

## A Geoprocessing Tool for Early Civil Work Notification to Optimize Fiber Optic Cable Installation Cost

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**Abstract :** Most of the cost of installing a new fiber optic cable is attributed to civil work-trenching-cost. In many cases, information technology departments receive project proposals in their eReview system, but not all projects are visible to everyone. Additionally, if there was no IT scope in the proposed project, it is not likely to be visible to IT. Sometimes it is too late to add IT scope after project budgets have been finalized. Finally, the eReview system is a repository of PDF files for each project, which commits the reviewer to manual work and limits automation potential. This paper details a solution to address the late notification of the eReview system by integrating IT Sites GIS data-sites locations-with land use permit (LUP) data-civil work activity, which is the first step before securing the required land usage authorizations and means no detailed designs for any relevant project before an approved LUP request. To address the manual nature of eReview system, both the LUP System and IT data are using ArcGIS Desktop, which enables the creation of a geoprocessing tool with either Python or Model Builder to automate finding and evaluating potentially usable LUP requests to reduce trenching between two sites in need of a new FOC. To achieve this, a weekly dump was taken from LUP system production data and loaded manually onto ArcMap Desktop. Then a custom tool was developed in model builder, which consisted of a table of two columns containing all the pairs of sites in need of new fiber connectivity. The tool then iterates all rows of this table, taking the sites' pair one at a time and finding potential LUPs between them, which satisfies the provided search radius. If a group of LUPs was found, an iterator would go through each LUP to find the required civil work between the two sites and the LUP Polyline feature and the distance through the line, which would be counted as cost avoidance if an IT scope had been added. Finally, the tool will export an Excel file named with sites pair, and it will contain as many rows as the number of LUPs, which met the search radius containing trenching and pulling information and cost. As a result, multiple projects have been identified - historical, missed opportunity, and proposed projects. For the proposed project, the savings were about 75% (\$750,000) to install a new fiber with the Euclidean distance between Abqaiq GOSP2 and GOSP3 DCOs. In conclusion, the current tool setup identifies opportunities to bundle civil work on single projects at a time and between two sites. More work is needed to allow the bundling of multiple projects between two sites to achieve even more cost avoidance in both capital cost and carbon footprint.

**Keywords :** GIS, fiber optic cable installation optimization, eliminate redundant civil work, reduce carbon footprint for fiber optic cable installation

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