Acknowledgements

This document is the product of Seattle Public Utilities’ (SPU) Base Map Drafting Group. The Base Map Group is a part of Technical Resources under Engineering Support for the Engineering Services Division of SPU.

Many people contributed to the excellence of this Guide:

Lori Randle – Principal Author
Brian Patton
Dean Huber
Steve Law
Jason Graham
Timothy Reese
Joshua Jones
Bradley Bryan
## Contents

Introduction: Guide to SPU Base Map Production  

Section 1. **Fundamentals of Base-Mapping**  
1.1 What is a Base Map? 3  
1.2 A Base Map Has Three Primary Parts. 3  
1.3 How Accurate is a SPU Base Map? 5  
1.4 GIS Themes in Base Maps 12  
1.5 Reusing Existing Base Maps 12  
1.6 Unconventional or "Down & Dirty" Tips 13

Section 2. **Starting a Base Map**  
2.1 Becoming Familiar with the Base Map Project 15  
2.2 Using Archived Base Maps 17  
2.3 Planning the Presentation 18  
2.4 Estimating Tips 19  

Section 3. **Conducting and Organizing Research**  
3.1 Types of Research Resources 21  
3.2 Primary Research Resources 22  
3.3 Organizing Research Using Planform 22  
3.4 SPU Records Vault Plans 23  
3.5 Franchise Utility Books 24  
3.6 Side Sewer Cards 27  
3.7 Gas Maps Tips 28  

Section 4. **Using Topographical Survey in SPU Base Maps**  
4.1 Standard Items in SPU Survey ACAD Drawing 29  
4.2 Items by Request per Project 31  
4.3 Quality-Checking the Survey Product 31  
4.4 Bringing Control and Right-of-Way to SPU Presentation Standard 31  
4.5 Interpreting the Survey Point Database 36  
4.6 Interpreting Survey Field Book Notes 37  
4.7 Reusing Existing Manually Drawn Base Maps with New Survey 38  
4.8 Applying the Survey Product to ACAD Drawing 38  
4.9 More Survey Point Applications 40  

Section 5. **Interpreting Research**  
5.1 Before Starting 43  
5.2 Proceed Chronologically 44  
5.3 If Using Existing Base Maps 44  
5.4 Add Research Reference Labels 44  
5.5 Do NOT Use Existing Conditions Shown on As-Builts 44  
5.6 Look for Key Information 46  
5.7 Use Secondary Research Resources to Check Map 48  
5.8 Resolve Questions and Conflicting Information 48  

Tips
Section 6. **Applying Research**

6.1 Vault Plans vs. Utility Books 51
6.2 Helpful Hints for SPU Vault Plans 51
6.3 Helpful Hints for Older SPU Vault Plans 52
6.4 Helpful Hints for Utility Books 53
6.5 Grading Plans 54
6.6 Paving Plans 54
6.7 Sewer and Drainage Plans 61
6.8 Side Sewer Cards 63
6.9ater Main Plans 65
6.10 Electrical, Signal Lighting, & Communications 65
6.11 Bridges and Structures 67
6.12 Landscaping 68

Section 7. **Conducting a Field Check**

7.1 Preparing for a Field Check 69
7.2 Preparing a Field Check Print 70
7.3 Field Location Techniques 71
7.4 Conducting a Field Check 73
7.5 Field Check Notes Readability 76
7.6 The Public 76
7.7 Time in Field/ in House 76

Section 8. **Self-Checking a Base Map**

8.1 Document Unresolved Questions 77
8.2 Using Compilation Research Documents 77
8.3 Check the Control and ROW 78
8.4 Look over the FC Notes 78
8.5 Review Most Recent As-Built Documents 78
8.6 Conduct Last Check for Street Use Utility Permits 78
8.7 Review Base Map Checklist 78
8.8 Update the Planform 78
8.9 Provide Check Print for the Checker 78
8.10 Provide SPU Records Vault Plans for the Checker 79
8.11 Assemble Research File for the Checker 79

Section 9. **Checking a Base Map**

9.1 Become Familiar with the Project 81
9.2 Have a Complete Research File in Hand 82
9.3 Use Base Map Checklist 82
9.4 Planform Must Be Current 82
9.5 Quality Check Survey Product 82
9.6 Check Topography Using Survey Product and Field Check Print 82
9.7 Initial Check of Utility Systems 83
9.8 In-Depth Check of Research Documents 83
9.9 Creating a Check Print 83
9.10 Checking in Phases with Multiple Check Prints 84
9.11 Color Coding Check Prints 85
9.12 General Comments 85
9.13 Labeling 85
9.14 Final Check 85
9.15 Intent of Corrections on Check Prints 85
Section 10. **Correcting Check Prints**

10.1 Types of Corrections Found on Check Prints 87
10.2 Color Coding Check Prints 87
10.3 Difference of Opinion 88
10.4 Highlight Completed Items 88
10.5 Sign and Date 88

Section 11. **Archiving**

11.1 Archived Base Maps and their Data Base 89
11.2 Why Archive the Research File? 89
11.3 Storage of the Research Files 90
11.4 Cleaning up Project Directory 91
10.5 Return Research Materials 91

Section 12. **Cutting Profiles**

12.1 Profile Request 93
12.2 Presentation Standard 93
12.3 Layers and Line Types 94
12.4 Symbols 94
12.5 Using Existing Elevation Data to Create a Profile View 95
12.6 When is Datum Conversion Necessary? 96
12.7 Datum Conversion Factors 96
12.8 Using Invert Elevation Data 97
12.9 Portraying Invert Elevation Data in Profiles 98
12.10 Where to Look for All Types of Elevation Data 98
12.11 Parts of an Existing Profile 99
12.13 Label Known Locations 102
12.14 Generate the Profile and Existing Grade 102
12.15 Locate Utility Crossings by Projection 102
12.16 Draw Ellipses to Represent Utility Crossings 103
12.17 Utilities Crossing Under 6-inch Diameter 103
12.18 Utilities Crossing 6-inch Diameter or Greater 103
12.19 Review before Proceeding 103
12.20 Determine Depth or Elevation of Crossing Utility 103
12.21 Placing Crossing Utility at Correct Elevation 104
12.22 Placing Crossing Utilities at Invert Elevations 104
12.23 Placing Crossing Utilities at Relative Depths 105
12.24 Process for Placing Crossing Utilities at Actual Elevations 105
12.25 Drawing Existing Parallel Utilities 105
12.26 Drawing Existing Parallel Utilities with Invert Elevation 107
12.27 Additional Callouts for Existing Utilities 107
12.28 Title the Profile View 107
12.29 Grid Standard 108

**Appendices**

Appendix 1: Base Map Checklist
Appendix 2: Presentation Standards and Examples
Appendix 3: Support Documents and Procedures
Appendix 4: Research Resources
List of Figures
Figure 6-1. Paving Features to Incorporate in SPU Base Maps 57
Figure 6-2. How to Draw Past Paving Improvements 60
Figure 7-1. Typical Field Check Questions 74
Figure 7-2. Items to Locate on a Field Check 75

Glossary

Revisions List
DOCUMENT CONVENTIONS

Several formatting styles are used in this manual to bring attention to its varying content:

**Cross References**

Cross references to other sections or appendices are in bold text:

See Section 3.8. See Appendix 3: SPU Presentation Standards and Examples.

**Examples**

Examples of various base map scenarios are shaded in blue:

**EXAMPLE:**

**Transition items**

Due to either technological advances or changes in policies or procedures, some items are in transition at the time of this writing. These items are marked with this symbol: ***

**Links**

Links to on-line information are shown in blue underline:

WWW://SPU

**Key Terms**

Important terms used in the base map process are in italics:

*as-built, control, or field check*

**Quotations**

Direct quotations or phrases are placed in quotes:

"Sample here"
GUIDE TO SPU BASEMAP PRODUCTION

INTRODUCTION

The Guide to SPU Base Map Production is a training and reference manual for creating Seattle Public Utilities (SPU) base maps.

The focus of this manual is the technical content of SPU base maps rather than software procedures used in base map production.

We have attempted to present material in a sequence that reflects base map production. It is impossible, however, to cover every instance encountered while creating base maps. Some areas have unique circumstances. In these cases, judgment calls will need to be made. Most likely, a decision will be a collaborative effort made by Base Map group members.

While the desired outcome of base mapping has not changed much over the years, the technology for producing base maps is ever-changing. This manual is a “living document” designed to accommodate frequent revisions. The following are some key features of the manual.

PREREQUISITIES

This guide assumes the user is familiar with SPU’s engineering practices, file management conventions, file naming conventions, line types, symbols, and layering standards. These items are explained in detail in the City of Seattle Inter-Departmental CADD Standards Core Elements manual.

BASE MAP CHECKLIST

The Base Map Checklist is a tool to use in conjunction with this manual. The checklist highlights the steps in creating a base map. Specific items within each step are cross-referenced to their corresponding sections in the manual. A copy of the Base Map Checklist is located in Appendix 1 and in the inside cover pocket of this manual.

Creating base maps is part science and part art. The science is in knowing how to interpret survey data and as-built documents. The art is in knowing how to reflect that information.

The CADD Standards Core Elements is a prerequisite for creating SPU base maps.

Use the Base Map Checklist as you read this manual. You’ll find a copy inside the front cover and in Appendix 1.
APPENDICES

The following are appendices to this manual:

- Appendix 1 is the Base Map Checklist.
- Appendix 2 illustrates SPU Presentation Standards through more than 60 examples of base maps.
- Appendix 3 explains support documents for SPU’s base-mapping process.
- Appendix 4 is a detailed list of research resources used to create base maps at SPU.

SUPPLEMENTARY DOCUMENTATION

Two related documents are used in base-mapping:

- City of Seattle Standard Plans
- Inter-departmental CADD Standards Core Elements

Information on the CADD Standards Core Elements is available through our software under “Help,” “SPU Help” and as a hardcopy document. Contact Dean Noble at 206-684-5137.
Section 1
FUNDAMENTALS OF BASE MAPPING

Section 1 Objectives

After you complete this section, you should be able to:

• Identify the basic parts of base maps
• Understand base map accuracy
• Know how to use GIS themes
• Discuss reusing existing base maps and the role of unconventional base maps

1.1 What is Base Map?

A base map is a graphical representation, usually depicted at 20 and sometimes 10 Scale (for crowded areas). Base maps show existing topographic features and underground utilities in a project area. A base map will also reflect the City’s property lines as they relate to public Right-of-Way (ROW) and other pertinent legal lines. This information is vital to the City of Seattle’s Capital Improvement Program (CIP) design process. Base maps give engineers and designers detailed information they need to plan improvements while avoiding conflicts with existing conditions above- and belowground. Most SPU base maps are located within the city limits and public ROW.

1.2 A Base Map Contains Three Primary Parts

SPU base maps contain 3 basic parts:

• Control and Right-of-Way
• Topographical Features
• Underground Utilities

See Appendix 2, Figure 3A.
A) CONTROL AND RIGHT-OF-WAY LINES

i) Control

The control found on a SPU Base map usually refers to lines, often called centerlines, monument lines, survey lines, all known as control lines. These lines are not topographic features. They are legally defined by survey control markers that are topographic features such as monuments, brass plugs, tacks, and other types of markers. Control lines are connected from survey marker to survey marker and can be found on almost every street and intersection within the public ROW. In fact, it is the placement of survey markers that defines the legal boundaries of the City’s property lines. City property contained within these boundaries is better known as the “Public Right-of-Way.”

ii) Right-of-Way

Public ROW is property within which the City of Seattle owns and maintains utilities. It is generally adjacent to private property. Public ROW contains roadways, walkways, and various public utilities. A base map will contain ROW lines depicting boundaries of the portion of land the City owns. Like control lines, ROW lines are not real features. They are legally defined and recorded at a specified offset distance from the control lines.

B) TOPOGRAPHICAL FEATURES

Aboveground features in a base map—known as topographical features—are derived from survey data. Topographical features can include, but are not limited
By law, the City must show the existence of underground utilities.

C) UNDERGROUND UTILITIES

The placement of underground utilities on base maps can include but are not limited to, sewers, storm drains, signals, lighting, electrical, phone, gas, water, cable, and steam. This information comes from historical engineering documents.

1.3 How Accurate is an SPU Base Map?

It is impossible to accurately reflect exactly what is above or below the ground. The limitations are numerous. The following are a few limitations:

- Slight errors in survey
- Actual construction of an improvement may differ slightly from the information contained in the historical engineering records.
- The needs of some projects dictate that some items are not reflected or are not reflected in great detail
- Limitations of the plotted scale to show every feature
- Movement of the earth versus historical data

Most of these limitations are accepted industry practice and incorporated as part of base-mapping. Keep in mind that most types of errors or omissions are minuscule and some accepted as “human error.”

A) SPU’S LEGAL OBLIGATION

The Revised Code of Washington (RCW) state law, Chapter 19.122.040 states:

"Project owners shall indicate in bid or contract documents the existence of underground facilities known by the project owner to be located within the proposed area of excavation."

Therefore, it is SPU’s legal obligation as “Project Owner” to indicate the existence and location of underground utilities.
B) DEGREES AND TYPES OF ACCURACY

The following is a partial list of instances in base mapping where degree and types of accuracy vary:

- Schematic symbols
- Content that vary according to design needs
- Artistic license.

i) Schematic Symbols

Some symbols included in base maps are schematic rather than true size due to limitations of plotting scales.

EXAMPLE: DEGREE OF ACCURACY

The pedestrian signal symbol is actually much larger than the actual piece of hardware it represents. However, if the symbol was drawn at its true size then it would be so small that it would not show clearly when plotted at 20 Scale. See Appendix 2, Figure 2F.
ii) Content Varies According to Design Needs

Various types of proposed improvements have slightly different needs for their base maps.

EXAMPLE: CONTENT VARIES BASED ON DESIGN NEEDS

A base map requested by a water designer may include all items in the parking strip such as street name signs, mailboxes, and parking signs. These items are typically not shown but the designer may be aware that the proposed water main may need to be placed under or very near the parking strip. See Appendix 2, Figure 2H.
iii) **Artistic License**

On occasion, it may be necessary for the drafter to use artistic license (or the "fudge factor") to be able to illustrate certain conditions.

**EXAMPLE: ARTISTIC LICENSE**

According to historical information, an electrical conduit has been installed almost directly under the front edge of the sidewalk in the parking strip. If the conduit was drawn as shown in the as-built, the electrical conduit line would not show. It would be obscured by the line representing the front of the sidewalk. In this case, it is better to move the line representing the conduit into the parking strip just far enough for it to be seen when plotted. See Appendix 2, Figure 3H.
C) GOAL OF BASE MAP ACCURACY IS WITHIN 0.2 FEET (2.4 INCHES)

Despite the limitations and examples listed above, most items included on a base map are reflected within a tolerance of 0.2’ (2.4”) or less. If a base map feature cannot be reflected accurately, then a disclaimer may need to be included on the map.

D) DISCLAIMER LABELS ON SPU BASE MAPS

A disclaimer label indicates that the creator of a base map has exhausted all resources available or appropriate to use for its creation. Disclaimer labels state in essence that mappers have given their best guess as to what is there, but are still unsure. The following is a partial list of disclaimers found on SPU Base maps and their meanings. See Appendix 2, Figure 5A.

- LOC? Best guess of location
- ABAN? May no longer be active
- REM? May have been removed
- CONN? Not sure where or what a pipe connects to.
- BURIED? Research indicates that a topological feature should be visible, but is not.

E) ACCURACY OF CONTROL AND RIGHT-OF-WAY

On a base map, the accuracy of the legally defined control and ROW lines is as good as the historical records available or the person who interprets that information. Typically, this information is provided by SPU’s Survey group.

F) ACCURACY OF ABOVEGROUND FEATURES

Using current survey data is the most accurate method for locating aboveground features despite the limitations listed above.

G) ACCURACY OF UNDERGROUND UTILITIES

i) Historical Data from Engineering Records

Most historical data from engineering records is very useful to base mapping. Nonetheless, it can pose challenges when information is conflicting. In that case, we evaluate all available information and make a best guess. In some cases, a disclaimer label may be needed in the base map. See Section 1.3D.
**ii) Survey’s Contribution to Accuracy of Underground Utilities**

Survey data provides survey points of castings located over maintenance holes (MH) or valves. When a sewer line is drawn on a base map from MH casting point to MH casting point, its location is considered more accurate than if it were drawn according to the historical engineering record alone.

**EXAMPLE: SURVEY DATA IS MOST ACCURATE**

Survey locates an MH casting point 0.3’ from the centerline of the street. The 85 year-old plan that built the sewer says the casting should be directly over the centerline. Which is correct? Almost without exception, the survey data is accepted as the most accurate. See Appendix 2, Figure 11C.
iii) Abandoned Underground Utilities

Some underground utilities are abandoned because they are old or can’t keep up with demand. Very seldom are they removed. One can be very certain that unless there was an improvement in the exact location of a utility, it has been abandoned rather than removed.

EXAMPLE: SHOWING ABANDONED UNDERGROUND UTILITIES
We show abandoned utilities because they may cause confusion during construction. See Appendix 2, Figure 5F.
1.4 GIS Themes in Base Maps

Base maps used to design CIP projects require a greater degree of accuracy than most GIS themes can provide. Most GIS themes are used for reference only. However, in some instances it is appropriate to incorporate GIS themes directly into a base map.

A.) INCORPORATION OF GIS THEMES

Very few GIS themes are ever incorporated into a base map. An exception is a special request. The most commonly used themes are addresses and private property lines.

B.) GIS THEMES FOR REFERENCE ONLY

The following is a partial list of GIS themes that may be helpful when used for reference only:

- aerial photos
- Row lines
- pavement edges.

C.) ***SIDE SEWER CARD SYSTEM TRANSITION

Side Sewer as-built records were previously recorded on Side Sewer Cards but are no longer. Instead, this information will be available through the Virtual Vault at http://SPUIMS1/vaulteval/mapmain.asp.

1.5 Reusing Existing Base Maps

It is a standard practice to look for existing base maps to reuse at the beginning of a new base map assignment. The primary reason is to save time and cost. If an existing base map is appropriate for re-use, then use historical engineering documents to update it from date of creation to the present. The update also consists of a field check by the drafter to locate changes, if any, to aboveground features. Occasionally, additional survey may be ordered, but it is usually minimal and will focus only on items pertinent to design.
1.6 Unconventional or “Down & Dirty” Base Maps

For special circumstances—emergency, funding crisis, or very simple designs—unconventional methods may be used to create non-standard base maps. These methods are usually very creative and typically do not benefit from a current survey to locate aboveground features. Usually, historical information will be the only source of data used to create unconventional maps.

One “down and dirty” method is to have an historical contract plan scanned and used as the base map. While a field check may be conducted to locate aboveground features, the end product will not be nearly as accurate had survey been done.

Tips: Fundamentals of Base Maps

- Base maps are used to give engineers and designers detailed information they need to plan improvements while avoiding conflicts with existing infrastructure and private property.

- The 3 primary sources of information contained in base maps are 1) control and ROW, 2) topographical data, and 3) underground utilities reflected by historical engineering records.

- Base map content may vary slightly according to the needs of the improvement for which it was created.
Section 2
STARTING A BASE MAP

Section 2 Objectives
This section describes how to start a base map project. To do that, you should be able to:

- Get familiar with a project by gathering information
- Know how to locate archived base maps
- Plan presentation style
- Estimate the job

2.1 Becoming Familiar with a Base Map Project
When a base map is assigned, your first task is to get familiar with the project. The more you know about a project, the easier it is to start production without complications. The following is list of the most common resources for starting a map:

A) MEET WITH SUPERVISOR OR LEAD
Normally, either a supervisor or lead has compiled a good deal of information before a base map is even assigned. It’s good practice to go over this information one-on-one with your supervisor or lead.

B) SPU SURVEY/BASE MAP REQUEST
The SPU Survey/Base Map Request form is completed by either the lead designer or project manager. This form is available online. See Appendix 3, Figure 11.
C) THE SCOPE

The **Scope** is a document used at project inception to define the following:

- area to be improved
- need for improvement
- course of action
- project manager and lead designer.

