

Pawnee-Daniels Park  
345kV Transmission Line Project

Site Plan Letter of Introduction

City of Aurora, Colorado

July 2017

Submitted by:



July 12, 2017

Steven Rodriguez  
City of Aurora  
Planning and Development Services  
15151 E. Alameda Parkway, 2<sup>nd</sup> Floor  
Aurora, CO 80015

Re: Pawnee-Daniels Park 345kV Transmission Line Project – Site Plan Application

Mr. Rodriguez:

As part of the Site Plan submittal, PSCo is providing the following Letter of Introduction for the Pawnee-Daniels Park 345kV Transmission Line Project. The other accompanying documents and additional requirements will be uploaded in conjunction with this letter to the City's "Development Review Plans Submittal and Referral Website".

This Letter of Introduction covers the required topics such as a description of the type of land use proposed, location of the project and justification for how the site plan conforms to the City's site plan criteria. However, in addition, I've provided some supplementary information that will hopefully answer some of the questions that I anticipate will be brought up at the Planning and Zoning Commission public hearing. Topics covered in the supplementary information include purpose and need, regulatory requirements, development schedule, public outreach efforts, electric and magnetic fields, noise, property values and underground vs. overhead construction.

I look forward to working with you on this crucial regional transmission line project that will not only benefit the City of Aurora but countless residents and businesses along the Front Range.

Please feel free to reach out to me at any point in the review/referral process with questions or comments.

Respectfully,



Derek Holscher, Principal Agent  
Direct - 303.571.7284  
Cell - 720.837.4742  
[derek.d.holscher@xcelenergy.com](mailto:derek.d.holscher@xcelenergy.com)

### Name of Applicant

Public Service Company of Colorado  
1800 Larimer Street Suite 400  
Denver, CO 80202

Xcel Energy is a major U.S. electric and natural gas company with regulated operations in eight Western and Midwestern states. Xcel Energy provides a comprehensive portfolio of energy-related products and services to 3.5 million electric customers and 2 million natural gas customers through four operating companies. As a point of clarification, the utility company name is Xcel Energy; however, the legal owner and operator of the utility facilities in Colorado is the operating company, Public Service Company of Colorado. All utility facilities and related land rights, including fee property, easements, permits, are owned by operated by and held in the name of Public Service Company of Colorado, a Colorado Corporation (PSCo).

### Description of the Request

Of the overall 125 mile Pawnee-Daniels Park 345 kilovolt (kV) Transmission Line Project (the Project), approximately 3.9 miles of new transmission line and 1.4 miles of rebuilt transmission line will be located within the City of Aurora. The entire alignment is within an existing high-voltage electric transmission corridor, the majority of which is owned by PSCo. The new and rebuilt transmission lines will be installed within an existing utility corridor adjacent to the existing transmission lines.

PSCo proposes to construct a new, double-circuit 345-kilovolt (kV) transmission line to connect its existing Pawnee Substation near Brush, Colorado, to its Daniels Park Substation south of the Denver metro-area. The 125-mile project, 3.9 miles located within the City of Aurora, is part of PSCo's Senate Bill 07-100 portfolio and is a critical component of the Colorado long range transmission plan. It will allow for the interconnection and delivery of new generation resources, including renewable energy to Front Range customers to meet new load growth and improve system reliability. PSCo resource plans will require additional generation resources in the future which could be comprised of both conventional and renewable resources. The resource plans may include development of gas-fired, solar and wind generation in the area northeast of the Denver-metro area. The Project would interconnect with the existing Missile Site Substation, near Deer Trail, and include a new 345kV transmission line between the Smoky Hill Substation in Aurora and the Daniels Park Substation. The Project includes improvements at several substations including the Daniels Park Substation, Smoky Hill Substation and one new substation (Harvest Mile) in Arapahoe County. The Project will also require rebuilding 1.4 miles of existing transmission line in Aurora from single circuit 230kV wood H-frame structures to double circuit 345kV steel monopole structures.

The Project is broken into 4 different components (see Figure 1):

1. String 13 miles of new 345kV line on existing structures from the Missile Site Substation west to a point near the Town of Byers
2. Rebuild 29 miles of the existing line and structures from single-circuit 230kV to double-circuit 345kV, starting at Smoky Hill Substation heading east (1.4 miles in Aurora)
3. Construction of a new electric substation in Arapahoe County, just east of the Smoky Hill Substation (Harvest Mile)
4. Constructing 20 miles of new mono-pole structures and 345kV line between the existing Smoky Hill and Daniels Park Substations

Component # 4 is proposed to be constructed within an existing 210' wide utility corridor, adjacent to an existing 230kV double-circuit transmission line. The majority of the land within the corridor is owned by PSCo. For those areas not owned in fee, PSCo has retained an easement. The four (4) jurisdictions that make up component #4 include the City of Aurora, Town of Parker, Arapahoe County and Douglas County. The City of Aurora is the last stop for land use permit approvals as the other three (3) jurisdictions have approved the project. This application will cover the 3.9 miles of component #4 that lie within the City of Aurora and the 1.4 miles of component #2.

### Purpose of the improvements

Generally, the Project is consistent with PSCo's focus on creating a reliable high-voltage transmission network for delivering cost-effective energy resources to Colorado consumers. The Project will complete the loop in the 345kV backbone transmission system that runs through the Front Range from Pawnee to the Comanche Station in Pueblo, Colorado (see Figure 2) by expanding on the Pawnee-Smoky Hill 345kV Transmission Project, which went into service in 2013. PSCo designed the Pawnee-Smoky Hill Project so that it could be easily expanded to facilitate construction of the Project. That high voltage backbone will accommodate additional resources, improve system reliability, and enhance operational flexibility.

