applicant intends to implement several measures to minimize soil disturbance. The scope of the proposed project has been designed by the applicant to minimize impacts to the resource to the extent practicable.

C. Compensation. In accordance with Chapter 310 Section 5(C)(6)(a), compensation is not required to achieve the goal of no net loss of wetland or waterbody functions and values since the project will not result in fill in the resource. For this reason, the Department determined that compensation is not required.

The Department finds that the applicant has avoided and minimized wetland and waterbody impacts to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project.

7. OTHER CONSIDERATIONS:

The Department did not identify any other issues involving existing scenic, aesthetic, or navigational uses, soil erosion, habitat or fisheries, the natural transfer of soil, natural flow of water, water quality, or flooding.

All other findings of fact, conclusions and conditions remain as approved in Department Order #L-25129-TF-A-N/L-25129-VP-B-N and subsequent Orders.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S.A. Sections 480-A et seq. and Section 401 of the Federal Water Pollution Control Act:

A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.

B. The proposed activity will not cause unreasonable erosion of soil or sediment.

C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life.

E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.

F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.

G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.

H. The proposed activity is not on or adjacent to a sand dune.

I. The proposed activity is not on an outstanding river segment as noted in Title 38 M.R.S.A. Section 480-P.

THEREFORE, the Department APPROVES the above noted application of CENTRAL MAINE POWER COMPANY to make several improvements to the Lewiston Loop project as described in Finding 1, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

1. Standard Conditions of Approval, a copy attached.

2. The applicant shall take all necessary measures to ensure that its activities or those of its agents do not result in measurable erosion of soil on the site during the construction of the project covered by this approval.

3. Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

4. All other Findings of Fact, Conclusions and Conditions remain as approved in Department Order #L-25129-TF-A-N/L-25129-VP-B-N, and subsequent Orders, and are incorporated herein.

THIS APPROVAL DOES NOT CONSTITUTE OR SUBSTITUTE FOR ANY OTHER REQUIRED STATE, FEDERAL OR LOCAL APPROVALS NOR DOES IT VERIFY COMPLIANCE WITH ANY APPLICABLE SHORELAND ZONING ORDINANCES.

DONE AND DATED IN AUGUSTA, MAINE, THIS 6TH DAY OF JULY, 2015.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Mark R Bergeron
For: Patricia W. Aho, Commissioner

Filed
JUL 07 2015
State of Maine
Board of Environmental Protection

PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES...

BC/L25129GN/ATS#79092

Natural Resources Protection Act (NRPA)
Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCE PROTECTION ACT, TITLE 38, M.R.S.A. SECTION 480-A ET.SEQ. UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

C. Erosion Control. The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.

D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.

E. Time frame for approvals. If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.

F. No Construction Equipment Below High Water. No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.

G. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.

H. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.

DEP INFORMATION SHEET
Appealing a Department Licensing Decision

Dated: March 2012 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's ("DEP") Commissioner: (1) in an administrative process before the Board of Environmental Protection ("Board"); or (2) in a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S.A. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S.A. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S.A. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This INFORMATION SHEET, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S.A. §§ 341-D(4) & 346, the *Maine Administrative Procedure Act*, 5 M.R.S.A. § 11001, and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 CMR 2 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days of the date on which the Commissioner's decision was filed with the Board will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by the Board's receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner a copy of the appeal documents and if the person appealing is not the applicant in the license proceeding at issue the applicant must also be sent a copy of the appeal documents. All of the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time submitted:

1. *Aggrieved Status.* The appeal must explain how the person filing the appeal has standing to maintain an appeal. This requires an explanation of how the person filing the appeal may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.
3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.
6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing on the appeal is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.
7. *New or additional evidence to be offered.* The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered by the Board in an appeal only when the evidence is relevant and material and that the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process or that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed the license normally remains in effect pending the processing of the appeal. A license holder may proceed with a project pending the outcome of an appeal but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, including the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, and any materials submitted in response to the appeal will be sent to Board members with a recommendation from DEP staff. Persons filing appeals and interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, a license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court, see 38 M.R.S.A. § 346(1); 06-096 CMR 2; 5 M.R.S.A. § 11001; & M.R. Civ. P 80C. A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. Failure to file a timely appeal will result in the Board's or the Commissioner's decision becoming final.

An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S.A. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452 or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

STATE OF MAINE

Department of Environmental Protection

PAUL R. LEPAGE
GOVERNOR

DARRYL N. BROWN
COMMISSIONER

March, 2011

Central Maine Power Company
c/o Gerry Mirabile
83 Edison Drive
Augusta, ME 04336

RE: Natural Resources Protection Act Application, Lewiston & Auburn, #L-25129-TF-A-N/L-25129-VP-B-N

Dear Mr. Mirabile:

Please find enclosed a signed copy of your Department of Environmental Protection land use permit. You will note that the permit includes a description of your project, findings of fact that relate to the approval criteria the Department used in evaluating your project, and conditions that are based on those findings and the particulars of your project. Please take several moments to read your permit carefully, paying particular attention to the conditions of the approval. The Department reviews every application thoroughly and strives to formulate reasonable conditions of approval within the context of the Department's environmental laws. You will also find attached some materials that describe the Department's appeal procedures for your information.

If you have any questions about the permit or thoughts on how the Department processed this application please get in touch with me directly. I can be reached at (207) 446-1586 or at beth.callahan@maine.gov.

Yours sincerely,

Beth Callahan

Beth Callahan, Project Manager
Division of Land Resource Regulation
Bureau of Land & Water Quality

pc: File

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION
AUGUSTA, ME 04333

DEPARTMENT ORDER

IN THE MATTER OF

CENTRAL MAINE POWER COMPANY	) NATURAL RESOURCES PROTECTION
Lewiston and Auburn, Androscoggin County	) FRESHWATER WETLAND ALTERATION
LEWISTON-LOOP PROJECT	) SIGNIFICANT VERNAL POOL
L-25129-TF-A-N (approval)	) WATER QUALITY CERTIFICATION
L-25129-VP-B-N (approval)	) FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S.A. Sections 480-A et seq. and Section 401 of the Federal Water Pollution Control Act, the Department of Environmental Protection has considered the application of CENTRAL MAINE POWER COMPANY with the supportive data, agency review comments, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. Summary: The applicant proposes to upgrade its existing transmission line system in the City of Lewiston and City of Auburn by constructing a new 115 kV transmission line in two sections, known as Section 255 and Section 256. The applicant also proposes to construct a new substation. The proposed project can be seen on a set of plans, the first of which is entitled "Central Maine Power Company, Lewiston Loop", prepared by TRC and dated October 13, 2010. The specific components of the proposed project are discussed in more detail as follows:

Section 255. The applicant proposes to construct a 115 kV aboveground transmission line, known as Section 255. Section 255 will originate at the proposed Middle Street substation in the City of Lewiston, travel north along the Pan Am Railway road bed, cross the Androscoggin River at the Veterans Memorial Bridge into the City of Auburn, and run parallel for two miles with the existing Sections 45 and 46 transmission lines. From this point, a new corridor will be constructed for the 115 kV line for a distance of two-thirds of a mile through woods and farm fields and across the river again to connect with the Gulf Island substation. Section 255 will consist of 61 pole structures (single and H-frame) at an approximate height of 85 feet. The pole structures will be spaced 400-500 feet apart.

Section 255 will permanently fill 64 square feet of forested freshwater due to placement of one pole (Pole #34); permanently convert 34,563 square feet of forested freshwater wetlands to scrub-shrub freshwater wetlands due to clearing activities; and temporarily alter 4,388 square feet of wetlands due to access associated with resource crossings. Section 255 will cross twelve streams. Seven of those streams will require some removal of canopy vegetation. The proposed project will also permanently alter a portion of the 250-foot critical terrestrial habitat of a significant vernal pool. Approximately 27,827 square feet of upland area and 3,928 square feet of forested freshwater wetlands associated with the significant vernal pool will be altered as a result of clearing activities for the proposed Section 255 transmission line.

Section 256. The applicant proposes to construct a 115 kV below ground transmission line, known as Section 256. Section 256 will originate from the proposed Middle Street substation in the City of Lewiston and travel south along Canal Street and Lisbon Street until it connects with the existing Lewiston Lower substation. No protected natural resources will be impacted as a result of the proposed Section 256 transmission line.

Middle Street substation. The applicant proposes to construct a 0.99 acre substation over an existing concrete foundation of a former industrial building. The foundation for the proposed substation was in place and functioning prior to the enactment of the Department's Stormwater Management Rules, Chapter 500. The proposed substation is located at the intersection of Middle Street, Lowell Street, and Chapel Street in the downtown area of the City of Lewiston. No protected natural resources will be impacted as a result of the proposed substation.

B. Current Use of the Site: Most of the proposed project is located within or adjacent to an existing transmission corridor. A portion of the existing corridor will be widened to accommodate the Section 255 transmission line. The applicant will construct approximately 2/3 of a mile of new transmission line corridor. The right-of-way in which the transmission line will be located is surrounded primarily by urban development, with some rural residential areas in Auburn. The proposed substation will be located in an industrialized area of Lewiston.

2. EXISTING SCENIC, AESTHETIC, RECREATIONAL OR NAVIGATIONAL USES:

In accordance with Chapter 315, Assessing and Mitigating Impacts to Scenic and Aesthetic Uses, the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix A to the application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project, aerial photographs of the project site, and photosimulations for the proposed project. Department staff visited the project site on January 31, 2011.

The proposed Section 255 will traverse the Androscoggin River in two locations. This river is a scenic resource visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities.

The applicant conducted an assessment of visual and aesthetic resources within 0.5 miles around the proposed project area for Section 255 and the proposed Middle Street substation. Given that Section 256 will be constructed below-ground, the applicant anticipates that Section 256 will not have a potential visual impact on scenic resources within the immediate viewshed.

The applicant's assessment is entitled "Visibility Analysis for the CMP Lewiston Loop Project", prepared by TRC, and dated December 2010. The applicant's analysis identified a number of small, urban parks and properties listed in or eligible for inclusion in the National Register of Historic Places within the viewshed of the proposed project. Results of the applicant's analysis are discussed below:

1. Section 255 Visual Analysis. Estimated tree heights in this area range from 40 to 60 feet. The applicant states that the potential visibility of the transmission pole structures is high within a quarter mile of the corridor. Some transmission line structures may be partially visible from four listed historic sites and four historic sites eligible for listing. Structures may be visible from five local parks within the assessment area. The applicant states that many of the views experienced by the local community are not of exceptional aesthetic quality and the proposed transmission line will be visible for a reasonably short duration while traveling on local roads. The applicant states that although the

transmission line will create a new visual element in the landscape, Section 255 will not dominate views because of intervening structures and vegetation, and the urban nature of the project area.

To mitigate for potential visual impacts, the applicant has developed an agreement with some landowners to install vegetative screening or privacy fencing to provide additional screening of the view of the transmission line.

2. Middle Street Substation Visual Analysis. The proposed substation will be constructed in a heavily industrialized and commercial area of downtown Lewiston. The applicant states that the proposed substation will not be out of character with existing land use and will not redefine the nature of the view in the immediate area. Viewer expectation is not anticipated to change in the area of the proposed substation.

The proposed project was evaluated using the Department's Visual Impact Assessment Matrix and was found to have an acceptable potential visual impact rating. Based on the information submitted in the application, the applicant's visual assessment, the visual impact rating and the site visit, the Department determined that the location and scale of the proposed activity is compatible with the existing visual quality and landscape characteristics found within the viewshed of the scenic resource in the project area.

The Department did not identify any issues involving existing recreational and navigational uses.

The Department finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the protected natural resource.

3. HABITAT CONSIDERATIONS:

The applicant proposes to permanently alter a portion of the 250-foot critical terrestrial habitat of a significant vernal pool. Approximately 27,827 square feet of upland habitat and 3,928 square feet of forested wetland associated with the significant vernal pool will be altered as a result of Section 255. No disturbance will occur within the depression of the significant vernal pool. The applicant states that the proposed impact to the significant vernal pool's habitat is necessary in order to create a new corridor for the northern portion of Section 255. The proposed project will also impact a portion of a vegetative buffer associated with two other vernal pools. However, these pools do not meet the Department's significance criteria and are not designated as significant vernal pools pursuant to Chapter 335, Section 9(B) of the Department's Significant Wildlife Habitat Rules.

Section 255 will cross twelve streams. Seven of those streams will require some removal of canopy vegetation. The applicant states that a 25-foot riparian buffer shall remain undisturbed on all streams. Herbicide treatment, mixing, and storage along with vehicle maintenance, refueling, and storage will be strictly prohibited within the buffer. Moreover, only hand cutting of capable species will occur in the buffer. The applicant also states that during construction, temporary bridges and mats will be used to cross streams.

The Maine Department of Inland Fisheries and Wildlife reviewed the proposed project and confirmed the applicant's observation of a significant vernal pool within the proposed new corridor of Section 255.

Chapter 335 requires that the applicant meet the following standards:

A. Avoidance. No activity may be permitted if there is a practicable alternative to the project that would be less damaging to the environment. Each application for a Natural Resources Protection Act permit must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist. The applicant submitted an alternative analysis for the proposed project completed by TRC and dated October 13, 2010. The applicant surveyed all of its existing right-of-way and the proposed corridor and considered other portions of the property to place the transmission line. The applicant considered the following alternatives to the proposed project:

1. No Action. The applicant determined that there is a significant need for the improvement of electrical service to the greater Lewiston-Auburn area, because the communities' electrical needs are growing rapidly. Further, the existing transmission lines have known operational issues. The applicant determined that this alternative is not feasible because it would not meet the goal of upgrading electrical service to the Lewiston-Auburn area.

2. Great Falls Crossing. This alternative involves using part of the existing Sections 45 and 46 transmission line corridor and the entire existing Section 149 route. The line would cross the Androscoggin River at Great Falls. This alternative would eliminate the crossing over Boxer Island and instead cross the Androscoggin River at Great Falls. It is a longer route, would have approximately the same amount of wetland impacts as the proposed project, and would require an expansion of the Great Falls substation. The applicant eliminated this alternative due to safety concerns based upon the proximity of the alternative's transmission line route to area businesses. Under this alternative, the transmission lines would not have the proper safety clearances.

3. Switzerland Road Crossing. For this alternative, Section 255 would extend from Gulf Island substation and use the existing Sections 45 and 46 corridor to cross the Androscoggin River. Although this alternative would require less wetland clearing, the applicant determined that this alternative is not feasible because live line clearances from area businesses would not be met in accordance with federal safety codes.

B. Minimal Alteration. The amount of significant wildlife habitat to be altered must be kept to the minimum amount necessary for meeting the overall purpose of the project. The applicant has minimized impact to the significant vernal pool by moving the proposed alignment of the Section 255 transmission line away from the pool's depression to the extent practicable. The applicant originally designed Section 255 to travel directly over the pool's depression.

Prior to the initial line clearing associated with Section 255, the location of the 250-foot critical terrestrial habitat of the significant vernal pool must be clearly marked or flagged in a manner that is easily recognizable and understood by the applicant, contractors, and any other associated party. Prior to any maintenance operations on Section 255, the 250-foot critical terrestrial habitat of the significant vernal pool must be flagged or located with a global positioning system (GPS). Further, the applicant must maintain a GPS database indicating the location of the significant vernal pool and all wetlands in the work area.

Clearing and mechanical maintenance of vegetation within 250 feet of a significant vernal pool habitat (SVPH) depression is prohibited between April 1st and May 31st. Maintenance clearing between April 1st and May 31st within the 250-foot critical terrestrial habitat must utilize hand tools only (e.g. brush hooks, chainsaws and selective herbicide applications), unless otherwise approved by the Department.

All riparian buffers must be flagged in the field prior to initial line clearing and flagged or located with a GPS prior to any maintenance operations.

C. Compensation. In accordance with Chapter 335 Section 3(D), compensation is required to achieve the goal of no net loss of significant wildlife habitat functions and values. The applicant submitted an evaluation of the proposed project site and the property that identifies the area of significant vernal pool, its associated 250-foot critical terrestrial habitat, and areas of wetlands within the habitat in Attachments 5 and 8 of the application. The report shows the 250-foot critical terrestrial habitat of the significant vernal pool and its relation to the location of proposed alteration. The applicant also submitted a Functional Assessment of onsite wetlands within the habitat and in other proposed impact areas. The assessment identified the principal wetland functions as being: production export, wildlife habitat, groundwater recharge, and sediment stabilization.

To compensate for lost functions and values of the impacted habitat buffer, the applicant submitted a mitigation plan that outlines preservation of a 12.2 acre tract of land via a conservation easement. The Androscoggin Land Trust has agreed to manage and maintain the preservation area, and the applicant is currently finalizing an agreement to transfer the preservation area to the trust organization. The applicant submitted a draft Declaration of Covenants and Restrictions that preserves approximately 12.2 acres of undeveloped land along the west side of the Androscoggin River. The applicant also submitted a habitat management plan, entitled "Proposed Sargent Property Mitigation Site Management Plan", prepared by TRC and dated February 2011. The management plan outlines the applicant's objectives to protect the existing wildlife habitat, wetland functions and values, and water quality on the preservation parcel from the threat of development and unregulated timber harvesting in such areas. Existing vegetation within this preservation area is consistent with the vegetation surrounding the site of the proposed project. This preservation area is directly adjacent to the significant vernal pool to be impacted, and this area will provide additional buffering for the habitat. Further, the preservation parcel contains upland areas, forested wetlands, four small streams and 1,620 linear feet of frontage along the Androscoggin River. The applicant determined that this preservation area was under threat of development, because the previous property owner was preliminarily considering various designs for development of the property. The entire preservation area of 12.2 acres exceeds the required ratio of 8 acres of preservation for each acre of habitat impact as outlined in Chapter 335.

Within 90 days of issuance of this Order, the deed restriction that protects the 12.2 acre preservation area in perpetuity shall be placed on the appropriate deed. The applicant must then submit a copy of the recorded deed to the Bureau of Land and Water Quality (BLWQ) within 30 days of execution of the deed.

The Department finds that the applicant has avoided and minimized impacts to significant wildlife habitat to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project. Further, the Department finds that the applicant has adequately off-set the loss of significant wildlife habitat functions and values from the proposed project. Lastly, the Department finds that the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life provided that the applicant adheres to the guidelines for clearing activities and maintenance operations within the significant vernal and stream riparian buffers associated with Section 255 as described above.

4. WETLANDS AND WATERBODIES PROTECTION RULES:

Section 255 will permanently fill 64 square feet of forested freshwater due to placement of pole structures; permanently convert 34,563 square feet of forested freshwater wetlands to scrub-shrub freshwater wetlands due to clearing activities; and temporarily alter 4,388 square feet of wetlands due to necessary construction access associated with resource crossings.

The Department's Wetlands and Waterbodies Protection Rules, Chapter 310, require that the applicant meet the following standards:

A. Avoidance. No activity may be permitted if there is a practicable alternative to the project that would be less damaging to the environment. Each application for a Natural Resources Protection Act permit must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist. The applicant submitted an alternative analysis for the proposed project completed by TRC and dated October 13, 2010. The applicant considered several alternative options to the proposed project which are discussed in Finding 3.

B. Minimal Alteration. The amount of wetland to be altered must be kept to the minimum amount necessary for meeting the overall purpose of the project. The applicant has minimized wetland impacts by co-locating the majority of Section 255 within an existing transmission line corridor; burying Section 256; and constructing the proposed Middle Street substation over existing impervious area.

All delineated freshwater wetlands must be flagged in the field prior to initial line clearing and flagged or located with a GPS prior to any maintenance operations. Additionally, if initial clearing or other construction activities result in areas of bare soil or minimally vegetated cover, the areas of bare soil must be revegetated. If the area does not revegetate naturally, then the applicant must apply a native wetland seed mix, and the area must be allowed to return to non-capable native woody and perennial herbaceous vegetation.

C. Compensation. In accordance with Chapter 310 Section 5(C)(6)(a), compensation is not required to achieve the goal of no net loss of freshwater wetland functions and values since the project will not result in over 15,000 square feet of freshwater wetland fill in the resource, which is the threshold over which compensation is generally required. For this reason, the Department determined that compensation is not required.
The proposed project will impact forested freshwater wetlands associated with the 250-foot critical terrestrial habitat of a significant vernal pool. The applicant has proposed to compensate for lost functions and values of the wetland impact within the 250-foot habitat by means of preservation of land. Specific compensation details relating to wetland impacts within the habitat are discussed in Finding 3.

The Department finds that the applicant has avoided and minimized wetland impacts to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project provided that all delineated freshwater wetlands must be flagged in the field prior to initial line clearing and flagged or located with GPS prior to any maintenance operations.

5. SOIL EROSION:

For most transmission and substation projects, the applicant utilizes a standard manual, entitled "Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects", as seen in Exhibit 7 of the application. This manual is largely based

upon the Department's Maine Erosion and Sedimentation Control BMPs. The applicant states that it will use this manual to protect soil and water resources during construction of the proposed project. The applicant has also agreed to implement additional construction practices to prevent further disturbance to nearby protected natural resources within Section 255. These additional construction practices are outlined in Finding 3 and Finding 4.

The Department finds that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

6. WATER QUALITY CONSIDERATIONS:

The Department does not anticipate that the proposed project will violate any state water quality law, including those governing the classification of the State's waters.

7. OTHER CONSIDERATIONS:

The Department did not identify any other issues involving existing scenic, aesthetic, or navigational uses, soil erosion, habitat or fisheries, the natural transfer of soil, natural flow of water, water quality, or flooding.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S.A. Sections 480-A et seq. and Section 401 of the Federal Water Pollution Control Act:

A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.

B. The proposed activity will not cause unreasonable erosion of soil or sediment.

C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life provided that the applicant adheres to the guidelines for clearing activities and maintenance operations within the significant vernal pool habitat, stream riparian buffers, and freshwater wetlands associated with Section 255 and records deed restrictions as described in Findings 3 and 4.

E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.

F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.

G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.

H. The proposed activity is not on or adjacent to a sand dune.

I. The proposed activity is not on an outstanding river segment as noted in Title 38 M.R.S.A. Section 480-P.

THEREFORE, the Department APPROVES the above noted application of CENTRAL MAINE POWER COMPANY to construct Sections 255 and 256 transmission lines and Middle Street substation as described in Finding 1, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

1. Standard Conditions of Approval, a copy attached.

2. The applicant shall take all necessary measures to ensure that its activities or those of its agent do not result in measurable erosion of soil on the site during the construction of the project covered by this approval.

3. Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

4. Prior to the initial line clearing associated with Section 255, the location of the 250-foot critical terrestrial habitat of the significant vernal pool must be clearly marked or flagged in a manner that is easily recognizable and understood by the applicant, contractors, and any other associated party. Prior to any maintenance operations on Section 255, the 250-foot critical terrestrial habitat of the significant vernal pool must be flagged or located with a GPS. Further, the applicant must maintain a GPS database indicating the location of the significant vernal pool and all wetlands in the work area.

5. Clearing and mechanical maintenance of vegetation within 250 feet of a SVP depression is prohibited between April 1st and May 31st. Maintenance clearing between April 1st and May 31st within the 250-foot critical terrestrial habitat must utilize hand tools only (e.g. brush hooks, chainsaws and selective herbicide applications), unless otherwise approved by the Department.

6. All stream riparian buffers must be flagged in the field prior to initial line clearing and flagged or located with a GPS prior to any maintenance operations.

7. All delineated freshwater wetlands must be flagged in the field prior to initial line clearing and flagged or located with a GPS prior to any maintenance operations.

8. If initial clearing or other construction activities within a freshwater wetland result in areas of bare soil or minimally vegetated cover, the areas of bare soil must be revegetated. If the area does not revegetate naturally, then the applicant shall apply a native wetland seed mix, and the area must be allowed to return to non-capable native woody and perennial herbaceous vegetation.

9. Within 90 days of issuance of this Order, the deed restriction that protects the 12.2 acre preservation area in perpetuity shall be placed on the appropriate deed. The applicant must then submit a copy of the recorded deed to the Department's Bureau of Land and Water Quality within 30 days of execution of the deed.

THIS APPROVAL DOES NOT CONSTITUTE OR SUBSTITUTE FOR ANY OTHER REQUIRED STATE, FEDERAL OR LOCAL APPROVALS NOR DOES IT VERIFY COMPLIANCE WITH ANY APPLICABLE SHORELAND ZONING ORDINANCES.

DONE AND DATED IN AUGUSTA, MAINE, THIS 2nd DAY OF March, 2011.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Tess Brown for
Darryl N. Brown, Commissioner

Filed
MAR - 2 2011
State of Maine
Board of Environmental Protection

PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES...

bc/ats#72662&72843/l25129an&bn

Natural Resource Protection Act (NRPA)
Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCE PROTECTION ACT, TITLE 38, M.R.S.A. SECTION 480-A ET.SEQ. UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.

B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.

C. Erosion Control. The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.

D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.

E. Initiation of Activity Within Two Years. If construction or operation of the activity is not begun within two years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits shall state the reasons why the applicant will be able to begin the activity within two years form the granting of a new permit, if so granted. Reapplications for permits may include information submitted in the initial application by reference.

F. Reexamination After Five Years. If the approved activity is not completed within five years from the date of the granting of a permit, the Board may reexamine its permit approval and impose additional terms or conditions to respond to significant changes in circumstances which may have occurred during the five-year period.

G. No Construction Equipment Below High Water. No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.

H. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.

I. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.

Revised (4/92/DEP LW0428

DEP INFORMATION SHEET
Appealing a Commissioner's Licensing Decision

Dated: May 2004 **Contact: (207) 287-2811**

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner: (1) in an administrative process before the Board of Environmental Protection (Board); or (2) in a judicial process before Maine's Superior Court. This INFORMATION SHEET, in conjunction with consulting statutory and regulatory provisions referred to herein, can help aggrieved persons with understanding their rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

DEP's General Laws, 38 M.R.S.A. § 341-D(4), and its Rules Concerning the Processing of Applications and Other Administrative Matters (Chapter 2), 06-096 CMR 2.24 (April 1, 2003).

HOW LONG YOU HAVE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written notice of appeal within 30 calendar days of the date on which the Commissioner's decision was filed with the Board. Appeals filed after 30 calendar days will be rejected.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, c/o Department of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017; faxes are acceptable for purposes of meeting the deadline when followed by receipt of mailed original documents within five (5) working days. Receipt on a particular day must be by 5:00 PM at DEP's offices in Augusta; materials received after 5:00 PM are not considered received until the following day. The person appealing a licensing decision must also send the DEP's Commissioner and the applicant a copy of the documents. All the information listed in the next section must be submitted at the time the appeal is filed. Only the extraordinary circumstances described at the end of that section will justify evidence not in the DEP's record at the time of decision being added to the record for consideration by the Board as part of an appeal.

WHAT YOUR APPEAL PAPERWORK MUST CONTAIN

The materials constituting an appeal must contain the following information at the time submitted:

1. *Aggrieved Status.* Standing to maintain an appeal requires the appellant to show they are particularly injured by the Commissioner's decision.

2. *The findings, conclusions or conditions objected to or believed to be in error.* Specific references and facts regarding the appellant's issues with the decision must be provided in the notice of appeal.

3. *The basis of the objections or challenge.* If possible, specific regulations, statutes or other facts should be referenced. This may include citing omissions of relevant requirements, and errors believed to have been made in interpretations, conclusions, and relevant requirements.

4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.

5. *All the matters to be contested.* The Board will limit its consideration to those arguments specifically raised in the written notice of appeal.

6. *Request for hearing.* The Board will hear presentations on appeals at its regularly scheduled meetings, unless a public hearing is requested and granted. A request for public hearing on an appeal must be filed as part of the notice of appeal.

7. *New or additional evidence to be offered.* The Board may allow new or additional evidence as part of an appeal only when the person seeking to add information to the record can show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process or show that the evidence itself is newly discovered and could not have been presented earlier in the process. Specific requirements for additional evidence are found in Chapter 2, Section 24(B)(5)

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license file is public information made easily accessible by DEP. Upon request, the DEP will make the material available during normal working hours, provide space to review the file, and provide opportunity for photocopying materials.
There is a charge for copies or copying services.

2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer questions regarding applicable requirements.

3. *The filing of an appeal does not operate as a stay to any decision.* An applicant proceeding with a project pending the outcome of an appeal runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge initiation of the appeals procedure, including the name of the DEP project manager assigned to the specific appeal, within 15 days of receiving a timely filing. The notice of appeal, all materials accepted by the Board Chair as additional evidence, and any materials submitted in response to the appeal will be sent to Board members along with a briefing and recommendation from DEP staff. Parties filing appeals and interested persons are notified in advance of the final date set for Board consideration of an appeal or request for public hearing. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision. The Board will notify parties to an appeal and interested persons of its decision.

II APPEALS TO MAINE SUPERIOR COURT

Maine law allows aggrieved persons to appeal final Commissioner licensing decisions to Maine's Superior Court, see 38 M.R.S.A. § 346(1); 06-096 CMR 2.26; 5 M.R.S.A. § 11001; & MRCivP 80C. Parties to the licensing decision must file a petition for review within 30 days after receipt of notice of the Commissioner's written decision. A petition for review by any other person aggrieved must be filed within 40-days from the date the written decision is rendered. The laws cited in this paragraph and other legal procedures govern the contents and processing of a Superior Court appeal.

ADDITIONAL INFORMATION: If you have questions or need additional information on the appeal process, contact the DEP's Director of Procedures and Enforcement at (207) 287-2811.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

EXHIBIT 9
CMP's Environmental Guidelines for Construction and Maintenance Activities on Transmission line and Substation Projects (2015)

CENTRAL MAINE POWER

Environmental Guidelines For Construction and Maintenance Activities on Transmission Line And Substation Projects

Prepared for:

Central Maine Power Company
83 Edison Drive
Augusta, Maine 04336

Prepared by:

TRC Engineering, LLC
249 Western Avenue
Augusta, Maine 04330

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DOCUMENT REVISION LOG

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-	All	Initial Release		1992
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-	Multiple	Update to correspond to DEP Guidelines	G. Mirabile	Dec 2007
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1	All	Converted to ISO Controlled Document	G. Mirabile	Oct 2012
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CENTRAL MAINE POWER COMPANY

Environmental Guidelines for Construction and Maintenance Activities on Transmission Line and Substation Projects

1.0 INTRODUCTION

These guidelines contain standards and methods used to protect soil and water resources during construction, reconstruction, and maintenance of transmission lines and substations. They are based on practical methods developed for construction in utility corridors and their use is enforced by both State of Maine and Federal regulatory agencies. The construction practices described in this manual are typically required by the regulatory agencies for all projects. These practices are commonly referred to as Best Management Practices (BMPs). Illustrations have been provided as part of this manual (Appendix D) which demonstrate both the proper and improper techniques used for the more common construction activities.

All contracts for work performed on Central Maine Power Company (CMP) transmission line rights-of-way and substation sites will include these specific guidelines to ensure the project is constructed in an environmentally conscious manner. CMP personnel or their designated representatives will ensure that the guidelines are followed by inspecting all work and prescribing corrective steps to be taken where necessary. While this manual takes into consideration legal requirements, project personnel are still responsible for compliance with all federal, state, and local requirements.

This guide uses a number of scientific and technical terms. Definitions of these terms are provided in Appendix A.

2.0 PLANNING AND DESIGN CONSIDERATIONS

Planning is an important practice that will reduce the risk of erosion on a construction site, saving both time and money for Central Maine Power Company and its contractors. An erosion control plan should be prepared during project planning and design phases. It will likely be required for any Maine Department of Environmental Protection and/or local permits.

The erosion control plan should consist of:

- A narrative.
- A map.
- Plan details.

The narrative should describe the proposed project, existing site conditions, adjacent land uses, and any natural resources or properties that might be affected by the project. Other important details to include are descriptions of critical areas, proposed construction start and end dates, construction sequence, and brief descriptions of erosion and sedimentation control measures,

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inspections and maintenance programs, and other clearing or construction that has taken place on the site in the last five years.

The map should include pre-development site contours at a scale to identify runoff patterns (minimum 5-foot contour interval), final contours, limits of clearing and grading, existing buffers, critical areas, natural resources, erosion control measures, and other clearing or construction that has taken place on the site in the last five years.

The plan details should include drawing of the erosion control structures and measures, design criteria and calculations, seeding specifications, and inspection and maintenance notes.

Key considerations include resource identification, familiarizing all parties with the construction site and limitations, and construction sequence.

2.1 Resource Identification

Sensitive natural areas which will receive priority treatment include:

- Streams and rivers.
- Great ponds.
- Wetlands.
- Steep slopes.
- Unstable soil conditions.

Sensitive natural areas which may receive priority treatment, depending upon the specifics of the project, include:

- Stream, river, pond, and wetland buffers.
- Significant wildlife habitats.
- Habitat for rare species.
- Historic and prehistoric sites.

During the planning phase, all sensitive natural areas that require priority treatment will be identified. The method of avoiding or crossing the sensitive natural areas to minimize impacts will be identified and incorporated into the project plans. Project plans should be designed and drawn to provide contractors and inspectors with a comprehensive reference guide that include, but is not limited to, locations of sensitive natural areas, access, and abutter and landowner issues. If modifications to the plans need to be made in the field, a designated person shall make necessary changes and shall notify all necessary personnel promptly. Copies of these plans should be provided and explained to equipment operators to assure that construction practices meet the intent of avoiding or minimizing impacts to the identified sensitive natural areas. In addition to the plans, the proposed access ways and water/wetland crossing locations, as well as other environmentally sensitive areas where activities will be restricted or prohibited, will be flagged and/or have signs posted.

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Prior to crossings or construction in or near any sensitive natural areas, a "walk-through" will be conducted. Attendees at the walk-through will include: 1) the contractor, 2) CMP and/or any designated representative, and may include 3) any assigned Third Party Inspector. The purpose of the walk-through is to establish the following objectives, **prior to any clearing or construction work**:

- Identify available or alternate points of access to the project site.
- Identify sensitive natural areas.
- Identify future "No-Access" areas.
- Review color designation for all flagging used.
- Establish the Communication Chain of Command (Contact Point).
- Identify and flag access/construction roads within the ROW and/or project area.
- Establish methods of access over water resource areas (mats, timber corduroy, frozen ground, tracked equipment).

In order to minimize impacts to sensitive natural areas, the above objectives will continually be evaluated throughout the construction process. Project superintendents, foremen, and inspectors should also monitor weather conditions and reports on an on-going basis. Knowledge of changing or anticipated wet weather will allow time to address erosion control needs. In this way, CMP and its contractors will be prepared to respond to changing environmental conditions (e.g., unusually wet or dry weather) and other unknowns that are inherent in the construction and maintenance of transmission lines.

2.2 "Walk-Through" Mechanics

2.2.1 Use of Flagging and Signs

Flagging will be conducted at the time of the walk-through in order to visually identify select features or construction methods to be used. Wetlands may be flagged earlier as part of project permitting. Signs may also be installed following the walk-through to direct construction to approved access routes and away from "no access" areas. The CMP flagging color-code is as follows:

- ***Glow-pink*** with the printed words "Wetland Delineation", "Wetland Boundary" or "Wetlands". This flagging denotes the edge of wetlands.
- ***Red*** with or without the printed words – "Do Not Cross". This flagging denotes a No-Access area where no equipment is allowed.
- ***Yellow*** – no printed words. This flagging denotes the location of an environmental measure such as a waterbar, hay bale barrier, or silt fence.
- ***Blue*** – no printed words. This flagging denotes approved travel ways. This is typically flagged on each side of the access-way to denote the designated travel lane for all access.
- ***Glow-pink with black stripes*** or otherwise printed with the words Buffer or Wetland Buffer. This denotes a setback from a water resource and should be treated the same as No-Access area.

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2.2.2 Identification and Use of Existing Roads

Available logging, farm, or access roads, as well as other existing rights-of-way, will be utilized for access to and from transmission line rights-of-way with permission of the respective landowners. In order to minimize ground disturbance, existing roads within the right-of-way and wetland/stream crossing areas will be used whenever possible for travel during construction, unless a better route is agreed upon during the walk-through. The movement of equipment and materials within the transmission line right-of-way will be confined as much as possible to a single road or travel path.

For example, it may be better to construct new access roads in order to: (1) minimize the span of a wetland or stream crossing, or (2) avoid the more environmentally sensitive or "wetter" portions of a wetland or stream crossing.

In all cases, CMP and its contractors will attempt to avoid and minimize impacts to sensitive natural areas. As a result of this procedure, wetland and stream crossings, steep slopes, unstable soils, and other sensitive natural areas will be avoided and adverse impacts minimized whenever practicable.

2.3 Construction Sequencing

Although a "Project Plan" may be specific in identifying the *locations* of water resource areas (wetlands, streams, etc), and the *methods* of access over water resource areas (crane mats, frozen ground, etc) it should not dictate *when* construction activities should occur. It would be impractical to include day to day activities in the "Project Plan" such as, 'pole X will be installed on Y date'. However, including environmental considerations in the daily and weekly project planning is very important. Factors such as the project schedule and weather often determine where and when construction activities occur; environmental impacts should also be considered. Below are some guidelines:

- Work closely with the individual(s) in charge of environmental compliance to plan project activities.
- Construction activities that cause soil disturbance should not occur during or just prior to forecast heavy rain events.
- Coordinate access planning with all of the contractors on the project. Often temporary access roads are used by several different contractors and the construction and use of temporary access roads can cause significant soil disturbance. Minimize equipment and vehicle travel on temporary access ways.
- Stabilize/restore disturbed areas as soon as possible, preferably while equipment is on site. Additional trips with equipment can create more soil disturbance which will need to be stabilized. Often a site can and should be stabilized within hours of when the soil disturbance occurred.
- Use frozen conditions to your advantage. There may be instances where water resource areas can be crossed during frozen conditions in lieu of installing crane mats. Before using this technique consult with the project environmental inspector.

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- Crane mats should be removed as soon as they are no longer needed and/or when conditions are favorable.

3.0 STANDARDS FOR CONSTRUCTION

3.1 Road Construction

The following five standards apply to the construction and/or upgrade of all roads, skid trails, yarding areas, or work pads whether temporary or permanent.

1. Where construction will be located near water resources, such that material or soil may be washed into them, these disturbances will be set back from the edge of the water resource to maximize the amount of undisturbed filtering area between the disturbed area and the resource. These "filter strips" will consist of an area of undisturbed vegetation between the edge of disturbed area and/or silt fence/hay bale barriers placed to intercept any sediment load in runoff water before it can enter the resource area. In order to maintain the integrity and effectiveness of filter strips, sediment barriers should be installed very early in the construction sequence, and they need to be monitored to make sure they are functional. Effective filter strip widths may vary from only a few feet in relatively well drained flat areas to as much as several hundred feet in steeper areas with more impermeable soils. The minimum width of the buffer strip shall be 25 feet or in accordance with local CEO or DEP regulations. The width of the filter strip shall be increased proportionately for slopes longer than 150 feet or for higher sediment concentrations. **Table 1** below provides the recommended widths for the filter strips according to the slope of land between the edge of the resource and any exposed soil.

Table 1
Recommended Widths For Filter Strips Between Disturbed Areas And Water Resources

Slope of Land Between Disturbance and the Resource (Percent)	Width of Filter Strip* (Feet)
0	25
10	45
20	65
30	85
40	105
50	125
60	145
70	165

*Measured along surface of the ground

2. Wherever possible, construction equipment will either avoid steep slopes or proceed across the slope in a safe manner to avoid excessive disturbance of vegetation and soils. Equipment will not travel straight up or down any slopes with a grade steeper than 10 percent, except where necessary due to safety concerns and/or terrain constraints.

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3. Where access roads or construction areas are to be built across the slope, the area will be properly sloped, slanting away from the cut bank to the outside edge of the roadbed in order to facilitate road surface drainage.
4. Slopes of cut-and-fill banks will be no steeper than 1 horizontal to 1 vertical. If located within 100 feet of water resources, the slopes will be no steeper than 2 horizontal to 1 vertical.
5. Rivers, streams, and wetland areas will be crossed, where necessary, at right angles to the channel and/or at points of minimum impact. To insure that natural drainage patterns will not be altered or restricted as a result of construction activities, crossings will be designed and constructed according to specific standards outlined below.

3.2 Stream or Wetland Crossings

The following standards apply to all unavoidable stream, drainage way, or wetland crossings encountered while accessing the project site or on the project site itself.

3.2.1 Types of Crossings Used

The type of crossing used for access is dependent on: the purpose and use of the crossing, the nature of the resource being crossed, ground conditions present at the time of construction, and construction materials available. Some planning guidance is provided below. The appropriate means and location of the crossing will be determined at the time of the formal walk-through. It is important to consult with the project environmental inspector prior to installing any crossing.

- Permanent culverts and bridges will be used only where long-term, continued, and frequent access is required (such as substation access roads).
- Temporary crossings will be used at all other locations. Temporary bridges, culverts, or crane mats must be used to cross any streams, drainage ways, or wetland swales that contain: (1) flowing water, (2) standing water, (3) saturated soils, or (4) organic/mucky soils.
- The use of corduroy as crossing material will be limited to wetlands which are not anticipated to have flowing or standing water during the construction period.
- In certain cases, no crossing material will be required if the stream bottom or drainage way is dry and contains a gravel or solid rock bottom (a "ford"). Fords can only be used if they will cause no unreasonable sedimentation of the stream and no unreasonable alteration of the stream banks and bottom.
- All crossings should include water bars or broad based dips or turn outs on the access, appropriately spaced on each side of the crossing, to promote filter-strip treatment of runoff. Consult Table 4 on page 12 of this document for specific water diversion structure spacing standards.
- All temporary crossings must be stabilized within seven (7) days of its removal, unless specified otherwise.

3.3 Construction in Wetlands

Where structures are to be placed in wetlands, topsoil must be excavated first, and stockpiled separate from subsoil. Be sure that stockpile soils are placed in such a manner that they are

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readily replaced into the excavated area. Soils shall be replaced into the excavated area in the opposite order they were removed. Excavation and pole placement in wetland areas should be completed within the same day. After pole installation, topsoil must be restored to the original surface grade, except where mounding around a structure is necessary for structure stability.

4.0 INSTALLATION OF CROSSINGS

4.1 Bridges

Bridges are a preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other waterway crossing methods. Most bridges can be quickly removed and reused without significantly affecting the stream or its banks and without interfering with fish migration.

Materials
Access bridge construction typically entails the use of log stringers as construction materials.

Sizing
Table 2 below illustrates the log sizing requirements depending on the span and anticipated loads.

Table 2
Log Bridge Stringer Requirements

Span	Minimum Log Diameter* (80,000 lb. Load)	(40,000 lb. Load)
8 ft.	16 in.	12 in.
12 ft.	18 in.	14 in.
16 ft.	20 in.	16 in.

Wheel guards: 10" diameter
- Size of deck planks: 4" x 12" x 12'
* Assume 6 stringers at 24" centers

Positioning
The following is guidance for the positioning and installation for all permanent and temporary bridges:

- Access roads will cross streams at right angles to the channel at a location with firm banks and level approaches whenever possible.
- Bridge piers and abutments will be aligned parallel to the stream flow so that the original direction of stream flow is not altered.
- Piers and abutments will be imbedded in good foundation material. The grade of the bridge should coincide with that of the road wherever practicable.

For additional specifications on bridge construction, refer to section F-2 of the Maine Erosion and Sediment Control BMPs (see full citation in Appendix C).

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4.2 Culverts

Materials

Permanent culverts will be either corrugated metal or plastic pipe. Temporary culverts will be corrugated metal, plastic pipe, or lumber ties. Chemically-treated wood will be not used.

Sizing

Permanent culverts will be sized to have a diameter of at least 3 times the cross-sectional area of the stream channel or will be designed to accommodate 25-year frequency flows. Multiple culverts may be used in place of one large culvert if they have the equivalent capacity of a larger one. A culvert sizing criteria table (3x Rule) produced by the MDEP can be found in Appendix G. However, it is recommended that an engineer be consulted when installing any permanent culvert.

Temporary culverts will also be sized to provide an opening at least 3 times the cross-sectional area of the stream channel and sized to accommodate a 25-year frequency storm flow. The stream channel cross-section will be determined at highest flows or will be approximated during periods of lower flows using the apparent natural high water marks remaining on the stream banks. For small intermittent streams, drainage ways or wetland crossings, the minimum sized culvert that may be used is 18 inches. Multiple culverts may be used in place of one larger culvert if they have the equivalent capacity of a larger one.

Positioning

The following is guidance for the positioning of all permanent and temporary culverts:

- Culverts should be placed to allow for the crossing to take place at right angles to the channel to assure that natural drainage patterns will not be altered.
- Culverts should be placed at the point of narrowest crossing and where firm banks and level approach slopes are available. Slopes should be no greater than 1.5 to 1.

Installation

The following is guidance for the installation of all permanent and temporary culverts:

- Culverts should be of sufficient length to allow both ends to extend at least one foot beyond the toe of any fill used to cover the culvert.
- Inlet and outlet armoring shall extend at least one pipe diameter beyond the upstream and downstream end of the culvert. See Table 3 below for outlet protection in erodible areas.
- Culverts should be bedded on firm ground. Supplemental use of geotextile with gravel can be used to create this firm base. Permanent culvert installation should include firm compaction of the foundation and the fill around the sides of the culvert. Compaction should be done in no less than 8-inch lifts.
- Both the inlet and outlet ends of the culverts will be set at or slightly below the natural stream bottom to allow passage of fish and other aquatic life at all levels of flow. At no point should either end of an installed culvert be positioned in the air out of the water.
- Multiple culverts must be offset in order to concentrate low flows into the culvert within the natural channel.

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- When working in and around a perennial stream, temporary stream diversion may be necessary to avoid creating turbidity in the stream water. This type of work requires a permit from Maine DEP, and must be coordinated with the project environmental inspector.
- Fill used to bury the culvert will be compacted at least half-way up the side of the culvert for its full length in insure that flowing water will not undermine the culvert.
- Culverts will be covered with fill to a depth of at least one foot or one and a half times the culvert diameter, whichever is greater.
- Road fill at the upstream (headwall) and downstream (out-fall) ends of culverts will be armored with either rock rip rap or logs to protect the road fill from being eroded by the action of water or road traffic. This material will be installed up to the level of anticipated high water.
- In areas where the streambed appears highly erodible, the streambed at the outlet end of the culvert will be lined with riprap to prevent erosion and potential stream bed scour. Table 3 below indicates the distances away from the culvert to install such riprap.

Table 3
Culvert Size - Length of Rock Protection

Culvert Diameter (Inches)	Length of Rock Protection From Culvert (Feet)
12 – 20	7
21 – 24	9
30	11
36	13
42 – 48	18
54 – 60	24
66 – 78	32

Removal

Temporary culverts will be removed once their use is no longer necessary. The fill material can be redistributed and spread out on the nearby uplands at a distance sufficient to prevent its reentry into the resource. Silt fence/hay bales, seeding, and mulching may be necessary to stabilize this material. The banks and bottoms of the stream, drainage way, or wetland should be restored to original conditions. Exposed soils on the banks and within 100 feet of the crossing should be stabilized using seed and mulch. Some banks and steep slopes adjacent to streams may require stabilization with curlex or jute matting in combination with seed and mulch.

4.3 Mats (Crane or Swamp Mats)

CMP construction projects require that adequate mats are present at the project site prior to construction. A readily accessible source of mats should also be available in case construction conditions change and necessitate the need for more mats.

Materials

A number of different sized and constructed crane mats are typically available. CMP requires that the appropriate mats be used for the appropriate crossing. For example:

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- Longer mats should be used for the longer crossing spans. This practice avoids the need to install additional mats within the crossing area in order to support the "span" mats.
- Mats should be in good condition to allow for their "clean" installation. Having mats in good condition prevents them from being dragged in versus them being carried in due to broken hitching cables, breaking apart on the job site, or becoming imbedded in mud due to their inability to support the required weight.
- Mats with partial/short timbers joined end to end should generally not be used to cross stream channels.

Installation

- Whenever possible, mats should be carried and not dragged. Dragging mats creates more soil disturbance which requires additional erosion control or final restoration work.
- At the crossing location, the ends of the crane mats should extend at least two feet onto firm banks or several feet into the upland edge of a wetland to assure a dry, firm approach onto the mats.
- At crossings which contain open or flowing water, the mats should be supported within the span using cross mats as abutments in order to prevent the impoundment of water or having water flow over the mats.
- At "dry" crossings where no water is present or anticipated during project construction, the mats may be placed directly onto the sensitive natural area in order to prevent excessive rutting, provided stream banks and bottoms are not altered.

Maintenance

Matted crossings should be continually monitored to assure their correct functioning. Mats which become covered with dirt should be kept clean and the material removed must be disposed of in an upland location. The material must not be scraped and shoveled into the water resource. Mats which become imbedded must be reset or layered to prevent mud from covering them or water passing over them.

Removal

Mats should not be removed until their use is absolutely no longer necessary. Specifically, all final restoration work should be completed prior to the mats being removed from the crossings. The planned removal of mats should be coordinated with CMP (or designated representative), the project environmental inspector, and any Third Party Inspector. As temporary structures, they should be removed within one year from the date of installation. All areas disturbed during ford removal shall be stabilized with seed and mulch.

4.4 Corduroy

Materials

Corduroy material will consist of de-limbed trees or logs. The logs must have a diameter greater than three inches at the small end and lengths greater than 18 feet. Shorter length material may be used only as described in the Installation section below.

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Positioning
Corduroy should be placed perpendicular to the direction of travel. Corduroy should be placed at the point of narrowest crossing and where firm banks and level approach slopes are available.

Installation
The corduroy should be placed with the longer length pieces laid down first. The bed of corduroy should not only be placed within the low portions of the crossing but also for at least three feet up the sides of any upland side slopes in order to prevent rutting and sedimentation from the approaches to the crossing.

Once a thick base of corduroy has been laid, pieces shorter than 18 feet can be used to fill gaps and raise the elevation of the corduroy to provide for a more stable crossing.

Removal
Removal is the reverse of installation. Once the corduroy has been removed from the crossing, it may be moved off the right-of-way, burned, or chipped. The material may also be spread and distributed on the ROW over the nearby upland if in accordance with the Maine Slash Law (see Appendix E) and approved by a CMP representative. The banks of streams and drainage ways must be graded back to original conditions. Exposed soils on the banks and within 100 feet of the crossing must be stabilized using seed and mulch. Banks of drainage ways that are expected to receive high flows should be stabilized with seed and curlex or jute matting.

5.0 SURFACE WATER DIVERSION STRUCTURES (WATER BARS)

A number of above-ground structures or techniques are available to divert water out of travel ways and work areas in order to prevent subsequent runoff and erosion. The terminology and definitions for these techniques (i.e., broad-based dips, water bars, skid humps, water turnouts, and cross-drainage box culvert) vary, but the purpose of all is to redirect water moving down a slope into adjacent vegetated areas (filter strips). Any activities that involve land grading have the potential to cause sedimentation. Their use and installation needs to be carefully planned. Planning for these techniques must include timing, use of natural buffers (filter strips), mulching, and temporary and permanent seeding. Minimizing the area of soil exposed at one time is a key component of ensuring that surface water diversion structures function effectively. General standards for their construction are as follows.

Materials
Most of these structures are constructed by excavating or moving and shaping earth from within the access way or work area. The cross-drainage culvert structure typically uses logs or timber to form a box-like structure to catch water from travel ways or side ditches in order to direct it across the travel way and away from disturbed areas.

Positioning
These structures should be installed immediately above and along steep pitches in the road and below seepage areas on natural or cut banks. They should be sited to take advantage of existing vegetation for filtering and slope away from the travel surface. The interval for installing these diversion structures depends on the slope of the road, as well as the nature of the road surface, soils, and wetness. Generally speaking, steeper slopes require shorter distances between

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diversion structures. The following table contains recommended distances between installed structures depending on slope.

Table 4 Recommended Distances Between Water Diversion Structures	
Slope (Percent)	Spacing (Feet)
2	250
5	135
10	80
15	60
20	45
30	35

All of these structures should be sized in anticipation of greater flows resulting from snow melt, spring runoff, and storm rains.

Installation

These structures should be installed at 30-degrees angled down grade. The shape of the backside portion of the structure should have a reverse slope of about 3 percent. Use of a pop-level is recommended to ensure that drainage is away from the road. Structures should be constructed with rounded (not vertical) mounds and dips to allow for firm compaction and to allow re-vegetation.

In the case of the cross-drainage culvert, the minimum width of the open face of the culvert should be 18 inches. The travel surface should consist of at least 12 inches of gravel or soil over the culvert. The slope of the culvert should be a drop of at least 5 inches in every 10 feet of length to ensure proper drainage.

The inlet end of all structures should extend beyond the edge of the access road so that it fully intercepts water flows that may flow onto the access road. The outlet end of the structure should extend out enough to prevent water from flowing around and re-entering the road or work area.

The discharge ends of any of these diversion structures should outlet into a vegetated filter strip. Where heavy flows are encountered or anticipated, the outlet end of the structures should incorporate an apron of rock, gravel, or brush to reduce water velocities. If construction will extend into fall and winter months, be sure to upgrade to meet winter standards all erosion control measures (e.g., increase amount of mulch, etc.), to protect the site from spring runoff.

Where the structure is within 100 feet of a stream or wetland, the incorporation of a small, excavated settling basin or ditch turnout to reduce the velocity of flows and the continued movement of sediment downslope should be considered. In addition, some type of sediment barrier (silt fencing or staked hay bales) will be installed at the outlet of the diversion structure, where vegetated filter strips are narrow or sparsely vegetated, in order to prevent sediment from eroding into water resources.

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Maintenance
Due to repeated travel over these structures, maintenance is critical to their effective functioning. As the structure becomes flattened or rutted, it needs to be re-excavated or graded to ensure the interception and redirection of water runoff. The ends of any cross-drainage culverts should be maintained by clearing away any potential blockages.

Removal
After the completion of the construction project, removal of these structures is not a requirement, with the exception of the cross-drainage culvert. The structures can be left in place provided they have been suitably stabilized with seed and mulch. Any hay bale barriers or silt fence at the outlet end should be removed when the site has a healthy vegetative cover.

6.0 SEDIMENT BARRIERS (STRUCTURAL MEASURES)

6.1 Introduction

The use of properly installed erosion and sediment control barriers is a fundamental and critical component for preventing erosion at CMP construction projects. Erosion control barriers include silt fence, hay bales, and/or erosion control mix berms. In some cases, these barriers may be deemed unnecessary by CMP, its representatives, or a Third Party Inspector due to factors including slope and filter strip width within project boundaries. A typical CMP construction project will use a combination of barriers to effectively control erosion near water resources. Installation and diligent maintenance of these barriers serves the following purposes:

- Assures the environmental integrity of those upland and water resource areas not designated or permitted for disturbance. Specifically, it maintains the onsite vegetative community and water quality of the surface water within the watershed.
- Assures compliance with all applicable federal, state, and local environmental and land use regulations or permit conditions.

Generally, silt fence is the preferred barrier because: it traps a much higher percentage of suspended sediments than hay bales; it can be easier to install, obtain, and transport; and is less costly. In addition, the structural longevity of silt fence is 60 days or longer unlike straw or hay bales' longevity which is 60 days or less.

The standards and procedures outlined in this section of the manual are meant to address a majority of the situations encountered during transmission line and substation construction activities. For additional information on sediment and erosion control methods and techniques, or to address a particularly problematic situation, this manual should be used in conjunction with and supplemented by the Maine Erosion and Sediment Control BMPs. For other recommended references, see Appendix C.

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6.2 Silt Fence

Materials

Silt fence is provided by a number of manufacturers and is generally a synthetic fabric pre-attached to wooden staking. The fabric should be pervious to water allowing a flow through rate of 0.3 gallon per square foot per minute. The fabric should contain stabilizers and ultraviolet ray inhibitors to allow it to sustain exposure of a minimum of 6 months. The height of the filter fabric should not exceed 4 feet in height.