A review of the project scope gives you a greater understanding of what is required to complete the base map. The scope can usually be found in the supervisor’s folder or in the project directory.

D) VISIT SITE WHEN NECESSARY

Generally, survey crews or designers supply digital photos before base mapping begins. On rare occasions even when photos are supplied, an area may contain such odd physical features that it may be difficult to visualize. If the base map area is large (greater than 2 blocks), visit the site to help associate surveyed points with landmarks you can view in the field.

E) PHOTOS

Carry a digital camera into the field. Even if photos have been supplied, additional shots may be needed to help clarify odd circumstances. You may have to photograph an entire area.

F) START A RESEARCH FOLDER

Miscellaneous documents pertaining to the project go into a research folder of hardcopy information. Start this folder if one hasn’t begun already. In most cases, the supervisor or lead will provide copies of miscellaneous information on the project in addition to **scope**. Typically, a map of the project area is included in folder.

**EXAMPLE: LOOK IN THE FOLDER**

A water system designer may provide a water **GIS** map whereas a sewer designer may provide an **SS card** or a sewer **GIS** map. Also, there may be copies of correspondence from the designer or project manager.
2.2 Using Archived Base Maps

A project area may contain archived base maps that can be reused to save time and money. You can use archived maps even if the existing base map covers only a portion of the project area. If you decide not to use the existing map, at the very least it is a valuable research resource.

Archived base maps come in 2 forms. They can be found as the following:

1) scanned and archived manually-drawn base maps
2) ACAD drawing files.

In either case, consider reusing them. If you reuse an archived base map, then update it from the time of its creation to the present.

A) LOCATING ARCHIVED MANUALLY-DRAWN BASE MAPS

The SPU Virtual Vault may be used to view and print scanned images of the manually-drawn base maps. With SPU Virtual Vault file number in hand, you can check-out original Mylar sheet(s) from the SPU Records Vault.

B) LOCATING ARCHIVED ACAD BASE MAP DRAWING FILES

The process for locating archived ACAD base maps is in transition. They will soon be available through the SPU Virtual Vault.

CAUTION: If the scanned images are not in standard SPU ACAD drawing file format needed for a base map . . .

Then, convert the manually-drawn base map to a standard SPU ACAD drawing file.
2.3 Planning the Presentation

Plan base map presentation early to save time and cost.

A) ORIENTATION

Orient the base map according to the SPU presentation standard. To do this, place the control line parallel with the bottom of the page and the north arrow pointing either up or to the left. While not a hard and fast rule, follow the SPU standard. There are exceptions to the presentation standard for difficult fits. Depending on the angle of the base map, the orientation could vary. Most often, the north arrow may be skewed slightly. It is important to choose the orientation early. Should it have to change later, text may also have to be changed. See Appendix 2, Figure 3D.

B) TEXT ORIENTATION

Most text should read from left to right or from bottom to top. The text that reads bottom to top is usually labels of items in a cross street. There are exceptions to this rule, but it should be adhered to whenever possible. See Appendix 2, Figure 4B.

C) PRESENTATION SCALE

Most base maps use a 20 Scale presentation. In some instances, however, 10 Scale presentation is preferred. See Appendix 2, Figure 3G.

i) 20 Scale

For most areas in Seattle, 20 Scale presentation is sufficient. It allows aboveground features like fire hydrants and driveways to be shown clearly along with the underground utilities.

ii) 10 Scale

If a project is located in the downtown or any utility intensive area, 10 Scale will likely be needed. Changing base map presentation scale from 20 to 10 Scale later on causes significant and costly delays because both text and symbols must be re-scaled, moved, and rotated.
2.4 Estimating

The Base Map group routinely estimates the number of hours needed to complete a project. To do so, the primary information needed is the area to be mapped in linear feet (both length and width). Next, complexity is determined based on the number of past improvements to the area. The resulting estimate is then used to schedule work and determine a completion date. In turn, the completion date is passed onto the lead designer and project manager. The Base Map group has developed a template for estimating. See Appendix 3, Figure 2.

A) ESTIMATING AREA USING QUARTER SECTIONS

Quarter-section maps are our most commonly used reference tools to estimate linear feet. They provide clearly defined information about the distance between monuments (length) and the ROWs (width).

B) DETERMINING COMPLEXITY

The level of complexity, defined by the number of past improvements to an area will need to be determined. This is done by using Planform, a compiled list of improvements for the area. See Section 3.3.

C) TRACKING AGAINST ESTIMATE

The Base Map group has developed a template for tracking time spent against the estimate. See Appendix 3, Figure 2a.

D) MODIFYING THE ESTIMATE

There are numerous occasions when an estimate must be modified.

EXAMPLE: MODIFYING THE ESTIMATE

It's decided that an existing base map will be used for the project. The significant time and cost savings means the estimate needs to be modified.

When an estimate needs to be modified because some of the work has been completed beforehand, the best approach is to estimate the base map as if it were being created from scratch. Then modify
the estimate. The *Estimate Breakdown form* is a useful tool for modifying estimates. See **Appendix 3, Figure 2a**.

**E) REVISIONING AN ESTIMATE MID-PROJECT**

After a base map is underway, it may be necessary to revise the original estimate to justify additional time spent due to circumstances unknown at the initial estimate. Unknown circumstances can include greater complexity than originally thought, missing research data or survey errors.

Give a revised file the name “REV1” to distinguish it from the original.

**Tips: Starting a Base Map**

Try to have the following information in hand when starting a base map:

- scope
- Survey/Base Map Request
- estimate
- photo of site
- SPU presentation style
- Base Map Checklist
- research folder.
Section 3
CONDUCTING & ORGANIZING RESEARCH

Section 3 Objectives
This section describes the research resources used throughout the base map process. After this section, you’ll understand
- The primary research sources are SPU Records Vault plans, franchise utility books, and side sewer cards.
- How to organize research using Planform
- The use of secondary resources such as gas maps

3.1 Types of Research Resources
Research is a key component in base-mapping and is the primary tool for defining underground utilities. Research provides everything that survey cannot. SPU owns or has at its disposal as-built plans that date back to the late 1800s.

Research resources generally fit in 2 categories, primary and secondary. On occasion, a third category, special research resources, applies. See Appendix 4 for a comprehensive list of the research resources available for base-mapping.

A) PRIMARY RESEARCH RESOURCES
Primary research resources are the as-built records that are the main source of underground utility information for SPU.

B) SECONDARY RESEARCH RESOURCES
The 2 main types of secondary research resources are 1) compilation documents and 2) supplementary documents.

i) Compilation Documents
Compilation documents are utility systems maps that include water maps, gas maps, and more. The source of data contained on utility system maps is typically a compilation of various sorts of as-built information, often schematic. Compilation documents contain useful information, but are not nearly as detailed as as-built documents. We use these compilations for reference checking only. They may be used to resolve conflicting or vague information.
Section 3
CONDUCTING & ORGANIZING RESEARCH

ii) Supplementary Documents
Supplementary documents include inspector’s books or street use permits. Inspector’s books and street use permits hold information that supplemented or accompanied creation of the as-builts. Typically, supplementary documents are only used to resolve conflicting or vague information.

iii) Special Research Resources
Almost always research materials are available within SPU. Special research resources can be necessary, however, when other agencies occupy property within the City. Two such agencies are WSDOT and the Seattle Parks Department (Parks). Both are occasional clients for base map and engineering services. Other times, we make base maps for areas outside Seattle because our infrastructure extends beyond city limits. In either case, it’s important to document the correct source.

3.2 Primary Research Resources
Many primary resources are used for base maps. The most common are:

- SPU Records Vault Plans
- franchise utility books
- *** Side Sewer Cards

The side sewer card system is in transition. Side Sewer as-built records will soon be available on GIS. In the interim use the side sewer cards.

3.3 Organizing Research Using Planform
Planform is a report used to catalogue research documents. Before drafting the base map, fill out Planform completely to help organize research documents. For specific instructions on the use of Planform, see Appendix 3, Figure 3.

A) BASE MAP “INFO” SECTION OF PLANFORM
The base map information section of Planform contains general information about the project. Filled it out as much as possible at the start and during mapping.

B) PLANFORM’S USE IN ESTIMATING
Complexity is a key factor used to estimate time and cost of a base map. Before estimating, a partially completed Planform containing just the list of SPU Records Vault plan and Franchise Utility book numbers can be used to tally the
number of improvements in an area. The downtown area has many improvements (SPU Vault plans and franchise utility books) while a residential street may not.

C) PLANFORM’S USE IN BASE MAPPING

Planform contains more than a list of improvements. It also contains detailed information about each of those improvements as well as other data. This list can be used to sort the research records chronologically or by type of improvement.

3.4 SPU Records Vault Plans

Vault plans are historical engineering documents stored in SPU’s Records Vault or Virtual Vault. Most are as-built plan sets of capital improvements. Some plan sets are private improvements that change or improve the public ROW. Examples of plans found in the SPU Records Vault are storm drains, sewers, water mains, paving, and signals and lighting. The SPU Records Vault also has a limited amount of WSDOT highway plans.

*** A) SPU RECORDS VAULT PLAN INDEXES

There are thousands of plans filed in the SPU’s Records Vault. Each is assigned a number, similar to a library system. Just like the library, an index is needed to locate the plans. We use 2 indices:

1. One is the VPI (Vault Plan Index), a hardcopy index located in the SPU Records Vault.
2. The other is the new and semi-complete automated SPU Virtual Vault Index.

i) Vault Plan Index (VPI)

A hardcopy index of the vault plans is located in the SPU Records Vault. In fact there are 2 of them. One is for the north end of Seattle, and the other for the south. Guides for both are located nearby. This master index has maps of the city with a grid imposed over it. The squares within the grid correspond to map/page numbers inside the vault plan indexes (VPIs). When referring to correct map/page number, check the desired location. The numbered map/pages show the vault plan file numbers near the desired location.

Given variations in record-keeping over the years, an occasional plan reference may be missing or incorrect on the VPI. Usually the wayward plan will be located in another manner.
Section 3
CONDUCTING & ORGANIZING RESEARCH

Utility Books are as-built drawings of improvements various franchise utilities have made over the years.

EXAMPLE: MISSING PLANS
A sewer plan not found on the VPI will be referenced on the side sewer card.

**ii) SPU Virtual Vault Index**

The SPU Virtual Vault Index is an automated index. It is very similar to modern library automated indices. Data such as “street names” is input, and a database shows a list of possible plans with that street name.

**B) VAULT PLAN CHECKOUT**

The Engineering Records Vault works much like a library: plans need to be checked out. Base map research may require 20 or more plans. The Vault staff has asked that we email them a list of the plans we’d like to check out. Their email address is EngRecordsVault SPU.

- When vault plans are not available for checking out, microfilm versions are available in most cases.
- Use Planform to record the vault plan information.

CAUTION: The online version of the franchise utility books and index maps is only current to the time they were scanned. For the most up-to-date franchise utility information, visit SDOT as directed in Appendix 4.

**3.5 Franchise Utility Books**

Franchise utility books, or simply utility books, are as-built documents of improvements built by entities required to take out Street Use Permits from the Street Use & Permits Section of the Seattle Department of Transportation (SDOT). Franchise utilities include phone, cable, gas, and communications. Seattle City Light (SCL) must also take out Street Use Permits. These permits result in as-built documentation contained within utility books. See Appendix 4 for how to access both the hardcopy and online franchise utility books.

**A) MAP INDEXES FOR FRANCHISE UTILITY BOOKS**

Franchise utility book index maps are used to show utility book numbers adjacent to the improvement area. Gas, electrical and telephone are shown on the map, each as a different color line. The utility book and page number are placed near the line it represents. See Appendix 4.

Two types of map indexes reference franchise utility books. The indexes are for areas 1) outside the downtown and 2) inside the downtown core. The reason for 2 indexes is the increased density of improvements to the downtown area. Each works slightly differently:
i) Map Index for Outside the Downtown Area

The map index for outside the downtown area uses a master index map of the city with a grid imposed over it. The squares within the grid reference a map number for that area.

The map number for this index will refer to a rolled 100 Scale ¼ section linen or Mylar map. That map will provide the utility book numbers.

ii) Map Index for Inside Downtown Area

The map index for inside the downtown area uses a master index map of the downtown area with a grid imposed over it. The squares within the grid reference a map number for that area. The map number for this index will refer to a rolled 10 Scale, rather than 100 Scale, linen map that is very clear and easy to read. The 10 Scale presentation is used because of the density of utilities downtown.

B) HISTORY OF 10 SCALE UTILITY MAPS

It is important to know a bit of history about these index maps before using them.

Before the 10 Scale utility maps were created, another system was used to index franchise utilities. The previous system indexed the oldest franchise utility improvements in the City. This older system, which is kept on index cards, is very difficult to use. It is rarely ever used.

At some point, the downtown 10 Scale utility maps were created. They are hand drawn on linen and each type of utility is assigned a color code. See Appendix 3, Figure 8. The 10 Scale utility maps replaced the need for the old index cards and the utility books they referenced. It appears the transfer was done by copying information from those utility books onto the 10 Scale maps. Thus, many utilities drawn on the 10 Scale maps do not have a utility book reference and are represented only by the 10 Scale utility maps. Those drawings have proven to be very accurate. It is usually not necessary to find the utility book reference or the book. When necessary, however, these references can be found in the card index.

It’s very important to note that franchise utility information is kept up-to-date on the 10 Scale utility maps, but improvements from CIP projects (sewer and paving mostly) in the SPU Records Vault are not. They are shown only as they were at the time the 10 Scale utility maps were created and have not been updated since and therefore may in accurate CIP planning.
It is permissible to treat the 10 Scale map like a primary, rather than secondary research resource, but only when no utility book reference is found. Otherwise, use the utility book referenced as the primary research resource. Occasionally utility book references can be found on adjacent 10 Scale utility maps and should be checked as well.

C) CHECKOUT CARDS

Utility books must be checked out if they are going to be removed from the Street Use area on the 37th floor. Checkout cards are available nearby. Once filled out, the card should be placed in the bookshelf in place of the utility book. The checkout cards help users locate a book in circulation.

D) MISSING BOOKS

If a utility book is missing, track it down. If it’s unavailable, try again later. In the meantime, make a note on your Planform. Contact your lead designer or supervisor if necessary to help acquire this information.

E) NUMBERING SYSTEM

The utility books are numbered and lettered to indicate the type of utility permit information it contains. For example, all of the gas books are numbers, while a SCL book is an alphanumeric number that starts with a 72 then a letter after it, e.g. 72GG. For more information, see Appendix 3, Figure 8.

F) COPYING AND LABELING UTILITY BOOK INFORMATION

Many utility books are available online. See Appendix 4. The utility books do not belong to SPU and no back-up copies exist. Therefore, every effort must be made to return utility books as soon as possible. Even though you can keep these book on loan, make a copy of all utility book pages referenced and place it in the research folder. The books may need to be returned mid-project.

Look for and copy the following from each utility book:

- entire project area
- Areas directly adjacent (handy reference)
- permit page of each reference.
- any legends or keys.
i) Copying Utility Book Index Maps

Copy utility book index map(s) in the project area. Label the copy with the map number in bold pen.

ii) Copying Utility Books

All utility book pages used must be copied and labeled with the book number. Be certain to label the cover (permit page) page with the utility book number in bold pen. Gather and staple any subsequent pages. If the cover page goes unlabeled, it’s very difficult to know which utility book it came from. Another benefit of copies is that they can be highlighted, making them easier to work with.

G) USE PLANFORM TO RECORD FRANCHISE UTILITY BOOK INFORMATION

See Appendix 3, Figure 3.

H) NEW STREET USE PERMITS

The project area may have Street Use Permits issued that are so new they have yet to be recorded in the franchise utility books. As a precaution, contact Street Use to check for recent or ongoing permits in the project area. Current contact is Rex Stratton 206-684-5193.

Rex will provide a permit number and the name of the Street Use Inspector assigned to the job. We contact the inspector with the hope that they will provide copies of their as-built permit notes. If so, label those items with the permit number, inspector’s name, date received, and your initials.

3.6 Side Sewer Cards

*** Side Sewer Cards are a type of as-built record that portrays the location of sewer and drainage connections from private buildings to sewer and drainage mainlines. A private property owner takes out a permit with the City for the connection. The result is an as-built location of the connection on the Side Sewer Card.

As with other research resources an index must be employed to sort through the thousands of records. For more in-depth information on locating Side Sewer Cards see Appendix 4. See the How to Read a SS Card in Appendix 3, Figure 10.

Side Sewer as-built records were previously recorded on Side Sewer Cards but are no longer available. Instead, this information will soon be available on GIS.
3.7 Gas Maps

Gas maps are a secondary source of information and are mostly used for reference only when creating base maps. On occasion, when the franchise utility books are confusing, gas maps can be used to resolve conflicting or unclear information. Typically, they are ordered for every project when collecting research. See Appendix 3, Figure 17 and Appendix 4 for information on ordering gas maps.

Tips: Conducting and Organizing Research

- Thoroughly conducting and organizing research is well worth it. Having the information in hand before production saves hours on down the line.
- Use Planform and its supporting process to start and organize your research.
- Keep research organized into a research folder. Make folders within a main folder for larger projects. For example, Side Sewer Cards and utility book copies may each require their own folder.
- For almost every primary research resource, a secondary source document supports it. Secondary sources are not used, however, unless a conflict or lack of information exists.

Example: Every Primary Source has a Secondary Source

<table>
<thead>
<tr>
<th>Primary Source</th>
<th>Secondary Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vault plans</td>
<td>Inspectors books</td>
</tr>
<tr>
<td>Utility books</td>
<td>Utility Permits</td>
</tr>
<tr>
<td>Side Sewer Cards</td>
<td>Sewer Permits</td>
</tr>
</tbody>
</table>
Section 4
USING TOPOGRAPHICAL SURVEY

Section 4 Objectives

After you complete this section, you should be able to:

- Use and refine survey data
- Understand how survey requests vary by project
- Quality check a survey product
- Interpret survey point database and field book notes
- Apply survey products to ACAD drawings

4.1 Standard Items in SPU Survey ACAD Drawing Files

Surveyors provide detail on topography—aboveground features. Survey data also yields legal information such as ROW, street names and site specifics. See Appendix 3, Figure 11 for the electronic SPU Survey/Base Map Request Form.

Certain items are standard for every survey ordered. Other items are requested or omitted based on the specific project. When the survey package is passed to the Base Map group, the following items should be included:

- Survey’s ACAD drawing. See Appendix 2, Figures 12A and C.
- Survey’s point database. See Appendix 3, Figure 13.

The following is a list of standard items in SPU’s Survey group ACAD drawing files:

A) CONTROL

Control points, control Lines, ROW, street names, stationing and legal lines are the backbone of a base map. These items are the skeleton upon which survey points are hung. They relate map features to the location. See Appendix 2, Figures 12A,C.
B) DATUM BLOCK

The Survey group fills out the *Datum Block* form and it is added to each ACAD drawing. The form states the history of the survey and how it was created. See Appendix 2, Figure 12I.

C) SPU STANDARD SYMBOLS

For SPU Standard Symbols see

*** SPU CADD Standards Core Elements

This information will be available soon in 2 forms. One form will be access through our software under "Help," "SPU Help." The other form will be as a hardcopy document. For more information on this transition, contact Dean Noble 206-684-5137.

D) SPU STANDARD SYMBOL FOR CASTINGS

The survey will include a point for every casting visible. In some cases, castings may not be located at the center of the structure underneath. If so, survey provides a shot, sketch, or note indicating location of the structure’s center. This information is be used later in the process to draw the structure, thereby showing its relationship to the casting on top.

E) TOPOGRAPHY

The survey will include enough *survey points* to describe the contour of the ground. It is important for the designer to know where the high and low elevations are and where the ground changes grade. These shots will not need to be drawn on the final base map product unless they define the limits of a feature or a paving surface. See Appendix 2, Figure 12A.
4.2 Survey Request Can Vary by Project

An SPU base map is created to serve design needs of a specific type of improvement or combination of improvements. The survey request for each may vary slightly.

