

# Rapid City Fifth Street Substation Upgrade and Expansion Project

*Improving life with energy*





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09SR026





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## Background

The Black Hills Power engineering and planning departments have identified the Fifth Street Substation as an area of concern because the age and type of existing equipment inside the facility is not capable of serving the projected load growth for the area.

The expansion and upgrade of the Black Hills Power Fifth Street Substation will improve system reliability and capacity in the Fifth Street area.

Black Hills Power has pursued other locations for the expansion, but this particular design and location combination addresses our needs most efficiently. Rebuilding the existing substation and adding an additional substation in another location would introduce problems with transmission line access and tying into existing distribution feeders.

The current site is located at the load center, has access to transmission lines and is the starting point for the distribution feeders we need to tie into.

Black Hills Power is working to find the best solution in balance with providing safe, reliable and affordable energy to our customers.





## Design Specifics

- Use of a low profile design to reduce visual impact on the neighborhood:
  - All new transmission lines into the substation and distribution feeder lines coming from the substation will be installed underground
  - Removal of several tall steel equipment structures and certain overhead lines
- Appealing wrought iron fencing design around entire substation
- Extensive landscaping planned to maintain the aesthetics of the residential area
- Off-street parking available for maintenance vehicles
- Noise levels are equal to or less than existing station and meet the City's Growth Management Department guidelines
- One control building, rather than two presently on site

## Timeline

- Black Hills Power submitted the proposed expansion plan to the Rapid City Growth Management Department in March, 2009.
- Black Hills Power participated in a Public Input Meeting sponsored by the City of Rapid City on June 10, 2009.
- City Council will meet August 17, 2009 on Fence Height Exception
- Planning Commission will decide Substation Expansion once Fence Height Exception is approved
- Construction would start fall of 2009 and be completed in summer of 2010





## Fence Design

Black Hills Power is working on a substation fence design that provides a balance between functionality and aesthetics. Black Hills Power understands that area residents would like to see a fence tailored to meet the aesthetics of a residential neighborhood.

Black Hills Power is required by code to install, at minimum, a seven foot high fence. We originally submitted an application for a standard seven foot tall chain link fence, with an additional foot of barbed wire. This fence design was denied by the City's Public Works Department and City Council members.

Black Hills Power then submitted a concrete wall application as an alternative. But it was also rejected due to shortcomings which included lack of air movement, snow drifting and diminished views.

As another alternative, substation neighbors and City Council members suggested a wrought iron fence as a suitable application. We feel this third fence design option offers the best solution, balancing form with function.

Black Hills Power has agreed to install an eight foot high wrought iron fence, similar to the designs on page 6, with brick/concrete corner/gate posts around the outside perimeter of the substation. This is the latest design submitted for approval to the Rapid City Public Works Committee.





5th Street Substation, Typical Corner/Gate Post



5th Street Substation, Typical Fence Section





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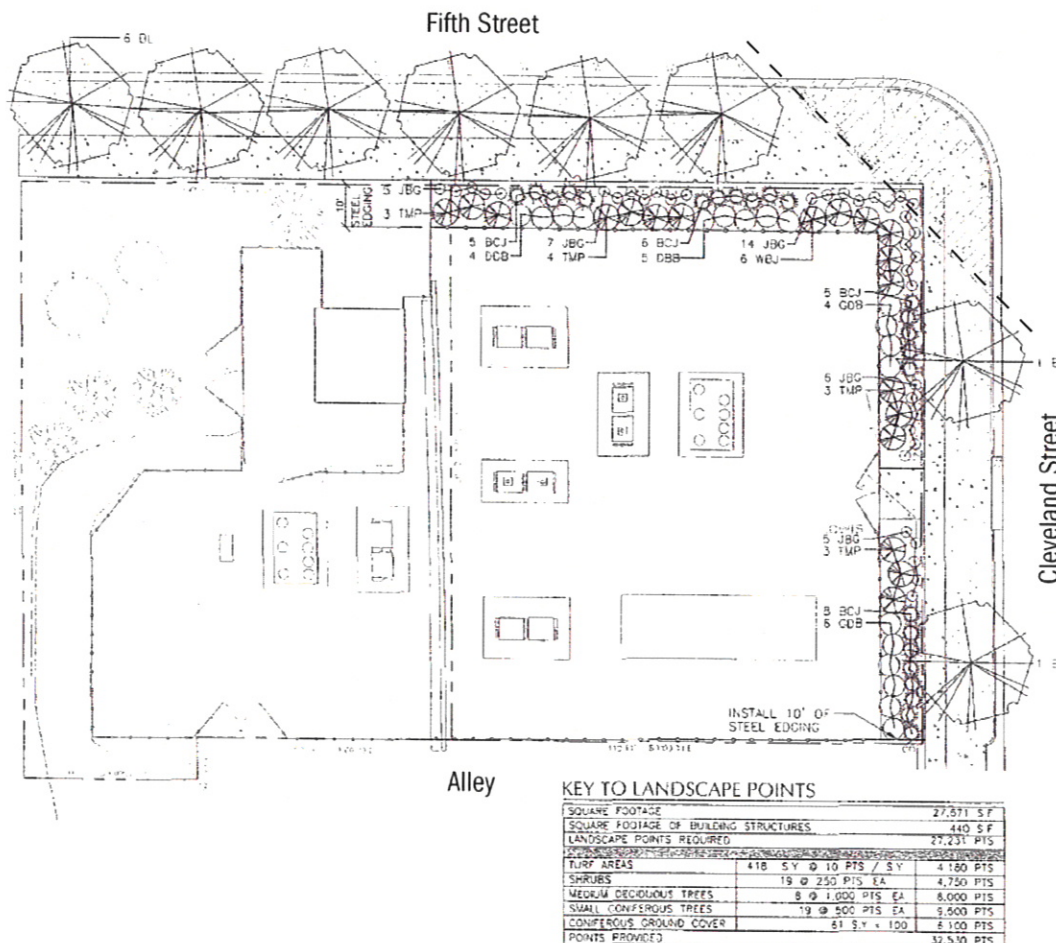
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## Landscaping