Placement

Silt fence is to be utilized at the edge of any planned work area or area which will cause the disturbance of soil. It will be installed to intercept any sheet flow of water and detain sediment from entering water resources or leaving the project site. It should be installed prior to starting work. Given the expansiveness of CMP transmission line projects in particular, the amount of silt fence placement must be selective; however, it should still be used in amounts sufficient to meet potential changing conditions in a pro-active manner. After the primary stabilization measures (temporary and permanent) have been implemented, silt fence use is encouraged in the following selected locations, as appropriate:

- Around all substation project sites.
- Along all access roads or work areas that are within 100 feet of water resources.
- Along all access roads or work areas in upland settings that encounter seepage moving across slope.
- Around all stockpiled soils.

In general, the placement of silt fence is appropriate when:

- Serving a drainage area of no more than .25 acre per 100 feet of silt fence length.
- The maximum slope length behind the fence is 100 feet or less.
- The maximum gradient behind the fence is 50% or 2:1 horizontal/vertical.
- Where the filter strip is not of an adequate width (see Table 1).

Installation

The following installation guidelines are the minimum which should be implemented; however, appropriate changes to silt fence installation should be made as conditions change during the construction operation.

Silt fence will be placed an adequate distance (6-10 feet) beyond the toe of the slope (if there is sufficient room) to allow for sediment accumulation between the disturbed area and the down-gradient water resources. If there is not sufficient room to place the silt fence an adequate distance beyond the toe of the slope, CMP, a representative of CMP, or the Third Party Inspector should be consulted. The barrier should be installed along the contour, within reason. The goal is to slow and pool the sediment-laden runoff to allow fine sediments to settle-out before the runoff enters the water resource. The ends of the barrier should be up-turned to maintain the pool volume.

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A trench shall be excavated approximately 6 inches wide and 6 inches deep on the up-slope side of the silt fence alignment. The lower edge of the silt fence fabric should be entrenched for a distance of at least 4 inches up-slope and then back-filled. Should frozen or rocky ground conditions prevent the effective or practical use of trenching, materials such as bark/wood chips, wood fiber mulch, or a soil erosion control mixture can be used. This material is to be mounded on top of at least 4 inches of filter fabric which would otherwise be trenched.
Silt fence should be installed in a continuous roll to avoid the need of a joint between different pieces of fence. If joints are necessary, filter fabric shall be "spliced" together at a support post, securely sealed, and with a minimum of 6 inches of overlap. Splicing rolls of silt fence entails twisting end posts together, creating a continuous section of silt fence.

Support posts should be placed on the down-slope side or the side closest to or facing the water resource. The posts should be placed 6 feet apart (a maximum of 10 feet may be acceptable in some locations) and driven securely into the ground, typically about one foot deep. Silt fence usually has posts pre-attached.

Silt fence should not be installed in streams or drainage ways where concentrated water flow is present or concentrated flows are anticipated.

Maintenance
Once a week, or after rainstorms producing at least ½ inch of rainfall, whichever is more frequent, the contractor is responsible for inspecting all temporary erosion and sediment control barriers. Such inspection is necessary to assure that the barriers are functioning properly as well as identifying new areas requiring installation. A maintenance log should be kept of all erosion control changes, improvements, and maintenance performed.

If any barriers are not functioning properly, they will be repaired or replaced. A sediment control barrier is not functioning if:

1. Water is flowing around the sides or under the barrier.
2. Soil has built up behind the barrier to the point more than half-way up the fence.
3. There is excessive sag in the fence.
4. There is evidence of sedimentation such as gully erosion, slumping of banks, or the discoloration of water outside of the perimeter silt fence.

Corrective measures include removing accumulated sediment from behind the barrier, restaking, extending the ends of the fence, or installing another fence further upslope.

Removal
Installed silt fence will be removed once it is evident that the soils have become stabilized and the potential for erosion no longer exists. In most cases, the silt fence will not be removed until at least one growing season has past. Removal of silt fence should be coordinated with CMP or their designated representative.

Any ridges or mounds of soil or caught sediment remaining in place after the silt fence has been removed, must be leveled-off to conform to the existing grade. Any newly exposed soil that may erode must be seeded and mulched.

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All removed silt fence must be properly disposed of off the project area.

6.3 Hay Bales

Placement

Like silt fence, hay bale barriers can be utilized at the edge of any planned work area or areas where soil disturbance has occurred or will occur. Barriers are installed to intercept sheet flow of water and detain sediment from entering water resources or leaving the project site. Given the expansiveness of CMP transmission line projects in particular, the amount of hay bale barrier placement must be selective, but still in amounts sufficient to meet potential changing conditions in a pro-active manner. Hay bale barriers will be used, as appropriate, in the following locations:

- Around all substation project sites.
- Along all access roads or work areas that are within 100 feet of a water resource area.
- Along all access roads or work areas in upland settings that encounter seepage moving across slope.
- Around all stockpiled soils.

In general, the placement of hay bales is appropriate when:

- Serving a drainage area of no more than .25 acre per 100 feet of barrier length.
- The maximum slope length behind the barrier is 100 feet or less.
- The maximum gradient behind the barrier of 50% or 2:1 horizontal/vertical.
- Where the filter strip is not of an adequate width (see Table 1).

Installation

The following installation guidelines are the minimum which should be implemented; however, appropriate changes to hay bale installation should be made as conditions change during the construction operation.

The barrier will be placed an adequate distance (6-10 feet) beyond the toe of the slope (if there is sufficient room) to allow for sediment accumulation between the disturbed area and the down-gradient sensitive areas. If there is not sufficient room to place the hay bales an adequate distance beyond the toe of the slope, CMP, a representative of CMP, the project environmental inspector, or the Third Party Inspector should be consulted. Within reason, the barrier should be installed along the contour. The goal is to slow and pool the sediment-laden runoff to allow fine sediments to settle-out before the runoff enters the water resource. The ends of the barrier should be up-turned to maintain the pool volume.

A shallow trench shall be excavated the width of the bale and to a minimum depth of 4 inches in which to bed the bale. The excavated soils are then used to seal the lower inside (up-slope) edge of the barrier. The bales should be set tightly together and entrenched with the baling string oriented on the sides (i.e., not touching the ground) in order to prevent deterioration of the string.

Every bale should be staked using 2 stakes per bale. The stakes should be driven in at angles such that it binds and forces abutting hay bales together.

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Gaps between bales shall be packed with loose hay to prevent water from escaping between the bales.

Hay bales will not be placed in streams where flow is present or anticipated.

Maintenance

Once a week, or after rainstorms producing at least ½ inch of rainfall, whichever is more frequent, the contractor is responsible for inspecting all temporary erosion and sediment control barriers. Such inspection is necessary to ensure the structures are functioning properly as well as identifying new areas requiring installation. A maintenance log should be kept of all erosion control changes, improvements, and maintenance performed.

If any barriers are not functioning properly, they must be repaired or replaced. A sediment barrier is not functioning if:

- Water is flowing around the sides or under the barrier.
- Soil has built up behind the barrier to the point more than half-way up the hay bale or where there is excessive lean to the barrier.
- There is evidence of sedimentation such as gully erosion, slumping of banks, or the discoloration of water outside of the hay bale barrier.

Corrective measures include removing accumulated sediment from behind the barrier, re-staking, extending the barrier at the ends, or installing another barrier further up-slope.

It is not recommended that straw or hay bales be used for periods greater than 60 days.

Removal

Installed hay bales will be removed once it is evident that the soils have become stabilized and the potential for erosion no longer exists. In most cases, the hay bale barrier will not be removed until at least a healthy growth of vegetation is established on the disturbed site. Removal of hay bale barriers should be coordinated with CMP or their designated representative.

Any ridges, mounds of soil, or caught sediment remaining in place after the hay bales have been removed, must be leveled-off to conform to the existing grade. Any newly exposed soil that may erode must be seeded and mulched.

All removed hay bales must be properly disposed of, or broken up and used as mulch on the bare soils near the barrier.

6.3.1 Problems With Straw or Hay Bale Barriers

There are several situations where straw or hay bale barriers may be ineffective or cause problems:

1. When improperly placed and installed (such as staking the bales directly to the ground with no soil seal or entrenchment), hay bales allow undercutting and end flow.

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2. When used in streams and drainage ways, high water velocities and volumes destroy or impair their effectiveness.
3. When bales are not inspected and maintained adequately.
4. When hay bale barriers are removed before up-slope areas have been permanently stabilized.
5. When hay bale barriers have not been removed after they have served their usefulness.

6.4 Erosion Control Mix Berms

Composition

Erosion control mix berms are made up of shredded bark, stump grindings, and composted bark. It may be made on a project site if adequate materials are available, however its composition needs to be a well-graded mix of different particle sizes. Wood chips, bark chips, ground construction debris and processed wood cannot make up the organic component of the mix. Be sure to consult with the project environmental inspector regarding the suitability of any erosion control mix material proposed for use.

Installation

Erosion control mix berms are simply placed on the surface of the ground and do not require any soil disturbance. The berm should be located in a similar manner to other sediment control barriers along contour, downslope of disturbed soils. Also similar to other sediment barriers, they should not be placed in areas of concentrated runoff, below culvert outlets, around catch basins, or at the bottom of a large contributing subwatershed. At the toe of shallow slopes less than 20 feet long, at a minimum berms should be 12" high and a minimum of 2 feet wide at their base. For longer or steeper slopes, the berms should be wider to accommodate additional runoff. They are ideal for installation on frozen ground, on shallow to bedrock soils, outcrops of bedrock, and heavily rooted forested areas (i.e., those areas where other barriers are difficult to install).

Erosion control mix can also be placed in a synthetic "sock" to create a contained stable sediment barrier. This is especially useful in areas where trenching is not feasible, such as frozen ground, across pavement, or compacted gravel. When in a sock, erosion control mix can staked in an area of concentrated flow (i.e., ditch or swale) as the netting prevents movement of the mulch mixture.

Maintenance

As with other barriers, inspection should be performed after each rainfall or daily during prolonged periods of rain. Accumulations of sediment should be removed when they reach half the height of the barrier, and the berms can be reshaped and new material can be added as needed.

Removal

In most cases, erosion control mix berms do not need to be removed. They will continue to function as they decompose, become part of the soil on the site and will naturally revegetate. If synthetic socks are used, the erosion control mix can be emptied from the sock and the socks can be disposed of off site.

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7.0 NONSTRUCTURAL EROSION CONTROL MEASURES

7.1 Nonstructural Measures Defined

Nonstructural measures are temporary or permanent methods used to cover exposed soil areas to prevent erosion from occurring. Their purpose is to cover whole areas of exposed soil to prevent initial erosion of soil from a construction site.

Examples of nonstructural measures include hay or straw mulch, erosion control mix, matting, or seeding.

7.2 Importance of Nonstructural Measures

Nonstructural measures are important because they provide both temporary and permanent protective cover to exposed soils. Generally, they provide the first line of protection against erosion, and can be the most effective means of preventing erosion. This protection is important because exposed soils are easily eroded by wind or water. Some soils such as silts can easily be removed from a construction site by rainwater. The impact of individual raindrops on exposed soils can loosen soil particles, and these particles can then be carried off the work site by runoff and deposited into water resources including streams, rivers, wetlands, ponds, and lakes. Silt particles don't settle out of water easily, and water siltation can pollute surface waters and harm aquatic creatures such as insects and fish. For example, brook trout, one of Maine's premier game fish species, requires clear, high quality water in order to survive. Silty water can reduce spawning habitat, irritate fish gills, lower oxygen content in water, and make fish susceptible to diseases.

Dry soil conditions and high winds can also cause siltation. When small particle soils such as silts become dry, they have a baby powder-like texture and can easily be swept away by winds. Nonstructural measures help prevent wind erosion because they hold moisture next to the soil, keep the soil from drying out due to wind exposure, and prevent winds from carrying away dry soil particles. Keep in mind, however, that proper construction sequencing is invaluable (See Section 2.3).

7.3 Placement of Nonstructural Measures

Nonstructural measures should be used whenever there is a possibility that exposed soils on a construction site could wash into adjacent sensitive water resources. Temporary nonstructural measures such as hay or straw mulch should be spread on exposed soils within 100-feet of water resources within 48 hours of initial soil disturbance, or before any predicted storm event. There are two types of nonstructural measures: temporary and permanent. Temporary measures are typically used <u>during</u> construction, while permanent measures are usually applied <u>after</u> construction is complete (i.e., restoration). Provided below are general discussions and explanations of the common nonstructural measures that are used on CMP construction sites.

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7.3.1 Temporary Measures

- Hay or straw mulch (unanchored on slopes less than 8%, anchored on slopes greater than 8%) on exposed soil areas and soil stockpiles in the construction area.
- Temporary seeding covered by hay or straw mulch on soil stockpiles or areas of exposed soil next to sensitive resources that are not scheduled for final restoration for 30 days (this only applies between the dates of April 16 to October 31 of any given year). Temporary seeding is not required during the Winter Construction Season.
- Erosion control mix can be used as a stand-alone temporary mulch on slopes that are 2 horizontal to 1 vertical, or less, on frozen ground, in forested areas, or at the edge of gravel parking and areas under construction. It should be applied at a thickness of 4 to 6 inches.
- Rolled Erosion Control Products (RECP's) such as Curlex or Jute matting, can be used on areas of high wind exposure, steep slopes (steeper than 8% grade), unstable soils, and stream/river bank restoration areas. Matting is typically anchored (usually with large staples, as recommended by the manufacturer). Although this type of material is usually used during final restoration, it is considered a temporary measure because it generally deteriorates within two years.

Table 5
Temporary Seeding Rates and Dates

Seed	Lb./Ac	Seeding Depth	Recommended Seeding Dates	Remarks
Winter Rye	112(2.0 bu)	1-1.5 in.	8/15-10/1	Good for fall seeding. Select a hardy species, such as Aroostook Rye.
Oats	80 (2.5 bu)	1-1.5 in.	4/1-7/1 8/15-9/15	Best for spring seeding. Early fall seeding will die when winter weather moves in, but mulch will provide protection.
Annual Ryegrass	40	.25 in.	4/1-7/1	Grows quickly but is of short duration. Use where appearance is important. With mulch, seeding may be done throughout growing season.
Sudangrass Perennial	40 (1.0 bu) 40 (2.0 bu)	.5-1 in. .25 in.	5/15-8/15 8/15-9/15	Good growth during hot summer periods. Good cover, longer lasting than Annual Ryegrass. Mulching will allow seeding throughout growing season.
Temporary mulch with or without dormant seeding			10/1-4/1	Refer to TEMPORARY MULCHING BMP and/or PERMANENT VEGETATION BMP.

Proper application rates, location, and seasonal consideration are provided in Table 6 on page 23 of this manual.

7.3.2 Permanent Measures

Uplands

- Permanent grass and legume seeding covered by hay or straw mulch on all areas that have been restored to final grade (this seeding generally applies between the dates of April 16 to October 31 of any given year). This is required to establish permanent, perennial, vegetative cover on exposed soils. Permanent seeding is not required during the Winter Construction Season, although dormant seeding may be performed. (See Section 8.0 for details on winter construction.)
- Seeds covered by anchored (usually with large staples) Curlex or jute matting in areas of high wind exposure, on steep slopes (steeper than 8% grade), unstable soils, and stream/river bank restoration areas.
- The soil may need to be properly prepared before any seeds are placed on the ground. This preparation may include addition of fertilizer (only in designated upland areas not adjacent to, or near waterbodies or wetlands, if in doubt ask the environmental or construction inspector) in areas that have been tested, and are found to be deficient in plant nutrients.
- Erosion control mix can also be used as a permanent mulch to provide a buffer around disturbed areas. It can be left in place to decompose and naturalize. It will eventually support vegetation, which should be promoted. If vegetation is desired in the short-term, legumes and woody vegetation can be planted, which will create additional stability.

Wetlands

- Wetland areas are to be seeded only with resource agency approved wetland seed mixes. If it is decided that wetlands will not be seeded, disturbed wetland will be graded to original contours, mulched with straw, and allowed to revegetate naturally.

As with the Temporary Measures, refer to Table 6 on page 23 for proper application rates, locations, and seasonal considerations.

For permanent seeding mixtures, consult the approved plans/proposal for the project, the environmental inspector, or Appendix A of the Maine Erosion and Sediment Control BMPs.

8.0 WINTER CONSTRUCTION CONSIDERATIONS

If a project is actively being constructed between November 1 and April 15 of any given year, sediment and erosion control guidelines developed by the Maine Department of Environmental Protection for projects occurring during the winter months must be followed.

Of course, nothing can replace good common sense. These guidelines may not be necessary at all times during the winter construction dates for several reasons. For example, if there is no snow on the ground or the ground isn't frozen by November 1, only the standard BMPs must be followed. Also, if the ground thaws and all snow is gone before April 15, the standard BMPs may be appropriate. Nothing substitutes good judgment, being familiar with the construction site, and being aware of the site-specific conditions. Proper construction sequencing (Section 2.3) can greatly minimize environmental impact during winter construction. When in doubt, contact the project construction manager or environmental inspector with any questions.

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Table 6 on page 23 highlights some of the major differences between the winter construction guidelines and normal BMPs used during construction and for temporary stabilization. The table presents differences for temporary measures that should be used during construction, and permanent measures when construction is completely done.

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Table 6
Nonstructural Erosion Control Measures (Seasonal Differences in Construction BMP Requirements)

Dates	General Construction April 16 through October 31 of every year	Winter Construction November 1 through April 15 of every year
Mulch on slopes less than 8%	Within 100-feet of sensitive water resources apply hay and/or straw mulch at a minimum of 70 lbs./1000 square feet of exposed soil (about 2 bales). Must be done within 7 days of initial soil disturbance and before storm forecasted events, unless specified otherwise.	Within 100-feet of sensitive water resources apply and maintain properly anchored hay and/or straw mulch at a minimum of 150 lbs./1000 square feet of exposed soil (about 5 bales) at all times. (double the April 16 – October 31 rate)
Mulch on slopes greater than 8%	Hay or straw mulch can be applied without being anchored, though specific site conditions may require use of anchoring.	Apply mulch as specified above. Properly anchor with Curlex, jute matting, or similar mulch netting on upland slopes exceeding 8% and within 100 feet of streams if no construction activities are anticipated for 7 or more days.
Area of exposed soils allowed at any one time	No restriction on area exposed, but contractor must attempt to minimize amount of exposed soil at any one time, especially next to water resources.	Not more than one (1) acre of exposed (not mulched or otherwise devoid of vegetative cover) soil.
Sediment barriers	A single line of sediment barriers including silt fence, hay bales, or wood waste filter berms must be installed between water resources and disturbed soils.	If soil is frozen, wood waste filter berms **or** 2 lines of sediment barriers (including hay bales and silt fence) must be placed between water resources and disturbed soils.
Temporary seeding in uplands	If required, apply at the rate specified by the supplier, CMP Environmental Department, or Environmental Inspector. Cover with mulch.	Not required, but if temporary seeding is desired, it must be applied at a rate 3 times higher than the General Construction Season, and covered with mulch.
Temporary seeding in wetlands	Wetlands are not to be seeded unless done so with an agency-approved seed mix. Annual Rye Grass is not acceptable and shall not be used. Disturbed wetland areas will be mulched exclusively with straw.	Wetlands are not to be seeded unless done so with an agency approved seed mix. Annual Rye Grass is not acceptable and shall not be used. Disturbed wetland areas will be mulched exclusively with straw.
Permanent seeding in uplands	Site must be seeded at rate specified by the supplier and covered with hay or straw mulch. If needed, the site can be limed and fertilized.	Not required before April 16, but if dormant seeding is desired, the site should receive an adequate cover of loam, if necessary, be seeded at a rate 3 times higher than the General Construction Season, and covered with mulch at a minimum of 150 lbs./1000 square feet.
Permanent seeding in wetlands	Do not apply permanent seed mixes to wetland areas unless they are specially designated wetland seed mixes approved by a resource agency.	Do not apply permanent seed mixes to wetland areas unless they are specially designated wetland seed mixes approved by a resource agency.
Temporary seedbed preparation	Apply limestone and fertilizer (uplands only) according to soil test data. If soil test is not possible, 10-10-10 fertilizer may be applied at a rate of 600 lbs./acre and limestone at 3 tons/acre.	Not required, but seedbed can be prepared according to General Construction requirements.

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Dates	General Construction April 16 through October 31 of every year	Winter Construction November 1 through April 15 of every year
Permanent seedbed preparation	Apply limestone and fertilizer (uplands only) according to soil test data. If soil test is not possible, 10-20-20 fertilizer may be applied at a rate of 800 lbs./acre and limestone at 3 tons/acre.	Not required before April 16, but if dormant seeding is desired, the seedbed can be prepared according to the General Construction requirements.
Temporary slope stabilization	Same as winter construction season, but mulch does not need to be anchored.	Anchored hay or straw mulch on slopes greater than 8% and drainage ways with greater than 3% slope as necessary. Wood waste mix can be used on slopes in place of anchored hay or straw mulch.
Maintenance of erosion controls	Same as winter construction guidelines.	All erosion controls should be inspected periodically to ensure proper function. If any evidence of erosion or sedimentation is evident, repairs should be made to existing controls or other methods should be used.
Inspection and monitoring	Monitoring should be performed as needed until a new, healthy vegetative cover is attained on the site. This applies to both temporary and permanent seeding.	Monitoring should be performed as needed to ensure proper stabilization and re-vegetation (both temporary and permanent). Starting in the spring following completion of the project, inspections should be performed until new, healthy vegetative cover is attained.

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9.0 SITE RESTORATION STANDARDS

Following completion of the construction work, the contractor will be responsible for conducting site restoration work. The following guidelines will apply to all activities, including temporary and permanent roads, stream/wetland crossings, staging and work areas, and substation sites.

9.1 Procedure

At the completion of project construction in an area or at the end of the construction, CMP or their designated representative, the contractor, and any Third Party Inspector will review the project's restoration needs and prioritize the areas. This prioritization should consider time of year, ground conditions, re-vegetation probabilities, and equipment availability. A restoration "walk-through" is strongly recommended.

In many cases a site can and should be restored within hours of when the soil disturbance occurred. Often getting the equipment to a site that needs to be restored only creates more disturbed area to restore. It is important to "restore as you go" to reduce the equipment travel on temporary access roads. It can be particularly difficult to restore an area that was disturbed during winter construction activities in the spring or summer.

Likely areas of restoration include, but are not limited to:

- Around substation construction areas.
- Around pole and anchor pole placement.
- All wetland, stream, or brook crossings, particularly the approaches and any stream banks.
- Drainage ways or ditches.
- All temporary or permanent constructed roads, yarding, and staging areas.
- Cut banks.
- Steep slopes (over 8%).

9.2 Methods for Restoration

There are several methods of restoration for different areas.

1. All soil that is excavated, mounded, or deposited during construction will be re-graded or removed from the site as directed by CMP. All re-grading and redistribution of soil will be done to match existing grade.
2. The banks and bottoms of brooks, streams, and rivers will be restored to natural conditions. In general, any material or structure used at temporary crossings will be removed, and the bank and bottoms restored to their original depth and contour.
3. On permanent access roads, stream culverts and bridges will be left intact and in good repair to remain available for maintenance operations and/or public access (woods roads, camp roads, etc.).
4. On those construction roads to be closed to future vehicle traffic (as determined by CMP), bridges, culverts, and other temporary crossing or water diversion structures will be removed and the banks and bottoms restored to original conditions.

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5. Previously installed water bars may remain or new ones will be installed at locations designated by CMP, their designated representative, or the Third Party Inspector. To prevent accelerated soil erosion, such water bars will be installed on all access and construction roads to be closed to vehicle traffic and on steep sections of permanent roads. Permanent water bars will be constructed to a sufficient height and width to divert the amount of water anticipated at each location as well as to provide some post-project permanence to the site. Water bars on permanent roads will be constructed in such a manner that they will remain effective and require minimal maintenance, and will be permanently seeded to ensure their long-term stability.
6. All areas severely rutted by construction equipment will be re-graded and permanently revegetated.
7. Upon completion of the project, the following areas will be permanently revegetated or otherwise permanently stabilized:
   a) All exposed soil within 100-feet of the edge of any water resource, including, but not limited to, discontinued roads, staging areas, and fill around the base of transmission line structures.
   b) Areas of exposed soil on slopes in excess of eight (8) percent, including discontinued roads and construction trails.
   c) Cut and fill banks subject to erosion.
8. Liming, fertilizing, and seeding requirements for permanent re-vegetation will depend upon the soil type and drainage condition of the site. In the absence of soil tests, permanent seeding will generally be done in accordance with "Procedures for Permanent Seeding for Erosion Control" found in Table 6 on page 23.
9. The contractor will be responsible for the proper maintenance of all revegetated areas until the project has been completed and accepted. Where seed areas have become eroded or damaged by construction operations, the affected areas will be promptly re-graded, limed, fertilized, and re-seeded as originally required.
10. The contractor will perform all erosion control work to the complete satisfaction of Central Maine Power Company before the work is accepted. Central Maine Power Company will base acceptance of the erosion control and stabilization work on a final inspection.

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APPENDIX A

DEFINITION OF TERMS

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APPENDIX A
DEFINITION OF TERMS

Adjacent to a natural resource: Within 75 feet of, or in a position to wash into, a water resource (river, stream, brook, pond, wetland, or tidal area).
Annual seed mix: Seed mixture largely made up of plants that only persist one growing season.
Brook: Essentially the same as a stream, a water course that has a defined channel, a gravel, sand, rock or clay base, and flows at least part of the year. It may be a dry channel part of the year.
Corduroy: Logs greater than 3 inches in diameter at the small end and at least 18 feet long that are placed perpendicular to travel direction, on approaches to and in wetlands for crossings. The purpose of the logs is to prevent rutting and preserve vegetation root integrity in and adjacent to wetland areas. May also be used on approaches to mats or bridge stream crossings.
Crossing: Any activity extending from one side to the opposite side of a sensitive natural resource whether under, through, or over that resource. Such activities include, but are not limited to, roads, fords, bridges, culverts, utility lines, water lines, sewer lines, and cables, as well as maintenance work on these crossings. Crossings should be done to minimize impact. For example, crossing at a right angle to the resource and finding the driest or narrowest spot is one method for minimizing impact.
Cross-sectional area: The cross-sectional area of a stream channel is determined by multiplying the stream channel width by the average stream channel depth. The stream channel width is the straight-line distance from the normal high water line on one side of the channel to the normal high water line on the opposite side of the channel. The average stream channel depth is the average of the vertical distances from a straight line between the normal high water marks of the stream channel to the bottom of the channel.
Culvert: A pipe or box structure of wood, metal, plastic, or concrete used to convey water.
Erosion: Movement of earthen material by water or wind.
Erosion control blanket (matting): Manufactured material made out of natural or synthetic fiber designed to control movement of earthen material when installed properly.
Erosion control mix: Erosion control mix consists primarily of organic materials such as shredded bark, wood chips, stump grindings, composted bark, or similar materials. Ground construction debris or reprocessed wood products are not acceptable for use in erosion control mix. It contains a well-graded mix of particle sizes and may contain rocks up to 4 inches in diameter. Properly manufactured mix will have organic matter content between 80 and 100 percent (dry weight), 100 percent of particles must pass a 6-inch screen, the organic portion needs to be fibrous and elongated, it may contain only small proportions of silts, clays, or fine sand, and its pH should be between 5.0 and 8.0. Its applications include erosion control berms and mulch.
Erosion control plans: Written guidelines specific to a project or activity, describing various techniques and methods to control erosion for specific construction activities.
Fill: Any earth, rock, gravel, sand, silt, clay, peat, or debris that is put into or upon, supplied to, or allowed to enter a water body or wetland. Material, other than structures, placed in or adjacent to a water body or wetland.

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Filter strip: Undisturbed areas of ground consisting of natural vegetation and natural litter such as leaves, brush, and branches, located between a water resource and access road, skid road or trail, or other area of disturbed soil.
Ford: A permanent crossing of a stream utilizing an area of existing, non-erodible substrate of the stream, such as ledge or cobble, or by placing non-erodible material such as stone or geotextile on the stream bottom.
Geotextile, Non-woven: Synthetic material made of spun polypropylene fiber used to support wetland fill or stabilize soils.
Geotextile, Woven: Synthetic material of woven polypropylene used to stabilize soils and make sediment barriers (silt fence).
Great pond: An inland water body which in a natural state has a surface area in excess of 10 acres, and any inland water body which is artificially formed or increased which has a surface area in excess of 30 acres.
Intermittent watercourse: Water course that has water in it only part of the year. It is still considered a natural resource.
Mats: Pre-constructed, portable, timber platforms used to support equipment or travel in or over wetlands or water bodies.
Mulch: Temporary erosion control such as hay, bark, or some similar natural material utilized to stabilize disturbed soil.
Perennial seed mix: Seed mixture made up of seeds from plants that persist for several years.
Perennial watercourse: A river, stream, or brook depicted as a solid blue line on the most recent edition of a United States Geological Survey 7.5 minute series topographic map. Typically has water in it year round.
Permanent access road: Project access road that is not restored after project construction completion. Permanent access roads should be designed and constructed so they are not an erosion problem.
Permanent stabilization: Establishment of a permanent vegetative cover on exposed soils where perennial vegetation is needed for long-term protection.
Permanent vegetative cover: Perennial seed stock, including but not limited to grasses and legumes that persist for more than several growing seasons.
Protected Natural Resource: Coastal sand dune system, coastal wetlands, significant wildlife habitat, fragile mountain areas, freshwater wetlands, community public water system primary protection areas, great ponds or rivers, streams, or brooks. (From the Maine Natural Resources Protection Act, 38 M.R.S.A. Section 480-B., revised 2007).
Riprap: Heavy, irregular-shaped rocks that are fit into place, usually without mortar, on a slope in order to stabilize and prevent soil erosion.
Sediment barrier: Staked hay bales, silt fence, or similar materials placed in a manner to intercept silt and sediment laden water runoff.
Sedimentation: Deposition of earthen material in a water body or wetland.
Sensitive Natural Resource: Area that deserves special attention because it is significant wildlife habitat, fisheries habitat, or has other natural resource values. These areas may require the use of minimum impact construction techniques such as use of mats, leaving vegetation intact for buffers, special timing of construction, or other specific techniques.
Settling basin (sediment/catch basin): Excavated pit placed to intercept water running off disturbed soils or dirt road bed. Usually used only where filter strip is inadequate to protect a stream, pond, or wetland from silt and sediment.

Silt fence: Woven geotextile sediment barrier. Proper installation requires placement on-contour and keying the fabric in at ground level.
Steep slopes: Slopes in excess of eight (8) percent.
Stone check dam: A small, temporary dam constructed across a swale or drainage ditch. The purpose is to reduce the velocity of concentrated flows, reducing erosion and trapping sediment generated in the ditch.
Stream: Generally, a channel between defined banks with a gravel, sand, rock, or clay base that flows at least part of the year. It may be a dry channel part of the year. The Maine Natural Resources Protection Act contains a more detailed definition.
Structure: Anything built for the support, shelter, or enclosure of persons, animals, goods, or property of any kind, together with anything constructed or erected with a fixed location on or in the ground. Examples of structures include buildings, utility lines, and roads.
Temporary access road: Road constructed solely for project access which is restored to original grade upon project completion, if not sooner. All exposed soils on access road adjacent to water bodies or on slopes steeper than eight percent must be stabilized with a permanent seed mix and mulch or matting.
Temporary stabilization: Mulch, matting, or seed, or a combination thereof, utilized to stabilize soil. Soil stockpiles left in place longer than 14 days must have temporary stabilization.
Temporary vegetative cover: An annual seed mixture, typically annual rye and oats.
Topography: The contour and elevation of the surface of the ground.
Turn out: Water diversion that directs water out of a ditch or off a travel-way and into a vegetated buffer.
Upland edge: The area of uplands alongside a wetland, stream, or water body.
Wastes requiring special handling: Wastes generated from construction activity including engine oil, hydraulic oil, gear oil, diesel, gasoline, or coolants.
Water bar: Constructed bar across an access road or skid trail that directs surface water off the road or trail into a stable vegetated surface or filter strip. They are used as a temporary measure on active roads or when closing roads permanently to prevent erosion.
Water body: River, stream, brook, pond, wetland, or tidal area.
Water resource: River, stream, brook, pond, wetland, or tidal area.
Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and for a duration sufficient to support, and which under normal circumstance do support, a prevalence of wetland vegetation typically adapted for life in saturated soils. The Maine Natural Resources Protection Act contains a more detailed definition.

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APPENDIX B

CONSTRUCTION MATERIALS SOURCE LIST

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APPENDIX B

CONSTRUCTION MATERIALS SOURCE LIST

The following list of vendors has been selected given the wide variety of construction materials they offer. The list is not meant to be all-inclusive or an indication of favored vendors.

W.H. Shurtleff Company (Culverts, Geotextiles)

One Runway Road
Suite 8
South Portland, Maine 04106-6169
1-800-633-6149
www.whshurtleff.com

A. H. Harris (Geotextiles, i.e. Curlex Excelsior Blankets)

22 Leighton Road
Augusta, Maine 04332
(207) 622-0821
www.ahharris.com

585 Riverside Street
Portland, Maine 04103
(207) 775-5764

North American Green (Erosion control materials)

Maine Distributor:
E.J. Prescott
P.O. Box 600
32 Prescott Street, Libby Hill Business Park
Gardiner, Maine 04345
(207) 582-1851
www.ejprescott.com

New England Organics (Erosion Control Mulch)

135 Presumpscot Street, Unit 1
Portland, ME 04103
1-800-933-6474
www.newenglandorganics.com

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APPENDIX C
OTHER RECOMMENDED REFERENCE MANUALS

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APPENDIX C

OTHER RECOMMENDED REFERENCE MANUALS

Maine Erosion and Sediment Control BMPs. Bureau of Land and Water Quality, Maine Department of Environmental Protection, Augusta, Maine. March 2003. DEPLW0588.

Best Management Practices for Forestry: Protecting Maine's Water Quality. Maine Forest Service, Augusta, Maine. 2004. www.maine.gov/doc/mfs/pubs/bmp_manual.htm

Forest Transportation Systems: Roads and Structures Manual. Seven Islands Land Company, Bangor, Maine. Third Edition, 1999.

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APPENDIX D

CONSTRUCTION TECHNIQUE ILLUSTRATIONS

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CULVERT CROSSING

IMPROPER INSTALLATION

- **Culvert is undersized, allowing overflow to cross travel-way**
- **Insufficient cover thickness over culvert**
- **Outlet is not stable, leading to erosion**
- **Culvert outlet is set too high causing it to be impassable to fish and other aquatic organisms**

PROPER INSTALLATION

- **Culvert is adequately sized for flow**
- **Sufficient cover thickness over culvert**
- **Inlet and outlet are adequately supported by gravel and rock to protect and maintain stability**
- **Outlet is properly seated at or below stream bottom allowing aquatic organisms to access upstream**

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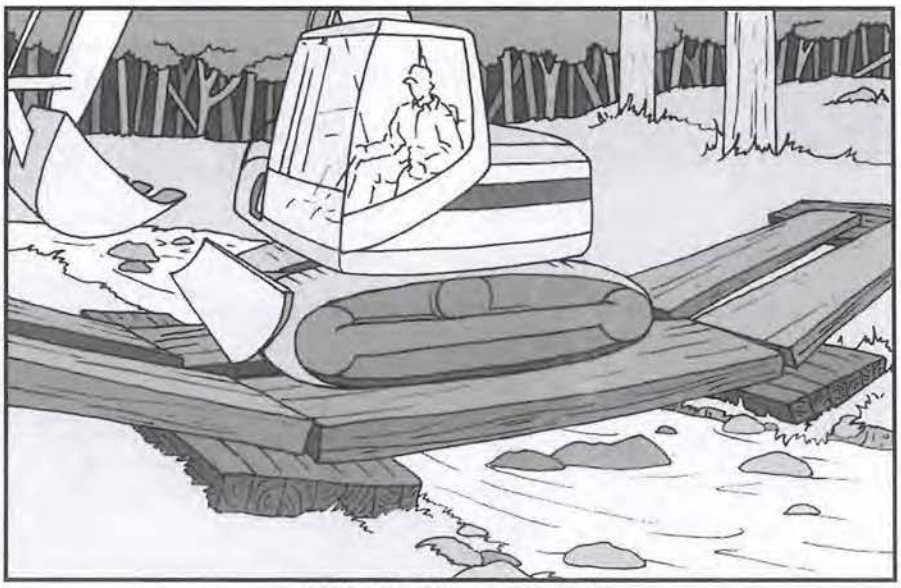
CRANE MATS – WATERBODY CROSSING

IMPROPER INSTALLATION

- **Mats not long enough to keep equipment out of water and wetland soils**
  - **Lacks cross supports which elevate travel mat**
- **Mats do not extend far enough to protect wetland soils from rutting**



PROPER INSTALLATION

- **Mats are elevated by cross-supports on stream banks, keeping them up out of water and out of wet soils**
  - **Water flows under mats**
- **Mats extend over approaches to crossing protecting soils from rutting and eroding**
  - **Equipment stays out of water and wetlands**

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CRANE MATS – WETLAND CROSSING

IMPROPER INSTALLATION

- **Long axis of mats is not perpendicular to travel direction**
- **Mats are working down into wetland causing significant disturbance and picking up mud**
- **Mats do not extend beyond wetland edge to solid ground**

PROPER INSTALLATION

- **Correct orientation relative to travel direction**
- **Entire wetland is spanned, preventing rutting at ends of crossing**

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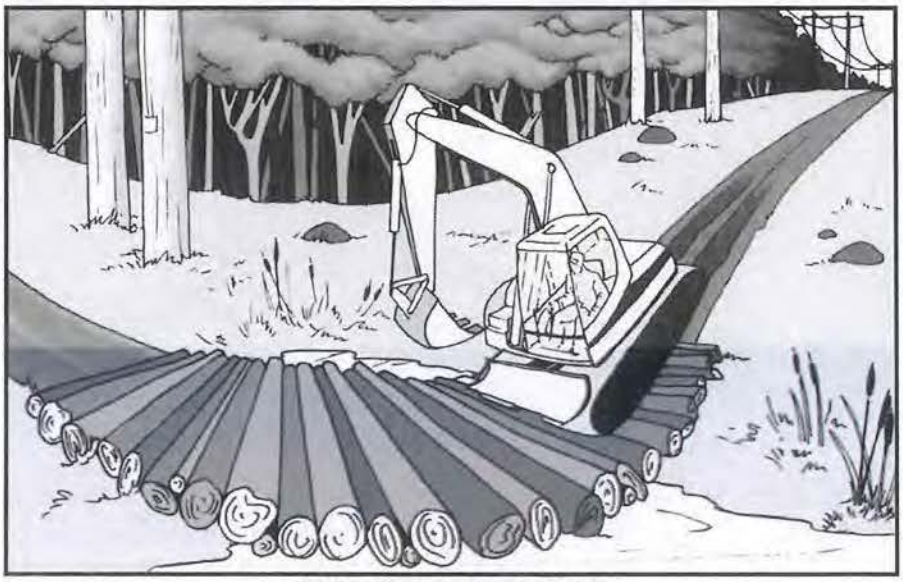
CORDUROY CROSSING

IMPROPER INSTALLATION

- **Insufficient corduroy to support equipment**
- **Corduroy is sunken into wetland soil**
- **Approaches are steep, rutted, and are not protected with additional corduroy or slash**
- **Flow is interrupted, and water is soiled with mud and silt**



PROPER INSTALLATION

- **Adequate amount of layered corduroy to protect soil from rutting**
- **Approaches are protected from rutting by extension of corduroy beyond edges of crossing**

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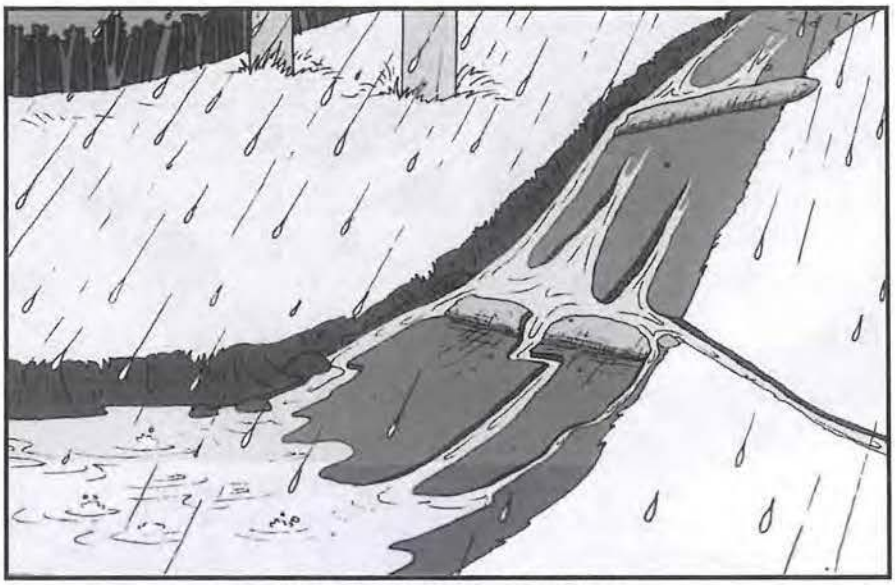
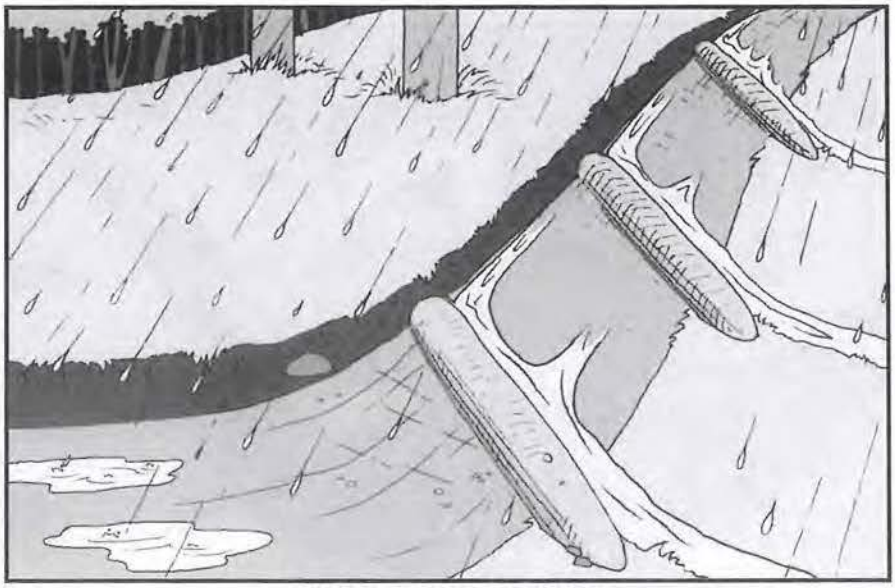
- **Flow is maintained and water is clear of mud and silt**

WATER BARS



IMPROPER INSTALLATION

- **Flow directed to uphill side on upper bar**
- **Angle of lower bar is too shallow**
- **Lower bar does not extend far enough, allowing water to escape around ends**
- **Bars are not high enough, allowing water to flow over top, eroding them**



PROPER INSTALLATION

- **Bars are at moderate angles**
- **There are enough bars to divert all water flowing down road**
- **Bars are high enough to prevent water from flowing over them**

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- **Bars extend beyond edges of road, preventing water from flowing around them**

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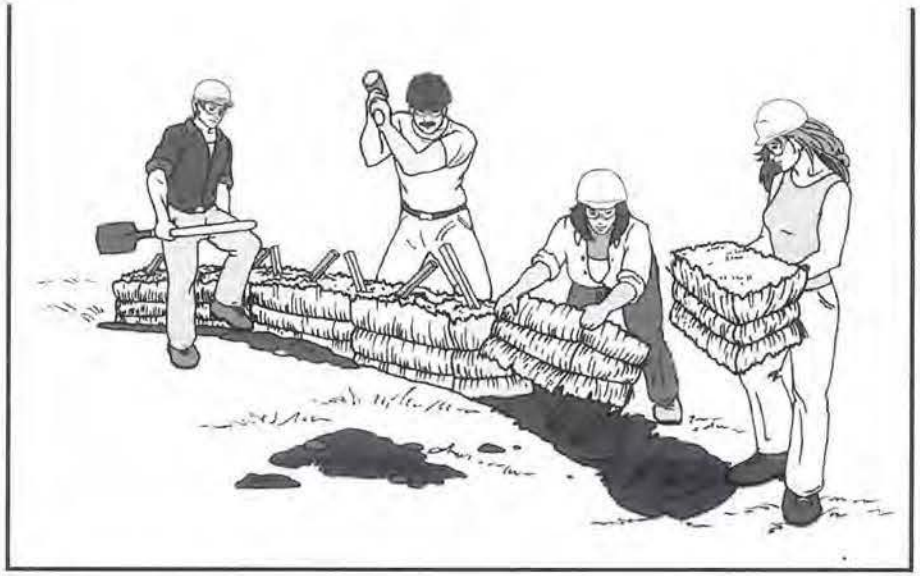


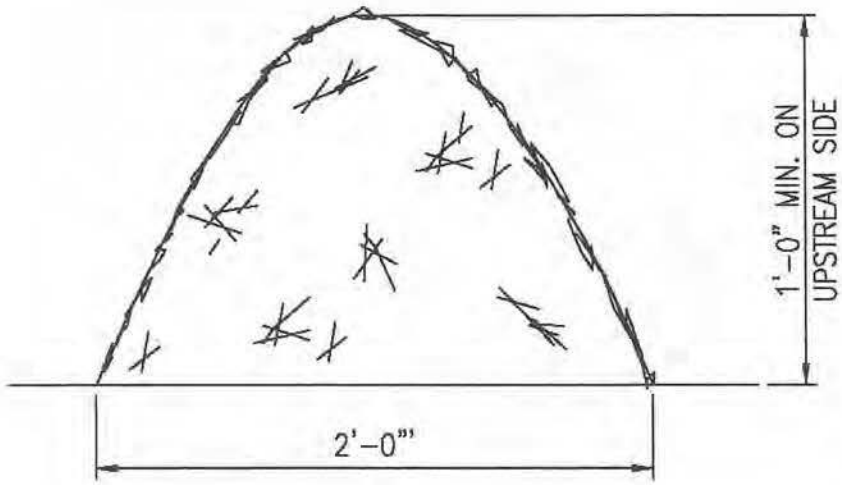
- Dug trench to key bales into ground
- Stakes placed and driven in at angles to snug bales together
- Excess dirt used to cover openings and cracks

SEDIMENT BARRIER – SILT FENCE

PROPER INSTALLATION

- Dug trench to key material into ground
- Stakes are placed facing away from disturbed area
- Excess material on bottom is buried with excess dirt to prevent water from flowing under fence

EROSION CONTROL MIX BERM DETAIL



- Use erosion control mix berm in place of silt fence and/or hay bale sediment barriers
- Erosion control soil/bark mix shall consist of: shredded bark, stump grindings, composted bark or flume grit and fragmented wood generated from water-flume log handling systems. The mix shall conform to the following:

    1. pH: 5.0 to 8.0
    2. Screen Size: 6" – 100% passing
       ¾" – 70% to 85% passing
       Mix shall not contain large portions of silts, clays or fine sands
    3. Organic material: 20% - 100% (dry weight basis)
       Organic portion must be fibrous and elongated
    4. Soluble salts shall be <4.0 mmhos/cm

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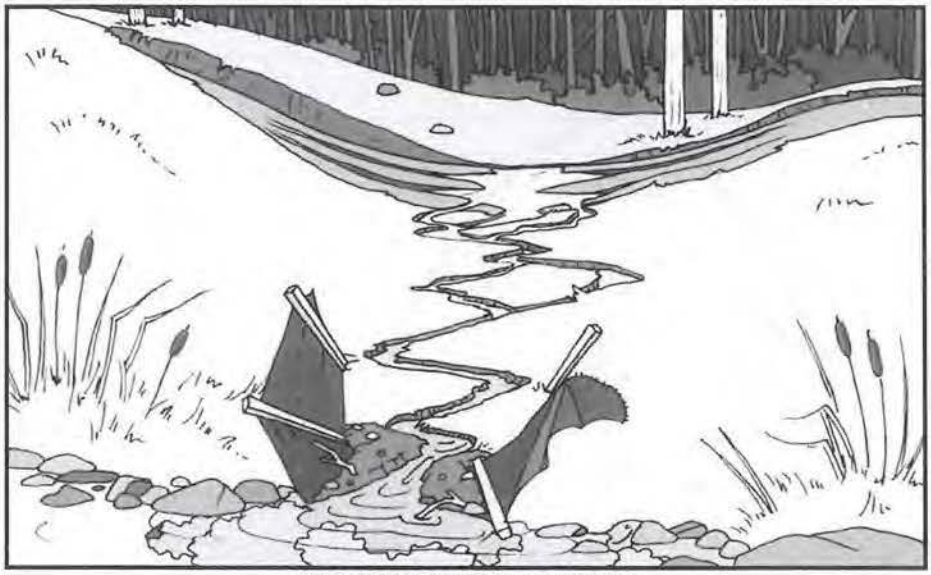
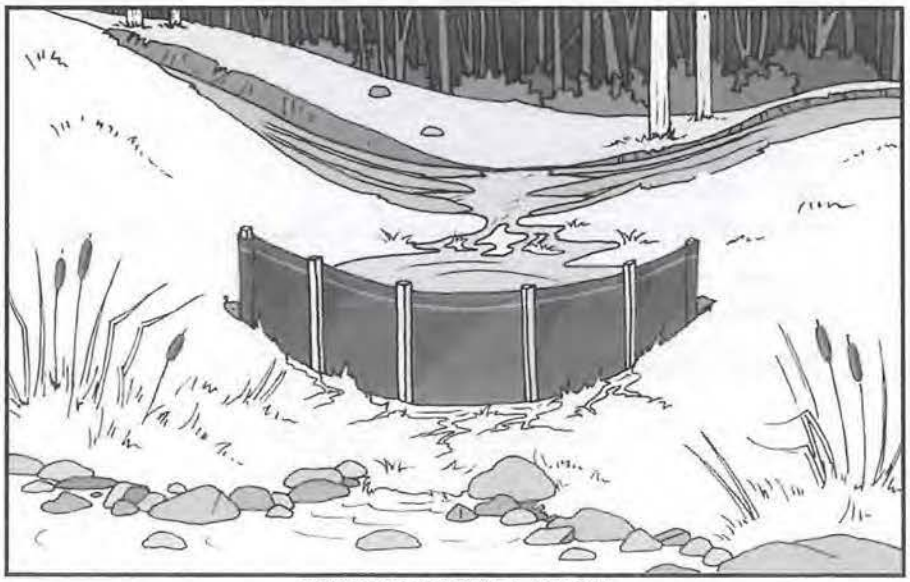
SEDIMENT BARRIER – SILT FENCE



IMPROPER INSTALLATION

- **Fence located too far from road and too close to resource**
- **Stakes installed on wrong side of fence**
- **Needs maintenance (restaking, restapling, or even replacement)**
- **Placed in concentrated flow**



PROPER INSTALLATION

- **Adequate distance from road and resource allows road to capture and slow water, and allows silt fence to filter it before reaching resource**
- **Stakes placed on correct side; facing resource, while filter fabric faces disturbed area**
- **Adequate length; fence is long enough and turned uphill at ends to prevent water from escaping around edges**

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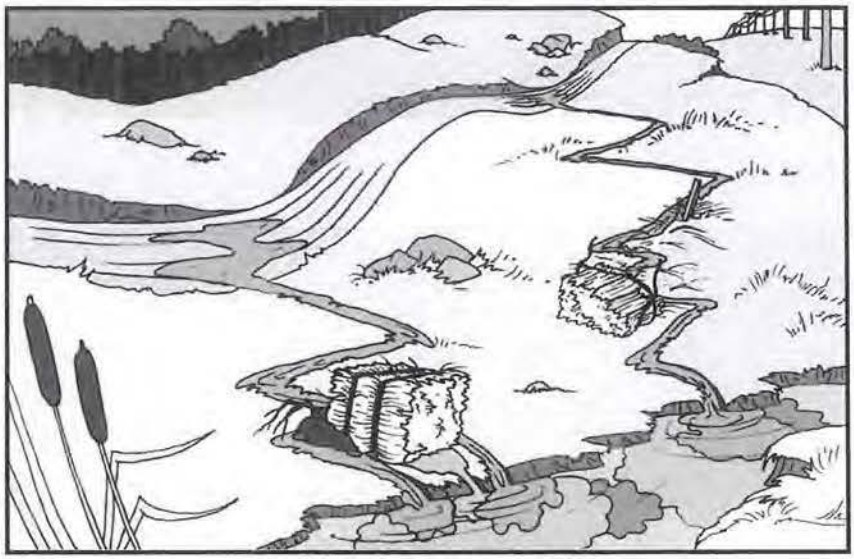
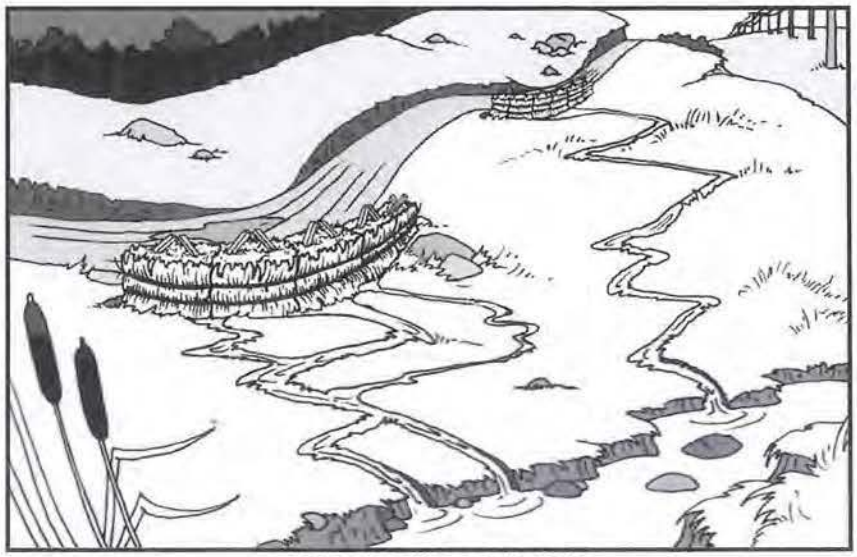
SEDIMENT BARRIER – HAY BALES



IMPROPER INSTALLATION

- **Placed in concentrated flow**
- **Hay bales are not staked**
- **Not enough hay bales to adequately capture and slow flow**
- **Too far from source of runoff and sediment**
- **Improper orientation of bales; horizontal grass fibers do not provide adequate filtration, and strings on ground rot and bales to fall apart**



PROPER INSTALLATION

- **Staked properly; bales are secure and snug to one another**
- **Sufficient number of bales to slow flow and insure that no water escapes around edges**
- **Positioned close to disturbance, and far from resource to allow proper filtration**
- **Vertical orientation of grass fibers provides adequate filtration**
- **Placed along contour to capture sheet flow**

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APPENDIX E

EROSION AND SEDIMENTATION CONTROL LAW* 38 M.R.S.A. § 420-C

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APPENDIX E

EROSION AND SEDIMENTATION CONTROL LAW*

38 M.R.S.A. § 420-C

A person who conducts, or causes to be conducted, an activity that involves filling, displacing or exposing soil or other earthen materials shall take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource as defined in section 480-B. Erosion control measures must be in place before the activity begins. Measures must remain in place and functional until the site is permanently stabilized. Adequate and timely temporary and permanent stabilization measures must be taken and the site must be maintained to prevent unreasonable erosion and sedimentation.

This section applies to a project or any portion of a project located within and organized area of this State. This section does not apply to agriculture fields. Forest management activities, including associated road construction or maintenance, conducted in accordance with applicable standards of the Maine Land Use Regulation Commission, are deemed to comply with this section. This section may not be construed to limit a municipality's authority under home rule to adopt ordinances containing stricter standards than those contained in this section.