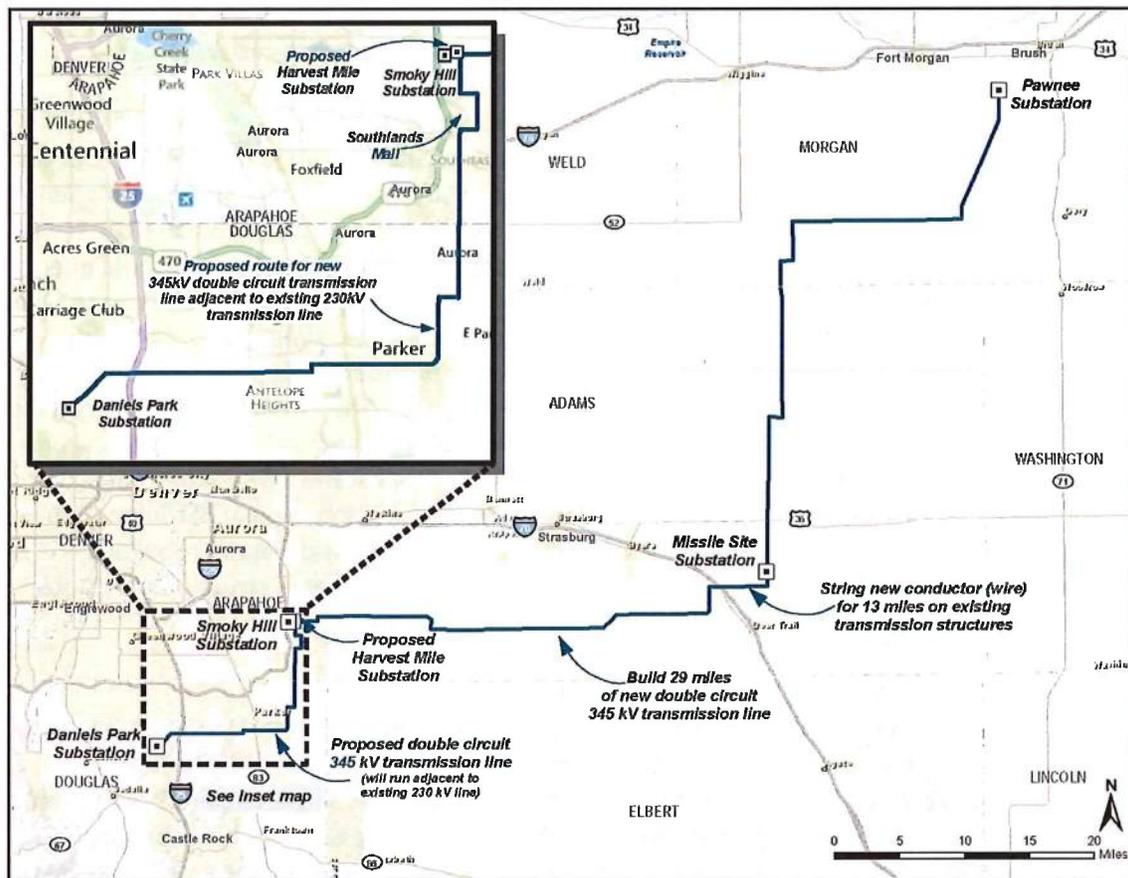


Figure 1-Project Overview Map

The original 230kV transmission system between Pawnee and the Denver-metro area, established in 1968, was contemplated for several hundred MW at or near the Pawnee power plant, which currently brings on approximately 800 MW from the Pawnee and Manchief power plants. The Pawnee-Smoky Hill Transmission Project was implemented to relieve transmission constraints and allow for interconnection of new generation resources. Since 2007, PSCo has added approximately 660 MW of wind generation in northeast Colorado that interconnects at Pawnee. An additional 850 MW of wind generation has been interconnected at the Missile Site Substation, which bisects the Pawnee-Smoky Hill 345kV line. As a result, the existing transmission system between Pawnee and the Denver-metro area has become constrained. Even though there is some flexibility due to the intermittent nature of the wind generation, there are increasing instances where the generation interconnected on that system has operated near maximum levels.

Moreover, the northeast region of Colorado continues to have a high potential for future resource developments, both gas and renewable resources (see Figure 3). Incremental transmission projects like the Project are a cost-effective way to access that generation. The Project will enable us to strengthen our backbone transmission capacity and alleviate constraints for operation of the existing generation in the project area.

#### Purpose and Need - Regulatory

When proposing a transmission line project of this scale, the Colorado regulatory process requires a utility to file a Certificate of Public Convenience and Necessity (CPCN) application with the Colorado Public Utilities Commission (CPUC). PSCo filed a CPCN for the Project on March 28, 2014. PSCo also requested that the CPUC make specific findings that the noise and electromagnetic field (EMF) levels resulting from the Project will be reasonable.

The CPUC referred the proceeding to Administrative Law Judge (ALJ) G. Harris Adams to conduct a public comment hearing and an evidentiary hearing and to prepare a recommended decision. On July 23, 2014, the ALJ held a public comment hearing in Parker, Colorado, where members of the public commented on the Project. On September 9, 2014, the ALJ held an evidentiary hearing and on November 25, 2014 the ALJ issued his Recommended Decision. The ALJ found that it is more probable than not that the future public convenience and necessity requires the Project because PSCo faces an additional resource need between 1,200 to 1,400 MW by 2024.

The ALJ determined that approval of the Project without further delay best assures the availability of transmission resources to deliver power corresponding with the development of new generation. Additionally, the ALJ found that the projected noise and EMF levels of the Project are reasonable. The ALJ therefore granted PSCo a CPCN for the Project.

The CPUC affirmed that the ALJ carefully determined the necessity of the Project consistent with the CPUC's growing familiarity with the proposed facilities and the future requirements of PSCo's overall system to meet customer loads and fulfill statutory objectives, including Senate Bill 07-100. The CPUC also noted that PSCo proved by a preponderance of the evidence that the future public convenience and necessity requires, or will require, construction of the Project.

The facts supporting this conclusion detailed in the Recommended Decision include additional capacity needs to transmit between 1,200 MW to 1,400 MW by 2024; the constraint on existing transmission

facilities supporting electric generation in northeast Colorado serving the Denver metropolitan area; and the inability of existing transmission to support future projected generation.

The CPUC also supports the ALJ's determinations that the projected noise levels and EMF levels for the Project are reasonable. Therefore, the CPUC adopted the ALJ's Recommended Decision and granted approval of the CPCN on March 11, 2015 (with the Decision mailed on April 9, 2015).