EXAMPLE: SURVEY REQUESTS VARY
Most sewer/drainage design survey requests include invert elevations for all the sewer and drainage structures along with survey points for all castings. Comparatively, a water design project may only request survey points for the castings. Conversely, a water design project may request all street name signs and mail boxes while a sewer/drainage design project will not. See Appendix 2, Figure 2H.

4.3 Quality-Checking the Survey Product

*** SPU’s survey group is in the midst of implementing a quality-checking (QC) system of their product before delivery to the Base Map group. In the interim, the QC system described below should be utilized.

Certain portions of the survey product must be inspected for accuracy upon receipt and before proceeding with the map. These items are the foundation of the base map and are listed below. To proceed and discover errors later on often cause delays and increase costs. It is imperative that the QC process is complete before proceeding with the base map. Notify your supervisor or lead if any of the components listed below are not included or are incorrect:

A) CONTROL POINTS

The control points (survey markers) provided in the survey drawing were either shot in the field as topography points or calculated from historic records, usually a combination of both. Determine which method was used for each control point by viewing the point database and/or the Datum Block. See Section 4.5. The distance between the control points provided in the survey drawing should be verified by comparing that information to a City of Seattle quarter section map (See Appendix 4) or other historical survey data. The distance should not vary by more than 0.2’. If the survey and the quarter section location differ by more than 0.2’ note the difference and notify your supervisor or lead. See Appendix 2, Figures 12A,C.
B) CONTROL LINES

The control lines are drawn between the control points. Verify the survey drawing to see that the control lines are included throughout the project area. The City of Seattle quarter section maps (see Appendix 4) along with other historical survey data may be used. See Appendix 2, Figures 12A, C.

C) RIGHT-OF-WAY

Compare the ROW lines on the City of Seattle quarter section maps (see Appendix 4) with the survey drawing. Verify that all lines are included. This includes alleys and ordinances owned by the City. Take care to notice utility easements on private property directly adjacent to the project area. The City may own utilities on private property affected by the project.

Compare offset distances of the ROW lines on the quarter section map to the survey product. See Appendix 2, Figure 12C.

D) STREET NAMES AND NORTH ARROWS

Confirm that street names, their prefixes, or suffixes match the quarter section map. See Appendix 2, Figures 12A, C.

E) STATIONING

Stationing is the assignment of a linear measurement from a control point (survey marker) to a control point along a control line. Typically control points are monuments and the control lines are the centerline of a street. Stationing is provided in the format of 0+00.

EXAMPLE: MONUMENTS

If a monument is assigned 0+00, then 100 feet from 0+00 would be shown as 1+00 and 200 feet from 0+00 would be shown as 2+00. Also, 1236.22 feet from 0+00 is shown as 12+36.22. See Appendix 2, Figure 3K.

Stationing is used to locate existing and proposed features in relationship to control points and control lines.

EXAMPLE: STATIONING

A maintenance hole is located at 2+36.45, 32.88 feet left. This means the maintenance hole is located 236.45 feet from 0+00 and is 32.88 feet left of the control line. The left and right distances are always measured perpendicular to the control line when facing towards the next higher station number, also known as “up-station.”
F) DATUM BLOCK

A fully completed datum block not only specifies the City of Seattle’s datum, but also contains information concerning the type and nature of the data used in the survey. It should be filled out completely. See Appendix 2, Figure 12I.

G) COORDINATE SYSTEM AND VERTICAL DATUM

The City has an official standard for the coordinate system and datum used in its projects. This information should be provided by the Survey group in the datum block. See Appendix 2, Figure 12I.

i) Checking the Coordinate System

The City of Seattle’s official coordinate system for horizontal control is “NAD 83/91.” The term is derived from North American Datum of 1983, 1991 adjustment Washington State Plane Coordinates, Lambert Conformal Projection, Washington North Zone. A range of numbers characterizes the NAD 83/91 coordinate system:

1. The “eastings” or X coordinate occur in a range of 1,200,000 to 1,300,000.

2. The “northings” or Y coordinate range from approximately 200,000 to 300,000.

ii) Checking the Vertical Datum

The City of Seattle’s official vertical control is “NAVD88 (North American Vertical Datum).” Unlike horizontal coordinates, it is difficult to use a range of numbers to check. Check the Datum Block contained in the survey drawing. It should specify “NAVD88.” If in doubt, seek additional help.

H) POINT DATA

Make certain the point data is available for viewing in LDT (SPU’s civil software). Check also that point data is located in the correct directory according to SPU file naming conventions.
I) INVERT ELEVATIONS

Determine if invert elevations are included in the survey request. If so, make certain the data is available.

**Invert Elevations**

*Invert elevations* are a measurement taken at the inside bottom of a pipe or structure that a pipe enters. The surveyor measures from the rim of a structure down to the invert of the pipe. This distance is called a *measure down*. The surveyor will then convert the *measure down* to an actual elevation by subtracting it from the known elevation of the rim.

Make sure the *measure down* calculation has been reduced to an actual elevation. An invert elevation of the maintenance

*** Recently, SPU’s Survey group began providing invert elevations as part of the point database. Prior to this, they were provided as field book notes and then transferred to the base map as reference notes.

J) SURVEY REQUEST SATISFIED

The SPU Survey Request Form for the project will specify the items requested. Verify the survey satisfies the survey request. See Appendix 3, Figure 11.

4.4 Changing Control and ROW to SPU Presentation Standard

In the preceding step, the control, ROW, street names, north arrow, stationing, and the datum block were items quality checked for accuracy. Their accuracy is the foundation for quality control of any base map.

In addition to accuracy, the presentation of these items is crucial. Check for correct SPU standard layers, linetypes, text sizes, labels, and symbols for the items listed below. See Appendix 2, Figure 3A.
A) CONTROL POINTS AND CONTROL LINES

Each control line should be labeled with a text symbol. There is a different text symbol for each one of the 3 following descriptions:

   i)  **Center Line**
   
   A centerline is a survey line that can be found in the center of the ROW.

   ii) **Monument Line**
   
   A monument line is a survey line that is not located in the center of the ROW and connects between monuments.

   iii) **Survey Line**
   
   A survey line is a line that does not fall into either of the 2 descriptions above.

B) RIGHT-OF-WAY

Be certain to distinguish between ROW, vacation ordinance, and easement line types.

C) STREET NAMES AND NORTH ARROWS

Use the correct presentation standard for side streets and main streets. Place the north arrow near the main street name labels.

D) STATIONING

Follow the SPU presentation standard for placement of stationing of the following items.

   - Increments of every 100’.
   - Survey control points such as monuments.
   - PCs (points of curvature) and PTs (points of tangency) along control lines.
     See Appendix 2, Figure 3C.

E) DATUM BLOCK

We do not change content of the datum block. We do, however, reposition or size it differently so that it fits into the base map presentation when plotted.
4.5 Interpreting the Survey Point Database

The survey point database is an integral part of the survey drawing provided by the Survey group. Survey’s point database contains the survey point data in a specific format. For each survey point, the database provides the point number, the northing coordinate, the easting coordinate, the elevation, and a description of the point, better known as a descriptor. See Appendix 3, Figure 13.

A) POINT NUMBERS

Point numbers are usually assigned sequentially as the survey progresses. Typically point numbers 1-999 are used as control points and 1000 and up are used for topography. For organizational purposes, a large survey might be divided into point ranges.

EXAMPLE: POINT NUMBERS

The survey of Greenwood Ave N from 85th to 87th is assigned point numbers 2000-3999, while 87th to 90th is assigned point numbers 4000-5999. The last point shot on the 85th to 87th portion was point number 3856. Point numbers 3857 through 3999 would then be left unused. This would allow additional surveying of the 85th to 87th if needed at a later time, while still maintaining the point numbering system as assigned. It is acceptable, even inevitable, that some point numbers will not be used, so it’s common to find gaps in the point numbering.

B) NORTINGS AND EASTINGS

The coordinate system used in surveys for SPU base maps is from the City of Seattle’s GIS database. This coordinate system is based on a north/south (northing) number and an east/west (easting) number to locate a point horizontally or on the horizontal plane within the area.

C) ELEVATIONS

Elevations are the relative distance above or below the City’s datum elevation, NAVD 88.

D) DESCRIPTORS

Each point in the survey is given a description known as a descriptor. The descriptor serves 2 purposes. First is to give meaning to the point. And second is to take advantage of tools in surveying software that will automatically insert SPU standard symbols, along with the point, into the ACAD drawing.
4.6 Interpreting Survey Field Book Notes

In the not so distant past, a survey field book contained detailed information corresponding to every survey point shot. However, advances in technology have eliminated that need. An electronic point database is created instead. See Section 4.5. Still, each survey has a field book associated with it that contains, at the very least, a location sketch of the area surveyed, the date, crewmembers, and other pertinent notes.

A) VARYING CONTENT

The content of a survey field book will vary per project for several reasons:

- specific needs of the project.
- advances in survey software.
- varying styles of the survey crews.

B) SKETCHES

A survey field book may contain sketches of particularly complex conditions.

  i) Sewer/Drainage Maintenance Holes (MH)

A sketch may show the inside of a MH structure, direction and flow of incoming and outgoing pipes, channel, or anything else inside the MH.

  ii) Other Conditions

Some conditions are very complex and require a sketch.

C) SURVEY NOTES OF INVERT ELEVATIONS OR DEPTH INFORMATION

Currently, invert elevations of pipes and depth information of structures are shot as electronic survey points and are a part of the point database. Before that time, these points were recorded as field book notes. Each invert elevation note corresponded to the survey point number of the casting of that structure.
4.7 Reusing Existing Manually-drawn Maps with New Survey

If a scanned manually-drawn base map is used, then it will need to be converted into an ACAD drawing file. The resulting ACAD drawing should be dimensionally accurate and aligned into the same coordinate system and control as the survey.

When comparing surveyed points to the reused base map, expect slight discrepancies in placement of topographical items. The catch is to incorporate both the reused base map and the new survey. The location of features located by the new survey is the correct one. The first task is to "tweak" or match the symbols from the reused map to the surveyed points. See your lead or supervisor for assistance.

Why Use a Reused Base Map and a New Survey?

A manually-drawn, reused base map carries no elevation data with it. Neither does the resulting ACAD drawing. Most designers and engineers need elevation data.

The manually-drawn base map will contain many underground utilities that will not have to be redrawn.

4.8 Applying the Survey Product to the ACAD Drawing

As survey technology advances, the ACAD drawing from the Survey group likewise provides more graphic entities for the base map. Currently, however, the survey product must be refined to achieve SPU’s base map presentation standard.

The following tasks should be performed simultaneously, as-you-go.

A) BROWSE THE SURVEY POINTS

Browse through the survey in numerical order. See that what is drawn matches the descriptor for a point or series of points. For a key of descriptor abbreviations, see the SPU Inter-Departmental CADD Standards Core Elements.

i) Scan the Point Database.

Certain shots related to ground elevations may be eliminated from this inspection. These points are almost always used for design purposes. Their descriptors are as follows:

- BOC
- CHK
• CR
• FL (Can disregard almost always)
• FOG
• GB
• GND
• Swale  (Can disregard almost always)
• Toe (Depends on what is being described)
• Top (Depends on what is being described)

ii) **Scan the Survey Field Book**

Scan the survey field book for sketches associated with corresponding survey points. Reflect that information on the map—if pertinent.

**B) CHANGE TO SPU PRESENTATION STANDARD**

By this phase, the control points, control lines, ROW, street names, and stationing should be in SPU presentation standard. Change any items in the survey drawing that still need it to SPU presentation standard.

i) **Line Work**

See that line work from the survey is the correct SPU standard layers and line type.

ii) **Orientation of Standard Symbols**

Current survey technology places all standard symbols facing north in their final ACAD drawing. This is due to limitations of the technology. However, most structures are not built pointing north. Rather, they are built parallel or perpendicular relative to the roadway they are on. Therefore, those symbols must be rotated or reinserted in the drawing. See Appendix 2, Figure 2A.

iii) **Place Standard Labels on Standard Symbols**

Some standard symbols have standard text labels. Some do not. Those that are labeled have them because that item could be mistaken for another. The exception is water and gas valves. If the water or gas valve is in direct proximity to its mainline, it is not labeled. If the valve is isolated from the mainline because it is a service line, then it is labeled. Typically we do not show service lines. See Appendix 2, Figure 2B and Inter-Departmental CADD Standards Core Elements.
C) DEVELOPING FIELD CHECK QUESTIONS

The process of going through surveyed points almost always brings up questions. It takes a field check to resolve them. Record your field check question on the base map. The question should be short, yet allow others to interpret it. Use the method shown in Appendix 2, Figure 10A.

D) ELIMINATE INCOMPLETE LINE ENDINGS

Any surface shown on the base map—like landscaping or paving—should have the lines closed unless the surface is on the edge of the map area. Often small gaps in the survey points or line work need to be completed. See Appendix 2, Figure 11C. Sometimes a field check is required to resolve the incomplete line.

E) RECORD SURVEY DEPTH

Record invert elevations and any other depth information noted in the survey field book. Please note this procedure is in transition and may not be needed. See Appendix 2, Figure 7B.

F) LABEL TOPOGRAPHIC FEATURES AS YOU PROCEED THROUGH POINTS

Do not wait. It will be overwhelming later. Determining which items need labeling and which do not will come with base-mapping experience. Browse Appendix 2 and the City of Seattle Standard Plans numbers 003a to 003o for examples. For examples of callout leaders, See Appendix 2, Figure 8A.

4.9 More Survey Point Applications

A) MAINTENANCE HOLES

For MHs, use the casting symbol. Do not use the MH symbol. This application will come later. This does not apply to inlets and catch basins. See Appendix 2, Figure 121E.
B) OTHER VAULT STRUCTURES
For any other type of vault structures, use the casting symbol. Do not use the vault symbol. This application will come later.

C) ENDS OF CULVERTS
Survey will locate the ends of culverts by shooting a point. The elevation given in the point database is its IE (invert elevation). Survey designates which end of the culvert (east, west, north, or south) it shoots. Draw the entire culvert if both ends are given. If only one end, then draw a portion and add a FC (field check) note. See Appendix 2, Figure 5G.

D) SMALL DITCHES
Survey shoots the centerline of small ditches, 1’ wide or less. This type of ditch is shown by drawing one line at the center line location. See Appendix 2, Figure 5D.

E) LARGE DITCHES
For large ditches, more than 1’ wide or more, survey will shoot the toe and top and possibly centerline as well. See Appendix 2, Figure 5D.

F) GUTTERS
The Gutter descriptor means the front of curb. Use these points to define the curb location. See Appendix 2, Figure 3M.

G) CURBS
Do not use the points survey defines as BOC (Back of Curb) to define curb location. Use Gutter to define curb instead. See Appendix 2, Figure 3M.

H) FIRE HYDRANT VALVES
Do not show the valves survey picks up adjacent to fire hydrants. It is assumed that every fire hydrant has a valve.

I) TREES
• For trees with a trunk size less than 1-foot diameter, use the standard tree symbol. See Appendix 2, Figure 2G.
• For trees with a trunk size of 1-foot diameter or more, the trunk and canopy are drawn to scale. For the trunk, insert the trunk symbol to scale. Do the same with the canopy, except that a field check is needed to determine size. See Appendix 2, Figure 2G.

J) FENCES

For fences, the survey will specify type: wood or metal. There is a line type for each. See Appendix 2, Figure 2E.

**Tips: Using Topographical Survey**

• Gather the following 3 items before proceeding.
  1. survey field book (copy) for the project research file
  2. CAD drawing
  3. point database.

• Quality Check the survey product before proceeding.

• Bring the elements of the survey drawing to SPU’s presentation standard when necessary.

• Scan through the field book and point database.

• Develop field check questions when necessary.

• Complete drawing, labeling, and adding field check notes as-you-go.
Section 5
INTERPRETING RESEARCH

Section 5 Objectives

Section 5 provides basic guidelines for interpreting research. Specifics on how to apply research are presented in Section 6. In practice, interpreting and applying research happen simultaneously. For training purposes, we present interpretation basics in this section.

After you complete Section 5, you should be able to:

- Understand the need to interpret research chronologically
- Follow guidelines for using existing conditions shown on as-builts
- Add research reference labels properly
- Look for key information when you interpret your research resources

5.1 Before Starting

Before starting the work outlined here in Section 5, the tasks described in Sections 2 through 4 should be complete. As you’ll recall, base-mapping requires researching primary and secondary documents.

Primary research documents are applied first and secondary documents used for the following:

- supplement missing information
- confirm the content applied from primary information
- resolve conflicting information
- help decide whether an item is unresolved in a final map.

The appropriate secondary information should be available in the research file.
5.2 Proceed Chronologically

Proceed chronologically from the plan list and review each plan. We recommend this method over that of seeking out all plans of one type (all sewer plans or all paving). By reviewing each plan in this manner, progressions in improvements will make sense and the likelihood of omitting items is reduced.

5.3 If Using Existing Base Maps

If an existing map is reused, then some portion of the utilities will already be drawn. In this case, conduct the research as usual by following the procedures listed below, but act as if the map is being checked rather than drawn. Make corrections or additions as necessary.

5.4 Add Research Reference Labels

A research reference is a label attached to underground utility callouts. They can consist of plan numbers, utility book numbers, or identification of various research documents used in base-mapping. See Appendix 2, Figure 7C. This step should be completed as each feature is added—not later. The Base Map group has created a custom tool called “Etag” to make this process easier. See Appendix 3, Figure 4 for instructions.

Once the base map has been created, research references can have many uses:

- creating profile views
- checking maps
- assisting engineers and designers with the design process
- tracking base map research if utility conflicts arise during construction.

5.5 Do NOT Use Existing Conditions Shown on As-Builts

The as-built improvement is the only information from the vault plan or utility book that should be applied to the base map.

Almost every SPU Records Vault plan—and sometimes utility books—show existing conditions at the time of as-built improvements. Vault plans from the 1970s onward may even contain their own base map to reflect existing conditions at that time. It’s important to distinguish which portion of an as-built document reflects the improvement and which portion reflects existing conditions at the time.
A) WHAT IS THE BEST WAY TO DEPICT AN IMPROVEMENT?
The optimum method for depicting an improvement is to use its source
document: the plan that built it.
The source document will give detailed information about placement of the
improvement.

B) WHAT IF . . . AN EXISTING CONDITION IS SHOWN ON AS-BUILT, BUT
NOT ON BASE MAP SO FAR?
- Make certain that no vault plans or utility books from earlier years
  are missing from the research.
- Check to see if the next 1 or 2 subsequent plans added the missing
  item(s).
- Look closely to see if the feature is shown as “proposed.” It may
  have never been built or it may be found on subsequent plans.
- Check the secondary research resource.

EXAMPLE: CHECK SECONDARY RESEARCH RESOURCE
If a gas main is missing, then check the gas maps.
- If a water main plan is missing, then check the Engineering Records
  Index plan database of water improvements. See Appendix 1 and
  Appendix 3, Figure 18.

C) WHAT IF . . . DRAWING EXISTING CONDITIONS SHOWN ON AS-BUILTS
AND STEPS ABOVE ARE EXHAUSTED?
- Draw the item. Scale relative distances off the as-built plan for
  placement of the existing item.
- Always add the phrase ”as ex” (as existing) to the research
  reference. This means the item drawn was from the as-built
  document that showed the feature as existing, rather than the plan
  that built it. See Appendix 2, Figure 7D.

EXAMPLE: ADD “AS EX” TO RESEARCH REFERENCE
An 8-inch water main is shown on plan 862-9 as existing yet no as-built plan can be located. The
research reference should say: “862-9(AS EX)”. 
5.6 Look for Key Information

As each plan or utility is viewed, consider the following key information:

A) OBLIGATION TO DRAW “WORST-CASE”

It is our obligation to draw the "worst case." In this instance worst-case means to draw items at their largest, if there's a question of size.

"Worst-Case" also means showing every item encountered if there’s a possibility it’s still in the ground. This includes abandoned utilities. See Appendix 2, Figure 5F.

B) RE-CREATE CONTROL

Draw the improvement by recreating the same control used on the as-built document.

EXAMPLE: RE-CREATE CONTROL

A gas main is shown to be offset 12 feet west of the curb on the west side of the street. Therefore that curb line is the control for that improvement. Determine where the curb was the year the gas main was built and offset the gas line that distance from that curb.