* The Erosion and Sedimentation Control Law is administered by the Maine Department of Environmental Protection (MDEP), Augusta, Maine. Please contact the MDEP with specific questions regarding this law.

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APPENDIX F

MAINE SLASH LAW* 12 M.R.S.A. § 9333

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APPENDIX F

MAINE SLASH LAW*

12 M.R.S.A § 9333

§9333. Disposal along railroad and utility lines

*1. **Stumpage owner**. A stumpage owner, operator, landowner or agent who cuts or causes or permits to be cut any forest growth on lands that are within or border the right-of-way of a railroad, a pipeline, or an electric power, telegraph, telephone or cable line may not place slash or allow it to remain on the ground within the right-of-way or within 25 feet of the nearer side of the right-of-way.*

*2. **Construction**. Slash accumulated by the construction and maintenance of a railroad, a highway, a pipeline or electric power, telegraph, telephone or cable line may not be left on the ground but must be hauled away, burned or chipped. Slash may not be left or place within the right-of-way or within 25 feet of the nearer side of the right-of-way. If a burning permit is denied or revoked under this chapter, the director may allow logs that are too large to be chipped to remain in the right-of-way until the director determines that their removal is economically feasible.*

*3. **Utility line maintenance**. Slash accumulated by the periodic maintenance of a pipeline or an electric power, telegraph, telephone or cable line may be disposed of in the following manner.*

- *A. Slash with a diameter of 3 inches or less may be left in piles on the ground within the maintained portion of the right-of-way. A pile may not be higher than 18 inches from the ground or longer than 50 feet and must be separated from other piles by a minimum of 25 feet in every direction. A buffer strip with a minimum width of 10% of the total width of the maintained right-of-way must be kept totally free of slash with a diameter of 3 inches or less.*
- *B. Slash with a diameter of more than 3 inches must be removed, chipped or limbed and placed on the ground surface. The pieces must be separated and may not be piled one piece over another. Slash of this size may be left within the maintained buffer strips.*
- *C. If a utility line right-of-way is adjacent to a road, slash that is 3 inches or less in diameter must be removed, burned or chipped. Slash with a diameter of more than 3 inches may be left on the ground within the right-of-way and must not be limbed and separated and may not be piled one piece over another. Usable timber products generated from the maintenance of a utility right-of-way may be piled within the right-of-way but must be removed within 30 days.*

* Note that this is an excerpt from the full text of the law. Please contact the Maine Forest Service, Augusta, Maine, for the full text of the law or with specific questions regarding the Slash Law.

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APPENDIX G

CULVERT SIZES FOR STREAM CROSSINGS

(3X RULE)

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CULVERT SIZES (ROUND) FOR STREAM CROSSINGS (3x RULE)

AVERAGE STREAM WIDTH

Take two measurements across the stream from bank to bank where you intend to place the culvert. Measurements should be taken at the normal high water line (NHWL). To find the NHWL during low flow periods look for water stains on rocks or a debris line along the bank. Add the first measurement to the second and divide this number by 2. This equals the average stream width.
Example: 36in. + 47 in. = 83in. 83÷2 = avg. stream width of 41.5 inches. (Round up to 42in.)

AVERAGE STREAM DEPTH

Take 3 measurements from the bottom of the stream to the NHWL.
Add the measurements together and divide this number by 3. This equals the avg. stream depth.
Example: 12in. + 16in. + 14in. = 42in. 42÷3 = average stream depth of 14 inches.

USING THE TABLE

Take the average width and depth figures and determine where they intersect on the table above.
*For example, for an average stream width of 42 inches (on the left side of the table), and an average stream depth of 14 inches (along the top of the table), the intersect shows a culvert diameter of 48 inches.

Average Stream Width		Average Stream Depth (Inches)														
Feet	Inches	2	4	6	8	10	12	14*	16	18	20	22	24	26	28	30
1	12	12	15	18	21	21	24	30	30	30	30	36	36	36	36	42
1.5	18	12	18	21	24	30	30	36	36	36	42	42	42	42	48	48
2	24	15	21	24	30	30	36	36	42	42	48	48	48	54	54	54
2.5	30	15	21	30	30	36	42	42	48	48	48	54	54	60	60	60
3	36	18	24	30	36	42	42	48	48	54	54	60	60	60	66	66
3.5	42*	18	30	36	36	42	48	48	54	54	60	60	66	66	72	72
4	48	21	30	36	42	48	48	54	54	60	66	66	66	72	72	78
4.5	54	21	30	36	42	48	54	54	60	66	66	72	72	78	78	84
5	60	21	30	42	48	48	54	60	66	66	72	72	78	78	84	84
5.5	66	24	36	42	48	54	60	60	66	72	72	78	78	84	84	90
6	72	24	36	42	48	54	60	66	66	72	78	78	84	90	90	96
6.0	78	24	36	42	54	60	60	66	72	78	78	84	90	90	96	96
7	84	30	36	48	54	60	66	72	72	78	84	84	90	96	96	102
7.5	90	30	42	48	54	60	66	72	78	84	84	90	96	96	102	102
8	96	30	42	48	54	66	66	72	78	84	90	90	96	102	102	108
8.5	102	30	42	48	60	66	72	78	84	84	90	96	102	102	108	108
9	108	30	42	54	60	66	72	78	84	90	96	96	102	108	108	114
9.5	114	30	42	54	60	66	72	78	84	90	96	102	102	108	114	114
10	120	30	48	54	66	72	78	84	90	96	96	102	108	114	114	120
10.5	126	36	48	54	66	72	78	84	90	96	102	108	108	114	120	120
11	132	36	48	60	66	72	78	84	90	96	102	108	114	114	120	126
11.5	138	36	48	60	66	78	84	90	96	102	108	108	114	120	126	126
12	144	36	48	60	66	78	84	90	96	102	108	114	120	120	126	132
12.5	150	36	48	60	72	78	84	90	96	102	108	114	120	126	132	132
13	156	36	54	60	72	78	90	96	102	108	114	114	120	126	132	138
13.5	162	36	54	66	72	84	90	96	102	108	114	120	126	132	132	138
14	168	36	54	66	72	84	90	96	102	108	114	120	126	132	138	144
14.5	174	36	54	66	78	84	90	96	108	114	120	126	126	132	138	144
15	180	42	54	66	78	84	96	102	108	114	120	126	132	138	144	144

EXHIBIT 10
Spill Contingency Plan Procedures

CENTRAL MAINE POWER COMPANY
Lewiston Substations District
SPCC Plan

SPCC Plan – Part 1

Facility Conformance [112.7(a)(1)]

This plan has been prepared to meet the requirements of 40CFR Part 112 - Oil Pollution Prevention, and will be followed in the event of an oil spill. This plan supplements the procedures outlined in the Spill Management and Prevention section of CMP's Environmental Procedures Manual. The plan consists of two parts: Part 1 which includes generic information applicable to all substations in the District; and Part 2 which includes specific information for individual substations and site specific diagrams.

Contact List [112.7(a)(3)(vi)]

Substation Operations Supervisor:

Fran Hanley

Office Phone:	(207) 795-4281	Home Phone:	(207) 242-9209
Cell Phone:	(207) 242-9209	Camp Phone:	N/A
Pager:	(207) 750-3775	Radio:	601

Other CMP Contacts:

Communications Center:	(207) 622-7421
Dispatcher:	(800) 750-2976
Environmental:	(207) 622-7421
S/S Crew:	(207) 622-7421
NASC Crew:	(207) 622-7421

Agency Contacts:

Dept. of Environmental Protection	(800) 482-0777
Dept. of Public Safety	(800) 452-4664
National Response Center	(800) 424-8802

Clean up Contractor Contacts:

Clean Harbors	So. Portland	(800) 526-9191
Environmental Projects	Gray	(207) 657-2400
ENPRO Services	So. Portland	(888) 367-6660

Management Approval [112.7]

CMP management fully supports the adoption of this plan, including committing the necessary manpower, equipment, and materials to expeditiously control and remove any quantity of oil that may be harmful to the environment.

Gerald N. Lizotte
Manager, Substation Operations

2/16/07
Date

Professional Engineer Certification [112.3(d)]:

By means of this certification I attest that I am familiar with the requirements of 40 CFR 112 (Oil Pollution Prevention); that I or my agent has visited and examined the facility; that the Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards, and the requirements of this part; that procedures for required inspections and testing have been established; and that the Plan is adequate for this facility.

STATE OF MAINE

Roy A. Koster, P.E.
Maine #3626
2/28/07

Discharge Prevention Measures [112.7(a)(3)(ii)] and Transfer Operations [112.8(d)]

When taking oil samples from equipment or transferring oil follow procedures to prevent spillage such as:

1. Place spill pads and/or 5 gallon pails beneath valves to collect drippage.
2. Ensure the hose is tightly connected prior to transferring oil.
3. If tank is sealed, open vents prior to transferring oil.
4. Prior to transferring oil from electrical equipment to a portable tank, ensure all valves for the portable tank are closed.
5. When re-filling electrical equipment from a portable tank, make use of the remote start and stop buttons.
6. Take care not to overfill the equipment by watching sight glass or floats, as appropriate.
7. Never leave equipment unattended during transfer operations.

Countermeasures for Discharge Discovery, Response and Cleanup [112.7(a)(3)(iv); 112.7(a)(5)]

Spill Response:

1. If danger of safety or fire, call fire department - do not allow fire department action without approval by responsible CMP Co. supervision.
2. Stop source of spill if possible.
3. Notify on-duty supervisor. If unable to contact supervisor, call CMP dispatcher.
4. If possible, keep spill from reaching navigable waters by use of sorbent material, small dams of sandbags or earth, trenches or pits.

Spill Reporting: Responsible supervisor shall immediately report all spills and/or releases to Environmental Compliance by calling the Communications Center and requesting them to page the person on duty, or by calling the Environmental pager directly (750-3500). Environmental Compliance shall report oil spills to the MDEP and for water related spills to the National Response Center. Follow up spill reports will be forwarded to agencies as required.

Spill Clean-up: CMP personnel will clean up small spills and/or releases using the available spill control equipment. If the spill is extensive and requires considerable time, effort and equipment to control and/or clean up, a clean up contractor may be called for assistance (see contact list). Spill control resources such as drums, bags, shovels, brooms, rags and power cleaner are available at the Lewiston and North Augusta Service Centers. Additional resources are listed below:

Spill Control Resources:

Material	*Quantity*	*Storage Location*	*Capabilities*
Sorbents	15 bags	Lewiston Service Center	25 gal/bag
Sorbents	2 rolls	Lewiston Service Center	47 gal/roll
Slickwic Boom 10'	200 ft	Lewiston Service Center	12 gal/boom
Speedi-Dry	10 bags	Lewiston Service Center	15 gal/bag
Emergency Spill Kit	1 kit	Company Vehicles	

Weepers: Periodically, minor equipment "weeps" may occur that create staining within the substations. When identified, temporary measures shall be taken to contain oil and limit staining until the equipment can be repaired. These measures may include placement and regular replacement of sorbent pads beneath the weep area. Gravel or crushed stone cover will keep pads in place and prevent sunlight degradation. Notify Environmental whenever oil leak is identified and when temporary spill pads are installed.

Information to Report in Event of Spill [112.7(a)(4)]

- Facility address
- Phone number
- Date and time of discharge
- Type of material discharged
- Estimated quantity spilled
- Damages or injuries
- Source of discharge
- Mitigation steps undertaken
- Media affected by discharge
- Need for evacuation
- Cause of discharge
- Names of individuals/organizations contacted

Spill Clean-up Debris Management [112.7(a)(3)(v)]

All contaminated soil and debris will be containerized and properly disposed of per State and Federal requirements.

Bulk Storage Containers [112.7(d), 112.8(c)(6)]

Bulk storage containers, including drums 55 gallons and greater and tanks used for oil transfer, if not elevated shall be stored on pallets so that they can be visually inspected for leaks. Inspections of these facilities shall occur at least quarterly during regular substation inspections. The tanks shall be inspected for leaks, settlement of the supports and deterioration of the container. Electrical equipment does not meet the definition of Bulk Storage Container; however, oil-filled electrical equipment (55 gallons or greater) shall be visually inspected for leaks on a quarterly basis at a minimum.

Personal Protective Equipment (PPE)

Employees working in a substation are required to wear hard hats, safety glasses and steel toe shoes in accordance with CMP's Accident Prevention Manual. In the event of a spill and/or release the following PPE is available in the spill cleanup kit, located on each company vehicle: 2 Tyvek suits, 2 pair rubber boots, 6 pair non-porous gloves and duct tape. Additional PPE is available at NASC.

Inspections, Testing and Recordkeeping [112.7(e)]

Inspections will take place quarterly in accordance with CMP Co. Inspection and Maintenance procedures. Inspections are recorded electronically using the Mobile Assets Management (MAM) Program. The data is uploaded into SAP, CMP's asset accounting database. If an oil spill is detected during an inspection, employees shall follow the spill response procedures above. Inspection records can be accessed by the Substation Operations Supervisor.

Training records and spill reports are retained in the Environmental Compliance Department for a minimum of three years. This SPCC Plan must be reviewed and updated at least every 5 years.

Training [112.7(f)(1,3)]

All substation personnel and supervisors shall be trained annually on the use of this plan and in measures to prevent, report, and clean up spills. In addition, they shall receive annual training in RCRA, OSHA Hazwoper (Awareness Level) and OSHA Hazard Communication.

Availability of Plan [112.3(e)]

A complete set of the plan for Lewiston Substations can be found:

- Original – General Office, Environmental Compliance Department
- Copy – North Augusta Service Center, Manager Substation Operations
- Copy – Lewiston Substations, Supervisor Substation Operations

Certification of Substantial Harm Determination
[112.20(e); (f)(1)]

Facility Name: **Lewiston Substations** – This certification applies individually to each substation within the Lewiston Substations District.

1. Does the facility transfer oil over water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons?

   ☐ Yes ☑ No

2. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground storage tank area?

   ☐ Yes ☑ No

3. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula) such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments?

   ☐ Yes ☑ No

4. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance (as calculated using the appropriate formula) such that a discharge from the facility would shut down a public drinking water intake?

   ☐ Yes ☑ No

5. Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and has the facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   ☐ Yes ☑ No

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Roy A. Koster, P.E
Lead Engineer, Compliance

Feb 28, 2007
Date

Plan Review and Update Log [112.5(b)]

Date	Activity	Responsible Person	Comment
March, 1997	Initial SPCC Plan	Carol Clark, PE	
September,2000	Plan Update	Carol Clark, PE	
February, 2004	Plan Update	Roy Koster, PE	
July, 2006	Kimball Road S/S Plan Update	Roy Koster, PE	
February, 2007	Plan Update	Roy Koster, PE	
February, 2009	Equipment updates to Denmark, Freeport, Kimball Road, Livermore Falls, Paris Hill, & Raymond 34.5; deleted Harrison	RK	

S/S Area: Lewiston
S/S No. TBD

CENTRAL MAINE POWER COMPANY
Substations SPCC Plan - Part 2

Facility: Middle St - Proposed
Middle Street
Lewiston

Security [112.7(g)]:
All Substations are fenced and locked. Lighting is available at each substation, but the yard is generally not lit at night. Danger signs warning of the electrical hazards are posted on the fences.

Facility Diagram [112.7(a)(3)(i)]:
See Attached

Customer:

Contact No.:

Regulated Oil-Containing Equipment (> or = 55 gal) [112.7(a)(3)(i)]:

Unless otherwise noted, type of oil is Mineral Oil

# of Units	Manufacturer	Equipment	Gallons	Serial No.	PCB (ppm)
1		Pump Storage Tank	2,000		Non-PCB
1	TBD	Transformer (T1)	6,500	TBD	Non-PCB
1	TBD	Transformer (T2)	6,500	TBD	Non-PCB
1	TBD	Transformer (T3)	6,500	TBD	Non-PCB

Largest Single Container - Gallons: 6,500

Total Storage - Gallons: 21,500

DRAINAGE

Type of System: Gravel base **Discharge:** Natural runoff **Proximity to Navigable Waters:** 80 feet to west

Prediction of Spill Characteristics [112.7(b)]:

Drainage outside of yard to west

Flow from an oil spill could range from minor weeps and drips to sheet flow over the yard surface if an entire unit failed. Rate of flow is not measureable.

Discharge Containment Structures [112.7(a)(3)(iii), 112.7(c), 112.8(b)]

Berm on west fence line

The facility is designed to absorb spills within porous surface soils. Affected soil will be removed during cleanup.

Deviation from Requirements of 112.7 [112.7(a)(2)]:

None

Non-practicality of Discharge Prevention Measures [112.7(d)]:

N/A

Unloading Racks [112.7(h)] / Repair of Field Constructed Aboveground Containers [112.7(i)]:

N/A

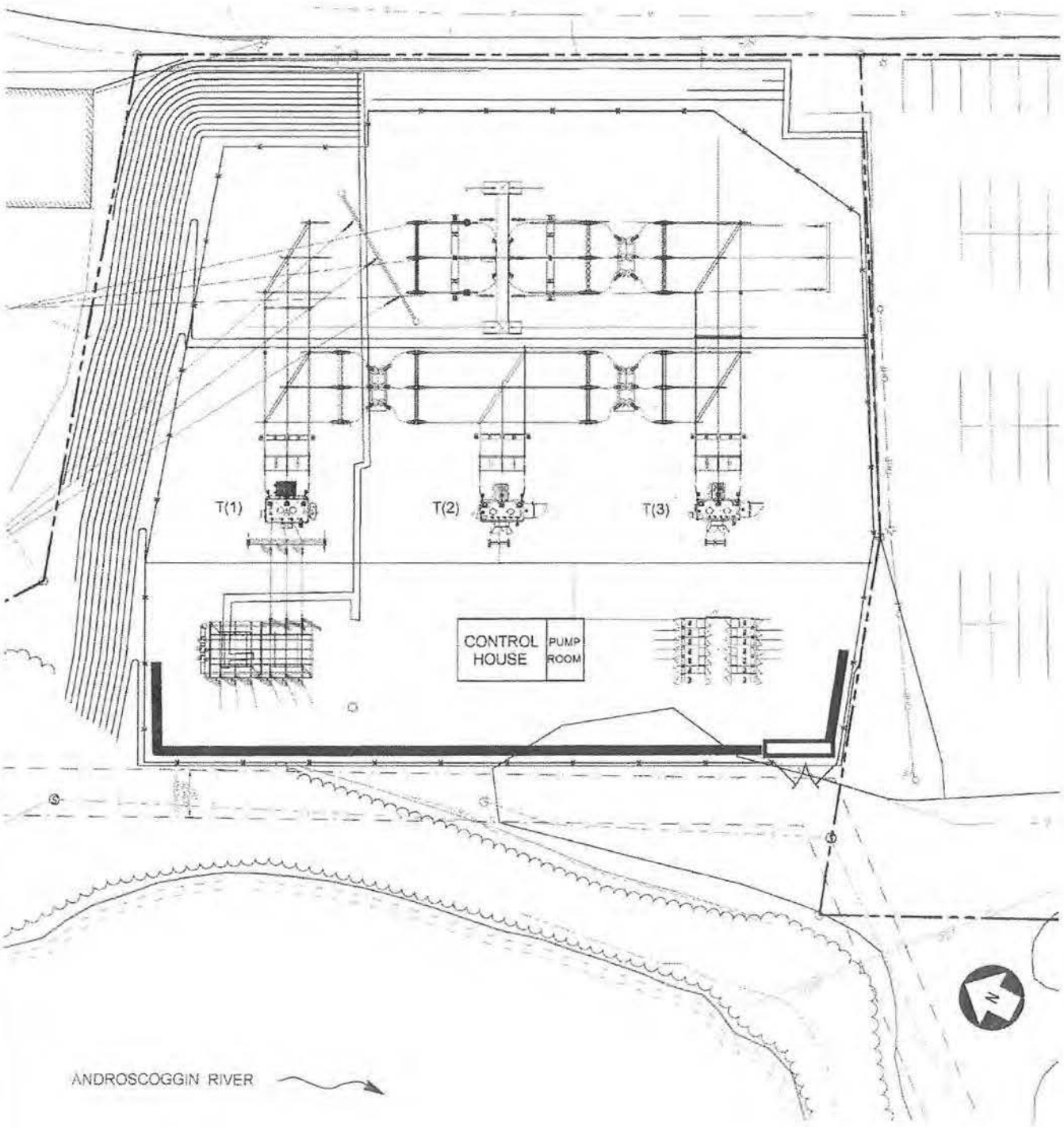
Additional Preventative Measures [112.7(j)]:

N/A

MODIFICATIONS/COMMENTS

for Jeremy Harvey
2/16/11

MIDDLE STREET SUBSTATION
(PROPOSED)



THRESHOLD

BERM

EXHIBIT 11
EMF Information

CENTRAL MAINE POWER
Maine Power Reliability Program

EMF Statement - Middle Street Substation
Lewiston Loop Project

(excerpt from Page 36 of the Rapid Report)

Q. How strong is the EMF from electric power substations?

A. In general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

EMF levels from Middle Street Substation are expected to be consistent with the statement above.

52 Farm View Drive, New Gloucester, ME 04260
Telephone 207.253.4001, Fax 207.253.4079
www.mainepower.com

IBERDROLA USA

EMF ELECTRIC AND MAGNETIC FIELDS

What is EMF and is it regulated?

EMF refers to the electric and magnetic fields produced through the generation, transmission, and use of AC (60 HZ alternating current) electric power.

We encounter EMF throughout our daily activities at work and at home. Sources of magnetic fields in our homes include fields generated by appliances, the wiring that powers those appliances, the distribution lines that supply electricity to the home, and any currents flowing on water pipes. Nearby transmission lines may also be a source of magnetic fields in the home but their contribution depends largely upon the distance from the home.

Some people have expressed concern that exposure to EMF might adversely affect human health. In response to these concerns, the National Institute of Environmental Health Sciences (NIEHS) has conducted numerous studies and a major review of research to evaluate the potential effects of EMF on human health. In June 1999, the NIEHS reported to the U.S. Congress that scientific evidence for an EMF-cancer link is weak. The following are excerpts from the report: "The NIEHS believes that the probability that ELF-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm."

In June 2007, after more than ten years of study, the World Health Organization (WHO) released a review of research on EMF and health. The conclusions of this report are consistent with previous review of NIEHS and other national and international agencies. Like NIEHS, the WHO reported that there is a weak statistical association between childhood leukemia and average exposure to magnetic fields at levels above 3-4 milligauss in some studies. However, the WHO also reported that no consistent adverse health effects, including cancer, had been reported in animals, even after exposure to high levels of EMF or that a mechanism to explain any adverse effect had been identified. Based on this review, the WHO concluded that the research does not establish that exposure to magnetic fields causes or contributes to any disease or illness and that electric fields pose no substantive health issues at levels generally encountered by the public. The WHO suggested that engineering practices to reduce EMF exposure from equipment or devices should be considered, provided that they yield other additional benefits, such as greater safety, or involve little or no cost.

60 Hz EMF is not regulated by the State of Maine and at the current time there are no federal standards for occupational or residential exposure to 60 Hz EMF. Nevertheless, CMP will consider the guidance from the WHO on this matter.

(continued)

EMF CONTINUED

Exposure To EMF Happens Everyday

Consult the following organizations for more information:

World Health Organization, International EMF Project
http://www.who.int/mediacentre/factsheets/fs322/en/index.html

U.S. National Institute of Environmental Health Sciences
Electric & Magnetic Fields http://www.niehs.nih.gov/health/topics/agents/emf/
Download NIEHS EMF Q&A (PDF) http://www.niehs.nih.gov/health/docs/emf-02.pdf

U.S. National Cancer Institute
http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields

Central Maine Power

83 Edison Drive
Augusta, ME 04336
(207) 623-352
www.cmpco.com

Common Sources of Magnetic Fields (mG)

Office Sources
Air Cleaners
Copy Machines
Fax Machines
Fluorescent Lights
Electric Pencil Sharpeners
Video Display Terminals

Bathroom Sources
Hair Dryers
Electric Shavers

Workshop Sources
Battery Chargers
Drills
Power Saws
Electric Screwdrivers (while charging)

Living Room Sources
Ceiling Fans
Window Air Conditioners
Color Televisions

Kitchen Sources
Blenders
Can Openers
Coffee Makers
Dishwashers
Food Processors
Garbage Disposals
Microwave Ovens
Mixers
Electric Ovens
Electric Ranges
Refrigerators
Toasters

Bedroom Sources
Digital Clock
Analog Clocks
Baby Monitor (unit nearest child)

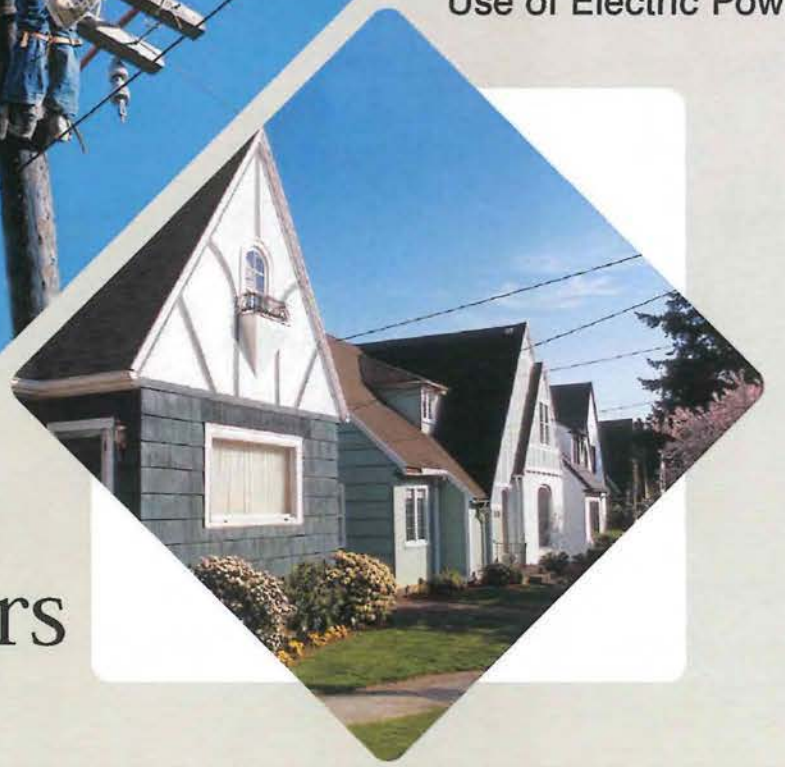
Laundry/Utility Sources
Electric Clothes Dryers
Washing Machines
Irons
Portable Heaters
Vacuum Cleaners
Sewing Machines

Source: EMF In Your Environment, U.S. Environmental Protection Agency, 1992.

June 2002

EMF

Electric and Magnetic Fields Associated with the Use of Electric Power



Questions & Answers

prepared by the
National Institute of Environmental Health Sciences
National Institutes of Health

EMF RAPID

sponsored by the
NIEHS/DOE EMF RAPID Program

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Reviews basic terms about electric and magnetic fields.

2 **Evaluating Potential Health Effects** 10

Explains how scientific studies are conducted and evaluated to assess possible health effects.

3 **Results of EMF Research** 16

Summarizes results of EMF-related research including epidemiological, clinical, and laboratory studies.

4 **Your EMF Environment** 28

Discusses typical magnetic exposures in homes and workplaces and identifies common EMF sources.

5 **EMF Exposure Standards** 46

Describes standards and guidelines established by state, national, and international safety organizations for some EMF sources and exposures.

6 **National and International EMF Reviews** 50

Presents the findings and recommendations of major EMF research reviews including the EMF RAPID Program.

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Selected references on EMF topics.

Introduction

Since the mid-twentieth century, electricity has been an essential part of our lives. Electricity powers our appliances, office equipment, and countless other devices that we use to make life safer, easier, and more interesting. Use of electric power is something we take for granted. However, some have wondered whether the electric and magnetic fields (EMF) produced through the generation, transmission, and use of electric power [power-frequency EMF, 50 or 60 hertz (Hz)] might adversely affect our health. Numerous research studies and scientific reviews have been conducted to address this question.

Unfortunately, initial studies of the health effects of EMF did not provide straightforward answers. The study of the possible health effects of EMF has been particularly complex and results have been reviewed by expert scientific panels in the United States and other countries. This booklet summarizes the results of these reviews. Although questions remain about the possibility of health effects related to EMF, recent reviews have substantially reduced the level of concern.

The largest evaluation to date was led by two U.S. government institutions, the National Institute of Environmental Health Sciences (NIEHS) of the National Institutes of Health and the Department of Energy (DOE), with input from a wide range of public and private agencies. This evaluation, known as the Electric and Magnetic Fields Research and Public Information Dissemination (EMF RAPID) Program, was a six-year project with the goal of providing scientific evidence to determine whether exposure to power-frequency EMF involves a potential risk to human health.

In 1999, at the conclusion of the EMF RAPID Program, the NIEHS reported to the U.S. Congress that the overall scientific evidence for human health risk from EMF exposure is weak. No consistent pattern of biological effects from exposure to EMF had emerged from laboratory studies with animals or with cells. However, epidemiological studies (studies of disease incidence in human populations) had shown a fairly consistent pattern that associated potential EMF exposure with a small increased risk for leukemia in children and chronic lymphocytic leukemia in adults. Since 1999, several other assessments have been completed that support an association between childhood leukemia and exposure to power-frequency EMF. These more recent reviews, however, do not support a link between EMF exposures and adult leukemias. For both childhood and adult leukemias, interpretation of the epidemiological findings has been difficult due to the absence of supporting laboratory evidence or a scientific explanation linking EMF exposures with leukemia.

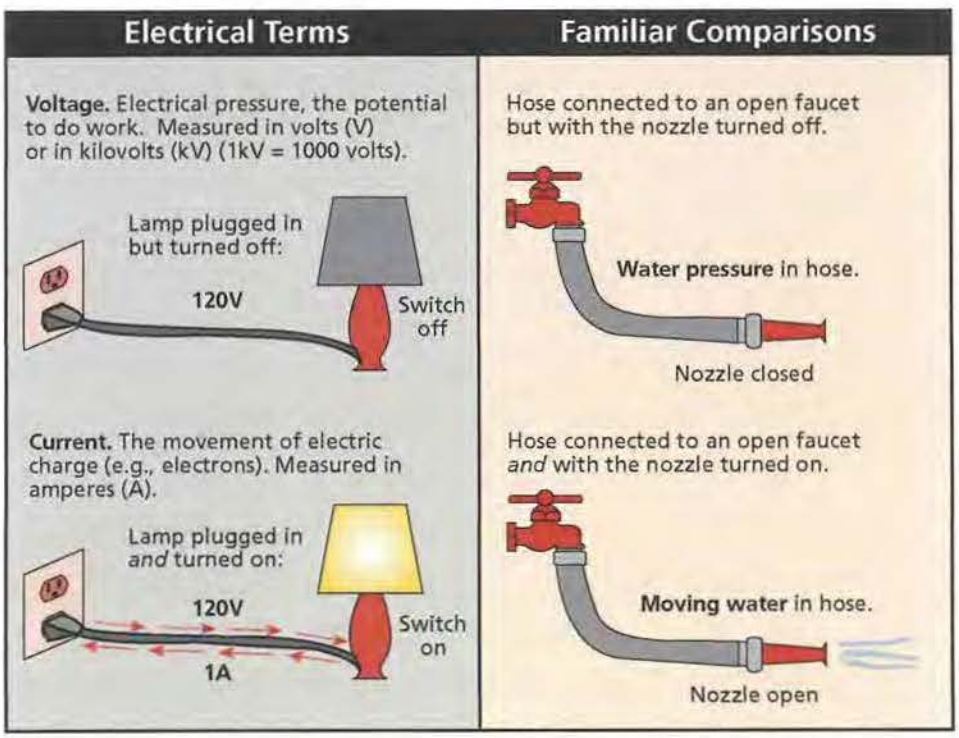
EMF exposures are complex and exist in the home and workplace as a result of all types of electrical equipment and building wiring as well as a result of nearby power lines. This booklet explains the basic principles of electric and magnetic fields, provides an overview of the results of major research studies, and summarizes conclusions of the expert review panels to help you reach your own conclusions about EMF-related health concerns.

1 EMF Basics

This chapter reviews terms you need to know to have a basic understanding of electric and magnetic fields (EMF), compares EMF with other forms of electromagnetic energy, and briefly discusses how such fields may affect us.

Q What are electric and magnetic fields?

A Electric and magnetic fields (EMF) are invisible lines of force that surround any electrical device. Power lines, electrical wiring, and electrical equipment all produce EMF. There are many other sources of EMF as well (see pages 33–35). The focus of this booklet is on power-frequency EMF—that is, EMF associated with the generation, transmission, and use of electric power.



Voltage produces an electric field and current produces a magnetic field.

Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter (V/m). Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T).

Most electrical equipment has to be turned on, i.e., current must be flowing, for a magnetic field to be produced. Electric fields are often present even when the equipment is switched off, as long as it remains connected to the source of electric power. Brief bursts

of EMF (sometimes called "transients") can also occur when electrical devices are turned on or off.

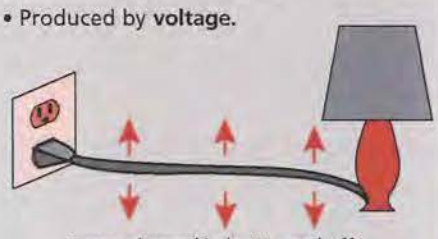
Electric fields are shielded or weakened by materials that conduct electricity—even materials that conduct poorly, including trees, buildings, and human skin. Magnetic fields, however, pass through most materials and are therefore more difficult to shield. Both electric fields and magnetic fields decrease rapidly as the distance from the source increases.

Even though electrical equipment, appliances, and power lines produce both electric and magnetic fields, most recent research has focused on potential health effects of magnetic field exposure. This is because some epidemiological studies have reported an increased cancer risk associated with estimates of magnetic field exposure (see pages 19 and 20 for a summary of these studies). No similar associations have been reported for electric fields; many of the studies examining biological effects of electric fields were essentially negative.

A Comparison of Electric and Magnetic Fields

Electric Fields

- Produced by **voltage.**

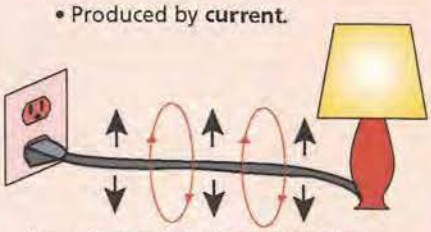


Lamp plugged in but turned off. Voltage produces an electric field.

- Measured in **volts per meter (V/m)** or in **kilovolts per meter (kV/m).**
- **Easily shielded** (weakened) by conducting objects such as trees and buildings.
- Strength decreases rapidly with increasing distance from the source.

Magnetic Fields

- Produced by **current.**

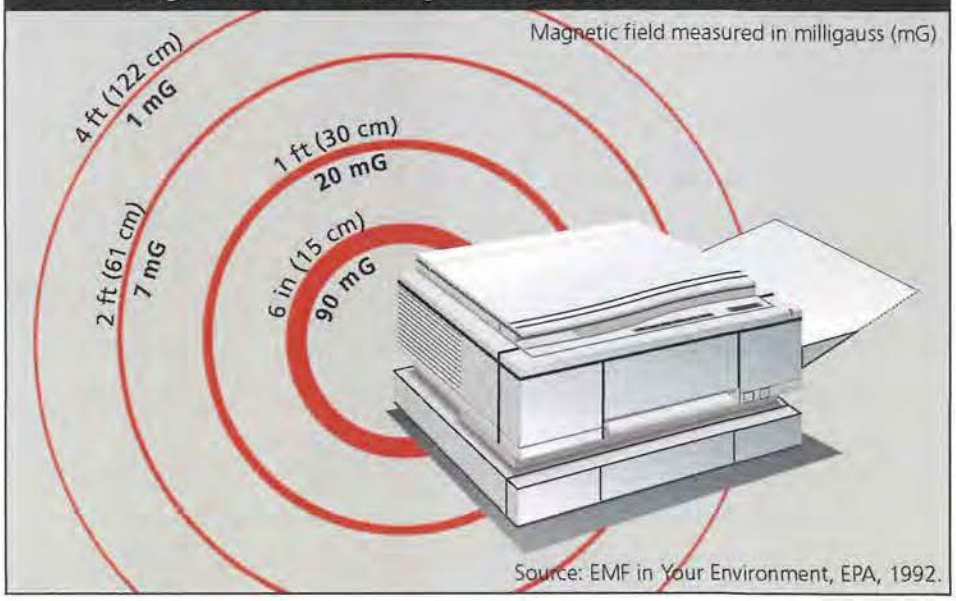


Lamp plugged in and turned on. Current now produces a magnetic field also.

- Measured in **gauss (G)** or **tesla (T).**
- **Not easily shielded** (weakened) by most material.
- Strength decreases rapidly with increasing distance from the source.

An appliance that is plugged in and therefore connected to a source of electricity has an electric field even when the appliance is turned off. To produce a magnetic field, the appliance must be plugged in and turned on so that the current is flowing.

Magnetic Field Strength Decreases with Distance



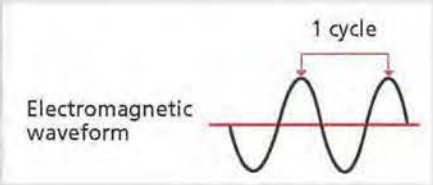
You cannot see a magnetic field, but this illustration represents how the strength of the magnetic field can diminish just 1–2 feet (30–61 centimeters) from the source. This magnetic field is a 60-Hz power-frequency field.

Characteristics of electric and magnetic fields

Electric fields and magnetic fields can be characterized by their wavelength, frequency, and amplitude (strength). The graphic below shows the waveform of an alternating electric or magnetic field. The direction of the field alternates from one polarity to the opposite and back to the first polarity in a period of time called one cycle. Wavelength describes the distance between a peak on the wave and the next peak of the same polarity. The frequency of the field, measured in hertz (Hz), describes the number of cycles that occur in one second. Electricity in North America alternates through 60 cycles per second, or 60 Hz. In many other parts of the world, the frequency of electric power is 50 Hz.

Frequency and Wavelength

Frequency is measured in hertz (Hz).
1 Hz = 1 cycle per second.



Examples:

Source	Frequency	Wavelength
Power line (North America)	60 Hz	3100 miles (5000 km)
Power line (Europe and most other locations)	50 Hz	3750 miles (6000 km)

Q How is the term EMF used in this booklet?

A The term "EMF" usually refers to electric and magnetic fields at extremely low frequencies such as those associated with the use of electric power. The term EMF can be used in a much broader sense as well, encompassing electromagnetic fields with low or high frequencies (see page 8).

Measuring EMF: Common Terms

Electric fields

Electric field strength is measured in volts per meter (V/m) or in kilovolts per meter (kV/m). 1 kV = 1000 V

Magnetic fields

Magnetic fields are measured in units of gauss (G) or tesla (T). Gauss is the unit most commonly used in the United States. Tesla is the internationally accepted scientific term. 1 T = 10,000 G

Since most environmental EMF exposures involve magnetic fields that are only a fraction of a tesla or a gauss, these are commonly measured in units of microtesla (μT) or milligauss (mG). A milligauss is 1/1,000 of a gauss. A microtesla is 1/1,000,000 of a tesla. 1 G = 1,000 mG; 1 T = 1,000,000 μT

To convert a measurement from microtesla (μT) to milligauss (mG), multiply by 10.
1 μT = 10 mG; 0.1 μT = 1 mG

When we use EMF in this booklet, we mean extremely low frequency (ELF) electric and magnetic fields, ranging from 3 to 3,000 Hz (see page 8). This range includes power-frequency (50 or 60 Hz) fields. In the ELF range, electric and magnetic fields are not coupled or interrelated in the same way that they are at higher frequencies. So, it is more useful to refer to them as "electric and magnetic fields" rather than "electromagnetic fields." In the popular press, however, you will see both terms used, abbreviated as EMF.

This booklet focuses on extremely low frequency EMF, primarily power-frequency fields of 50 or 60 Hz, produced by the generation, transmission, and use of electricity.

Q How are power-frequency EMF different from other types of electromagnetic energy?

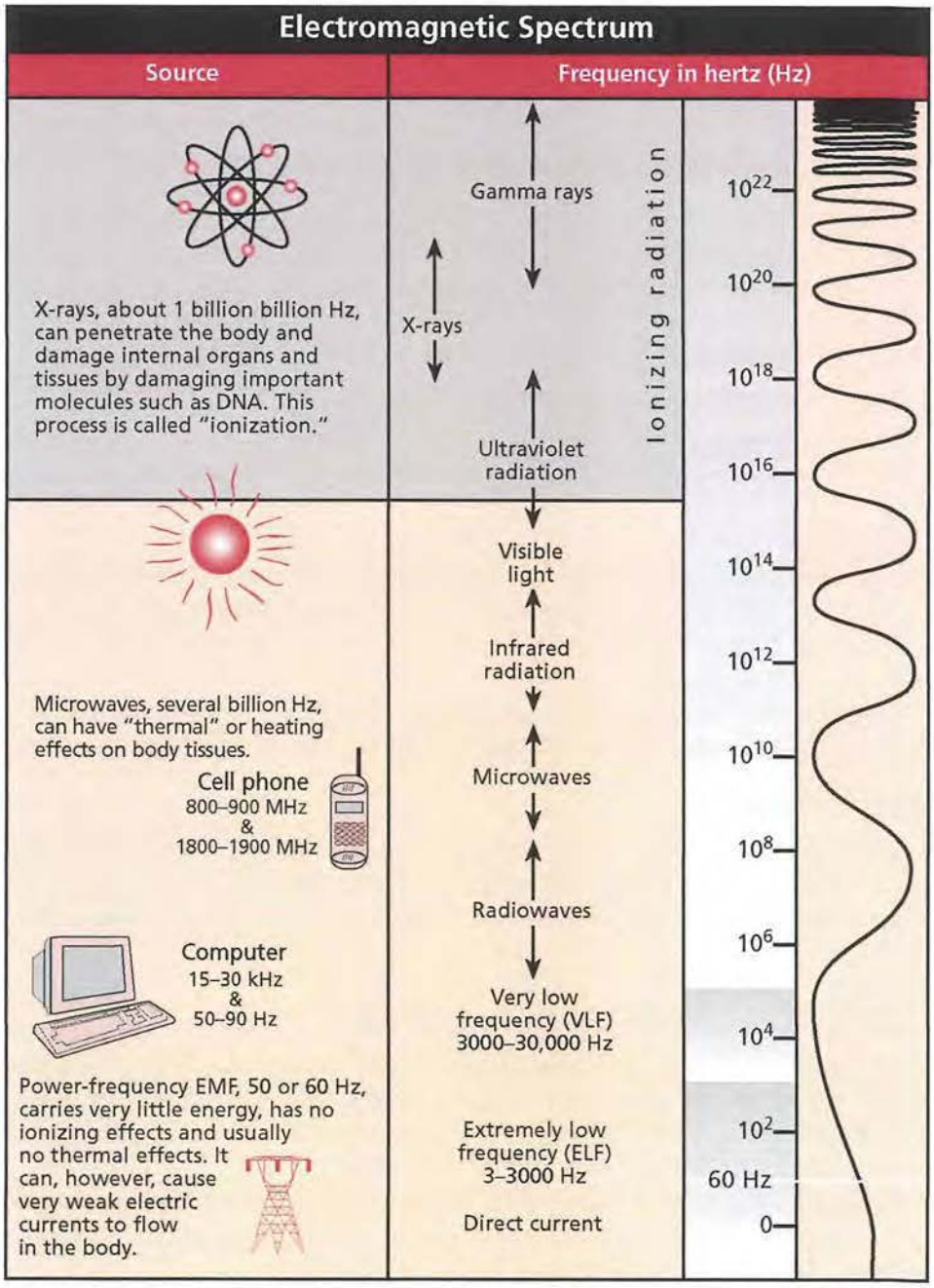
A X-rays, visible light, microwaves, radio waves, and EMF are all forms of electromagnetic energy. One property that distinguishes different forms of electromagnetic energy is the frequency, expressed in hertz (Hz). Power-frequency EMF, 50 or 60 Hz, carries very little energy, has no ionizing effects, and usually has no thermal effects (see page 8). Just as various chemicals affect our bodies in different ways, various forms of electromagnetic energy can have very different biological effects (see "Results of EMF Research" on page 16).

Some types of equipment or operations simultaneously produce electromagnetic energy of different frequencies. Welding operations, for example, can produce electromagnetic energy in the ultraviolet, visible, infrared, and radio-frequency ranges, in addition to power-frequency EMF. Microwave ovens produce 60-Hz fields of several hundred milligauss, but they also create microwave energy inside the oven that is at a much higher frequency (about 2.45 billion Hz). We are shielded from the higher frequency fields inside the oven by its casing, but we are not shielded from the 60-Hz fields.

Cellular telephones communicate by emitting high-frequency electric and magnetic fields similar to those used for radio and television broadcasts. These radio-frequency and microwave fields are quite different from the extremely low frequency EMF produced by power lines and most appliances.

Q How are alternating current sources of EMF different from direct current sources?

A Some equipment can run on either alternating current (AC) or direct current (DC). In most parts of the United States, if the equipment is plugged into a household wall socket, it is using AC electric current that reverses direction in the electrical wiring—or alternates—60 times per second, or at 60 hertz (Hz). If the equipment uses batteries, then electric current flows in one direction only. This



The wavy line at the right illustrates the concept that the higher the frequency, the more rapidly the field varies. The fields do not vary at 0 Hz (direct current) and vary trillions of times per second near the top of the spectrum. Note that 10^4 means 10 x 10 x 10 x 10 or 10,000 Hz. 1 kilohertz (kHz) = 1,000 Hz. 1 megahertz (MHz) = 1,000,000 Hz.

produces a "static" or stationary magnetic field, also called a direct current field. Some battery-operated equipment can produce time-varying magnetic fields as part of its normal operation.

Q What happens when I am exposed to EMF?

A In most practical situations, DC electric power does not induce electric currents in humans. Strong DC magnetic fields are present in some industrial environments, can induce significant currents when a person moves, and may be of concern for other reasons, such as potential effects on implanted medical devices (see page 47 for more information on pacemakers and other medical devices).

AC electric power produces electric and magnetic fields that create weak electric currents in humans. These are called "induced currents." Much of the research on how EMF may affect human health has focused on AC-induced currents.

Electric fields

A person standing directly under a high-voltage transmission line may feel a mild shock when touching something that conducts electricity. These sensations are caused by the strong electric fields from the high-voltage electricity in the lines. They occur only at close range because the electric fields rapidly become weaker as the distance from the line increases. Electric fields may be shielded and further weakened by buildings, trees, and other objects that conduct electricity.

Magnetic fields

Alternating magnetic fields produced by AC electricity can induce the flow of weak electric currents in the body. However, such currents are estimated to be smaller than the measured electric currents produced naturally by the brain, nerves, and heart.

Q Doesn't the earth produce EMF?

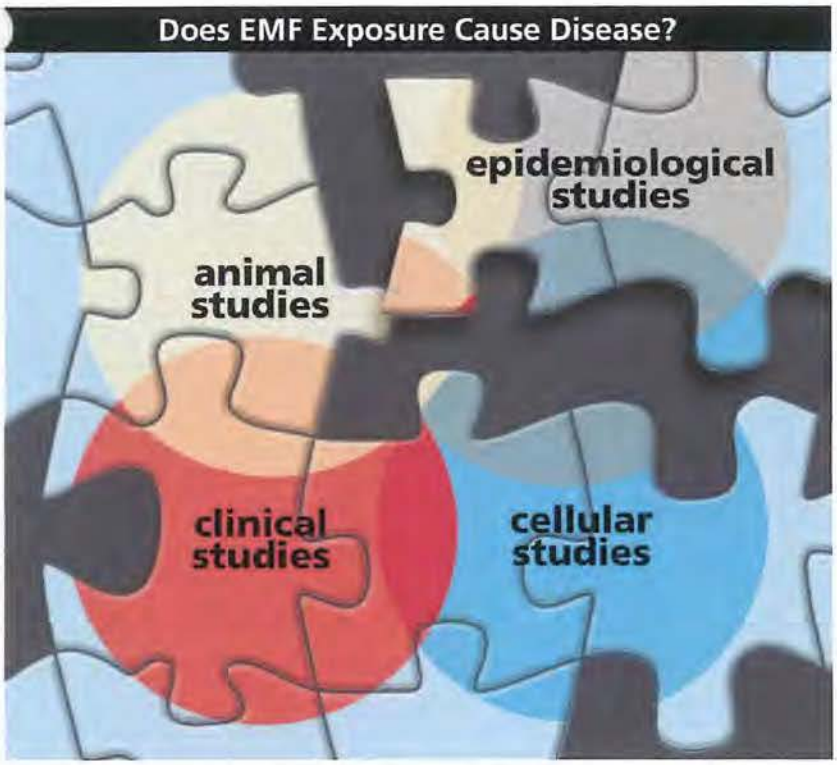
A Yes. The earth produces EMF, mainly in the form of static fields, similar to the fields generated by DC electricity. Electric fields are produced by air turbulence and other atmospheric activity. The earth's magnetic field of about 500 mG is thought to be produced by electric currents flowing deep within the earth's core. Because these fields are static rather than alternating, they do not induce currents in stationary objects as do fields associated with alternating current. Such static fields can induce currents in moving and rotating objects.

2 Evaluating Potential Health Effects

This chapter explains how scientific studies are conducted and evaluated to assess potential health effects.

Q How do we evaluate whether EMF exposures cause health effects?

A Animal experiments, laboratory studies of cells, clinical studies, computer simulations, and human population (epidemiological) studies all provide valuable information. When evaluating evidence that certain exposures cause disease, scientists consider results from studies in various disciplines. No single study or type of study is definitive.



Laboratory studies and human studies provide pieces of the puzzle, but no single study can give us the whole picture.

Laboratory studies

Laboratory studies with cells and animals can provide evidence to help determine if an agent such as EMF causes disease. Cellular studies can increase our understanding of the biological mechanisms by which disease occurs. Experiments with animals provide a means to observe effects of specific agents under carefully controlled conditions. Neither cellular nor animal studies, however, can recreate the complex nature of the whole human organism and its environment. Therefore, we must use caution in applying the results of cellular or animal studies directly to humans or concluding that a lack of an effect in laboratory studies proves that an agent is safe. Even with these limitations, cellular and animal studies have proven very

useful over the years for identifying and understanding the toxicity of numerous chemicals and physical agents.

Very specific laboratory conditions are needed for researchers to be able to detect EMF effects, and experimental exposures are not easily comparable to human exposures. In most cases, it is not clear how EMF actually produces the effects observed in some experiments. Without understanding how the effects occur, it is difficult to evaluate how laboratory results relate to human health effects.

Some laboratory studies have reported that EMF exposure can produce biological effects, including changes in functions of cells and tissues and subtle changes in hormone levels in animals. It is important to distinguish between a biological effect and a health effect. Many biological effects are within the normal range of variation and are not necessarily harmful. For example, bright light has a biological effect on our eyes, causing the pupils to constrict, which is a normal response.

Clinical studies

In clinical studies, researchers use sensitive instruments to monitor human physiology during controlled exposure to environmental agents. In EMF studies, volunteers are exposed to electric or magnetic fields at higher levels than those commonly encountered in everyday life. Researchers measure heart rate, brain activity, hormonal levels, and other factors in exposed and unexposed groups to look for differences resulting from EMF exposure.

Epidemiology

A valuable tool to identify human health risks is to study a human population that has experienced the exposure. This type of research is called epidemiology.

The epidemiologist observes and compares groups of people who have had or have not had certain diseases and exposures to see if the risk of disease is different between the exposed and unexposed groups. The epidemiologist does not control the exposure and cannot experimentally control all the factors that might affect the risk of disease.

Most researchers agree that epidemiology—the study of patterns and possible causes of diseases—is one of the most valuable tools to identify human health risks.

Q How do we evaluate the results of epidemiological studies of EMF?

A Many factors need to be considered when determining whether an agent causes disease. An exposure that an epidemiological study associates with increased risk of a certain disease is not always the actual cause of the disease. To judge whether an agent actually causes a health effect, several issues are considered.

Strength of association

The stronger the association between an exposure and disease, the more confident we can be that the disease is due to the exposure being studied. With cigarette smoking and lung cancer, the association is very strong—20 times the normal risk. In the studies that suggest a relationship between EMF and certain rare cancers, the association is much weaker (see page 19).

Dose-response

Epidemiological data are more convincing if disease rates increase as exposure levels increase. Such dose-response relationships have appeared in only a few EMF studies.

Consistency

Consistency requires that an association found in one study appears in other studies involving different study populations and methods. Associations found consistently are more likely to be causal. With regard to EMF, results from different studies sometimes disagree in important ways, such as what type of cancer is associated with EMF exposure. Because of this inconsistency, scientists cannot be sure whether the increased risks are due to EMF or other factors.

Biological plausibility

When associations are weak in an epidemiological study, results of laboratory studies are even more important to support the association. Many scientists remain skeptical about an association between EMF exposure and cancer because laboratory studies thus far have not shown any consistent evidence of adverse health effects, nor have results of experimental studies revealed a plausible biological explanation for such an association.

Reliability of exposure information

Another important consideration with EMF epidemiological studies is how the exposure information was obtained. Did the researchers simply estimate people's EMF exposures based on their job titles or how their houses were wired, or did they actually conduct EMF measurements? What did they measure (electric fields, magnetic fields, or both)? How often were the EMF measurements made and at

what time? In how many different places were the fields measured? More recent studies have included measurements of magnetic field exposure. Magnetic fields measured at the time a study is conducted can only estimate exposures that occurred in previous years (at the time a disease process may have begun). Lack of comprehensive exposure information makes it more difficult to interpret the results of a study, particularly considering that everyone in the industrialized world has been exposed to EMF.

Confounding

Epidemiological studies show relationships or correlations between disease and other factors such as diet, environmental conditions, and heredity. When a disease is correlated with some factor, it does not necessarily mean that the correlated factor causes the disease. It could mean that the factor occurs together with some other factor, not measured in the study, that actually causes the disease. This is called confounding.

For example, a study might show that alcohol consumption is correlated with lung cancer. This could occur if the study group consists of people who drink and also smoke tobacco, as often happens. In this example, alcohol use is correlated with lung cancer, but cigarette smoking is a confounding factor and the true cause of the disease.

Statistical significance

Researchers use statistical methods to determine the likelihood that the association between exposure and disease is due simply to chance. For a result to be considered "statistically significant," the association must be stronger than would be expected to occur by chance alone.

Meta-analysis

One way researchers try to get more information from epidemiological studies is to conduct a meta-analysis. A meta-analysis combines the summary statistics of many studies to explore their differences and, if appropriate, calculates an overall summary risk estimate. The main challenge faced by researchers performing meta-analyses is that populations, measurements, evaluation techniques, participation rates, and potential confounding factors vary in the original studies. These differences in the studies make it difficult to combine the results in a meaningful way.

Pooled analysis

Pooled analysis combines the original data from several studies and conducts a new analysis on the primary data. It requires access to the original data from individual studies and can only include diseases or factors included in all the studies, but it has the advantage that the same parameters can be applied to all studies. As with meta-analysis, pooled analysis is still subject to the limitations of the experimental

design of the original studies (for example, evaluation techniques, participation rates, etc.). Pooled analysis differs from meta-analysis, which combines the summary statistics from different studies, not their original data.

Q How do we characterize EMF exposure?

A No one knows which aspect of EMF exposure, if any, affects human health. Because of this uncertainty, in addition to the field strength, we must ask how long an exposure lasts, how it varies, and at what time of day or night it occurs. House wiring, for example, is often a significant source of EMF exposure for an individual, but the magnetic fields produced by the wiring depend on the amount of current flowing. As heating, lighting, and appliance use varies during the day, magnetic field exposure will also vary.

For many studies, researchers describe EMF exposures by estimating the average field strength. Some scientists believe that average exposure may not be the best measurement of EMF exposure and that other parameters, such as peak exposure or time of exposure, may be important.

