

PDC

PORTLAND DEVELOPMENT COMMISSION

DATE: October 13, 2010
TO: Board of Commissioners
FROM: Bruce A. Warner, Executive Director
SUBJECT: Report Number 10-92
Foster-Woodstock Streetscape Project Briefing

EXECUTIVE SUMMARY

BOARD ACTION REQUESTED

None – information only.

SUMMARY

This report provides an update of progress made for the Foster-Woodstock Streetscape Project (the Project) in the Lents Town Center Urban Renewal Area (LTC URA). The Project includes streetscape improvements and potential undergrounding of public utilities on Foster Road, Woodstock Boulevard, and SE 92nd Avenue – the heart of the Lents Town Center; the creation of inviting entryways into the town center; and special streetscape design for SE Ramona Street at the entrance to the MAX Station platform. A map of the Project area is included in Attachment A.

The Portland Development Commission (PDC) Board of Commissioners (Board) approved the Intergovernmental Agreement (IGA) with the Portland Bureau of Transportation (PBOT) on December 9, 2009, for the first phase of the Project, covering design, engineering, and construction drawings. In early spring 2011, staff will ask for further Board action by bringing forward an IGA with PBOT covering funding for the construction phase.

BACKGROUND

The Foster-Woodstock Streetscape Project began in 2006 with a \$1.9 million Metropolitan Transportation Improvement Program (MTIP) grant. Grant funds, along with PDC matching funds of \$200,000, will implement the 1999 LTC Business District Transportation Plan, adopted by City Council, to design and build street improvements along SE Foster and SE Woodstock in the LTC that include sidewalk improvements, stormwater bio-swales, street trees, street furniture, curb bulb-outs, parking, and bike lanes to enhance and promote revitalization in the town center.

Public Participation

The Project was initiated with the development of a Public Participation Plan and formation of a Project Citizen Advisory Committee (CAC) to prioritize street improvement elements with available funds and make a recommendation to the LTC Urban Renewal Advisory Committee (URAC). After five public meetings and an open house, the LTC URAC endorsed the prioritization recommendations on November 10, 2009. These priorities were included in the

URAC's recommendations during last year's budget process. The Project then moved into the design phase, utilizing the CAC process to develop schematic designs to guide engineering plans.

During the design phase between December 2009 and May 2010, four public meetings and a community open house were held. The CAC's recommended schematic designs were presented to the URAC and endorsed on May 11, 2010. These endorsed schematic designs will guide the next phase of design engineering. The purpose of today's presentation is to provide a visual overview of the endorsed designs, as well as present the results from the utility undergrounding study.

Public Benefit

This Project will provide a benefit to the public by increasing pedestrian safety with improved sidewalks, provide stormwater management, create a visually pleasing streetscape, establish identity markers, and add on-street parking. The Project is intended to stimulate commercial development and revitalization by adding necessary infrastructure and an attractive entry point into the Lents Town Center.

Financial Impact/Feasibility

The IGA for \$1.815 million with PBOT for design and engineering was approved by the Board in December 2009. PBOT will match those funds with the \$1.9 million grant through the MTIP. As disclosed during the adoption of the IGA, it is anticipated that an additional \$787,000 LTC URA funds will be needed to complete construction of the streetscape improvements and the east and west entryways.

While the design costs for Ramona Street improvements were included in the IGA, construction is not, nor in the MTIP funds. Current cost estimate for construction of the Ramona Street improvements is approximately \$1.289 million.

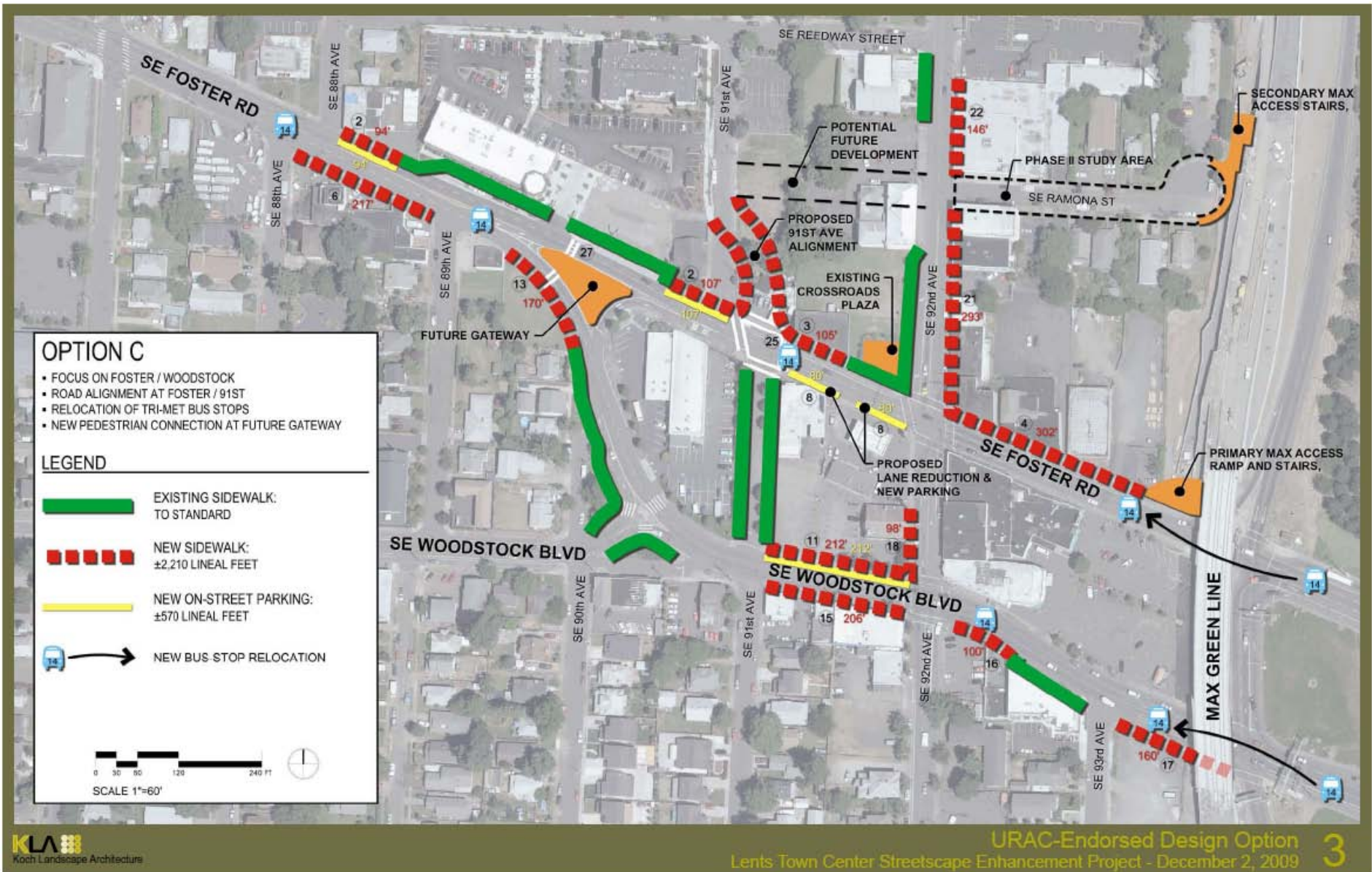
As requested at the December 9, 2009, PDC Board meeting, staff contracted with Kittleson & Associates to conduct a feasibility study on undergrounding public utilities in the project areas. The study (see Attachment B) includes cost estimates that staff will present at the briefing.