C) DRAW PIPES THE CORRECT SIZE

Pipes under 12-inch diameter are shown as a single line.

Pipes 12-inch diameter or greater are drawn as a double lines. Pipe sizes noted on plans are the inside diameter of the pipe, but it is the outside diameter that must be drawn.

EXAMPLE: CORRECT SIZE PIPES

A 12-inch sewer pipe has an outside diameter of 1.33 feet. The outside diameters of concrete and steel/iron pipes are available on a pipe chart. See Appendix 3, Figure 16.

D) DRAW PIPE BENDS

Pipe bends (joints) for gas and water mains are shown with an SPU standard symbol. See Appendix 2, Figure 1A.
E) DRAW PIPE ENDS
Pipe ends are shown several ways:

- A plug symbol means an existing pipe was plugged during an improvement.
- A tilde symbol means the pipe continues on but this is where the Base Map stops showing it.
- A tic symbol is used to represent the actual end of a pipe.

See Appendix 2, Figure 1B.

F) ADD CALLOUTS
Callouts should be added for each improvement as it is applied, not later. This is another common cause of errors and delays. The following is a list for labeling underground utilities: See Appendix 2, Figure 5H.

- Callouts should be placed in white space whenever possible.
- Callouts should repeat often enough for easy identification. About every 200’ or 10” on the paper. For complex areas, callouts should be placed closer together.
- Stair stepped callouts. This technique is practiced when there are several parallel utilities and their callouts are being repeated.
- Place a callout on each side of maintenance holes, vaults, structures, and bends.
- “Etag” is a block with hidden attributes used to add research references to callouts. It places the reference on the correct layer and if the callout is moved the reference will follow even if it is frozen. See Appendix 3, Figure 4.

G) ADD PIPE CALLOUTS
At a minimum, pipe size and pipe use are called out every time. Callouts can include, but are not limited to the following information:

- **Research Resource Reference.** See Appendix 2, Figure 7C.
- **Pipe Size** (Callout inside diameter, but draw outside diameter). See Appendix 2, Figure 5H.
- **Pipe Use** (water, sewer, and more). See Appendix 2, Figure 5H.
- **Pipe Material** generally only for project pipes.
Section 5
INTERPRETING RESEARCH

EXAMPLE: PIPE CALLOUTS

Usually pipe materials are called out only for the type of pipes that the project is building. The base map is being created for a water project, so call out the pipe material of water pipes only. See Appendix 2, Figure 5H.

- **Pipe Status.** If the pipe was no longer in use it would be labeled as abandoned. See Appendix 2, Figure 5F.
- **Disclaimers.** A disclaimer may be used when information is unclear or unavailable. See Appendix 2, Figure 5A.

EXAMPLE: DISCLAIMERS

If it’s not certain the pipe has been abandoned or not, then label the pipe: ABAN?. The following is a list of some the more common disclaimers found on a base map:

- LOC?
- ABAN?
- SIZE APPROX
- REM?

- Pipe callouts have loop leaders. See Appendix 2, Figure 8.
- Pipe callouts for pipes 12" diameter or greater are broken loop leader callouts. See Appendix 2, Figure 8.

5.7 Use Secondary Research Resources to Check Map

By this point, all the primary research resources have been reviewed and applied to the base map. Now the secondary research resources should be used as a last check and confirmation. See Section 3.1B. If following sources are used, add a research reference to the callout:

- gas maps
- water book
- sewer drainage maps.

5.8 Resolve Questions and Conflicting Information

It’s a rare occasion when questions and conflicts don’t arise when interpreting research resources. As questionable items are encountered, note them a “Zquestion” layer. The following are a few methods that may be helpful:
A) MISSING RESEARCH

- If as-built plans show an improvement as existing, that situation may indicate a missing research document. See Sections 5.5B,C.
- In a few cases where no records are available, it may be due to:
  - A utility crew performed work and created no record.
  - A private party built an improvement illegally or with no permit.
  - The improvement was built before the area became part of the City of Seattle.

B) SURVEY DATA WINS

Survey data (almost) always prevails over all other sources. This is especially true for placement of a feature.

C) DISCLAIMERS

Some things may never be resolved. It is very important to note these with a disclaimer. See Section 5.6G.

D) WHAT HAPPENS WHEN AN ABOVEGROUND FEATURE IS SHOWN ON AS-BUILT, BUT NOT FOUND BY SURVEY?

This could be due to a number of things:

- A plan or utility book from an earlier date is missing from research.
- The item was built, but it’s buried.
- The item was built, but there is no plan for it.
- The item was built, but is gone now.
- The item was never built.

Follow through by making an field check (FC) note. The FC note should include either the plan or utility book number.

**EXAMPLE: ABOVEGROUND FEATURES NOT FOUND BY SURVEY**

A plan shows a maintenance hole but the survey did not pick it up. Point the field check note to the location and add a field check note. It should read something like: “MH from 774-78. Buried?” See Appendix 2, Figure 10A.
**Tips: Interpreting Research**

- Do not draw features on a base map from a plan that shows the feature as existing . . . unless that plan is the *only* source of information available.
- Always give a research resource reference.
- Proceed chronologically.
- Keep track of unresolved issues on a Z layer.
- Finish drawing each item before moving on. This helps resolve interpretation issues as they occur.
- Get help for unresolved items after going through all the research resources.
Section 6
APPLYING RESEARCH

Section 6 Objectives
This section is an in-depth guide for applying 11 types of research resources:

- Vault plans
- Older SPU Vault plans
- Utility books
- Grading plans
- Paving plans
- Sewer and drainage plans
- Side sewer cards
- Water main plans
- Electrical, signal, lighting and communications plans
- Bridges and structures
- Landscaping

Appendix 4 provides details for accessing these and other research references.

6.1 Vault Plans Versus Utility Books
It is important to be aware that both vault plans and utility books contain varying styles of drafting. This variance is due to technological advances, alternate drafting standards, and drafters.

6.2 Helpful Hints for Vault Plans
Vault plans can have multiple types of improvements occurring on a single sheet. Water mains and sewer improvements can be found on the same sheet. Installation of a water main and a sewer together may also be found. Follow these steps:
• Look over each plan carefully.
• Scan the cover, index, and notes sheets. Look for special notes, cross-references to other sheets, supplemental sheets, keys, legends, details, sections, inspector’s book number, and other pertinent information.
• Reference City of Seattle Standard Plans. Certain features are built over and over again (maintenance holes, catch basins and inlets). Rather than show details of building the same features, reference the City of Seattle Standard Plans. Many items are assigned Standard Plan numbers. This highly useful information is not often used.

**EXAMPLE: STANDARD PLAN NUMBER CHANGES ON OLDER PLANS**

Many editions of the Standard Plans have been published over the years. Numbers assigned to specific Standard Plans have changed. If the Standard Plan needs to be researched, then look in the edition that correlates with the as-built date of the improvement. In the 1991 edition, Standard Plan Number 130 is a maintenance hole. In the 1967 Standard Plans edition it is an extruded curb.

• Was the plan ever built? Most were, but not all.
• Was a portion canceled or crossed out?
• Distinguish what the plan is building from the entities it shows as existing.
• What control is used to locate the improvement? Is it a centerline, ROW line, or another feature?
• Find every portion of the plan that applies to the project area.
• Pay careful attention to red colored as-built notes.

### 6.3 Helpful Hints for Older SPU Vault Plans

Many older plans sets are inked on linen and stored rolled-up. Older plans sets have been divided into and assigned more than one plan number to enable their fit into plan storage tubes. Usually, plan indexes will reveal all the plan numbers.

**EXAMPLE: PLANS WITH MORE THAN ONE NUMBER**

A sewer plan number 78-29 may also include plan numbers 78-28 and 78-30.

The 78-29 number is the plan view of the sewer. It provides detailed as-built information, including the location of the improvement in relationship to the control.

Number 78-30 is the profile of the sewer. Besides furnishing elevation information, it provides detailed information on the type of maintenance holes used and the as-built length of pipe runs.

Number 78-28 refers to the LID (Local Improvement District) map. It shows the improvement location and how landowners were assigned fees for work based on amount of property owned. This information can be ignored. Still, it is a good idea to scan the sheet to see if it contains other useful information.
• *** Parts of older plan sheets may be deteriorated, especially around the edges. In some cases this can be remedied by viewing its microfilm copy. The plan may have been microfilmed prior to the deterioration. At present many older plans are being repaired and then scanned for viewing through the SPU Virtual Vault.

• Older plans often include references to standard plan numbers for standard features built. These can be ignored in most cases.

• Pay careful attention to light pencil notes on older plans. These notes were usually done as an afterthought by others conducting research. They can include things like updating a street name changed by crossing out the old one and adding the new one or adding stationing to a control line. These are not official notes (like as-built notes) but may be helpful.

• Significance of the Inspector’s Book Reference. An inspector’s book is a report assembled by the project’s inspector during construction to record design changes that occurred in the field, among other things. In turn, the design change information from the inspector’s book is then used to transform the plan set to an as-built drawing. Therefore, the inspector’s book is considered a secondary research document and it is not routinely utilized. It is used on occasion to supplement incomplete or confusing as-built plan information.

6.4 Helpful Hints for Utility Books

Just like the SPU Records Vault plans, utility books can contain varying degrees of information:

• Look over each book carefully.

• Make sure you have a copy of the first page of the permit, known as the “permit page.”

• Note any legends or keys.

• Note references to other utility books.

• Make sure all pages needed for the project area are copied, labeled and available. Keep pursuing those books that were not available during initial research. The supervisor or lead can advise for missing books.

• Control Used to Locate the Improvements in Franchise Utility Books. The control used by the Street Use inspectors can vary greatly. They have been known to use monument lines (we hope), existing features, a combination of items, or no control at all. If an existing feature like a maintenance hole is used for control then it should be determined:

  a. Is the feature still there?

  b. Is a similar feature nearby that could be mistaken for it?
• **Significance of the Permit Number Listed on the Permit Page.** Just like the inspector’s book for vault plans, the permit number listed on the permit page is a secondary research resource for Franchise Utility Books.

• **Unusual Bends in Pipes.** Unusual bends in franchise utilities usually indicate that the utility is maneuvering around an existing object.

• **Depth Information from Utility Books.** The depth of the utility being built is commonly provided in utility books. Some utility books will go a step further and provide the depths of existing utilities encountered during the work as well as the new improvement. During design, this information is especially useful in creating profile views of existing conditions. See Appendix 2, Figure 7B.

### 6.5 Grading Plans
Grading plans are often the first improvement to an area. Even though the actual grading (cut and fill) will not need to be reflected on the base map, other items in the grading plan may be useful. The direction of slope and/or the percent grade of the new grade will be given. Grading plans may also contain drainage structures and their connections to the mainline as well as curb and sidewalk improvements. See Appendix 2, Figure 6K.

### 6.6 Paving Plans
The design process requires the need to know specific information pertaining to paving features in a project area. Even though survey points and line-work provide certain current paving conditions, more is needed. That additional paving information can be found in the as-built paving improvement plans.

**A) REQUIRED PAVING FEATURES FOR SPU BASE MAPS:**

1) **Current Curb Edge From Survey**
   The current curb edge is provided by survey data. See Appendix 2, Figure 6M.

2) **Curb Edge Per Plan**
   The curb edge should be drawn on a construction layer per plan. See Appendix 2, Figure 6M.
iii) **Limits of Each Type of Paving**

Multiple improvements may have led to varied paving surfaces and subsurfaces. The limits are either pointed out with a callout or are defined by a dimension string. Most often, both methods are used. See Appendix 2, Figure 6E.

iv) **Paving Material**

Multiple paving improvements also contribute to varying paving materials. Some are apparent and show on the surface, while others are subsurfaces and can only be found on as-built paving plans. See Appendix 2, Figure 6E.

v) **Paving Thickness**

This information can only be found through research of as-built paving plans. Paving thickness is given for concrete only. Asphalt surfaces are called out, but no thickness is given. See Appendix 2, Figure 6G.

vi) **Subsurfaces**

This information can only be found through research of as-built paving plans. It's common for multiple concrete paving improvements in adjacent locations and of varying thickness to be covered by a single asphalt surface. In this case, a dashed line on the base map shows the subsurface. See Appendix 2, Figure 6E.

vii) **Brick, Sandstone, or Concrete Gutters**

Gutters in this case, refer to a thin strip of pavement located between the curb and the roadway. Gutters are built of a material different than that of the pavement directly adjacent to it. Survey data may state that the entire roadway including the gutter area is covered with asphalt, yet there may still be a brick, sandstone, or concrete gutter underneath. If so, an as-built plan will indicate it and show its limits (where it starts and ends) and dimension (width). See Appendix 2, Figure 6G.

viii) **Slopes**

Slopes are given in percent grade and can be found on grading and paving plans. For asphalt surfaces, show the direction of slope only. For concrete surfaces, show both the percent grade and direction of slope including asphalt covered concrete surfaces. Slope may change slightly after initial grading of the area. Be certain to use only the most current slope information. See Appendix 2, Figure 6K.
lx) Curb Ramps
Plans are not needed for curb ramps. Survey provides this information. If not, they can be verified by a field check. See Appendix 2, Figure 6J.

xi) Granite Curbs
Granite curbs require special care during construction so we show the limits. Limits should be verified by field check. See Appendix 2, Figure 6C.

xii) Former Street Car Railway Areas
Until the 1940s, many Seattle arterials had streetcar railway systems. These areas were left with unique paving conditions. Rails were removed but ties left in place. The gaps were filled with concrete paving of varying depths—estimated at an average of 18”. For this situation, the limits of the area are defined on the base map and the area given a special callout. See Appendix 2, Figure 6F.

xiii) Walks
Walks are usually provided by survey points. As-built plans can fill in gaps of information survey may miss. See Appendix 2, Figure 6A.

xiv) Driveways
Use survey or field data for driveway locations. Do not use plans. See Appendix 2, Figure 6J.

Table 6-1 summarizes the paving items required, their source, and if they require line-work and or callouts.
Table 6-1. Paving Features to Incorporate into SPU Base Maps

<table>
<thead>
<tr>
<th>Feature</th>
<th>From Survey</th>
<th>From Plans</th>
<th>Line-work</th>
<th>Callout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Curb</td>
<td>Yes</td>
<td>No</td>
<td>* Yes</td>
<td>No</td>
</tr>
<tr>
<td>Curb per Plan</td>
<td>No</td>
<td>Yes</td>
<td>Construction lines only</td>
<td>No</td>
</tr>
<tr>
<td>Limits of Paving Improvement</td>
<td>Surface only</td>
<td>Yes</td>
<td>* Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Material</td>
<td>Surface only</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Subsurface</td>
<td>No</td>
<td>Yes</td>
<td>* Limits</td>
<td>Yes</td>
</tr>
<tr>
<td>Gutters</td>
<td>Surface only</td>
<td>Yes</td>
<td>* Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Slope</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Symbol</td>
</tr>
<tr>
<td>Curb Ramps</td>
<td>Yes</td>
<td>No</td>
<td>Symbol</td>
<td>No</td>
</tr>
<tr>
<td>Granite Curbs</td>
<td>Maybe</td>
<td>Yes</td>
<td>Limits</td>
<td>Yes</td>
</tr>
<tr>
<td>Former Street Railway Area</td>
<td>No</td>
<td>Yes</td>
<td>* Limits</td>
<td>Yes</td>
</tr>
<tr>
<td>Walks</td>
<td>Yes</td>
<td>Yes</td>
<td>* Limits</td>
<td>Yes</td>
</tr>
<tr>
<td>Driveways</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Tree Cut-outs</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Rails</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

* = Include in a dimension string. See Appendix 2, Figures 9A, B, C, D, E, F.

B) PAVING FEATURES NOT REQUIRED FOR SPU BASE MAPS:

- Every paving improvement plan usually shows or notes stabilizing material underneath it such as aggregate, gravel, or sand. It is not necessary to call out these materials.
- Backs of curbs are not shown on SPU base maps. Only the front edge is required.
- Do not call out paving thickness of walks.
• Do not call out paving thickness of asphalt.
• Do not give percent grade of asphalt surfaces. Show the direction of grade only.

C) PAVING CALLOUTS

At a minimum, paving callouts include paving thickness, materials, research resource references, and curved leaders pointing to the limits of each.

i) Thickness
Include the thickness of concrete material only.

ii) Material
Paving materials most commonly called out are concrete, brick, and asphalt.

iii) Multiple Layers of Paving
When multiple layers of paving are present, it is customary to start with the top layer first.

EXAMPLE: LAYERS OF PAVING
“Asph/6”Conc/Brick” means asphalt over 6” concrete over brick.

iv) Slopes
Slopes are called out with an SPU standard symbol. The percent grade may or may not be included, depending on the paving surface and/or sub-surface.

v) Dimension Strings
The dimension string defines the limits of paving features visible on the surface as well those that are not. It will also define the distance of the survey control line to the ROW and other paving features. See Appendix 2, Figures 9A, B, C, D, E, F.

• Dimension strings include the total distance from one side of the ROW to the other.
• Dimension strings do not include asphalt edges, only rigid surfaces like concrete are provided.
• They can also include distances that relate to the control lines.
• Gutters are a separate dimension string placed near the main one.

There can be varying circumstances that will affect the content of a dimension string. Not every case can be covered here.
vi) **Granite Curbs**
Granite curbs should be called out.

vii) **Ends of curbs**
Occasionally, the curb will end abruptly and its limits will need to be shown and called out by saying “EOC” for end of curb.

viii) **Disclaimers**
A disclaimer may be used when information is unclear or unavailable.

**EXAMPLE: DISCLAIMER**

It may be certain that the surface is concrete but the plan may not have been clear on the thickness. Call out as: ?"CONC. This means unknown inches thick of concrete.

---

**D) CHALLENGE OF DRAWING PAVING FEATURES FROM PLANS**

Drawing paving features from plans can be a challenge for projects in busy parts of the city. Paving alignments change often over the years. Streets get widened; curb radius’ change, and paving thickness goes up and down. Paving alignment and features provided by survey may differ from those shown on earlier as-built paving plans. Despite those differences, the past as-built paving plans contain required base map information.

Some of the paving information applied from the as-built plans will appear as line-work in the final base map. Other information must be drawn as construction lines for reference only.

---

**E) WHY INCLUDE CURB AND PAVING ALIGNMENTS FROM PAST IMPROVEMENTS?**

Paving and curb alignments from the past are a valuable resource for the following reasons:

- These lines can be used to define the limits of various paving surfaces and subsurfaces.
- These lines can be used to define the control for subsequent improvements.

**EXAMPLE: PAST IMPROVEMENTS**

An older gas line was measured off an old curb alignment that no longer exists because the street has been widened.
F) WHY DRAW CURRENT CURB LINE PER PLAN IF SURVEY PROVIDES IT?

Draw the current curb line according to the plan. Place it on its designated construction layer. When an *as-built* plan uses the curb line as its *control line* to locate an improvement, the construction line is offset to the given distance. The current survey curb line does not work that way. No matter how straight it looks, the survey curb line is lumpy due to natural phenomenon and human limitations.

G) STEPS FOR DRAWING PAST PAVING IMPROVEMENTS

The best method for capturing paving features is to use chronological order to draw improvements from every *as-built* paving plan. Do so even if you do not match current survey conditions. Certain paving features required on SPU base maps can **only** be found from past paving plans. If paving is very complex (3 or more *as-built* paving plans per city block), consider placing information from each paving plan on an individual construction layer. This keeps data organized. Each individual layer name may contain the plan number and as-built year. Each construction layer can then be distinguished by color.

