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ENGINEERING REPORT:

APPLICATION FOR FACILITIES CHANGES
KAYO(FM) CHANNEL 257C1, 99.3 MHz
ELMA, WA

BLACK HILLS BROADCASTING, L.P.

5/2001

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1. Purpose of Application

This Engineering Report is part of an application for facilities changes for FM station KAYO at Elma, Washington,¹ by Black Hills Broadcasting, L.P. The proposed operation will be on FM Channel 257C1 (99.3 MHz) with a maximum lobe effective radiated power of 12 kilowatts (10.79 dBk) at an antenna height above average terrain of 650 meters. The ERP specified is the maximum for Class C1 facilities at this antenna height, as calculated in accordance with the Commission's Rules.

2. Allocation Considerations

The attached spacing study shows that the proposed operation meets the co-channel and adjacent channel spacing requirements for Class C1 stations as prescribed in §73.207 of the Commission's Rules, with the exception of short-spacings to KREW 257A Naches and KWJJ 258C1 Portland. (Additional short-spacings to Canadian operations are discussed below.) Operation pursuant to §73.215 of the Commission's Rules is requested with respect to KREW and KWJJ, and Exhibit B-16 is included to demonstrate the lack of prohibited contour overlap with those two stations.

CFOX-FM 257C at Vancouver, British Columbia

The proposed operation is short-spaced to the licensed operation of CFOX-FM on Channel 257C at Vancouver, British Columbia. Under the terms of the Working Arrangement for the Allotment and Assignment of FM Broadcasting Channels Under the Agreement

¹The KAYO community of license was changed from Aberdeen to Elma by the Report and Order in MM Docket No. 00-13.

Between the Government of Canada and the Government of the United States of America Relating to the FM Broadcasting Service, as amended in 1997 ("Working Arrangement"), the required co-channel Class C1 to Class C spacing is 302 kilometers, whereas the distance between the proposed KAYO site and the CFOX-FM site is 265.3 kilometers. The attached allocation study map demonstrates that the proposed KAYO 34 dBu F(50,10) contour will not overlap the CFOX-FM 58 dBu F(50,50) contour at any location over Canadian land areas. Per the terms of Section 5.2.2.1 of the Working Arrangement, the distance to the CFOX-FM 58 dBu F(50,50) protected contour has been based on maximum allowable parameters, out to a maximum distance of 97 kilometers.

The proposed operation is also short-spaced under the domestic Class C1 to Class C spacing requirement of 270 kilometers with respect to CFOX-FM. The attached allocation study map demonstrates that the proposed KAYO 60 dBu F(50,50) contour will not receive any overlap from the CFOX-FM 40 dBu F(50,10) contour. Therefore, the proposed operation is believed to be in full compliance with domestic and international allotment requirements.

CBCV-FM-1 258A at Metchosin/Sooke, British Columbia

The proposed operation is short-spaced to the licensed operation of CBCV-FM-1 on Channel 258A at Metchosin/Sooke, British Columbia.² Under the terms of the Working Arrangement, the required co-channel Class C1 to Class A spacing is 168 kilometers,

²Channel 258A was originally assigned for use at Sooke, British Columbia, at NL 48-21-28 x WL 123-41-10, but has since been reassigned for use at Metchosin/Sooke.

whereas the distance between the proposed KAYO site and the CBCV-FM-1 site is 161.98 kilometers. The attached allocation study map demonstrates that the proposed KAYO 48 dBu F(50,10) contour will not overlap the CBCV-FM-1 54 dBu F(50,50) contour at any location over Canadian land areas. Per the terms of Section 5.2.2.1 of the Working Arrangement, the distance to the CBCV-FM-1 54 dBu F(50,50) protected contour has been based on maximum allowable parameters, out to a maximum distance of 38 kilometers.

The proposed operation meets the domestic Class C1 to Class A spacing requirement of 133 kilometers with respect to CBCV-FM-1. Therefore, no analysis with respect to interference received from CBCV-FM-1 is required in this application, and the proposed operation is believed to be in full compliance with domestic and international allotment requirements.

FM Database Date: 010502

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Call Status	City St	FCC File No.	Channel Freq.	ERP(kw) HAAT(m)	Latitude Longitude	Bearing deg-True	Dist (km)	Req (km)
KPLUaux LIC	TACOMA WA	BMLED-900402KD	203C 88.5	30.000 189.0	47-28-50 122-31-58	39.0	72.56 0.00	0 AUX
KWJZ LIC	SEATTLE WA	BLH-970317KB	255C 98.9	58.000 DA 714.0	47-30-14 121-58-29	55.8	105.96 0.96	105 CLOSE
KWJZaux CP	SEATTLE WA	BPH-990415IC	255C 98.9	17.500 377.0	47-32-41 122-06-28	50.5	100.51 0.00	0 AUX
CFOX FM DELETED	VANCOUVER BC	- RM-9679	257C 99.3	72.000 DA 686.0	49-21-29 122-57-09	2.9	265.31 -36.69	302 SHORT
KAYO-FM LIC	ABERDEEN WA	RM-9679 BLH-950626KE	257C1 99.3	0.000 0.0	46-54-05 123-25-07	248.9	22.81 -222.19	245 SHORT
KAYOaux CP	ABERDEEN WA	BXPH-000403ABA	257C1 99.3	0.680 615.0	46-58-31 123-08-21	0.0	0.00 0.00	0 AUX
ADD	ELMA WA	RM-9679	257C1 99.3	0.000 0.0	46-57-31 123-35-18	267.1	34.23 -210.77	245 SHORT
KREW-FM LIC	NACHES WA	BLH-000210ABI	257A 99.3	0.790 274.0	46-36-02 120-52-06	102.7 SS	178.33 -21.67	200 SHORT
ABSOLUTE MINIMUM 73.215 SPACING = 178 KM								
KAYO-FM LIC	OLYMPIA WA	BLFTB-000630ADI	257D 99.3	3.200 0.0	47-00-58 122-54-57	74.9	17.58 0.00	0 BOOST
CBCV-FM1 NOTE:	METCHOSIN BC	S/OOKE RM-	258A 99.5	0.064 324.0	48-24-09 123-34-20	348.6	161.98 -6.02	168 SHORT