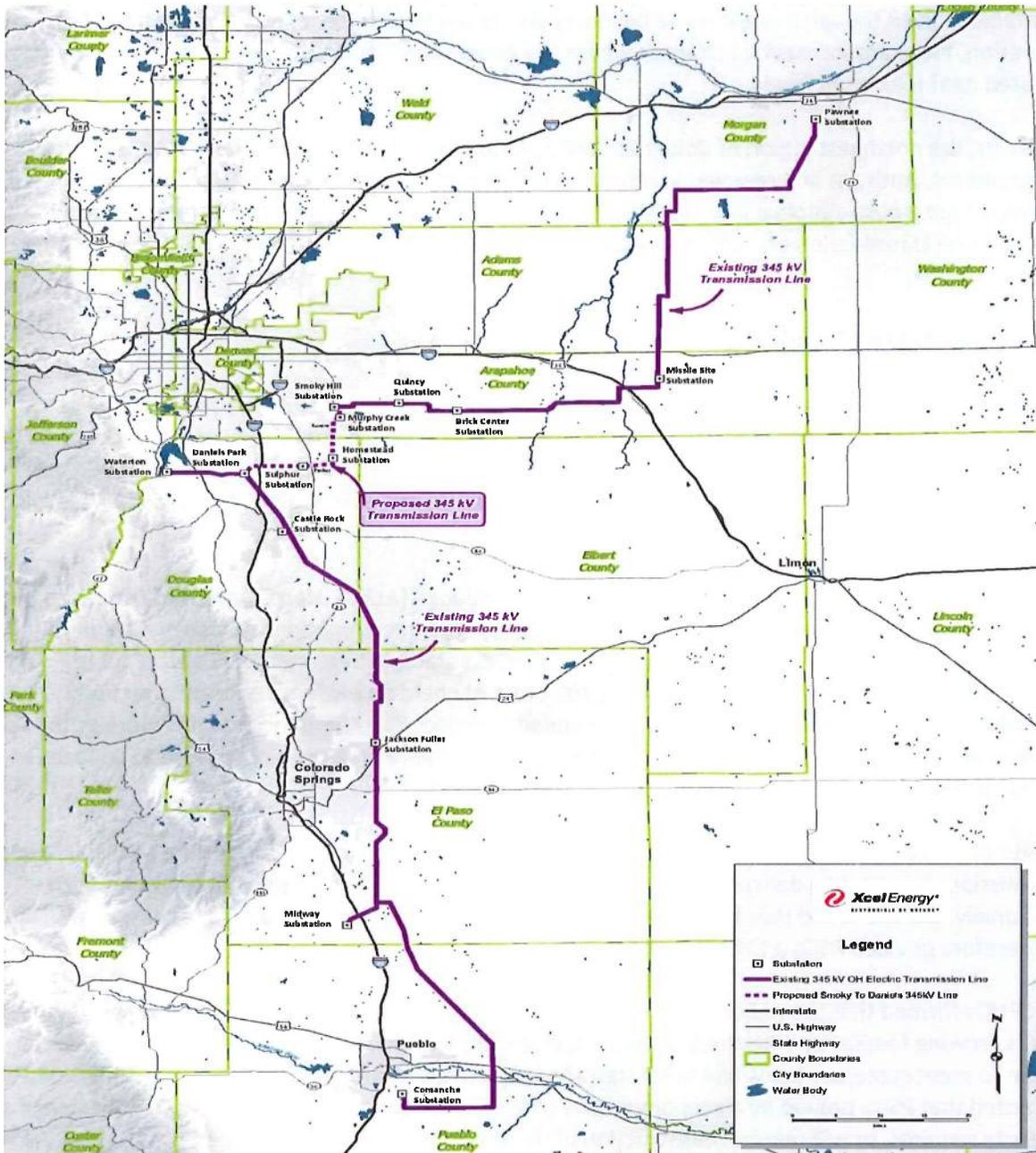


Figure 2 – 345kV System Map

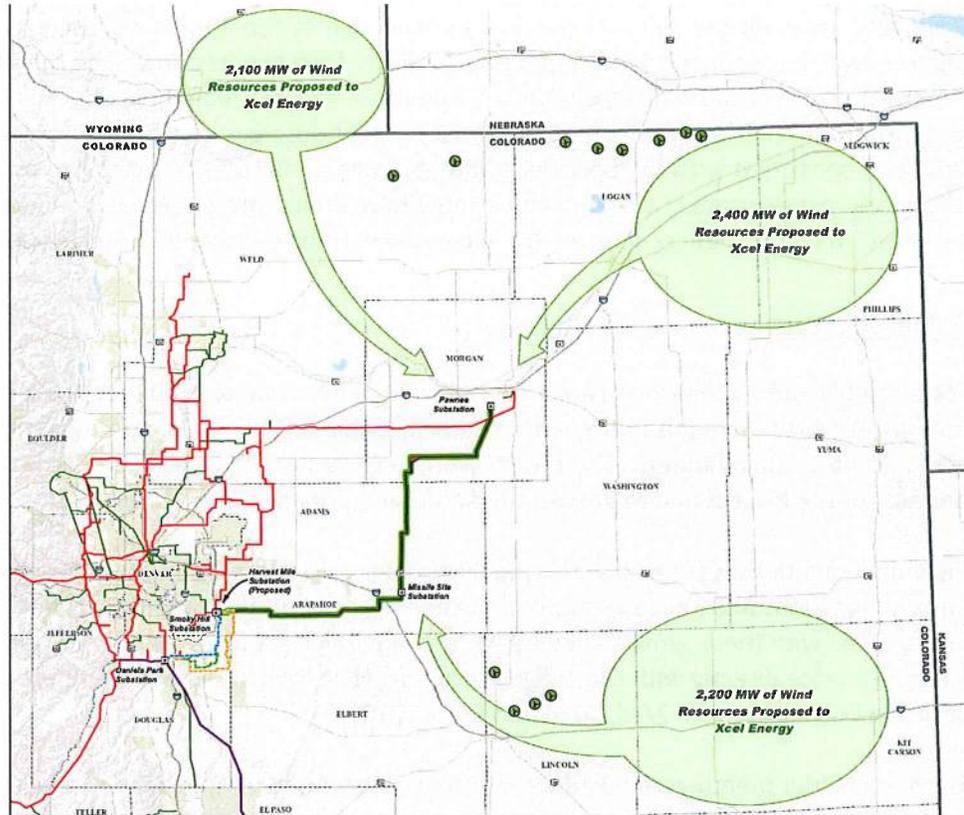
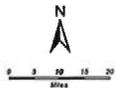
**Pawnee-Daniels Park  
 345kV Transmission Project**

**Wind Resources Proposed  
 to Xcel Energy**

1 Megawatt (MW) = 750 homes

**Legend**

- Existing Wind Generation (Includes Locations Not Owned by Xcel)
- Substation
- 115kV Transmission Line
- 230kV Transmission Line
- 345kV Transmission Line
- Pawnee-Smoky Hill 345kV Upgrade
- Route Alternative A (existing transmission corridor)
- Route Alternative B
- Route Alternative C
- County Boundary