The landscaping design, provided by Wyss Associates, meets all City guidelines for visibility and safety at the intersection of Cleveland and Fifth Street. It includes small shrubs and bushes on the street side perimeter of the substation fence, as well as some larger trees in the boulevard.

A wide angle picture of the proposed expansion property as it exists today and an artist rendition of the proposed design can be seen on pages 11-14 of this document.







## Noise Level Information

The substation has been designed in such a way to specifically address impacts to the adjacent landowners. The new transformer on the expanded facility was placed as far toward Fifth Street as possible, while the available land and a control building were placed between the transformer and the alley. This design will help to minimize the noise levels on the east side of the new addition.

- The City's Growth Management Department Staff Report dated June 25, 2009 set the acceptable noise rating of 65 db to 70 db within a residential district.
- Black Hills Power has taken noise level readings at various locations on the outside perimeter of the substation fence. Noise level readings were taken under normal operating conditions as well as with the fans on. These readings indicate that we are within the guidelines provided by the City's Growth Management Department.
- The majority of the noise within a distribution substation originates from the transformers. Both transformers on site will be replaced and will meet guidelines set by the City's Growth Management Department.





## Alternate Options Studied

The existing Fifth Street substation location has most of the distribution infrastructure in place to deliver power directly to customer loads in the area. This substation serves the entire commercial and residential load in the area as well as the Rapid City Regional Hospital.

Constructing a new substation away from the load center would expose our customers to potential reliability issues, and would introduce the need for additional distribution infrastructure through the area. A new substation would not entirely satisfy load growth requirements in the area. The existing Fifth Street substation would still need to be expanded and/or upgraded to ensure delivery of safe, reliable service.

### Alternate Locations:

Transmission line access, load center considerations and distribution line infrastructure must be taken into account when determining whether or not a location will be suitable to house a distribution substation. Black Hills Power has pursued alternate sites in the area, but the current site offers the most reliable and cost-effective option for serving existing and projected load growth requirements in the area.

Below are alternate substation site locations that have been considered by Black Hills Power and a brief description of why they were not selected.

- A site north of the St. Thomas Moore School and south of Oakland Street was considered as a potential site for a new substation. St. Thomas Moore was not interested in selling this property to Black Hills Power.
- A site on the east side of Seventh Street between Cleveland and Indiana Streets was also looked at as an alternative. Black Hills Power and City Staff members were in agreement that it would be a better option to expand the existing Fifth Street substation rather than introduce a new substation into another residential neighborhood.





- A site west of Fifth Street and south of the Hospital was also investigated as a potential site, but it was located too far from existing load to be practical. A new substation would have to be built and the existing substation would need to be upgraded to effectively serve load.
- The site across from McDonalds, as suggested by neighbors who live adjacent to the existing substation, was looked at but was not considered a viable option. A long drainage ditch that crosses the entire site is positioned in such a way that it would prevent proper placement of required substation equipment.
- Reconstructing the Fifth Street substation on the existing piece of property without expansion was also considered. The plan was rejected because the existing piece of property is not large enough to accommodate the additional required facilities.
- Black Hills Power has a substation south of Catron Boulevard that serves to the north of Catron Boulevard on Fifth Street. Serving additional load from that site is not practical because the distance to the load center is excessive.



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**Before**  
Cleveland  
Street View



**After**  
Cleveland  
Street View  
Artist  
Rendering









# Rapid City Fifth Street Substation Upgrade and Expansion Project

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**Before**  
Fifth Street  
View



**After**  
Fifth Street  
View Artist  
Rendering











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Rapid City Growth  
Management Department