Page 2

NOTE: MOVED TO METCHOSIN/SOOKE, BC

ABSOLUTE MINIMUM 73.215 SPACING = 158 KM

LIC	OR	BLH- 920212KC	99.5	312.0	122- 41- 40	0.00	AUX
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APP	WA	BPFT- 981030TC	99.5	865.0	121-58-06	0.00	TRANS
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LIC	WA	BLH- 000204AAG	99. 9	714. 0	121- 58- 29	SS	0. 96	CLOSE
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LIC	WA	BXLH-001018ACN	99.9	388.0	122-06-25	0.00	AUX
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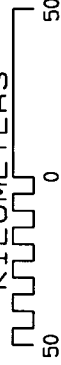
44444 END OF FM SPACING STUDY FOR CHANNEL 257 44444

This allocation study map demonstrates that the KAYO 34 dBu F(50, 10) contour will not overlap the CFOX-FM 58 dBu F(50, 50) contour at any location over Canadian land areas, nor will the KAYO 48 dBu F(50, 10) contour overlap the CBCV-FM-1 54 dBu F(50, 50) contour.

Per the terms of Section 5.2.2.1 of the Working Arrangement, the distances to the CFOX-FM 58 dBu F(50, 50) and CBCV-FM-1 54 dBu F(50, 50) protected contours have been based on maximum allowable parameters, out to maximums of 97 and 38 kilometers, respectively.

This map also demonstrates that the CFOX-FM 40 dBu F(50, 10) contour, as calculated based on 100 kW at 600 meters HAA, will not overlap the KAYO 60 dBu F(50, 50) contour.

KILOMETERS



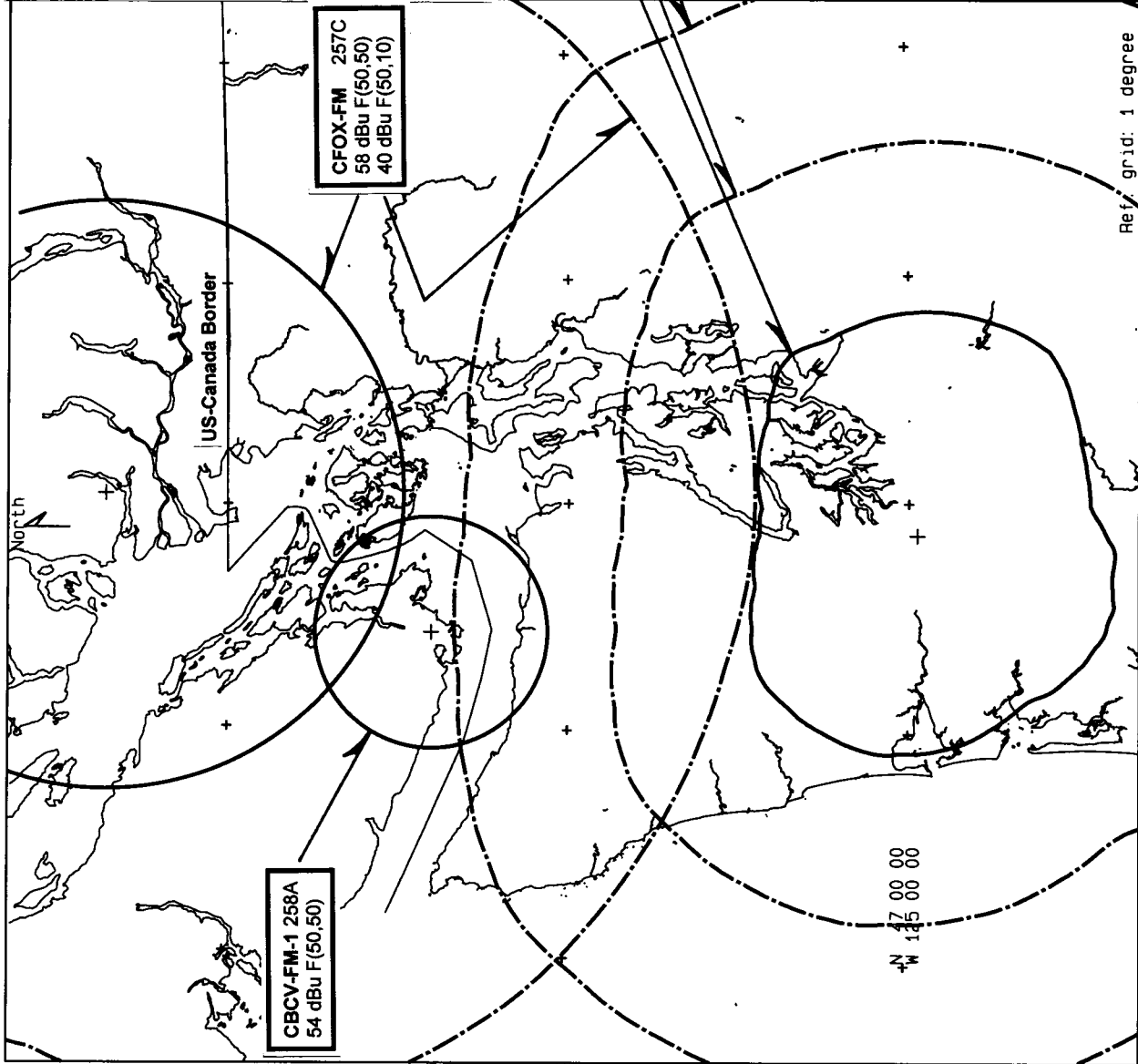
Allocation Study Map

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May 2001

KAYO (FM)

Ref. grid: 1 degree



3. Facilities Proposed

The proposed operation will be on Channel 257C1 (99.3 MHz) with an effective radiated power of 12 kilowatts. Operation is proposed with a 2-level circularly-polarized half-wave-spaced directional panel antenna system. The antenna will be side-mounted on a uniform cross-section guyed tower located atop Capitol Peak. There are no other broadcast users of this site, other than an auxiliary construction permit for KAYO.