As each subsequent improvement is added, some lines may transition from construction lines to SPU standard paving lines. Some construction lines may need to be erased. Table 6-2 shows 6 steps for reviewing paving plans chronologically:

**Table 6-2. How to Draw Past Paving Improvements**

<table>
<thead>
<tr>
<th>Step</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pretend paving points and lines from Survey are not there until you've finished reviewing all paving plans. Lines can be frozen temporarily</td>
</tr>
<tr>
<td>2.</td>
<td>Draw the paving alignment shown on the plan</td>
</tr>
<tr>
<td>3.</td>
<td>Include the other paving features shown on the plan</td>
</tr>
<tr>
<td>4.</td>
<td>Move on to the next plan</td>
</tr>
<tr>
<td>5.</td>
<td>Do not re-draw a paving alignment that is identical to what has been reflected on previous plans</td>
</tr>
</tbody>
</table>
| 6.   | Determine which lines to place on an SPU standard paving layer. Erase or put on a construction layer. Imagine how plan meshes with prior paving improvements. Ask these questions:  
  - Does new paving plan remove paving from prior improvement?  
  - Does new paving plan add paving in addition to paving from prior plans?  
  - Does the curb radius change?  
  - Does paving thickness differ from previous plan? |
6.7 Sewer and Drainage Plans

Several types of information are derived from sewer/drainage plans as each plan is reviewed. The plan indicates the type and size of MH symbol to use and its placement in relationship to the casting. Then the pipe is drawn and labeled. The final task is to add the side connections. The following items describe in detail how to apply sewer and drainage research:

A) CASTING AND MAINTENANCE HOLE (MH) SYMBOLS

Survey provides a casting symbol and survey point for each MH. Base-mappers, however, add the MH symbol from their research of as-built plans. The casting symbol represents the casting (lid) that covers MHs. The “MH” symbol represents the outside wall of the MH structure underground. Most MHs are built concentrically, with the casting centered over the MH structure, but not always. Survey may give you a field book note to indicate if a casting is offset from center of the MH structure. The as-built sewer/drainage plans give the precise information. See Appendix 2, Figure 3I.

B) CORRECT SIZE AND PLACEMENT OF MH

MHs drawn on Base Maps should reflect the outside diameter of the MH structure and its placement in relationship to the MH casting. Sewer/drainage plans may indicate this information in several ways. The profile portion of the plan may give a Standard Plan number to indicate the MH type or give a reference to a detail that describes a non-standard maintenance hole. In any case, the outside diameter and correct placement of the MH symbol can be determined by viewing the Standard Plan, profile, or detail.

C) OUTSIDE DIAMETER OF MH

Often the outside diameter of an MH structure is non-issue. Most MHs are built from a Standard Plan type that matches the size of the most frequently used SPU MH symbol. If this is not the case, then resize MH symbol or draw it to scale. To find the outside diameter of the MH structure, refer to the plan that built it.

D) SEWER/DRAINAGE PLANS AND STANDARD PLAN REFERENCES

Sewer and drainage plans often refer to City of Seattle Standard Plan numbers to indicate the type of MH built for a project. Most MHs—unless customized—are built according to a Standard Plan number. Standard Plan numbers vary from edition to
edition. Therefore, when researching *Standard Plans*, use the edition published when the plan was *as-built* (or just before) to determine MH types and sizes.

**E) DETERMINING STANDARD PLAN MH TYPES FROM PLANS**

In most cases a plan will designate the Standard Plan number of the MHs by a note or a callout at each MH. This information may be found in the plan view, a profile view, or in a note. A callout may say “MH Type 104”. That is the same as saying *Standard Plan* number 104.

**NOTE: DOUBLE NUMBERS FOR AS-BUILT PLANS**

MH callouts on as-built plans may use 2 sets of numbers. One is the MH Type. The other is a design number. It is important not to confuse these. See Appendix 2, Figure 11D.

**F) DRAWING SEWER/DRAINAGE PIPES FROM PLANS AND SURVEY**

Before proceeding with this step, the center of the MH structures should be established from survey data, and *as-built* plan research when necessary. Draw the sewer/drainage pipes from the center of the MH structure to center of the connecting MH structure unless otherwise noted on the plan.

After the pipes are drawn, most likely the pipe location will differ slightly from the *as-built* plan.

**EXAMPLE: PIPE LOCATIONS THAT DIFFER**

The plan indicates that the pipe and MH structures are located directly over the centerline of a street. However, after following the procedure above, the pipe and MHs are not located there. In this case the survey data will dictate the location of the pipes and MHs. See Appendix 2, Figure 11C.

If the pipe is 12-inch diameter or larger then draw a single construction line and then offset the distance to the pipe’s outside diameter. See Appendix 3, Figure 16 for the pipe chart.

**G) OFFSET PIPES IN MH**

Pipes nearly always align from the center of one MH structure to the center of another. On occasion, pipes and castings can be offset from the center of a MH structure. Survey may have given an indication in their field book notes, but the
sewer/drainage plan is needed to give detailed information and exact offset distances. See Appendix 2, Figure 31.

H) TYPES OF SEWER AND DRAINAGE MAINLINES
- PS (Pipe Sewer). This type of sewer allows sewage and storm water to flow into its lines. For this reason it is also known as a “combined” sewer.
- PSD (Pipe Storm Drain). This type of mainline allows storm water only.
- PSS (Pipe Sanitary Sewer). This type of sewer allows only sewage to flow into its lines. Storm water is not allowed. Many PSSs were PSs in the past. In the late 1960s through the 1970s, many “sewer separation” projects built PSD systems near PS systems. Once the PSD systems were built, the former PS systems were then designated “PSS” systems.

I) DRAWING CULVERTS FROM PLANS
Most times culverts will have already been drawn by this phase because survey points will have picked up their end points. This is not always the case. Occasionally there will be culverts shown on the plans with no corresponding survey points. Draw the culvert and include the phrase “REM?” and “ABAN?” with its callout. See Appendix 2, Figure 5G.

J) SEWER/DRAINAGE CALLOUTS
At a minimum, sewer/drainage callouts include pipe size, use, research resource reference, and loop leader wrapping around the pipe. The following are label designations:
- PS
- PSD
- PSS.

6.8 Side Sewer Cards
*** The side sewer card system is in transition. Side sewer as-built records were previously recorded on side sewer cards but unavailable since May 2001. This information will soon be available on GIS. In the interim, use the side sewer cards. A temporary disclaimer note is available and should be applied to each base map until the situation is resolved. See Appendix 3, Figure 5.
Before proceeding read “How to Read a Side Sewer Card.” See Appendix 3, Figure 10.

A) OFFSET DISTANCE OF SIDE CONNECTIONS
Start by drawing a construction line perpendicular to the MH. Use the line for offsetting the distance given to the side connection along the sewer or drainage mainline. If the side connection is not perpendicular to the mainline, but is angled, an offset distance is required for the point at which a side connection crosses the property line. If the distance is not given on the side sewer card, then scale it.

B) THREE TYPES OF SIDE CONNECTIONS
2. SS (Side Sewer). An SS is a side connection of a PS.
3. SD (Service Drain). SDs have storm water flowing through them. A PSD can only have an SD as a side connection. However, a PS can have SDs as side connections, too. Rarely, a PSS may have an SD as a side connection as well. The way to determine what qualifies as an SD is to view the side sewer card. If the source of the connection comes from catch basin, roof drain, or a ditch/culvert system, it is an SD.
4. SSS (Sanitary Side Sewer). An SSS is a side connection of a PSS.

C) LABEL DESIGNATION FOR SIDE CONNECTIONS:
The following labels designate side sewers and service drains:
- SS
- SD
- SSS.

D) LABEL PLACEMENT
- Place label just inside the private property line and end the line with a tilde.
- If the side connection is very long, label it with a loop leader along its run.
- Provide depth information on the Zref layer.
6.9 Water Main Plans

Drawing water mains from plans is fairly straightforward. Once in a while, a water improvement can be found in a utility book rather than a vault plan. Sometimes research will indicate a water main plan is missing. Either can happen from a record-keeping glitch because SPU recently had a separate water department. A database has been assembled to help find water improvement plans. See Appendix 2, Figure 18 and Appendix 4. The following are steps for applying water main research:

- **Draw the water main per plan.**
- **Water Valves.** Water valves are part of every water main and are picked up by survey. Unlike sewer/drainage MHs, water valves do not dictate where the water main will be drawn. In addition, water valves near fire hydrants are not shown. It is assumed every fire hydrant assembly has one.
- **Elevations Notes on Water Mains from Plans.** Water plans sometimes offer the elevations at the top of the water main at or near hydrants. This type of note appears as a number in a circle. Include that information to the Base Map by placing it on a reference layer and note as "El @ top of main = 102'.
- **Connect the hydrant to the main.**
- **Add pipe joints**
- **Give research resource reference.**

6.10 Electrical, Signal, Lighting, & Communications

Electrical, signal, lighting, and communications improvements are grouped here because they are treated similarly in base-mapping. These improvements can be found in both SPU Records Vault plans and franchise utility books.

A) UTILITY VAULTS AND MHS

Utility vaults and MHs are treated like sewer/drainage MHs. Survey provides a casting symbol or point and research will show the outside dimension of the vault or MH structure in relationship to the casting. However, unlike sewer/drainage MHs, survey usually does not provide information about the inside of these structures. Typically, this information comes from the vault plan or utility books that built it.
B) CONDUIT, DUCT, AND DIRECT BURIAL CABLE

The terms conduit, duct, and direct burial cable should be defined before proceeding. At times, the utility books use these terms in a different manner than the SPU standard. A utility book may call a conduit a duct and duct a conduit. However, the SPU standard for base maps is as follows:

i) Conduit
A plastic or metal pipe to used to contain wires inside.

ii) Duct Banks
A structure enclosing and supporting many evenly spaced conduits usually made of concrete.

iii) Direct Burial Cable
Cable buried directly in the ground without being inside a conduit.

C) SHARED TRENCHES AND DUCT BANKS

It is not unusual for electrical, signal, lighting, and communications improvements to share a trench or duct bank. As similar improvements are added, they, too, can be placed in the same trench.

D) CONSOLIDATION OF LINES FOR MULTIPLE UTILITIES IN SAME TRENCH

For clarity, when various types of utilities share the same trench the lines may be consolidated. If ductwork is present, its line-work will be drawn. Otherwise, for all those items less than 12-inch diameter, a single line may be drawn.

E) LABELS AND CALLOUTS

At a minimum, electrical, signal, lighting, and communications call- outs include size, usage, research resource references, and loop leaders. See the Standard Plan No. 003a and 003c for the specific callout types for electrical, signal, lighting, and communications.

F) STACKED CALLOUTS MULTIPLE UTILITIES IN THE SAME TRENCH

A stacked callout may be used when calling out multiple utilities in the same trench. See Appendix 2, Figure 5B.
G) CALLOUTS FOR DUCT BANKS
Ducts are square or rectangular. Their size is called out by giving width by depth.

**EXAMPLE: DUCTBANK CALLOUTS**
24 inch x 18 inch TD means that this is a 24-inch wide by 18-inch deep telephone duct. In many instances, the as-built document will not give the dimensions (width and depth) of the duct bank. An educated guess can be made. In that case the duct is drawn the width that is guessed but the callout will say 16 inch x 8 inch ED (SIZE APPROX). See Appendix 2, Figure 5B.

H) VAULTS WITH DRAINS
Some vaults have drains connected to sewer or drainage lines. This scenario is usually found on the as-built document, but sometimes can be found only on the side sewer card.

I) WESTERN UNION TO WORLDCOM
Western Union used to occupy certain conduit runs in the downtown area. WorldCom has taken over their system. If a Western Union conduit run appears on an as-built document, draw it, but do not label “ABAN.” WorldCom lines are active.

6.11 Bridges & Structures
Most portions of bridge and structure as-built documents are not needed for base maps. However a few items can be useful. See Appendix 2, Figure 3N.

A) PIERS
Typically survey will pick up bridge piers because they are visible, but bridge footings must also be shown. That information is in the as-built plans.

On occasion a plan may show that a bridge or trestle has been cut off leaving its piers buried. In this case the piers and their footings should be drawn per as-built plan, paying special attention to their placement and spacing.
B) RETAINING WALLS
Treat large structural type retaining walls (not rock face walls) as if they were piers. Survey will pick up points along the wall but the as-built document will reveal information about the footing. Sometimes older vault plans give little or no footing information for street retaining walls. Whenever possible, draw the footing outline if it is given.

C) BRIDGE ABUTMENTS
Survey will likely pick up points along the top of an abutment. Once in a while, the underside of the abutment may be needed and can be found on the as-built plans.

6.12 Landscaping
Irrigation lines are the only item to show from landscaping plans. They are shown as waterlines. Survey data may give locations of sprinkler heads or irrigation items, but there is no need to show these items per plan.

Tips: Applying Research
- Vault plans and utility books contain varied styles of drafting
- The design process requires that we know specific information about paving features
- Sewer and drainage plans are the source of several types of information
- Water main plans are straightforward—but record-keeping can be inconsistent based on recent reorganization of SPU’s divisions
- Electrical, signal, lighting and communication are treated similarly in base-mapping.
Section 7
FIELD CHECKING

Section 7 Objectives

After you complete this section, you should be able to:

• Prepare a field check
• Prepare a field check print
• Understand field location techniques
• Conduct a field check

7.1 Preparing for a Field Check

A field check is conducted after the surveyed features and underground utilities are applied to the base map. The purpose of a field check is to:

• Verify existence and location of topographical features provided by survey.
• Resolve field check (FC) questions.
• Locate features that survey does not typically provide.

The following preparations should be made before the field check:

A) RESERVE CAR

Preferably the day before it’s needed, especially if the weather is expected to be clear and dry.

B) FIND A PARTNER

We highly recommend that no one goes into the field alone. Ask the supervisor or lead to recommend someone according to workload.

C) GEAR UP

Take the following gear:

• Shoes. A pair of sturdy closed toe shoes should be worn. Sturdy boots may be needed for unimproved areas. On some occasions rain boots may be needed. The City can supply rain boots.
• **Fluorescent Outerwear.** Either a fluorescent vest or raingear should be worn. The City can provide both.

• **City ID and Business Cards.** Always wear your City ID and take a few business cards if you have them.

• **Cell Phone.** Take a cell phone if possible.

### D) CHECK SUPPLIES

Gather the following supplies:

- **Clip board.** To hold field check (FC) prints
- **Small engineer’s scale (optional).** When many items need to be field located, a small engineer’s scale can be useful for drawing items on the field check print.
- **Field check (FC) prints.** A print of the base map containing the FC questions.
- **Large rubber band (optional).** Holds field check print down on the clipboard.
- **A 25’ and 100’ engineers tape**
- **Colored pencils and pens**
- **Lumberman’s Crayon**
- **Digital Camera.** Take pictures of those features that are complicated or confusing.

---

**EXAMPLE: PHOTOS OF COMPLICATED FEATURES**

It is difficult for survey to describe a retaining wall with a chain link fence embedded in it.

---

### 7.2 Preparing a Field Check Print

A FC print should be prepared so it is of optimum use in the field and afterwards. See Appendix 2, Figure 10A. The following is a list of items that should be included on a field check print:

1. **Survey Point Symbol and Point Numbers.** The survey point symbol and point number should be included on the field check print. This helps get oriented in the field. This information can also be used to locate or clarify features relative to surveyed points.

2. **FC symbol and its corresponding question.**

3. **Initials of person conducting the field check and the date.** This should be hand written in large print, preferably in the bottom right corner.
4. **North arrow and street names.**

5. Freeze unnecessary layers, as reference, construction, and question layers. These items can make field check notes difficult to read.

### 7.3 Field Location Techniques

Different features require field locating techniques depending on the accuracy required. Some methods, such as photography, merely clarify features. Other methods, such as measuring features in relationship to other surveyed points, provide more accurate location.

**EXAMPLE: LOCATION TECHNIQUES VARY**

A missed inlet requires a more accurate field location technique than a missed WCR.

Use the following techniques to complete a base map:

**A) TRIANGULATION**

This is a method that locates a feature relative to 2 surveyed points. A measurement is taken from each survey point to the feature to be located. The distance measured is to the nearest 0.1’. After the field check has been conducted, a circle is drawn with each survey point at its center. The radius of each circle is the distance measured in the field from that survey point to the feature being located. The feature is located at the point where the 2 circles intersect. See Appendix 2, Figure 10C.

The 2 survey points chosen should meet the following criteria:

- The 2 points and the feature being located should form an imaginary triangle.
- The points should be easily identified.

**EXAMPLE: SURVEY POINT CRITERIA**

A catch basin survey point is preferred over a pavement survey point.

- The points should be located no further than 100’ away from the feature being located.
B) STATIONING LINE FROM A KNOWN POINT

This method involves establishing a known point along a known alignment as the base line. It requires 2 people to take measurements. Use this only when:

- Many features are to be located
- Very few or no survey points within 100’ of feature(s) are to be located.

To correctly use this method, the known point and alignment must be established.

EXAMPLE: STATIONING LINE FROM KNOWN POINT

At a street corner the walks may intersect. The intersecting corner located on the back edge of concrete walk (CW) is a preferred “known” point because it is usually located either by survey or by the plan that built it. In this manner, the front or back edge of the CW will then become the “known alignment” because it has been defined by survey or by the plan that built it. All items to be located can then be measured off this “known alignment”.

The known point is then assigned 0+00 and should be noted on the field check print. Then a 100’ survey tape is pulled along the known alignment. Mark the 100’ line as 1+00 on both the field check print and the concrete walk (CW). The CW may be marked using a lumberman’s crayon.

Keep the 100’ survey tape in place on the CW. Hold the starting end of a 25’ engineer’s tape from the feature to be located. Another person will walk the 25’ tape to the 100’ tape at a right angle. First, note the distance from 0+00 on the 100’ tape where the 25’ tape crosses the 100’ tape. Second, note the distance measured on the 25’ tape from the feature to the 100’ tape. Next, draw the feature and label with a station and offset distance. See Appendix 2, Figure 10D.

C) VISUALLY LOCATING OBJECTS

This method is used for features that do not require exact locations.

EXAMPLE: VISUALLY LOCATING OBJECTS THAT DO NOT NEED EXACT LOCATION

Survey missed a WCR. Its exact location is not required. All that needs to be known is that it exists and its approximate location. Record it on the field check print by sketching the WCR where it is seen.

Some features may be located visually in relation to other objects. See Appendix 2, Figure 10E.
EXAMPLE: VISUALLY LOCATING FEATURES IN RELATION TO OTHER OBJECTS

Survey missed a WM (water meter) that is located in the parking strip adjacent to the front edge of the CW. Most CWs have score marks that are 2' squares. This feature makes it easy to locate this object visually. Count the number of squares from the closest known survey point—like a driveway or private walk—and multiply by 2 for the number of feet. Next, draw the WM symbol on the field check print.

D) SHADING PAVING SURFACES

Use various colored pencils to shade the limits of complicated or varied pavement surfaces. Although this is not a true method for locating paving features, it works to clarify confusing paving surfaces. Use different colors to shade each surface. See Appendix 2, Figure 10F.

E) TAKING PHOTOS

Taking photos is not a true location method. But it, too, is useful for clarifying confusing or complicated features. Sketch a camera symbol on the FC print. Place it where you were standing while taking the photo. The camera symbol should be pointing towards the features being photographed.

Usually more than one photograph is taken per field check. Thus, it’s a good idea to number or name each symbol to cross reference the number or name of its corresponding photograph. See Appendix 2, Figure 10G.

7.4 Conducting a Field Check

The following tasks are carried out on every field check:

A) VERIFY EXISTENCE AND LOCATION OF TOPOGRAPHICAL FEATURES PROVIDED BY SURVEY

1) Utility Topographical Features

Verify the existence and location of utility related topographical features such as fire hydrants, power poles, valves, and maintenance holes by drawing a small check mark next to each item verified on the FC print.
ii) Non-Utility Topographical Features

Visually verify the existence and location of non-utility related topographical features such as curbs, driveways, and paving surfaces. You do not need to draw a checkmark for these items.

B) RESOLVE FIELD CHECK QUESTIONS.

Typically, several FC questions arise in the process of creating the base map. The table below contains examples of typical FC questions and recommended field location techniques. Table 7-1 shows these issues.

