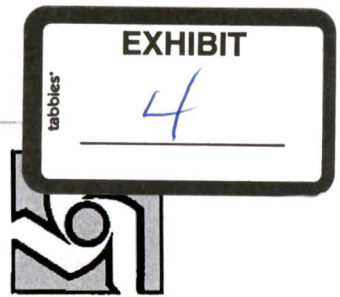


**BASIN ELECTRIC
POWER COOPERATIVE**

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503
PHONE: 701-223-0441 FAX: 701-557-5336



August 22, 2013

Darrell Nitschke
Executive Director
North Dakota Public Service Commission
600 East Boulevard, Dept 408
Bismarck, ND 58505-0480

Re: Case No. PU-11-696
Basin Electric Power Cooperative
AVS-Neset 345-kV Transmission Project
Siting Application

Dear Mr. Nitschke:

Enclosed for filing please find an electronic CD, an original and ten (10) copies of Basin Electric Power Cooperative's map books for the Route and Structures Applications. In addition you will find an original and ten (10) copies of the Mercer County Conditional Use Permit and the Noise Analysis for the Tande and Gumbo Creek Substations. The Conditional Use Permit and Noise Analysis have been submitted electronically directly to the docket.

Sincerely,

A handwritten signature in black ink that reads "Cris Miller".

Cris Miller
Senior Environmental Project Administrator

cm/sr
Enclosures

cc: Casey Jacobson w/o
Duey Marthaller w/o

Memorandum



Date: February 18, 2013
To: Cris Miller, Basin Electric Power Cooperative
From: Gabriel Weger, Burns & McDonnell
Subject: Tande Substation Preliminary Noise Analysis

Burns & McDonnell has analyzed the preliminary, expected sound contribution from the proposed Tande Substation, located near Tioga, North Dakota for Basin Electric Power Cooperative. The model analyzed the sound levels expected at the three nearest residences due to the two 600 MVA transformers at Basin's Tande Substation.

Department of Housing and Urban Development (HUD) Criteria

The substation will be located in Dunn County, which does not have any applicable noise ordinances. The state of North Dakota has a noise statute based on nuisance, but provides no decibel levels that must be achieved. Therefore, this project will be compared to HUD guideline noise levels for residential areas. HUD developed formal requirements related specifically to noise in 1971 (23 CFR 772). The noise regulations set forth the exterior noise standards seen in Table 1 for new housing construction assisted or supported by HUD. These noise levels are based on an L_{dn} noise level. L_{dn} is the day/night sound level, in which the average, steady sound levels (L_{eq}) are time weighted, with a 10-dB penalty applied during nighttime hours (i.e., if L_{eq} sound levels are 45 dBA, then the nighttime sound levels are artificially inflated to 55 dBA for the calculation of L_{dn}). Table 1 also lists the appropriate noise attenuation required by the HUD regulations for housing construction that is assisted by HUD.

Table 1
HUD Site Acceptability Standards

Noise Level, L_{dn} (dBA)	Acceptability	Attenuation Level Required
Not exceeding 65	Acceptable	None
65 to 75	Normally not acceptable	5 dB attenuation above the attenuation provide by standard construction required in 65 to 75 L_{dn} zone, 10 dB attenuation in 70 to 75 L_{dn} zone
Exceeding 75	Unacceptable	N/A

Based on the HUD guidance for new construction, an L_{dn} of 65 dBA will be considered acceptable for the residences near the substation. For the purposes of this memo, the predicted noise levels from the transformers at the substation were compared to the HUD standards.



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Page 2

Modeling Methodology

The transformers expected to be installed at the Basin Tande Substation will be 345/230 kV transformers with a rating of 600 MVA. The sound profile for the transformers was calculated using the equations from the Electric Power Plant Environmental Noise Guide¹ and then normalized so the transformer would emit sound pressure levels of 75 dBA two meters from the unit. This is consistent with the quieted, 600-MVA transformers installed at the Judson Substation. The expected sound-power profile created and modeled for the transformers is shown below in **Table 2**.