The antenna support structure will extend just 199 feet above ground and will not require notification to the Federal Aviation Administration. Therefore, this structure does not require an Antenna Structure Registration Number.

a. NIER Calculations

Study of the area within 1000 meters of the proposed site reveals no other likely sources of non-ionizing radiation. Thus, the ground level NIER values near the base of the proposed structure are believed to be negligible. Precise calculations are made only with regard to the levels from this proposal.

The power density calculations shown below were made using the techniques outlined in the EPA report titled: *An Engineering Assessment of the Potential Impact of Federal Radiation Protection Guidance on the AM, FM, and TV Broadcast Services* (Gailey & Tell, April, 1985). All calculations contained herein are based on the measured element patterns for the antenna, and follow the procedure shown in the Gailey and Tell report.

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The patterns were identified by applying the procedure outlined in the report to the measurement data contained in the report titled: *Element Pattern Measurements on FM Antennas* (EPA-520/ 6-85-107, June 1985).

"Ground level" calculations in this report have been made at a reference height of 2 meters above ground to provide a worst-case estimate of exposure for persons standing on the ground in the vicinity of the tower. Equation #1, contained in the Gailey & Tell report and shown below, was used to calculate the ground level power density figures from each antenna at incremental distances from the base of its supporting tower.

$$S(FW/cm^2) = \frac{(\text{Adjusted ERP in Watts}) \times 1.64 \times 2.56 \times 100}{4 \times B \times (\text{Distance})^2}$$

Where: Adjusted ERP in Watts is the maximum lobe effective radiated power times the element pattern factor times the array pattern factor.

Distance = Distance in meters from the center of radiation to the calculation point.

Ground level power densities have been calculated for locations extending from the base of the tower to a distance of 1000 meters. Values past this point are increasingly negligible.

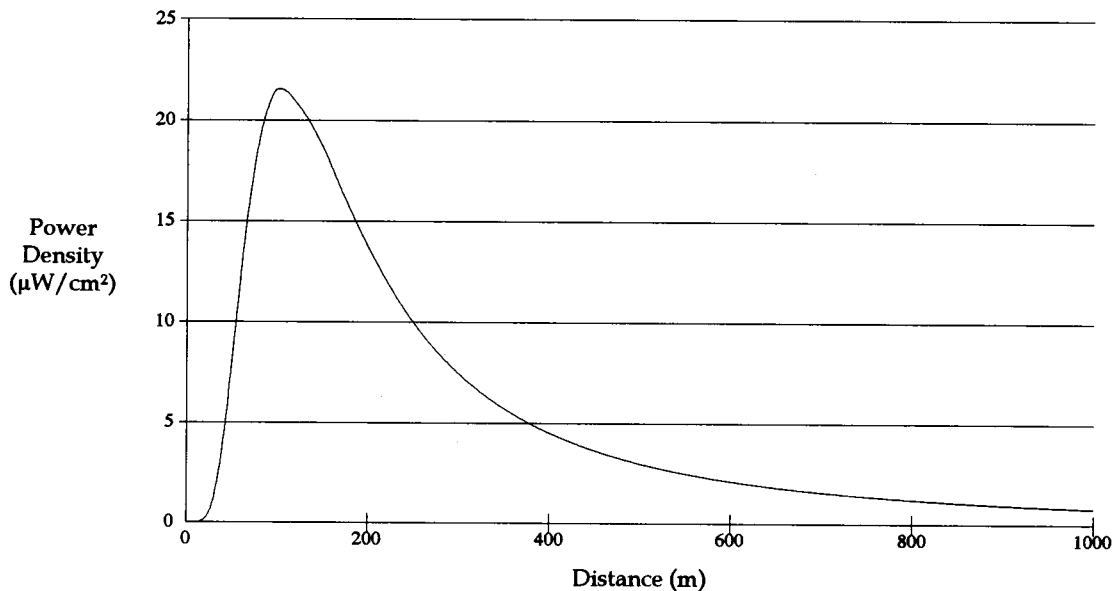
Calculations of the power density produced by the proposed antenna system assume a Type 6 element pattern, which is the element pattern for the Shively panel antenna proposed for use. The highest calculated ground level power density occurs at a distance of 102 meters from the base of the antenna support structure. At this point the power

density is calculated to be 21.6 FW/cm², just 2.2% of 1000 FW/cm² (the FCC standard for controlled environments) and just 10.8% of 200 FW/cm² (the FCC standard for uncontrolled environments).

Public access to the site is restricted by a locked gate and the antenna tower will be posted with warning signs. Pursuant to OST Bulletin No. 65, all station personnel and contractors are required to follow appropriate safety procedures before any work is commenced on the antenna tower, including reduction in power or discontinuance of operation before any maintenance work is undertaken.

The permittee/licensee in coordination with other users of the site must reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency radiation in excess of FCC guidelines.