Project Phases and Timelines

Phase I	Pre-Design (April 2009 – November 2009) - Complete
Phase II	Design Concepts (December 2009 – May 2010) – Complete
Phase III	Design Engineering (estimated time: June 2010 – March 2011) - Underway
Phase IV	Construction (estimated time: April 2011 – December 2011) - Future

ATTACHMENTS:

- A. Project area map
- B. Kittleson & Associates, Inc. *Utility Underground Study – Revised Draft*, dated October 5, 2010





KITTELSON & ASSOCIATES, INC.
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TECHNICAL MEMORANDUM

Utility Underground Study – **REVISED DRAFT**

Date: October 5, 2010 Project #: 11110

To: Sue Lewis, Portland Development Commission

From: Charles Radosta, P.E.
Jerry Baarspul, P.E., Baarspul Consulting, Inc.

cc: Rich Newlands, City of Portland
Dan Layden, City of Portland

EXECUTIVE SUMMARY

The decision to underground overhead utilities ultimately comes down to who pays for the conversion and the willingness to take on these expenses. Oregon Administrative Rules regulate payment for the conversion when work is done within an undergrounding district. The creation of an undergrounding district provides the authority to require adjacent property owners to connect to the new underground system, regardless of their expense to upgrade their private property's electrical system to comply with current regulations. The creation of a new undergrounding district is a political process that involves City Council approval and amendments to City Codes.

When undergrounding is done without an undergrounding district, then the work is commonly paid for by the local jurisdiction if the agency can justify the expense and is willing to pay for the undergrounding plus the required improvements on private properties (assuming the private property owners agree to have this work done on their property). An exception to this is when there is 100% cooperation from the adjacent property owners to pay for their own upgrades, in which the local jurisdiction only needs to pay for the undergrounding work within the right-of-way. Typically, the local jurisdiction would pay for the undergrounding infrastructure including all trenching, conduits, vaults, etc. while the local utility would pay for pulling the wires, installing the appurtenances, and providing connection points within the right-of-way for the adjacent property owners.

The primary benefits to undergrounding the utilities are aesthetics and safety. This report discusses overarching issues associated with converting overhead utilities to underground utilities and also examines three proposed projects in greater detail for consideration of

undergrounding their existing overhead utilities. All three projects are outside of any pre-existing undergrounding districts in the City of Portland.

Project estimates to underground the utilities per the conceptual-level designs of the projects and the information provided by the various utility companies range from \$500 to \$850 per foot, with the variability in pricing due to the complexity of the project and the ability to install the underground facilities in conjunction with roadway improvements.

On NE 97th Avenue, it appears that a majority of the adjacent property owners agree with the proposed overhead to underground conversion; however, NE 97th Avenue would be a localized undergrounding roadway section without defined long-term plans to expand undergrounding beyond this street segment.

SE Ramona Street has multiple adjacent property owners that have not been contacted specifically about this effort; their level of cooperation for converting from overhead to underground service connections is unknown at this point. Many of these houses are early 1900s vintage and the conversion costs to upgrade these individual properties could be expensive. On the other hand, SE Ramona Street is within an area that could someday become an undergrounding district.

If the Lents Town Center area were converted from overhead to underground utilities, creating an undergrounding district is the likely outcome which requires local jurisdiction approval and may take a few years to fully enact. Undergrounding in Lents will be more expensive than at the other two locations because the work would be done without other roadway improvements and will impact recently improved sections within the Lents district. While it is possible to place all underground utilities behind curbs, the size of the underground vaults and potential constraints to long-term growth of street trees may preclude this from being the desired option in Lents as well as in other areas. Along with the \$850 per lineal foot cost for the conversion, there is an additional \$575 to \$950 per lineal foot cost to convert the 115kV high voltage lines passing through this area making full undergrounding within this district feasible but likely not practical due to the excessive costs.



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EXECUTIVE SUMMARY: Provided as separate document

INTRODUCTION

The Portland Development Commission (PDC), in conjunction with the City of Portland (PBOT), retained Kittelson & Associates, Inc. (KAI) and Baarspul Consulting, Inc. to conduct a study on the parameters of undergrounding overhead utilities along prescribed roadway corridors that are being considered for redesigns. PDC is considering undergrounding the utilities and will use the study to make an informed decision. The prescribed scope is primarily focused around collecting information from various sources in the industry and documenting the findings.

To research undergrounding options and alternatives, KAI conducted telephone interviews with a variety of individuals including City engineers, consultant engineering peers, and public and private utilities. These interviews helped provide information regarding potential issues, benefits, and costs of undergrounding utilities. *Appendix A contains a summary of the phone conversations.*

PDC is moving forward with complete street improvements at two locations: SE Ramona Street from SE 92nd Avenue to the MAX station, and NE 97th Avenue from NE Glisan Street to NE Davis Street. Both projects will replace the current pavement, add stormwater features, construct new sidewalks, and/or install street trees. PDC is also designing sidewalk improvements to SE Foster Road and SE Woodstock Boulevard in the Lents Town Center area.