**Table 2
Expected Transformer Sound Profiles**

Transformer	Maximum Transformer Rating (MVA)	Transformer Sound Power Level (L _w) at Octave Band Frequency (Hz) (dBA)									Normalized Value (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Basin	600	90	96	98	93	93	87	82	77	70	102

Receivers were placed around the expected fence line and at the three closest residences to the proposed substation. See Figure 1 in Attachment 1 for locations of the sound receivers. The sound metric L_{dn} was calculated to compare with the HUD standards. HUD considers 15 hours of daytime and 9 hours of nighttime when calculating L_{dn}. The predicted L_{eq} noise levels and the corresponding L_{dn} sound metrics are presented below.

Predicted Noise Levels

The modeled sound-pressure levels for the residential areas are shown below in Table 3. The fence line of the substation had modeled L_{eq} sound levels between 46.7 and 58.7 dBA, and L_{dn} values between 53.1 and 65.1 dBA.

**Table 3
Expected Sound Levels**

Receiver	Receiver Type	Sound Pressure Level (dBA)	
		L _{eq}	L _{dn}
House 1	Residence	34.9	41.3
House 2	Residence	40.5	46.9
House 3	Residence	42.8	49.2

¹ Electric Power Plant Environmental Noise Guide, Volume 1, 2nd Edition (Edison Electric Institute, 1984)

Memorandum *(continued)*



February 18, 2013

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HUD requirements state that L_{dn} sound levels cannot exceed 65 dBA at any residence. The highest-predicted L_{dn} impact at the nearby residences is 49.2 dBA. Therefore, it is not expected that operation of the Tande Substation will cause sound levels that exceed the HUD requirements. To graphically represent the expected sound impacts of the proposed substation, Figure 1 in Attachment 1 provides an L_{dn} sound-level isopleth in 5-dBA contour increments.