Power Density vs Distance



Ground-Level NIER Analysis

OET FMModel

KAYO(FM) Elma, WA

Antenna Type: Shively panel
Number of Elements: 2
Element Spacing: 0.5 wavelength

Distance: 1000 meters
Horizontal ERP: 12 kW
Vertical ERP: 12 kW

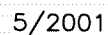
Antenna Height: 58 meters AGL

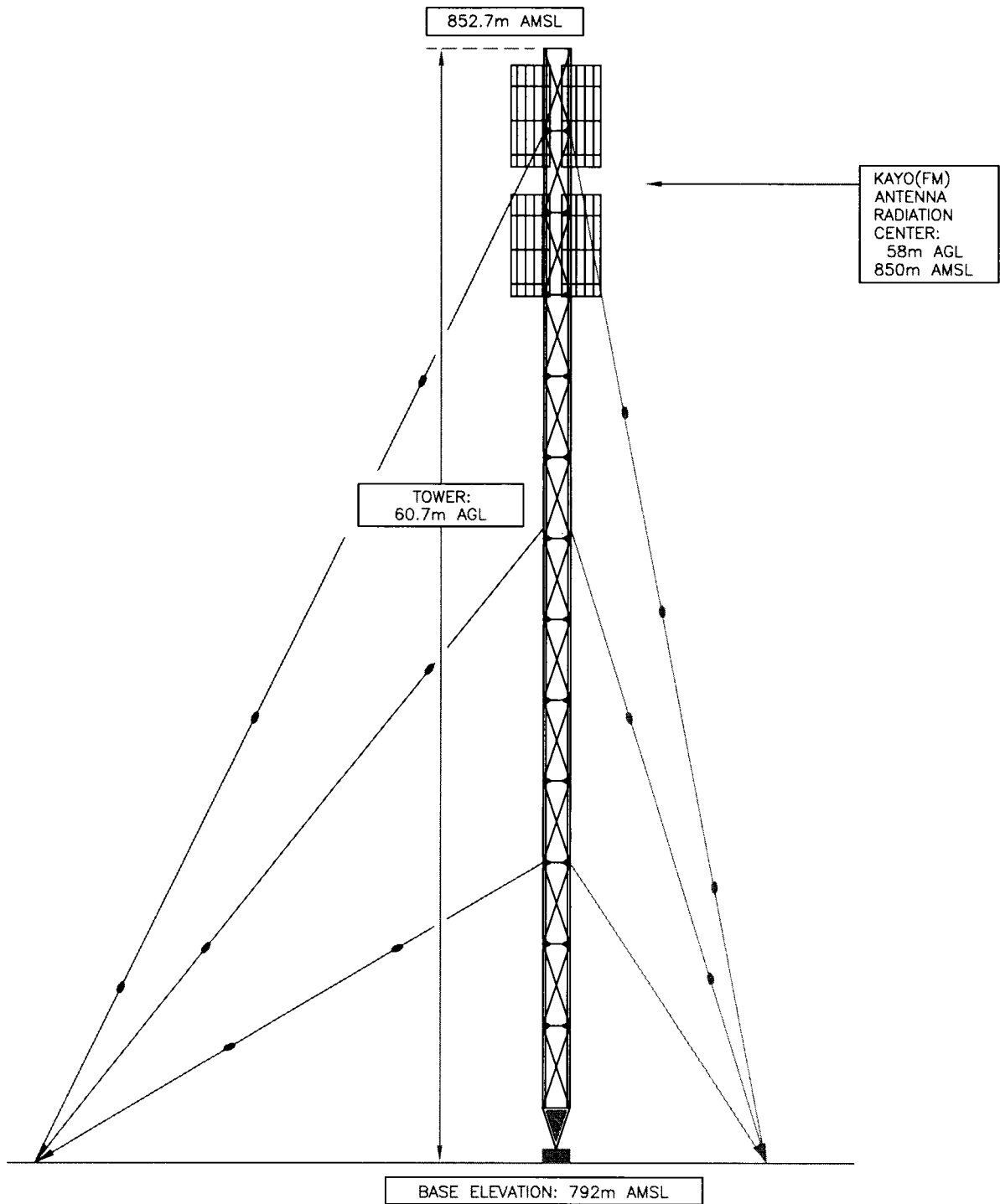
Maximum Power Density is 21.6 $\mu\text{W}/\text{cm}^2$ at 102 meters from the antenna structure.

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b. Blanketing Contour

The 115 dBu contour for the proposed facilities extends 1.4 kilometers from the tower, based on the calculation methodology shown in §73.318 of the Commission's Rules. Much of the area within the blanketing contour is unpopulated. The height of the proposed antenna above ground and its vertical radiation characteristics should mitigate any adverse effects to nearby residents or other communications facilities. If such adverse effects occur, the applicant will be responsible for their amelioration as prescribed in §73.318, including receiver-induced intermodulation to facilities in existence or authorized or receivers in use prior to grant of this application.