PDC is presenting information at a PDC Board meeting in October, at which staff will present a recommendation whether to proceed with funding the undergrounding of the street

improvement projects. This report documents field visits to these specific projects plus findings regarding undergrounding utilities within these projects.

GLOBAL ISSUES WHEN CONVERTING EXISTING OVERHEAD UTILITIES

The following summarizes some of the overall issues with undergrounding overhead utilities on projects.

Utility Benefits and Concerns With Undergrounding Systems

Issues With Undergrounding Utilities – Service Disruption

PGE can experience some system disruption due to construction when undergrounding overhead utility lines. On the City of Portland’s Gibbs Street project, PGE was able to make the new connection to existing businesses and residences within 30 minutes. The only obstacles occurred when the new connection required upgrades to existing meters and service equipment.

When relocating overhead utilities to underground facilities, the new underground system must not impact the ability to retain the use of the overhead system until the system conversion is complete.

Issues With Undergrounding Utilities – Future Impacts Due to Excavation

Qwest does not foresee any benefits to having its utilities underground. Qwest has more incidents with underground utilities than with overhead utilities.

Meanwhile the City of Beaverton historically has had a minimal number of underground utilities damaged due to excavation work.

Issues With Undergrounding Utilities – Removing Old Overhead Poles and Equipment

On other undergrounding projects, PP&L often relocates its wires underground first. The challenge is to force the other franchise utilities such as phone and cable to move their wires off the poles so that the poles can eventually be removed. Without proactive communication and adequate advance notification, undergrounding all utilities could delay completion of a street improvement project. Removing wires off relocated poles often delays street improvement projects where no undergrounding is involved.

Issues With Undergrounding Utilities – Loss of Ampacity

PGE notes that when utilities are buried more than 3-4 feet below the ground, the insulating capacity increases which decreases the ampacity. Thus, undergrounding an overhead utility run could result in a need to increase the size of the wiring to minimize line loss.

Issues With Undergrounding Utilities – High-Voltage Transmission Lines

PGE estimates that undergrounding overhead high-voltage transmission lines costs roughly \$3.0-5.0 million per mile due to the size of conduit and wire needed to accommodate the 115 kV wires. Each high-voltage wire requires its own 6" diameter conduit, and the vaults required every 500-700 feet need to be 10 feet by 30 feet to handle the connections. In its entire system, PGE currently only has around 500 feet of buried 115 kV transmission lines.

Issues With Undergrounding Utilities – Maintenance

When a break occurs in an overhead line, the break can be easily located and repaired. When a break occurs in a buried system, the break can be more difficult to locate and repair resulting in longer outages for the repairs. Conversely there are fewer breaks with an underground system especially during ice and wind storms.

Issues With Undergrounding Utilities – Excavation Adjacent to Buildings

There are some building issues that need to be addressed for land use areas that allow a zero foot building setback from the right-of-way line. If the decision is to place the underground utility lines under the sidewalks, and if an existing building is already there, then excavation for a large utility vault could result in a 10'-12' deep cut immediately adjacent to the building. An old building with questionable foundations and/or situations where the bottom of the excavation goes below the building's footing could potentially undermine the building. Similarly, if the utilities are built first and then a building is built at a zero-foot setback, the building excavation could undermine the utility conduits and vaults. This is one of the reasons why PBOT and PDC are considering undergrounding NE 97th Avenue as part of the road improvement project rather than as part of future redevelopment.

Utilities placed a safe distance from the right-of-way line (10'6) will allow construction of the underground utilities beyond the 1:1 "zone of influence" slope requirements from the building footings. Conversely, if a building is built in the future, this added distance could either move the footing out of the 1:1 zone of influence of the vaults and conduits and/or provide adequate space for shoring.

Benefits With Undergrounding Utilities – Inclement Weather

Among the benefits of being underground is avoiding inclement weather events. Both the City of Beaverton and PGE did parallel studies a few years ago to determine the benefits and costs associated with undergrounding overhead utilities in that jurisdiction. Undergrounding overhead utilities reduces power outages in winter months; the City of Beaverton had severe ice storms in 1979 and 1980 that were detrimental to the City due to the number of overhead power lines in the City back then. The City believes that having utilities underground has been beneficial at reducing the number of power outages.

Benefits With Undergrounding Utilities – Avoiding Overhead Conflicts

Light poles and trees are other overhead obstacles that are avoided when utility lines are undergrounded. Street trees are permitted to grow tall and true without special trimming to avoid overhead lines. Another problem experienced with overhead power lines is the placement of cable and telephone wires in conflict with traffic signal displays.

When street trees are placed over utility trenches, issues with tree roots impacting the utilities can be avoided when the conduits are encased with a concrete slurry. Placing utility lines in conduits allow easier access to the lines when utilities are adjacent to trees. On the other hand, there could be conflicts with City Arborist requirements on street trees and obstructions.

Benefits With Undergrounding Utilities – Reliability

Some power companies have found that undergrounding their power system provides improved reliability, especially when the system is installed in conduits (versus direct-buried) and encased in concrete slurry.

Benefits With Undergrounding Utilities – Aesthetics

One of the main reasons for placing overhead utilities underground is aesthetics. Without overhead wires and the associated utility poles, the traveling public is left to focus on the traffic control devices (signals, road signs, etc.) and the other elements that enhance the roadway corridor such as street trees and ornamental street lights.

Benefits With Undergrounding Utilities – Safety

Utility poles are fixed objects that are often located within the clear zone of a roadway and can become hazards when vehicles errantly veer off the road. Relocating overhead utilities underground removes these fixed objects from roadway clear zones. Placing the utilities underground also eliminates fall hazards for the utility workers. While installing submersible transformers adds confined space hazards when switching units are placed in vaults, placing transformers on above ground pads eliminates the confined space hazard.

Non-Issue: Planning for Future Developments

The power companies can easily plan for future developments by installing laterals to vacant lots and calculating for future loads in its line loss calculations. In addition, Qwest can also easily plan for future developments by running laterals to the property limits.