Q What is the average field strength?

A In EMF studies, the information reported most often has been a person's EMF exposure averaged over time (average field strength). With cancer-causing chemicals, a person's average exposure over many years can be a good way to predict his or her chances of getting the disease.

There are different ways to calculate average magnetic field exposures. One method involves having a person wear a small monitor that takes many measurements over a work shift, a day, or longer. Then the average of those measurements is calculated. Another method involves placing a monitor that takes many measurements in a residence over a 24-hour or 48-hour period. Sometimes averages are calculated for people with the same occupation, people working in similar environments, or people using several brands of the same type or similar types of equipment.

Q How is EMF exposure measured in epidemiological studies?

A Epidemiologists study patterns and possible causes of diseases in human populations. These studies are usually observational rather than experimental. This means that the researcher observes and compares groups of people who have had certain diseases and exposures and looks for possible "associations." The epidemiologist must find a way to estimate the exposure that people had at an earlier time.

Association

In epidemiology, a positive association between an exposure (such as EMF) and a disease is not necessarily proof that the exposure *caused* the disease. However, the more often the exposure and disease occur together, the stronger the association, and the stronger is the possibility that the exposure may increase the risk of the disease.

Some exposure estimates for residential studies have been based on designation of households in terms of "wire codes." In other studies, measurements have been made in homes, assuming that EMF levels at the time of the measurement are similar to levels at some time in the past. Some studies involved "spot measurements." Exposure levels change as a person moves around in his or her environment, so spot measurements taken at specific locations only approximate the complex variations in exposure a person experiences. Other studies measured magnetic fields over a 24-hour or 48-hour period. Exposure levels for some occupational studies are measured by having certain employees wear personal monitors. The data taken from these monitors are sometimes used to estimate typical exposure levels for employees with certain job titles. Researchers can then estimate exposures using only an employee's job title and avoid measuring exposures of all employees.

Methods to Estimate EMF Exposure

Wire Codes

A classification of homes based on characteristics of power lines outside the home (thickness of the wires, wire configuration, etc.) and their distance from the home. This information is used to code the homes into groups with higher and lower predicted magnetic field levels.

Spot Measurement

An instantaneous or very short-term (e.g., 30-second) measurement taken at a designated location.

Time-Weighted Average

A weighted average of exposure measurements taken over a period of time that takes into account the time interval between measurements. When the measurements are taken with a monitor at a fixed sampling rate, the time-weighted average equals the arithmetic mean of the measurements.

Personal Monitor

An instrument that can be worn on the body for measuring exposure over time.

Calculated Historical Fields

An estimate based on a theoretical calculation of the magnetic field emitted by power lines using historical electrical loads on those lines.

3 Results of EMF Research

This chapter summarizes the results of EMF research worldwide, including epidemiological studies of children and adults, clinical studies of how humans react to typical EMF exposures, and laboratory research with animals and cells.

Q Is there a link between EMF exposure and childhood leukemia?

A Despite more than two decades of research to determine whether elevated EMF exposure, principally to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. Much progress has been made, however, with some lines of research leading to reasonably clear answers and others remaining unresolved. The best available evidence at this time leads to the following answers to specific questions about the link between EMF exposure and childhood leukemia:

Is there an association between power line configurations (wire codes) and childhood leukemia? No.

Is there an association between measured fields and childhood leukemia? Yes, but the association is weak, and it is not clear whether it represents a cause-and-effect relationship.

Q What is the epidemiological evidence for evaluating a link between EMF exposure and childhood leukemia?

A The initial studies, starting with the pioneering research of Dr. Nancy Wertheimer and Ed Leeper in 1979 in Denver, Colorado, focused on power line configurations near homes. Power lines were systematically evaluated and coded for their presumed ability to produce elevated magnetic fields in homes and classified into groups with higher and lower predicted magnetic field levels (see discussion of wire codes on page 15). Although the first study and two that followed in Denver and Los Angeles showed an association between wire codes indicative of elevated magnetic fields and childhood leukemia, larger, more recent studies in the central part of the United States and in several provinces of Canada did not find such an

association. In fact, combining the evidence from all the studies, we can conclude with some confidence that wire codes are not associated with a measurable increase in the risk of childhood leukemia.

The other approach to assessing EMF exposure in homes focused on the measurements of magnetic fields. Unlike wire codes, which are only applicable in North America due to the nature of the electric power distribution system, measured fields have been studied in relation to childhood leukemia in research conducted around the world, including Sweden, England, Germany, New Zealand, and Taiwan. Large, detailed studies have recently been completed in the United States, Canada, and the United Kingdom that provide the most evidence for making an evaluation. These studies have produced variable findings, some reporting small associations, others finding no associations.

National Cancer Institute Study

In 1997, after eight years of work, Dr. Martha Linet and colleagues at the National Cancer Institute (NCI) reported the results of their study of childhood acute lymphoblastic leukemia (ALL). The case-control study involved more than 1,000 children living in 9 eastern and midwestern U.S. states and is the largest epidemiological study of childhood leukemia to date in the United States. To help resolve the question of wire code versus measured magnetic fields, the NCI researchers carried out both types of exposure assessment. Overall, Linet reported little evidence that living in homes with higher measured magnetic-field levels was a disease risk and found no evidence that living in a home with a high wire code configuration increased the risk of ALL in children.

United Kingdom Childhood Cancer Study

In December 1999, Sir Richard Doll and colleagues in the United Kingdom announced that the largest study of childhood cancer ever undertaken—involving nearly 4,000 children with cancer in England, Wales, and Scotland—found no evidence of excess risk of childhood leukemia or other cancers from exposure to power-frequency magnetic fields. It should be noted, however, that because most power lines in the United Kingdom are underground, the EMF exposures of these children were mostly lower than 0.2 microtesla or 2 milligauss.

After reviewing all the data, the U.S. National Institute of Environmental Health Sciences (NIEHS) concluded in 1999 that the evidence was weak, but that it was still sufficient to warrant limited concern. The NIEHS rationale was that no individual epidemiological study provided convincing evidence linking magnetic field exposure with childhood leukemia, but the overall pattern of results for some methods of measuring exposure suggested a weak association between increasing exposure to EMF and increasing risk of childhood leukemia. The small number of cases in these studies made it impossible to firmly demonstrate this association. However, the fact that similar results had been observed in studies of different populations using a variety of study designs supported this observation.

A major challenge has been to determine whether the most highly elevated, but rarely encountered, levels of magnetic fields are associated with an increased risk of leukemia. Early reports focused on the risk associated with exposures above 2 or 3 milligauss, but the more recent studies have been large enough to also provide some information on levels above 3 or 4 milligauss. It is estimated that 4.5% of homes in the United States have magnetic fields above 3 milligauss, and 2.5% of homes have levels above 4 milligauss.

What is Cancer?

Cancer

"Cancer" is a term used to describe at least 200 different diseases, all involving uncontrolled cell growth. The frequency of cancer is measured by the incidence—the number of new cases diagnosed each year. Incidence is usually described as the number of new cases diagnosed per 100,000 people per year.

The incidence of cancer in adults in the United States is 382 per 100,000 per year, and childhood cancers account for about 1% of all cancers. The factors that influence risk differ among the forms of cancer. Known risk factors such as smoking, diet, and alcohol contribute to specific types of cancer. (For example, smoking is a known risk factor for lung cancer, bladder cancer, and oral cancer.) For many other cancers, the causes are unknown.

Leukemia

Leukemia describes a variety of cancers that arise in the bone marrow where blood cells are formed. The leukemias represent less than 4% of all cancer cases in adults but are the most common form of cancer in children. For children age 4 and under, the incidence of childhood leukemia is approximately 6 per 100,000 per year, and it decreases with age to about 2 per 100,000 per year for children 10 and older. In the United States, the incidence of adult leukemia is about 10 cases per 100,000 people per year. Little is known about what causes leukemia, although genetic factors play a role. The only known causes are ionizing radiation, benzene, and other chemicals and drugs that suppress bone marrow function, and a human T-cell leukemia virus.

Brain Cancer

Cancer of the central nervous system (the brain and spinal cord) is uncommon, with incidence in the United States now at about 6 cases in 100,000 people per year. The causes of the disease are largely unknown, although a number of studies have reported an association with certain occupational chemical exposures. Ionizing radiation to the scalp is a known risk factor for brain cancer. Factors associated with an increased risk for other types of cancer—such as smoking, diet, and excessive alcohol use—have not been found to be associated with brain cancer.

To determine what the integrated information from all the studies says about magnetic fields and childhood leukemia, two groups have conducted pooled analyses in which the original data from relevant studies were integrated and analyzed. One report (Greenland et al., 2000) combined 12 relevant studies with magnetic field measurements, and the other considered 9 such studies (Ahlbom et al., 2000). The details of the two pooled analyses are different, but their findings are similar. There is weak evidence for an association (relative risk of approximately 2) at exposures above 3 mG. However, few individuals had high exposures in these studies; therefore, even combining all studies, there is uncertainty about the strength of the association.

The following table summarizes the results for the epidemiological studies of EMF exposure and childhood leukemia analyzed in the pooled analysis by Greenland et al. (2000). The focus of the summary review was the magnetic fields that occurred three months prior to diagnosis. The results were derived from either calculated historical fields or multiple measurements of magnetic fields. The North American

Residential Exposure to Magnetic Fields and Childhood Leukemia

	Magnetic field category (mG)					
	>1 – ≤2 mG		>2 – ≤3 mG		>3 mG	
First author	Estimate	95% CL	Estimate	95% CL	Estimate	95% CL
Coghill	0.54	0.17, 1.74	No controls		No controls	
Dockerty	0.65	0.26, 1.63	2.83	0.29, 27.9	No controls	
Feychting	0.63	0.08, 4.77	0.90	0.12, 7.00	4.44	1.67, 11.7
Linet	1.07	0.82, 1.39	1.01	0.64, 1.59	1.51	0.92, 2.49
London	0.96	0.54, 1.73	0.75	0.22, 2.53	1.53	0.67, 3.50
McBride	0.89	0.62, 1.29	1.27	0.74, 2.20	1.42	0.63, 3.21
Michaelis	1.45	0.78, 2.72	1.06	0.27, 4.16	2.48	0.79, 7.81
Olsen	0.67	0.07, 6.42	No cases		2.00	0.40, 9.93
Savitz	1.61	0.64, 4.11	1.29	0.27, 6.26	3.87	0.87, 17.3
Tomenius	0.57	0.33, 0.99	0.88	0.33, 2.36	1.41	0.38, 5.29
Tynes	1.06	0.25, 4.53	No cases		No cases	
Verkasalo	1.11	0.14, 9.07	No cases		2.00	0.23, 17.7
Study summary	0.95	0.80, 1.12	1.06	0.79, 1.42	1.69*	1.25, 2.29
	1 – <2 mG		2 – <4 mG		≥4 mG	
**United Kingdom	0.84	0.57, 1.24	0.98	0.50, 1.93	1.00	0.30, 3.37

95% CL = 95% confidence limits.

Source: Greenland et al., 2000.

* Mantel-Haenszel analysis (p = 0.01). Maximum-likelihood summaries differed by less than 1% from these summaries; based on 2,656 cases and 7,084 controls. Adjusting for age, sex, and other variables had little effect on summary results.

** These data are from a recent United Kingdom study not included in the Greenland analysis but included in another pooled analysis (Ahlbom et al. 2000). The United Kingdom study included 1,073 cases and 2,224 controls.

For this table, the column headed "estimate" describes the relative risk. Relative risk is the ratio of the risk of childhood leukemia for those in a magnetic field exposure group compared to persons with exposure levels of 1.0 mG or less. For example, Coghill estimated that children with exposures between 1 and 2 mG have 0.54 times the risk of children whose exposures were less than 1 mG. London's study estimates that children whose exposures were greater than 3 mG have 1.53 times the risk of children whose exposures were less than 1 mG. The column headed "95% CL" (confidence limits) describes how much random variation is in the estimate of relative risk. The estimate may be off by some amount due to random variation, and the width of the confidence limits gives some notion of that variation. For example, in Coghill's estimate of 0.54 for the relative risk, values as low as 0.17 or as high as 1.74 would not be statistically significantly different from the value of 0.54. Note there is a wide range of estimates of relative risk across the studies and wide confidence limits for many studies. In light of these findings, the pooling of results can be extremely helpful to calculate an overall estimate, much better than can be obtained from any study taken alone.

studies (Linet, London, McBride, Savitz) were 60 Hz; all other studies were 50 Hz. Results from the recent study from the United Kingdom (see page 17) are also included in the table. This study was included in the analysis by Ahlbom et al. (2000). The relative risk estimates from the individual studies show little or no association of magnetic fields with childhood leukemia. The study summary for the pooled analysis by Greenland et al. (2000) shows a weak association between childhood leukemia and magnetic field exposures greater 3 mG.

Q Is there a link between EMF exposure and childhood brain cancer or other forms of cancer in children?

A Although the earliest studies suggested an association between EMF exposure and all forms of childhood cancer, those initial findings have not been confirmed by other studies. At present, the available series of studies indicates no association between EMF exposure and childhood cancers other than leukemia. Far fewer of these studies have been conducted than studies of childhood leukemia.

Q Is there a link between residential EMF exposure and cancer in adults?

A The few studies that have been conducted to address EMF and adult cancer do not provide strong evidence for an association. Thus, a link has not been established between residential EMF exposure and adult cancers, including leukemia, brain cancer, and breast cancer (see table below).

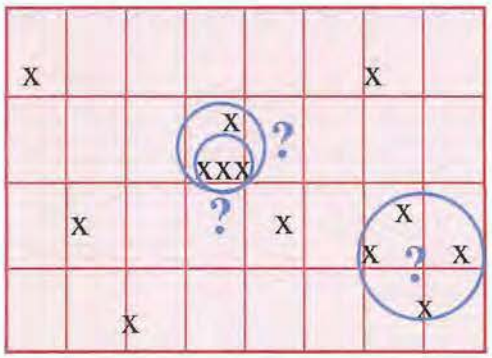
Residential Exposure to Magnetic Fields and Adult Cancer

			Results (odds ratios)		
First author	Location	Type of exposure data	Leukemia	CNS tumors	All cancers
Coleman	United Kingdom	Calculated historical fields	0.92	NA	NA
Feychting and Ahlbom	Sweden	Calculated & spot measurements	1.5*	0.7	NA
Li	Taiwan	Calculated historical fields	1.4*	1.1	NA
Li	Taiwan	Calculated historical fields		1.1 (breast cancer)	
McDowall	United Kingdom	Calculated historical fields	1.43	NA	1.03
Severson	Seattle	Wire codes & spot measurements	0.75	NA	NA
Wrensch	San Francisco	Wire codes & spot measurements	NA	0.9	NA
Youngson	United Kingdom	Calculated historical fields	1.88	NA	NA

CNS = central nervous system.
*The number is statistically significant (greater than expected by chance).
Study results are listed as "odds ratios" (OR). An odds ratio of 1.00 means there was no increase or decrease in risk. In other words, the odds that the people in the study who had the disease (in this case, cancer) and were exposed to a particular agent (in this case, EMF) are the same as for the people in the study who did not have the disease. An odds ratio greater than 1 may occur simply by chance, unless it is statistically significant.

Q Have clusters of cancer or other adverse health effects been linked to EMF exposure?

A An unusually large number of cancers, miscarriages, or other adverse health effects that occur in one area or over one period of time is called a "cluster." Sometimes clusters provide an early warning of a health hazard. But most of the time the reason for the cluster is not known. There have been no proven instances of cancer clusters linked with EMF exposure.



The definition of a "cluster" depends on how large an area is included. Cancer cases (x's in illustration) in a city, neighborhood, or workplace may occur in ways that suggest a cluster due to a common environmental cause. Often these patterns turn out to be due to chance. Delineation of a cluster is subjective—where do you draw the circles?

Q If EMF does cause or promote cancer, shouldn't cancer rates have increased along with the increased use of electricity?

A Not necessarily. Although the use of electricity has increased greatly over the years, EMF exposures may not have increased. Changes in building wiring codes and in the design of electrical appliances have in some cases resulted in lower magnetic field levels. Rates for various types of cancer have shown both increases and decreases through the years, due in part to improved prevention, diagnosis, reporting, and treatment.

Q Is there a link between EMF exposure in electrical occupations and cancer?

A For almost as long as we have been concerned with residential exposure to EMF and childhood cancers, researchers have been studying workplace exposure to EMF and adult cancers, focusing on leukemia and brain cancer. This research began with surveys of job titles and cancer risks, but has progressed to include very large, detailed studies of the health of workers, especially electric utility workers, in the United States, Canada, France, England, and several Northern European countries. Some studies have found evidence that suggests a link between EMF exposure and both leukemia and brain cancer, whereas other studies of similar size and quality have not found such associations.

California

A 1993 study of 36,000 California electric utility workers reported no strong, consistent evidence of an association between magnetic fields and any type of cancer.

Canada/France

A 1994 study of more than 200,000 utility workers in 3 utility companies in Canada and France reported no significant association between all leukemias combined and cumulative exposure to magnetic fields. There was a slight, but not statistically significant, increase in brain cancer. The researchers concluded that the study did not provide clear-cut evidence that magnetic field exposures caused leukemia or brain cancer.

North Carolina

Results of a 1995 study involving more than 138,000 utility workers at 5 electric utilities in the United States did not support an association between occupational magnetic field exposure and leukemia, but suggested a link to brain cancer.

Denmark

In 1997 a study of workers employed in all Danish utility companies reported a small, but statistically significant, excess risk for all cancers combined and for lung cancer. No excess risk was observed for leukemia, brain cancers, or breast cancer.

United Kingdom

A 1997 study among electrical workers in the United Kingdom did not find an excess risk for brain cancer. An extension of this work reported in 2001 also found no increased risk for brain cancer.

Efforts have also been made to pool the findings across several of the above studies to produce more accurate estimates of the association between EMF and cancer (Kheifets et al., 1999). The combined summary statistics across studies provide insufficient evidence for an association between EMF exposure in the workplace and either leukemia or brain cancer.

Q Have studies of workers in other industries suggested a link between EMF exposure and cancer?

A One of the largest studies to report an association between cancer and magnetic field exposure in a broad range of industries was conducted in Sweden (1993). The study included an assessment of EMF exposure in 1,015 different workplaces and involved more than 1,600 people in 169 different occupations. An association was reported between estimated EMF exposure and increased risk for chronic lymphocytic leukemia. An association was also reported between exposure to magnetic fields and brain cancer, but there was no dose-response relationship.

Another Swedish study (1994) found an excess risk of lymphocytic leukemia among railway engine drivers and conductors. However, the total cancer incidence (all tumors included) for this group of workers was lower than in the general Swedish population. A study of Norwegian railway workers found no evidence for an association between EMF exposure and leukemia or brain cancer. Although both positive and negative effects of EMF exposure have been reported, the majority of studies show no effects.

Q Is there a link between EMF exposure and breast cancer?

A Researchers have been interested in the possibility that EMF exposure might cause breast cancer, in part because breast cancer is such a common disease in adult women. Early studies identified a few electrical workers with male breast cancer, a very rare disease. A link between EMF exposure and alterations in the hormone melatonin was considered a possible hypothesis (see page 24). This idea provided motivation to conduct research addressing a possible link between EMF exposure and breast cancer. Overall, the published epidemiological studies have not shown such an association.

Q What have we learned from clinical studies?

A Laboratory studies with human volunteers have attempted to answer questions such as,

Does EMF exposure alter normal brain and heart function?
Does EMF exposure at night affect sleep patterns?
Does EMF exposure affect the immune system?
Does EMF exposure affect hormones?

The following kinds of biological effects have been reported. Keep in mind that a biological effect is simply a measurable change in some biological response. It may or may not have any bearing on health.

Heart rate

An inconsistent effect on heart rate by EMF exposure has been reported. When observed, the biological response is small (on average, a slowing of about three to five beats per minute), and the response does not persist once exposure has ended.

Two laboratories, one in the United States and one in Australia, have reported effects of EMF on heart rate variability. Exposures used in these experiments were relatively high (about 300 mG), and lower exposures failed to produce the effect. Effects have not been observed consistently in repeated experiments.

Sleep electrophysiology

A laboratory report suggested that overnight exposure to 60-Hz magnetic fields may disrupt brain electrical activity (EEG) during night sleep. In this study subjects were exposed to either continuous or intermittent magnetic fields of 283 mG. Individuals exposed to the intermittent magnetic fields showed alterations in traditional EEG sleep parameters indicative of a pattern of poor and disrupted sleep. Several studies have reported no effect with continuous exposure.

Hormones, immune system, and blood chemistry

Several clinical studies with human volunteers have evaluated the effects of power-frequency EMF exposure on hormones, the immune system, and blood chemistry. These studies provide little evidence for any consistent effect.

Melatonin

The hormone melatonin is secreted mainly at night and primarily by the pineal gland, a small gland attached to the brain. Some laboratory experiments with cells and animals have shown that melatonin can slow the growth of cancer cells, including breast cancer cells. Suppressed nocturnal melatonin levels have been observed in some studies of laboratory animals exposed to both electric and magnetic fields. These observations led to the hypothesis that EMF exposure might reduce melatonin and thereby weaken one of the body's defenses against cancer.

Many clinical studies with human volunteers have now examined whether various levels and types of magnetic field exposure affect blood levels of melatonin. Exposure of human volunteers at night to power-frequency EMF under controlled laboratory conditions has no apparent effect on melatonin. Some studies of people exposed to EMF at work or at home do report evidence for a small suppression of melatonin. It is not clear whether the decreases in melatonin reported under environmental conditions are related to the presence of EMF exposure or to other factors.

Q What effects of EMF have been reported in laboratory studies of cells?

A Over the years, scientists have conducted more than 1,000 laboratory studies to investigate potential biological effects of EMF exposure. Most have been *in vitro* studies; that is, studies carried out on cells isolated from animals and plants, or on cell components such as cell membranes. Other studies involved animals, mainly rats and mice. In general, these studies do not demonstrate a consistent effect of EMF exposure.

Most *in vitro* studies have used magnetic fields of 1,000 mG (100 μT) or higher, exposures that far exceed daily human exposures. In most incidences, when one laboratory has reported effects of EMF exposure on cells, other laboratories have not been able to reproduce the findings. For such research results to be widely accepted by scientists as valid, they must be replicated—that is, scientists in other laboratories should be able to repeat the experiment and get similar results. Cellular studies have investigated potential EMF effects on cell proliferation and differentiation, gene expression, enzyme activity, melatonin, and DNA. Scientists reviewing the EMF research literature find overall that the cellular studies provide little convincing evidence of EMF effects at environmental levels.

Q Have effects of EMF been reported in laboratory studies in animals?

A Researchers have published more than 30 detailed reports on both long-term and short-term studies of EMF exposures in laboratory animals (bioassays). Long-term animal bioassays constitute an important group of studies in EMF research. Such studies have a proven record for predicting the carcinogenicity of chemicals, physical agents, and other suspected cancer-causing agents. In the EMF studies, large groups of mice or rats were continuously exposed to EMF for two years or longer and were then evaluated for cancer. The U.S. National Toxicology Program (http://ntp-server.niehs.nih.gov/) has an extensive historical database for hundreds of different chemical and physical agents evaluated using this model. EMF long-term bioassays examined leukemia, brain cancer, and breast cancer—the diseases some epidemiological studies have associated with EMF exposure (see pages 16–23).

Several different approaches have been used to evaluate effects of EMF exposure in animal bioassays. To investigate whether EMF could promote cancer after genetic damage had occurred, some long-term studies used cancer initiators such as ultraviolet light, radiation, or certain chemicals that are known to cause genetic damage. Researchers compared groups of animals treated with cancer initiators to groups treated with cancer initiators and then exposed to EMF, to see if EMF exposure promoted the cancer growth (initiation-promotion model). Other studies tested the cancer promotion potential of EMF using mice that were predisposed to cancer because they had defects in the genes that control cancer.

Animal Leukemia Studies: Long-Term, Continuous Exposure Studies, Two or More Years in Length			
First author	Sex/species	Exposure/animal numbers	Results
Babbitt (U.S.)	Female mice	14,000 mG, 190 or 380 mice per group Some groups treated with ionizing radiation.	No effect
Boorman (U.S.)	Male and female rats	20 to 10,000 mG, 100 per group	No effect
McCormick (U.S.)	Male and female mice	20 to 10,000 mG, 100 per group	No effect
Mandeville (Canada)	Female rats	20 to 20,000 mG, 50 per group *In utero* exposure	No effect
Yasui (Japan)	Male and female rats	5,000 to 50,000 mG, 50 per group	No effect

10 milligauss (mG) = 1 microtesla (μT) = 0.001 millitesla (mT)

Leukemia

Fifteen animal leukemia studies have been completed and reported. Most tested for effects of exposure to power-frequency (60-Hz) magnetic fields using rodents. Results of these studies were largely negative. The Babbitt study evaluated the subtypes of leukemia. The data provide no support for the reported epidemiology findings of leukemia from EMF exposure. Many scientists feel that the lack of effects seen in these laboratory leukemia studies significantly weakens the case for EMF as a cause of leukemia.

Breast cancer

Researchers in the Ukraine, Germany, Sweden, and the United States have used initiation-promotion models to investigate whether EMF exposure promotes breast cancer in rats.

The results of these studies are mixed; while the German studies showed some effects, the Swedish and U.S. studies showed none. Studies in Germany reported effects on the numbers of tumors and tumor volume. A National Toxicology Program long-term bioassay performed without the use of other cancer-initiating substances showed no effects of EMF exposure on the development of mammary tumors in rats and mice.

The explanation for the observed difference among these studies is not readily apparent. Within the limits of the experimental rodent model of mammary carcinogenesis, no conclusions are possible regarding a promoting effect of EMF on chemically induced mammary cancer.

Other cancers

Tests of EMF effects on skin cancer, liver cancer, and brain cancer have been conducted using both initiation-promotion models and non-initiated long-term bioassays. All are negative.

Three positive studies were reported for a co-promotion model of skin cancer in mice. The mice were exposed to EMF plus cancer-causing chemicals after cancers

had already been initiated. The same research team as well as an independent laboratory were unable to reproduce these results in subsequent experiments.

Non-cancer effects

Many animal studies have investigated whether EMF can cause health problems other than cancer. Researchers have examined many endpoints, including birth defects, immune system function, reproduction, behavior, and learning. Overall, animal studies do not support EMF effects on non-cancer endpoints.

Q Can EMF exposure damage DNA?

A Studies have attempted to determine whether EMF has genotoxic potential; that is, whether EMF exposure can alter the genetic material of living organisms. This question is important because genotoxic agents often also cause cancer or birth defects. Studies of genotoxicity have included tests on bacteria, fruit flies, and some tests on rats and mice. Nearly 100 studies on EMF genotoxicity have been reported. Most evidence suggests that EMF exposure is not genotoxic. Based on experiments with cells, some researchers have suggested that EMF exposure may inhibit the cell's ability to repair normal DNA damage, but this idea remains speculative because of the lack of genotoxicity observed in EMF animal studies.

4 Your EMF Environment

This chapter discusses typical magnetic field exposures in home and work environments and identifies common EMF sources and field intensities associated with these sources.

Q How do we define EMF exposure?

A Scientists are still uncertain about the best way to define "exposure" because experiments have yet to show which aspect of the field, if any, may be relevant to reported biological effects. Important aspects of exposure could be the highest intensity, the average intensity, or the amount of time spent above a certain baseline level. The most widely used measure of EMF exposure has been the time-weighted average magnetic field level (see discussion on page 15).

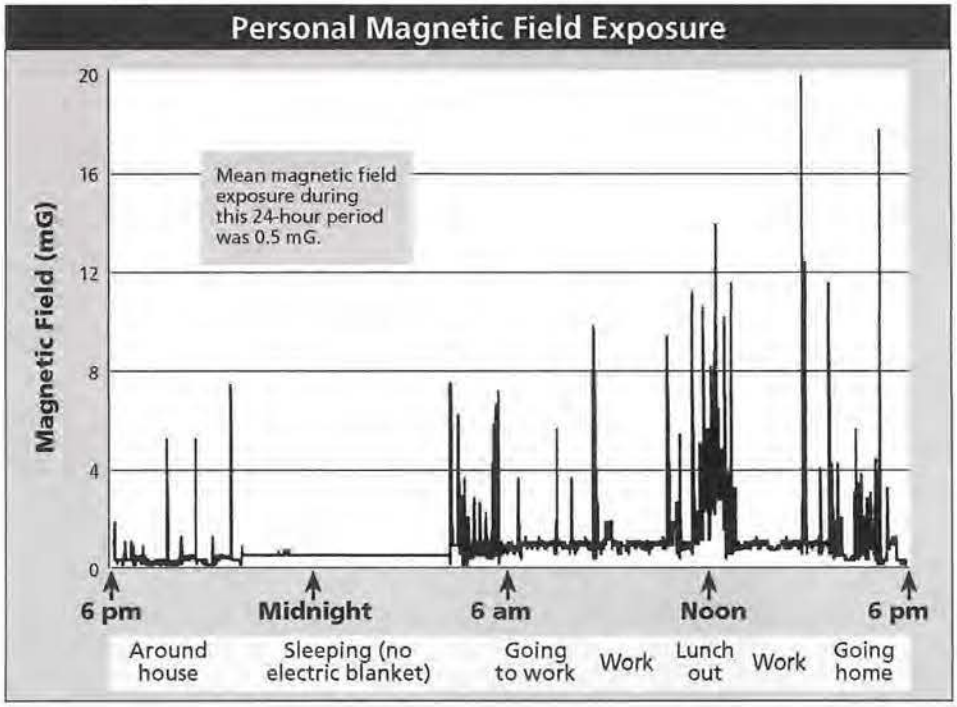
Q How is EMF exposure measured?

A Several kinds of personal exposure meters are now available. These automatically record the magnetic field as it varies over time. To determine a person's EMF exposure, the personal exposure meter is usually worn at the waist or is placed as close as possible to the person during the course of a work shift or day.

EMF can also be measured using survey meters, sometimes called "gaussmeters." These measure the EMF levels in a given location at a given time. Such measurements do not necessarily reflect personal EMF exposure because they are not always taken at the distance from the EMF source that the person would typically be from the source. Measurements are not always made in a location for the same amount of time that a person spends there. Such "spot measurements" also fail to capture variations of the field over time, which can be significant.

Q What are some typical EMF exposures?

A The figure below is an example of data collected with a personal exposure meter.



In the above example, the magnetic field was measured every 1.5 seconds over a period of 24 hours. For this person, exposure at home was very low. The occasional spikes (short exposure to high fields) occurred when the person drove or walked under power lines or over underground power lines or was close to appliances in the home or office.

Several studies have used personal exposure meters to measure field exposure in different environments. These studies tend to show that appliances and building wiring contribute to the magnetic field exposure that most people receive while at home. People living close to high voltage power lines that carry a lot of current tend to have higher overall field exposures. As shown on page 32, there is considerable variation among houses.

Q What are typical EMF exposures for people living in the United States?

A Most people in the United States are exposed to magnetic fields that average less than 2 milligauss (mG), although individual exposures vary.

The following table shows the estimated average magnetic field exposure of the U.S. population, according to a study commissioned by the U.S. government as part

of the EMF Research and Public Information Dissemination (EMF RAPID) Program (see page 50). This study measured magnetic field exposure of about 1,000 people of all ages randomly selected among the U.S. population. Participants wore or carried with them a small personal exposure meter and kept a diary of their activities both at home and away from home. Magnetic field values were automatically recorded twice a second for 24 hours. The study reported that exposure to magnetic fields is similar in different regions of the country and similar for both men and women.

Estimated Average Magnetic Field Exposure of the U.S. Population

Average 24-hour field (mG)	Population exposed (%)	95% confidence interval (%)	People exposed* (millions)
> 0.5	76.3	73.8–78.9	197–211
> 1	43.6	40.9–46.5	109–124
> 2	14.3	11.8–17.3	31.5–46.2
> 3	6.3	4.7–8.5	12.5–22.7
> 4	3.6	2.5–5.2	6.7–13.9
> 5	2.42	1.65–3.55	4.4–9.5
> 7.5	0.58	0.29–1.16	0.77–3.1
> 10	0.46	0.20–1.05	0.53–2.8
> 15	0.17	0.035–0.83	0.09–2.2

*Based on a population of 267 million. This table summarizes some of the results of a study that sampled about 1,000 people in the United States. In the first row, for example, we find that 76.3% of the sample population had a 24-hour average exposure of greater than 0.5 mG. Assuming that the sample was random, we can use statistics to say that we are 95% confident that the percentage of the overall U.S. population exposed to greater than 0.5 mG is between 73.8% and 78.9%. Source: Zaffanella, 1993.

The following table shows average magnetic fields experienced during different types of activities. In general, magnetic fields are greater at work than at home.

Estimated Average Magnetic Field Exposure of the U.S. Population for Various Activities

Average field (mG)	Population exposed (%)				
	Home	Bed	Work	School	Travel
> 0.5	69	48	81	63	87
> 1	38	30	49	25	48
> 2	14	14	20	3.5	13
> 3	7.8	7.2	13	1.6	4.1
> 4	4.7	4.7	8.0	< 1	1.5
> 5	3.5	3.7	4.6		1.0
> 7.5	1.2	1.6	2.5		0.5
> 10	0.9	0.8	1.3		< 0.2
> 15	0.1	0.1	0.9		

Source: Zaffanella, 1993.

Q What levels of EMF are found in common environments?

A Magnetic field exposures can vary greatly from site to site for any type of environment. The data shown in the following table are median measurements taken at four different sites for each environment category.

EMF Exposures in Common Environments
Magnetic fields measured in milligauss (mG)

Environment	Median* exposure	Top 5th percentile
OFFICE BUILDING		
Support staff	0.6	3.7
Professional	0.5	2.6
Maintenance	0.6	3.8
Visitor	0.6	2.1
SCHOOL		
Teacher	0.6	3.3
Student	0.5	2.9
Custodian	1.0	4.9
Administrative staff	1.3	6.9
HOSPITAL		
Patient	0.6	3.6
Medical staff	0.8	5.6
Visitor	0.6	2.4
Maintenance	0.6	5.9
MACHINE SHOP		
Machinist	0.4	6.0
Welder	1.1	24.6
Engineer	1.0	5.1
Assembler	0.5	6.4
Office staff	0.7	4.7
GROCERY STORE		
Cashier	2.7	11.9
Butcher	2.4	12.8
Office staff	2.1	7.1
Customer	1.1	7.7

*The median of four measurements. For this table, the median is the average of the two middle measurements.
Source: National Institute for Occupational Safety and Health.

Q What EMF field levels are encountered in the home?

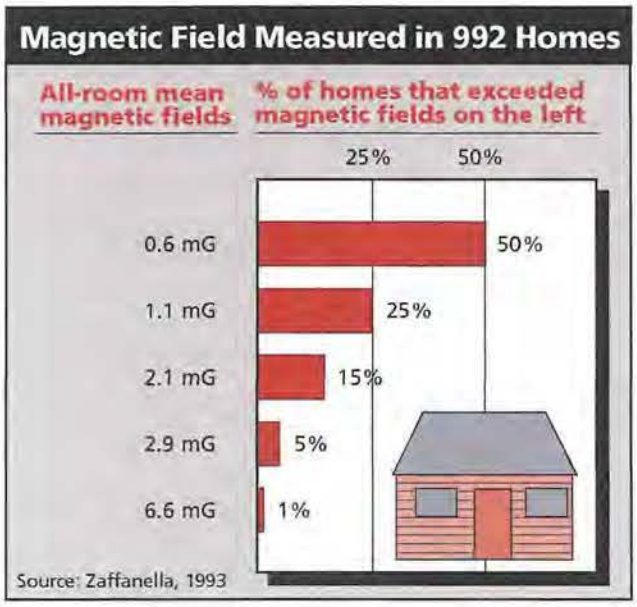
A

Electric fields

Electric fields in the home, on average, range from 0 to 10 volts per meter. They can be hundreds, thousands, or even millions of times weaker than those encountered outdoors near power lines. Electric fields directly beneath power lines may vary from a few volts per meter for some overhead distribution lines to several thousands of volts per meter for extra high voltage power lines. Electric fields from power lines rapidly become weaker with distance and can be greatly reduced by walls and roofs of buildings.

Magnetic fields

Magnetic fields are not blocked by most materials. Magnetic fields encountered in homes vary greatly. Magnetic fields rapidly become weaker with distance from the source.



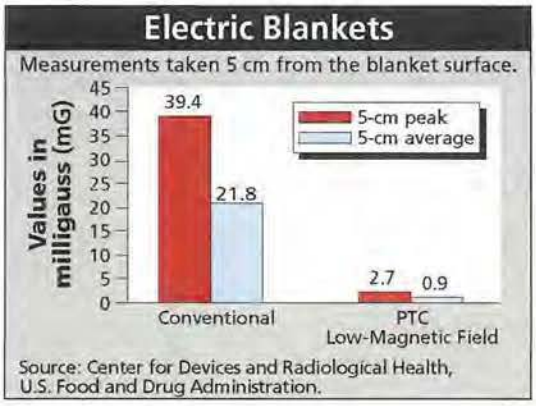
The chart on the left summarizes data from a study by the Electric Power Research Institute (EPRI) in which spot measurements of magnetic fields were made in the center of rooms in 992 homes throughout the United States. Half of the houses studied had magnetic field measurements of 0.6 mG or less, when the average of measurements from all the rooms in the house was calculated (the all-room mean magnetic field). The all-room mean magnetic field for all houses studied was 0.9 mG. The measurements were made away from electrical appliances and reflect primarily the fields from household wiring and outside power lines.

If you are comparing the information in this chart with measurements in your own home, keep in mind that this chart shows averages of measurements taken throughout the homes, not the single highest measurement found in the home.

Q What are EMF levels close to electrical appliances?

A Magnetic fields close to electrical appliances are often much stronger than those from other sources, including magnetic fields directly under power lines. Appliance fields decrease in strength with distance more quickly than do power line fields.

The following table, based on data gathered in 1992, lists the EMF levels generated by common electrical appliances. Magnetic field strength (magnitude) does not depend on how large, complex, powerful, or noisy the appliance is. Magnetic fields near large appliances are often weaker than those near small devices. Appliances in your home may have been redesigned since the data in the table were collected, and the EMF they produce may differ considerably from the levels shown here.



The graph shows magnetic fields produced by electric blankets, including conventional 110-V electric blankets as well as the PTC (positive temperature coefficient) low-magnetic-field blankets. The fields were measured at a distance of about 2 inches from the blanket's surface, roughly the distance from the blanket to the user's internal organs. Because of the wiring, magnetic field strengths vary from point to point on the blanket. The graph reflects this and gives both the peak and the average measurement.

Sources of Magnetic Fields (mG)*

	Distance from source 6″	1′	2′	4′
Office Sources				
AIR CLEANERS				
Lowest	110	20	3	–
Median	180	35	5	1
Highest	250	50	8	2
COPY MACHINES				
Lowest	4	2	1	–
Median	90	20	7	1
Highest	200	40	13	4
FAX MACHINES				
Lowest	4	–	–	–
Median	6	–	–	–
Highest	9	2	–	–
FLUORESCENT LIGHTS				
Lowest	20	–	–	–
Median	40	6	2	–
Highest	100	30	8	4
ELECTRIC PENCIL SHARPENERS				
Lowest	20	8	5	–
Median	200	70	20	2
Highest	300	90	30	30
VIDEO DISPLAY TERMINALS (see page 48) (PCs with color monitors)**				
Lowest	7	2	1	–
Median	14	5	2	–
Highest	20	6	3	–
Bathroom Sources				
HAIR DRYERS				
Lowest	1	–	–	–
Median	300	1	–	–
Highest	700	70	10	1
ELECTRIC SHAVERS				
Lowest	4	–	–	–
Median	100	20	–	–
Highest	600	100	10	1

	Distance from source 6″	1′	2′	4′
Workshop Sources				
BATTERY CHARGERS				
Lowest	3	2	–	–
Median	30	3	–	–
Highest	50	4	–	–
DRILLS				
Lowest	100	20	3	–
Median	150	30	4	–
Highest	200	40	6	–
POWER SAWS				
Lowest	50	9	1	–
Median	200	40	5	–
Highest	1000	300	40	4
ELECTRIC SCREWDRIVERS (while charging)				
Lowest	–	–	–	–
Median	–	–	–	–
Highest	–	–	–	–

	Distance from source 1′	2′	4′
Living/Family Room Sources			
CEILING FANS			
Lowest	–	–	–
Median	3	–	–
Highest	50	6	1
WINDOW AIR CONDITIONERS			
Lowest	–	–	–
Median	3	1	–
Highest	20	6	4
COLOR TELEVISIONS**			
Lowest	–	–	–
Median	7	2	–
Highest	20	8	4

Continued

Sources of Magnetic Fields (mG)*

	Distance from source 6"	1'	2'	4'
Kitchen Sources				
BLENDERS				
Lowest	30	5	–	–
Median	70	10	2	–
Highest	100	20	3	–
CAN OPENERS				
Lowest	500	40	3	–
Median	600	150	20	2
Highest	1500	300	30	4
COFFEE MAKERS				
Lowest	4	–	–	–
Median	7	–	–	–
Highest	10	1	–	–
DISHWASHERS				
Lowest	10	6	2	–
Median	20	10	4	–
Highest	100	30	7	1
FOOD PROCESSORS				
Lowest	20	5	–	–
Median	30	6	2	–
Highest	130	20	3	–
GARBAGE DISPOSALS				
Lowest	60	8	1	–
Median	80	10	2	–
Highest	100	20	3	–
MICROWAVE OVENS***				
Lowest	100	1	1	–
Median	200	4	10	2
Highest	300	200	30	20
MIXERS				
Lowest	30	5	–	–
Median	100	10	1	–
Highest	600	100	10	–

	Distance from source 6"	1'	2'	4'
Kitchen Sources				
ELECTRIC OVENS				
Lowest	4	1	–	–
Median	9	4	–	–
Highest	20	5	1	–
ELECTRIC RANGES				
Lowest	20	–	–	–
Median	30	8	2	–
Highest	200	30	9	6
REFRIGERATORS				
Lowest	–	–	–	–
Median	2	2	1	–
Highest	40	20	10	10
TOASTERS				
Lowest	5	–	–	–
Median	10	3	–	–
Highest	20	7	–	–
Bedroom Sources				
DIGITAL CLOCK****				
Lowest		–	–	–
Median		1	–	–
High		8	2	1
ANALOG CLOCKS (conventional clockface)****				
Lowest		1	–	–
Median		15	2	–
Highest		30	5	3
BABY MONITOR (unit nearest child)				
Lowest	4	–	–	–
Median	6	1	–	–
Highest	15	2	–	–

Continued

Sources of Magnetic Fields (mG)*

	Distance from source 6"	1'	2'	4'
Laundry/Utility Sources				
ELECTRIC CLOTHES DRYERS				
Lowest	2	–	–	–
Median	3	2	–	–
Highest	10	3	–	–
WASHING MACHINES				
Lowest	4	1	–	–
Median	20	7	1	–
Highest	100	30	6	–
IRONS				
Lowest	6	1	–	–
Median	8	1	–	–
Highest	20	3	–	–

	Distance from source 6"	1'	2'	4'
Laundry/Utility Sources				
PORTABLE HEATERS				
Lowest	5	1	–	–
Median	100	20	4	–
Highest	150	40	8	1
VACUUM CLEANERS				
Lowest	100	20	4	–
Median	300	60	10	1
Highest	700	200	50	10
SEWING MACHINES				

Home sewing machines can produce magnetic fields of 12 mG at chest level and 5 mG at head level. Magnetic fields as high as 35 mG at chest level and 215 mG at knee level have been measured from industrial sewing machine models (Sobel, 1994).

Source: EMF In Your Environment, U.S. Environmental Protection Agency, 1992.

* Dash (–) means that the magnetic field at this distance from the operating appliance could not be distinguished from background measurements taken before the appliance had been turned on.

** Some appliances produce both 60-Hz and higher frequency fields. For example, televisions and computer screens produce fields at 10,000-30,000 Hz (10-30 kHz) as well as 60-Hz fields.

*** Microwave ovens produce 60-Hz fields of several hundred milligauss, but they also create microwave energy inside the appliance that is at a much higher frequency (about 2.45 billion hertz). We are shielded from the higher frequency fields but not from the 60-Hz fields.

**** Most digital clocks have low magnetic fields. In some analog clocks, however, higher magnetic fields are produced by the motor that drives the hands. In the above table, the clocks are electrically powered using alternating current, as are all the appliances described in these tables.

Q What EMF levels are found near power lines?

A Power transmission lines bring power from a generating station to an electrical substation. Power distribution lines bring power from the substation to your home. Transmission and distribution lines can be either overhead or underground. Overhead lines produce both electric fields and magnetic fields. Underground lines do not produce electric fields above ground but may produce magnetic fields above ground.

Power transmission lines

Typical EMF levels for transmission lines are shown in the chart on page 37. At a distance of 300 feet and at times of average electricity demand, the magnetic fields from many lines can be similar to typical background levels found in most homes. The distance at which the magnetic field from the line becomes indistinguishable from typical background levels differs for different types of lines.

Power distribution lines

Typical voltage for power distribution lines in North America ranges from 4 to 24 kilovolts (kV). Electric field levels directly beneath overhead distribution lines may vary from a few volts per meter to 100 or 200 volts per meter. Magnetic fields directly beneath overhead distribution lines typically range from 10 to 20 mG for main feeders and less than 10 mG for laterals. Such levels are also typical directly above underground lines. Peak EMF levels, however, can vary considerably depending on the amount of current carried by the line. Peak magnetic field levels as high as 70 mG have been measured directly below overhead distribution lines and as high as 40 mG above underground lines.

Q How strong is the EMF from electric power substations?

A In general, the strongest EMF around the outside of a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

Q Do electrical workers have higher EMF exposure than other workers?

A Most of the information we have about occupational EMF exposure comes from studies of electric utility workers. It is therefore difficult to compare electrical workers' EMF exposures with those of other workers because there is less information about EMF exposures in work environments other than electric utilities. Early studies did not include actual measurements of EMF exposure on the job but used job titles as an estimate of EMF exposure among electrical workers. Recent studies, however, have included extensive EMF exposure assessments.

A report published in 1994 provides some information about estimated EMF exposures of workers in Los Angeles in a number of electrical jobs in electric utilities and other industries. Electrical workers had higher average EMF exposures (9.6 mG) than did workers in other jobs (1.7 mG). For this study, the category "electrical workers" included electrical engineering technicians, electrical engineers, electricians, power line workers, power station operators, telephone line workers, TV repairers, and welders.

Typical EMF Levels for Power Transmission Lines*

115 kV

	Approx. Edge of Right-of-Way	15 m (50 ft)	30 m (100 ft)	61 m (200 ft)	91 m (300 ft)
Electric Field (kV/m)	1.0	0.5	0.07	0.01	0.003
Mean Magnetic Field (mG)	29.7	6.5	1.7	0.4	0.2

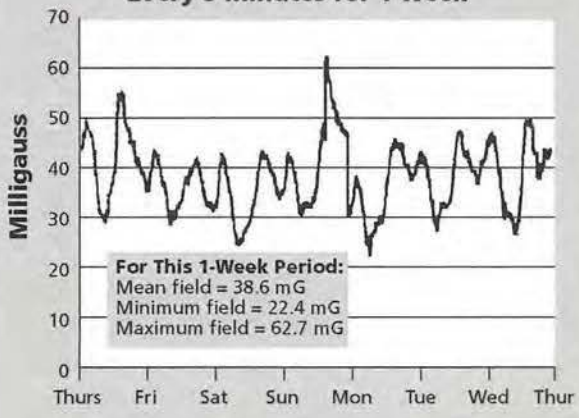
230 kV

	Approx. Edge of Right-of-Way	15 m (50 ft)	30 m (100 ft)	61 m (200 ft)	91 m (300 ft)
Electric Field (kV/m)	2.0	1.5	0.3	0.05	0.01
Mean Magnetic Field (mG)	57.5	19.5	7.1	1.8	0.8

500 kV

	Approx. Edge of Right-of-Way	20 m (65 ft)	30 m (100 ft)	61 m (200 ft)	91 m (300 ft)
Electric Field (kV/m)	7.0	3.0	1.0	0.3	0.1
Mean Magnetic Field (mG)	86.7	29.4	12.6	3.2	1.4

Magnetic Field from a 500-kV Transmission Line Measured on the Right-of-Way Every 5 Minutes for 1 Week



Electric fields from power lines are relatively stable because line voltage doesn't change very much. Magnetic fields on most lines fluctuate greatly as current changes in response to changing loads. Magnetic fields must be described statistically in terms of averages, maximums, etc. The magnetic fields above are means calculated for 321 power lines for 1990 annual mean loads. During peak loads (about 1% of the time), magnetic fields are about twice as strong as the mean levels above. The graph on the left is an example of how the magnetic field varied during one week for one 500-kV transmission line.

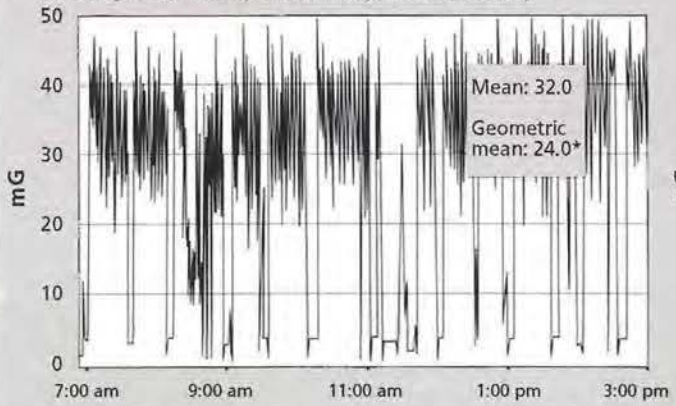
*These are typical EMFs at 1 m (3.3 ft) above ground for various distances from power lines in the Pacific Northwest. They are for general information. For information about a specific line, contact the utility that operates the line.
Source: Bonneville Power Administration, 1994.

Q What are possible EMF exposures in the workplace?

A The figures below are examples of magnetic field exposures determined with exposure meters worn by four workers in different occupations. These measurements demonstrate how EMF exposures vary among individual workers. They do not necessarily represent typical EMF exposures for workers in these occupations.

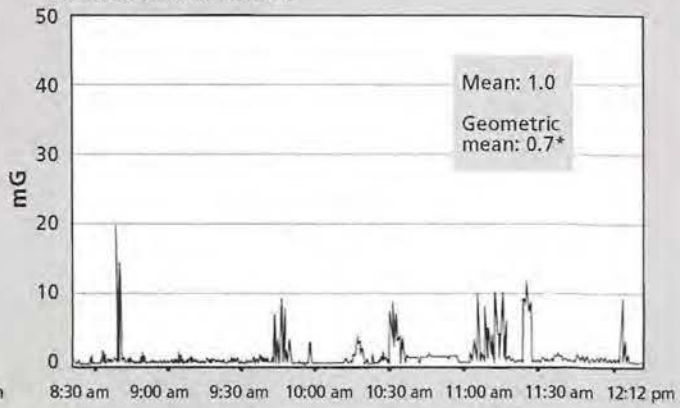
Magnetic Field Exposures of Workers (mG)

Sewing machine operator in garment factory



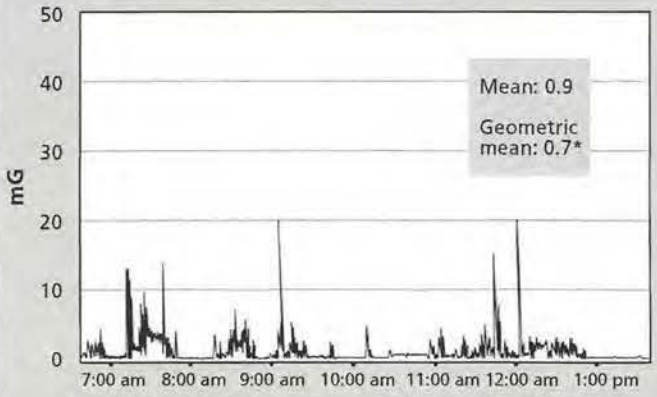
The sewing machine operator worked all day, took a 1-hour lunch break at 11:15 am, and took 10-minute breaks at 8:55 am and 2:55 pm.

Maintenance mechanic



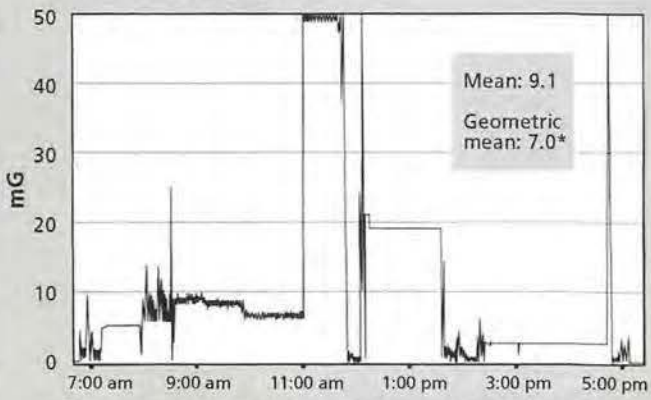
The mechanic repaired a compressor at 9:45 am and 11:10 am.

Electrician



The electrician repaired a large air-conditioning motor at 9:10 am and at 11:45 am.

Government office worker



The government worker was at the copy machine at 8:00 am, at the computer from 11:00 am to 1:00 pm and also from 2:30 pm to 4:30 pm.

*The geometric mean is calculated by squaring the values, adding the squares, and then taking the square root of the sum.
Source: National Institute for Occupational Safety and Health and U.S. Department of Energy.

The tables below and on page 41 can give you a general idea about magnetic field levels for different jobs and around various kinds of electrical equipment. It is important to remember that EMF levels depend on the actual equipment used in

EMF Measurements During a Workday

Industry and occupation	ELF magnetic fields measured in mG: Median for occupation*	ELF magnetic fields measured in mG: Range for 90% of workers**
ELECTRICAL WORKERS IN VARIOUS INDUSTRIES		
Electrical engineers	1.7	0.5–12.0
Construction electricians	3.1	1.6–12.1
TV repairers	4.3	0.6–8.6
Welders	9.5	1.4–66.1
ELECTRIC UTILITIES		
Clerical workers without computers	0.5	0.2–2.0
Clerical workers with computers	1.2	0.5–4.5
Line workers	2.5	0.5–34.8
Electricians	5.4	0.8–34.0
Distribution substation operators	7.2	1.1–36.2
Workers off the job (home, travel, etc.)	0.9	0.3–3.7
TELECOMMUNICATIONS		
Install, maintenance, & repair technicians	1.5	0.7–3.2
Central office technicians	2.1	0.5–8.2
Cable splicers	3.2	0.7–15.0
AUTO TRANSMISSION MANUFACTURE		
Assemblers	0.7	0.2–4.9
Machinists	1.9	0.6–27.6
HOSPITALS		
Nurses	1.1	0.5–2.1
X-ray technicians	1.5	1.0–2.2
SELECTED OCCUPATIONS FROM ALL ECONOMIC SECTORS		
Construction machine operators	0.5	0.1–1.2
Motor vehicle drivers	1.1	0.4–2.7
School teachers	1.3	0.6–3.2
Auto mechanics	2.3	0.6–8.7
Retail sales	2.3	1.0–5.5
Sheet metal workers	3.9	0.3–48.4
Sewing machine operators	6.8	0.9–32.0
Forestry and logging jobs	7.6	0.6–95.5***

Source: National Institute for Occupational Safety and Health.
ELF (extremely low frequency)—frequencies 3–3,000 Hz.
* The median is the middle measurement in a sample arranged by size. These personal exposure measurements reflect the median magnitude of the magnetic field produced by the various EMF sources and the amount of time the worker spent in the fields.
** This range is between the 5th and 95th percentiles of the workday averages for an occupation.
*** Chain saw engines produce strong magnetic fields that are not pure 60-Hz fields.

the workplace. Different brands or models of the same type of equipment can have different magnetic field strengths. It is also important to keep in mind that the strength of a magnetic field decreases quickly with distance.