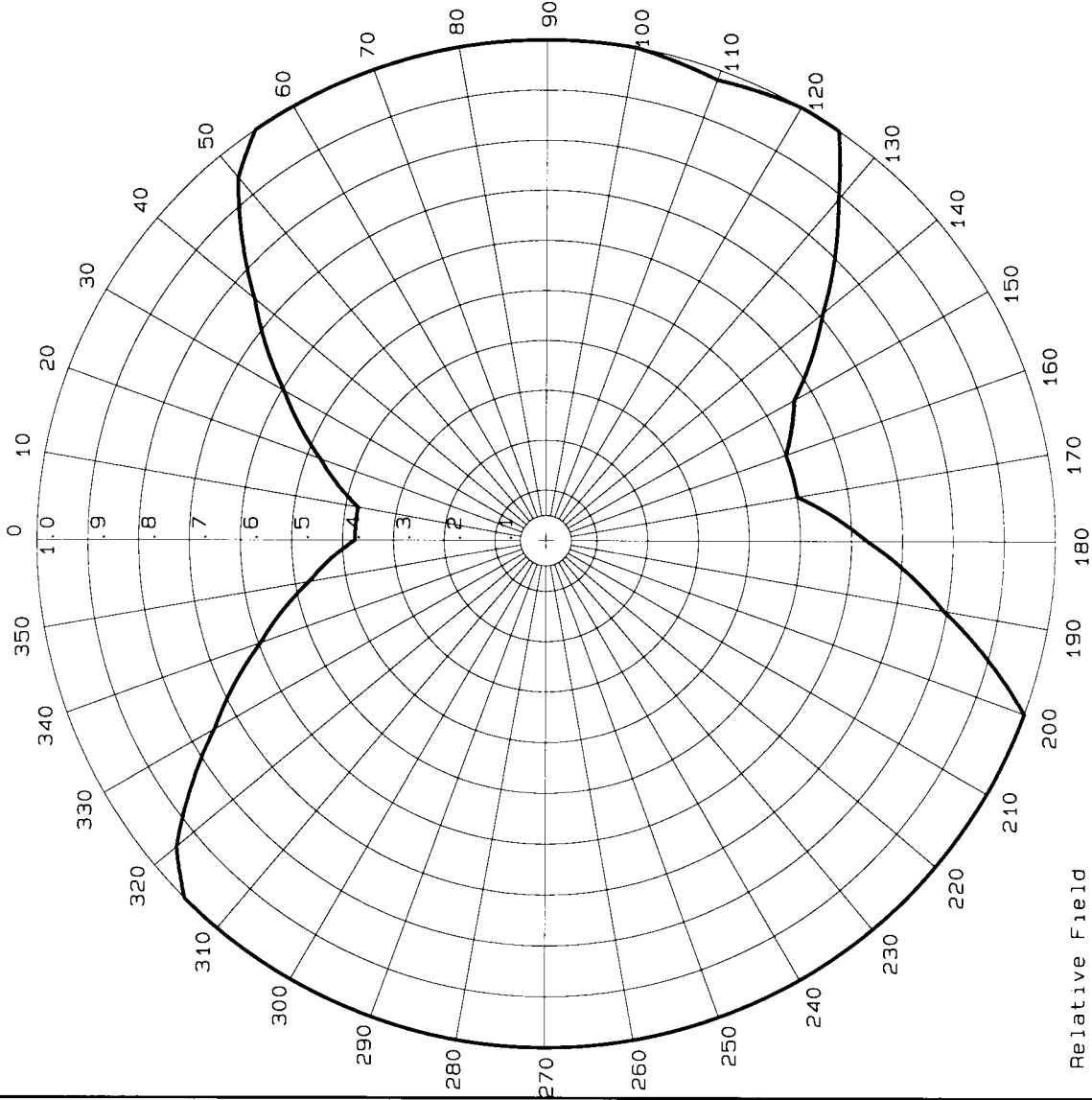
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KAYO(FM)

EXHIBIT B-6
VERTICAL PLAN SKETCH
ELMA, WA

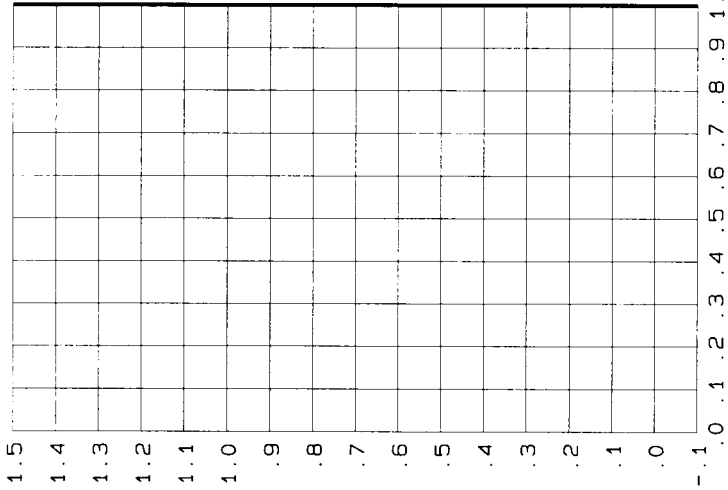
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HORIZONTAL PLANE PATTERN



VERTICAL PLANE PATTERN

Azimuth: .0



Pattern file: D:\KAYO\KAYOCAP.PAT

Exhibit B-12A

Envelope Pattern Plot

KAYO(FM)

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FIELD ELEVATION PATTERN

ANT. MFG.: SHIVELY LABS

ANT. TYPE: 6810-2-SS

Exhibit B-12B

Vertical Plane Pattern Plot

KAYO(FM)