Gabriel Weger

Attachment 1: Tande Substation L_{dn} Contours

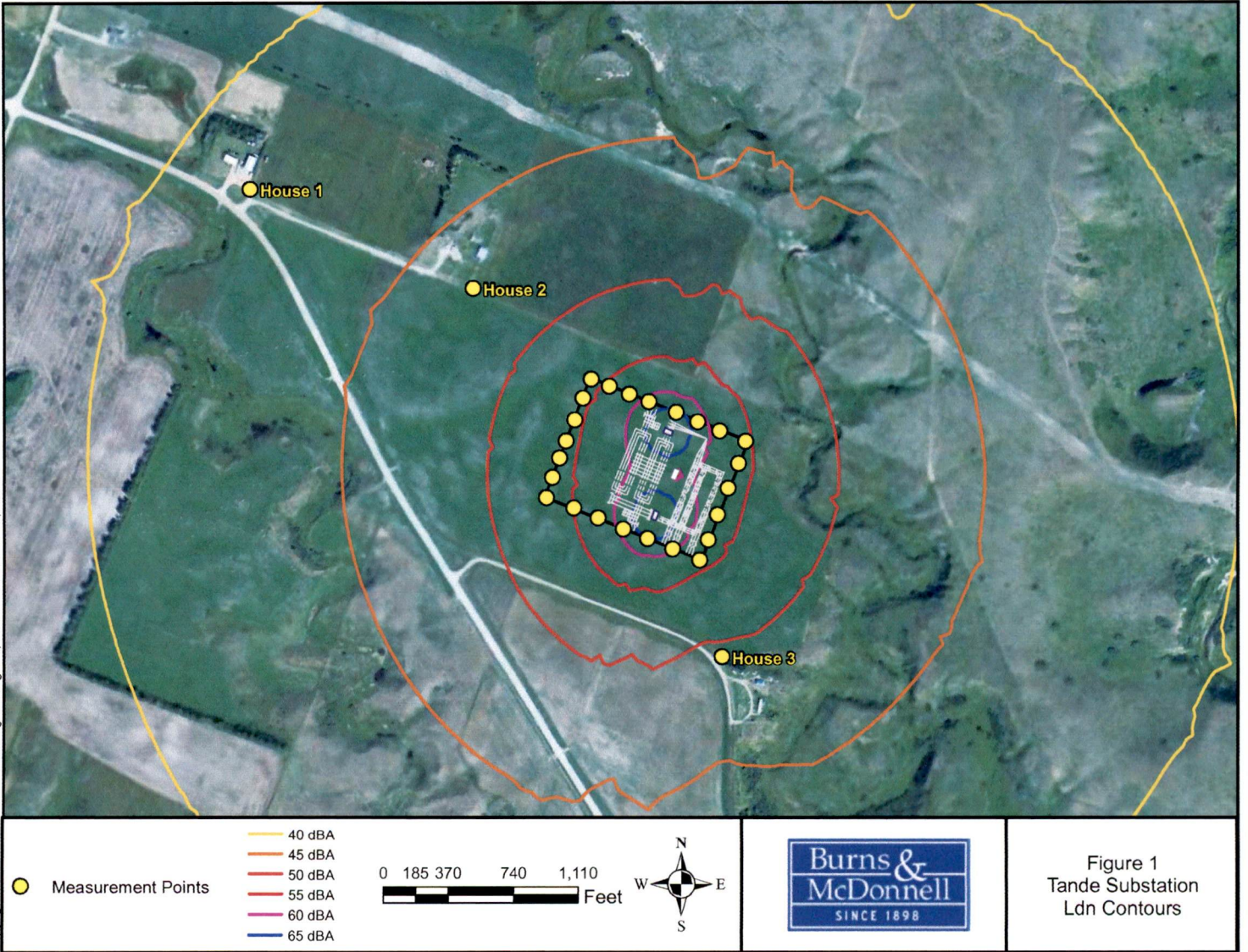


Figure 1
Tande Substation
Ldn Contours

Memorandum



Date: August 19, 2013
To: Cris Miller, Basin Electric Power Cooperative
From: Gabriel Weger, Burns & McDonnell
Subject: Gumbo Creek Substation Preliminary Noise Analysis

Burns & McDonnell has analyzed the preliminary, expected sound contribution from the proposed Gumbo Creek Substation, located near Killdeer, North Dakota for Basin Electric Power Cooperative. The model analyzed potential sound levels at the six nearest residences due to the installation of two 200-MVA transformers at Basin's Gumbo Creek Substation.

Department of Housing and Urban Development (HUD) Criteria

The substation will be located in Dunn County, which does not have any applicable noise ordinances. The state of North Dakota has a noise statute based on nuisance, but provides no decibel levels that must be achieved. Therefore, this project will be compared to HUD guideline noise levels for residential areas. HUD developed formal requirements related specifically to noise in 1971 (23 CFR 772). The noise regulations set forth the exterior noise standards seen in Table 1 for new housing construction assisted or supported by HUD. These noise levels are based on an L_{dn} noise level. L_{dn} is the day/night sound level, in which the average, steady sound levels (L_{eq}) are time weighted, with a 10-dB penalty applied during nighttime hours (i.e., if hourly L_{eq} sound levels are predicted