If you have questions or want more information about your EMF exposure at work, your plant safety officer, industrial hygienist, or other local safety official can be a good source of information. The National Institute for Occupational Safety and Health (NIOSH) is asked occasionally to conduct health hazard evaluations in workplaces where EMF is a suspected cause for concern. For further technical assistance contact NIOSH at 800-356-4674.

Q What are some typical sources of EMF in the workplace?

A Exposure assessment studies so far have shown that most people's EMF exposure at work comes from electrical appliances and tools and from the building's power supply. People who work near transformers, electrical closets, circuit boxes, or other high-current electrical equipment may have 60-Hz magnetic field exposures of hundreds of milligauss or more. In offices, magnetic field levels are often similar to those found at home, typically 0.5 to 4.0 mG. However, these levels can increase dramatically near certain types of equipment.

EMF Spot Measurements

Industry and sources	ELF magnetic fields (mG)	Other frequencies	Comments
ELECTRICAL EQUIPMENT USED IN MACHINE MANUFACTURING			
Electric resistance heater	6,000–14,000	VLF	
Induction heater	10–460	High VLF	
Hand-held grinder	3,000	–	Tool exposures measured at operator's chest.
Grinder	110	–	Tool exposures measured at operator's chest.
Lathe, drill press, etc.	1–4	–	Tool exposures measured at operator's chest.
ALUMINUM REFINING			
Aluminum pot rooms	3.4–30	Very high static field	Highly-rectified DC current (with an ELF ripple) refines aluminum.
Rectification room	300–3,300	High static field	
STEEL FOUNDRY			
Ladle refinery			
Furnace active	170–1,300	High ULF from the ladle's big magnetic stirrer	Highest ELF field was at the chair of control room operator.
Furnace inactive	0.6–3.7	High ULF from the ladle's big magnetic stirrer	Highest ELF field was at the chair of control room operator.
Electrogalvanizing unit	2–1,100	High VLF	
TELEVISION BROADCASTING			
Video cameras (studio and minicams)	7.2–24.0	VLF	
Video tape degaussers	160–3,300	–	Measured 1 ft away.
Light control centers	10–300	–	Walk-through survey.
Studio and newsrooms	2–5	–	Walk-through survey.
HOSPITALS			
Intensive care unit	0.1–220	VLF	Measured at nurse's chest.
Post-anesthesia care unit	0.1–24	VLF	
Magnetic resonance imaging (MRI)	0.5–280	Very high static field, VLF and RF	Measured at technician's work locations.
TRANSPORTATION			
Cars, minivans, and trucks	0.1–125	Most frequencies less than 60 Hz	Steel-belted tires are the principal ELF source for gas/diesel vehicles.
Bus (diesel powered)	0.5–146	Most frequencies less than 60 Hz	
Electric cars	0.1–81	Some elevated static fields	
Chargers for electric cars	4–63	–	Measured 2 ft from charger.
Electric buses	0.1–88	–	Measured at waist. Fields at ankles 2-5 times higher.
Electric train passenger cars	0.1–330	25 & 60 Hz power on U.S. trains	Measured at waist. Fields at ankles 2-5 times higher.
Airliner	0.8–24.2	400 Hz power on airliners	Measured at waist.
GOVERNMENT OFFICES			
Desk work locations	0.1–7	–	Peaks due to laser printers.
Desks near power center	18–50	–	
Power cables in floor	15–170	–	
Building power supplies	25–1,800	–	
Can opener	3,000	–	Appliance fields measured 6 in. away.
Desktop cooling fan	1,000	–	Appliance fields measured 6 in. away.
Other office appliances	10–200	–	

Source: National Institute for Occupational Safety and Health, 2001.
ULF (ultra low frequency)—frequencies above 0, below 3 Hz.
ELF (extremely low frequency)—frequencies 3–3,000 Hz.
VLF (very low frequency)—frequencies 3,000–30,000 Hz (3–30 kilohertz).

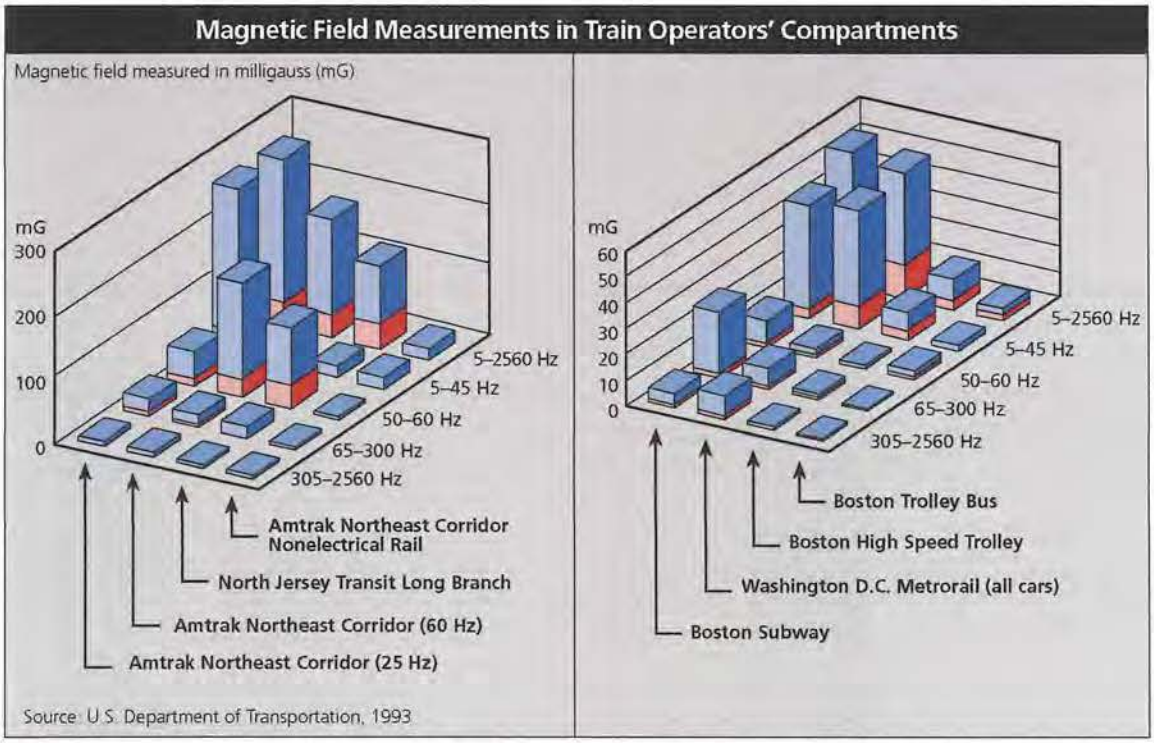
Q What EMF exposure occurs during travel?

A Inside a car or bus, the main sources of magnetic field exposure are those you pass by (or under) as you drive, such as power lines. Car batteries involve direct current (DC) rather than alternating current (AC). Alternators can create EMF, but at frequencies other than 60 Hz. The rotation of steel-belted tires is also a source of EMF.

Most trains in the United States are diesel powered. Some electrically powered trains operate on AC, such as the passenger trains between Washington, D.C. and New Haven, Connecticut. Measurements taken on these trains using personal exposure monitors have suggested that average 60-Hz magnetic field exposures for passengers and conductors may exceed 50 mG. A U.S. government-sponsored exposure assessment study of electric rail systems found average 60-Hz magnetic field levels in train operator compartments that ranged from 0.4 mG (Boston high speed trolley) to 31.1 mG (North Jersey transit). The graph on the next page shows average and maximum magnetic field measurements in operator compartments of several electric rail systems. It illustrates that 60 Hz is one of several electromagnetic frequencies to which train operators are exposed.

Workers who maintain the tracks on electric rail lines, primarily in the northeastern United States, also have elevated magnetic field exposures at both 25 Hz and 60 Hz. Measurements taken by the National Institute for Occupational Safety and Health show that typical average daily exposures range from 3 to 18 mG, depending on how often trains pass the work site.

Rapid transit and light rail systems in the United States, such as the Washington D.C. Metro and the San Francisco Bay Area Rapid Transit, run on DC electricity. These DC-powered trains contain equipment that produces AC fields. For example, areas of strong AC magnetic fields have been measured on the Washington Metro close to the floor, during braking and acceleration, presumably near equipment located underneath the subway cars.



These graphs illustrate that 60 Hz is one of several electromagnetic frequencies to which train operators are exposed. The maximum exposure is the top of the blue (upper) portion of the bar; the average exposure is the top of the red (lower) portion.

Q How can I find out how strong the EMF is where I live and work?

A The tables throughout this chapter can give you a general idea about magnetic field levels at home, for different jobs, and around various kinds of electrical equipment. For specific information about EMF from a particular power line, contact the utility that operates the line. Some will perform home EMF measurements.

You can take your own EMF measurements with a magnetic field meter. For a spot measurement to provide a useful estimate of your EMF exposure, it should be taken at a time of day and location when and where you are typically near the equipment. Keep in mind that the strength of a magnetic field drops off quickly with distance.

Independent technicians will conduct EMF measurements for a fee. Search the Internet under "EMF meters" or "EMF measurement." You should investigate the experience and qualifications of commercial firms, since governments do not standardize EMF measurements or certify measurement contractors.

At work, your plant safety officer, industrial hygienist, or other local safety official can be a good source of information. The National Institute for Occupational Safety and Health (NIOSH) sometimes conducts health hazard evaluations in workplaces where EMF is a suspected cause for concern. For further technical assistance, contact NIOSH at 800-356-4674.

Q How much do computers contribute to my EMF exposure?

A Personal computers themselves produce very little EMF. However, the video display terminal (VDT) or monitor provides some magnetic field exposure unless it is of the new flat-panel design. Conventional VDTs containing cathode ray tubes use magnetic fields to produce the image on the screen, and some emission of those magnetic fields is unavoidable. Unlike most other appliances which produce predominantly 60-Hz magnetic fields, VDTs emit magnetic fields in both the extremely low frequency (ELF) and very low frequency (VLF) frequency ranges (see page 8). Many newer VDTs have been designed to minimize magnetic field emissions, and those identified as "TCO'99 compliant" meet a standard for low emissions (see page 48).

Q What can be done to limit EMF exposure?

A Personal exposure to EMF depends on three things: the strength of the magnetic field sources in your environment, your distance from those sources, and the time you spend in the field.

If you are concerned about EMF exposure, your first step should be to find out where the major EMF sources are and move away from them or limit the time you spend near them. Magnetic fields from appliances decrease dramatically about an arm's length away from the source. In many cases, rearranging a bed, a chair, or a work area to increase your distance from an electrical panel or some other EMF source can reduce your EMF exposure.

Another way to reduce EMF exposure is to use equipment designed to have relatively low EMF emissions. Sometimes electrical wiring in a house or a building can be the source of strong magnetic field exposure. Incorrect wiring is a common source of higher-than-usual magnetic fields. Wiring problems are also worth correcting for safety reasons.

In its 1999 report to Congress, the National Institute of Environmental Health Sciences suggested that the power industry continue its current practice of siting power lines to reduce EMF exposures.

There are more costly actions, such as burying power lines, moving out of a home, or restricting the use of office space that may reduce exposures. Because scientists are still debating whether EMF is a hazard to health, it is not clear that the costs of such measures are warranted. Some EMF reduction measures may create other problems. For instance, compacting power lines reduces EMF but increases the danger of accidental electrocution for line workers.

We are not sure which aspects of the magnetic field exposure, if any, to reduce. Future research may reveal that EMF reduction measures based on today's limited understanding are inadequate or irrelevant. No action should be taken to reduce EMF exposure if it increases the risk of a known safety hazard.

5 EMF Exposure Standards

This chapter describes standards and guidelines established by state, national, and international safety organizations for some EMF sources and exposures.

Q Are there exposure standards for 60-Hz EMF?

A In the United States, there are no federal standards limiting occupational or residential exposure to 60-Hz EMF.

At least six states have set standards for transmission line electric fields; two of these also have standards for magnetic fields (see table below). In most cases, the maximum fields permitted by each state are the maximum fields that existing lines produce at maximum load-carrying conditions. Some states further limit electric field strength at road crossings to ensure that electric current induced into large metal objects such as trucks and buses does not represent an electric shock hazard.

State Transmission Line Standards and Guidelines

	Electric Field		Magnetic Field	
State	On R.O.W.*	Edge R.O.W.	On R.O.W.	Edge R.O.W.
Florida	8 kV/m[a] 10 kV/m[b]	2 kV/m	—	150 mG[a] (max. load) 200 mG[b] (max. load) 250 mG[c] (max. load)
Minnesota	8 kV/m	—	—	—
Montana	7 kV/m[d]	1 kV/m[e]		
New Jersey	—	3 kV/m		
New York	11.8 kV/m 11.0 kV/m[f] 7.0 kV/m[d]	1.6 kV/m	—	200 mG (max. load)
Oregon	9 kV/m	—	—	—

*R.O.W. = right-of-way (or in the Florida standard, certain additional areas adjoining the right-of-way). kV/m = kilovolt per meter. One kilovolt = 1,000 volts. [a]For lines of 69-230 kV. [b]For 500 kV lines. [c]For 500 kV lines on certain existing R.O.W. [d]Maximum for highway crossings. [e]May be waived by the landowner. [f]Maximum for private road crossings.

Two organizations have developed voluntary occupational exposure guidelines for EMF exposure. These guidelines are intended to prevent effects, such as induced currents in cells or nerve stimulation, which are known to occur at high magnitudes, much higher (more than 1,000 times higher) than EMF levels found typically in

occupational and residential environments. These guidelines are summarized in the tables on the right.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) concluded that available data regarding potential long-term effects, such as increased risk of cancer, are insufficient to provide a basis for setting exposure restrictions.

ICNIRP Guidelines for EMF Exposure

Exposure (60 Hz)	Electric field	Magnetic field
Occupational	8.3 kV/m	4.2 G (4,200 mG)
General Public	4.2 kV/m	0.833 G (833 mG)

International Commission on Non-Ionizing Radiation Protection (ICNIRP) is an organization of 15,000 scientists from 40 nations who specialize in radiation protection.
Source: ICNIRP, 1998.

The American Conference of Governmental Industrial Hygienists (ACGIH) publishes "Threshold Limit Values" (TLVs) for various physical agents. The TLVs for 60-Hz EMF shown in the table are identified as guides to control exposure; they are not intended to demarcate safe and dangerous levels.

ACGIH Occupational Threshold Limit Values for 60-Hz EMF

	Electric field	Magnetic field
Occupational exposure should not exceed	25 kV/m	10 G (10,000 mG)
Prudence dictates the use of protective clothing above	15 kV/m	–
Exposure of workers with cardiac pacemakers should not exceed	1 kV/m	1 G (1,000 mG)

American Conference of Governmental Industrial Hygienists (ACGIH) is a professional organization that facilitates the exchange of technical information about worker health protection. It is not a government regulatory agency.
Source: ACGIH, 2001.

Q Does EMF affect people with pacemakers or other medical devices?

A According to the U.S. Food and Drug Administration (FDA), interference from EMF can affect various medical devices including cardiac pacemakers and implantable defibrillators. Most current research in this area focuses on higher frequency sources such as cellular phones, citizens band radios, wireless computer links, microwave signals, radio and television transmitters, and paging transmitters.

Sources such as welding equipment, power lines at electric generating plants, and rail transportation equipment can produce lower frequency EMF strong enough to interfere with some models of pacemakers and defibrillators. The occupational exposure guidelines developed by ACGIH state that workers with cardiac pacemakers should not be exposed to a 60-Hz magnetic field greater than 1 gauss (1,000 mG) or a 60-Hz electric field greater than 1 kilovolt per meter (1,000 V/m) (see ACGIH guidelines above). Workers who are concerned about EMF exposure effects on pacemakers, implantable defibrillators, or other implanted electronic medical devices should consult their doctors or industrial hygienists.

Nonelectronic metallic medical implants (such as artificial joints, pins, nails, screws, and plates) can be affected by high magnetic fields such as those from magnetic resonance imaging (MRI) devices and aluminum refining equipment, but are generally unaffected by the lower fields from most other sources.

The FDA MedWatch program is collecting information about medical device problems thought to be associated with exposure to or interference from EMF. Anyone experiencing a problem that might be due to such interference is encouraged to call and report it (800-332-1088).

Q What about products advertised as producing low or reduced magnetic fields?

A Virtually all electrical appliances and devices emit electric and magnetic fields. The strengths of the fields vary appreciably both between types of devices and among manufacturers and models of the same type of device. Some appliance manufacturers are designing new models that, in general, have lower EMF than older models. As a result, the words "low field" or "reduced field" may be relative to older models and not necessarily relative to other manufacturers or devices. At this time, there are no domestic or international standards or guidelines limiting the EMF emissions of appliances.

The U.S. government has set no standards for magnetic fields from computer monitors or video display terminals (VDTs). The Swedish Confederation of Professional Employees (TCO) established in 1992 a standard recommending strict limits on the EMF emissions of computer monitors. The VDTs should produce magnetic fields of no more than 2 mG at a distance of 30 cm (about 1 ft) from the front surface of the monitor and 50 cm (about 1 ft 8 in) from the sides and back of the monitor. The TCO'92 standard has become a *de facto* standard in the VDT industry worldwide. A 1999 standard, promulgated by the Swedish TCO (known as the TCO'99 standard), provides for international and environmental labeling of personal computers. Many computer monitors marketed in the U.S. are certified as compliant with TCO'99 and are thereby assured to produce low magnetic fields.

Beware of advertisements claiming that the federal government has certified that the advertised equipment produces little or no EMF. The federal government has no such general certification program for the emissions of low-frequency EMF. The U.S. Food and Drug Administration's Center for Devices and Radiological Health (CDRH) does certify medical equipment and equipment producing high levels of ionizing radiation or microwave radiation. Information about certain devices as well as general information about EMF is available from the CDRH at 888-463-6332.

Q Are cellular telephones and towers sources of EMF exposure?

A Cellular telephones and towers involve radio-frequency and microwave-frequency electromagnetic fields (see page 8). These are in a much higher frequency range than are the power-frequency electric and magnetic fields associated with the transmission and use of electricity.

The U.S. Federal Communications Commission (FCC) licenses communications systems that use radio-frequency and microwave electromagnetic fields and ensures that licensed facilities comply with exposure standards. Public information on this topic is published on two FCC Internet sites: http://www.fcc.gov/oet/info/documents/bulletins/#56 and http://www.fcc.gov/oet/rfsafety/

The U.S. Food and Drug Administration also provides information about cellular telephones on its web site (http://www.fda.gov/cdrh/ocd/mobilphone.html).

6 National and International EMF Reviews

This chapter presents the findings and recommendations of major EMF research reviews, including the U.S. government's EMF RAPID Program.

Q What have national and international agencies concluded about the impact of EMF exposure on human health?

A Since 1995, two major U.S. reports have concluded that limited evidence exists for an association between EMF exposure and increased leukemia risk, but that when all the scientific evidence is considered, the link between EMF exposure and cancer is weak. The World Health Organization in 1997 reached a similar conclusion.

The two reports were the U.S. National Academy of Sciences report in 1996 and, in 1999, the National Institute of Environmental Health Sciences report to the U.S. Congress at the end of the U.S. EMF Research and Public Information Dissemination (RAPID) Program.

The U.S. EMF RAPID Program

Initiated by the U.S. Congress and established by law in 1992, the U.S. EMF Research and Public Information Dissemination (EMF RAPID) Program set out to study whether exposure to electric and magnetic fields produced by the generation, transmission, or use of electric power posed a risk to human health. For more information about the EMF RAPID Program, visit the web site (http://www.niehs.nih.gov/emfrapid).

The U.S. Department of Energy (DOE) administered the overall EMF RAPID Program, but health effects research and risk assessment were supervised by the National Institute of Environmental Health Sciences (NIEHS), a branch of the U.S. National Institutes of Health (NIH). Together, DOE and NIEHS oversaw more than 100 cellular and animal studies, as well as engineering and exposure assessment studies. Although the EMF RAPID Program did not fund any additional epidemiological studies, an analysis of the many studies already conducted was an important part of its final report.

The electric power industry contributed about half, or $22.5 million, of the $45 million eventually spent on EMF research over the course of the EMF RAPID Program. The NIEHS received $30.1 million from this program for research, public outreach, administration, and the health assessment evaluation of extremely low frequency (ELF) EMF. The DOE received approximately $15 million from this program for engineering and EMF mitigation research. The NIEHS contributed an additional $14.5 million for support of extramural and intramural research including long-term toxicity and carcinogenicity studies conducted by the National Toxicology Program.

EMF RAPID Program Interagency Committee

- National Institute of Environmental Health Sciences
- Department of Energy
- Department of Defense
- Department of Transportation
- Environmental Protection Agency
- Federal Energy Regulatory Commission
- National Institute of Standards and Technology
- Occupational Safety and Health Administration
- Rural Electrification Administration

An interagency committee was established by the President of the United States to provide oversight and program management support for the EMF RAPID Program. The interagency committee included representatives from NIEHS, DOE, and seven other federal agencies with EMF-related responsibilities.

The EMF RAPID Program also received advice from a National EMF Advisory Committee (NEMFAC), which included representatives from citizen groups, labor, utilities, the National Academy of Sciences, and other groups. They met regularly with DOE and NIEHS staff to express their views. NEMFAC meetings were open to the public. The EMF RAPID Program sponsored citizen participation in some scientific meetings as well. A broad group of citizens reviewed all major public information materials produced for the program.

NIEHS Working Group Report 1998

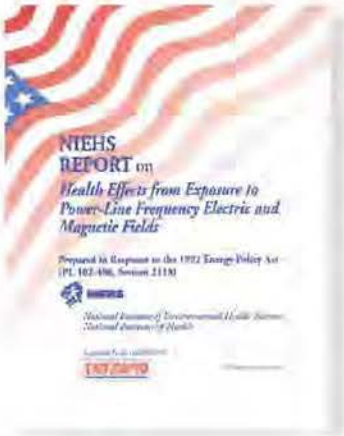
In preparation for the EMF RAPID Program's goal of reporting to the U.S. Congress on possible health effects from exposure to EMF from power lines, the NIEHS convened an expert working group in June 1998. Over 9 days, about 30 scientists conducted a complete review of EMF studies, including those sponsored by the EMF RAPID Program and others. Their conclusions offered guidance to the NIEHS as it prepared its report to Congress.

Using criteria developed by the International Agency for Research on Cancer, a majority of the members of the working group concluded that exposure to power-frequency EMF is a possible human carcinogen.

The majority called their opinion "a conservative public health decision based on limited evidence for an increased occurrence of childhood leukemias and an increased occurrence of chronic lymphocytic leukemia (CLL) in occupational settings." For these

diseases, the working group reported that animal and cellular studies neither confirm nor deny the epidemiological studies' suggestion of a disease risk. This report is available on the NIEHS EMF RAPID web site (http://www.niehs.nih.gov/emfrapid).

NIEHS Report to Congress at Conclusion of EMF RAPID Program



In June 1999, the NIEHS reported to the U.S. Congress that scientific evidence for an EMF-cancer link is weak.

The following are excerpts from the 1999 NIEHS report:

> The NIEHS believes that the probability that ELF-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm.
>
> The scientific evidence suggesting that extremely low frequency EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies, although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed.

The full report is available on the NIEHS EMF RAPID web site (http://www.niehs.nih.gov/emfrapid).

No regulatory action was recommended or taken based on the NIEHS report. The NIEHS director, Dr. Kenneth Olden, told the Congress that, in his opinion, the conclusion of the NIEHS report was not sufficient to warrant aggressive regulatory action.

The NIEHS did not recommend adopting EMF standards for electric appliances or burying electric power lines. Instead, it recommended providing public information about practical ways to reduce EMF exposure. The NIEHS also suggested that power companies and utilities "continue siting power lines to reduce exposures and . . . explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards." The NIEHS encouraged manufacturers to reduce magnetic fields at a minimal cost, but noted that the risks do not warrant expensive redesign of electrical appliances.

The NIEHS also encouraged individuals who are concerned about EMF in their homes to check to see if their homes are properly wired and grounded, since incorrect wiring or other code violations are a common source of higher-than-usual magnetic fields.

National Academy of Sciences Report

In October 1996, a National Research Council committee of the National Academy of Sciences (NAS) released its evaluation of research on potential associations between EMF exposure and cancer, reproduction, development, learning, and behavior. The report concluded:

> Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.

The NAS report focused primarily on the association of childhood leukemia with the proximity of the child's home to power lines. The NAS panel found that although a link between EMF exposure and increased risk for childhood leukemia was observed in studies that had estimated EMF exposure using the wire code method (distance of home from power line), such a link was not found in studies that had included actual measurements of magnetic fields at the time of the study. The panel called for more research to pinpoint the unexplained factors causing small increases in childhood leukemia in houses close to power lines.

World Health Organization International EMF Project

The World Health Organization (WHO) International EMF Project, with headquarters in Geneva, Switzerland, was launched at a 1996 meeting with representatives of 23 countries attending. It was intended to respond to growing concerns in many member states over possible EMF health effects and to address the conflict between such concerns and technological and economic progress. In its advisory role, the WHO International EMF Project is now reviewing laboratory and epidemiological evidence, identifying gaps in scientific knowledge, developing an agenda for future research, and developing risk communication booklets and other public information. The WHO International EMF Project is funded with contributions from governments and institutions and is expected to provide an overall EMF health risk assessment. Additional information about this program can be found on the WHO EMF web site (http://www.who.int/peh-emf).

As part of this project, in 1997 a working group of 45 scientists from around the world surveyed the evidence for adverse

EMF health effects. They reported that, "taken together, the findings of all published studies are suggestive of an association between childhood leukemia and estimates of ELF (extremely low frequency or power-frequency) magnetic fields."

Much like the 1996 U.S. NAS report, the WHO report noted that living in homes near power lines was associated with an approximate 1.5-fold excess risk of childhood leukemia. But unlike the NAS panel, WHO scientists had seen the results of the 1997 U.S. National Cancer Institute study of EMF and childhood leukemia (see page 17). This work showed even more strongly the inconsistency between results of studies that used a wire code to estimate EMF exposure and studies that actually measured magnetic fields.

Regarding health effects other than cancer, the WHO scientists reported that the epidemiological studies "do not provide sufficient evidence to support an association between extremely-low-frequency magnetic-field exposure and adult cancers, pregnancy outcome, or neurobehavioural disorders."

World Health Organization International Agency for Research on Cancer

The WHO International Agency for Research on Cancer (IARC) produces a monograph series that reviews the scientific evidence regarding potential carcinogenicity associated with exposure to environmental agents. An international scientific panel of 21 experts from 10 countries met in June 2001 to review the scientific evidence regarding the potential carcinogenicity of static and ELF (extremely low frequency or power-frequency) EMF. The panel categorized its conclusions for carcinogenicity based on the IARC classification system—a system that evaluates the strength of evidence from epidemiological, laboratory (human and cellular), and mechanistic studies. The panel classified power-frequency EMF as "possibly carcinogenic to humans" based on a fairly consistent statistical association between a doubling of risk of childhood leukemia and magnetic field exposure above 0.4 microtesla (0.4 μT, 4 milligauss or 4 mG).

In contrast, they found no consistent evidence that childhood EMF exposures are associated with other types of cancer or that adult EMF exposures are associated with increased risk for any kind of cancer. The IARC panel reported that no consistent carcinogenic effects of EMF exposure have been observed in experimental animals and that there is currently no scientific explanation for the observed association between childhood leukemia and EMF exposure. Further information can be obtained at the IARC web sites (http://www.iarc.fr and http://monographs.iarc.fr).

International Commission on Non-Ionizing Radiation Protection

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) issued exposure guidelines to guard against known adverse effects such as stimulation of nerves and muscles at very high EMF levels, as well as shocks and burns caused by touching objects that conduct electricity (see page 47). In April 1998, ICNIRP revised its exposure guidelines and characterized as "unconvincing" the evidence for an association between everyday power-frequency EMF and cancer.

European Union

In 1996, a European Union (EU) advisory panel provided an overview of the state of science and standards among EU countries. With respect to power-frequency EMF, the panel members said that there is no clear evidence that exposure to EMF results in an increased risk of cancer.

Australia—Radiation Advisory Committee Report to Parliament

In 1997, Australia's Radiation Advisory Committee briefly reviewed the EMF scientific literature and advised the Australian Parliament that, overall, there is insufficient evidence to come to a firm conclusion regarding possible health effects from exposure to power-frequency magnetic fields.

The committee also reported that "the weight of opinion as expressed in the U.S. National Academy of Sciences report, and the negative results from the National Cancer Institute study (Linet et al., 1997) would seem to shift the balance of probability more towards there being no identifiable health effects" (see pages 17 and 53).

Canada—Health Canada Report

In December 1998, a working group of public health officers at Health Canada, the federal agency that manages Canada's health care system, issued a review of the scientific literature regarding power-frequency EMF health effects. They found the evidence to be insufficient to conclude that EMF causes a risk of cancer.

The report concluded that while EMF effects may be observed in biological systems in a laboratory, no adverse health effects have been demonstrated at the levels to which humans and animals are typically exposed.

As for epidemiology, 25 years of study results are inconsistent and inconclusive, the panel said, and a plausible EMF-cancer mechanism is missing. Health Canada pledged to continue monitoring EMF research and to reassess this position as new information becomes available.

Germany—Ordinance 26

On January 1, 1997, Germany became the first nation to adopt a national rule on EMF exposure for the general public. Ordinance 26 applies only to facilities such as overhead and underground transmission and distribution lines, transformers, switchgear and overhead lines for electric-powered trains. Both electric (5 kV/m) and magnetic field exposure limits (1 Gauss) are high enough that they are unlikely to be encountered in ordinary daily life. The ordinance also requires that precautionary measures be taken on a case-by-case basis when electric facilities are sited or upgraded near homes, hospital, schools, day care centers, and playgrounds.

Great Britain—National Radiological Protection Board Report

The National Radiological Protection Board (NRPB) in Great Britain advises the government of the United Kingdom regarding standards of protection for exposure to non-ionizing radiation. The NRPB's advisory group on non-ionizing radiation periodically reviews new developments in EMF research and reports its findings. Results of the advisory group's latest review were published in 2001. The report reviewed residential and occupational epidemiological studies, as well as cellular, animal, and human volunteer studies that had been published.

The advisory group noted that there is "some epidemiological evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children." Specifically, the NRPB advisory group's analysis suggests "that relatively heavy average exposures of 0.4 μT [4 mG] or more are associated with a doubling of the risk of leukaemia in children under 15 years of age." The group pointed out, however, that laboratory experiments have provided "no good evidence that extremely low frequency electromagnetic fields are capable of producing cancer."

Scandinavia—EMF Developments

In October 1995, a group of Swedish researchers and government officials published a report about EMF exposure in the workplace. This "Criteria Group" reviewed EMF scientific literature and, using the IARC classification system, ranked occupational EMF exposure as "possibly carcinogenic to humans." They also endorsed the Swedish government's 1994 policy statement that public exposure limits to EMFs were not needed, but that people might simply want to use caution with EMFs.

In 1996, five Swedish government agencies further explained their precautionary advice about EMF. EMF exposure should be reduced, they said, but only when practical, without great inconvenience or cost.

Health experts in Norway, Denmark, and Finland generally agreed in reviews published in the 1990s that if an EMF health risk exists, it is small. They acknowledged that a link between residential magnetic fields and childhood leukemia cannot be confirmed or denied. In 1994, several Norwegian government ministries also recommended increasing the distance between residences and electrical facilities, if it could be done at low cost and with little inconvenience.

Q What other U.S. organizations have reported on EMF?

A

American Medical Association

In 1995, the American Medical Association advised physicians that no scientifically documented health risk had been associated with "usually occurring" EMF, based on a review of EMF epidemiological, laboratory studies, and major literature reviews.

American Cancer Society

In 1996, the American Cancer Society released a review of 20 years of EMF epidemiological research including occupational studies and residential studies of

adult and childhood cancer. The society noted that some data support a possible relationship of magnetic field exposure with leukemia and brain cancer, but further research may not be justified if studies continue to find uncertain results. Of particular interest is the summary of results from eight studies of risk from use of household appliances with relatively high magnetic fields, such as electric blankets and electric razors. The summary suggested that there is no persuasive evidence for increased risk with more frequent or longer use of these appliances.

American Physical Society

The American Physical Society (APS) represents thousands of U.S. physicists. Responding to the NIEHS Working Group's conclusion that EMF is a possible human carcinogen, the APS executive board voted in 1998 to reaffirm its 1995 opinion that there is "no consistent, significant link between cancer and power line fields."

California's Department of Health Services

In 1996, California's Department of Health Services (DHS) began an ambitious five-year effort to assess possible EMF public health risk and offer guidance to school administrators and other decision-makers. The California Electric and Magnetic Fields (EMF) Program is a research, education, and technical assistance program concerned with the possible health effects of EMF from power lines, appliances, and other uses of electricity. The program's goal is to find a rational and fair approach to dealing with the potential risks, if any, of exposure to EMF. This is done through research, policy analysis, and education. The web site has educational materials on EMF and related health issues for individuals, schools, government agencies, and professional organizations (http://www.dhs.ca.gov/ps/deodc/ehib/emf).

Q What can we conclude about EMF at this time?

A Electricity is a beneficial part of our daily lives, but whenever electricity is generated, transmitted, or used, electric and magnetic fields are created. Over the past 25 years, research has addressed the question of whether exposure to power-frequency EMF might adversely affect human health. For most health outcomes, there is no evidence that EMF exposures have adverse effects. There is some evidence from epidemiology studies that exposure to power-frequency EMF is associated with an increased risk for childhood leukemia. This association is difficult to interpret in the absence of reproducible laboratory evidence or a scientific explanation that links magnetic fields with childhood leukemia.

EMF exposures are complex and come from multiple sources in the home and workplace in addition to power lines. Although scientists are still debating whether EMF is a hazard to health, the NIEHS recommends continued education on ways of reducing exposures. This booklet has identified some EMF sources and some simple steps you can take to limit your exposure. For your own safety, it is important that any steps you take to reduce your exposures do not increase other obvious hazards such as those from electrocution or fire. At the current time in the United States, there are no federal standards for occupational or residential exposure to 60-Hz EMF.

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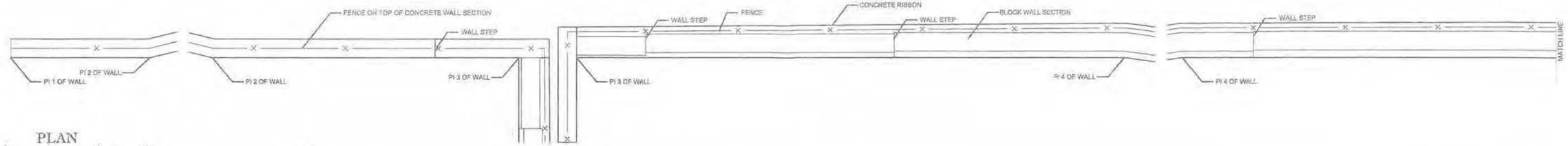
EXHIBIT 12
Retaining Wall and Fence Detail



PLAN

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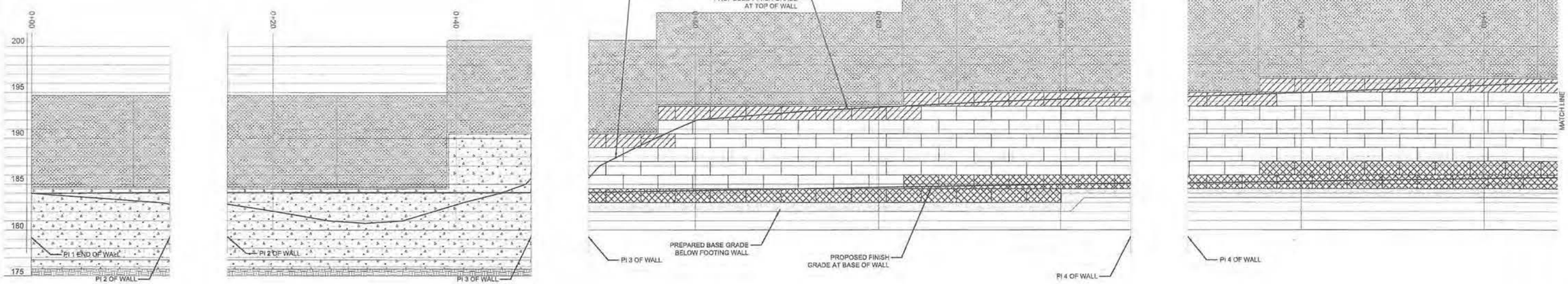
(IN FEET)
1 inch = 5 ft.



ELEVATION

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(IN FEET)
1 inch = 5 ft.

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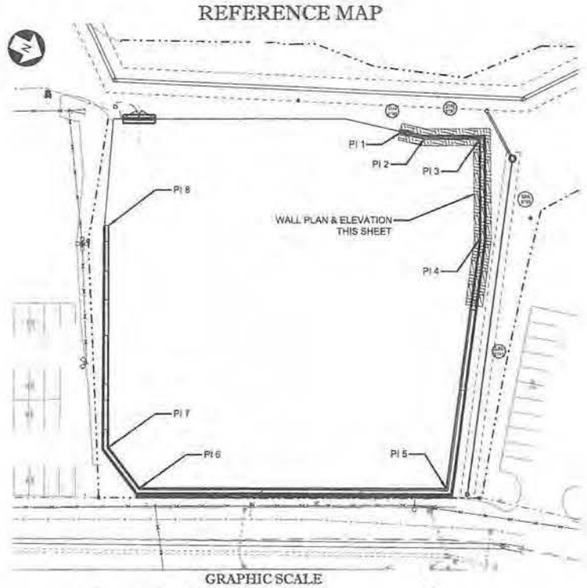

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.

PI-PT
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NOTE:

1. FENCING SYSTEM IS SPECIFICALLY DESIGNED TO BE NON-CONDUCTIVE TO ELECTRICITY. HEIGHT OF FENCE TO BE MIN. 10'-0" AS MEASURED FROM THE TOP OF RETAINING WALL, CONCRETE RIBBON.

2. FENCE POSTS TO BE SPACED AT A MAX. 6'-0" CENTERS. FENCE POSTS TO BE ANCHORED INTO 41" BLOCK AS SHOWN IN DETAILS.

3. FENCE PANELS MAY BE CUT TO FIT POST SPACING. CUTS TO BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

4. FENCE TO POST CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

5. CLEAR SPACE SPACE BETWEEN RETAINING WALL AND THE BOTTOM OF THE FENCE TO BE A MAX. OF 3 INCHES.

6. FORCE PROTECTION COPING WITH J BOLTS TO BE LOCATED FOR BLOCKS WITH FENCE POST CONNECTION, SEE SHEET 913-03-02 SH.14.

BLOCK LEGEND

- 24" BLOCK
- 41" BLOCK
- 60" BLOCK

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RETAINING WALL PLAN AND PROFILE

MIDDLE STREET SUBSTATION LEWISTON, ME

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CK. UEI/MEV | NO. 973-03-02 SH. 10 | REV. C
APP. UEI/XXX | DATE

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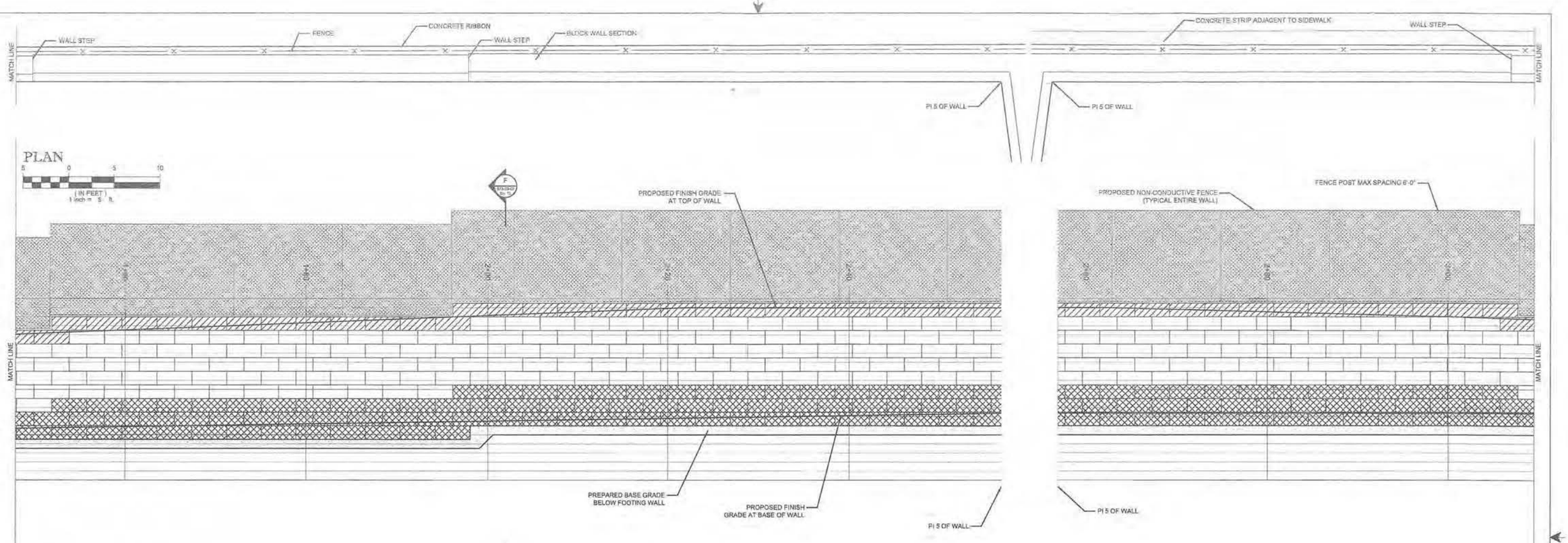

ELEVATION

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(IN FEET)
1 inch = 5 ft.

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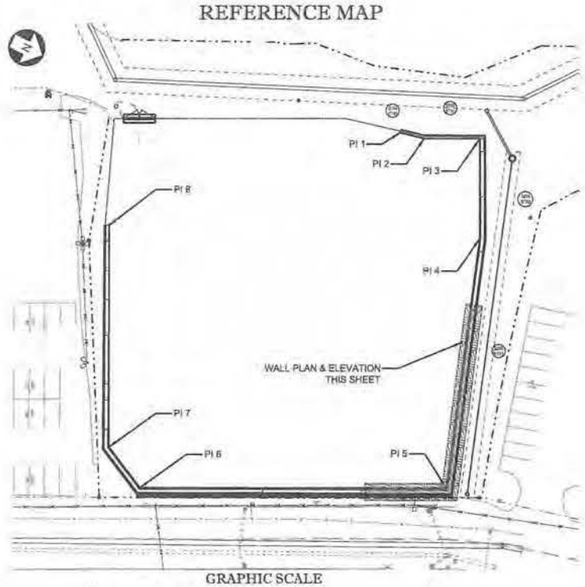

GRAPHIC SCALE

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(IN FEET)
1 inch = 40 ft.

PI-PT
SEE COORDINATE POINTS
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NOTE:

1. FENCING SYSTEM IS SPECIFICALLY DESIGNED TO BE NON-CONDUCTIVE TO ELECTRICITY. HEIGHT OF FENCE TO BE MIN. 10'-0" AS MEASURED FROM THE TOP OF RETAINING WALL, CONCRETE RIBBON.

2. FENCE POSTS TO BE SPACED AT A MAX. 6'-0" CENTERS. FENCE POSTS TO BE ANCHORED INTO 4" BLOCK AS SHOWN IN DETAILS.

3. FENCE PANELS MAY BE CUT TO FIT POST SPACING. CUTS TO BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

4. FENCE TO POST CONNECTION TO BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.

5. CLEAR SPACE SPACE BETWEEN RETAINING WALL AND THE BOTTOM OF THE FENCE TO BE A MAX. OF 3 INCHES.

6. FORCE PROTECTION COPING WITH J BOLTS TO BE LOCATED FOR BLOCKS WITH FENCE POST CONNECTION. SEE SHEET 973-03-02 SH. 14.

BLOCK LEGEND

- 24" BLOCK
- 41" BLOCK
- 60" BLOCK

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RETAINING WALL PLAN AND PROFILE

MIDDLE STREET SUBSTATION LEWISTON, ME

DR. UEI/AMG
CK. UEI/MEV
APP. UEI/XXX
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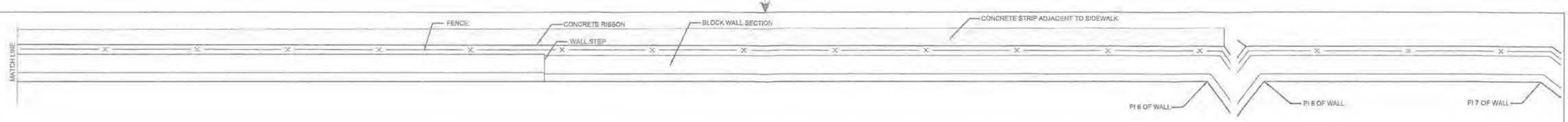

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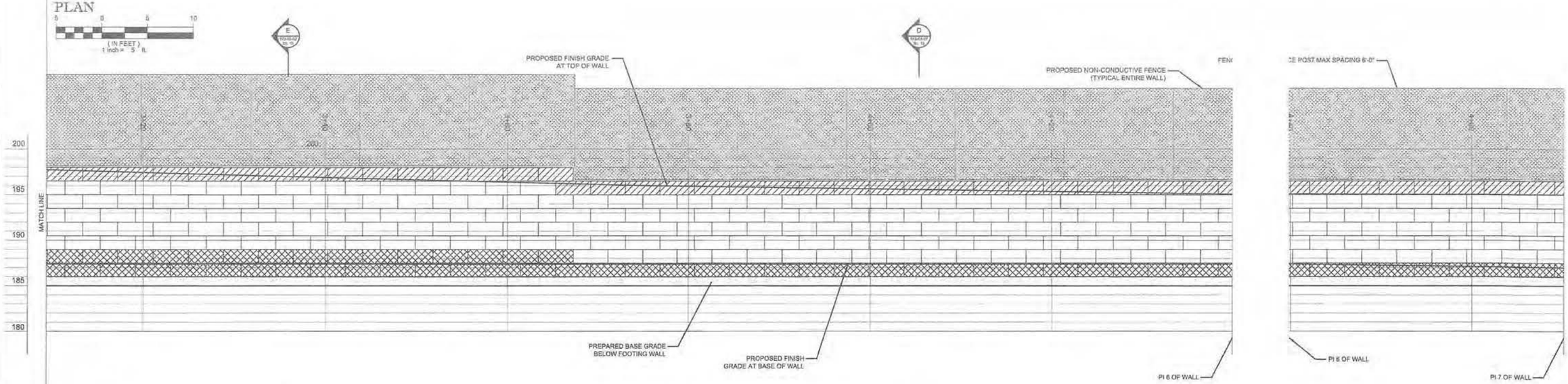

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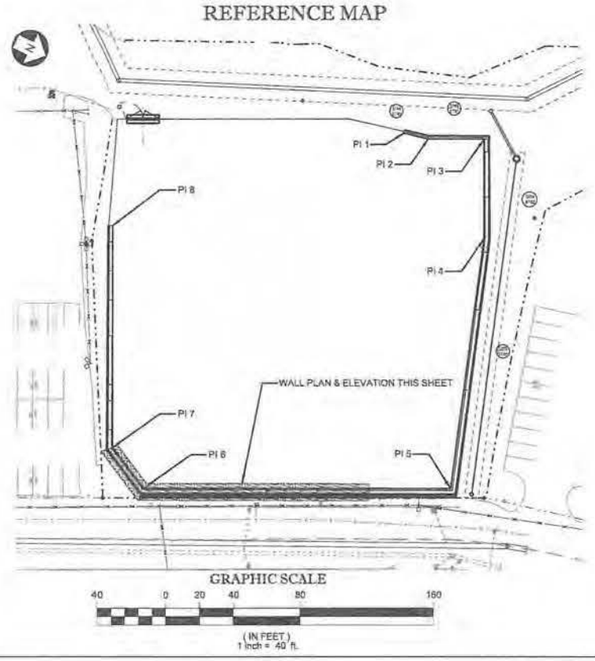

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BLOCK LEGEND

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RETAINING WALL PLAN AND PROFILE

MIDDLE STREET SUBSTATION LEWISTON, ME

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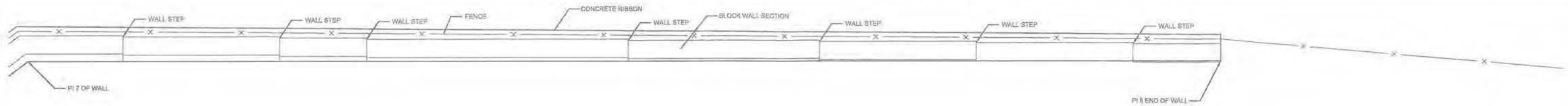

PLAN

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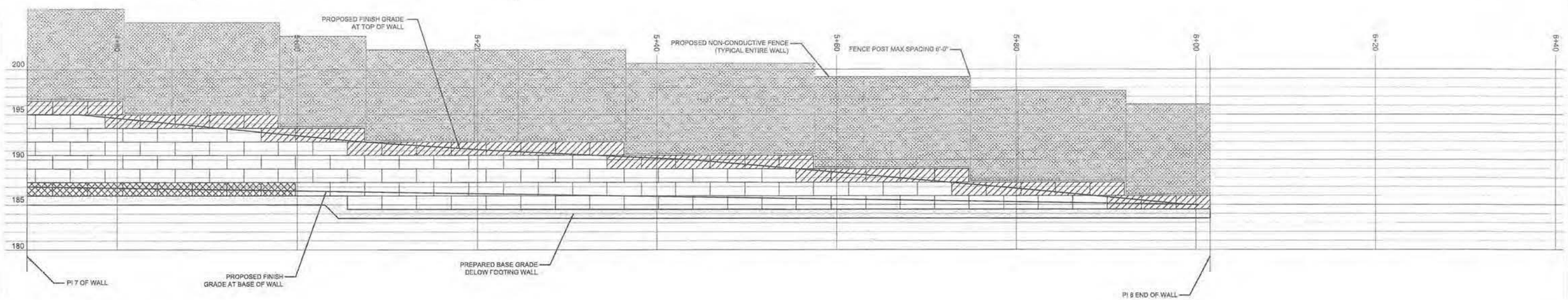
1 inch = 5 ft



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1 inch = 5 ft

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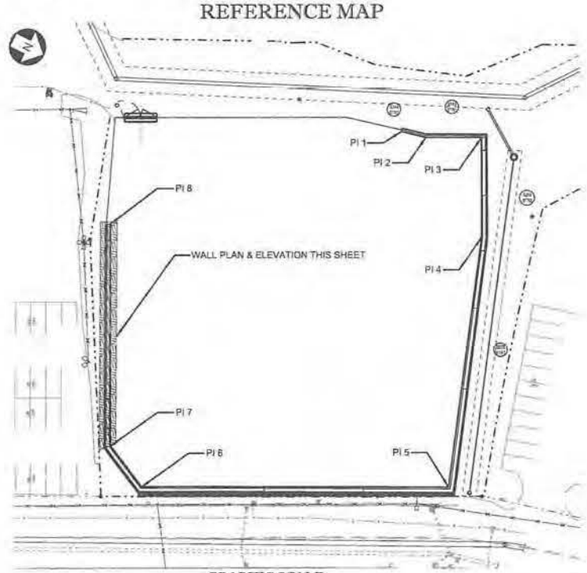

GRAPHIC SCALE
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(IN FEET)
1 inch = 40 ft.

BLOCK LEGEND

- 24" BLOCK
- 41" BLOCK
- 60" BLOCK

PI=PT
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APP. UEI/XXX

973-03-02 SH. 13 | REV. B

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ARCH D

Union Street Substation
Portland, Maine

ANC Non-Conductive Fencing System for Securing Utility Enclosures

Project Submittals as manufactured by ALABAMA METAL INDUSTRIES CORPORATION

Submittal Date:

Contract Number:

Project Name:

Section Number: 32 30 00

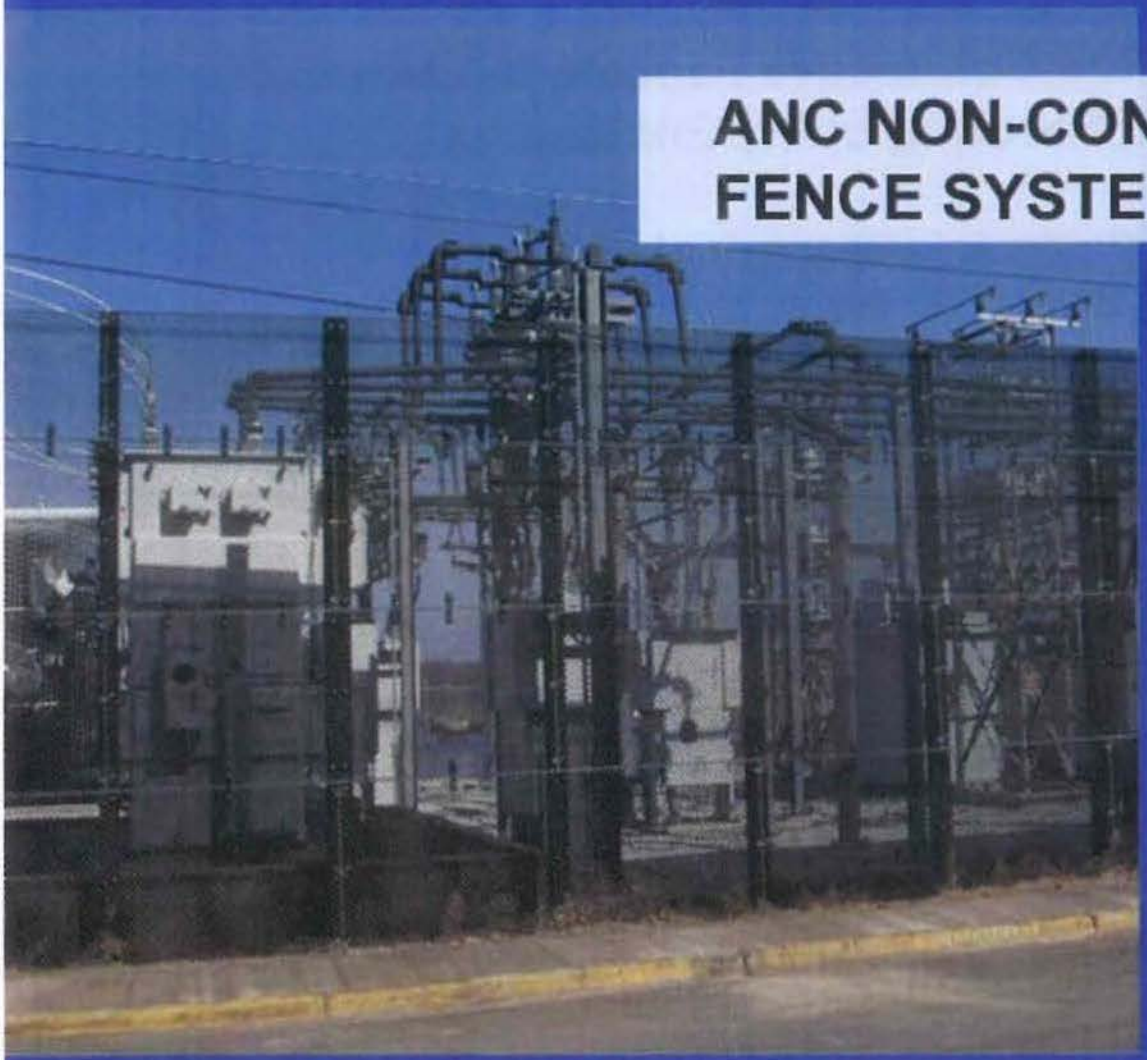
Contractor's Name:

All information contained herein is accurate as known at the time of publication. Specifications may change and AMICO reserves the right to change product specifications without notice and without incurring obligations.