**Figure 3 – Proposed Wind Resources Map**

General development schedule

According to PSCo’s Certificate of Public Convenience and Necessity (CPCN) that was approved by the Colorado Public Utilities Commission (CPUC) on March 11, 2015, the in-service date for the Project was slated for May 2022 with construction beginning in 2020. In May 2016, PSCo filed a petition with the CPUC asking them to modify their previous decision in order to accelerate the in-service date and start of construction. The modified dates included an in-service date of October 31, 2019 with construction beginning on January 31, 2019 for the Smoky Hills-Daniels Park portion of the Project. In September 2016, PSCo, along with multiple parties, agreed to a settlement that included moving the in-service date to 2019. The settlement agreement was approved by the CPUC on September 30, 2016 and on October 20, 2016 the CPUC issued its written approval.

As part of the Tax Extenders Package, Congress recently extended the Production Tax Credit (PTC) for new wind generation projects. Advancing the in-service date of the Project will help ensure that PSCo customers reap the benefit of the PTC which significantly reduces the cost of wind generation.

The Project will also allow additional resources to be implemented in the project area in a manner that is consistent with the timing of beneficial energy resources – a goal of Senate Bill 07-100. PSCo believes that the Project meets the objectives of Senate Bill 07-100. This statute requires in part that PSCo develop plans for the construction or expansion of transmission facilities necessary to deliver electric power consistent with the timing of the development of beneficial energy resources located in or near Energy Resource Zones (ERZs) - Section 40-2-126(2)(b), C.R.S. The current utilization of the

Pawnee-Smoky Hill line and how that line as expanded by the Project will accommodate new gas-fired and renewable resources. PSCo expects natural gas-fired generation will be the dispatchable energy supply of choice because it's economically favorable, a key to managing intermittency of wind generation and has lower pollutants and lower greenhouse gas emissions than other fossil fuels. The Project is consistent with the underlying intent of Senate Bill 07-100 by having us build new lines necessary to interconnect and transmit energy from areas where there is a substantial possibility that there will in fact be new generators (or expanded existing generation) interconnecting to our system.

### Public Outreach

PSCo's public outreach efforts launched in July 2013 when we started meeting with various residents, non-governmental organizations, elected officials, Home Owners Associations (HOAs), senior planning staff and other stakeholders. The efforts were designed to educate the public on purpose, impact and benefits of the Project and to answer questions and provide information.

Individual meetings were held with key stakeholders, agencies, and others to gather information, answer questions and educate them on the need for the project, and their role in the process. Early interactions with these groups allowed PSCo to quickly identify issues of importance to the community. PSCo met twice directly with the Tollgate Crossing HOA/Metro District, founders of the opposition group Stop the Power Lines, on 7/15/2014 and 8/26/2016.

The stakeholder meetings allowed for a formal presentation of information to either individuals or small groups, whereas the open house venues allowed for information exchange in a more casual format. The same information was presented at each stakeholder meeting and subsequent open houses.

### *Open House Meetings*

During the week of March 17, 2014, we hosted a series of large scale open house meetings at the following locations:

- Monday, March 17, 2014; 6-8pm  
Parker Arts Culture & Events Center (PACE)
- Tuesday, March 18, 2014; 4-6pm  
Heritage @ Eagle Bend Golf Clubhouse
- Wednesday, March 19, 2014; 6-8pm  
Highpoint Church
- Thursday, March 20, 2014; 6-8pm  
The Wildlife Experience

Over 6,000 invitations to the open houses were mailed out to residents within a quarter mile of the existing corridor as well as all other stakeholders that were contacted as part of our public outreach efforts; approximately 138 people attended the open houses. Notification of the open houses was posted on the project website and in the following publications leading up the meetings: Aurora Sentinel, Parker Chronicle, Douglas County News Press and the Aurora and Douglas County Your Hub sections of the Denver Post.

Information provided at the open houses included project overview, need, resource planning, siting and permitting, transmission design, EMF, property values, undergrounding, comment forms and a variety of maps and figures. All of the information presented at the open house meetings was made available and posted to the project website ([www.transmission.xcelenergy.com](http://www.transmission.xcelenergy.com)) which is continually updated as new developments occur. The public is also able to leave comments about the project on the website and a project hotline was established to gather public comments (303.318.6307).

After the March 2014 open house meetings, Xcel Energy engaged in several discussions and meetings with many of the interested stakeholders including an opposition group called Halt the Power Lines in an effort to address their concerns with the project.

As noted above, as part of the CPCN proceeding, as directed by the CPUC, the ALJ held a public comment hearing on July 23, 2014 at the Parker Arts and Cultural Events Center. Attendees at the hearing were able to voice their concerns and opinions of the Project.

In response to the public comments received at the open house meetings and during the CPCN public comment hearing concerning other options for the transmission line route, PSCo studied and reviewed alternative routes for the transmission line. The alternative routes were analyzed, narrowed down and shared with the public at another series of open house meetings held on September 29, 30 and October 1, 2015.

For this round, 8,300 direct mail pieces were sent out to residents within a quarter mile of the existing corridor as well as the alternative routes and included all the other stakeholders that had been contacted as part of our public outreach efforts. Newspaper ads ran during the week of September 14 and September 22 and our social media team made zip code targeted notifications throughout the project area. Approximately 475 people attended the open houses which were held in the following locations:

- Tuesday, September 29, 2015; 6-8pm  
Parker Fieldhouse
- Wednesday, September 30, 2015; 6-8pm  
Wildlife Experience
- Thursday, October 1, 2015; 6-8pm  
Heritage @ Eagle Bend Golf Clubhouse

#### *Public Comments*

At the onset of public outreach, the project team identified agency and public participants that would possibly be impacted or affected or have useful information related to the project area. As more stakeholders were identified, they were added to the stakeholder list and were updated regularly on the project status.