to be 45 dBA, then the nighttime sound levels are artificially inflated to 55 dBA for the calculation of L_{dn}). Table 1 also lists the appropriate noise attenuation required by the HUD regulations for housing construction that is assisted by HUD.

Table 1
HUD Site Acceptability Standards

Noise Level, L_{dn} (dBA)	Acceptability	Attenuation Level Required
Not exceeding 65	Acceptable	None
65 to 75	Normally not acceptable	5 dB attenuation above the attenuation provide by standard construction required in 65 to 75 L_{dn} zone, 10 dB attenuation in 70 to 75 L_{dn} zone
Exceeding 75	Unacceptable	N/A

Based on the HUD guidance for new construction, an L_{dn} of 65 dBA will be considered acceptable for the residences near the substation. For the purposes of this memo, the predicted noise levels from the transformers at the substation were compared to the HUD standards.



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Modeling Methodology

The transformers proposed to be installed at the Gumbo Creek Substation will be 345/115-kV transformers with a rating of 200 MVA. The sound profile for each transformer was calculated using the equations from the Electric Power Plant Environmental Noise Guide¹. The sound-power profile created and modeled for the transformers is shown below in **Table** . The layout for the substation was based off of Basin’s Tande Substation. Tande Substation is a 345/230-kV substation but will have a similar layout to the Gumbo Creek Substation. The analyzed site layout is provided in Figure 1.