ALABAMA METAL INDUSTRIES CORPORATION
3245 Fayette Avenue ◊ Birmingham, AL 35208 ◊ Telephone 800/366-2642 ◊ Facsimile 205/786-6527
email fmayer@gibraltar1.com

AMICO

ANC NON-CONDUCTIVE FENCE SYSTEM



A GIBRALTAR INDUSTRIES COMPANY QUALITY PRODUCTS – COAST TO COAST

ANC Composite Fence System™

Non-Conductive Fencing

Alabama Metal Industries Corporation, AMICO, produces the ANC Composite Fence System™. The ANC System™ is a revolutionary concept that allows the security barrier to be non-conductive (does not conduct electricity) and invisible to radar (microwave transmissions).

AMICO continues to introduce and improve physical security products with many added features. The ANC System is no exception. This composite fence system is also:

Non-Magnetic
Fire Retardant
CorrosionResistant

and available in either Medium or Maximum Security.

The System

For ease of new construction and the retrofit of existing fences the basic components have been designed to be similar to standard fencing. Utilizing the AMICO network of Certified and Approved Dealer/Installers we can recommend skilled installers throughout the United States and Canada. Since the system is not made of metal the weight per square foot is much lighter than steel yet almost as strong. Typical ANC Composite Panels are capable of sustaining impact loads in excess of 2,000 lbs.

Materials

The ANC Composite Fence System utilizes panels, posts, fittings and fasteners all made from materials proven to be non-conductive and invisible to microwaves.

Panels

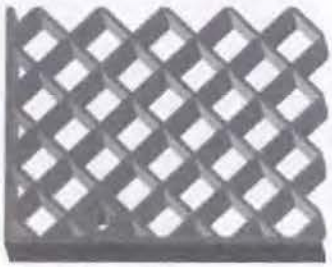
Panels are manufactured in two standard sizes; 3-ft x 12-ft long and 4-ft x 12-ft long.

Standard Stock Panel Sizes		
Style	High	Wide
ANC 1.0-1.75	3'	12'
ANC 1.0-1.75	4'	12'
ANC .50-2.25	3'	12'
ANC .50-2.25	4'	12'

The 3 and 4-ft sizes provide barriers 6-ft high through 15-ft high. The 12-ft panel width allows ease of installation and added strength with each panel spanning on three posts.

Panels are available with diferent size openings. The different opening sizes of the panels allow for different levels of security.

ANC .50-2.25 Medium Security



ANC 1.0-1.75 Maximum Security
Dark gray is the standard color

Isometric view of H-Post, ANC Panels, Panel Plugs and Back Straps.

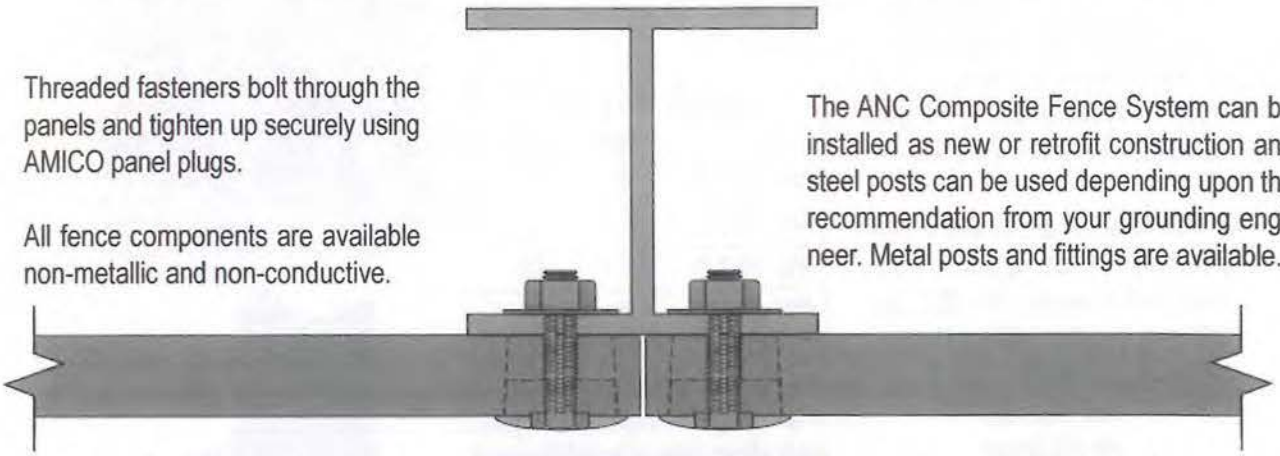
ANC Composite Fence System™

Non-Conductive Fencing

The ANC Composite Fence System™ combines non-conductivity and security into an easy to install solution for the energy industry, air and marine transportation

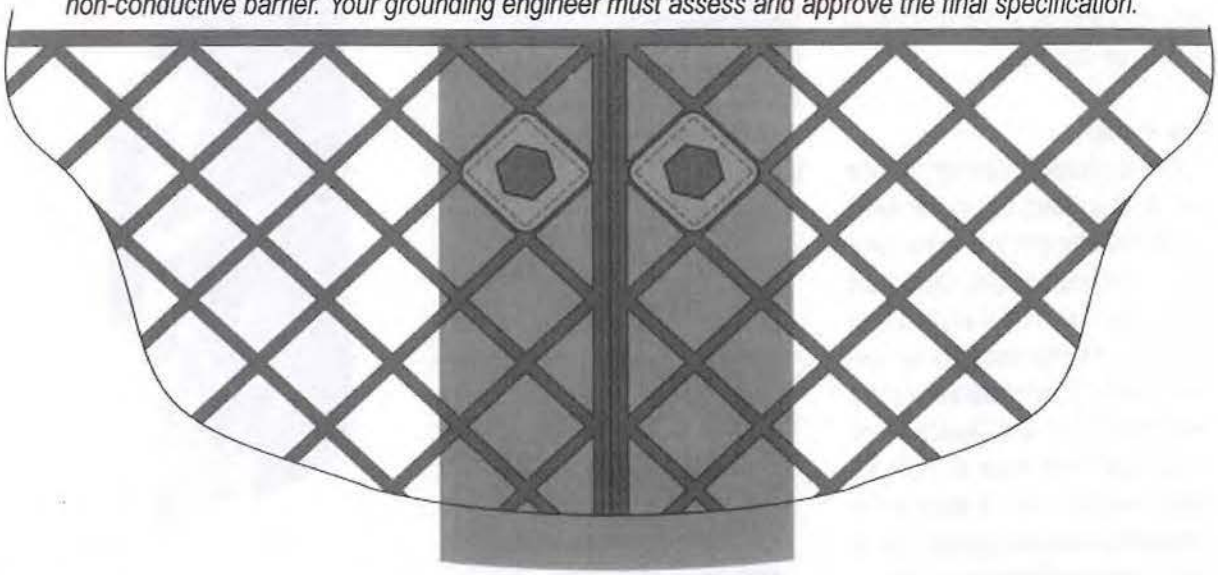
Threaded fasteners bolt through the panels and tighten up securely using AMICO panel plugs.

All fence components are available non-metallic and non-conductive.



The ANC Composite Fence System can be installed as new or retrofit construction and steel posts can be used depending upon the recommendation from your grounding engineer. Metal posts and fittings are available.

The materials and information contained herein are designed as a guildline for selecting and planning a non-conductive barrier. Your grounding engineer must assess and approve the final specification.



Permits visibility and air flow

Provides Safety and Security

Height Not a Problem

For more information on our security products, visit www.amico-securityproducts.com or call **800/366-2642**.

ANC COMPOSITE FENCE SYSTEM™

Non-Conductive Fencing

PART 1 - General

1.01 DESCRIPTION OF WORK

Included work not limited to the supply and installation of an electrically non-conductive / radar invisible barrier as specified below.

1.02 SUBMITTALS

Product Data: Submit manufacturers' specifications, ANC Non-Conductive Fencing literature and samples as required prior to ordering.

1.03 QUALITY ASSURANCE

Certified and Approved Dealer / Installers shall provide experienced installation crews to install the non-conductive / radar transparent fencing system as specified.

1.04 STORAGE AND HANDLING

Materials shall be stored in such a manner to ensure proper ventilation, drainage and to protect against damage from weather, vandalism and theft. In event of any freight damage, note damage on the freight bill and contact manufacturer immediately.

PART 2 – PRODUCTS

2.01 MANUFACTURER AND ACCEPTABLE PRODUCT

The Electrically Non-Conductive mesh panels shall conform with material specifications as manufactured by Alabama Metal Industries Corporation (AMICO), Birmingham, AL. Security Products Department: Telephone 800/366-2642

2.02 MATERIALS

The materials used to manufacture the non-conductive / radar transparent fence system are not covered under any ASTM standard at this time. The materials and accoutrements for this fencing system are unique. All panels, fittings and methods of securing are of a design impletented for the purpose of creating an electrically non-conductive and or transparent to electromagnetic wave (radar transparent) barrier. All design, construction and components shall be approved by the owner's grounding engineer to meet the desired level of non-conductivity and electromagnetic wave transparency.

2.03 NON-CONDUCTIVE FENCING

A. NEW AND RETROFIT CONSTRUCTION

Depending upon grounding conditions and requirements new non-conductive fence panels may be installed utilizing either non-conductive framework or schedule 40 / SS-40 steel framework. For grounding purposes the fittings and fasteners securing panels to the framework shall be the same material as the framework; non-conductive or steel.

B. Existing metal fence framework may be incorporated into the non-conductive fence. Existing fence posts of a suitable strength and height may be reused to install AMICO non-conductive panels, metal fittings and metal fasteners. Any existing chain link fabric, barbed wire or barbed tape must be removed since these metal items will conduct electricity throughout the fence line.

2.04 RADAR TRANSPARENT FENCING

NEW CONSTRUCTION

With the intent of being invisible to radar and microwave transmissions; all panels, posts, fittings, fasteners and accoutrements shall be non-metallic.

2.05 FINISH

The thru color finish does not require painting. Standard colors are dark gray and green. The finish will not rust or corrode.

PART 3 – Execution

3.01 INSTALLATION

A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
B. ANC Fencing must be installed using AMICO non-conductive panels and fittings.
C. Fence post spacing shall be spaced to allow each panel to join on a post. If two or more panels are used to attain a certain barrier height the panels ends shall be staggared for added strength and security.

QUALITY PRODUCTS COAST TO COAST AMICO A GIBRALTAR INDUSTRIES COMPANY

ALABAMA METAL INDUSTRIES CORPORATION
3245 Fayette Avenue u Birmingham, AL 35208
800/366-2642 u Fax 205/786-6527

For information on other AMICO physical security products
Secura Fence System® - Security Mesh® - Secura Lath® - Secura Mesh Partition System® and Ornamesh®
see our website www.amico-securityproducts.com

ANC COMPOSITE FENCE SYSTEM™

ANC .50 - 2.25

ANC COMPOSITE FENCE SYSTEM™
Non-Conductive Fencing

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK
Included work not limited to the supply and installation of an electrically non-conductive / reduced radar reflective barrier as specified below.

1.02 SUBMITTALS
Product Data: Submit manufacturers' specifications, ANC Non-Conductive Fencing literature and samples as required prior to ordering. Prior to ordering test certified test results shall be submitted providing the documented ability of the fence system to prevent the transmission of electricty throught the system for electric utility applications and the level of radar reflectivity for airport installation. Further, horizontal load deflection test results shall be submitted.

1.03 QUALITY ASSURANCE
Certified and Approved Dealer / Installers shall provide experienced installation crews to install the ANC Fence System as specified.

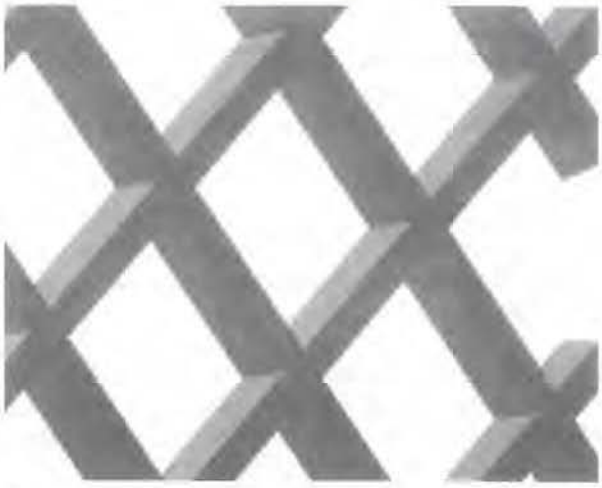
1.04 STORAGE AND HANDLING
Materials shall be stored in such a manner to ensure proper ventilation, drainage and to protect against damage from weather, vandalism and theft. In event of any freight damage, note damage on the freight bill and contact manufacturer immediately.

PART 2 – PRODUCTS

2.01 MANUFACTURER AND ACCEPTABLE PRODUCT
The Electrically Non-Conductive mesh panels shall conform with material specifications as manufactured by Alabama Metal Industries Corporation (AMICO), Birmingham, AL. Security Products Department:
Telephone 800/366-2642 or email ancfence@gibraltar1.com

2.02 MATERIALS
The materials and accoutrements for this fencing system are unique. All panels, fittings and methods of securing are of a design implemented for the purpose of creating a barrier that does not conduct electricity and greatly reduces the barriers radar signature. All design, construction and components shall be approved by the owner to meet the desired level of non-conductivity and electromagnetic wave transparency.

A. ANC COMPOSITE FENCE PANELS – ANC .50 – 2.25
The ANC Mesh used shall conform to the following specification:
1. Width of panel – 12 ft.
2. Height of panel – 3 ft and 4 ft.
3. Mesh diamond opening – 2.25 inch x 2.25 inch nominal allowing 72% open area
4. Mesh thickness – 0.500 inch nominal
5. Weight – 1.36 pounds per square foot
6. Standard Color - Dark Gray



2.03 ELECTRICAL UTILITY NON-CONDUCTIVE FENCING
A. NEW AND RETROFIT CONSTRUCTION
Depending upon grounding conditions and requirements new non-conductive fence panels may be installed utilizing either non-conductive framework or schedule 40 / SS-40 steel framework.
B. Existing metal fence framework may be incorporated into the non-conductive fence. Existing fence posts of a suitable strength and height may be retrofitted using AMICO non-conductive panels, metal fittings and metal fasteners. Any existing chain link fabric, barbed wire or barbed tape must be removed since these metal items will conduct electricity throughout the fence line.

2.04 RADAR AND AIRPORT APPLICATIONS NEW CONSTRUCTION
All panels, posts, fittings, fasteners and accoutrements used with the intent of minimizing the radar signature of the barrier shall be non-metallic.

2.05 FINISH
The thru color finish does not require painting. The standard color is dark gray. Request information on custom colors. The finish will not rust or corrode.

PART 3 – EXECUTION

3.01 INSTALLATION
A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
B. ANC Fencing must be installed using AMICO non-conductive panels, fittings and installed by AMICO Certified and Approved Dealer / Installers.
C. Where possible fence post spacing shall be spaced to allow each panel to join on a post. If two or more panels are used to attain a certain barrier height the panels ends shall be staggered for added strength and security.
D. Follow the fittings useage tables for each type of application whether the application be 100% Non-Conductive non-metallic or using steel framework to assure safety and security.
E. Cutting, sealing and safety information is available upon request from the manufacturer.

Alabama Metal Industries Corporation
AMICO
January 2008

ANC COMPOSITE FENCE SYSTEM™

ANC 1.0 - 1.75

ANC COMPOSITE FENCE SYSTEM™
Non-Conductive Fencing

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

Included work not limited to the supply and installation of an electrically non-conductive / reduced radar reflective barrier as specified below.

1.02 SUBMITTALS

Product Data: Submit manufacturers' specifications, ANC Non-Conductive Fencing literature and samples as required prior to ordering. Prior to ordering test certified test results shall be submitted providing the documented ability of the fence system to prevent the transmission of electricty throught the system for electric utility applications and the level of radar reflectivity for airport installation. Further, horizontal load deflection test results shall be submitted.

1.03 QUALITY ASSURANCE

Certified and Approved Dealer / Installers shall provide experienced installation crews to install the ANC Fence System as specified.

1.04 STORAGE AND HANDLING

Materials shall be stored in such a manner to ensure proper ventilation, drainage and to protect against damage from weather, vandalism and theft. In event of any freight damage, note damage on the freight bill and contact manufacturer immediately.

PART 2 – PRODUCTS

2.01 MANUFACTURER AND ACCEPTABLE PRODUCT

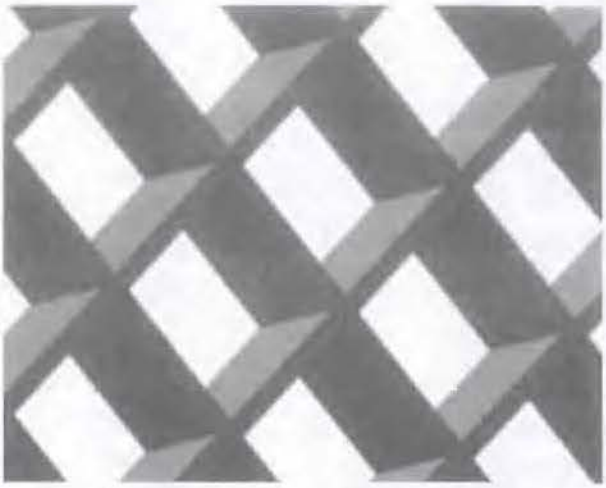
The Electrically Non-Conductive mesh panels shall conform with material specifications as manufactured by Alabama Metal Industries Corporation (AMICO), Birmingham, AL. Security Products Department:
Telephone 800/366-2642 or email ancfence@gibraltar1.com

2.02 MATERIALS

The materials and accoutrements for this fencing system are unique. All panels, fittings and methods of securing are of a design implemented for the purpose of creating a barrier that does not conduct electricity and greatly reduces the barriers radar signature. All design, construction and components shall be approved by the owner to meet the desired level of non-conductivity and electromagnetic wave transparency.

A. ANC COMPOSITE FENCE PANELS – ANC 1.0 – 1.75
The ANC Mesh used shall conform to the following specification:

1. Width of panel – 12 ft.
2. Height of panel – 3 ft and 4 ft.
3. Mesh diamond opening – 1.75 inch x 1.75 inch nominal allowing 68% open area
4. Mesh thickness – 1.000 inch nominal
5. Weight – 2.36 pounds per square foot
6. Standard Color - Dark Gray



2.03 ELECTRICAL UTILITY NON-CONDUCTIVE FENCING

A. NEW AND RETROFIT CONSTRUCTION
Depending upon grounding conditions and requirements new non-conductive fence panels may be installed utilizing either non-conductive framework or schedule 40 / SS-40 steel framework.
B. Existing metal fence framework may be incorporated into the non-conductive fence. Existing fence posts of a suitable strength and height may be retrofitted using AMICO non-conductive panels, metal fittings and metal fasteners. Any existing chain link fabric, barbed wire or barbed tape must be removed since these metal items will conduct electricity throughout the fence line.

2.04 RADAR AND AIRPORT APPLICATIONS NEW CONSTRUCTION

All panels, posts, fittings, fasteners and accoutrements used with the intent of minimizing the radar signature of the barrier shall be non-metallic.

2.05 FINISH

The thru color finish does not require painting. The standard color is dark gray. Request information on custom colors. The finish will not rust or corrode.

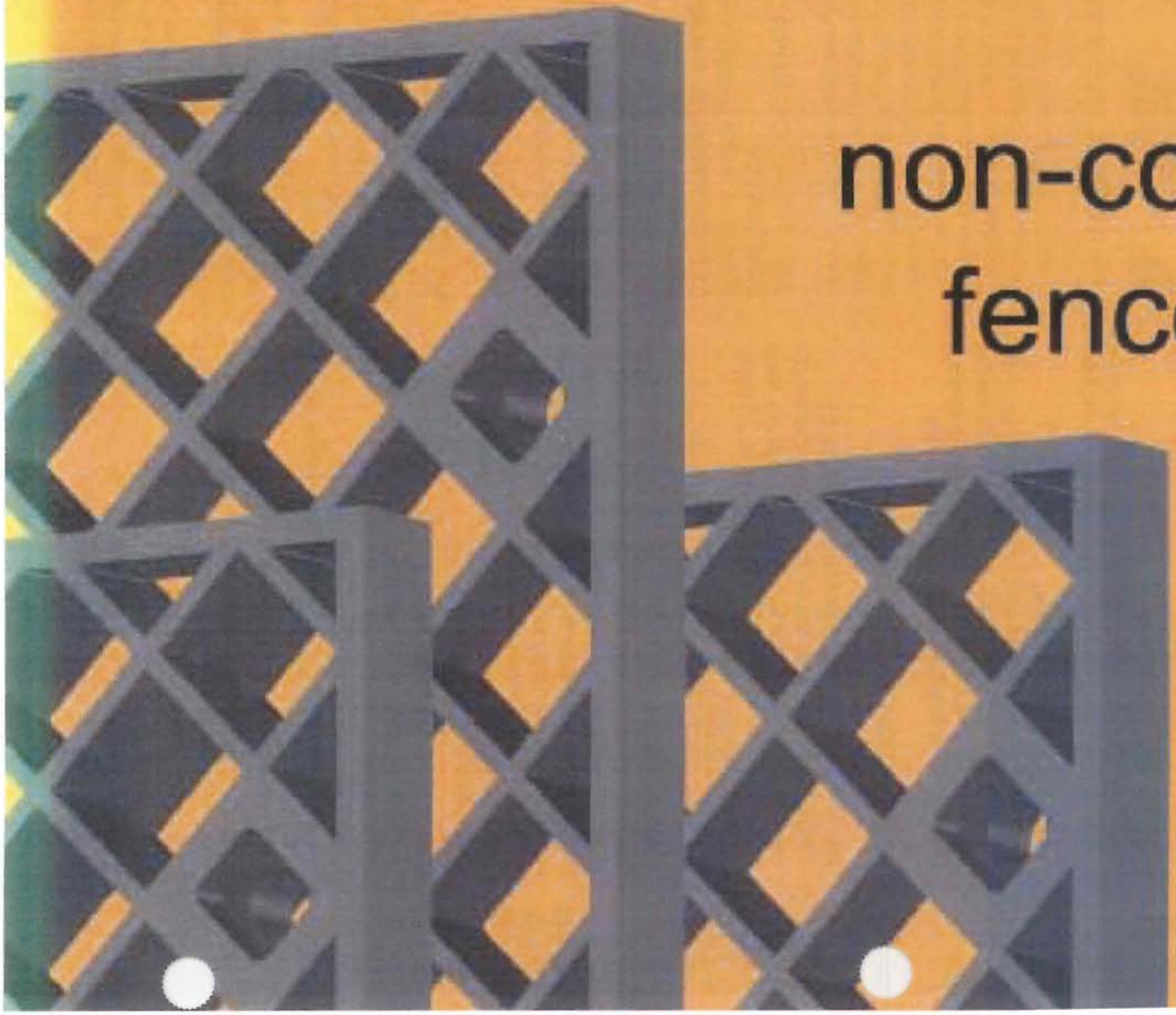
PART 3 – EXECUTION

3.01 INSTALLATION

A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
B. ANC Fencing must be installed using AMICO non-conductive panels, fittings and installed by AMICO Certified and Approved Dealer / Installers.
C. Where possible fence post spacing shall be spaced to allow each panel to join on a post. If two or more panels are used to attain a certain barrier height the panels ends shall be staggered for added strength and security.
D. Follow the fittings useage tables for each type of application whether the application be 100% Non-Conductive non-metallic or using steel framework to assure safety and security.
E. Cutting, sealing and safety information is available upon request from the manufacturer.

Alabama Metal Industries Corporation
AMICO January 2008

INSTALLATION GUIDELINES



the anc non-conductive fence system by

AMICO®

GIBRALTAR INDUSTRIES

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The following Installation Guidelines should be used as a guide for installing the ANC Non-Conductive Fence System™. There are numerous jobsite conditions that cannot be foreseen or detailed in advance. Therefore good common sense and proper safety practices must be used during installation. Installation problems that arise should be directed to the AMICO Security Department in Birmingham, Alabama. 8:00 AM to 5:00 PM CST.

Installation Tips

1. A three man crew is best suited for installation of the ANC System.
2. Before starting, review all installation instructions pertinent to your layout (i.e. panels, post types, gates, fittings and fasteners)
3. Identify on the panels which side is the attack side. Wedge plug fittings fit into the panels from the attack side.
4. Threaded fasteners are on the inside face of the barrier.
5. Panels install horizontally in front of posts.
6. Make sure all posts are installed plumb.
7. Posts shall be set as a standard, 6'~¼"+¼" max. on center web to web. H posts require 12-in. diameter post holes.
8. Begin installation process at a building wall, end or corner of layout.
9. Cut panels or posts using a circular saw with a masony, carbide tip or diamond coated blade. Bolt cutters are an acceptable method of cutting ANC.50-2.25
10. Holes drilled in posts shall require a carbide tip drill bit.
11. All cut edges or drilled surfaces MUST be coated with AMICO sealant.
12. All bolt threads must be coated with AMICO sealant to prevent unwanted removal.
13. Contractor should advise AMICO of any grade change in excess of 1% in order to suggest best method for installation.
14. Different grade conditions and methods of installing panels must be discussed with the owner or specifier prior to installation.
15. The use of steel or existing posts must be agreed upon with the owner or specifier prior to the installation.

Special Tools Required

1. Power saw with a masonry, carbide tip or diamond coated blade: use a rotary saw for straight cuts, a jig saw for circular cuts. For large fabrication jobs, use a diamond grit blade and diamond grit drill bits.
2. Sawhorses or platforms for supporting products while cutting.
3. Tape measure, straight edge, and chalk-line or felt tip pen for marking cuts.
4. Sandpaper, to smooth cut edges prior to sealing. For best results, use a

Recommended Safety Practices

1. Carefully read the Material Safety Data Sheet (MSDS). If you do not have a MSDS, contact AMICO prior to fabricating. Individuals with respiratory ailments should not fabricate ANC products.
2. Observe common safety precautions when using cutting tools. Always wear gloves when handling ANC products. Wear approved safety glasses or goggles to protect your eyes and a respirator (mask) to reduce inhalation of dust. We recommend the use of a NIOSH/MSHA approved mask for dust with a permissible exposure limit (PEL) of not less than 0.1 mg/M3.
3. Dust from cutting ANC products can cause skin irritation. Wear long sleeve clothing to reduce dust from coming into contact with skin. If cutting products causes difficulty in breathing or excessive skin irritation, stop immediately and consult a physician.
4. Observe common safety precautions when using the Sealing Kit. Read and follow instructions enclosed in the kit prior to using. Always wear safety glasses and protective clothing when working with ANC products or using a Sealing Kit. Do not allow resin or catalyst to come in contact with skin.

Procedures

1. Support panel securely so it will not flex or shift during cutting.
2. Mark cuts clearly and carefully.
3. Use even steady pressure when cutting. Excessive pressure may cause heat and/or ragged edges. Replace dull blades to prevent heat buildup.
4. Sand all cut edges. Open grit sandpaper on a high-speed sanding wheel provides best results. Use #20 sandpaper for fine sanding and #16 sandpaper for fast sanding. Use light, even pressure to prevent uneven surfaces.
5. Use a seal kit to coat all cut, drilled or sanded surfaces. This is recommended to prevent water absorbtion and corrosive chemicals from reaching exposed glass fibers.
6. Carefully read and follow the instructions included with the sealing kit.

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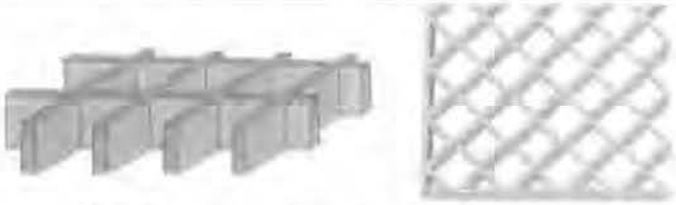
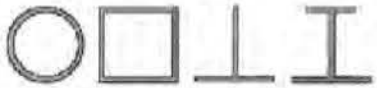
PANELS - are manufactured from a specific resin designed to enhance the non-conductive properties. Panels are produced in the diamond pattern for added physical strength. The strands of the diamond are tapered inward to allow the Wedge Plug Fitting to seat securely into the diamond opening allowing the threaded fastener to tighten panels to posts. Panels are available in both 3-foot and 4-foot high x 12-foot long. See table to the right for panel dimensions. Panels can be stacked to create any height barrier.



Dark Gray is the standard color for the ANC System.
Call for lead times on custom colors.

POSTS are available in different shapes for specific applications. Round and Square shapes are generally used for gate and terminal posts. T-'s are used for terminating intersecting fence runs. H-type posts are the standard line posts. Round, Square, T-s and H-Type posts are available for different installation applications.
Field drilling holes for fasteners is required.

Panel Dimensions (Nominal)					
Panel Type	Thickness	Height	Length	Opening	Weight
ANC .50 - 2.25	½"	3-ft.	12-ft.	2¼"	50-lbs. ea.
	½"	4-ft.	12-ft.	2¼"	66-lbs. ea.
ANC 1.0 - 1.75	1"	3-ft.	12-ft.	1¾"	85-lbs. ea.
	1"	4-ft.	12-ft.	1¾"	115-lbs. ea.



Posts and fittings are available to accomodate round, square, T and H-Type framework.

TOLERANCE - These panels are a handmade and molded products with the attack side having a smooth mill finish surface and the inside face shall have a smooth painted finish.

TESTING has confirmed the value of the AMICO ANC Fence System for both airport radar interference and electric generating and substation site applications.Certified tests report can be provided upon request.

AIRPORT S-Band (2.7-3.0 GHz) land based Airport Surveillance Radar (ASR-8, ASR-9, and ASR-11) and Weather Radar was tested against a similarly shaped all-metallic version of the fence. The ANC System shows an improvement of radar reflectivity from 68% - 90% when tested at different incident angles and polarization. S-Band radar is the standard type of ground radar used at commercial airports.

Electric generating and distribution stations can experience arcing on a frequent basis. Testing has shown the ANC System can receive *660,000 volts without transmitting electricity across the panel. *The ANC System can withstand a higher voltage than what was tested.

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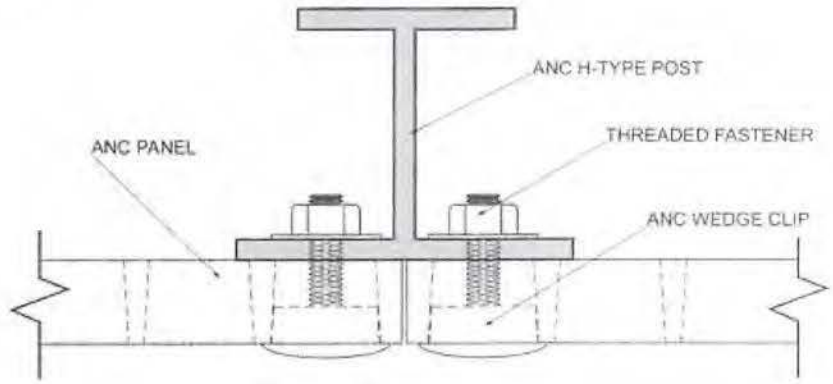
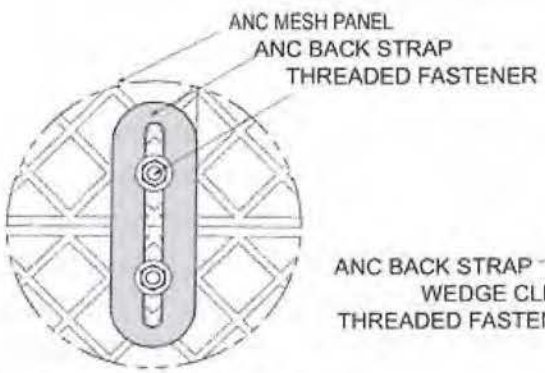
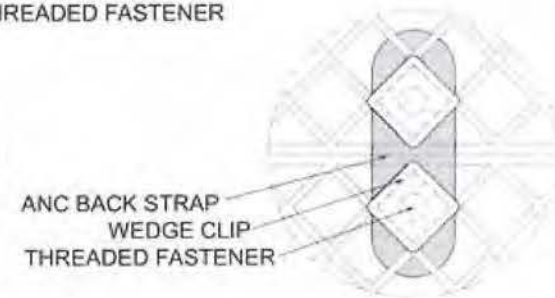
FITTINGS are designed to secure the panels to the posts and mid-panel to mid-panel connections.

ANC Wedge Plugs are used to secure the threaded fastener from the attack side of the panel.



ANC Back Straps with Wedge Clips secure panel to panel joints





Panel To Panel Connections On 6-Ft. Post Spacing				
Panel Type	Panel Thickness	Panel Height	Vertical Joints	Horizontal Joints
ANC .50 - 2.25	½"	3-ft.	3	3
	½"	4-ft.	3	3
ANC 1.0 - 1.75	1"	3-ft.	3	2
	1"	4-ft.	3	2

Rear Side of ANC Back Strap

Attack Side of ANC Back Strap

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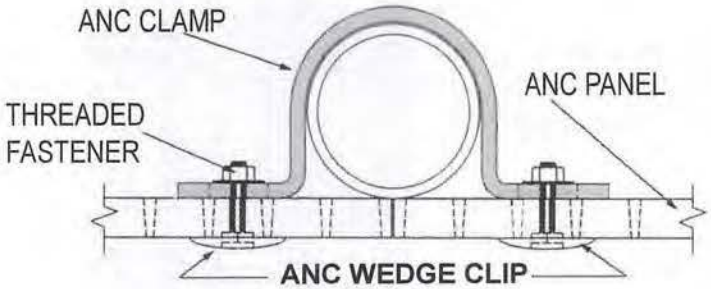
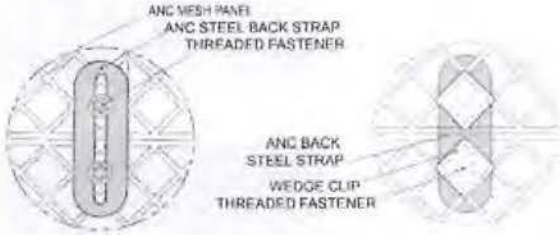
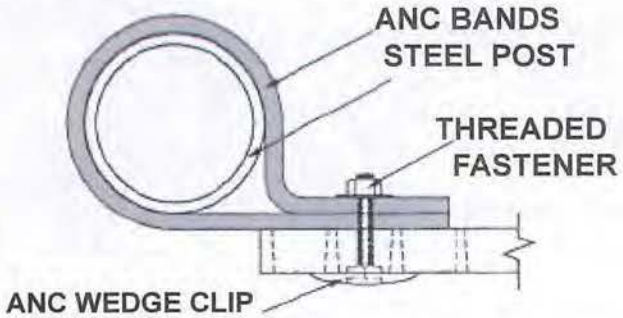
ANC Steel Clamps secure panels to steel line posts.

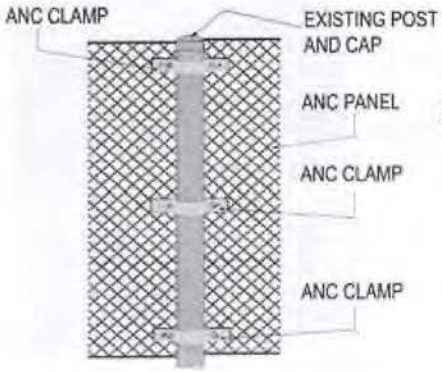




ANC Steel Bands are used to secure panels to steel terminal posts, and must be used every time the fence line changes direction. Even slight changes in direction of 10º or more.

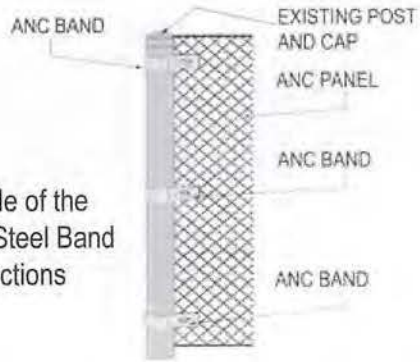


Panel To Panel Connections On 8-Ft. Post Spacing				
Panel Type	Panel Thickness	Panel Height	Vertical Joints	Horizontal Joints
ANC .50 - 2.25	½"	3-ft.	3	4
	½"	4-ft.	3	4
ANC 1.0 - 1.75	1"	3-ft.	3	3
	1"	4-ft.	3	3



View from the inside of the panel showing ANC Steel Clamp and panel connections

View from the inside of the panel showing ANC Steel Band and panel connections



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Top Left - ANC System around electric substation.

Top Right - Close up of the substation retrofit using ASF .50-2.25 mesh on steel framework

Below Left - Mesh to mesh panels are secured using Wedge Plugs, ANC Back Straps and non conductive threaded fasteners.

Below Right - New Construction of a 12-Foot Wide Double Drive Gate. Note the heavy jbracing to avoid sagging.

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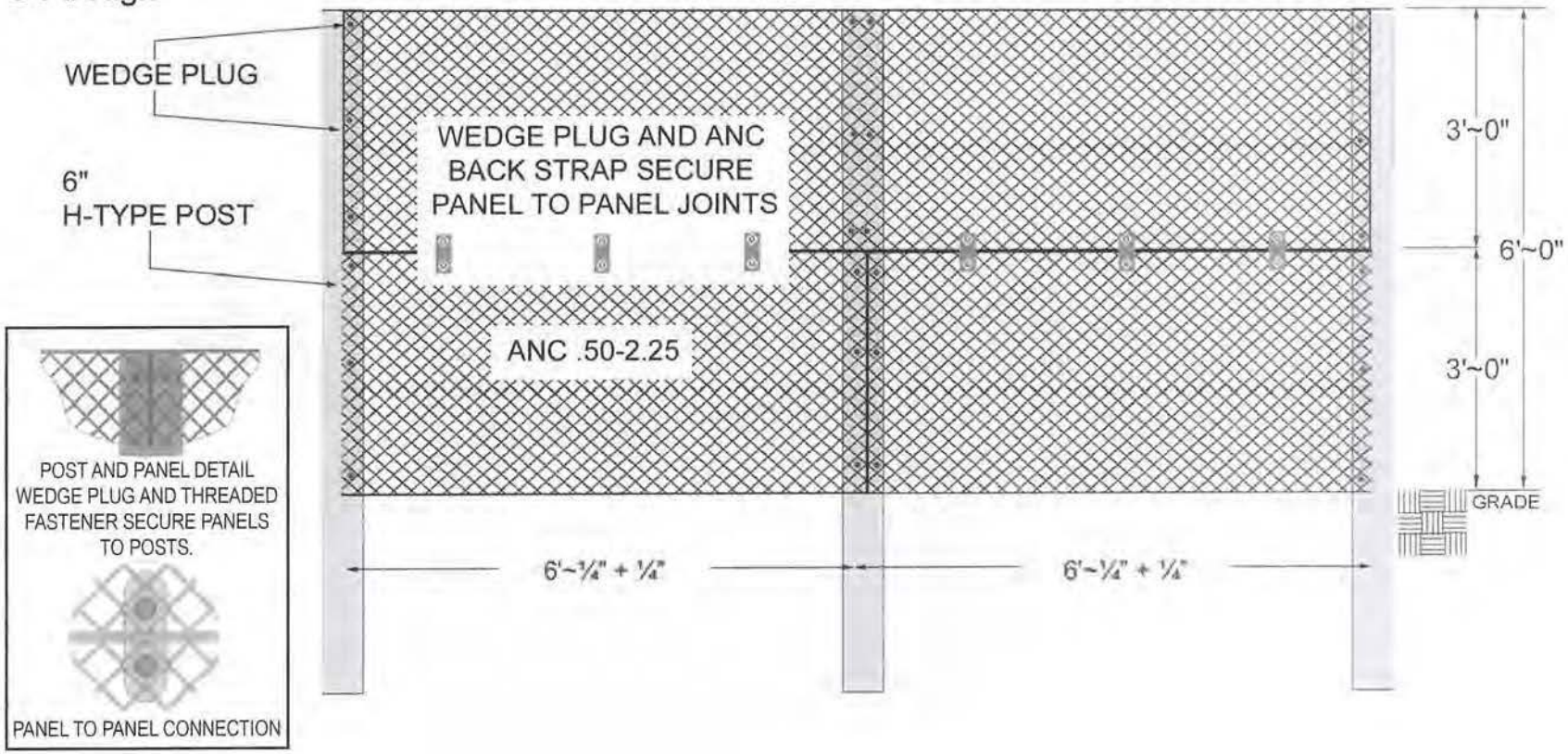
ANC NON-CONDUCTIVE FENCE SYSTEM™
ANC .50-2.25 PANELS

New Construction
6-Ft. High



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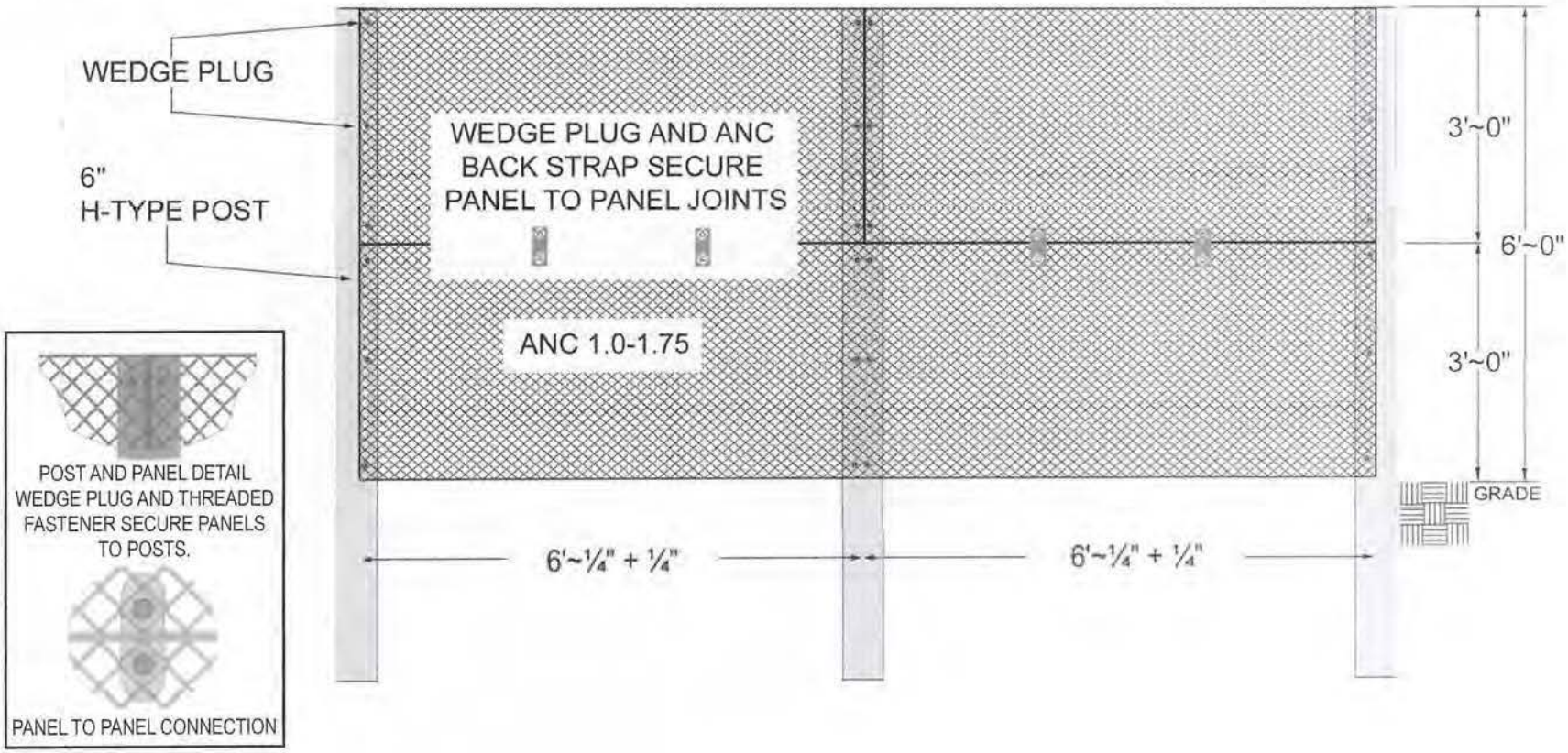
ANC 1.0-1.75 PANELS

New Construction
6-Ft. High



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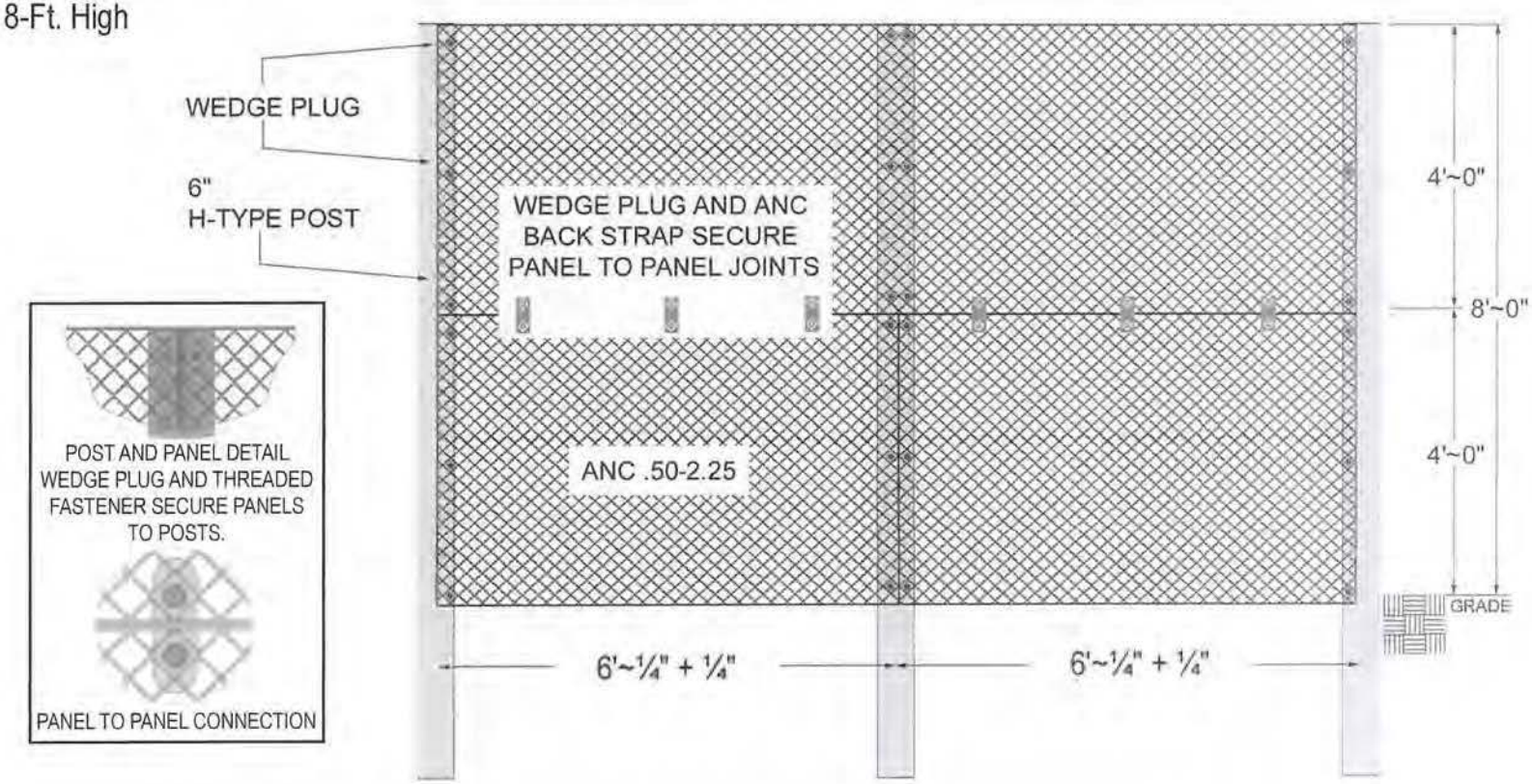
8-Ft. High



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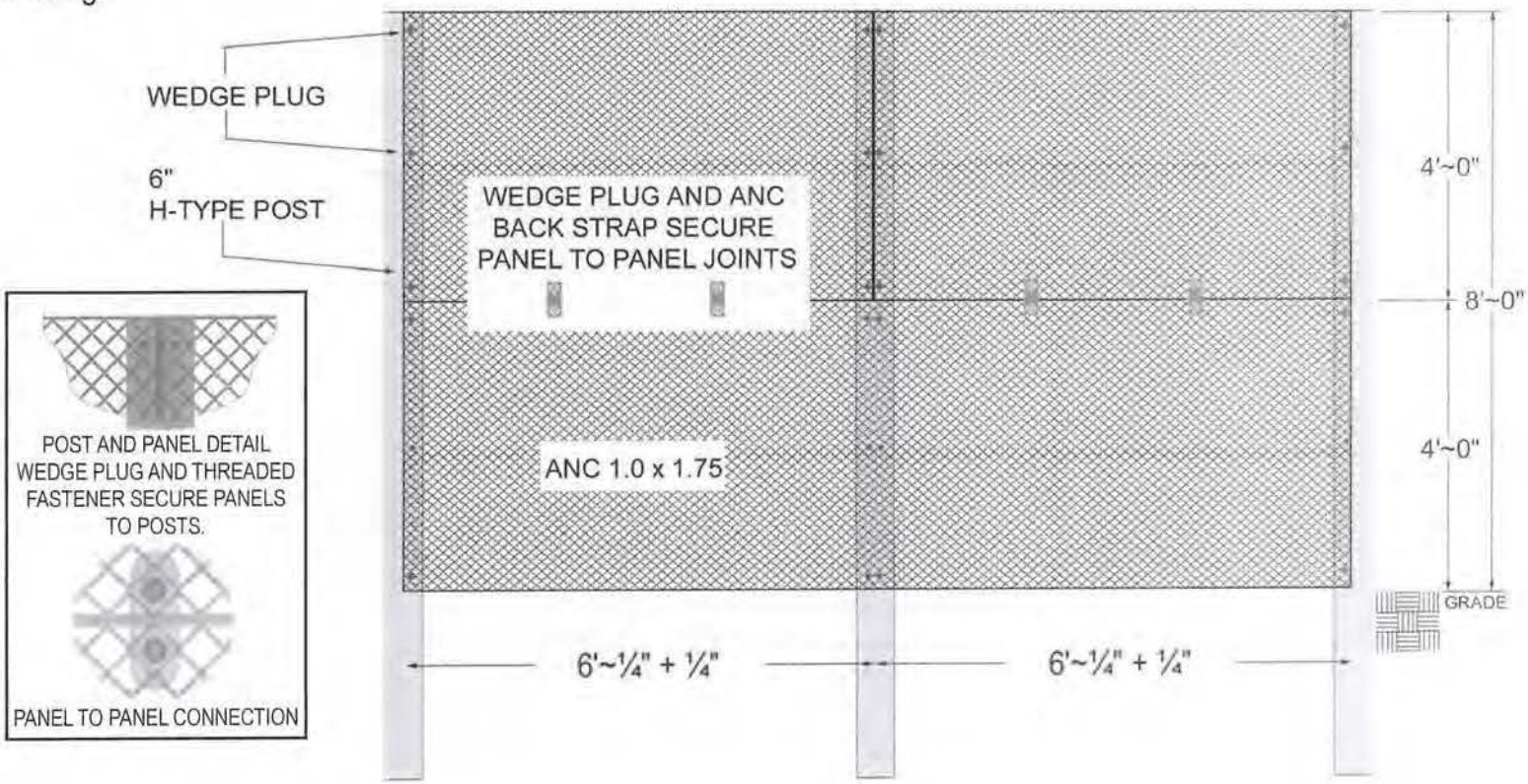

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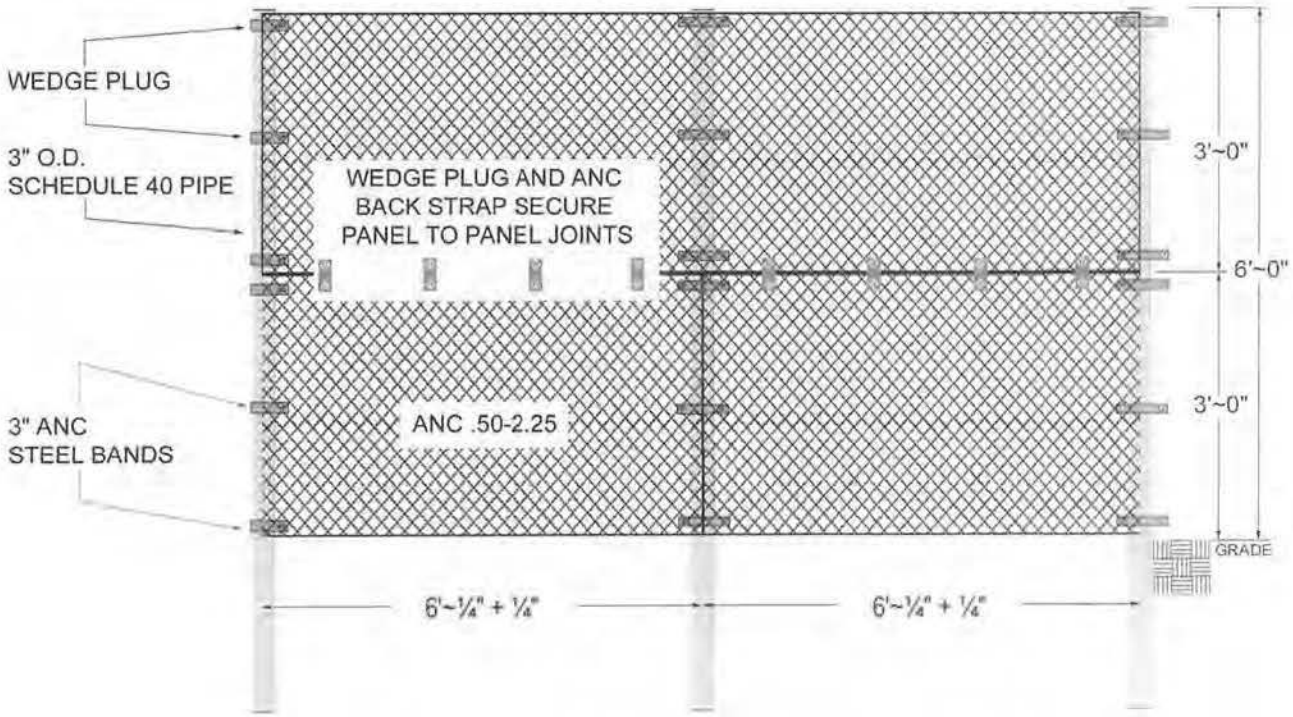