Table 7-1. Typical Field Check Questions

<table>
<thead>
<tr>
<th>Description</th>
<th>Info Required</th>
<th>Location Technique</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfinished lines in base map area</td>
<td>Limits of surfaces</td>
<td>Visual/shading</td>
<td>continue surface lines to the edge of the base map area.</td>
</tr>
<tr>
<td>Ditches</td>
<td>Flow direction and width if not provided</td>
<td>Visual</td>
<td></td>
</tr>
<tr>
<td>Catch basin or inlet lid details structure nonstandard or survey’s description does not match symbol or research</td>
<td>A sketch of the lid</td>
<td>Visual</td>
<td>Draw large enough to see detail on the FC print. Note the location of inlet or outlet pipes if necessary.</td>
</tr>
</tbody>
</table>

C) LOCATE FEATURES THAT SURVEY MAY NOT PROVIDE.

The content of every survey provided varies slightly. Table 7-2 lists typical items located on a field check.

EXAMPLE: LOCATING FEATURES SURVEY DOES NOT PROVIDE

Some surveys will provide a note that states the orientation of the luminaries and others will not. Regardless, this information is still needed for the base map.
Some information that is needed to complete the base map is never provided by survey but should be recorded for every field check.

**EXAMPLE: CHECKING FEATURES SURVEY DOES NOT PROVIDE**
The heights of fences and retaining wall should be noted on every field check.

### Table 7-2. Items to Locate on a Field Check*

<table>
<thead>
<tr>
<th>Item</th>
<th>Info Required</th>
<th>Technique</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granite curbs</td>
<td>Limits</td>
<td>Visual</td>
<td>Usually located on PC or PT of curb</td>
</tr>
<tr>
<td>CW and driveways</td>
<td>Does CW cross driveway? Does driveway cross CW?</td>
<td>Visual/</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>shading</td>
<td></td>
</tr>
<tr>
<td>Monuments</td>
<td>Verify location</td>
<td>Visual</td>
<td>Look at intersections. Draw checkmark if provided. Sketch if not.</td>
</tr>
<tr>
<td>Survey markers</td>
<td>Verify location</td>
<td>Visual</td>
<td>Look at intersections. Draw checkmark if provided. Sketch if not.</td>
</tr>
<tr>
<td>Addresses</td>
<td>Numbers. Note orientation of building. Place # s in front.</td>
<td>Visual</td>
<td>Get info only when # s are easy to read.</td>
</tr>
<tr>
<td>Wheel chair ramps</td>
<td>Verify</td>
<td>Visual</td>
<td>No need give exact location or size.</td>
</tr>
<tr>
<td>Fence</td>
<td>Height and material</td>
<td>Visual</td>
<td>If varies, FC note “4’ to 6’HI”</td>
</tr>
<tr>
<td>Rockery</td>
<td>Height</td>
<td>Visual</td>
<td>If varies, FC note “6’ to 8’HI”</td>
</tr>
<tr>
<td>Retaining Walls</td>
<td>Height and material</td>
<td>Visual</td>
<td>If varies, FC note “2’ to 4’HI”</td>
</tr>
<tr>
<td>Luminaries or lights</td>
<td>Orientation</td>
<td>Visual</td>
<td>Sketch</td>
</tr>
<tr>
<td>Tree canopy</td>
<td>Size</td>
<td>Visual</td>
<td>Sketch. Look at curb line for relative distances. Use building lines, other features.</td>
</tr>
<tr>
<td>Aerial or underground</td>
<td></td>
<td>Visual</td>
<td>Aerial wires run pole to pole?</td>
</tr>
<tr>
<td>electricity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conduit Risers on Poles</td>
<td>Location/size. More than 1, how many?</td>
<td>Visual</td>
<td>Sketch small circle next to pole. Note diameter of conduit</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Limits</td>
<td>Visual</td>
<td>Note only if landscaping</td>
</tr>
<tr>
<td>Gravel</td>
<td>Limits</td>
<td>Visual</td>
<td>Only when it is a driveway</td>
</tr>
<tr>
<td>WCR</td>
<td>Location</td>
<td>Visual</td>
<td>Sketch symbol</td>
</tr>
<tr>
<td>Area under construction</td>
<td>Limits</td>
<td>Visual</td>
<td>Sketch approx limits and note.</td>
</tr>
</tbody>
</table>

*These are items that survey might not note.*
7.5 Field Check Notes Readability

FC notes should be legible because this information needs to be readable to others.

7.6 The Public

The scope of the work should be known for possible questions people might ask. City of Seattle ID should always be worn where visible. Carry business cards as well as the name and phone number of the project manager.

7.7 Time in the Field Versus In-house

Spend no more than 4 hours at a time in the field before transferring the FC information to the base map. More time that that can result in loss of valuable information.
Section 8
SELF-CHECKING

Section 8 Objectives

After you complete this section, you should be able to self-check your base map. The benefits of self-checking are:

- Increase quality
- Creates learning opportunity by looking at map through checker’s perspective
- Provides a sense of accomplishment and ownership
- Builds goodwill between base map creator and lead or supervisor who checks the work

8.1 Document Unresolved Questions

Self-checking means inspecting a first draft base map before submitting it to the lead or supervisor. Leads and supervisors are responsible for checking maps.

Occasionally, questions arise when creating a base map that cannot be easily resolved. If that’s the case, it is very crucial at this stage to document any remaining unresolved questions. The best place to store this information is on the Zquestion layer. Briefly, note the unresolved question and list the steps taken so far to resolve it. Make sure the wording makes sense to others beside yourself.

More than likely, a thorough check will have to be done before arriving at a solution. It helps during self-checking if there is a clear trail of information to follow. If no documentation of unresolved questions is provided, the lead or supervisor may think the base map drafter just ignored it.

8.2 Using Compilation Research Documents

There is no reason to go over every survey point or research document to perform a good self-check. However, use of "compilation" (secondary) research documents helps streamline self-checking. The following is a list of most commonly used compilation research documents: Side Sewer Cards, gas maps and utility maps. See Section 3.1B.
8.3 Check the Control and ROW

Compare the control and ROW one last time to the quarter section map to check for omissions or errors. Check to see that stationing labels at control points are orientated correctly. Check also that the distances between control points are correct compared to the survey data and the quarter section map.

8.4 Look Over the Field Check Notes

It’s a good idea to see that everything from the field check was added.

8.5 Review Most Recent As-Built Documents

Look over the latest as-built construction documents. They may be used as a reference tool to check the base map for completeness. A good quality and easy to read set of plans will show the existing utilities.

8.6 Conduct Last Check for Street Use Utility Permits

Give one last check to see if there have been any Street Use utility permits issued or completed recently in the area, especially if it has been months since the base map was first assigned.

8.7 Review Base Map Checklist

The Base Map Checklist is very helpful for a self-check. Simply check off items on the list.

8.8 Update the Planform

This is a very important step. Sometimes along the way research documents will be found that were not added to the research list from the start. Others will have no way of knowing additional information was found if the research list is not updated.

8.9 Provide Check Print for the Checker

The check print for the checker should look like a final print. All "Z" layers should be frozen, all line-types should be standard, and all the survey point data should be turned off.
8.10 **Provide SPU Records Vault Plans for the Checker**

Give the checker all the SPU Records Vault plans. Try to have them assembled as neatly as possible.

8.11 **Assemble Research File for the Checker**

Finally, assemble your research materials neatly in the research folder. Fold larger documents to fit the folder. Organize the materials and make sure that all hardcopy documents pertaining to the research are in the folder. This also saves time for the checker. Include the following items:

- quarter section map of project area
- scope (if provided)
- Survey Request form (if provided)
- print-out of survey point database
- copy of Survey field book notes
- field check prints
- current Planform
- copies of the Utility Book Map Index
- copies of the utility books
- newer utility permits (if any)
- Side Sewer Cards
- gas maps
- microfilm copies of any SPU Vault plans that are not available.
- significant correspondence and emails
- miscellaneous research documents.
Section 9
CHECKING A BASE MAP

Section 9 Objectives

After you complete this section, you should be able to:

• Quickly become familiar with the project
• See that all materials needed for checking are provided
• Quality check the survey
• Review research records
• Record any errors, omissions, questions or comments

9.1 Become Familiar with the Project

A finished base map is a complex product containing many features. Even the most experienced base-mapper is likely to have omitted information or made an occasional error.

As each base map differs depending on the project, so can depth and extent of checking. The checking process also varies according to experience level of the base-mapper. The base map checker must gain experience with the checking process to make this determination.

It is important to be aware of any significant issues that pertain to the project:

• Briefly Review Section 2.
• Check the base map calendar date deadline.
• Read through any correspondence in the research file or project directory.
• Were there any significant problems encountered during creation of the base map?
• Examine the project directory. See that the SPU file naming conventions have been used and that all files needed are available. At a minimum, the base map drawing file should be found in the directory. The following is a list of additional files that are commonly found in the project directory along with the base map:

  Planform
  Estimate
  *** Survey request
9.2 Have a Complete Research File in Hand

The research file must contain all the documents needed for checking before starting the checking process. Review Section 8.11 for the materials needed for the checking process.

9.3 Use Base Map Checklist

To check a base map, the checker needs to retrace many of the procedures laid out in this manual. Sometimes check takes less detail—other times the same level of detail. Use the Base Map Checklist for this purpose. See Appendix 1.

9.4 Planform Must be Current

Verify that all the research documents used during the creation of the base map have been entered on the Planform. Be sure to include any that were encountered after the initial research. Check to see that the “Base Map Info” portion of Planform has been filled out as well.

9.5 Quality Check the Survey Product

It is imperative that this step be completed before proceeding further. Follow the procedures in Sections 4.3 and 4.4.

9.6 Check Topography Using Survey Product and Field Check Print

See that the surveyed points have been interpreted correctly and there are no omissions on the base map. Follow the steps in Sections 4.5 through 4.10:

1. Open the base map in LDTr3 and go over the point database. It is helpful to have a point printout handy. After a sampling, proceed in detail (or not), depending on the quality encountered so far. Always check significant points for sewer/drainage or water structures, depending on the design use.

2. If you find errors, write down the point number on the check print and comment if necessary. General comments may be added if the same errors occur repeatedly.
3. Check any survey depth information that has been recorded on a “Z” layer. Check to see that all information from the field book (e.g. invert elevations and detail sketches) have been added to the map.

4. Examine the field check print to check that the items noted in the field have been added to the base map.

9.7 Initial Check of the Utility Systems

Perform an initial check of the underground utilities by looking at each one as a system.

EXAMPLE: INITIAL CHECK OF UTILITY SYSTEMS
View all drainage features as a system. Do all the inlets and catch basins show their connections? Are all the catch basins connected to a mainline? Does each building have a side sewer connection?

SPU’s ACAD customization contains a routine that will allow the operator to view each system in one color on the screen while the rest of the base map line work will retain its screened back colors. This is an excellent checking tool.

9.8 In-depth Check of Research Documents

The primary purpose of going through each plan is to check that the elements in Section 5 have been applied to the base map.

Using Planform as a checklist, review each plan. Then review the side sewer information and all secondary research documents utilized for the base map.

9.9 Creating a Check Print

The notations made on a check print are the primary tool used to communicate with the base map creator, who, most often, makes the corrections. The base map creator should submit a plot suitable for use as a check print. See Section 8.9.
If the base map area is simple and the base-mapper experienced, then likely 1 check print will suffice. On many occasions, however, it is necessary to create more than 1 check print. Sometimes, this is due to project complexity or number of comments returned by a checker.

9. 10 Checking in Phases with Multiple Check Prints

If the process outlined here is followed, the checker will have checked the base map in 3 phases:

1. QC the survey product. This phase includes control and ROW.
2. Check the topography and the field check print.
3. Check the underground utilities.

A) MULTIPLE CHECK PRINTS

Multiple check prints can make the correction process easier for the inexperienced base-mapper and for checking complex areas. Comments don’t seem so overwhelming if delivered on separate sheets.

The multiple-check-print method also enforces the concept of completing each phase of base map creation before proceeding to the next. It can illustrate how accuracy early on helps prevent multiple errors later.

B) HOW MANY CHECK PRINTS ARE ENOUGH?

It is very typical to create 2 check prints but more can be made if necessary, especially for very complex areas or new base mappers:

<table>
<thead>
<tr>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Check Print #1</strong></td>
</tr>
<tr>
<td>control</td>
</tr>
<tr>
<td>ROW</td>
</tr>
<tr>
<td>topography</td>
</tr>
<tr>
<td>• SPU presentation standard of the above items</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Check Print #2</strong></td>
</tr>
<tr>
<td>• Primary Research Documents</td>
</tr>
<tr>
<td>• Secondary Research Document</td>
</tr>
<tr>
<td>• City of Seattle <em>Standard Plan</em> references</td>
</tr>
</tbody>
</table>
C) MULTIPLE CHECK PRINTS CAN SAVE TIME
Corrections can be being made to a first check print while a second check print is being produced.

9.11 Color Coding Check Prints
It is traditional to use the color red to indicate errors and blue for comments. Blue may also be used to note an unimportant error that does not need to be changed, but rather remembered for next time. Use any color, as long as you indicate what it means.

9.12 General Comments
When certain errors are found repeatedly, it is a good idea to write a general comment rather than pointing out the same error over and over.

9.13 Labeling
Initial and date every check print on the bottom right. If multiple check prints are used, label the phases contained on each check print as well.

9.14 Final Check
After the corrections have been completed the check prints will be returned for a final check. If multiple check prints are used then label them “Sheet 1 of ___” and “Sheet 2 of ___” and so on. Then staple them together on the left edge. If new check prints are generated for final corrections, then label and staple them as well.

9.15 The Intent of Corrections on Check Prints
The tone of the corrections made by the checker is educational. The checker should be careful not to scold. Corrections should give just enough information so the person performing the work knows how to proceed, without doing the work for them. When in doubt, pose corrections and comments as questions rather than directions.
The comments directed to an inexperienced base-mapper would be different than those directed towards the more experienced base-mapper.

EXAMPLE: INTENT OF CORRECTIONS

A horizontal bend in a gas main is drawn at the wrong location. For the experienced base-mapper, all that may be necessary is a comment pointing to the incorrect bend saying, “See utility book 271-45 pg. 45.” Yet the inexperienced base-mapper may need a sketch of the correction along with the comment.
Section 10
CORRECTING CHECK PRINTS

Section 10 Objectives
After you complete this section, you should be able to:

- Identify the 3 basic types of corrections
- Color code check prints
- Understand differences of opinion
- Highlight your questions to a comment

10.1 Types of Corrections Found on Check Prints
Base maps are detailed and complex. Some corrections will always be needed after a check. The checker’s primary focus is accuracy and SPU presentation standard. The checker’s primary form of communication is a set of check prints that contain comments, questions, omissions, and corrections. Read over the check print and ask questions that may arise.

The following are the 3 types of correction found on check prints:

1. **Redrawn Correctly.** Some corrections may show an item that needs to be redrawn due to errors in research or deviation from the SPU Presentation Standard.

2. **General Error Note.** If an error or omission is repeated throughout the base map the checker may make a general error note rather than pointing it out repeatedly.

3. **Comments/Questions.** The checker may pose questions or make comments.

10.2 Color Coding Check Prints
The checker may have used various colors as a communication tool. The meaning of the colors should be clear. If not, ask. For example, it is traditional to use red to indicate errors and blue for comments. Blue may also be used to note an unimportant error that does not need to be changed.
10.3 Difference of Opinion

During the correction process these differences of opinion can arise:

- Some research records are ambiguous or contradictory.
- In some instances, the checker may not be able to resolve an issue and may be suggesting more research is required.
- It is possible that the checker may have made errors.

If the check print contains corrections with which the base-mapper disagrees, it is strongly encouraged and very important the issue be discussed. A questionable correction on a check print should never be carried forward without dialogue. A discussion between base-mapper and checker/supervisor should resolve it.

10.4 Highlight Completed Items

The base-mapper should highlight each question or comment as the base map is revised. If there is a response to a checker’s comment, it should be noted on the check print. Proceed with the corrections, marking out each one with a highlighter pen as they are completed.

10.5 Sign and Date

The drafter should sign and date the check print on completion of corrections to the base map.
Section 11
ARCHIVING

Section 11 Objectives
After you complete this section, you should be able to:
- Archive a completed base map into the correct database
- Store research files properly

11.1 Archived Base Maps and Their Database

Archiving a completed base map is critical. Archiving ensures that base maps are available for future use. The archiving process is in transition. More details will come.

Each base map is archived as an ACAD file. Besides creating an ACAD file information is added to a data base as well. This information is very useful if the base map is to be reused.

The following are examples of the database information for each base map:
- narrative of the geographical location
- base map history
  - scanned manually-created base map?
  - reused ACAD file?
  - full base map?
- survey history
- creation date.

See Appendix 3, Figure 6 for archiving instructions.

11.2 Why Archive the Research File?

The information contained in the research folders can be used for several purposes and are kept for our protection. For information on the content of a research folder See Section 8.11.
A) CONSTRUCTION
During the construction phase of a project, problems may arise with the existing conditions reflected in the base map.

EXAMPLE: HOW RESEARCH FOLDERS ARE USED
A side sewer may be revealed by trenching but not be shown on the base map. This side sewer may necessitate a design change mid-construction, a costly delay. We may be asked to trace our research to see if this was due to a research error.

B) PROFILES
The information contained in a research folder oftentimes is used to create profiles for that project.

C) EXPANSION OF SCOPE
The scope of a project can change at any time during the design or pre-construction. If an expansion of the area is required, then the research file will not have to be recreated.

D) DESIGN QUESTIONS
At any time during the design and construction, questions may arise that can only be answered by having the research file available.

11.3 Storage of the Research Files
The research files are stored in filing cabinets located in the Base Map group area. Several tasks should be performed for correct storage:

A) STORE FILES ALPHA NUMERICALLY
These files should be stored alpha numerically, by job number.

EXAMPLE: HOW ALPHA NUMERICAL FILING WORKS
C3AA402 will be filed before C399406.
B) DELETE UNNECESSARY HARD-COPY ITEMS
Items such as the plan list or estimate are stored electronically in the Base Map group’s project directory. They do not need to be stored in the hardcopy research folder.

C) COMPACT STORAGE
The file itself should be neated up for compact storage. Larger items such as field check prints should be trimmed smaller. Eliminate paper rings and paper clips. Use a heavy-duty stapler if needed instead.

D) FILE FOLDERS
Depending on the size of the project, one or more folders may be needed for storage. Assemble a hanging folder with a tabular label noting the job number. Place the research folder inside. This process may be repeated to accommodate larger projects.

When construction is complete and the project has been as-built, the research folders can be thrown away.

11.4 Cleaning up Project Directory
As a final step, inspect the project directory and eliminate any intermediary files you may have created during the base map creation process.

11.5 Return Research Materials
Return all checked out original research materials to their places. This is an important step to keeping good working relations with those groups we depend on for information. If the item is not from the SPU records vault, make a copy before returning it.
Section 12
CUTTING PROFILES

Section 12 Objectives

After you complete this section, you should understand:

- Cutting profiles is a non-routine request
- SPU presentation standards apply to profiles
- Layers and line types for profiles are the same as those for base maps
- How to prepare profiles

12.1 Profile Request

A profile is an elevation view of a designated alignment contained within a base map. Profiles are created only when a designer or engineer requests one to aid with their design process. Profiles provide elevations of the existing grade and utilities near a proposed alignment. The role of the Base Map group in profile creation is to help the designer reflect existing conditions in a profile view. See Appendix 2, Figure 14A.

Before the designer can request a profile, they must know the location of their proposed alignment. The completed base map can influence that decision because the base map may reveal potential utility conflicts with the proposed design.

12.2 Presentation Standard

Some may say there is no presentation standard for profiles because we have yet to develop SPU CAD/Civil Software customization for this process. Nevertheless, there is an SPU Presentation Standard for profiles. It is modeled after the presentation style used in manual profile drawings of the past and is directly related to the current SPU Presentation Standard for base maps.
12.3 Layers and Line Types
The layers and line types used to represent the existing utilities in profiles are the same as those used for base maps.

12.4 Symbols
There are no symbols available as blocks for profiles. However, there should be because certain items are used over and over again. In the interim, create your own blocks or reuse features from other profiles. Draw all structures to their outside, rather than inside, dimensions. Remember to draw each item to reflect the differential scale of the profile standard.

The following is a list of typical symbols needed in a profile. See Appendix 2, Figure 14B.