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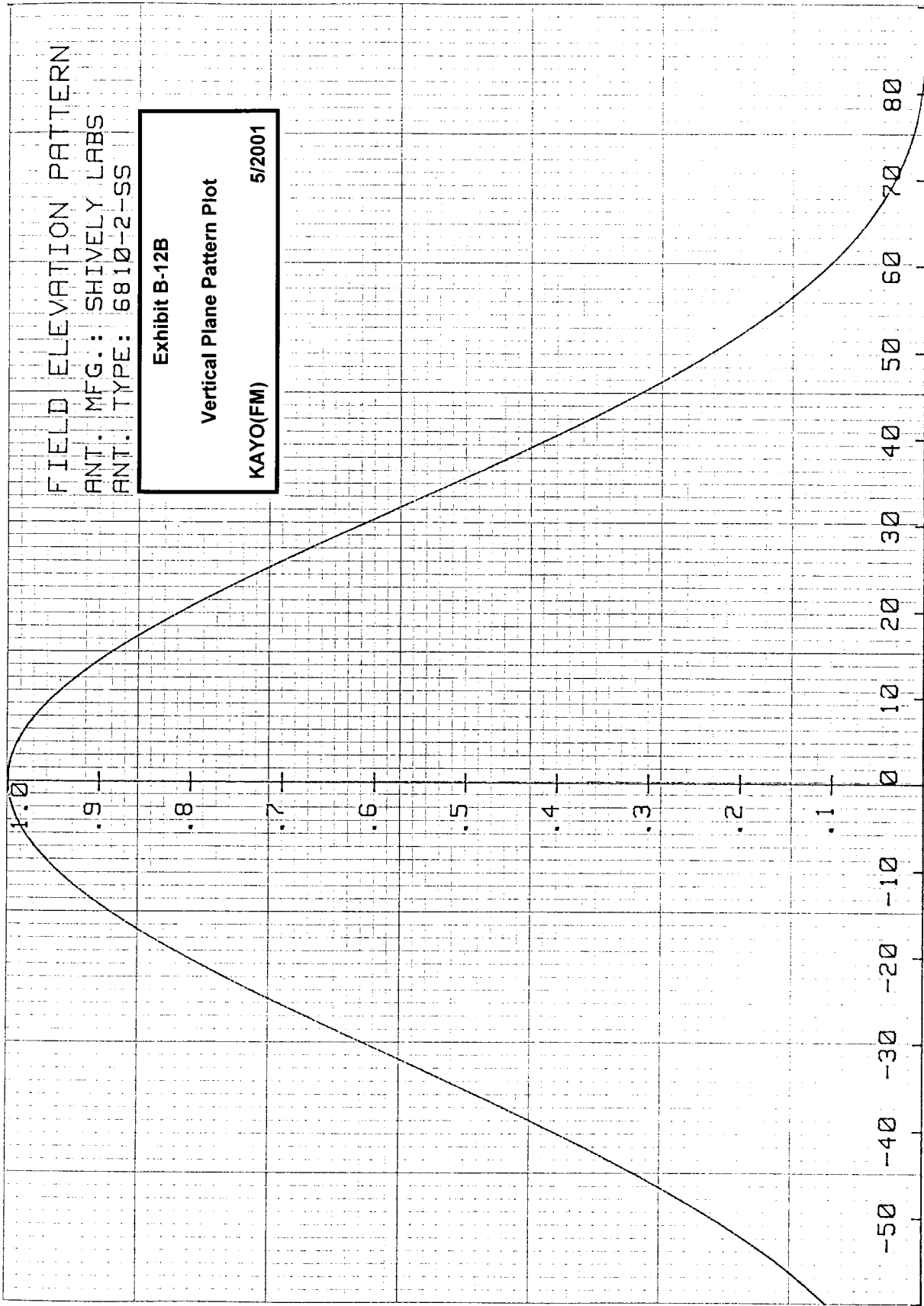