Non-Issue: Undergrounding Location Within Right-Of-Way

The local jurisdiction has authority over where underground facilities are placed within their right-of-way. This study looked at placing the conduits and vaults in the sidewalk area; one of the challenges with placing the joint utility trench in the planter and sidewalk area are when conduits for one utility need to bypass a vault for a different utility. As such, it is not ideal to place the vaults behind the curb unless the conduits can be pushed out into the street. There was some question as to whether utility conduits could be placed within the furnishing zone resulting in street trees above the conduits. PGE was not concerned about street trees above their conduits as their conduits have at least 3-feet of cover; however, this may impact the life of the tree. Utility conduits can be placed within 5-feet center-to-center of a waterline or at least 3-feet skin-to-skin between the utility and the waterline.

Placing vaults within a sidewalk area does create some additional issues for the utility companies. If the lids are solid, they need to be slip-resistant. If the vault requires ventilation, then the gratings need to be heel-proof (typically ¼" maximum openings, but varies from jurisdiction to jurisdiction). When access is required into the vault, this may end up closing the sidewalk which has other implications. When vaults are placed in the roadway and if ventilation is required, the utility company may need to run a vent into the adjacent landscape zone.

Non-Issue: Phased Implementation of Undergrounding Utilities

There is the possibility that the underground conduits and vaults could be installed as part of a street improvement project and then allow the utilities to convert the area to underground in the future. In this scenario the overhead utilities would remain in place until such time as when all adjacent property owners and the utility companies are ready to make the conversion. These underground conduits can remain empty for years without any deterioration; however, if the conversion is delayed too long and/or the adjacent properties demand more power, then the underground conduits may be insufficient to meet the new demand and require additional work. Once the undergrounding work is complete, all the overhead facilities with associated appurtenances will need to be removed and damaged surfaces repaired. The power companies would need to convert their systems all at once instead of piecemeal connections to individual properties along a corridor.

Issues When Converting Existing Utility Connections to Residences and Businesses

A challenge with switching to an underground system is converting the meter connection to residences and businesses, as the existing meter with an overhead connection requires

conversion to a meter with an underground feed. At a minimum the change in the power feed requires a new meter; however, if the existing meter is not compliant with the current National Electric Code (NEC) (Reference 1) it can open other issues downstream. For example, the customer's electrical panel may also need to be replaced with the replacement of the meter, and the existing wiring in the building could also be an issue if it does not include proper ground wiring. The power company cannot reconnect service to a residence or business until the new service and meter receives the appropriate electrical permits. In addition, the change can require a new location at which the service connection is made. As such, the actual cost for this work can vary.

In the past, residences had the option of accepting the new underground power feed or maintaining an aerial connection. To maintain an aerial connection, customers can either add a new utility pole in their front yard to recreate the overhead connection from that point to the building or install a junction box at the base of the house and run a new conduit pipe along the exterior to the top of the existing weatherhead (so that the wire will then enter the building from the existing entry). PGE recently changed its policy, however, which eliminates the dual-weatherhead option.

At Government Camp on Mt. Hood, Clackamas County used urban renewal dollars to complete a utility undergrounding project back in 2001. PGE required 75% of the property owners to hook up before proceeding with the project. On that project, coordination between the various utility companies became an issue as the phone and cable companies were tardy in completing their relocation work and delayed the project. Each property owner had to pay an electrician to convert their respective services to those that could accommodate underground power feeds; urban renewal dollars could have been used to cover this expense but was not at the request of the project's Citizens Advisory Committee. One property owner who refused to pay for this expense elected instead to install a wood pole in his/her front yard and from there maintained an aerial connection to the house.

Meanwhile on the City of Portland's OHSU Tram project along SW Gibbs Street, PGE reconnected power to several residences via a new conduit pipe along the exterior of the houses to the top of the existing weatherhead after placing the main power lines underground.

When a road authority or a neighborhood group wishes to relocate aerial power wires underground, the power company requires that the requesting entity initiate all conversations with adjacent property owners. Further, PGE or PP&L require a signed letter from each property owner before proceeding with the installation to ensure concurrence with the planned work. The requesting entity is responsible for all infrastructure costs associated with converting an aerial system to an underground system, including trenching, conduit, vaults, and permitting. The power company is only able to access private property if the road authority has obtained rights of entry, temporary construction easements, or access via eminent domain.

Essentially all customers affected by the conversion must agree in writing up front to modify their service entrance and meter bases as necessary to accept the underground power. The customers must obtain proper approvals from local jurisdictions.

The Oregon Public Utility Commission (OPUC) Tariff Rule I states the Customer is responsible for all costs associated with:

1. Trenching and boring
2. Conduit
3. Vaults
4. Transformer Pads
5. Street Crossings
6. Backfilling
7. Paving
8. Special easement and permit costs associated with the underground facilities.
9. Miscellaneous project coordination costs

The customer is also responsible for the remaining value (overhead retirement costs) of the existing overhead facilities plus the cost of reconfiguring associated overhead facilities to support the underground conversion. This might include the replacement of poles, reframing, the addition of guys and anchors.

Meanwhile the power company is responsible for the costs of the following items:

1. Cable
2. Transformers
3. Components
4. Secondary services
5. Meters

The power company is also responsible for the system switching and operating costs associated with the conversion up to the applicable Line Extension Allowance (LEA). If the above costs exceed the LEA, then the Customer is responsible for the difference. In the case of mainline conversions, the power company assumes that the LEA covers all expenses.

City of Portland Restrictions on Above-Ground Utilities

PBOT manages utility franchise agreements with PGE and PP&L. Meanwhile, a different branch of the City (the Utility Franchise/Utility License Management Program) manages utility franchise agreements with non-electrical utilities such as Qwest and Comcast. PBOT does not allow above-ground utilities within its right-of-way by Title 17 in its Administrative Rules (Reference 2), both for safety and for aesthetic reasons; the only exceptions are granted for utility poles and back guys. Each project has the ability to apply for a variance to City policy, which must show proof that other options were first tried. The final decision on whether or not to grant a variance ultimately rests with the City Engineer.