Table 2
Expected Transformer Sound-Power Profile

Transformer	Maximum Transformer Rating (MVA)	Transformer Sound Power Level (Lw, dBA) at Octave Band Frequency (Hz)									Normalized Value (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Basin	200	99	105	107	102	102	96	91	86	79	111

Receivers were modeled at the six closest residences to the proposed substation. See Figure 2 for locations of the sound receivers. The sound metric L_{dn} was calculated for each receiver to compare with the HUD standards. HUD considers 15 hours of daytime and 9 hours of nighttime when calculating L_{dn} . The predicted L_{eq} noise levels and the corresponding L_{dn} sound metrics are presented below.

Predicted Noise Levels

Using industry-accepted sound modeling software, the expected sound-pressure levels were predicted. The software is a scaled, three-dimensional program which takes into account each piece of sound-emitting equipment on site and predicts future sound-pressure levels over an area of interest. The model calculates sound propagation based on ISO 9613-2:1996, General Method of Calculation. ISO 9613-2 assesses the sound levels based on the Octave-Band Center-Frequency range from 31.5 Hz to 8000 Hz. The atmospheric conditions were assumed to be calm, and the temperature and relative humidity were left at the program default values.

The modeled sound-pressure levels for the residential areas are shown below in Table 3. The sound levels modeled do not include background noise, as it varies with location and time of day. For results that more accurately represent the total sound levels experienced at the residences, an ambient noise survey would need to be conducted. The noise generated from the substation

¹ Electric Power Plant Environmental Noise Guide, Volume 1, 2nd Edition (Edison Electric Institute, 1984)

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would then be added to the noise from the gas wells and other ambient sources in the area to establish the overall noise expected at the residences.

Table 3
Expected Sound Levels

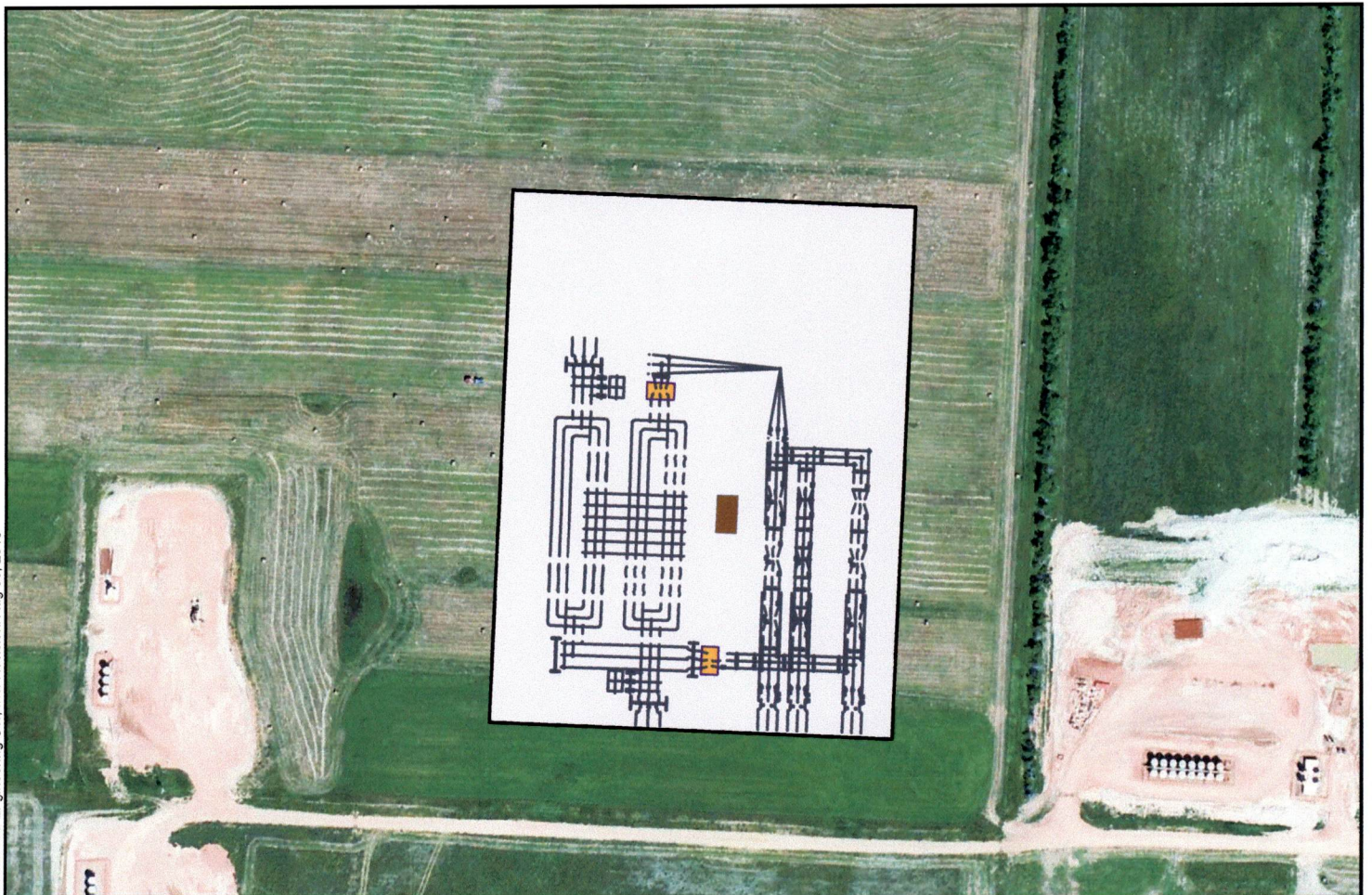
Receiver	Sound Pressure Level (dBA)	
	L_{eq}	L_{dn}
Residence 1	38.6	45.0
Residence 2	32.9	39.3
Residence 3	30.3	36.7
Residence 4	32.4	38.8
Residence 5	34.7	41.1
Residence 6	29.0	35.4