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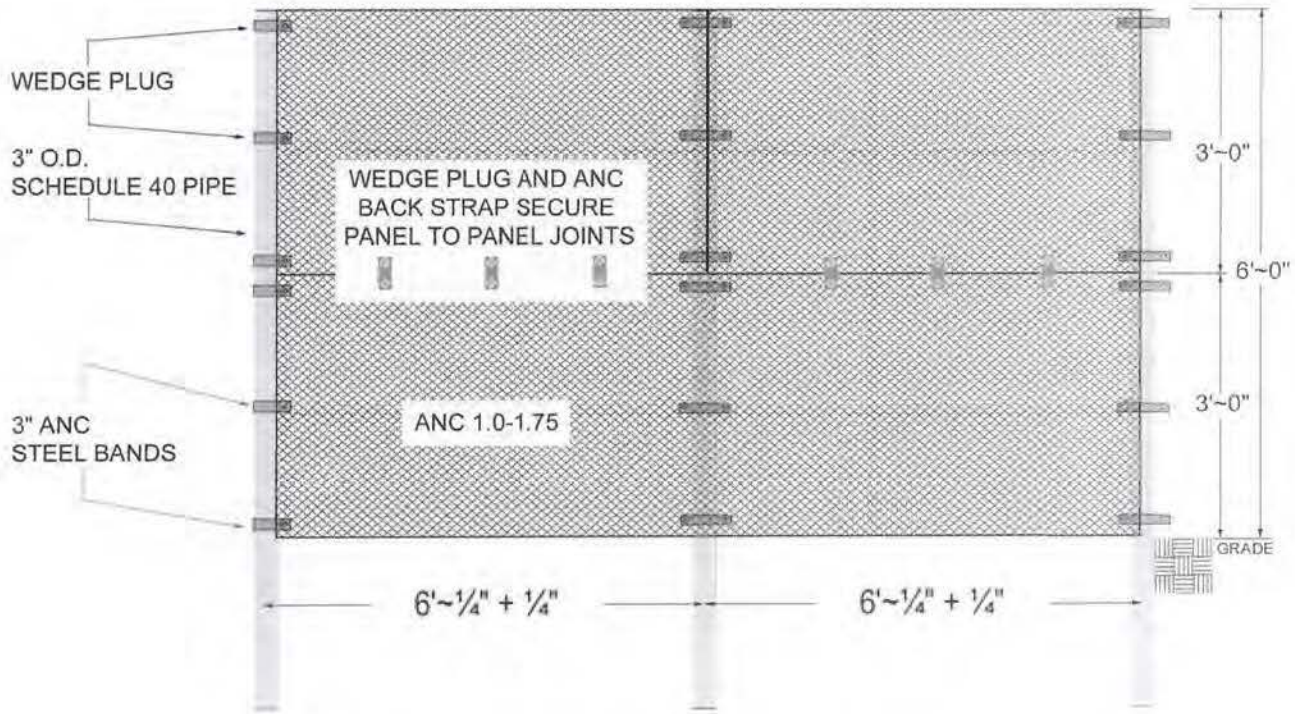

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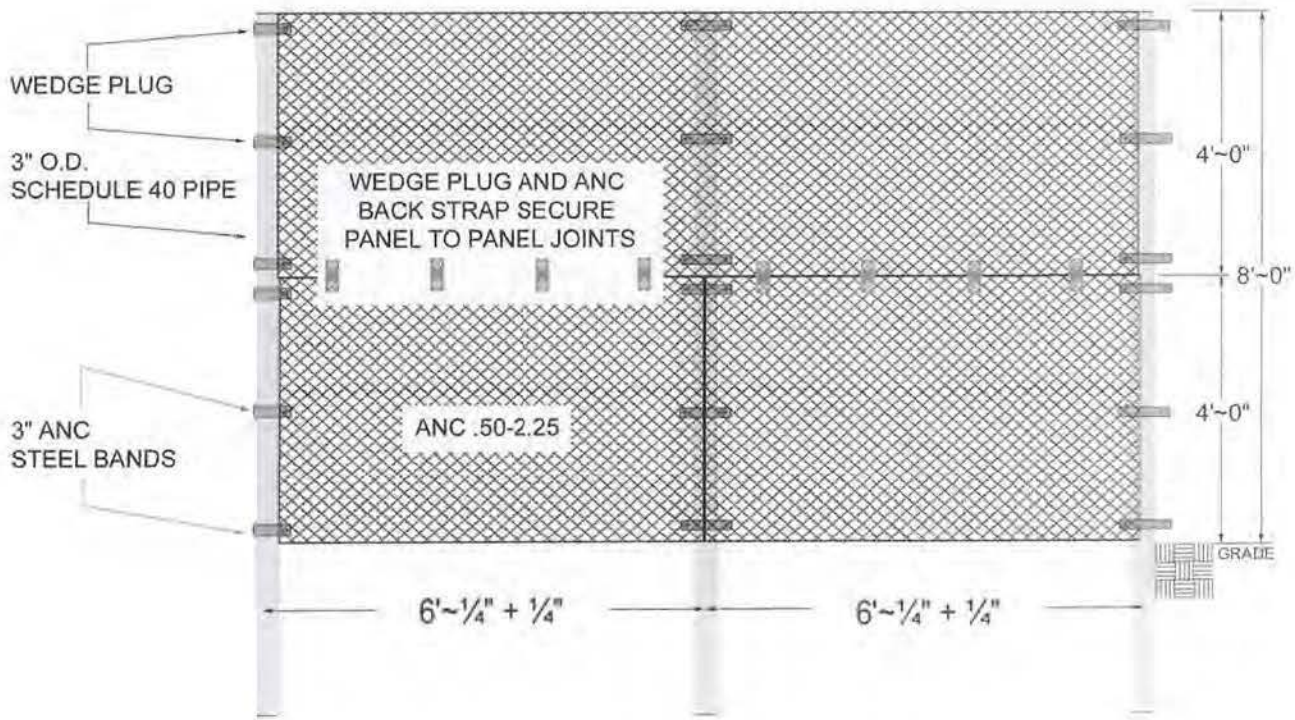

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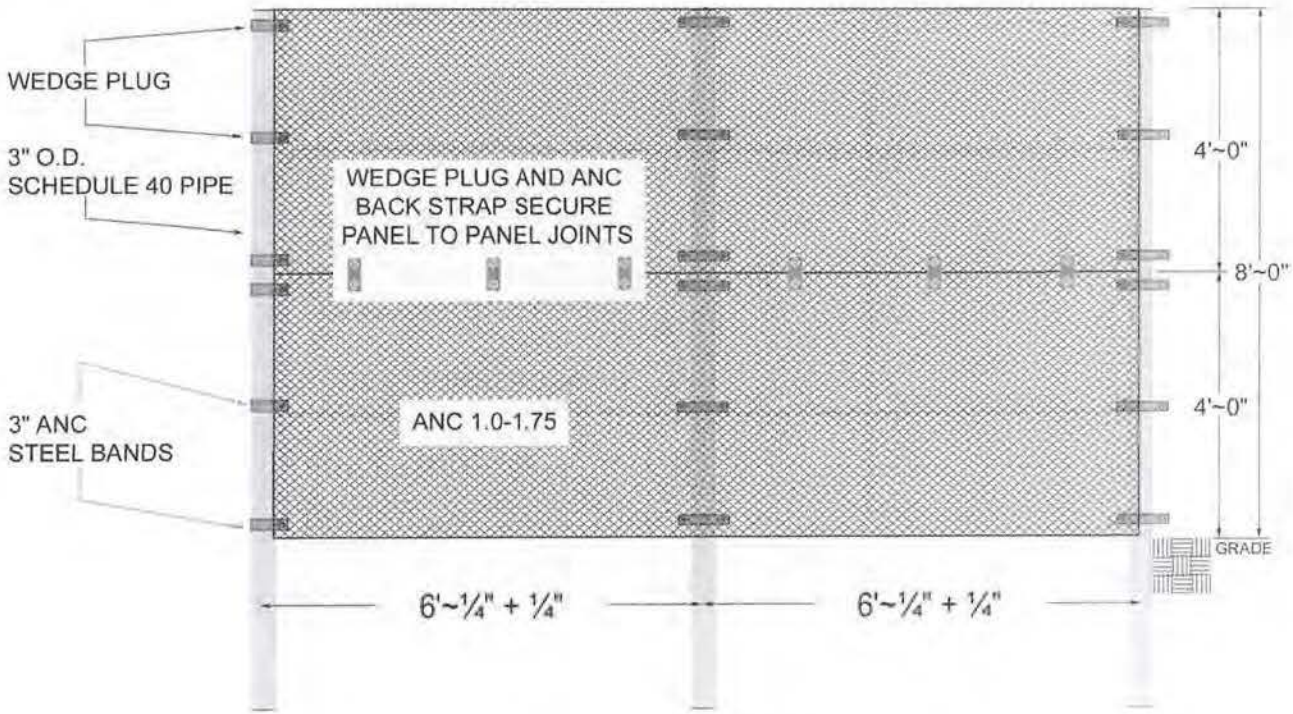

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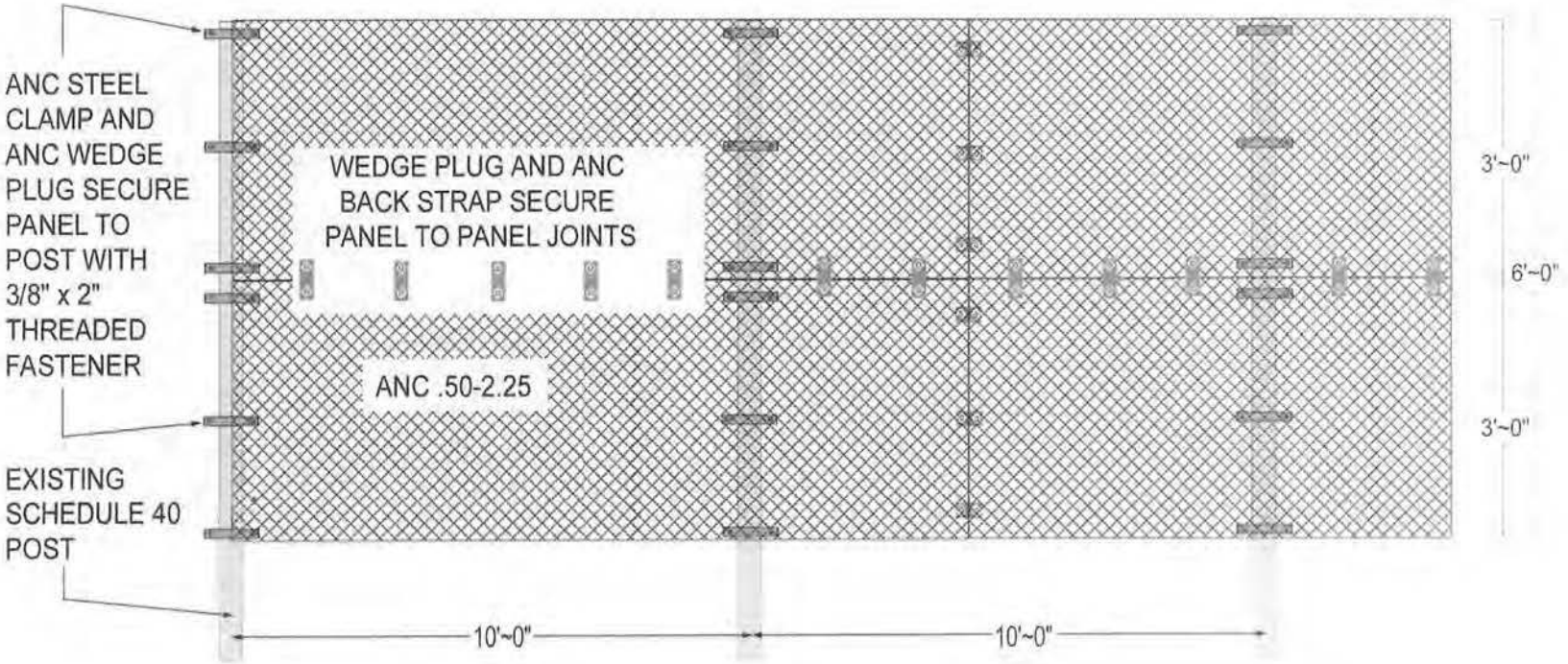

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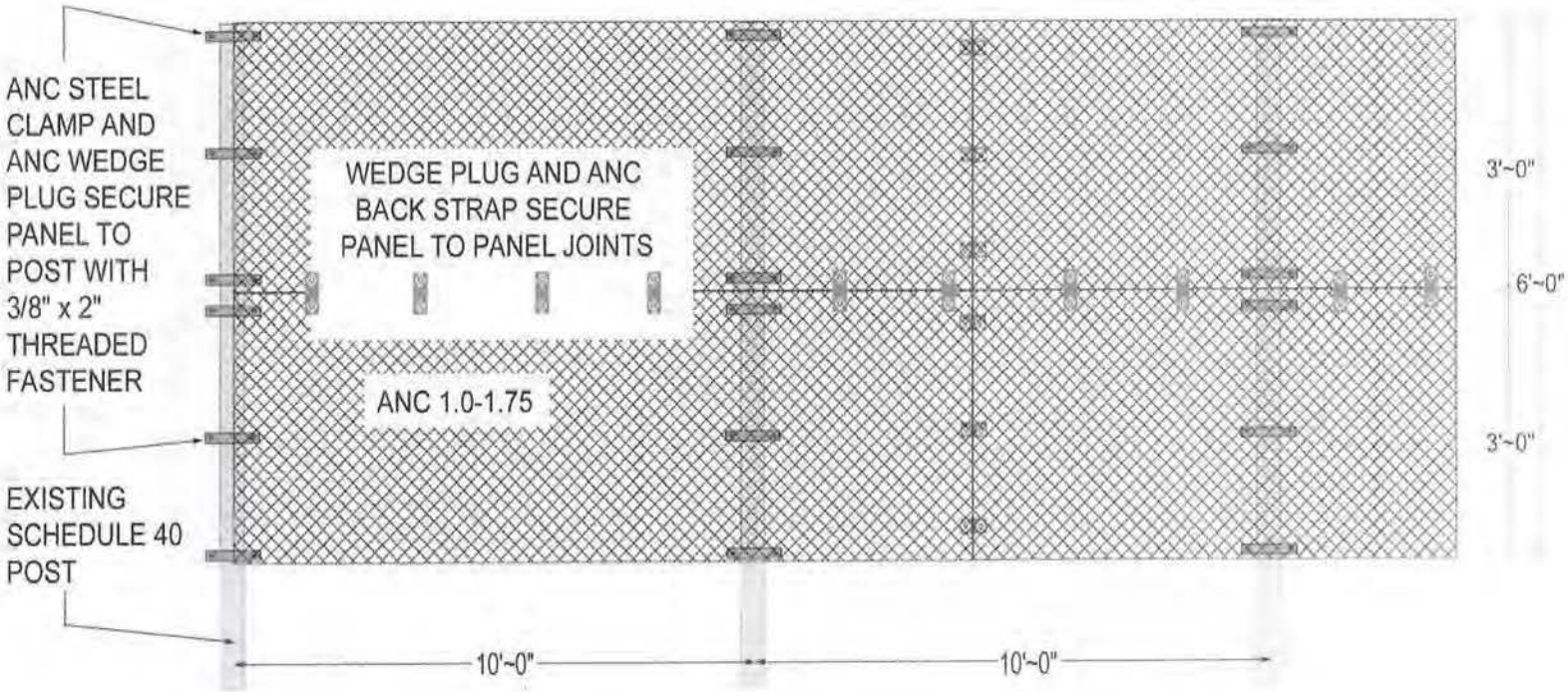

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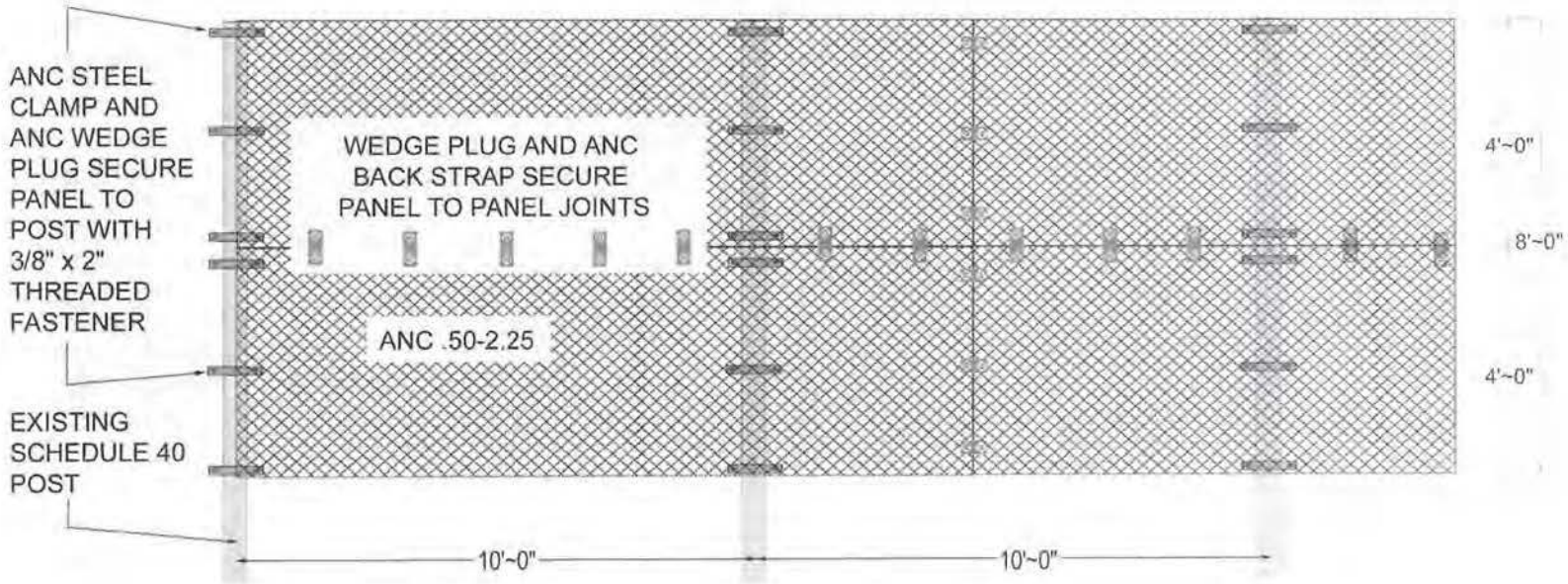

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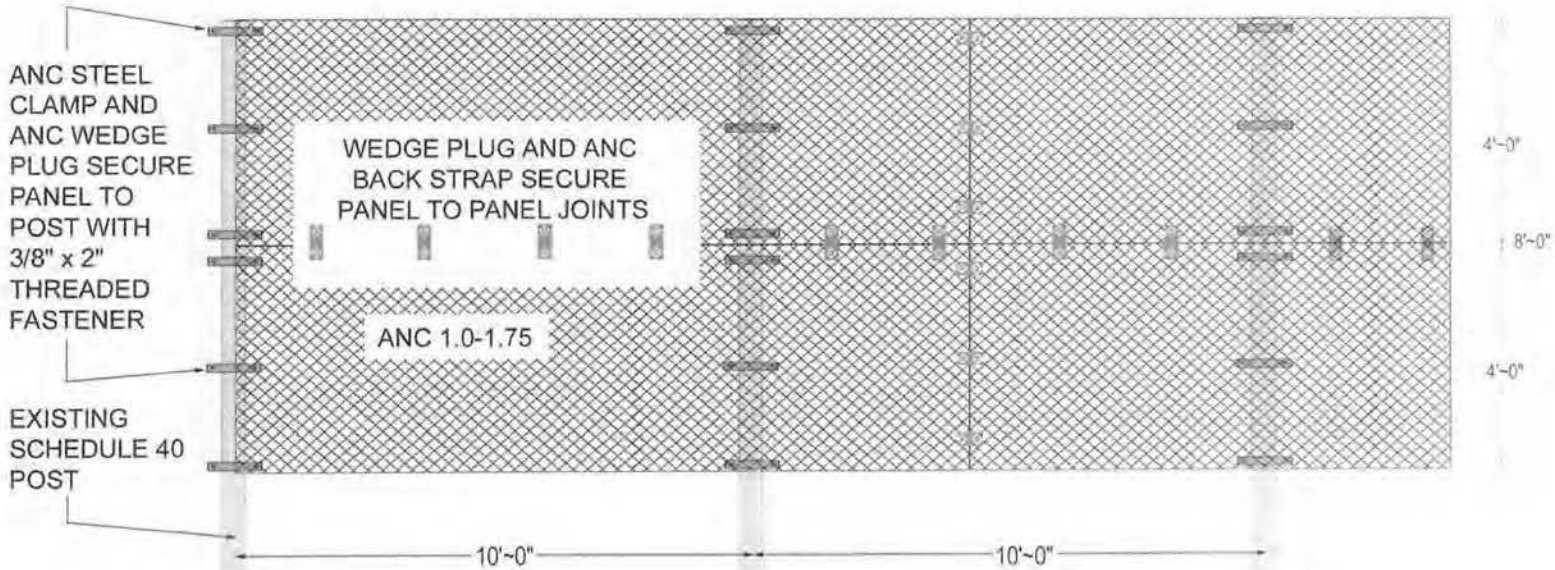

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PART 1 - GENERAL

1.01 DESCRIPTION OF WORK
Included work not limited to the supply and installation of an electrically non-conductive / reduced radar reflective barrier as specified below.

1.02 SUBMITTALS
Product Data: Submit manufacturers' specifications, ANC Non-Conductive Fencing literature and samples as required prior to ordering.

1.03 QUALITY ASSURANCE
Certified and Approved Dealer / Installers shall provide experienced installation crews to install the ANC Fence System as specified.

1.04 STORAGE AND HANDLING
Materials shall be stored in such a manner to ensure proper ventilation, drainage and to protect against damage from weather, vandalism and theft. In event of any freight damage, note damage on the freight bill and contact manufacturer immediately.

PART 2 – PRODUCTS

2.01 MANUFACTURER AND ACCEPTABLE PRODUCT
The Electrically Non-Conductive mesh panels shall conform with material specifications as manufactured by Alabama Metal Industries Corporation (AMICO), Birmingham, AL. Security Products Department:
Telephone 800/366-2642 or email ancfencing ancfencing@amico-us.com

2.02 MATERIALS
The materials used to manufacture the ANC Fence System are not covered under any ASTM standard at this time. The materials and accoutrements for this fencing system are unique. All panels, fittings and methods of securing are of a design implemented for the purpose of creating a barrier that does not conduct electricity and greatly reduces the barriers radar signature. All design, construction and components shall be approved by the owner to meet the desired level of non-conductivity and electromagnetic wave transparency.

2.03 NON-CONDUCTIVE FENCING
A. NEW AND RETROFIT CONSTRUCTION
Depending upon grounding conditions and requirements new non-conductive fence panels may be installed utilizing either non-conductive framework or schedule 40 / SS-40 steel framework.
B. Existing metal fence framework may be incorporated into the non-conductive fence. Existing fence posts of a suitable strength and height may be retrofitted using AMICO non-conductive panels, metal fittings and metal fasteners. Any existing chain link fabric, barbed wire or barbed tape must be removed since these metal items will conduct electricity throughout the fence line.

2.04 RADAR AND AIRPORT APPLICATIONS NEW CONSTRUCTION
All panels, posts, fittings, fasteners and accoutrements used with the intent of minimizing the radar signature of the barrier shall be non-metallic.

2.05 FINISH
The thru color finish does not require painting. The standard color is dark gray. Request information on custom colors. The finish will not rust or corrode.

PART 3 – EXECUTION

3.01 INSTALLATION
A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
B. ANC Fencing must be installed using AMICO non-conductive panels, fittings and installed by AMICO Certified and Approved Dealer / Installers.
C. Where possible fence post spacing shall be spaced to allow each panel to join on a post. If two or more panels are used to attain a certain barrier height the panels ends shall be staggered for added strength and security.
D. Vertical joints must be staggered on the ANC .50-2.25 mesh panels and is preferred on the ANC 1.0-1.75 mesh panels.
E. Follow the fittings useage tables for each type of application whether the application be 100% Non-Conductive non-metallic or using steel framework to assure safety and security.
F. Follow the cutting, sealing and safety information on pages 2 and 20 of this publication.

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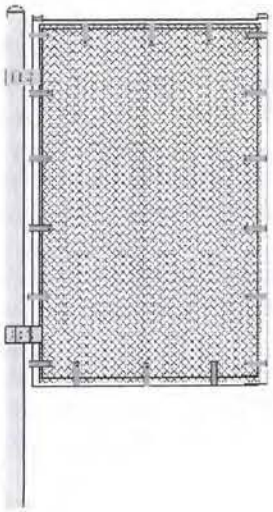
100% ANC Non-Conductive Fence Construction.

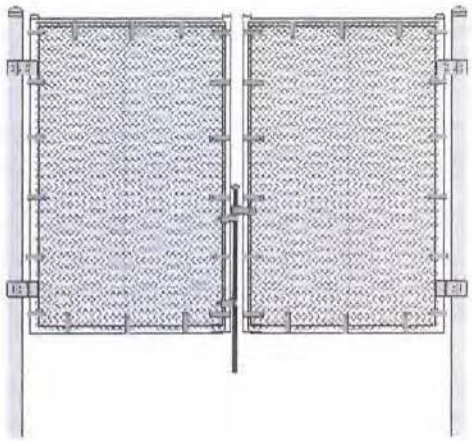
ANC Non-Conductive Gates are available in leaf widths up to 10-feet allowing a gate opening of 20-feet



Lower Left - Single leaf swing gate using steel gate frames, steel fittings and gate hinges. Available in 3-ft. and 4-ft. widths x 6-ft and 8-ft. heights. Custom sizes are available on request.

Lower Right - Double drive gates using steel gate frames, steel fittings and gate hinges.are available with leaf widths up to 8-ft. allowing 16-ft. opening e.g. 16-ft. double drive gates.

These steel frame gate design as shown must be approved by the owner's grounding engineer.



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Cutting and Sealing Panels

The preferred shop or job site method of cutting panels is with a carbide tip blade in a circular saw. When drilling holes in posts use a carbide tip drill bit.

Follow the following Safety and Installation Guidelines:

1. Support panel securely so it will not flex or shift during cutting.
2. Mark cuts clearly and carefully.
3. Use even steady pressure when cutting. Excessive pressure may cause heat and or ragged edges. Replace dull blades to prevent heat buildup.
4. Sand all cut edges. Open grit sandpaper on a high-speed sanding wheel provides best results. Use #20 sandpaper for fine sanding and #16 sandpaper for fast sanding. Use light, even pressure to prevent uneven surfaces.
5. Use an AMICO seal kit to coat all cut, drilled or sanded surfaces. This is recommended to prevent water absorbtion and corrosive chemicals from reaching exposed glass fibers.
6. Carefully read and follow the instructions included with the sealing kit.
7. Carefully read the Material Safety Data Sheet (MSDS). If you do not have a MSDS, contact AMICO prior to fabricating. Individuals with respiratory ailments should not fabricate ANC products.
8. Observe common safety precautions when using cutting tools. Always wear gloves when handling ANC products. Wear approved safety glasses or goggles to protect your eyes and a respirator (mask) to reduce inhalation of dust. We recommend the use of a NIOSH/MSHA approved mask for dust with a permissible exposure limit (PEL) of not less than 0.1 mg/M3.
9. Dust from cutting ANC products can cause skin irritation. Wear long sleeve clothing to reduce dust from coming into contact with skin. If cutting products causes difficulty in breathing or excessive skin irritation, stop immediately and consult a physician.
10. Observe common safety precautions when using the Sealing Kit. Read and follow instructions enclosed in the kit prior to using. Always wear safety glasses and protective clothing when working with ANC products or using a Sealing Kit. Do not allow resin or catalyst to come in contact with skin.

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AMICO

Alabama Metal Industries Corporation

3245 Fayette Avenue

Birmingham, Alabama 35208

800/366-2642 Fax 205/786-6527

ancfencing @ gibraltar1.com

A GIBRALTAR INDUSTRIES COMPANY

May 8, 2010

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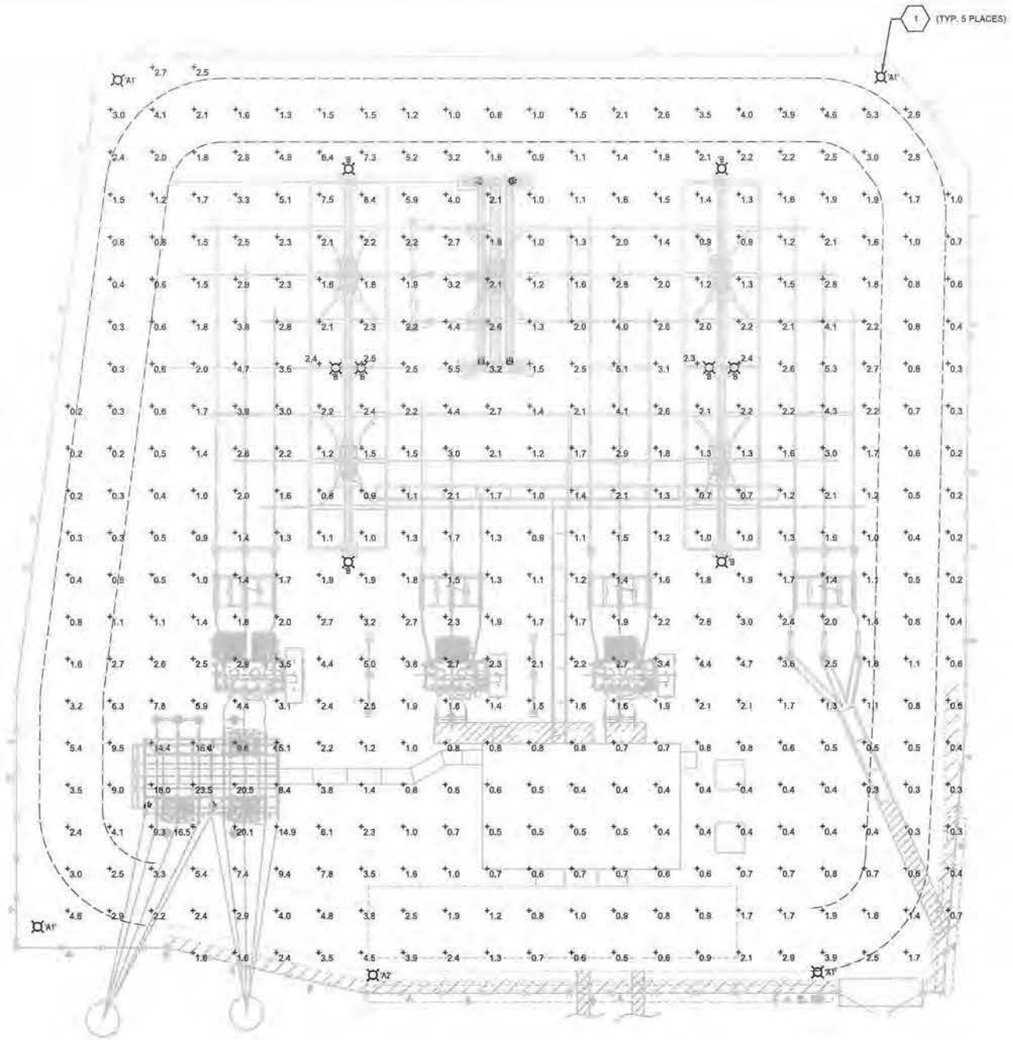
EXHIBIT 13
Lighting Plan



SITE LIGHTING PLAN

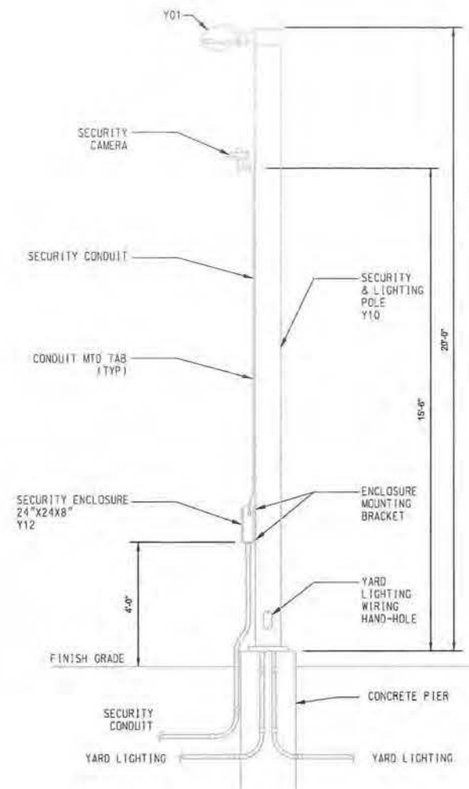
1/16"=1'-0" 0 8' 16' 32'

LEGEND

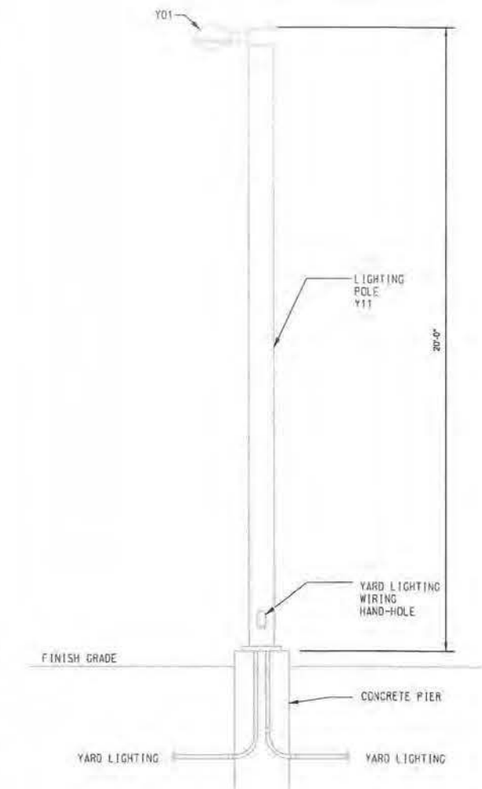
- 'A' EXTERIOR SITE LIGHTING FIXTURE. SUBSCRIPT INDICATES FIXTURE TYPE.
- *2.0 INDICATES FOOTCANDLE LEVEL.

SHEET KEYNOTES

1. POLES SHALL BE INSTALLED A MINIMUM OF 5'-0" INSIDE FENCELINE.



A1 THIS SH. PERIMETER LIGHTING & SECURITY N.T.S.



A2 THIS SH. PERIMETER LIGHTING N.T.S.

LIGHTING FIXTURE SCHEDULE

LAMP TYPES - FL, FLUORESCENT; IN, INCANDESCENT; MV, MERCURY VAPOR; MH, METAL HALIDE; HP, HIGH PRESSURE SODIUM; LP, LOW PRESSURE SODIUM; Q, QUARTZ; LED, LIGHT EMITTING DIODE
ENVIRONMENT - IN, INDOOR; DL, DAMP LOCATION; WL, WET LOCATION; HZ, HAZARDOUS; CR, CORROSIVE
MOUNTING - R, RECESSED; S, SURFACE; P, PENDANT; W, WALL; PL, POLE; ST, STANCHION

TYPE	MANUFACTURER	CATALOG NO.	DESCRIPTION	LAMPS NO.	LAMPS WATTS	LAMPS TYPE	ENVIR.	MOUNTING TYPE	MOUNTING HEIGHT	VOLTS	REMARKS
A	AEL / ACUITY BRANDS	115-10S-RN-MT2-R3-FG-NR	COBRA HEAD WITH R3 DISTRIBUTION, NO PHOTOCELL, MULTI-TAP BALLAST, PROVIDE 20' ROUND, GRAY POLE LITHONIA TYPE RSS 20 4B	1	100	HPS	WL	PL	20'-0"	240	FULL CUT-OFF NIGHT FRIENDLY
B	HOLOPHANE - PREDATOR	PF-250HP-MV-W-3-G	WORK LIGHT, WIDE DISTRIBUTION, MULTI-VOLT BALLAST, WITH STAINLESS STEEL MOUNTING YOKE	1	250	HPS	WL	S	*25'-0"	240	WITH 45° TILT *UNLESS OTHERWISE NOTED

NOTE:
1. MOUNTING HEIGHT INDICATED ON LIGHTING PLANS ARE FROM ABOVE FINISHED GRADE (A.F.G.) TO BOTTOM OF LIGHTING FIXTURE.

STATISTICS

DESCRIPTION	SYMBOL	AVG	MAX	MIN	MAX/MIN	AVG/MIN
Calc Zone #1	+	4.2 fc	36.6 fc	0.3 fc	122.0:1	14.0:1

PRELIMINARY
IFB- ISSUE FOR BID
NOT FOR CONSTRUCTION

Ulteig
Bismarck - Denver - Detroit Lakes - Fargo - Sioux Falls - St. Paul
4285 Lexington Avenue N
St. Paul, MN 55126
Phone: 651.415.3800 Fax: 651.415.2001
Web: www.ulteig.com
Ulteig Project Number: 13.02179

PE Stamp: STATE OF MAINE Thomas Severance 10577 PROFESSIONAL ENGINEER
Digitally signed by Thomas Severance
Date: 2015.07.15 21:31:38-05'00'

IUSA ENGINEERING
CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION
Property of Iberdrola, USA

CMP IBERDROLA - USA

REV.	DATE	BY	DESCRIPTION	APP.
D	7/16/2015	UEI/TJS	ISSUED FOR BID	UEI/TJS
C	6/8/2015	UEI/TJS	IFR 85% REVIEW - REVISE & RESUBMIT	UEI/TJS
B	5/12/2015	UEI/TJS	IFR 90%	UEI/TJS
A	4/1/2015	UEI/TJS	IFR 60%	UEI/TJS

DR.	UEI/VML	SCALE: 1/16"=1'-0"	FILE: 973-06-03.S01
CK.	UEI/TJS	NO.	REV.
APP.	UEI/TJS	973-06-03 SH. 01	D
DATE			

LIGHTING PLAN
115/34KV & 115/12KV

MIDDLE STREET SUBSTATION LEWISTON, ME

ARCH D CADD Drawing, DO NOT REVISE MANUALLY

CITY OF LEWISTON

Department of Planning & Code Enforcement

Lewiston
All-America City
2007

TO: **Planning Board**
FROM: **David Hediger, City Planner**
DATE: **October 22, 2015**
RE: **October 25, 2015 Planning Board Agenda Item IV(b)**

Request by the Lewiston School Department for a capital expenditure not included in the 2016 Lewiston Capital Improvement Program of an estimated $1.7 million for the addition and equipping of six new classrooms at Farwell Elementary School.

Pursuant to Article VII, Sections 4(f) of the Zoning and Land Use Code, the board shall review and make a recommendation to the city council with regard to all capital expenditures costing $100,000.00 or more which are not included in the annual capital program.

Lewiston Public Schools is seeking the support of the Planning Board to build and fund a 6-classroom structure adjacent to the Farwell Elementary School. The School Department's e Facilities Committee has unanimously endorsed adding 6 permanent classrooms at Farwell to be available for August 2015. On October 19, 2015 the School Committee unanimously adopted the following resolution:

> Move to authorize the Superintendent to seek Planning Board and City Council approval to provide with the construction and financing of a six classroom building adjacent to Farwell Elementary School at an estimated cost of $1.7 million for occupancy no later than August 2016 and with funding through emergency LCIP or other mechanism as determined by the City Treasurer.

Reference should be made to documentation provide by the School Department.

ACTION NECESSARY:

Make a motion pursuant to Article VII, Sections 4(f) of the Zoning and Land Use Code to send a favorable recommendation to the City Council for a capital expenditure at an estimated cost of $1.7 million for the construction and financing of a six classroom building adjacent to Farwell Elementary School for occupancy no later than August 2016.

10/21/15

To: Lewiston Planning Board

From: Bill Webster, Superintendent

Re: Facilities Plan, Enrollment and Recommendation to Add Six Elementary Classrooms at Farwell

Lewiston Public Schools is seeking the support of the Planning Board to build and fund a 6-classroom structure adjacent to the Farwell Elementary School building. This updated memo is intended to accompany the enclosed PowerPoint presentation and 6 attachments, all of which are described below.

2011 Facilities Plan

In September 2011 the School Committee unanimously approved the Facilities Plan drawn up by the Facilities Committee. This plan is included here as Attachment I and has been updated for the status of all the proposed projects. Of the major projects listed, most have been completed and include the takeover of the Multi-Purpose Building, the renovation and expansion of Lewiston Middle School and the expansion of McMahon Elementary School. Open projects include the new state-funded elementary school project and the replacement of the Montello roof. The major project not done was the addition of two portables at Martel because of the new school project.

There were several smaller projects not in the original plan that were subsequently authorized by the School Committee and completed. These include the expansion of the Farwell parking lot, the new Montello entrance and corridor and restroom upgrades, gym bulb replacements, and waterproofing the exterior walls of LHS, Dingley and LMS.

Enrollment Update

While our enrollment numbers fluctuate daily, the attached schedule clearly shows the magnitude of the recent enrollment increase. Attachment II compares our enrollment by grade for September 30, 2015, last December's projection and for October 1, 2014. In total, we projected an increase of 122 and experienced an increase of 263, which is 141 students above the projection. Interestingly, our K enrollment is down 16 from last year and virtually identical to what was projected.

As suggested in the PowerPoint, our unexpected enrollment increase is the result of a rapid increase in newcomers moving to Lewiston and that this trend will be capped in part by the availability of rental housing.

Updated Enrollment Projections and Additional Classrooms Needed

For the third time, professional demographers have demonstrated an inability to accurately project Lewiston's school enrollment. This most recently occurred in the December 2014 projection referred to above. Attachment III is our in-house projection going through 2026. These numbers include this September's unexpected jump in enrollment, but assume there will not be a continuation of growth from outside of Lewiston.

Below are some of the takeaways from this latest projection:

- Our present enrollment of 5,515 will continue to grow over the next several years to a peak of roughly 5,900. Much of the growth will be at Lewiston High School as our larger elementary classes make their way up through the grades.
- We presently need 10 classrooms at the elementary level to meet the desired average classroom size, and our elementary needs will peak in 2020, one year after the expected opening of the new elementary school.
- Lewiston High School could use as much as 12 additional classrooms this year, but that number will drop over the next two years as the existing senior and junior classes are larger than the 7th and 8th grade classes in LMS. The need for additional high school classrooms will grow again beginning in 2019, and enrollment will peak at over 1,500 students in 2024.
- Our recent middle school renovation and expansion will presently accommodate the expected increase in students.

Draft of 2015 Facilities Plan

Using the classrooms needed projection above, the Facilities Committee has unanimously endorsed the Facilities Plan in Attachment IV. These recommendations include:

- Adding 6 permanent classrooms at Farwell to be available for August 2015.
- Working with the City about possibly expanding our presence in the Lewiston Armory to house an alternative education program for 80 freshmen who are not proficient.
- Assuming voter approval in June 2016, completing the new state-funded elementary school project for opening in September 2019. The new school will house students from the present Martel and Longley schools.
- Leaving open the ultimate future use of Longley and Martel. Options include using either school as a the site for an experiential high school program serving as many as 150 students beginning in 2019 or 2020. Another option for Longley would be for relocation and expansion of all district prekindergarten classrooms, freeing up classroom space in all remaining elementary schools.

Desired Outcome

The key issue right now is your consideration of supporting the addition of 6 classrooms at Farwell to be available for August 2016. Attachment V includes a possible rendition of the classroom, which would be a separate structure adjacent to Farwell Elementary School. Attachment VI shows the proposed placement of the structure on the property.

I request your support for this project for the following reasons:

- As shown in the PowerPoint, Farwell is the only elementary school in which we could add 6 classsrooms without needing expect non-classroom space such as the gym and cafeteria.
- This year we added a 3rd classroom for Farwell's kindergarten and 1st grade. The additional classroom space will allow the addition of Farwell's first prekindergarten room (presently done

at Montello, where there is a waiting list) and expansion of grades 2 through 6 from two classrooms at each grade level to three classrooms at each grade level.

- These additional rooms will expand the capacity of Farwell to roughly 480 students, still the smallest LPS elementary school after Longley and Martel are combined in the new school.
- The additional space will help LPS reduce elementary class size throughout the City using school choice decisions to be more in line with the goal of a maximum of 22 students per elementary class, provided that we do not experience another unexpected increase of newcomers.
- These six additional classrooms will also serve as insurance in the event that Lewiston continues to experience further increases in elementary school enrollment.

Funding Options

Attachment VII presents two funding and construction options. Option A is funding for a leased, modular facility that would be partially funded by the State of Maine under DOE's leasing support program. The program provides leasing support for up to $8 per square foot for 5 years. A leased facility, however, is expected to be removable.

Option B represents bonding for a permanent facility would potentially match the life expectancy of the existing building. It is less costly in the initial years but more costly over the full term of the financing.

School Committee Action

On October 19th the School Committee unanimously adopted the resolution below. The total amount was based upon a leasing option after discussion with the City Treasurer. This decision could be revisited based upon feedback by the Planning Board and/or City Council.

Move to authorize the Superintendent to seek Planning Board and City Council approval to provide with the construction and financing of a six classroom building adjacent to Farwell Elementary School at an estimated cost of $1.7 million for occupancy no later than August 2016 and with funding through emergency LCIP or other mechanism as determined by the City Treasurer.

Lewiston Public Schools
10-Year Facilities Plan
September 7, 2011
With Updated Status as of 10/2015

INTRODUCTION

Unlike most school districts in Maine, Lewiston school-age enrollment is expected to increase approximately 2% per year over the next decade. This will necessitate the construction of additional classroom space as our schools are essentially at full capacity today. This facilities plan represents a roadmap to meet our classroom needs. Facilities Committee members include Shawn Chabot, Bruce Damon, Dean Flannigan, Tom Hood, Ronnie Paradis, Joe Perryman, Paul St. Pierre, Bill Webster and Steve Whitfield.

ENROLLMENT PROJECTIONS

Twice in the last decade Lewiston Public Schools has contracted with Planning Decisions Consultants Group of South Portland to perform 10-year enrollment projections in conjunction with our two most recent construction projects. The usefulness of their work is in question, however, as our student counts have been materially above their forecasts each year. The firm was challenged, no doubt, by the unpredictability of immigration patterns and larger family sizes typical in our New Mainer population.

We are left with how best to forecast our student trends. Rather than working with Planning Decisions (the only such firm in Maine), one reasonable approach is to assume a long-term continuation of our present elevated kindergarten enrollments. Approximately 465 children are entering kindergarten this year, and this also is similar to last year's figure. If this trend continues indefinitely, Lewiston student enrollment will increase by 1,000 over the next decade.

CLASSROOM NEEDS

Average classroom size in Lewiston is already a little over 20 students. This figure will likely continue to increase as our schools deal with expected enrollment growth, long construction timelines, budget constraints and future uncertainties. A key question is when should we construct a new classroom as building rooms to accommodate a peak, rather than sustained enrollment, is an undesirable use of public funds. Here we are using the conservative assumption that a new classroom should be added to accommodate every additional 25 students. This then suggests that Lewiston will need another 40 classrooms over the next 10 years.

FACILITIES PLAN

The table on the last page of this report presents enrollment projections and classrooms needs through 2024, when enrollment projections stabilize under the assumption listed. Below is a tentative plan to provide the necessary space.

School Committee Decision by	Completion Date	Project Description	# of Rooms	Rough Cost Estimate	*10/2015 Status*
September 2011	December 2011	Replacement of Longley boilers and conversion to natural gas	-	485,000	*Completed*
September 2011	January 2012	Energy audit of Lewiston High School	-	40,000	*Finished Conversion*
November 2011	March 2012	Phase 1 architectural and engineering review of Lewiston Middle School	-	75,000	*Completed*
April 2012	August 2012	Annual capital maintenance and improvement plan (We are researching this further by asking the question what level of annual funding is needed to maintain our existing facilities, fields and playgrounds.)	-	200,000/yr	*In budget.*
May 2012	August 2012	Replacement of Montello lockers and hallway improvements	-	100,000	*Completed*
May 2012	August 2012	Add two portable classrooms at Martel. A lease on an additional parking area has already been secured.	2	50,000	*Not done*
January 2012	August 2012	With City approval, take over City space in the multi-purpose building for prekindergarten space, freeing up classroom space at Geiger McMahon, and Montello.	4	200,000	*Completed*
January 2012	August 2013	Construction of new McMahon gymnasium and additional classrooms	8	3,500,000	*Completed*
May 2012	Multi-year project?	LMS Improvements.	8	4,000,000	*Completed*
May 2013	August 2013	Add two portable classrooms	2	50,000	*Not done*
May 2014	August 2014	Replacement of Montello Roof	-	600,000	*Being done*
May 2015	August 2015	Addition portables needed prior to completion of new school project.	4		*Converted other rooms*
January 2014?	August 2016	New school project State funded. The project planning process over the next two years will determine whether or not this project replaces one or two schools.	19 net addition	30,000,000	*In-progress*
January 2017?	August 2019	New classrooms and performing arts space at Lewiston High School	8	???	*Future*

The major additional completed projects that were not in original Facilities Plan include:

1. New Montello entrance and corridor and restroom upgrades
2. Expansion of Farwell parking lot
3. Expansion of Lewiston Adult Education into former Multi-Purpose Building space
4. Various room projects throughout the district to add classroom space
5. Gym bulb replacements
6. Waterproofing the exterior walls of LHS, Dingley and LMS.
7. Upgrade of door locks in all classrooms.

10/22/2015 9:58

Enrollment	09/30/2015	Projected	10/01/2014		Projected over '14	'15 over '14	'15 over projected
PreK	267	273	247		26	20	-6
K	452	455	468		-13	-16	-3
1	475	446	415		31	60	29
2	430	403	444		-41	-14	27
3	433	438	433		5	0	-5
4	429	425	424		1	5	4
5	406	422	388		34	18	-16
6	382	383	358		25	24	-1
Elementary	**3274**	**3245**	**3177**		**68**	**97**	29
7	363	346	347		-1	16	17
8	345	327	327		0	18	18
LMS	**708**	**673**	**674**		**-1**	**34**	35
9	356	330	338		-8	18	26
10	346	338	385		-47	-39	8
11	372	377	307		70	65	-5
12	360	293	281		12	79	67
LHS	**1434**	**1338**	**1311**		**27**	**123**	96
Other	99	120	90		30	9	-21
Total	**5515**	**5376**	**5252**		**124**	**263**	**139**

Lewiston Public Schools

Enrollment Projection and Additional Classrooms Needed

by Bill Webster

10/22/2015 9:59	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
PreK	247	267	300	300	300	320	320	320	320	320	320	320	320
K	468	452	450	450	450	450	450	450	450	450	450	450	450
1st	415	475	449	447	447	447	447	447	447	447	447	447	447
2nd	444	430	472	446	444	444	444	444	444	444	444	444	444
3rd	433	433	427	469	443	441	441	441	441	441	441	441	441
4th	424	429	430	424	466	440	438	438	438	438	438	438	438
5th	388	406	426	427	421	463	437	435	435	435	435	435	435
6th	358	382	403	423	424	418	460	434	432	432	432	432	432
Elementary Total	**3177**	**3274**	**3357**	**3386**	**3395**	**3423**	**3437**	**3409**	**3407**	**3407**	**3407**	**3407**	**3407**
7th	347	363	380	400	420	421	415	457	431	429	429	429	429
8th	327	345	361	378	398	417	418	412	454	428	426	426	426
LMS Total	**674**	**708**	**741**	**778**	**818**	**838**	**833**	**869**	**885**	**857**	**855**	**855**	**855**
9th	338	356	327	342	359	378	396	397	391	431	406	404	404
10th	385	346	338	310	324	341	359	376	377	371	409	385	383
11th	307	372	328	321	294	307	323	341	357	358	352	388	365
12th	281	360	353	311	304	279	291	306	323	339	340	334	368
LHS Total	**1311**	**1434**	**1346**	**1284**	**1281**	**1305**	**1369**	**1420**	**1448**	**1499**	**1507**	**1511**	**1520**
Outplaced & Alt	90	99	99	99	99	99	99	99	99	99	99	99	99
TOTAL	**5252**	**5515**	**5543**	**5547**	**5593**	**5665**	**5738**	**5797**	**5839**	**5862**	**5868**	**5872**	**5881**
Elementary Increase		97	83	29	9	28	14	-28	-2	0	0	0	0
LMS Increase		34	33	37	40	20	-5	36	16	-28	-2	0	0
LHS Increase		123	-88	-62	-3	24	64	51	28	51	8	4	9
Annual Increase		**263**	**28**	**4**	**46**	**72**	**73**	**59**	**42**	**23**	**6**	**4**	**9**
Needed Elem Rooms		10	14	15	15	16	17	16	16	16	16	16	16
Farwell Expansion			6	6	6	6	6	6	6	6	6	6	6
New School (Net Increase)						15	15	15	15	15	15	15	15
Shortfall (Surplus)		10	8	9	9	-5	-4	-5	-5	-5	-5	-5	-5
Needed LHS Rooms		12	8	5	5	6	9	12	13	16	16	16	16
Armory Rooms			4	4	4	4	4	4	4	4	4	4	4
Longley Conversion							16	16	16	16	16	16	16
Shortfall (Surplus)		12	4	1	1	2	-11	-8	-7	-4	-4	-4	-4

Lewiston Public Schools

by Bill Webster

Enrollment Projection and Additional Classrooms Needed

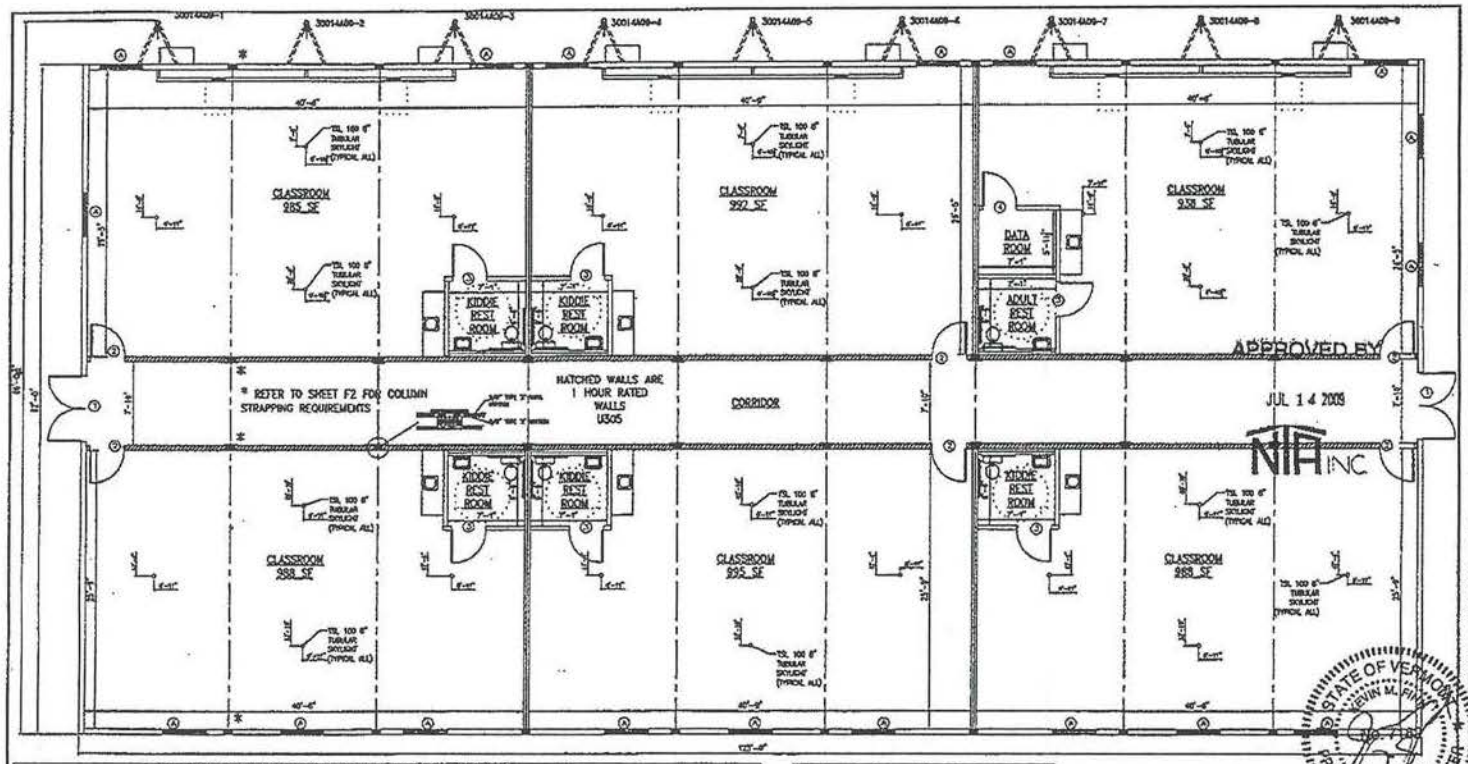
(1) Assumes 1 new preK class in "16 & '19, K class of 450 each yr, 0.5% move-out rate 1st-8th, & 5% LHS dropout rate each yr.

