

Development of Low-Cost GIS-Based Document Retrieval System

By Jan J. Wolf

Abstract:

The ASAP (As-built, Subdivision, and Plat) Finder is a low-cost and freely distributable GIS application developed by the City of Newberg, Oregon that enables an individual to quickly retrieve documents based on geographic information associated with such documents. The ASAP Finder utilizes Python scripts and ArcObject code to integrate ArcGIS software and MS Access to provide a user-friendly way to access pertinent documents. Through the ASAP Finder, the City of Newberg is now able to rapidly access documents that previously were extremely cumbersome to work with and disseminate. In turn, this saves time and money for the City and entities that interact with the City.

Inevitably, when a municipality undergoes change, much documentation of such change is required. Concomitant with this is that the quantity of change runs parallel to the quantity of documents. Subsequently, as the quantity of documents increases the complexity of maintaining and rapidly accessing such documentation takes on even greater importance. This does not even take into account the quality of such documentation nor the added complexity of document management if natural or man-made disasters make their way into the mix.

GIS is a great tool for documenting change, but as many of us know, documents found within government are created in a myriad number of ways and, unfortunately, not always in GIS. Working within the Engineering department at the City of Newberg, Oregon the documentation of change that I deal with primarily comes in the form of “as-built” drawings. Records of specific public infrastructure come in various states of quality and quantity making organization complicated.

One of the first challenges staff looked at was how we had been managing such “infrastructure” documents. Decaying, worn papers and somewhat pungent mylar sheets lying in flat files in various states of disarray would be a quick synopsis of the situation. Handwritten notebooks as to how to find these drawings were the only location method available to our staff. In general, this was a rather cumbersome methodology but more-or-less workable (although at times intimidating) way to handle document management for a small city of just over 20,000 people.

The staff felt it would be prudent to make the investment in a scanner and scan all the “as-built” documents into an electronic form. In addition to capturing the information contained in the paper and mylar documents by scanning them, Newberg also needed a quick means for accessing the scanned images. The first step in dealing with this was to devise a new coherent numbering scheme for the documents and enter reference information about the document into a Microsoft Access database. The database includes such information as the new document number, project name/subdivision, streets shown on the drawing (physically written there and/or implied), and what utilities are shown on the drawing. In addition, the year of when the utility work was incorporated into the new numbering system.

Overall, this system worked fine. However, there were a few remaining issues: How would information be retrieved? Where would the scans of the drawings reside on the network? The initial retrieval strategy involved a form-based querying tool in MS Access. In theory, this worked but spelling sensitivity issues and the general lack of a geographic context generally rendered things very problematic.

The As-built, Subdivision, and Plat Finder, or ASAP Finder for short, was created in Newberg to address these issues. The ASAP Finder is a free, public domain application that is triggered from within the ArcGIS Desktop environment and works in conjunction with the querying and formatting capabilities of MS Access and the malleable power of ArcObject programming and Python scripting.

The ASAP Finder works with our initial database mentioned above with the stipulation that one populates street names contained in drawings with names that are found in the GIS streets dataset. This dataset is maintained in an ESRI Personal Geodatabase.

Basically, the ASAP Finder application is started from within ArcMap where the streets of interest are selected. This selection utilizes the standard selection tools available in ArcMap. Due to the nature of the query algorithm employed in the ASAP Finder at least two unique streets need to be selected and intersecting streets are most effective. Once the street selection is made the ASAP Finder button can then be pushed. (Figure 1)