**Table 1 – Initial Stakeholder List**

Aurora Economic Development	Arapahoe County	Town of Parker	Creekside West at Canterbury Crossing
Denver South Eco Dev	City of Lone Tree	Aurora Public Schools	Villages of Parker/Canteberry Crossing
Parker Chamber of Commerce	Douglas County	Cherry Creek School District	Rocking Horse Developers Meeting
Aurora Chamber	City of Castle Pines	Cherry Creek School District, Skyvista MS	Ponderosa Hills
E470 Authority	City of Aurora	Cherry Creek School District, Foxridge MS	Cherry Creek Highlands
South Metro Denver EDG	High Point Church	Cherry Creek School District, CTHS	Rowley Downs
Coventry Development	Cherry Creek Church	Citizens Budget Advisory Committee	Tallyn's Reach
Highlands Ranch Metro District	Tallyn's Reach Neighborhood	Cherry Creek School District, Pineridge Elementary	Heritage at Eagle Bend
Shea Homes Colorado	Sorrel Ranch Metro District	Cherry Creek School District, Buffalo Trail Elementary	Rocking Horse Master Association
Meridian Metro District	Parker Homestead Metro District	Tollgate Crossing Metro District	Newlin Meadows HOA
Douglas County Business Alliance	Southlands	Rocking Horse Metro District	Dove Hill Estates
Shea Properties	Bradbury Ranch HOA	Ridgegate West Village	Regency HOA
Tollgate Crossing	Castle Pines North Master Association	Neu Town Master Association	Tollgate Crossing HOA
Highlands Ranch Community Association	Whispering Pines Metro District	Surrey Ridge HOA	Sorrel Ranch HOA
Northwood Retail/Southlands Mall	Eagle's Nest Metro District	Ranney Property	Wheatlands Metro District
Tallyn's Reach Metro District	Eagle Bend Metro District	Southlands Metro District	Forest Trace Metro District

A comment database is being used to track and manage all comments. Submission types include, e-mail, hotline phone calls, open house comment forms and face to face meetings.

Comments were categorized so that trends could be analyzed. Table 2 identifies the number of comments per category. Please note that individual comments may have more than one category assigned.

**Table 2 - Comment Criteria**

<b>Criteria</b>	<b>Total</b>
Preferred Alternative A	568
Preferred Alternative B	16
Preferred Alternative C	88
Preferred No Alternatives	13
Project Purpose & Need	213
Visual/Aesthetic Resources	545
Proximity to Residences	592
Land Use	342
Water Resources	104
Historic/Cultural Sites	135
Radio/TV Interference	215
Property Values	253
Noise	295
Health & Safety	475
Biological Resources	203
Proximity to Trees	17
Underground	49
Total Project Cost	249
Add lines to Existing Structures	31
Prairie Dogs	3
General/Other	218

The information below provides a snapshot of the comment tracking overview between members of the public and project representatives during public outreach. A total of **1,010** discrete “Communications” with the public have been logged and include: in-person meetings between project representatives and the public, phone calls, hotline phone calls, emails, Facebook posts, letters of support and paper comment forms.

- Total number of communications through 2/15/2016 – **1,010**
- Total number of emails – **214**
- Total number of hotline calls – **38**
- Total number of in-person meetings – **47**
- Total number of phone calls – **40**
- Total number of comment forms – **629**

The Project has received roughly **629** paper comment forms from members of the public, which have been transcribed and logged. The Project has also received **27** letters of support from governing agencies and NGOs including the Aurora Chamber of Commerce and the Aurora Economic Development Council.

The issues and preferred route alternatives identified by commenters provide information about the ways that the public views the Project. Based on the information at the date of this narrative, respondents show a strong preference for Preferred Alternative A, the existing corridor. Eighty three percent (**83%**) of respondents favored this route as compared with Alternatives B (**2%**) and C (**13%**), or no preferred route (**2%**).

Comments received by the project are recorded in a database and catalogued according to issues that commenters have mentioned. The information below represents the top five (5) issues mentioned by commenters.

*Top Five Issues Commenters Cited in Their Comments*

1. Proximity to Residences – 58.6% identified concerns about proximity to residences
2. Visual/Aesthetic Resources – 53.9 % identified concerns about aesthetic and visual resources
3. Health and Safety (including EMF) – 47% identified issues related to health and safety
4. Land Use – 33.8% included land use concerns
5. Noise – 29.2% mentioned concerns about noise

Summary of the potential impacts and proposed mitigation measures

Electric and Magnetic Fields (EMF) and Noise

*EMF*

As part of the regulatory CPCN approval process, the CPUC sets standards for the reasonableness of noise levels and EMF. PSCo is required to meet state standards for both as outlined in the Code of Colorado Regulations (Section 4 CCR 723-3). In a decision granting the CPCN (adopted on March 11, 2015), the CPUC found that the EMF and noise levels for the Project were reasonable. In adopting the ALJ's recommended decision, the CPUC found that the uncontested evidence demonstrated that undergrounding transmission lines to minimize environmental impacts was not warranted due to increased costs and construction impacts. Additionally, burying transmission lines would not eliminate magnetic fields.

EMF exists wherever electricity is produced or used, and EMF surrounds any electrical appliance of wire that is conducting electricity. Everyone is exposed to these fields at home when you turn on a lamp, email a friend, or use an electric oven or microwave to cook your dinner. The frequency of fields produced by electricity transmission, typical of power lines, is low and electric and magnetic fields exist separately.

Magnetic fields, measured in milliGauss (mG), are produced by electric current and only exist when an electric appliance is turned on, the higher the current, the greater the magnetic field. As with electric fields, the strength of a magnetic field dissipates rapidly as you move away from its source.

Colorado has not established field exposure limit values for magnetic fields, as measured at the edge of a project's right of way. By comparison, New York has adopted a value of 200 mG for any transmission line, regardless of voltage. The American Conference of Governmental Industrial Hygienists has set a not-to-exceed value of 10,000 mG for occupational exposure and 1,000 mG for those workers with pacemakers. The International Commission on Non-Ionizing Radiation Protection has set exposure limits of 833 mG for the general public.

PSCo requested that the CPUC approve 150 mG to be a reasonable level for this project, which is a reasonable level based upon past CPUC action and standards adopted by others. CPUC staff reviewed each section of the Project and found expected magnetic field levels to be less than 150 mG at the edge

of the transmission line right of way at one meter above the ground. The CPUC approved this level as reasonable.

### *Mitigation Measures*

Our engineering team designed the Project to incorporate two measures to help mitigate EMF:

- Arranging phasing conductors in a configuration to reduce magnetic fields (and noise).
- Increasing the height of transmission structures (an extra five feet more than required) to reduce the magnetic field at ground level.