Thus pad-mounted transformers, which are typically needed when converting an overhead system to an underground system, are not allowed within existing right-of-way even if space exists in planter strips or behind sidewalk. To remedy the situation, power companies must either place the pad-mounted transformers on private property through a permanent easement or install submersible transformers beneath the sidewalk. A third option is to install transformers on utility poles along adjacent streets where utility poles are still allowed, provided that the distance to those transformers is not too great. PGE's and PP&L's preference between locating an above-ground pad-mounted transformer on private property and installing a submersible transformer within the right-of-way is to locate on private property. Pad-mounted transformers are readily accessible for maintenance, less expensive, and not susceptible to flooding.

The City of Portland has five underground utility districts established by City Code 17.60 (Reference 3). The districts include the downtown core, two within the inner eastside, one immediately south of downtown, and a fifth near the airport. Per conversations with the City, a sixth may be developed along SW Gibbs Street due to the OHSU aerial tram line.

The development of new undergrounding districts in the City of Portland is a complex process that includes an amendment to City Code and ratification from City Council. Before a new undergrounding district could be created, the City would need to resolve the cost implications with the various overhead utilities in that area. One of the main items that often stop requests for new districts in the City is the issue of compensation for utility companies. Most areas in the City that have requested undergrounding districts are not in a position to cover the cost among the neighboring properties, and City Council is not amiable to having those costs shared among all ratepayers within the City for the benefit of that one neighborhood.

Other agencies are not as stringent with their requirements for above-ground structures. The City of Beaverton, for example, allows above-ground pad-mounted transformers within public right-of-way; however, they must reside outside the roadway clear zone which often places them behind the back of sidewalk.

Oregon Laws for Undergrounding Overhead Utilities

Oregon Revised Statute 758 (Reference 4) describes procedures for converting existing overhead electric and communication facilities to underground facilities. It summarizes the authority that public agencies have to require the conversion of overhead facilities, to develop assessment districts if necessary, and to notify landowners. ORS 758.250 mentions that the conversion of facilities on private property is made at the expense of the landowner, and that the utility is required to obtain a permit or an easement prior to working on private property.

Oregon Administrative Rule 860 Division 22 (Reference 5) describes procedures for establishing rates for public energy and telecommunication utilities. OAR 860-022-0046 in particular outlines methods utilities can recoup costs for converting overhead utilities to underground systems when required by governments. Utilities are allowed to collect the conversion costs from all or only a portion of the customers located within the boundaries of the government.

PGE's Rule I on Line Extensions (Reference 6) further clarifies PGE's rules on undergrounding utilities. Per this policy, PGE requires the formation of an underground district in the area.

PGE through the OPUC developed Tariff 142 (Reference 7) to summarize its adjustments to a customer's normal bill to cover compensation for expenses incurred for converting electric facilities from overhead to underground at PGE's expense. PGE applied this adjustment recently in Sandy, after the City passed an ordinance in 2006 requiring local utilities to relocate overhead facilities underground. The fee adjustment required OPUC approval before implementation, which was ultimately granted in 2009.

While Oregon does not have statewide funding programs established to facilitate the undergrounding of existing overhead utilities, some local agencies have enacted their own programs through which they promote undergrounding activities. The Cities of Beaverton and San Diego have enacted language covering utility relocations through City Code 60.65 (Reference 8) and Council Policy 600-08 (Reference 9).

In addition, Pacific Gas & Electric (PG&E) in California has formalized Tariff 20 (Reference 10) that describes how PG&E will replace its existing overhead facilities with underground facilities. Tariff 20 arose from a 1967 policy from the California PUC that encourages the undergrounding of electric and communication facilities in belief that underground facilities improves aesthetics and property values. Tariff 20 does include a series of conditions such as requirements for creation of an underground district, pre-established cost sharing arrangements, and agency-provided earthwork and associated construction.

COST ESTIMATING

It is difficult to provide a "cost per foot" estimate for projects, given the variables associated with each specific project and the lack of design details provided to date by the various utility companies. Items that affect the cost of facility relocations include the ability for power companies to place transformers above ground instead of below ground; whether or not the utility relocation work is being performed as part of other roadway enhancement projects; the nature of the businesses and residences along the roadway; and the impacts with converting utility connections to those properties.

The City of Portland's Gibbs Street utility relocation project is a good representative of the variability associated with this process. That project, which was completed in 2006, covered the undergrounding of existing overhead utilities along SW Gibbs Street between SW Barbur Boulevard and SW Hood Avenue beneath the OHSU aerial tram. The project was essentially a utility relocation project without any additional roadway work; the only other primary item included in the project was new street lighting. The bid quotes on that 1800'-long project varied between \$665,000 and \$985,000 (\$520,000 and \$780,000 for just the undergrounding work), resulting in a cost-per-foot between \$370 and \$550.

The City of Hillsboro commissioned a study to develop an underground utility master plan within a 10-block area of downtown Hillsboro (Reference 11). The master plan outlines a block-by-block strategy as properties redevelop over the next 20 years. The assumptions in the master plan, however, are based on leaving the major transmission lines along Oregon Highway 8 above-ground. Per that study, the cost-per-block estimate is roughly \$263,000 or approximately \$600 per foot.

Table 1 summarizes *approximate* per-foot costs associate with the various elements associated with undergrounding overhead utilities.

Table 1 Approximate Unit Prices for Undergrounding Utilities

Item	Approximate Unit Prices	Comments
Mobilization	3-5% of the total construction cost	Costs vary by location
Traffic Control	5-10% of the total construction cost	Costs vary by traffic characteristics and location of the utility trench
Conduits/Trenching/ Vaults/Transformers/ Backfill	\$250.00-\$500.00/ft	Costs vary by vault/transformer size and location (pad-mount vs. submersible); type and number of vaults/transformers dictated by utility companies. Lower costs achieved when combined with road/streetscape projects vs. stand-alone underground utility improvement projects
Misc. Roadwork	\$25.00-\$50.00/ft	Costs include asphalt patch of trench, driveway/sidewalk repair, etc.; lower costs achieved when combined with road/streetscape projects vs. stand-alone underground utility improvement projects
Street Lighting	\$50.00-\$100.00/ft	Costs vary by type of pole/fixture, type of roadway, etc.
On-Site Electrician	\$1,500-\$3,000/ea	Cost for reconfiguration of residential meter/service equipment
Miscellaneous/ Contingency	20-30%	Contingency varies of complexity of project and amount of detail provided

Appendix B contains accumulated cost estimating data.