A) PIPE CROSSINGS
Pipe crossings are represented as ellipses. See Section 12.16.

B) MAINTENANCE HOLES
See the City of Seattle Standard Plans to determine the correct dimensions of MH structures.

i) Concentric
If a structure is concentric, then a cone shape is drawn to reflect the chimney.

ii) Non-concentric
If a structure is non-concentric, then the access chimney will need to be drawn in its correct location.

iii) Outside Bottom Elevations of MH Structures
Every MH structure’s depth is determined by the invert elevations of the pipes that it contains. Therefore, this is not a dimension that can be found in City of Seattle Standard Plans. Given this limitation, the bottom outside elevation of MH structures is not shown exactly in profiles, but instead estimated. The usual procedure is to show the bottom elevation of the MH structure a minimum of 8 inches below the lowest invert elevation given.
C) VAULTS
Vaults are usually rectangular shaped structures. Some vaults have access chimneys like MHs.

A great deal of information about vaults is available in the franchise utility books. The books offer information such as headroom (distance from floor to ceiling) and inside dimensions of the vault along with the wall thickness. The depth of the chimney, from lid of the vault to the ceiling is sometimes also given.

D) HAND HOLES, CATCH BASINS, AND POWER POLE FOUNDATIONS
For dimensions see the City of Seattle Standard Plans.

E) RAILROAD TRACKS
Draw each track as a section of an I-beam or borrow the railroad tracks drawn in another profile.

12.5 Using Existing Elevation Data to Create a Profile View
Special attention must be paid to the source and type of elevation data being used to create the profile view of existing conditions. This information comes from 2 primary sources: survey data and historical engineering documents.

Depth information is given 2 ways. One is given as a relative depth from a known elevation. The other is an actual elevation.

A) RELATIVE DEPTHS
Relative depths are given in relation to a known feature, mostly the depth under the existing grade. Existing utility research records provide most of the relative depth information. The most common form of relative depth information comes from notes found on as-built research records that have encountered existing utilities during construction.

Relative depth information can also be given as the distance below or above another existing utility or feature.
i) **Below**

Most relative depth information is given as a distance below a known feature.

**EXAMPLE: RELATIVE DEPTH**
A telephone franchise utility book states that the telephone conduit is buried 4.5 deep below the existing grade.

ii) **Above**

Occasionally relative depth information can be given as the distance above a known feature.

**EXAMPLE: USING EXISTING ELEVATION DATA**
A water main as-built plan shows that a service drain was encountered 1.5' above the proposed water main.

---

B) **ACTUAL ELEVATIONS**

An actual elevation is an elevation given in reference to a known datum. Actual elevations come from survey data and as-built research records.

**BEWARE: ACTUAL ELEVATION**
If depth information is given in the form of an actual elevation from research records, it is highly likely that it will not be in the same datum as our survey data. A datum conversion will be necessary to place the crossing utility at the correct elevation on the profile.

---

### 12.6 When is Datum Conversion Necessary?

Due to technological advances in satellite technology, SPU’s survey group has made a progressive switch from City of Seattle Datum to NAVD88 Datum (North American Vertical Datum) as recently as 2001. Therefore, when using actual elevations from historical as-built records to create profiles it becomes necessary to perform a datum conversion to NAVD88.

### 12.7 Datum Conversion Factors

There are over 100 years of historical as-built research records in SPU’s Records Vault and most of those exist in other datum besides NAVD88. In fact, very few as-built plan records will be in NAVD88 because the switch to that datum was so recent. Of course, that will change as time passes and more CIP are completed.
A) CONVERSION FROM CITY OF SEATTLE DATUM TO NAVD88

No generic number is used to convert City of Seattle Datum to NAVD88. This is due to the precise information provided by satellite technology. City datum and NAVD88 vary by several inches. Thus they are localized conversion factors for various areas within the city.

SPU’s survey group will provide a localized conversion factor along with their survey data. This factor is found in the Datum Block included with each base map. If no localized conversion factor is provided in the Datum Block, then contact SPU’s survey manager. Do not use the ‘generic’ conversion factor provided in the City of Seattle Standard Plans for datum conversion from City of Seattle Datum to NAVD88 unless no other information is available. However, an average difference is from 9.6’ to 9.7’.

B) CONVERSION FROM KING COUNTY AND METRO DATUM TO NAVD88.

Presently, most as-built research records in SPU’s Records Vault are in City of Seattle Datum. However, there is the occasional research record encountered that is in King County or Metro Datum.

If one of those records is to be used to create the profile, then it is necessary to convert their datum to City of Seattle Datum before proceeding. This can be done by referring to the conversion table found in the City of Seattle Standard Plans, Plan No. 001.

Once the King County or Metro Datum has been converted to City of Seattle Datum then follow the step described above and converts from City of Seattle Datum to NAVD88.

12.8 Using Invert Elevation Data

Invert elevations are measurements given at the bottom inside lip of a pipe as it enters or exits a MH or other structure. It is the most common method for expressing the elevation of sewer and drainage mainlines. Invert elevation data can come from either survey data or as-built plans. Always choose current survey data over plan information. Invert elevations are usually given as actual elevations by either survey or the plan that built it. However, occasionally they are given as relative depths from the current survey, and are called ‘measure downs’, the distance from the MH rim to the invert elevation.
A) INVERT ELEVATIONS FROM SURVEY DATA
When survey crews gather invert elevation data, they start out with a relative depth. A measurement is taken from the MH lid on the surface down to the bottom inside of the pipe, better known as a “measure down.”

The measure downs are then converted to actual elevations. The only time invert elevations are given to the Base Map group as relative depths is when the Survey group has not reduced their data to actual elevations.

B) INVERT ELEVATIONS FROM AS-BUILT RECORDS
As-built records give invert elevations as actual elevations.

12.9 Portraying Invert Elevation Data in Profiles
An invert elevation is a measurement taken from the bottom inside wall of a pipe. It is necessary to determine where that point is in relationship to the existing utilities as they are drawn. The urge may be to place the bottom of existing utility on that point. That is not correct. To accomplish correct placement of existing utilities at invert elevations, see Appendix 2, Figure 14C.

12.10 Where to Look for all Types of Elevation Data
The following section describes where to find elevation data:

A) SURVEY POINTS DESCRIBED AS “IE”

B) “Z” LAYERS ON BASE MAPS
The most expedient method of obtaining depth information is by accessing the “Z” layers of the base map where depth information has been recorded. When the Z layer(s) are thawed, the depth information can be found in proximity of the object in question.
ZREF is a layer that contains reference information from research records. That information typically includes a plan or utility book number along with depth or elevations data.

**C) STANDARD DEPTHS**

If both the survey and research records do not yield the depth information needed, then draw the crossing utility at its standard depth. See *Standard Plan No 030*.

**12.11 Parts of an Existing Profile**

Existing profile drawings consist of several parts. See *Appendix 2, Figures 14D,G*.

**A) EXISTING GRADE**

Every profile will show the existing grade. This is the elevation of the ground above the proposed alignment.

**B) EXISTING UTILITIES**

Existing utilities are shown as *crossing* or *parallel* to the proposed alignment. Even though these existing utilities may not be exact perpendicular *crossings* or exactly *parallel* to the proposed alignment, they are still portrayed either one way or the other. The 2 methods may also be combined to show a utility running parallel and then turning to cross the proposed alignment.

In addition, the elevation of each existing utility is shown.

**C) CALLOUTS**

There are several types of callouts that label the existing features in a profile:

1) *Parallel Utilities*

The parallel utilities are labeled similarly to those on a base map.

2) *Utility Crossings*

The utility crossings are labeled on a vertically drawn line with the lower end located just above existing grade at the point the utility crosses the
proposed alignment. The text is always on the left side of the line and is facing left.

**iii) Existing Invert Elevations**

The existing invert elevations of any pipes in the profile area are called out. The callout looks similar to the utility crossing callout, but extends down from the existing maintenance hole structure, not up from the existing grade.

Most invert elevations are given by survey. For those that are not, the invert elevation is given per plan and should be labeled “PER PLAN.”

**iv) Monument and center lines along with the street name**

**v) Street Margins (ROW Lines)**

**vi) Disclaimers**

Just as in a base map, a profile can also contain disclaimers in its callouts. In fact, the disclaimers in callouts on the base map for the existing utilities should be copied onto the profile.

There is a disclaimer label that is unique to profiles and may be added to a callout along with other standard base map disclaimers. This unique disclaimer is “DEPTH?.” It means that all the research resources to determine the depth of the existing utility have been exhausted.

**D) DIFFERENTIAL SCALE**

The SPU Presentation Standard for a profile scale is normally 20’ per inch horizontal and 10’ per inch vertical. In rare instances, scale may change, but the horizontal scale will remain 2 times smaller than vertical scale Appendix 2, Figure 14I.

**E) GRID**

Each profile will have a grid to mark the horizontal and vertical distances.

**F) ELEVATIONS**

The horizontal lines of the grid indicate the elevation at that mark.
G) CONTROL
The vertical lines will mark the stationing along the proposed alignment.

H) TITLE
The profile has a title that indicates the following information:
- Location
- Orientation
- Scale.

See Appendix 2, Figure 14I.

12.12 Design Needs: What Can Vary?
Just as with base maps, the content of profiles may vary slightly depending on the needs of the project.

A) SPU DIVISION DESIGN EMPHASIS
SPU’s Water Division will want water structures emphasized, while the Drainage, Wastewater and Solid Waste Division will expect the emphasis to be on their various existing sewer and drainage structures.

B) SCALE
Just as with base maps, the scale of profiles may vary on occasion.

C) CONTROL
Most commonly, sewer and drainage design will base their control on the street stationing, while water design will use pipeline stationing.

D) SIDE CONNECTIONS
Drainage/Wastewater and Solid Waste Design use a slightly different depiction of side connections than does Water Design.
i) **For Sewer & Drainage Design**

Sewer and drainage design chooses to depict side connections shown at their interpolated depth on the profile. The following disclaimer note should be attached to the profile: "Side connection crossings are calculated and are shown at their approximate depth."

ii) **For Water Design**

Water Design chooses to depict side connections at the depth of the connection near the property line. The following disclaimer note should be attached to the profile: "Side connection crossings are depicted at their depth at the property line and are approximate."

12.13 **Label Known Locations**

Project all street center and ROW lines that cross the proposed alignment into the profile, and then label each. See Appendix 2, Figures 14 E.

12.14 **Generate the Profile Grid and Existing Grade**

*** The process for generating the grid and existing grade is a complex process that is accomplished through use of SPU’s civil engineering software. There is no formal process at this time.

12.15 **Locate Utility Crossings by Projection**

Use the following steps to project utility locations that cross a proposed alignment:

A) **LABEL THE CROSSINGS**

B) **REDISTRIBUTE THE LABELS**

Occasionally, there is a cluster of utilities crossings so close together that it makes labeling difficult. The labels may redistribute into a fan shape to accommodate the situation. See Appendix 2, Figures 14 E,F.
12.16 Draw Ellipses to Represent Utility Crossings
Most pipes are round, but utility crossings are drawn as elliptical rather than round shapes to reflect the differential scale of the profile.

**EXAMPLE: ELLIPSES**
In a 20 horizontal and 10 vertical scale profile, a pipe with 12 inches outside diameter is drawn as an ellipse that is 12-inches wide and 24 inches long.

12.17 Utilities Crossing Under 6-Inch Diameter
Utilities crossings under 6” in diameter may not show up clearly if drawn to their exact scale. Therefore, draw all the utility crossings under 6” as ellipses that are 6” wide and 12” high.

12.18 Utilities Crossings 6-Inch Diameter or Greater
Draw utilities crossings 6” in diameter or greater as ellipses and to their correct outside diameter.

**EXAMPLE: ELLIPSES FOR 6-INCH OR GREATER DIAMETER**
A 12-inch sewer pipe has an outside diameter of 1.33 feet. Draw the ellipse 1.33 feet wide and 2.66 feet high.

12.19 Review Before Proceeding
The following steps should be complete at this point:
- The crossing utilities have been located on the profile by projection lines from the base map.
- The crossing utilities have been labeled.
- An ellipse has been drawn to represent the crossing utility and has been placed on its projection line.

12.20 Determine Depth or Elevation of Crossing Utility
The next step to creating a profile is to determine the depth of each crossing utility:
- Will depth information come from current survey or as-built plans?
- Is elevation data given as a relative depth?
- Is elevation data given as an actual elevation?
• Is elevation data given as an invert elevation?
• Standard depth may have to be determined in the absence of elevation information.

12.21 Placing Crossing Utility at Correct Elevation

Once the depth or elevation of the crossing utility has been determined, the ellipse must be moved up or down along the vertical projection line to its correct elevation on the profile grid.

There are three primary steps to placing a crossing utility at the correct elevation. This process will vary slightly, depending if the information given is a relative depth or an actual elevation, however the common steps are listed below:

A) ESTABLISH A BASELINE
This is accomplished by establishing a baseline at a known elevation and then offsetting the crossing utility to the desired elevation. The ellipse is then moved to the desired elevation.

B) OFFSET THE BASELINE TWICE THE DISTANCE
Due to the differential scale of the profile, every baseline offset must be moved two times the desired distance. It is very important to remember to perform this step every time a baseline is offset.

C) DETERMINE THE PROXIMITY OF THE ELLIPSE
The proximity of the ellipse to the offset base line must be determined. It will be placed either under, over, or at an invert elevation.

If the ellipse being moved is given as an invert elevation then special care must be taken.

12.22 Placing Crossing Utilities at Invert Elevations

An invert elevation is a measurement taken from the bottom inside wall of a pipe. It is necessary to determine where that point is in relationship to the ellipse as it is drawn. The urge may be to offset the base line to the invert elevation and then place the bottom of the ellipse on that line. That is not correct. To correctly place the ellipse follow these steps: See Appendix 2, Figure 14C.
• Offset the baseline to the invert elevation.
• Determine the wall thickness of the pipe. See Appendix III, Figure 16.
• Offset the invert elevation line downward the distance of the wall thickness of the pipe.
• Move the bottom of the ellipse to the lowest offset line.

12.23 Placing Crossing Utilities at Relative Depths

Establish the baseline by determining what object the relative depth is given from, usually the existing grade. Then draw a horizontal construction line at this elevation and offset it the appropriate distance.

Next decide if the ellipse should be placed above or below the offset base line. In almost every case, move the top of the ellipse to the offset baseline, because most relative depths are given as the depth under an object, not over.

12.24 Placing Crossing Utilities at Actual Elevations

The process for placing crossing utilities at actual elevations is slightly different than for relative depths.

Establish the baseline by assigning it to one of the horizontal grid lines on the profile. Each of the horizontal gridlines is located at a known elevation. Draw a construction line over the grid line if necessary and then offset the baseline the to the desired location.

12.25 Drawing Existing Parallel Utilities

It is very likely existing utilities are parallel or nearly parallel to the proposed alignment as reflected on the base map. Existing parallel utilities that are located within 10’ on either side of the proposed alignment need to be shown in profile view. Often, an existing parallel utility is the subject of the profile view.

EXAMPLE: EXISTING PARALLEL UTILITIES
The proposed alignment is over a sewer main line from MH to MH.
A) BASIC PROCEDURES
The basic procedures for drawing parallel utilities are very similar to those for
drawing crossing utilities. The steps, however, are in a different order:

1. Establish the elevation.
2. Draw the parallel utility.
3. Offset 2 times the distance to reflect a differential scale.
4. Label the parallel utility.

B) PARALLEL UTILITY ELEVATIONS PROCEDURES
The following are steps for establishing the elevation of an existing parallel utility:

1. Establish a baseline to use for offsetting.
2. Determine if datum conversion necessary.
3. Determine if the elevation data is given as a relative depth?
4. Determine if the elevation data is given as an actual elevation?
5. Determine if the elevation data is given as an invert elevation? (See
   Section 12.26)
6. Standard depth may have to be determined in the absence of elevation
   information.

C) DRAW THE EXISTING PARALLEL UTILITIES
Most existing parallel utilities can be shown intermittently or as needed to avoid
clutter in the drawing. If the parallel utility is the subject of the profile, then it
must be shown entirely.

D) LABEL
Label the existing utility as if it were on a base map. If the depth is unknown, then
label “DEPTH?”. 
12.26 Drawing Existing Parallel Utilities with Invert Elevation

Take special care when using invert elevation data to draw existing parallel utilities. The urge may be to draw the bottom of the parallel utility at the same elevation of the invert elevation. This is incorrect. Instead:

1. Draw the parallel utility line from the invert elevation to the next invert elevation or at the correct slope.
2. Determine the wall thickness of the pipe.
3. Offset the line downward the distance of the wall thickness.
4. Offset the lowest line the distance of the outside diameter of the pipe.
5. Erase the first line drawn, which is the inside bottom wall of the pipe.

12.27 Additional Callouts for Existing Utilities

By now, each existing utility has been drawn in profile view and labeled. Some circumstances require additional callout information:

A) INVERT ELEVATIONS AT EXISTING MAINTENANCE HOLES

Existing MHs need to be labeled with their invert elevations. See Appendix 2, Figure 14H.

B) UNABLE TO DETERMINE THE DEPTH.

For those existing utilities where no depth information was available, label “DEPTH?”. 

C) PIPE MATERIAL

Pipe material information, if available, should be added to an existing utility if it is the subject of the profile view.

12.28 Title the Profile View

In most cases, the profile view should be labeled with a title to allow a profile drawing to stand alone. The title should include alignment view and direction from which it is viewed. The scale should also be included. For lettering size and labeling presentation standard, see Appendix 2, Figure 14I.
12.29 Grid Standard

Designers who use profile view determine the final appearance of the grid. However, the automated process that produces the existing grade also produces a grid. Use the automated grid for now. Make certain it contains stationing of the proposed alignment and numbers marking the elevations (usually every 10’).

Tips: Cutting Profiles

Do the following in order:

- Generate the existing grade.
- Mark centerlines and street margins.
- Label existing utility crossings.
- Draw existing utility crossings.
- Draw existing MHs or other structures along the proposed alignment.
- Draw existing parallel utilities.
- Label existing parallel utilities.
- Add extra callouts for invert elevation, pipe materials, and disclaimers.
- Make a title.
Appendix 1
Base Map Checklist

The Base Map Checklist is to be used by base map drafters and those interested in reviewing or building understanding of the base map process. This document is integral to the training function of this Guide. It is presented here as Appendix 1. A copy is also inserted into the inside cover of the Guide. And the checklist is included in Appendix 3, which is a collection of base map production support documents.
Base Map Checklist

Project Name: ____________________________ Job #: ________

This checklist is a tool to help the base map drafter create more accurate maps. It follows the SPU process for base-mapping. Use it in tandem with the Guide to SPU Base Map Production.

Section 1: Fundamentals of Base Mapping  General review for base map drafters, leads and supervisors

Section 2: Starting a Base Map  See
- Meet with supervisor or lead  2.1A
- Review survey/base map request  2.1B
- Review project scope  2.1C
- Do you need to visit the site?  2.1D
- Are there any photos for the area?  2.1E
- Start research folder. Include map of project area.  2.1F
- Check for existing base maps? (Manual or AutoCAD)  2.2A,B
- Plan base map presentation, orientation, and scale  2.3
- Review or create estimate. Determine project deadline.  2.4

Section 3: Conducting & Organizing Research
- Start Planform  3.3
- Research and check-out engineering plans from the SPU Records Vault or plot from Virtual Vault  3.4
- Research & copy Franchise Utility Books  3.5
- Copy side sewer cards  3.6
- Order Gas maps  3.8
Tips on research tasks  Tips

Section 4: Using Topographical Survey  Quality-Checking (QC) the Survey Product:  4.3
- Verify control points  4.3A
- Verify & draw control lines if needed  4.3B
- Verify accuracy of right-of-way lines  4.3C
- Are there street names and North arrows in the drawing?  4.3D
- Check for stationing in the drawing  4.3E
### Section 4: Using Topographical Survey (cont.)