The CPUC determined that based on commission rules, prior findings and comparative standards, PSCo has shown that the Project has been designed to avoid magnetic fields. The CPUC also determined the magnetic levels, measured as described above, are reasonable. No party contested PSCo's CPCN testimony in support of these findings.

### *EMF – Tollgate Crossing Home Owners Association (HOA)*

Due to concerns regarding the amount of Electric and Magnetic Fields (EMF) present in the community, and the amount that may be present after the proposed increase in the number of power lines in the community, PSCo agreed to participate in a manual reading of the current magnetic field levels in the community. On December 8th, 2016, three PSCo representatives and one member of the community participated in a series of manual magnetic field measurements around the community.

These measurements were taken to establish a firsthand account of existing EMF exposure. As a way of demonstrating a concrete foundation to the various studies, models and illustrations that PSCo has made available to residents, concerned citizens and various government officials. When the readings were taken, there was only one set of power lines running through the ROW within Tollgate Crossing. PSCo is planning to put another set of power lines in the ROW. When that happens, PSCo projects that the magnetic field levels will still fall within the PUC 150 mG limit at the edge of the ROW. Actually, under ideal conditions, some areas will actually generate lower magnetic field levels than the current levels - due to proper phase alignment and cancelling caused by the power lines being properly 'tuned' to intentionally reduce electric and magnetic field intensities. Measurements included ~1.08 mG when situated at a distance of approximately ~229 feet away from the power lines (homes that are on the other side of the ROW), ~2.08mG when situated at a distance of approximately ~175 feet from the power lines (homes that are nearest to power lines) and ~44.8 mG when situated directly beneath the existing power lines.

### *Noise*

As part of the regulatory CPCN approval process, the CPUC sets standards for the reasonableness of noise levels. PSCo is required to meet state standards as outlined in the Code of Colorado Regulations (Section 4 CCR 723-3). In a decision granting the CPCN (adopted on March 11, 2015), the CPUC found that the noise levels for the Project were reasonable.

In the CPCN process, PSCo consistently considered ways to effectively mitigate noise associated with transmission facilities and substations. In the CPCN application, PSCo included studies addressing potential noise levels (expressed in decibels). PSCo modeled and measured project noise levels radiating beyond the property line or transmission right of way, plus an additional 25 feet, as outlined in the code.

The Residential Zone threshold is the most stringent in any defined zone. Based on code requirements, noise measured at 50 decibels or less beyond the property line or right of way (as applicable) at a distance of 25 feet in a Residential Zone is deemed reasonable. Noise measured at 55 decibels beyond the property line or right of way (as applicable) at a distance of 25 feet in a Commercial Zone is also deemed reasonable.

PSCo projected audible noise levels for each section of the project (under both fair and wet and rainy weather conditions). The noise levels modeled for each Residential Zone section were less than 50 decibels and Commercial Zone sections were 50.5 decibels.

### *Mitigation Measures*

To help mitigate noise, PSCo designed this project using low-corona hardware on transmission lines. Alternate phasing arrangements also reduce noise. Corona is what creates hissing, crackling, or popping sounds emanating from transmission lines, and generally increases with voltage. Corona is a small electrical discharge, not unlike the static electrical charge that you may experience touching a metal object when walking on carpet.

All high-voltage transmission lines experience significant corona during wet weather, when water droplets form on the line. In normal, fair weather conditions, corona and its corresponding audible noise are usually at low levels (approximately 25 decibels less than wet weather noise). Corona also increases approximately 1 decibel for every 1,000 feet in elevation gain.

CPUC staff reviewed PSCo's studies for all sections of the Project and supported a finding that the noise levels for all sections were deemed reasonable. No party has contested PSCo's CPCN testimony in support of these findings.

### **Decibel Level Reference Chart**

<b>Decibel Level – dB(a) Examples</b>	
120-130	Pneumatic Chipper
110-120	Loud audible horn (1 mile distance away)
90-100	Inside subway (New York)
80-90	Inside motorbus
70-80	Average traffic on street corner
60-70	Conversational speech
50-60	Typical business office
40-60	Living room, suburban area
30-40	Library ambient noise
20-30	Bedroom at night
10-20	Broadcasting studio
0-10	Threshold of hearing

Courtesy: Electric Power Research Institute

### Property Values

Prior to the first round of open house meetings in March of 2014, PSCo hired an independent third party appraiser (Michael H. Earley, MAI, SRA) to complete a comprehensive study of property values in 11 housing subdivisions along the existing transmission line corridor (preferred route) in Douglas County, City of Aurora and Town of Parker, Colorado. Study areas included: Maher Ranch; Castle Pines; Green

Valley; Founders Village; Rowley Downs; Surrey Ridge; Sorrel Ranch; Tallyn's Reach; Creekside, Tollgate Crossing; and Villages of Parker. The study examined both property value increases over time and comparable properties by location.

Mr. Earley has three (3) years of construction experience, six (6) years of being a part time Independent Fee Appraiser and thirty-eight (38) years of being a full time Independent Fee Appraiser with a heavy emphasis and background on transmission lines. He has also taught seminars on transmission lines versus property values. He has appraised in the following states; Colorado, Wyoming, Nebraska, New Mexico, Kansas, North Carolina, Nevada, Michigan, Oklahoma and has been a qualified expert witness in several counties throughout Colorado including Douglas and Arapahoe.

The subdivisions listed above were selected based on the following criteria:

- Their proximity to the existing PSCo 230kV transmission line, which is also the preferred route for the Project, and/or similar transmission line structures.
- They offered a variety of residentially improved homes sites in platted subdivisions, homes of different ages, and a requisite number of home sales for analysis.

Three of the study areas (Maher Ranch, Castle Pines, and Green Valley) included multiple existing transmission lines similar to those proposed for the Project. One study area, Sorrel Ranch, consisted of relatively new home construction (2010-2013) built directly adjacent to an existing high voltage transmission line right-of-way.

The independent appraiser investigated sales databases within all study areas and determined subsets for paired-sale analysis within each subdivision area. The appraiser analyzed the market data over a selected time frame to determine if property values were impacted by:

- A home's proximity to transmission power lines;
- The specific appearance and design of the transmission lines, including the type(s) of structure, voltage, or number of structures in a study area;
- Views of transmission lines (either bisected or parallel views); and
- Perceptions regarding electric and magnetic fields (EMF)

For purposes of this study, **Market Value** is defined as the most probable price which a property should bring in a competitive and open market, under all conditions requisite to a fair sale, with the buyer and seller each acting prudently and knowledgeably. This is the same definition set forth in the Appraisal Institute's *The Appraisal of Real Estate (10<sup>th</sup> Edition)*.