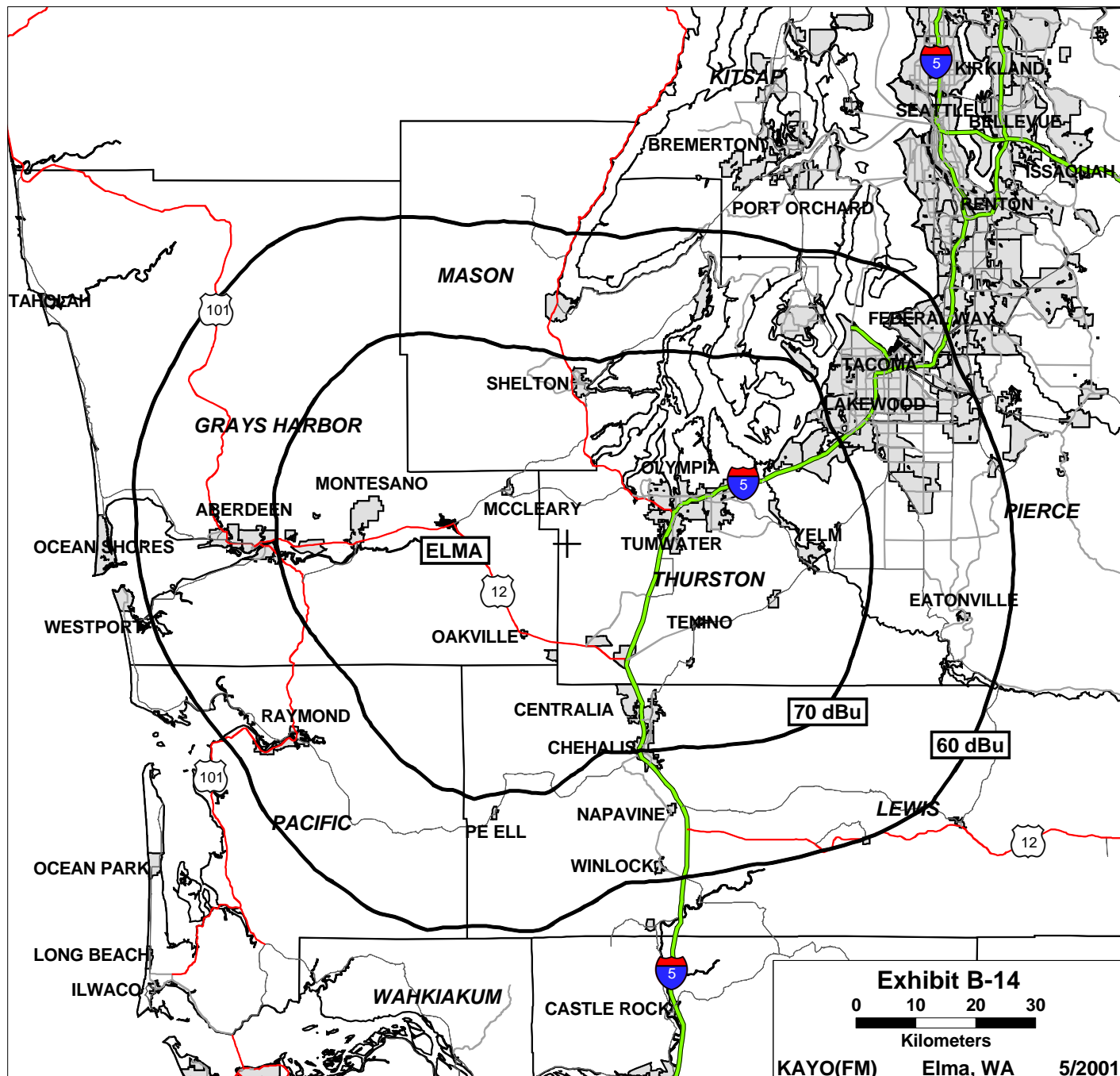
Exhibit B-12C

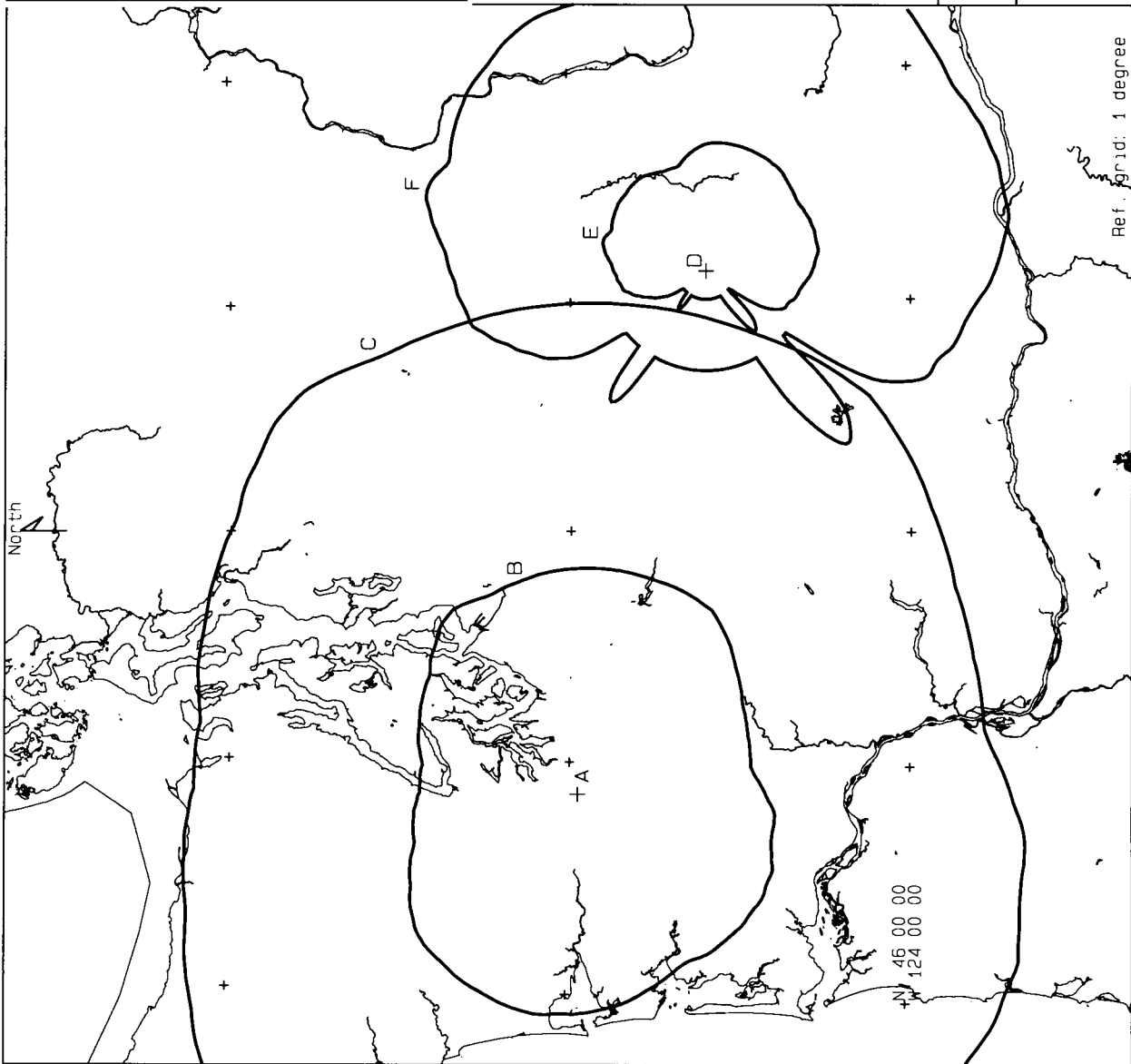
Directional Antenna Statement

The proposed antenna is a 2-level Shively panel antenna system, which will be side mounted on a uniform cross-section guyed tower. The characteristics of the tower and intended orientation of the antenna will be specified by the manufacturer as a part of the design information submitted with the license application.

The proposed antenna will not be mounted at the top of a tower which contains a top-mounted platform, and no other antennas will be mounted with horizontal or vertical proximity less than that specified by the manufacturer.