DESCRIPTION OF PROJECTS

NE 97th Avenue (NE Glisan Street – NE Davis Street)

Existing Conditions

NE 97th Avenue is currently a substandard improved street that parallels Interstate 205. The roadway features a narrow paved surface with gravel shoulders and currently lacks curbs, sidewalks, and storm drainage facilities. The west side features gravel parking area near NE Glisan Street and a paved multiuse path. The east side features all of the overhead utilities.



Adjacent land uses include residences along the east end of the roadway, with a TriMet maintenance facility along the west side and a few houses located along the southern end of the corridor along the west side (see photo). Per the City’s zoning maps (Reference 12), the area is zoned “RxD” (high density multi-dwelling zone with design overlay) which is common for areas near transit stops and employment centers.

Inventory Overhead Utilities and Document Constraints

Per field observations and the survey files provided by the City, the roadway features a combination of overhead and underground utilities. There is a short segment of underground power where PP&L feeds the existing TriMet maintenance facility west of the roadway. The underground utilities include water, gas, and sanitary. The overhead utilities are primarily power, cable, and telephone.

The poles along NE 97th Avenue are actually owned by Qwest and not PP&L. Qwest has been made aware of this project but has not yet provided a conceptual design.

Evaluate Age and Condition of Current Utility Poles

Most of the poles along NE 97th Avenue appear to be in good shape, with some as recent as 2007. It appears that a couple of them were installed or replaced as part of the TriMet Green Line project as the newer poles are adjacent to the underground feed to the TriMet maintenance facility along I-



205. In addition to one pole with a date stamp reading the year 2007, a second pole has a date stamp reading 2006, two additional poles are dated 1985, and a fifth pole that does not have a date; all of these poles seem to be in good shape from field observations. The southernmost pole along the LID improvement area near NE Davis Street does not appear to be in good shape per field observations (see photo), although as noted below field observations do not provide the measure by which PGE and PP&L determine the quality of existing poles.

PGE and PP&L conduct routine inspections on their poles and conduct core samples roughly every decade. Depending on the type of wood used, poles that appear to be in poor shape on the exterior may still have a solid core that justifies continued service. PGE does not have a sunset clause on its poles (i.e. a 20-year design life after which all poles are required to be replaced).

Proposed Improvements

The City recently established a local improvement district (LID) along this segment of NE 97th Avenue titled the “NE 97th Avenue Green Street Local Improvement District” (Reference 13). The LID project will remove the existing roadway surfaces, regrade, and place a new asphalt concrete street; construct stormwater drainage improvements; install new curbs, curb extensions, and sidewalks; and plant street trees. The LID project is estimated to cost roughly \$1.2 million, with the adjacent private residences responsible for roughly one-third of the expense. The City intends to bid the project in January 2011.

This LID is unique in that a developer owns approximately half of the properties along NE 97th Avenue and is funding a majority of the private portion of the LID. The developer has conceptual plans to redevelop several existing properties along the east side of NE 97th Avenue and desires undergrounding the overhead system as part of the LID. Per the City, however, the LID cannot pay for undergrounding overhead utilities as it is currently written. Adding the expense to underground the existing overhead utilities would require outside funding or a new City Council hearing.

Future redevelopment of the adjacent properties will include constructing a new east-west NE Flanders Street “woonerf”, which is a City street with low vehicular speeds in which pedestrians, bicyclists, and vehicles generally share the same space. The redevelopment will also include electric charging stations among other amenities. The decision whether or not to install public charging stations along NE 97th Avenue in addition to private charging stations onsite is still under discussion.

The Gateway Master Plan includes vacating NE 97th Avenue between NE Couch and NE Davis Streets. This may be impossible to implement as the City has water lines running along NE 97th Avenue that will need to remain within public right-of-way.

Issues and Constraints with Undergrounding Overhead Utilities on this Project

Undergrounding the NE 97th Avenue system may be an issue since the power feeding the TriMet maintenance facility appears to be 3-phase power. PP&L does not typically underground 3-phase power, although PP&L is working on a design that addresses this design feature. An option could be to install a step-down transformer on TriMet's property to allow the power conversion to occur off-site.

PP&L's tariff with the City may require the City or PDC to pay for the price difference between relocating overhead utility poles versus undergrounding the system. The project team discussed who would fund the expense for electricians reconfiguring the service panels at the various houses along NE 97th Avenue. Due to the nature of the project, it is likely that the City or PDC would fund this item. There is some risk with this option, as there could be downstream issues at the various private properties when the panels are reconfigured if some houses do not have proper grounding of existing equipment, etc.

The proposed stormwater facilities along NE 97th Avenue may make it challenging to place underground utilities beneath them, as the facilities are 5-10 feet deep in several locations. It is common for underground utilities to require an additional 3 feet of vertical clearance below the bottom of the ditch that could place the lateral crossings 8-14 feet below ground.

Feasibility with Undergrounding Overhead Utilities on this Project

It is practical to place the overhead utilities underground along NE 97th Avenue. For the power system there are a few alternatives for transformer placement. The project team discussed the option of placing the power system along the west side of NE 97th Avenue within ODOT right-of-way. This allows PP&L to use less expensive above-ground pad-mounted transformers instead of submersible transformers. While it was suggested that ODOT would not be agreeable to allowing transformers within its right-of-way, the project team will explore this option with the ODOT district office to confirm its opinion. One of the downsides with this option is that it places the underground utilities on the opposite side of NE 97th Avenue from most of the areas they need to serve.

Another option to explore on this project is the possibility of installing an empty conduit and vault system underground in anticipation of the future undergrounding of the utilities. This option defers the undergrounding until the redevelopment occurs in the future, allowing the existing residences with overhead services to retain their current service connections. This will benefit the properties within the project area that are planned to be removed in the future; however, the other properties will still require future modifications to their existing services to accommodate the eventual undergrounding of the utilities.