The results of the study indicated there is no measurable market impact on property values from power lines, regardless of the number of lines, the voltage, the type of structure, age of the homes/subdivisions, direction of views, proximity to lines or perceptions of EMF concerns.

The study is supported further by comparable market analysis examining appreciation rates, paired sales analysis, statistical descriptive measures and statistical regressions.

### Underground vs. Overhead Transmission Lines

High-voltage transmission lines transport bulk electricity from generation sources to customers, often over long distances. In 2010, there were approximately 106,000 miles of 345kV or greater high-voltage

transmission lines in the United States. The percentage of existing underground transmission is estimated at 0.5 percent of this total. There are no underground 345kV lines in any of the eight jurisdictions where Xcel Energy operates. Out of a total of over 4,000 miles of transmission lines in Colorado, PSCo has only about 50 miles of transmission lines (115kV & 230kV) constructed underground, most of which are in high load and congested urban areas and near airplane flight paths at airports.

Burying high-voltage transmission lines may be appropriate in densely populated urban settings, near airports, or when sufficient right-of-way is not available for an overhead line. Electric utilities consider the following factors when deciding whether to construct high-voltage transmission facilities (345kV or higher) above ground or bury them:

#### *Costs*

An underground 345kV line costs 10 to 20 times the cost of an overhead line due to time, materials, process, the need to include transition substations and the use of specialized labor. The Project (including transition substations) would cost an estimated \$40 million per mile to bury. The proposed overhead double circuit 345kV line would cost \$1.5 million per mile. PSCo generally only considers underground construction if the difference in cost between overhead construction and underground construction is paid for by those requesting it or if technical constraints make it impossible to construct the line overhead. Part of the added cost to bury lines may include routing to avoid other underground installations, such as water, natural gas and sewer lines. An overhead line often can be routed around or over these difficult areas.

#### *Power restoration*

The reliability of overhead and underground transmission lines is generally comparable. While underground lines are immune to the effects of weather, this type of facility is susceptible to damage from geologic or subsoil instabilities, as well as inadvertent damage resulting from excavations. Underground lines also present challenges during outages. Faults occurring in underground installations are typically more difficult to locate and repair than with overhead lines. The increased difficulty and duration for repairs cause significantly longer power outages than with overhead power lines. Repair of solid dielectric cables or high-pressure fluid-filled conduits would require pulling in a new section of cable and splicing it into the existing cable at two vaults. Such a repair could take weeks or months. In contrast, overhead line outages can often be repaired within hours, because any damage is readily visible and accessible.

#### *Capacity requirements*

For underground transmission, a greater number of cables are often required to match the capacity of the overhead circuit. The proposed Project would require three cables per phase (three phase system, total of nine cables) to match the bundle overhead conductor. The additional components increase the underground cost as an additional duct bank, vaults, splices and terminations are required which can also reduce overall system reliability.

#### *Line-length challenges*

High-voltage underground lines may require additional equipment to ensure proper electrical performance along the distance of the transmission line. The additional equipment translates to a higher overall cost, limits the length of the underground line installation and increases the likelihood of failure because of additional components.

### *Multiple cables and cooling options*

Overhead lines are air cooled and widely spaced for safety. Underground cables are installed in concrete encased PVC duct banks. Heat generated by the cables is dissipated into the earth.

### *Construction impacts*

Burying transmission lines has more environmental impacts than placing them overhead. A 345kV overhead line typically requires erecting structures and placing foundations every 800 to 1,000 feet. Typical structures are 150 feet tall, while the diameter of the foundations ranges from 10 to 12 feet. Burying a 345kV double circuit transmission line at a minimum would require two continuous trenches or duct banks at least 5 feet wide at the bottom, 7 feet deep, and separated by at least 20 feet. Considerable clearing and grading would be necessary, and dust and noise from construction would last three to six times longer than it would for overhead construction. Large concrete splice vaults or access structures are needed at 1,500- to 2,000-foot intervals. Permanent access to the vaults is required to perform annual maintenance or future repairs.

### *Easement and land purchase requirement*

An overhead line typically has a wider easement footprint than an underground line. However, undergrounding 345kV transmission lines requires small substations – called transition substations – wherever the underground cable connects to overhead transmission. Transition substations have a footprint of approximately 250 by 400 feet and require grading, access roads, stormwater management facilities, fencing and night time lighting.

### *Life expectancy*

Underground high-voltage transmission lines generally need to be replaced after approximately 40+ years, while overhead lines have a life expectancy of more than 80 years.

### *Site restoration*

Site restoration for underground construction is a much larger endeavor than it is for overhead construction because soil is disturbed along the entire route. Top soils have to be restored and returned to vegetated areas, and all hard surface areas must be reestablished to meet local codes. Vegetated areas may require up to two years to return to preconstruction conditions.

### Compliance with Site Plan Criteria in Section 146-405(F)

Approval of site plans under this section may include conditions or limitations. The following criteria shall be considered by the planning and zoning commission in reviewing applications under this section:

1. *Consistency with comprehensive plan.* The proposed site plan is consistent with the provisions of the comprehensive plan, the City Code, and plans and policies adopted by city council that apply to the affected area. Here are a few examples of how the Project complies with the City's Comprehensive Plan:

#### Chapter II. Aurora's Sustainability Plan

- *Vision* – When the goals of the City are achieved, Aurora facilitates implementation of smart grid technology, including addressing security vulnerabilities, and adequate transmission capacity.

- *Plans, Programs and Projects: Aurora’s Commitment to Sustainability – Transmission.* Any new renewable energy project must move its power to its customers. Currently this transmission is a challenge in the western states as there is limited capacity on existing transmission lines to handle the extra electricity utilities predict is needed, and states want to produce, in the next 20 years. Colorado could face potentially severe energy and economic challenges if the state’s utilities are delayed in developing planned high-voltage electric transmission. The Front Range’s existing transmission system is already constrained. The Colorado Long Range Transmission Planning Group estimates that, by the year 2015, almost \$2 billion must be invested in the “backbone” transmission system of this area alone. Colorado utilities are working cooperatively to develop new transmission projects. These projects must assure reliable electric service and advance renewable energy development. Failure to upgrade existing transmission lines and build new transmission infrastructure could have long-lasting consequences.
- *Issues and Needs - Renewable Energy:* Facilitating an increase in transmission capacity will contribute to the success of local renewable energy projects, allowing electricity generated from remote renewable energy sources to be efficiently transmitted to demand centers.
- *Strategies – Renewable Energy:* Work with the utilities to expand and upgrade transmission capacity on a regional level. Ensure that the City Code allows smart grid technology upgrades as the national transmission system is renovated.