A certification of the mounting and orientation of the antenna from a licensed surveyor, or in states where permitted, a licensed engineer authorized to perform surveying work, will be provided with the license application.



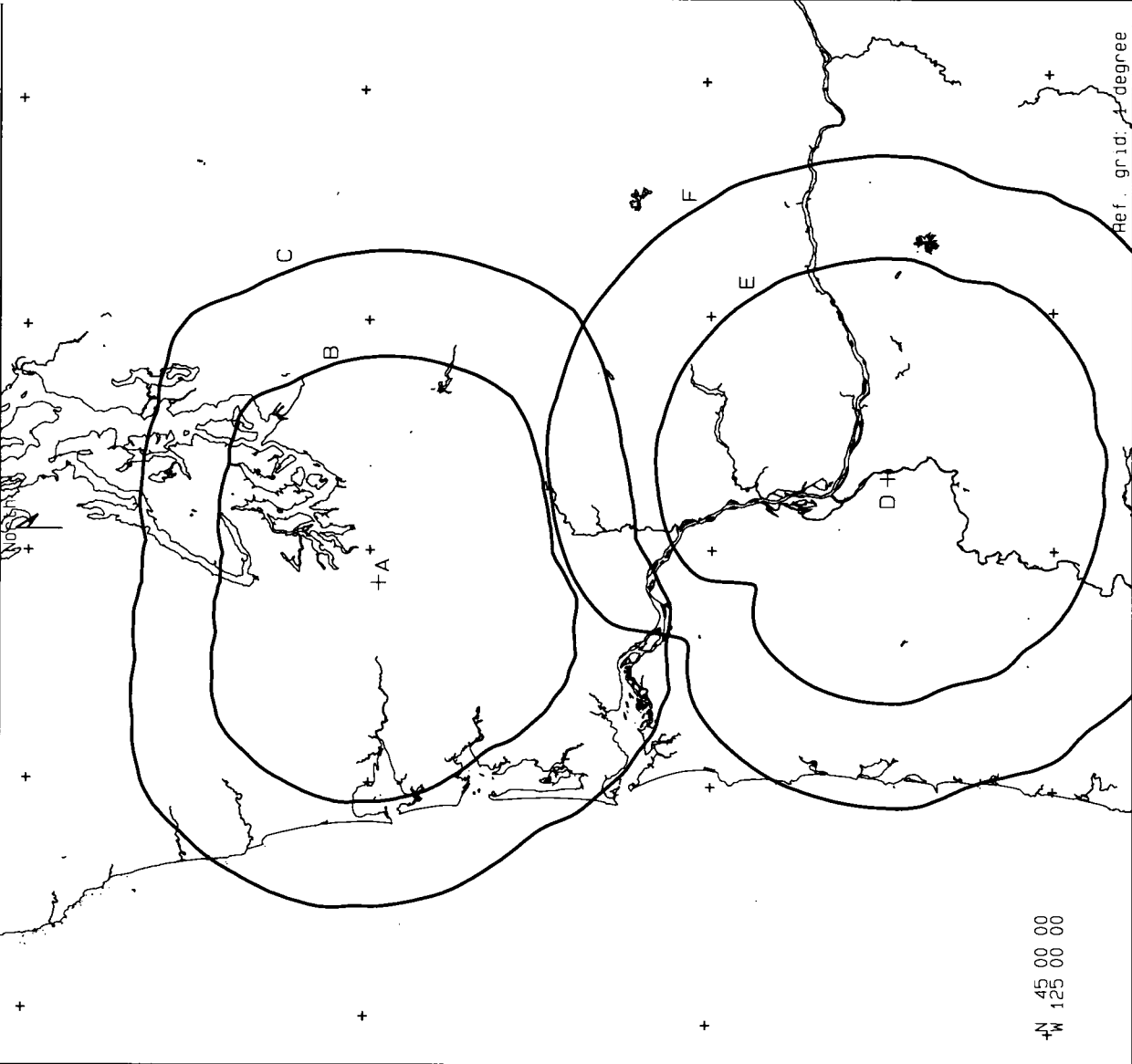


Ref. grid: 1 degree

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Exhibit B-16 Cochannel Allocation Study Map		
KAYO(FM)		257C1
Proposed		Elma, WA
A	Transmitter Site	
B	60 dBu F(50,50) Contour	
C	40 dBu F(50,10) Contour	
KREW(FM)		257A
Licensed		Naches, WA
D	Transmitter Site	
E	60 dBu F(50,50) Contour	
F	40 dBu F(50,10) Contour	
Note: KREW contours are based on actual facilities, as KREW is authorized under §73.215.		



Allocation Study Map
Hatfield and Dawson
KAYO (FM)
May 2001



HATFIELD & DAWSON SEATTLE, WA

Exhibit B-16
First Adjacent Channel
Allocation Study Map

KAYO(FM) 257C1
Proposed Elma, WA

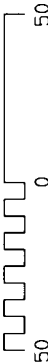
A Transmitter Site
B 60 dBu F(50,50) Contour
C 54 dBu F(50,10) Contour

KWJJ(FM) 258C1
Licensed Portland, OR

D Transmitter Site
E 60 dBu F(50,50) Contour
F 54 dBu F(50,10) Contour

Note: KWJJ contours are based on maximum
Class C1 facilities of 100 kW at 299 m HAAT.

KILOMETERS



Allocation Study Map

Hatfield and Dawson

May 2001

KAYO (FM)

6. Statement of Engineer

This Engineering Report, which is part of an application for facilities changes for FM station KAYO at Elma, Washington, has been prepared under my direct supervision. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Engineer in the States of Washington and California.

Signed this 30th day of May, 2001.

Benjamin F. Dawson III, P.E.

Hatfield & Dawson Consulting Engineers