After reviewing the proposed design of the project, the team discussed the option of placing above-ground pad-mounted transformers along the planned NE Flanders Street "woonerf". There will be a five-foot landscape strip behind the back of sidewalk outside the proposed right-of-way that will allow PP&L room to place above-ground pad-mounted transformers. Given the

extra cost associated with submersible transformers and the uncertainty at this time whether or not ODOT will grant permission for PP&L to place above-ground pad-mounted transformers within its right-of-way, this may be the best option for the project.

At this point, it appears that the joint utility trench will likely end up along the east side of NE 97th Avenue with power on one side of the trench and cable and telephone on the other side of the trench.

Conceptual-Level Construction Cost Estimate

Based on the information provided to date, Table 2 summarizes the anticipated construction costs to underground the existing system along NE 97th Avenue:

Table 2 Approximate Prices for Undergrounding Utilities along NE 97th Avenue

Item	Approximate Prices	Comments
Mobilization	3%	Lower mobilization cost due to proximity to I-205
Traffic Control	5%	Lower traffic control cost due to street characteristics
Conduits/Trenching/ Vaults/Transformers/ Backfill	\$250.00/ft	Used lower cost figure due to amount of new roadwork in conjunction with undergrounding effort
Misc. Roadwork	\$25.00/ft	Used lower cost figure due to amount of new roadwork in conjunction with undergrounding effort
Street Lighting	\$75.00/ft	
On-Site Electrician	\$2,000/ea	Cost for reconfiguration of residential meter/service equipment
Miscellaneous/ Contingency	25%	
TOTAL	\$400,000	\$500/foot based on roughly 800 feet of improvements for NE 97 th Avenue

PP&L also provided a ballpark cost estimate for its crews to install an underground system along NE 97th Avenue featuring above-ground pad-mounted transformers. The PP&L estimate is roughly \$100,000 for its crews to install the equipment and another \$50,000 for the equipment itself, which translates to approximately \$150 per foot for just the power system. The estimate does not include any work within private property or other expenses. PP&L has yet to provide an estimate for undergrounding the system with submersible transformers. These figures are not included in Table 2.

SE Ramona Street (SE 92nd Avenue to I-205)

Existing Conditions

SE Ramona Street is a 400' long dead end roadway that terminates near a new TriMet Green Line MAX station along I-205. The roadway is a traditional older city street with a 30' wide paved surface, curbs and 10' wide sidewalks on each side of the roadway. A few of the commercial buildings along the west end of the roadway are flush with the back of sidewalk, while most of the residences east of SE 92nd Avenue are set back from the right-of-way. The 10' wide sidewalk includes a handful of existing trees and tailored landscaping maintained by adjacent residences.

Surrounding land uses include a combination of residences and businesses, with apartment complexes located along the north side and the TriMet station at the east end of the block. PDC records show that three of the residential properties and the commercial building on the SE corner of SE 92nd Avenue and SE Ramona Street are older buildings built prior to World War I. Meanwhile three of the other residential properties were built within the past 35 years. Per the City's zoning maps, the area is zoned "ExD" (central employment with design overlay) which is a zoning code that allows industrial and commercial uses at a central location. The north end of the cul-de-sac is zoned "R2a" (low density multi-dwelling zone with alternative design density overlay zone) which is a zoning code that promotes duplexes, townhouses, row houses and garden apartments.

Inventory Overhead Utilities and Document Constraints

Per field observations and the survey files provided by the City, the roadway features a combination of overhead and underground utilities. The underground utilities include water, gas, telephone, and a combined storm/sanitary line. In addition, there are short segments where overhead power lines are routed underground to access adjacent properties. Some of these underground services utilize pole-mounted transformers; one apartment complex along the north side of SE Ramona Street utilizes a pad-mounted transformer located behind the sidewalk on the north side of the street. The overhead utilities are primarily power, cable, and telephone.



Evaluate Age and Condition of Current Utility Poles

Most of the poles appear to be in good shape, with some as recent as 2008. It appears that several were replaced as part of the TriMet Green Line project. The pole on the west side of SE 92nd Avenue and SE Ramona Street and the pole at the east end of SE Ramona Street near the cul-de-sac are both labeled with tags reading “2008” on them. A third pole immediately east of SE 92nd Avenue is dated 1988, while a fourth pole near the apartment complex is dated 1976; both of them appear to be in good shape from field observations. A fifth pole located midway along the south side does not have a date listed on the pole and appears to be in good shape. A sixth pole, which is located midway along the north side, does not appear to be in good shape per field observations.

Proposed Improvements

The primary motivation to underground the existing overhead utilities are aesthetic; the City wishes to enhance the appearance of this roadway and make the connection between the TriMet Green Line MAX station and the Lents Town Center more attractive. Further, some of the existing utilities along SE Ramona Street protrude into the through pedestrian zone (see photo).

Issues and Constraints with Undergrounding Overhead Utilities on this Project

Undergrounding the existing utilities along this roadway could present some challenges. The proximity of the commercial buildings to the sidewalk does not allow much room to excavate for new submersible transformers. In addition, the commercial building along the north side has a significant array of panels attached to its eastern wall with four weatherheads, a large main service cabinet, and six smaller service cabinets (see photos). Reconfiguring the power connection to this building may be challenging and require construction easements to trench onto private property. Further, there may be limited access near this building for a submersible transformer due to the close proximity of commercial driveways near the existing cabinets.



Feasibility with Undergrounding Overhead Utilities on this Project



While it is practical to place the overhead utilities underground along SE Ramona Avenue, additional coordination is needed between the City’s design team and the utilities to confirm possible locations for the utility trenches and vaults. Unlike the NE 97th Avenue project, the SE Ramona Avenue project does not have easy options for locating above-ground pad-mounted transformers. Unless PGE is able to obtain private easements, its transformers would need to be located underground within the City’s right-of-way.