Chapter IV. Part D – Providing Systems for the Delivery of Services

- *Strategies - Electric, Gas, and Petroleum Public Utility Facilities*
    - o Use existing utility corridors for new utility extensions whenever possible
    - o Plan new utility corridors to preserve the development potential in the strategic areas outlined in this plan
    - o Incorporate utility corridors into the city’s open space and trails system where appropriate
2. *Impact on existing city infrastructure and public improvements.* The Project will not require additional local government services beyond those currently provided in the area. The Project creates no additional demand for transportation infrastructure, educational facilities, housing, water (other than trucked-in water) or wastewater treatment, or public transportation. During construction, it is anticipated that traffic will slightly increase; the impact to local roads will vary day by day as the project moves along the route. To mitigate any potential impacts to local City roads, Traffic Control Plans will be prepared and followed during construction. PSCo anticipates that after construction, the Project will receive one to two vehicle visits per month for inspection and maintenance purposes. The existing roadway network within the Project area can accommodate the level of activity anticipated for these purposes as well as construction activities.
3. *Density.* There are no densities applicable to the use of a transmission line. Therefore, since the density is different from those of adjacent properties, the City’s criteria specify that steps be taken to achieve compatibility. The height of the new monopoles will range between 100 feet to 150 feet and will be similar in height to the existing lattice structures currently located in the corridor. This height is determined by the National Electric Safety Code (NESC), which takes into account the required line to ground clearances. The monopoles can be manufactured as

galvanized steel or weathering steel; and PSCo will defer to the City's preference determining which type is better suited for the surrounding environment. The footprint of the Project, within the City of Aurora will consist of the new monopoles and two pole angle structure foundations (approximately 5 feet in diameter), leaving the rest of the corridor open for other uses such as bike paths and trails, pending approval from PSCo.

4. *Protection and appropriate use of environmental features and topography to enhance the development.* By using the existing transmission line corridor, the Project has been designed to preserve and protect the water quality and wildlife habitat of riparian corridors, wetlands, and floodplains. Natural areas within the existing transmission corridor, including bike trails, are being preserved and integrated to define neighborhood and community character. In addition, by using the existing transmission line corridor, the design of the development will maintain the approximate topographic form of major ridgelines, swales, and landforms.
5. *Landscaped area.* Due to clearance requirements that need to be upheld from the National Electric Safety Code and the North American Electric Reliability Corporation, landscaping is typically not allowed within transmission line corridors. However, it is possible for PSCo to work with the City on implementing mitigation measures to have landscaping installed on private property adjacent to the corridor.
6. *Internal efficiency of design.* Since the proposed use of the Project is expansion of an existing transmission line corridor, the proposed design maintains the existing internal efficiency for the public, including safe and convenient bike/pedestrian access to common areas for recreation and other services, facilities, and amenities adjacent or in proximity of the corridor. The proposed design will provide for safe and convenient access for PSCo personnel to perform routine inspections and maintenance.
7. *Control of nuisance impacts.* The Project is a necessary capital improvement to expand the existing electric transmission system in Colorado. The proposed Project location has been selected based on the ability to utilize existing facilities and the opportunity to utilize an existing corridor. The Project will comply with all federal, state and local regulations. There will be no fumes, vibration or odor anticipated by this Project after construction is completed. The only dust resulting from the Project would occur during construction and watering trucks or other best-management practices will be utilized to minimize dust caused by construction activities. Depending on the City's preferences, the new monopole structures will be either self-weathering steel which oxidizes to resemble a natural brown look or galvanized steel that has a gray color. Neither of these structure types have a tendency to cause glare. There were specific findings of reasonableness from the CPUC on both noise and EMF, all of which will be within State and Federal guidelines.
8. *Urban design, building architecture, and landscape architecture.* The proposed Project will be constructed within an existing utility corridor that has been planned to accommodate the Project since the early 1960s. The land for the corridor was purchased by PSCo in the early 1960s. The existing 230kV transmission line in the corridor was constructed to one side of the corridor in 1968, allowing enough room on the other side for future transmission facilities. Construction of the Project will enhance the function and marketability of the surrounding region by allowing sufficient access to a more reliable power source. The Project will allow for

the interconnection and delivery of new generation resources, including renewable energy to Front Range customers to meet new load growth and improve system reliability. The Project will help provide power for future developments in the surrounding area similar in character to those already in place. Constructing the Project in the existing corridor will help prevent the proliferation of an additional transmission line in the surrounding area, keeping identical uses in the same location. The Project will not have any effects on the immediate area within the corridor itself as there are similar existing facilities within it and sufficient space to accommodate the Project. The steel monopole structures proposed for the Project will introduce new visual elements to the existing corridor; however the net visual impact will be minimized by placing new structures adjacent to the existing structures for visual symmetry. The type of steel used for the new monopole structures will help visually and can be decided on by the City as appropriate. Either galvanized steel or self-weathering steel can be used for the new structures.

9. *Adequacy, accessibility, and connectivity of traffic and circulation plans.* PSCo anticipates that after construction, the Project will receive one to two vehicle visits per month for inspection and maintenance purposes. The existing roadway network within the Project area can accommodate the level of activity anticipated for these purposes as well as construction activities. The footprint of the Project, within the City of Aurora will consist of the new monopoles and two pole angle structure foundations (approximately 5 feet in diameter), leaving the rest of the corridor open for other uses such as bike paths and trails, pending approval from PSCo. Natural areas within the existing transmission corridor, including bike trails, are being preserved and integrated to define neighborhood and community character.
10. *Street standards.* There will be no new public and/or private streets constructed as part of the Project. PSCo anticipates that after construction, the Project will receive one to two vehicle visits per month for inspection and maintenance purposes. The existing roadway network within the Project area can accommodate the level of activity anticipated for these purposes as well as construction activities.
11. *Past Performance.* The planning commission is authorized to consider the past performance of PSCo in their consideration of any site plan. The planning commission may deny any approval of a site plan if PSCo is determined to be in violation of any requirements, conditions, or representations on a prior development. PSCo is not aware of any violations on any of their prior developments within the City.