DRAFT

FACILITIES PLAN

October 5, 2015

School Committee Decision by	Completion Date	Project Description	# of Class-rooms	Rough Cost Estimate
October 2015	August 2016	Addition of 6 permanent classrooms at Farwell. This will expand Farwell capacity to house three classrooms per grade level and expand enrollment from roughly 360 to 475.	6	1,700,000
April 2016	August 2016	Take over Armory 2nd floor allowing for at least 4 additional classrooms to house alternative education program for freshmen who are not proficient. This work may be fully funded by grant.	4	100,000
April 2016	September 2016	Add sidewalk for pedestrians to walk safely from Geiger parking lot to school		10,000
April 2016	September 2016	Air condition the LHS library and Martel space. These are the only school libraries not presently with air conditioning.		180,000
April 2017	Summer 2017	Repave Montello parking lot.		80,000
April 2017	Summer 2018	Replace/repair Dingley roof	-	150,000
April 2017	Summer 2018	Replace Longley windows, add insulation and paint building exterior.		450,000
Completed	August 2019	New elementary school project that will be State funded if approved by voters in June 2016. School will be located in Franklin Pasture and pick up the students presently at Martel and at Longley. Capacity of school is planned for 888 students. Tentative plan is for Longley to be used for high school programming and Martel to be closed and turned over to the City.	15 net addition	30,000,000



DOOR/WINDOW SPECIFICATIONS & ROUGH-IN SCHEDULE

LD.	DESCRIPTION	ROUGH-IN	QNTY
1	6/0 X 7/0 WASCOTE FIBERGLASS DOUBLE DOOR W/STEEL JAMB, 24"X36" VISION PANEL, (UP 43" TO BOTTOM) DOOR CLOSER TOLL #12841, PANIC HARDWARE TOLL #8000DEE & KEYED LEVER SET TOLL #CR2881C, ADJUSTABLE CENTER MULLION 4.5"X4.5" NRP BALL BEARING HINGES (BRUSHED CHROME), WEATHER STRIPPING, ALUMINUM THRESHOLD, 180° SWING, 5 PIN REMOVABLE CORES AND KEYED TO VANGUARD MASTER, PROJECT MASTER AND BUILDING MASTER	76" X 86"	2
2	3/0 X 6/8 1-3/4" FRESH-WOOD PRE-FINISHED SOLID CORE WOODGRAIN DOOR W/20 MIN FIRE RATING, PRE-FINISHED "WESTERN WHITE" TIMELY STEEL FRAME, 5"X20" WIRE GLASS VISION PANEL, (UP 43" TO BOTTOM) KEYED LEVER SET, TOLL #2481CTL (GRADE 2) & SPRING HINGES (INCLUDES 2-SPRING AND 1-BB HINGE BRUSHED CHROME) KEYED SAME AS ABOVE	37-1/2" X 81"	6
3	3/0 X 6/8 1-3/4" FRESH-WOOD PRE-FINISHED SOLID CORE WOODGRAIN DOOR W/PRE-FINISHED "WESTERN WHITE" TIMELY STEEL FRAME, PRIVACY LEVER SET TOLL #2676CTL, STANDARD MORTISE HINGES 4.5"X4.5" BRUSHED CHROME (1-1/2 PAIR) KEYED SAME AS ABOVE	37-1/2" X 81"	6
4	3/0 X 6/8 1-3/4" FRESH-WOOD PRE-FINISHED SOLID CORE WOODGRAIN DOOR W/PRE-FINISHED "WESTERN WHITE" TIMELY STEEL FRAME, KEYED LEVER SET TOLL #2475CTL, STANDARD MORTISE HINGES 4.5X4.5" BRUSHED CHROME (1-1/2 PAIR) KEYED SAME AS ABOVE	37-1/2" X 81"	1
A	4/0 X 4/2 "WHITE" SUNCRUNE VINYL FRAMED HORIZONTAL SLIDER W/WHITE "WHITE" INSULATED GLASS (EGRESS TYPE LOW E ARGON FILLED), "WHITE" PRE-FINISHED WOOD RETURN AND CASING, F/C INSECT SCREENS, "WHITE" VINYL MINI BLINDS & 15" VINYL SHUTTERS (MEETS 5.7 SF EGRESS REQUIREMENTS)	30 1/2"W X 47 1/2"H UP 80" A.F.F. TO TOP	18

INSTALL HEADER ABOVE DOORS & WINDOWS
DOUBLE 2X10 #3 SPF OR BETTER MAX SPAN 57"
DOUBLE 2X12 #3 SPF OR BETTER MAX SPAN 76"

WATER BOTTLE NOTE:
DRINKING FOUNTAINS OR BOTTLED WATER SHALL BE PROVIDED ON SITE BY OTHERS IN ACCORDANCE WITH SECTION 410.1 OF THE INTERNATIONAL PLUMBING CODE. A SERVICE SINK SHALL BE PROVIDED AND INSTALLED ON SITE WHERE REQUIRED.

BUILDING NOTES:

1. ATTIC VENTILATION SHALL NOT BE LESS THAN 1/150th OF THE SQUARE FOOT AREA BEING VENTILATED, UNLESS A VAPOR BARRIER IS INSTALLED THEN THE RATIO SHALL BE REDUCED TO 1/300th.
2. THE BUILDING EXTERIOR AND ALL FACILITIES WITHIN THE BUILDING SHALL BE IDENTIFIED WITH THE INTERNATIONAL SYMBOL OF ACCESSIBILITY.
3. BUILDER/DEALER SHALL BE RESPONSIBLE FOR ON SITE BARRIER FREE PROVISIONS: STEPS, RAMPS, PARKING SIGNS, ETC. – BUILDING APPROACH (WALK OR RAMP) WITH A MINIMUM WIDTH OF 3' AND A GRADIENT OF NOT MORE THAN 1/20 FEET FOR SIDEWALKS AND A MAXIMUM OF 1/12 FOR RAMPS.
4. LANDING SHALL BE PROVIDED OUTSIDE OF EACH EXIT DOOR, EACH EXIT DOOR – 3 FOOT MINIMUM WIDTH WITH 1/2" MAXIMUM CHANGE IN ELEVATION, LANDING TO EXTEND A MINIMUM OF 24" PAST STRIKE EDGE OF THE DOOR, LANDING AND RAMPS BY OTHERS AT SITE.
5. ALL LOCKS TO BE UNLOCKABLE FROM THE INTERIOR WITHOUT THE USE OF A KEY OR SPECIAL KNOWLEDGE.
6. CORROSION RESISTANT FLASHING AT TOP AND SIDES OF DOORS, WINDOWS AND AT ROOF PENETRATIONS.
7. ALL GLAZING WITHIN 24" OF EXTERIOR PASSAGE DOORS AND IN PASSAGE DOORS, OR WITHIN 18" OF FLOOR TO BE "SAFETY GLAZED" AND 30 MARKED.

Mobile/Modular EXPRESS INC.
1301 TRIMBLE RD.
EDGEWOOD, MD 21009
PHONE: (410) 676-3700
FAX: (410) 676-7288

58120 C.R. 3, SOUTH
ELKHART, IN 46516
PHONE: (574) 295-1214
FAX: (574) 295-2232

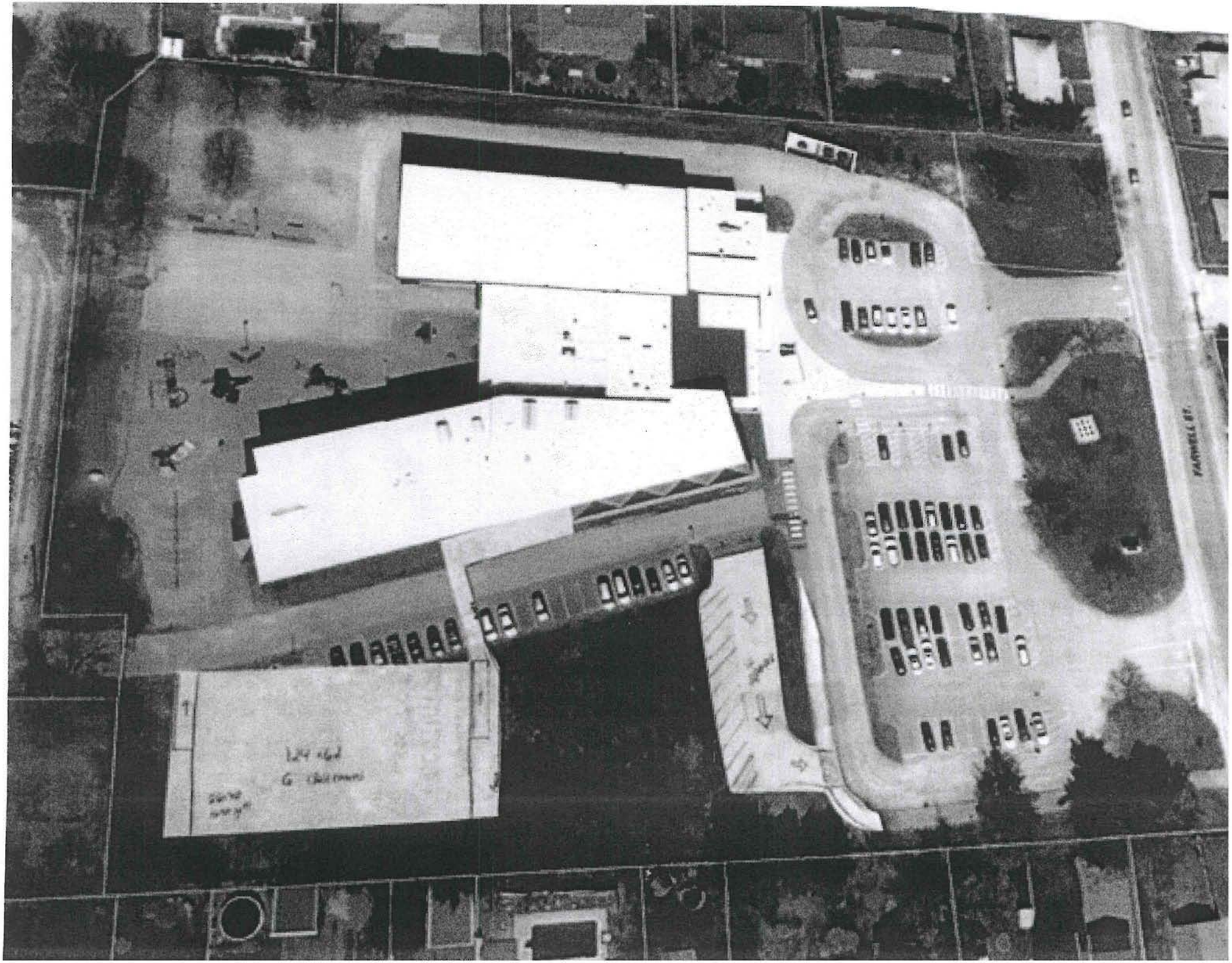
64 HESS ROAD
LEOLA, PA 17540
PHONE: (717) 656-2081
FAX: (717) 656-4349

SCHIAVI LEASING
CR12466
PELHAM CLASSROOM

OVERALL FLOOR PLAN

DWG. NO.:	A1
DESIGNED:	4/28/09
PLOTTED:	6/25/09 11:56AM
SERIAL NO.:	30014A09-1-9
SCALE:	N.T.S.

REVISIONS	DATE
CUSTOMER REVISIONS	5-8-09
ENGINEER REVISIONS	6-24-09



LPS FARWELL Additional 6 Classroom - Build/Financing Options

Assumptions

Lease Interest Rate	3.20%	(per quote 10/2/15 GSB)
Leased Term	5	years
Princ Pymt	Annual	
Bond Interest Rate	2.70%	(per estim H Hunter)
Bond Term - option 1	10	years; Improvments only
Bond Term - option 2	15	years; Bldg only or entire project

OPTION A - Modular Build, Leased Building, 10 yr bond for improvements

	Structure	Improvements	TOTAL
COST	$ 1,200,000	$ 476,000	**$ 1,676,000**
Drawdown FY16	$ -	$ 135,000	
Drawdown FY17	$ 1,200,000	$ 341,000	
Annual P&I	$ 255,352	$ 54,951	
Total Interest Cost	$ 76,762	$ 73,507	**$ 150,269**
MDOE Leased Space			
Program $8 psf / 5yrs	$ (307,520)		**$ (307,520)**
Total estimated cost including debt service interest			**$ 1,518,749**

First payment	FY16-17	FY17-18
Last payment	FY20-21	FY27-28

Note: lease payments due at beginning of period

MDOE Lease Subsidy FY18 - FY22

Annual Effect on Operating Budget:	Annual	Total		
Year 1 (FY16-17), lease only	*$ 255,352*	$ 255,352		
Yrs 2-5, lease, MDOE subsidy, bond P&I	*$ 248,799*	$ 995,196	**FY17 - FY21: $**	**1,250,549**
Year 6, MDOE subsidy, bond P&I	*$ (6,553)*	$ (6,553)		
Years 7 - 11, bond P&I	*$ 54,951*	$ 274,754		
		$ 1,518,749		

OPTION B - Stick Build, 15 yr bond for Building and Improvements

	Structure	Improvements	TOTAL	
COST	$ 1,440,000	$ 456,000	**$ 1,896,000**	
Drawdown FY16 (estim)	$ 1,240,000	$ 291,000		*$ 1,531,000*
Drawdown FY17	$ 200,000	$ 165,000		*$ 365,000*
Annual P&I	$155,395			
Total Interest Cost	$434,927		**$ 434,927**	
Total estimated cost including debt service interest			**$ 2,330,927**	

First payment	FY17-18
Last payment	FY32-33

Annual Effect on Operating Budget:	Annual	Total		
Year 1*	*$ -*	$ -		
Years 2 - 5, bond P&I	*$ 155,395*	$ 621,580	**FY17 - FY21: $**	**621,580**
Years 6 - 16, bond P&I	*$ 155,395*	$ 1,709,346		
		$ 2,330,927		

** Assumes bond sold in first FY with first debt service in second FY*

Lewiston Public Schools

Enrollment Update
and
Proposal to Add Six Classrooms at Farwell Elementary School

October 19, 2015
Bill Webster, Superintendent

LEWISTON PUBLIC SCHOOLS

Fall 2015 Enrollment Spike

	Enrollment	Over Fall 2014
Demographic Study Projection	5,374	122
Actual	5,515	263
Unexpected		141

LEWISTON PUBLIC SCHOOLS 2

Questions Raised

* Why the increase?
* What does this suggest for future enrollment and for class size?
* How do we provide appropriate facilities for students?
* What impact does this have on our plans for a new elementary school?

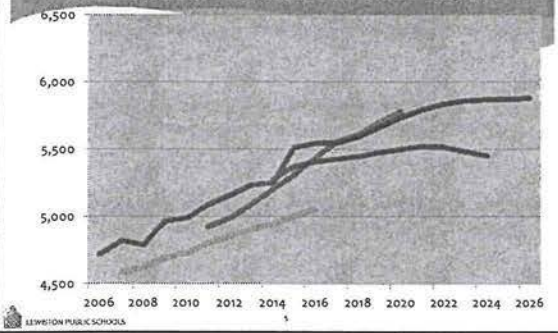
LEWISTON PUBLIC SCHOOLS 3

One Caution

- Enrollment Numbers Change Daily
  - One recent week Lewiston schools registered 30 new students and another 15 students moved away.
  - The overall message in this data is still clear.

LEWISTON PUBLIC SCHOOLS

Lewiston Enrollment



LEWISTON PUBLIC SCHOOLS

Children of Non-Native GA Applicants

9/1/14 to 8/31/15	168*
9/1/13 to 8/31/14	72
9/1/12-/8/31/13	54
9/1/11-8/31/12	102

*The majority of these children arrived late spring or this summer. Another 25 children were recorded after 8/31/15.

LEWISTON PUBLIC SCHOOLS

Last 100 Children of Non-Native GA Applicants

# of Children	From Maine	Country of Origin
38	24	Angola
21	5	Somalia
14	6	Djibouti
10	0	Kenya
8	6	Burundi
6	0	Ethiopia
5	5	Central African Rep.
102	46	

LEWISTON PUBLIC SCHOOLS 7

Newcomers Registered in Schools

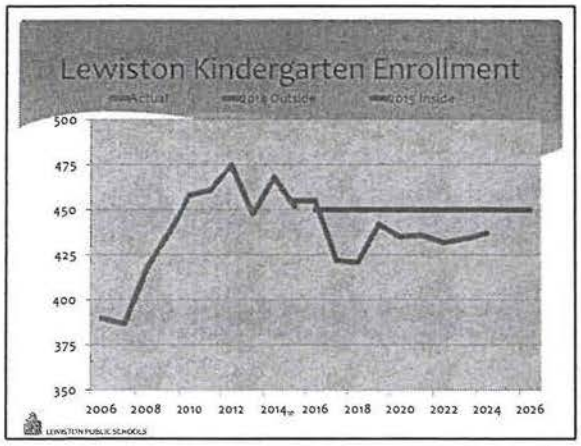
Fall 2015	289
Fall 2014	183
Difference	106

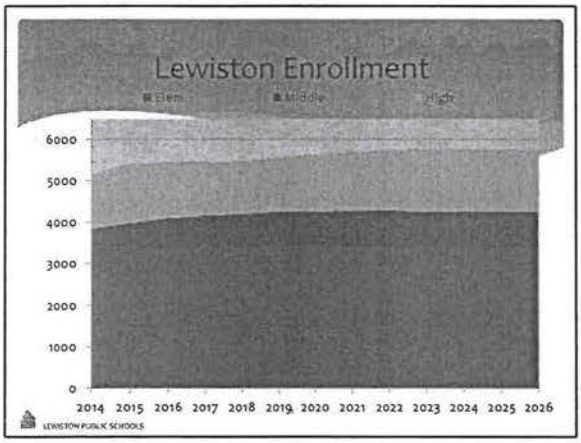
LEWISTON PUBLIC SCHOOLS 8

What about Future Trends?

* 12k of Lewiston's 25k households are renters.
* Vacancy rate estimates are around 3% to 4%.
* Lewiston may have the capacity to house another 1,000 or so children in rental housing.
* Newest projection increases enrollment by a maximum of 400 students.

LEWISTON PUBLIC SCHOOLS 9





Elementary Enrollment Capacity

School	Non-Classroom Capacity*	Present Enrollment	Difference
Farwell	480	360	120
Geiger	720	740	-20
Longley	400	410	-10
Martel	320	330	-10
McMahon	720	660	60
Montello	720	780	-60
	3,360	3,280	80

*Without consideration of number of classrooms.

Why Expand Farwell?

School can be expanded without going beyond the capacity of the cafeteria, gym, library.

* Will allow addition of preK room and 3 classrooms at each grade level.
* Will help LPS maintain, if not reduce, elementary class size throughout the City using school choice decisions.
* 6 new classrooms will serve as insurance for further unexpected enrollment increases.

LEWISTON PUBLIC SCHOOLS 13

Meeting K-6 Classroom Needs

				With Expansion	
	Students	Class-rooms	Ave Size	Class-rooms	Ave Size
March 2015	2,928	131	22.4	-	-
Actual Fall 2015	3,007	138	21.8	-	-
Projected Fall 2016	3,057	139	22.0	144	21.2
With another 100 students	3,157	139	22.7	144	21.9
Projected Fall 2019	3,103	150*	21.7	155	20.0
With another 300 students	3,403	150*	22.7	155	22.0

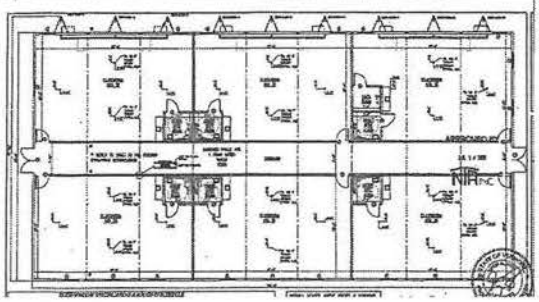
*Number of additional classrooms in new school is yet-to-be finalized.

14

Proposed Site Plan for Farwell

LEWISTON PUBLIC SCHOOLS 15

Six Classroom Modular Building



LEWISTON PUBLIC SCHOOLS 16

Proposed Farwell Modular

- Financed through a lease expected to be partially funded by State support.
- Modular could be removed once new school opens, assuming that elementary enrollment does not spike further.
- Construction would start this school year for completion by August 2016.

LEWISTON PUBLIC SCHOOLS 17

LMS and LHS Classroom Needs

- The 2014 LMS expansion and renovation raised the capacity of LMS to handle the expected peak enrollment of 885.
- High school enrollment will peak at over 1,500 students in 2023. Capacity is, perhaps, a maximum of 1,400.

LEWISTON PUBLIC SCHOOLS 18

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- We are in discussion with the City to explore having more classrooms at the Armory including for a new alternative program for 80 freshmen who are not proficient.
- Longley Elementary and Martel Elementary schools will be available space in the Fall of 2019 if the new school opens on schedule. One option is a new experiential program for 150 or so high school students.

LEWISTON PUBLIC SCHOOLS 19

New School is Right-Sized

+/- 800 students is ideal for programming.

- Present enrollment of Longley and Martel is 750.
- New school is designed for 888 students.
- Farwell expansion and new school will increase elementary capacity by over 300 students. Latest projection has a maximum 150 student increase.

LEWISTON PUBLIC SCHOOLS 20

Questions and Answers

LEWISTON PUBLIC SCHOOLS 21

Lewiston Public Schools

Enrollment Update
and
Proposal to Add Six Classrooms at Farwell Elementary School

October 19, 2015
Bill Webster, Superintendent

LEWISTON PUBLIC SCHOOLS

Fall 2015 Enrollment Spike

	Enrollment	Over Fall 2014
Demographic Study Projection	5,374	122
Actual	5,515	263
Unexpected		141

LEWISTON PUBLIC SCHOOLS 2

Questions Raised

* Why the increase?
* What does this suggest for future enrollment and for class size?
* How do we provide appropriate facilities for students?
* What impact does this have on our plans for a new elementary school?

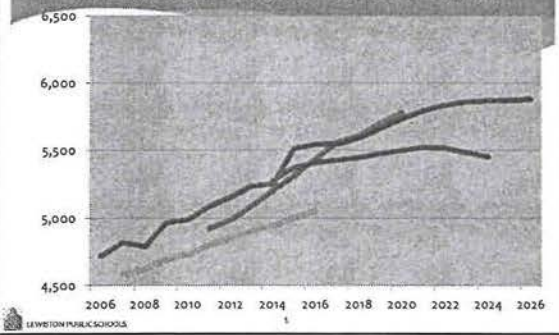
LEWISTON PUBLIC SCHOOLS 3

One Caution

* Enrollment Numbers Change Daily
  * One recent week Lewiston schools registered 30 new students and another 15 students moved away.
  * The overall message in this data is still clear.

LEWISTON PUBLIC SCHOOLS

Lewiston Enrollment



LEWISTON PUBLIC SCHOOLS

Children of Non-Native GA Applicants

9/1/14 to 8/31/15	168*
9/1/13 to 8/31/14	72
9/1/12-/8/31/13	54
9/1/11-8/31/12	102

*The majority of these children arrived late spring or this summer. Another 25 children were recorded after 8/31/15.

LEWISTON PUBLIC SCHOOLS

Last 100 Children of Non-Native GA Applicants

# of Children	From Maine	Country of Origin
38	24	Angola
21	5	Somalia
14	6	Djibouti
10	0	Kenya
8	6	Burundi
6	0	Ethiopia
5	5	Central African Rep.
102	46	

LEWISTON PUBLIC SCHOOLS 7

Newcomers Registered in Schools

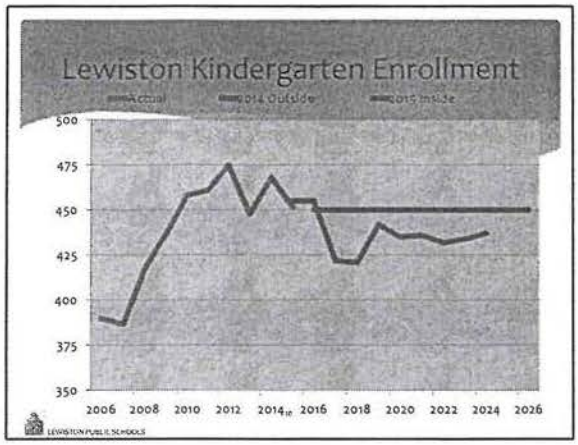
Fall 2015	289
Fall 2014	183
Difference	106

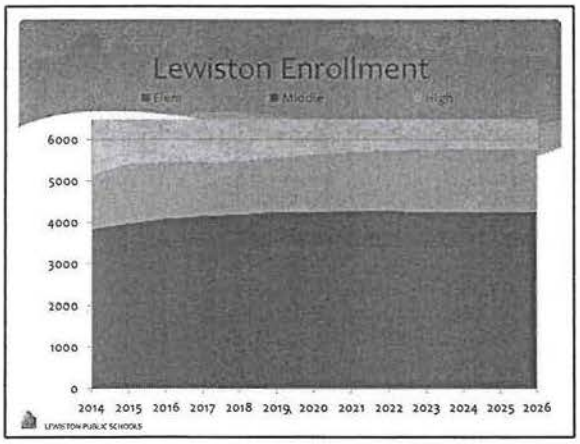
LEWISTON PUBLIC SCHOOLS 8

What about Future Trends?

* 12k of Lewiston's 25k households are renters.
* Vacancy rate estimates are around 3% to 4%.
* Lewiston may have the capacity to house another 1,000 or so children in rental housing.
* Newest projection increases enrollment by a maximum of 400 students.

LEWISTON PUBLIC SCHOOLS 9





Elementary Enrollment Capacity

School	Non-Classroom Capacity*	Present Enrollment	Difference
Farwell	480	360	120
Geiger	720	740	-20
Longley	400	410	-10
Martel	320	330	-10
McMahon	720	660	60
Montello	720	780	-60
	3,360	3,280	80

*Without consideration of number of classrooms.

Why Expand Farwell?

School can be expanded without going beyond the capacity of the cafeteria, gym, library.

* Will allow addition of preK room and 3 classrooms at each grade level.
* Will help LPS maintain, if not reduce, elementary class size throughout the City using school choice decisions.
* 6 new classrooms will serve as insurance for further unexpected enrollment increases.

LEWISTON PUBLIC SCHOOLS 13

Meeting K-6 Classroom Needs

				With Expansion	
	Students	Class-rooms	Ave Size	Class-rooms	Ave Size
March 2015	2,928	131	22.4	-	-
Actual Fall 2015	3,007	138	21.8	-	-
Projected Fall 2016	3,057	139	22.0	144	21.2
With another 100 students	3,157	139	22.7	144	21.9
Projected Fall 2019	3,103	150*	21.7	155	20.0
With another 300 students	3,403	150*	22.7	155	22.0

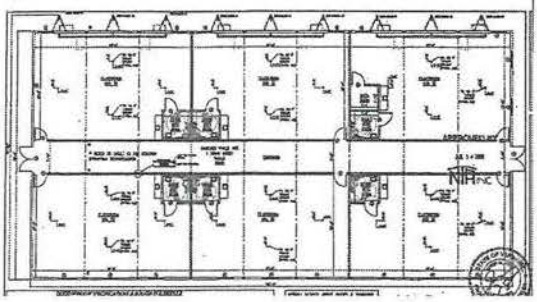
*Number of additional classrooms in new school is yet-to-be finalized.

14

Proposed Site Plan for Farwell

LEWISTON PUBLIC SCHOOLS 15

Six Classroom Modular Building



LEWISTON PUBLIC SCHOOLS 16

Proposed Farwell Modular

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LEWISTON PUBLIC SCHOOLS 17

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LEWISTON PUBLIC SCHOOLS 20

Questions and Answers

LEWISTON PUBLIC SCHOOLS 21

CITY OF LEWISTON

Department of Planning & Code Enforcement

Lewiston
All-America City
2007

TO: Planning Board
FROM: David Hediger, City Planner
DATE: October 22, 2015
RE: October 26, 2015 Planning Board Agenda Item V(a)

Acquisition of 119 Walnut Street/Drouin Field.

Pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code, the board shall review and make a recommendation to the city council with regard to the acquisition and disposition of all public ways, lands, buildings and other municipal facilities.

The Lewiston School Department is interested in acquiring the property at 119 Walnut Street/Drouin Field as part of the proposed improvements associated with the construction of a new elementary school on Franklin Pasture. The proposed elementary school is likely to be constructed in an area currently occupied by athletic fields. The School Department has indicated that the acquisition of 119 Walnut Street is a necessary purchase for the elementary school project in order to have sufficient space to replace all the playing fields that will be impacted.

The property is owned by the Roman Catholic Bishop of Portland and consists of approximately 3.4 acres of playing fields and a concession stand used by St. Dominic's High School. The property is located in the Institutional Office (IO) district in which academic and municipal uses are allowed. The City has the property assessed at $263,730. The School Department has a tentative agreement with the Archdiocese of Portland for the purchase of Drouin Field at its appraised price of $270,000. The agreement requires a $25,000 nonrefundable deposit with closing to occur no later than July 1, 2016. Funding will be part of the FY 16 LCIP previously approved by the Lewiston School Committee and Lewiston City Council for the new elementary school project. Therefore, the requested action by the Planning Board is limited to providing a recommendation on the acquisition of the property.

Reference should be made Lewiston School Superintendents memorandum to the Planning Board dated October 21, 2015.

ACTION NECESSARY:

Make a motion pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code to send a favorable recommendation to the City Council for the acquisition of 119 Walnut Street (including, if any, specific conditions raised by the Planning Board).

10/15/15

To: Lewiston School Committee and Lewiston Planning Board

From: Bill Webster, Superintendent

Re: Recommendation to Purchase Drouin Field

The Planning Board is receiving this memo, as per City Charter the Planning Board is to make a recommendation on all land purchases.

I have reached a tentative agreement with the Archdiocese of Portland for the purchase of Drouin Field at its appraised price of $270,000. As you know, the acquisition of this field will allow for the relocation of the softball field and practice field from Franklin Pasture so that we can proceed with the full implementation of the plan as presently proposed (see Attachment I). Under the tentative agreement, which has been reviewed by our legal counsel, Lewiston Public Schools will make a $25,000 nonrefundable deposit with closing to occur no later than July 1, 2016. This will allow us to decide whether or not the remaining $245,000 purchase would occur in fiscal 2016 or fiscal 2017.

A possible School Committee motion might be as follows:

Move to authorize the Superintendent to seek Planning Board support and proceed with the purchase of Drouin Field at the appraised cost of $270,000.

HARRIMAN

MEETING NOTES

To	Bill Webster, Scott Brown, David Schoenherr, JPL, MDL, FLC
From	Jeff Larimer
Date	July 24, 2015
Project	Lewiston Elementary School Project No. 14493
Subject	DOE/BGS Meeting via Conference Call on July 23, 2015

Attendees

Bill Webster	Superintendent, Lewiston Public Schools
Tom Shannon	Chair, Site Selection Committee
Joe Perryman	Facilities Director, Lewiston Public Schools
Jason Fuller	LHS Athletic Director
Scott Brown	DOE
Paul Johnson	DOE
Stan Sawyer	DOE
David Schoenherr	BGS
Jeff Larimer	Harriman

1. Discussed and confirmed everyone's understanding of the proposed scope of the project which, in general, appears to be acceptable to all parties.
    a. DOE will financially support as part of the new school project, the relocation and/or replacement, as deemed necessary, the elements outlined below in order to allow for the construction of the new elementary school on the Franklin Pasture site.
        i. All athletic fields for football, soccer, lacrosse, track, baseball, softball, JV sports and practice that currently exist at the Franklin Pasture property
        ii. All supporting elements such as bleachers, press box, lighting, scoreboards, concessions and storage buildings, dugouts, fencing, flagpoles, monuments, walkways, etc.
        iii. Improvements to the athletic fields at Drouin Field. The purchase of Drouin Field would be by the City of Lewiston and would not be a part of this project.
    b. What is new or replaced and what is relocated will be defined in more detail as work progresses through the site application and site concept design process.
2. The site selection committee meets on Tuesday, July 28th with the expectation that they will vote to recommend moving forward with Parcel Q. Assuming a positive vote, a presentation of the site selection committee's recommendation would be made to the school committee on August 17th at which time the site selection would be made public.
3. An updated schedule is being developed for next Tuesday's meeting with a target date of November 10th to be able to present the site to the State Board for approval.

46 HARRIMAN DRIVE
AUBURN, ME 04210
207.784.5100

123 MIDDLE STREET
PORTLAND, ME 04101
207.775.0053

ONE PERIMETER ROAD
MANCHESTER, NH 03103
603.626.1242

www.harriman.com

4. To meet the target date, the following will need to occur:
    a. Technical consultants will need to be retained for geotech, traffic and environmental assessment.
    b. All relative state agencies will need to be contacted for their preliminary assessment of the proposed site.
    c. The Owner will need to have a purchase and sale agreement on the Drouin property, if the Drouin property is going to be included in project and if the state is going to participate in the upgrades to the Drouin property.
    d. The site application will need to prepared, completed and submitted to DOE one month prior to the state board meeting or about October 9th. This may require one or more review meetings with DOE prior to the final submittal.
    e. Schedule a Public Hearing/Straw Vote in mid-October and prior to the meeting with the Construction Committee.
    f. Meet with the Construction Committee to receive their recommendation.
5. Next meeting to be determined.

If written notice is not received within two weeks of receipt, the above meeting notes represent an accurate summary of the meeting and its conclusions.

HARRIMAN

September 22, 2015

David Hediger dhediger@lewistonmaine.gov
Deputy Director/City Planner
Planning & Code Enforcement
Lewiston City Hall
27 Pine Street
Lewiston, ME 04240

Re: New Elementary School
Lewiston Public Schools
Lewiston, ME
Project No. 14493
Site Development Informational Meeting

Dear David:

As you are aware, Lewiston Public Schools is in the conceptual planning phase for replacing both the Martel and Longley Schools with a new Elementary School that is proposed for the Franklin Pasture athletic complex along East Avenue. As discussed in today's informational staff meeting, a similar informational meeting with the Planning Board at this early stage would be desirable. Please include the Lewiston Public Schools on the next regular Planning Board agenda, potentially October 5th, for a brief informational presentation meeting. The attached Concept-1 drawing shows the proposed school facilities and the relocated High School sports fields.

Let us know if you need anything else. Thank you.

Sincerely,
Harriman

Jeffrey P. Larimer, AIA
Principal • Architect
jlarimer@harriman.com

jplar

Enclosures: Concept-1 plan

cc: Bill Webster, Lewiston Public Schools bwebster@lewistonpublicschools.org
Ryan Barnes, Lewiston Public Works rbarnes@lewistonmaine.org

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CITY OF LEWISTON

Department of Planning & Code Enforcement

Lewiston
All-America City
2007

TO: Planning Board
FROM: David Hediger, City Planner
DATE: October 22, 2015
RE: October 26, 2015 Planning Board Agenda Item V(c)

35 Ellis Street Rear–Land Donation

Pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code, the board shall review and make a recommendation to the city council with regard to the acquisition and disposition of all public ways, lands, buildings and other municipal facilities.

Administration received a request from owners Rudolph and Armance Dumais to donate 35 Ellis Street Rear to the city. This vacant 2.62 acre parcel is almost entirely located in the Resource Conservation (RC) district and is essentially undevelopable having no frontage, is significantly impacted by shoreland zoning, flood plain, wetlands, a sewer line as part of a cross country sewer collection system, and an inland wading waterfowl habitat. The current assessed value on this property is $1,920. There are 10 abutters, three of which are the City owning lots that are also undevelopable.

The City Council voted unanimously on September 19, 2015 to execute the required documents to accept ownership of the parcel of vacant land located at 35 Ellis Street Rear. On September 28th the Board voted that proposed acquisition be referred back to the City Council for purposes of rescinding their action taken on September 15, 2015 and for the Council to follow ordinance requirements accordingly by first requesting a recommendation from the Planning Board in accordance with Article VII, Section 3(e) and 4(h) of the Zoning and Land Use Code. On October 6th, the Council passed a resolve 7-0 rescinding their September19th resolve and requested the Planning Board to review the potential acquisition of 35 Ellis Street and to provide its recommendation to the City Council, consistent with the city ordinance.

City staff recommends accepting the donation of this property given that it is not developable as it may be beneficial for future wetland mitigation or open space.

ACTION NECESSARY:

Make a motion pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code to send a favorable recommendation to the City Council for the acquisition in the form of a donation of 35 Ellis Street Rear (including, if any, specific conditions raised by the Planning Board).

CITY OF LEWISTON

Department of Planning & Code Enforcement

Lewiston
All-America City
2007

TO: Planning Board
FROM: David Hediger, City Planner
DATE: September 24, 2015
RE: September 28, 2015 Planning Board Agenda Item V(a)

35 Ellis Street Rear–Land Donation

Pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code, the board shall review and make a recommendation to the city council with regard to the acquisition and disposition of all public ways, lands, buildings and other municipal facilities.

Staff has been directed to request a recommendation from the Planning Board for the acquisition of 35 Ellis Street Rear. Administration received a request from owners Rudolph and Armance Dumais to donate this land to the city. This vacant 2.62 acre parcel is almost entirely located in the Resource Conservation (RC) district and is essentially undevelopable having no frontage, is significantly impacted by shoreland zoning, flood plain, wetlands, a sewer line as part of a cross country sewer collection system, and an inland wading waterfowl habitat. The current assessed value on this property is $1,920. There are 10 abutters, three of which are the City owning lots that are also undevelopable.

The City Council voted unanimously on September 19, 2015 to execute the required documents to accept ownership of the parcel of vacant land located at 35 Ellis Street Rear. Prior to the City accepting ownership, a recommendation from the Planning Board is needed. City staff recommends accepting the donation of this property given that it is not developable as it may be beneficial for future wetland mitigation or open space.

ACTION NECESSARY:

Make a motion pursuant to Article VII, Section 4(h) of the Zoning and Land Use Code to send a favorable recommendation to the City Council for the acquisition in the form of a donation of 35 Ellis Street Rear (including, if any, specific conditions raised by the Planning Board).

EXECUTIVE DEPARTMENT

Edward A. Barrett, City Administrator
Phil Nadeau, Deputy City Administrator

September 3, 2015

To: Honorable Mayor and Members of the City Council
Fr: Edward A. Barrett
Su: Offer to Donate the Property at 35 Ellis Rear

We have received the attached letter from Rudolph and Armance Dumais offering to donate the property located at 35 Ellis Rear (see attached map). Ellis Street runs from Pond Road between Grove and Sabattus. The lot is primarily back land and is completely covered by the floodplain and wetlands. While it can be accessed from Ellis Street (a private street in this area) via a reserved right of way, it is effectively an unbuildable lot. It also has a city 18 inch PVC sewer line traversing part of the property. The property is assessed at $1,920 with an annual current tax bill of $52.55.

The City owns 10 other lots in the immediate area, all of which are either wet or effectively without road access. On the attached map, the property outlined in dark black is 35 Ellis Street Rear. The properties marked with dots are currently owned by the City.

The only realistic value associated with this property is its potential use as future mitigation for wetland impacts elsewhere in the No Name Stream watershed. It could also be potentially useful should the City eventually be required to develop a watershed management plan for No Name Stream should it fail to meet required water quality due to non-point source runoff.

City Hall, 27 Pine Street, Lewiston, ME 04240 • Tel. (207) 513-3121 • TTY/TDD (207) 513-3007 • Fax (207) 795-5069
Email: ebarrett@lewistonmaine.gov • pnadeau@lewistonmaine.gov
Web Page: www.lewistonmaine.gov

August 14, 2015

City of Lewiston
Attn: Janet Labbe
27 Pine Street
Lewiston, ME 04240

RE: 00-003235

Dear Janet Labbe,

We are writing you as requested regarding a parcel of land #00-003235, that was past on to Rudolph Dumais when his brother Joseph Dumais past away. We no longer want this parcel of land and have no use for it. It is all wet / bog land.

Please let us know if there is anything else we need to do. You may reach us at 207-784-7759.

Sincerely,

Rudolph Dumais

Armance Dumais

CITY OF LEWISTON

REAL ESTATE TAX STATEMENT

Fiscal Year 201
July 1, 2015-June 30, 201

PARCEL NUMBER	ACCOUNT NUMBER	DATE OF BILLING
00-003235	31308	07/30/2015

LOCATION OF PROPERTY AND DESCRIPTION
00035 ELLIS ST REAR
LAND - 2 ACRES

000001304890003191003191910112 0
**********AUTO**SCH 5-DIGIT 04240
DUMAIS, RUDOLPHE
DUMAIS, ARMANCE
27 ELLIS ST
LEWISTON, ME 04240-3313

Tel- 784-7759

27 ALICE ST residence.

TOTAL TAXES	52.55
BILL NUMBER	16A00003235
DUE SEPTEMBER 15, 2015	26.28
DUE MARCH 15, 2016	26.27
AMOUNT PAID TO DATE	0.00
INTEREST DUE	0.00
BALANCE DUE	52.55

CURRENT BILLING INFORMATION

Valuation	1,920.00
Homestead Exemption	0.00
Other Exemption	0.00
Taxable Valuation	1,920.00
Tax Rate	27.37
TOTAL TAX	52.55

PAYMENT & REMITTANCE INSTRUCTIONS

Please send remittance copy below
Payment by check: payable to: CITY OF LEWISTON
Payment by Credit/Debit Card: PLEASE NOTE: A 2.5% merchant fee (minimum of $1.00) will be charged on all credit/debit card transactions.
Please complete credit/debit card information and sign remittance copy below.

Mail to: City of Lewiston Tax Collector
27 Pine Street
Lewiston, ME 04240-7200

TAXPAYER NOTICE

Notice is hereby given that your property tax for fiscal year July 1, 2015 through June 30, 2016 is payable in (2) equal installments on September 15, 2015 and March 15, 2016 and interest will be charged on the first installment at an annual rate of 7% from September 16, 2015. Interest will be charged on the second installment at an annual rate of 7% from March 16, 2016.

Pursuant to Title 36 ss 502 of Maine law, the ownership and taxable valuation of all real and personal property subject to taxation shall be fixed as of April 1st of each year. If you have sold your property since April 1, 2015, it is your obligation to forward this bill to the current property owner.

This bill is for taxes due for the current fiscal year 2016 (July 1, 2015 – June 30, 2016). If "Prior Taxes Due" is indicated above, the outstanding amount for any prior tax year(s) is not included in the amount due on this tax bill.

Your property taxes are utilized to fund the following:

City Budget	58.3%
School Budget	37.1%
County Budget	4.6%

As a result of funds received from the state through the state municipal revenue sharing program, homestead exemption reimbursement and state aid to education, your property tax bill has already been reduced by 45%.

The City's outstanding bonded indebtedness as of June 30, 2015 is $135,773,438.

QUESTIONS ?

Regarding valuations, please contact Assessor's Office at 513-3122.
Regarding payments and interest, please contact Tax Collector's Office at 513-3131.

OFFICE HOURS

8:30 a.m. - 4:00 p.m. Monday - Friday

REMITTANCE COPY - PLEASE SUBMIT BOTTOM PORTION ALONG WITH YOUR PAYMENT

CITY OF LEWISTON
REAL ESTATE TAX STATEMENT

DUMAIS, RUDOLPHE
DUMAIS, ARMANCE
27 ELLIS ST
LEWISTON, ME 04240-3313

TELEPHONE #

If you wish to pay by credit card indicate card type and write number and signature below.
☐ MasterCard ☐ Visa ☐ Amex ☐ Discover
PLEASE NOTE: A 2.5% merchant fee ($1.00 minimum) will be charged on all credit/debit card transactions.
NAME ON CARD
ZIP CODE
Credit Card Number
Security Code
Expiration Date
Signature

LOCATION	00035 ELLIS ST REAR LAND - 2 ACRES
PARCEL NUMBER	00-003235
ACCOUNT NUMBER	31308
DATE OF BILLING	07/30/2015
DUE SEPTEMBER 15, 2015	26.28
DUE MARCH 15, 2016	26.27
PAYMENT AMOUNT	

All-America City 2007

City of Lewiston
Planning & Code Enforcement

Gil Arsenault, Director

It's Happening Here! LEWISTON • AUBURN

MEMORANDUM

To: **City Clerk's Office**
City Council Members
Mayor Robert E. Macdonald

From: **David Hediger**

Date: **September 28, 2015**

Subject: **Planning Board Action**

The Planning Board took the following action at their meeting held on September 28, 2015 regarding the acquisition of 35 Ellis Street Rear.

The following motion was made:

MOTION: by **Paul Madore** that proposed acquisition of 35 Ellis Street Rear be referred back to the City Council for purposes of rescinding their action taken on September 15, 2015 to execute the required documents to accept ownership of the parcel of vacant land located at 35 Ellis Street Rear and for the Council to follow ordinance requirements accordingly by first requesting a recommendation from the Planning Board in accordance with Article VII, Section 3(e) and 4(h) of the Zoning and Land Use Code. Second by **Michael Marcotte.**

VOTE: **5-1-1 (Passed)** Walter Hill opposed. Pauline Gudas abstained.

Note: The Board expressed great frustration that this request for acquisition –albeit a donation of land – was acted upon by the City Council prior to the Planning Board providing a formal recommendation as required by ordinance. Some members of the Board were surprised by the Council's action and staff's oversight of this matter given recent discussions and actions of the Planning Board and City Council regarding the acquisition of 2 and 26 Oxford Street and donations of land to the City acted upon by the Planning Board earlier in 2015. There remains a question of whether there is a general lack of respect for the Planning Board by the City Council, Administration and staff.

c: Ed Barrett, City Administrator
Planning Board Members

Lewiston
All-America City
2007

City of Lewiston, Maine
Department of City Clerk

Kathleen M. Montejo, MMC
City Clerk & Registrar of Voters

Kelly J. Brooks, CMC
Deputy City Clerk

It's Happening Here!
LEWISTON • AUBURN

CERTIFICATION OF CITY COUNCIL ACTION

I, Kathleen M. Montejo, City Clerk of Lewiston, Maine, do hereby certify that the following action was taken by the Lewiston City Council at a public meeting of the City Council, held on Tuesday, October 6, 2015:

RESOLVE RESCINDING THE ORDER ACCEPTING THE DONATION OF THE PROPERTY AT 35 ELLIS STREET REAR AND REQUSETING A RECOMMENDATION FROM THE PLANNING BOARD

VOTE (11)

Motion by Councilor Cayer, seconded by Councilor Cloutier:

To approve the Resolve rescinding the Order accepting the donation of the property at 35 Ellis Street Rear and requesting a recommendation from the Planning Board:

Whereas, at its meeting of September 15, 2015, the City Council approved an Order, Accepting the Donation of the Property at 35 Ellis Street Rear; and

Whereas, City Ordinance requires that the City Council seek an opinion from the Planning Board in most instances before property is acquired or disposed of; and

Whereas, property acquisition orders are frequently conditioned upon a positive recommendation from the Planning Board; and

Whereas, the City Administrator failed to seek an opinion from the Planning Board or to include the standard conditional language in the acquisition order; and

Whereas, when informed of this error, the City Administrator stopped any further action on the acquisition pending a review and recommendation by the Planning Board; and

Whereas, the Planning Board discussed this at its September 28th meeting and recommended that the Council rescind its previous action to ensure that the correct procedure is followed by seeking an opinion from them in advance of final Council action;

Now, therefore, be it resolved by the City Council of the City of Lewiston that the Council Order authorizing the City Administrator to execute the required documents to accept ownership of the parcel of vacant land located at 35 Ellis Street Rear is hereby rescinded.

(Continued on page 2)

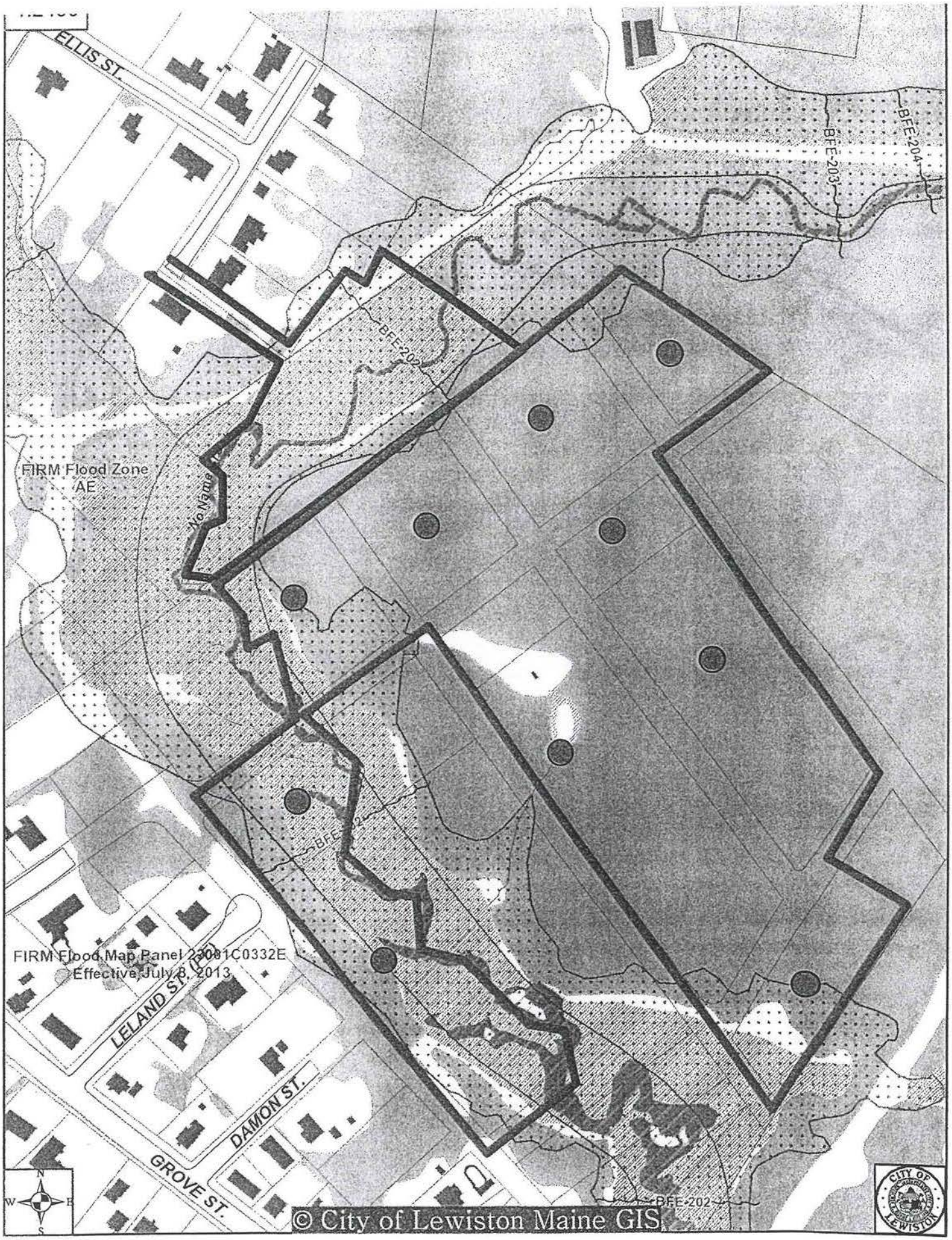
... Resolved that the Planning Board is requested to review the potential acquisition of 35 Ellis Street and to provide its recommendation to the City Council.

Passed by a Vote of 7-0
(Note – Councilor D'Auteuil was excused from the meeting and the Mayor cast a vote in his place.)

ATTEST:

Kathleen M. Montejo, MMC
City Clerk

October 19, 2015
Date


ELLIS ST.
BFE-204
BFE-203
BFE-202
FIRM Flood Zone
AE
No Name
FIRM Flood Map Panel 23081C0332E
Effective July 8, 2013
LELAND ST.
DAMON ST.
GROVE ST.
BFE-202
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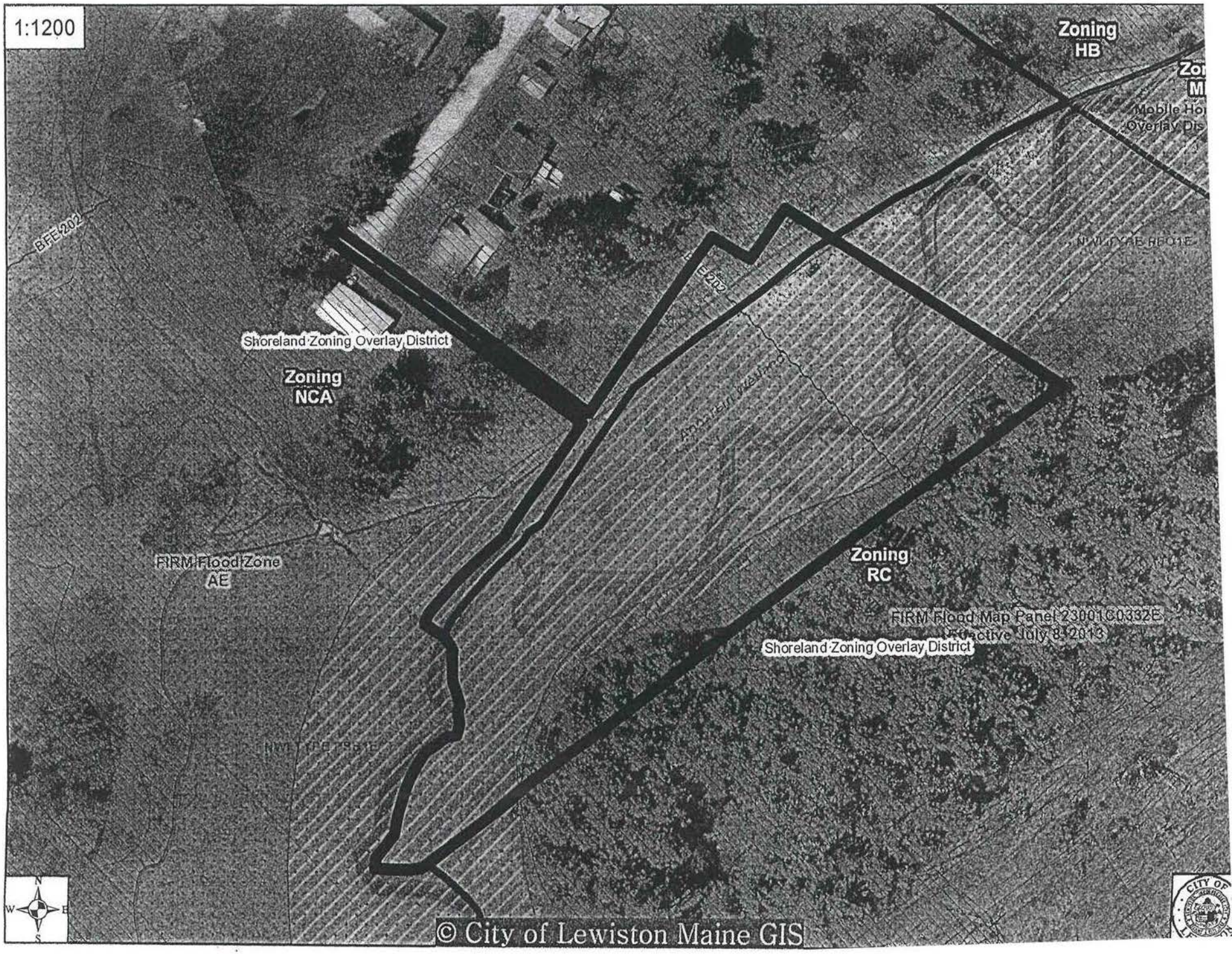
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Effective July 8, 2013
Shoreland Zoning Overlay District
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