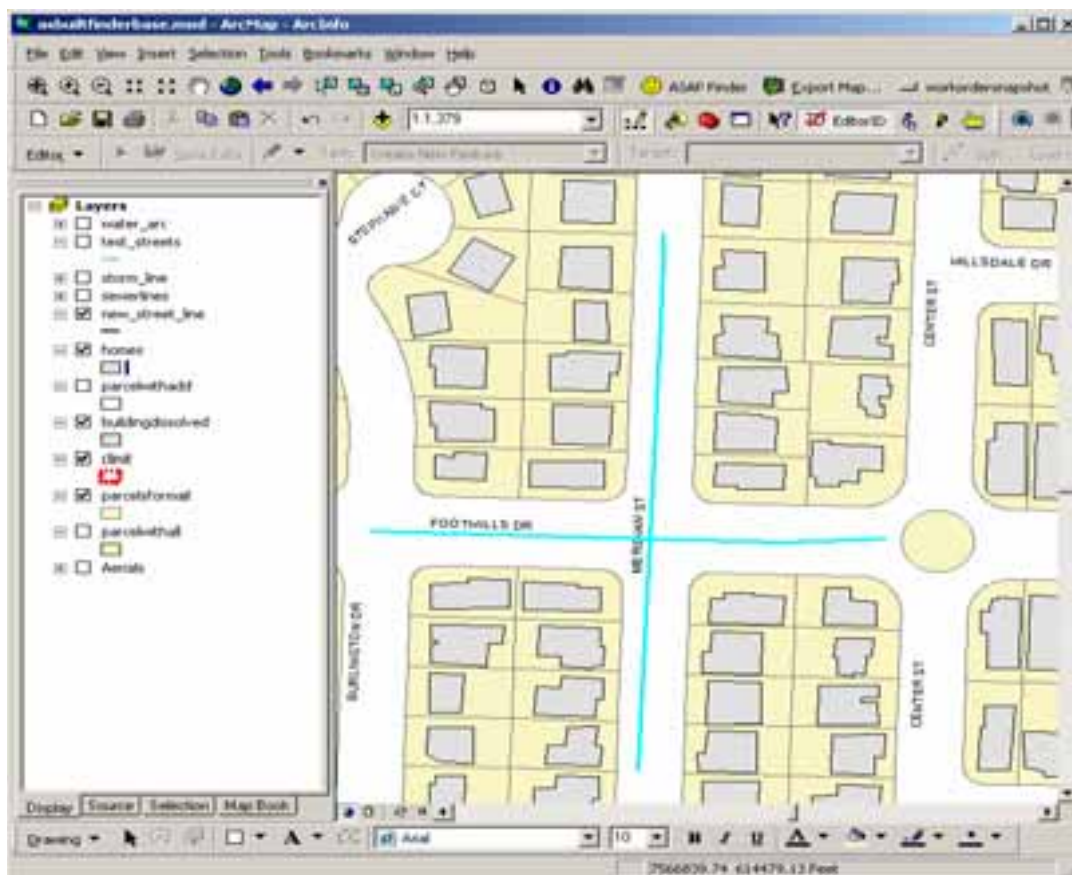


Figure 1 – Streets of interest selected and ready for ASAP Finder button to be pushed.

| Issue Number | Issue Street | Drawing Number | Description | Status | Issue Location | Drawing Number | Sheet | Project Name | Sub-Block Name |
|--------------|--------------|----------------|---|--------|----------------|----------------|-------|--|------------------------------------|
| AMERICAN ST | FOOTHILLS DR | AS0011B | S:\CD\As-built\Engineering\AS-Built\7011B\7011B.DWG | 0 | 0 | 0 | 0 | | DAY-KROLL NO. 8 |
| AMERICAN ST | FOOTHILLS DR | AS0011A | S:\CD\As-built\Engineering\AS-Built\7011A\7011A.DWG | 0 | 0 | 0 | 0 | | DAY-KROLL NO. 8 |
| AMERICAN ST | FOOTHILLS DR | AS0006A | S:\CD\As-built\Engineering\AS-Built\7006A\7006A.DWG | 0 | 0 | 0 | 0 | | DAY-KROLL NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0007 | S:\CD\As-built\Engineering\AS-Built\7007\7007.DWG | 0 | 0 | 0 | 0 | | DAY-KROLL NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0008 | S:\CD\As-built\Engineering\AS-Built\7008\7008.DWG | Yes | 0 | Yes | 0 | TOILETS AT DAY-KROLL NO. 2 & NO. 3 | TOILETS AT DAY-KROLL NO. 2 & NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0009 | S:\CD\As-built\Engineering\AS-Built\7009\7009.DWG | 0 | 0 | 0 | 0 | TWO TOILETS AT DAY-KROLL NO. 2 & NO. 3 | TOILETS AT DAY-KROLL NO. 2 & NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0010C | S:\CD\As-built\Engineering\AS-Built\7010C\7010C.DWG | Yes | 0 | Yes | 0 | TWO TOILETS AT DAY-KROLL NO. 2 | TOILETS AT DAY-KROLL NO. 2 |
| AMERICAN ST | FOOTHILLS DR | AS0010B | S:\CD\As-built\Engineering\AS-Built\7010B\7010B.DWG | 0 | 0 | 0 | 0 | TWO TOILETS AT DAY-KROLL NO. 2 | TOILETS AT DAY-KROLL NO. 2 |
| AMERICAN ST | FOOTHILLS DR | AS0009P | S:\CD\As-built\Engineering\AS-Built\7009P\7009P.DWG | Yes | 0 | Yes | 0 | DAY-KROLL NO. 3 | DAY-KROLL NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0009C | S:\CD\As-built\Engineering\AS-Built\7009C\7009C.DWG | 0 | Yes | 0 | 0 | DAY-KROLL NO. 3 | DAY-KROLL NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0009B | S:\CD\As-built\Engineering\AS-Built\7009B\7009B.DWG | 0 | 0 | 0 | 0 | DAY-KROLL NO. 3 | DAY-KROLL NO. 3 |
| AMERICAN ST | FOOTHILLS DR | AS0010B | S:\CD\As-built\Engineering\AS-Built\7010B\7010B.DWG | 0 | 0 | 0 | 0 | DAY-KROLL | DAY-KROLL |

Figure 3 – Sample HTML page generated by the ASAP Finder including hyperlinks and snapshot of area in question.

In conclusion, the ASAP Finder cuts down the time required to find desired documents and maintains the geographic context needed to work with the scanned documents. The ASAP Finder allows the City of Newberg to rapidly access documents that previously were extremely cumbersome to work with and disseminate. In turn, this saves time and money for the City and entities that interact with the City. For example, someone can come into the office looking for "as-builts" and return home within 20 minutes with what they are looking for.

Currently, the ASAP Finder works as a ArcGIS Desktop application that can pull documents off the network or a DVD. Future plans for ASAP Finder include the following (not necessarily in order of implementation or feasibility):

- 1) Adjustment of the ASAP Finder to make it an Internet-based application.
- 2) Creation of an option to find associated documents that belong to the set.
- 3) Fine tune selection to select specific utilities of interest.
- 4) Ranking of results of query by suitability of particular drawings.
- 5) Functionality to allow drawings to be placed directly into ArcGIS with proper georectification.
- 6) Portability to other database formats.

7) Modification of the ASAP Finder for use out in the field.

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