Conceptual-Level Construction Cost Estimate

Based on the information provided to date, Table 3 summarizes the anticipated construction costs to underground the existing system along SE Ramona Avenue:

Table 3 Approximate Prices for Undergrounding Utilities along SE Ramona Avenue

Item	Approximate Prices	Comments
Mobilization	3%	Lower mobilization cost due to proximity to I-205
Traffic Control	6%	Lower traffic control cost due to street characteristics
Conduits/Trenching/ Vaults/Transformers/ Backfill	\$350.00/ft	Used lower cost figure due to amount of new roadwork in conjunction with undergrounding effort
Misc. Roadwork	\$25.00/ft	Used lower cost figure due to amount of new roadwork in conjunction with undergrounding effort
Street Lighting	\$75.00/ft	
On-Site Electrician	\$2,000/ea	Cost for reconfiguration of residential meter/service equipment
Miscellaneous/ Contingency	25%	
TOTAL	\$270,000	\$670/foot based on roughly 400 feet of improvements for SE Ramona Street

Lents Town Center (SE Foster Road and SE Woodstock Boulevard)

Existing Conditions

The Lents Town Center is a commercial area located along the west side of I-205. The roadways are primarily older city streets with paved surfaces, curbs, and sidewalks on each side of the roadway. Several of the commercial buildings are flush with the back of sidewalk, and the sidewalk widths are narrow in several areas with obstacles within the through pedestrian zone (see photo).



Per the City's zoning maps, the area is zoned "ExD" (central employment with design overlay) which is a zoning code that allows allow industrial and commercial uses which need a central location.

Inventory Overhead Utilities and Document Constraints



Per field observations, the area features a mixture of overhead and underground utilities and a combination of older and newer equipment. The overhead utilities are primarily power, cable, and telephone; included in the overhead utility lines are major transmission lines running along SE Woodstock Boulevard.

The existing street lighting in the area combines luminaires attached to utility poles, steel poles installed when the I-205/Foster/Woodstock interchange was constructed in the 1970s, and new ornamental poles (see photo).

Evaluate Age and Condition of Current Utility Poles

Due to the number of poles within the study area, we did not complete a detailed review of each utility pole within the town center. There are several poles that appear in good shape; conversely, there are also several poles that appear older and possibly need replacement.

Proposed Improvements

The PDC has identified the Lents Town Center as a priority for redevelopment, including retail, office, institutional, and high-density residential uses that complement the surrounding neighborhood. A primary goal is to transform the area into a vibrant focal point for the community. Among the proposed improvements include realigning SE 91st Avenue, sidewalk widening and intersection corner design, and new gateway treatments.

Issues and Constraints with Undergrounding Overhead Utilities on this Project

Undergrounding the existing utilities in the town center will present multiple challenges. The proximity of the commercial buildings to the sidewalk does not allow much room to excavate the submersible transformers. In addition, there are some portions of the town center that are already improved such as along the north side of SE Foster Road that would require removing new streetscape to provide underground power to the recently-constructed businesses.

Further, PGE has 115 kV high-voltage transmission lines running along SE Woodstock Boulevard and 13 kV medium-voltage transmission lines running along SE Foster Road that likely need to remain as overhead transmission lines due to the cost of undergrounding these transmission lines. The proximity of the Lents Town Center to existing PGE substations increases the voltage demand along the Foster/Woodstock corridor. PGE estimates that undergrounding the system along SE Foster Road would require four 6" conduits with 8' x 20' vaults, and given the amperage of the system the vaults would need to be located above-ground.

Feasibility with Undergrounding Overhead Utilities on this Project

While it is practical to place the all overhead utilities underground in the town center, in all likelihood the only feasible overhead utilities to underground include telephone, cable, and lower-voltage feeder lines. Additional coordination is needed between the City's design team and the utilities to confirm possible locations for the utility trenches and vaults. If overhead utility poles remain on the adjacent streets, it is possible to place above-ground transformers on those poles and then feed the power underground to the town center which would be more cost effective than providing submersible transformers. Unless PGE is able to obtain private easements, its transformers would need to be located underground within the City's right-of-way.

We anticipate that the cost to underground the utilities within the Lents Town Center may be more expensive since there are not planned street improvements associated with every block of the area. Some of the undergrounding work will require its own utility trench and subsequent repaving and/or curb and sidewalk work.

Conceptual-Level Construction Cost Estimate

Based on the information provided to date, Table 4 summarizes the anticipated construction costs to underground the existing system in the Lents Town Center except for the high-voltage and medium-voltage transmission lines:

Table 4 Approximate Prices for Undergrounding Utilities in the Lents Town Center

Item	Approximate Prices	Comments
Mobilization	3%	Lower mobilization cost due to proximity to I-205
Traffic Control	10%	High traffic control costs due to heavy traffic volumes in project area
Conduits/Trenching/ Vaults/Transformers/ Backfill	\$450.00/ft	Used higher cost figure due to the complexity of the project area <i>NOTE: estimate does not include undergrounding the high-voltage or medium-voltage transmission lines</i>
Misc. Roadwork	\$50.00/ft	Used higher cost figure due to the limited amount of new roadwork in conjunction with undergrounding effort
Street Lighting	\$75.00/ft	
On-Site Electrician	\$2,000/ea	Cost for reconfiguration of residential meter/service equipment
Miscellaneous/ Contingency	30%	
TOTAL	\$4.0M	\$840/foot based on roughly 4800 feet of improvements for the Lents Town Center

PGE prepared an estimate to the City last year summarizing the anticipated costs associated with undergrounding its equipment (except for its high-voltage transmission lines) within the Lents Town Center. PGE estimated a cost of roughly \$1M for undergrounding its facilities in a “best case” scenario. This estimate is in addition to the figures shown in Table 4, although these expenses are expected to be covered by PGE through its tariff process.

CONCLUSION

The decision to underground overhead utilities ultimately comes down to the ability to justify payment for the additional expense to offset the benefits to the local community in improved aesthetics and safety. All three projects are candidates for undergrounding their existing utilities, although it is cost-prohibitive to underground the high-voltage lines and medium-voltage lines within the Lents Town Center. Project estimates range from \$500 to \$850 per foot based on the complexity of the project and the ability to install the underground facilities in conjunction with roadway improvements. The project team ultimately requires additional information from PGE, Qwest, and PP&L to make a more refined determination on the cost difference between undergrounding the existing system versus relocating the existing overhead system.

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