HUD requirements state that L_{dn} sound levels cannot exceed 65 dBA at any residence. The substation is planned for a rural area with the closest residence being over 1 kilometer away. The highest-predicted L_{dn} impact at the nearby residences is 45.0 dBA. Therefore, it is not expected that operation of the Gumbo Creek Substation will cause sound levels that exceed the HUD requirements. To graphically represent the expected sound impacts of the proposed substation, Figure 3 provides an L_{dn} sound-level isopleth in 5-dBA contour increments.

Gabriel Weger

Attachments:

- Figure 1
- Figure 2
- Figure 3



- Transformers
- Building
- Substation Boundary

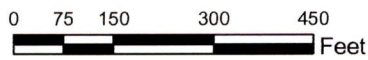


Figure 1
Gumbo Creek
Substation Layout

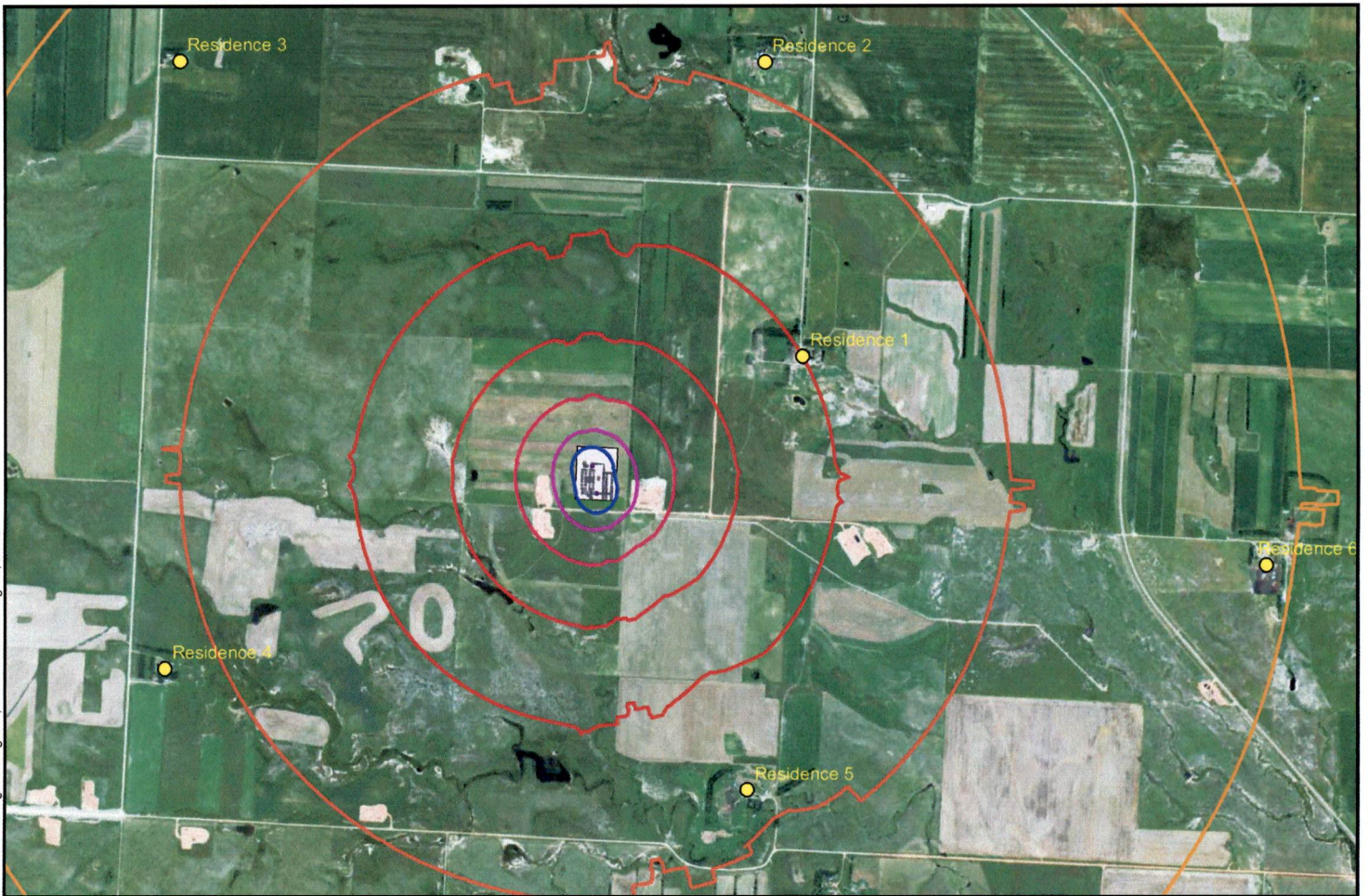


- Residence
- Substation Boundary



Figure 2
Gumbo Creek
Residence Locations

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- 30 dBA
- 35 dBA
- 40 dBA
- 45 dBA
- 50 dBA
- 55 dBA
- 60 dBA
- 65 dBA



Figure 3
Gumbo Creek
Ldn Noise Contours

RECEIVED AUG 21 2013

**MERCER COUNTY BOARD OF COMMISSIONERS
STANTON, NORTH DAKOTA**

**CERTIFICATE OF APPROVAL OF A CONDITIONAL USE
ZONING CASE 13-08-02**

ISSUED TO: Basin Electric Power Cooperative
1717 East Interstate Ave
Bismarck ND 58503


CONDITIONAL USE: 345-Kilovolt Transmission Line

LEGAL DESCRIPTION: Subject route, Sections 7,8,14,15,16,17, &23
T145N R88W. Sections 7,8,9,10,11 &12
T145N R89W. Sections 7,8,9,10,11 &12
T145N R90W of the 5th P.M. Mercer
County, ND

PLANNING COMMISSION: Recommended approval August 15th, 2013

REMARKS: Approved on condition of Public Service
Commission approval

Issued this 21st day of August 2013, by the Board of Mercer County
Commissioners.



Frank Bitterman, Chairman



Shana Brost, County Auditor