- Make sure the **datum block** is completely filled out  
  - 4.3F
- Verify coordinate system and datum of the drawing  
  - 4.3G
- Verify that the point data in LDT is available  
  - 4.3H
- Verify that all the survey depth information (invert elevations) is in the drawing (sewer & drainage jobs only)  
  - 4.3I
- Was survey/base map request satisfied?  
  - 4.3J

#### Change Control & ROW to SPU Presentation Standard:

- Add correct symbol to control points if missing  
  - 4.4A
- Label control lines with correct text symbol  
  - 4.4A
- Distinguish between ROWs, ordinances & easements by using correct line types  
  - 4.4B
- Change street names to correct text height & place North arrows near main street names.  
  - 4.4C
- Change stationing to SPU presentation standard  
  - 4.4D
- Orient/resize the **datum block**  
  - 4.4E

#### Apply the Survey Product to the AutoCAD Drawing:

- Browse through the survey points (see 4.5A-D to find out how to interpret the survey point database)  
  - 4.8A
- Change Survey’s line work and symbols to SPU presentation standard and add text labels to symbols as needed  
  - 4.8B
- Develop and record field check questions  
  - 4.8C
- Eliminate incomplete line endings  
  - 4.8D
- Label topographic features with text  
  - 4.8F

**Tips on using Survey’s data**  
- Tips

### Section 5: Interpreting Research

#### General Guidelines:

- Before starting  
  - 5.1
- Proceed chronologically  
  - 5.2
- If using existing base maps  
  - 5.3
- Add research references  
  - 5.4
- Do not use existing conditions shown on as-built  
  - 5.5
- Look for key information  
  - 5.6
- **Tips for interpreting research**  
  - Tips

### Section 6: Applying Research

- Vault plans vs. utility books  
  - 6.1
- Helpful hints for vault plans  
  - 6.2
- Helpful hints for older vault plans  
  - 6.3
- Helpful hints for vault plans  
  - 6.4
### Section 6: Applying Research (cont.)

- Grading plans  
- Paving plans  
- Sewer & drainage plans  
- Side sewer cards  
- Water main plans  
- Electrical, signal, lighting, & communications.  
- Bridges and structures  
- Landscaping Plans  

**Final Research Tasks:**

- Using secondary resources as checking tool  
- Resolve questions and conflicts along the way.

### Section 7: Conducting a Field Check

- Prepare for field check  
- Prepare field check print  
- Use correct field location techniques  
- Conduct field check  
- Make field check notes  
- Add field check findings to the base map

### Section 8: Self-Checking the Base Map

- Document unresolved questions  
- Use compilation documents for self check  
- Review the control and right-of-way  
- Review field check notes  
- Review most recent as-built documents  
- Conduct last check for street use utility permits  
- Review base map checklist (this document)  
- Update the Planform w/ most current information  
- Provide check print for checker  
- Provide all records & vault plans for the checker  
- Assemble research file for the checker

### Section 9: Checking a Base Map

- Become familiar with the project  
- Have a complete research file
Section 9: Checking a Base Map
- Use base map checklist (this document)  9.3
- Is the Planform current?  9.4
- QC the survey product  9.5
- Check topography using survey and field check print  9.6
- Perform initial check of the utility system  9.7
- Do in-depth check of the research documents  9.8
- Do you need multiple check prints?  9.10
- Are all check prints labeled?  9.13
- Do a final check (after all corrections are complete)  9.14

Section 10: Correcting Check Prints
- Review check print  10.1
- Highlight completed items  10.4
- Sign and date check print  10.5

Section 11: Archiving Completed Base Map
- Archive base map  11.1
- Archive the research file  11.3
- Clean up project directory  11.4
- Return research materials  11.5

Section 12: Cutting Profiles
- Profile planning  12.1–12
- Label known locations  12.13
- Generate existing grade  12.14
- Align XREF'd base map to the profile for projection  12.15
- Locate utility crossings by projection  12.15
- Draw ellipses to represent utility crossings  12.16
- Review before proceeding  12.19
- Determine the depth or elevation of the crossing utility  12.18–24
- Draw existing parallel utilities  12.25
- Add callouts for existing utilities  12.27
- Title the profile  12.28
# Appendix 2
## Presentation Standards and Examples

### Table of Contents

<table>
<thead>
<tr>
<th>Figure #</th>
<th>Figure Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Pipe Joints</td>
</tr>
<tr>
<td>1B</td>
<td>Pipe Ends</td>
</tr>
<tr>
<td>2A</td>
<td>Orientation of Survey Symbols</td>
</tr>
<tr>
<td>2B</td>
<td>Text Labels for symbols</td>
</tr>
<tr>
<td>2E</td>
<td>Retaining Walls, Rockeries, and Fences</td>
</tr>
<tr>
<td>2F</td>
<td>Schematic Blocks</td>
</tr>
<tr>
<td>2G</td>
<td>Tree symbols and callouts</td>
</tr>
<tr>
<td>2H</td>
<td>Street Sign &amp; Mailbox Symbols</td>
</tr>
<tr>
<td>3A</td>
<td>Control Lines, Right-of-Way, Above Ground Features, &amp; Underground Utilities</td>
</tr>
<tr>
<td>3C</td>
<td>Stationing a PC &amp; PT on a Control Line</td>
</tr>
<tr>
<td>3D</td>
<td>Base Map Orientation (North Arrow Pointing Up)</td>
</tr>
<tr>
<td>3E</td>
<td>Base Map Orientation (North Arrow to the Left)</td>
</tr>
<tr>
<td>3F</td>
<td>Base Map Orientation (Out of the Ordinary)(Best Fit)</td>
</tr>
<tr>
<td>3G</td>
<td>When to Use 10 Scale Presentation</td>
</tr>
<tr>
<td>3H</td>
<td>Fudge Factor</td>
</tr>
<tr>
<td>3I</td>
<td>Castings &amp; Structures</td>
</tr>
<tr>
<td>3K</td>
<td>Stationing on Monuments</td>
</tr>
<tr>
<td>3L</td>
<td>Lines Must Not End in Space</td>
</tr>
<tr>
<td>3M</td>
<td>Curb &amp; Gutter Points</td>
</tr>
<tr>
<td>3N</td>
<td>Abutments, Piers, Footings, &amp; Retaining Walls</td>
</tr>
<tr>
<td>3O</td>
<td>Street End Stubs</td>
</tr>
<tr>
<td>4A</td>
<td>Text sizes</td>
</tr>
<tr>
<td>4B</td>
<td>Text orientation</td>
</tr>
<tr>
<td>5A</td>
<td>Disclaimers</td>
</tr>
<tr>
<td>5B</td>
<td>Conduit &amp; Duct Callouts</td>
</tr>
<tr>
<td>5D</td>
<td>Showing Small &amp; Large Ditches</td>
</tr>
<tr>
<td>5F</td>
<td>Callouts for Abandoned Utilities</td>
</tr>
<tr>
<td>5G</td>
<td>Drawing Culverts from Plans</td>
</tr>
<tr>
<td>5H</td>
<td>Presentation for Callouts</td>
</tr>
<tr>
<td>6A</td>
<td>Walks from Survey and Plans</td>
</tr>
<tr>
<td>6C</td>
<td>Granite Curb &amp; End of Curb Call Outs</td>
</tr>
<tr>
<td>6E</td>
<td>Multiple Paving Improvements Within the Same Street</td>
</tr>
<tr>
<td>6F</td>
<td>Former Street Car Railway Area</td>
</tr>
<tr>
<td>6G</td>
<td>Gutter Callout &amp; Asphalt/Concrete Callout</td>
</tr>
<tr>
<td>Figure #</td>
<td>Figure Name</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>6J</td>
<td>Curb Ramps and Driveways</td>
</tr>
<tr>
<td>6K</td>
<td>Paving Slopes</td>
</tr>
<tr>
<td>6L</td>
<td>Driveways</td>
</tr>
<tr>
<td>6M</td>
<td>Current Curb Edge vs Plan Curb Edge</td>
</tr>
<tr>
<td>7B</td>
<td>Depth Information from Various Research References</td>
</tr>
<tr>
<td>7C</td>
<td>Research Resources References from Various Research Doc's</td>
</tr>
<tr>
<td>7D</td>
<td>&quot;AS EX&quot; Added to a Research Reference Callout</td>
</tr>
<tr>
<td>7E</td>
<td>Catch Basin &amp; Inlet Connections</td>
</tr>
<tr>
<td>8A</td>
<td>Leaders</td>
</tr>
<tr>
<td>9A</td>
<td>Dim String to Centerline</td>
</tr>
<tr>
<td>9B</td>
<td>Dim String to Monument Lines</td>
</tr>
<tr>
<td>9C</td>
<td>Dim Strings on a Paving Subbase</td>
</tr>
<tr>
<td>9D</td>
<td>Dim Strings for Gutters</td>
</tr>
<tr>
<td>9E</td>
<td>Dim Strings with Double Arrows</td>
</tr>
<tr>
<td>9F</td>
<td></td>
</tr>
<tr>
<td>10A</td>
<td>Field Check Notes</td>
</tr>
<tr>
<td>10C</td>
<td>Locate an Object by Triangulation</td>
</tr>
<tr>
<td>10D</td>
<td>Locate an Object Using a Stationing Line Relative to a Surveyed Point</td>
</tr>
<tr>
<td>10E</td>
<td>Locate an Object Visually</td>
</tr>
<tr>
<td>10F</td>
<td>Shading Paved Surfaces</td>
</tr>
<tr>
<td>10G</td>
<td>Taking Photos in the Field</td>
</tr>
<tr>
<td>11C</td>
<td>Sewer Located Off the Center Line</td>
</tr>
<tr>
<td>11D</td>
<td>MH Type &amp; Standard Plan # Are the Same</td>
</tr>
<tr>
<td>11E</td>
<td>Offset pipe going into MH</td>
</tr>
<tr>
<td>12A</td>
<td>Survey Points, Control Lines &amp; Points, Right-of-Way Lines, Contours</td>
</tr>
<tr>
<td>12C</td>
<td>Control Line Stationing on a Survey Drawing</td>
</tr>
<tr>
<td>12I</td>
<td>Datum Block from Survey</td>
</tr>
<tr>
<td>14A</td>
<td>Typical Profile</td>
</tr>
<tr>
<td>14B</td>
<td>Typical Profile Symbols</td>
</tr>
<tr>
<td>14C</td>
<td>Layout a Pipe Using Invert Elevations</td>
</tr>
<tr>
<td>14D</td>
<td>Parts of a Profile</td>
</tr>
<tr>
<td>14E</td>
<td>Known Locations &amp; Fanned Out Labels on a Profile</td>
</tr>
<tr>
<td>14G</td>
<td>Parts of a Profile II</td>
</tr>
<tr>
<td>14H</td>
<td>Invert Elevation Callouts on a Profile</td>
</tr>
<tr>
<td>14I</td>
<td>Profile Title</td>
</tr>
</tbody>
</table>
THIS IS A 90° PIPE JOINT FOR A SINGLE LINE PIPE

THIS IS A TEE PIPE JOINT FOR A SINGLE LINE PIPE

PIECE JOINTS ARE USED FOR EVERY ANGLE

THIS IS A 90° PIPE JOINT FOR A DOUBLE LINE PIPE

THIS IS A TEE PIPE JOINT FOR A DOUBLE LINE PIPE

City of Seattle
Seattle Public Utilities

PIPE JOINTS

SCALE: 1" = 20'

FIGURE NO. 1A
SURVEY BRINGS IN SYMBOLS WITH ROTATION OF 0°.

NOTE:
A STREET LIGHT POLE WOULD NEED TO BE ROTATED TO IT'S REAL ORIENTATION.
PEDESTRIAN LIGHT SYMBOL
SCHEMATIC BLOCKS ARE
DRAWN MUCH LARGER
THAN THEIR ACTUAL SIZE.
NORTH ARROW ORIENTATION IS OUT OF THE ORDINARY. THE NORTH ARROW DOES NOT POINT UP OR TO THE LEFT.
FUDGE FACTOR

The edge of this duct run is located directly under the edge of the concrete walk according to the utility book that built it. It has been repositioned slightly for the sake of clarity. Consider carefully before using the "FUDGE FACTOR."

SCALE: 1" = 20'
MH SYMBOL
CONCENTRIC WITH CASTING CENTERED OVER STRUCTURE

CASTING SYMBOL
OFFSET FROM THE CENTER OF THE MH STRUCTURE

OFFSET PIPES GOING INTO LARGE MH STRUCTURE

SCALE: 1" = 20'

City of Seattle
Seattle Public Utilities
CASTINGS & STRUCTURES
FIGURE NO. 3I
STATIONING ON MONUMENTS

SCALE: 1" = 20'

City of Seattle
Seattle Public Utilities

STATIONING ASSIGNED TO MONUMENT

STATIONING ASSIGNED TO MONUMENT

This area under construction in 1997. KCPO - Channel 13
LINES MUST NOT END IN SPACE
NOTE:
PAVING LIMIT LINES, CONTROL LINES, & RIGHT-OF-WAY LINES GO THROUGH THE DIM STRING. THE UNDERGROUND UTILITIES ARE STUBBED OUT AND DO NOT GO THROUGH THE DIM STRING.
NOTICE THAT THE TEXT IS BEING READ FROM LEFT TO RIGHT AND BOTTOM TO TOP.
E. PINE ST.

STACKED CALLOUT
INDICATES THESE UTILITIES ARE IN THE SAME TRENCH

MULTIPLE CONDUIT CALLOUT
THERE ARE FOUR 4" ECD'S INCLUDED IN THIS CALLOUT

DUCT CALLOUT
NW 107TH ST

CULVERT
ONE END LOCATED BY SURVEY
SURVEY INSIDE THE STRUCTURE

CULVERT ENDS
LOCATED BY SURVEY

CULVERT END
NOT LOCATED BY SURVEY

CULVERT PER PLAN
NOT LOCATED BY SURVEY

SCALE: 1" = 20'

City of Seattle
Seattle Public Utilities

DRAWING CULVERTS FROM PLANS
FIGURE NO. 5G
NOTE: THE CALLOUTS ARE ON EACH SIDE OF THE MANHOLE

STACKED CALLOUTS

PIPE MATERIAL WITH CALLOUT

City of Seattle
Seattle Public Utilities

PRESENTATION FOR CALLOUTS

FIGURE NO. 5H
NOTE:
THE FINAL CONC WALK CONFIGURATION WILL BE VERIFIED DURING THE FIELD CHECK.

BACK OF WALK LOCATION FROM AS—BUILT PLAN

SURVEY POINT

END OF CONC WALK LOCATION FROM AS—BUILT PLAN
GRANITE CURB & END OF CURB (EOC) CALLOUT

NOTE THE "EOC" CALLOUT AND TIC SYMBOL MARK THE LOCATION AT THE END OF THE GRANITE CURB
PAVING SUB-BASE LINE
DESIGNATES THE CHANGE
FROM 8" CONC TO 5" CONC
UNDER THE ASPHALT.

NOTE:
MULTIPLE PAVING IMPROVEMENTS
RESULT IN VARIOUS PAVING SURFACES,
SUBSURFACE MATERIALS, AND THICKNESS

SCALE: 1" = 20'

City of Seattle
Seattle Public Utilities

MULTIPLE PAVING IMPROVEMENTS
WITHIN THE SAME STREET

FIGURE NO. 6E
BOYLSTON AVE

GUTTER CALLOUT

ASPHALT & CONCRETE CALLOUT
ONLY CONCRETE GIVES PAVING
THICKNESS. ASPHALT DOES NOT.

SCALE: 1" = 20'

GUTTER CALLOUT & ASPHALT/ CONCRETE CALLOUT

City of Seattle
Seattle Public Utilities

FIGURE NO. 6G
Curb ramps and driveways are drawn from survey points.
DRIVEWAY CALLOUT
USE SURVEY OR FIELD DATA TO VERIFY LIMITS OF DRIVEWAYS
NOTE:
THE CURB EDGE FROM SURVEYED POINTS, BETTER KNOWN AS "GUTTER", IS SLIGHTLY SKewed FROM THE CURB EDGE PER PLAN. DRAW THE CURB EDGE PER PLAN AND PLACE ON A CONSTRUCTION LAYER FOR FUTURE USE.
RESEARCH RESOURCE REFERENCES ARE PROVIDED FOR EVERY RESEARCH DOCUMENT UTILIZED.

UTILITY BOOK REFERENCE

SCALE: 1" = 20'

City of Seattle
Seattle Public Utilities

RESEARCH RESOURCE REFERENCES FROM VARIOUS RESEARCH DOC'S

FIGURE NO. 7C
ADD THE PHRASE "AS EX" TO THE PLAN REFERENCE WHEN THE IMPROVEMENT SHOWN WAS FOUND AS AN EXISTING FEATURE ON A RESEARCH DOCUMENT AND NO AS-BUILT PLAN IS AVAILABLE.

(811-74) (AS EX)

(145-162) (36' D) G(HP) (7)

(5'D)

(5'D)

"AS EX" ADDED TO A RESEARCH REFERENCE CALLOUT

FIGURE NO. 7D
DIM STRING TO CENTERLINE
TO ONLY INCLUDE TOTAL
RIGHT-OF-WAY WIDTH ABOVE
NOTE:
The top paving surface is asphalt from curb to curb. The thickness of the concrete subbase beneath varies.

DIM STRINGS OVER A CONCRETE SUBBASE

SUBBASE LINETYPE

SCALE: 1" = 20

City of Seattle
Seattle Public Utilities

DIM STRINGS ON A PAVING SUBBASE

FIGURE NO. 9C
NOTE: THE GUTTER DIM STRING IS CLOSE TO MAIN DIM STRING. AND JUST ABOVE THE

DIM STRINGS FOR GUTTERS
NOTE: DOUBLE ARROW IS USED TO INDICATE THERE IS MORE RIGHT-OF-WAY BEYOND, BUT IT IS OUT OF THE BASE MAP AREA.

DIM STRING WITH DOUBLE ARROW.
INCLUDE THE TOTAL RIGHT-OF-WAY WIDTH UNDERNEATH THE DIM STRING AT THE MON LINE.
LOCATE AN OBJECT BY TRIANGULATION

This HH was located by triangulation between two known points.
LOCATING AN OBJECT USING SURVEY POINTS
FOR THIS EXAMPLE 0+00 WAS ESTABLISHED
AT THE INTERSECTION OF BACK OF WALK
AND THE EDGE OF DRIVEWAY WHICH IS A
KNOWN SURVEY POINT

THE TREE LOCATED AT
0+40, LT 3’ IS 40’ FROM
0+00 AND 3’ LEFT OF THE
BACK OF THE CONC WALK

City of Seattle
Seattle Public Utilities

LOCATE AN OBJECT USING A STATIONING
LINE RELATIVE TO A SURVEY POINT

FIGURE NO.
10D
INSERT CAMERA SYMBOL
PLACE IT WHERE STANDING WHEN
THE PHOTO WAS SHOT. RIGHT CLICK
ON CAMERA SYMBOL TO ACCESS
BLOCK PROPERTIES AND CREATE
HYPERLINK TO ACTUAL PHOTO.
NOTE:
The plan that built the 12" PSS says it was built directly over the center line.

MH CASTING
FROM SURVEY

12" PSS
SLIGHTLY SKewed
FROM CENTER LINE

11C
MANHOLE NUMBER

MANHOLE TYPE CORRESPONDS TO STANDARD PLAN NUMBER

MH TYPE & STANDARD PLAN # ARE SAME

CITY OF SEATTLE
DEPARTMENT OF ENGINEERING

STANDARD PLAN No. 130

Type 130 Manhole

Notes:
1. Minimum Pipe Diameter = 21".
2. See Std. Spec. Sec. 6.3 for further requirements.
3. When overall depth of Manhole is less than 7' 6" or Type 134 Manhole may be substituted for the Type 130 Manhole.
4. For Manholes constructed of alternate materials see Std. Plan No. 131.

City of Seattle
Seattle Public Utilities
NOTICE THAT THE PIPE ENTERS THE MH AT THE UPPER PORTION OF THE STRUCTURE AND NOT THE CENTER
Basis of Bearing: INTX WABASH AVE.S/RAINIER AVE.S to INTX WABASH AVE.S/CLOVERDALE PL.S

Coordinate Basis:
Monument (1) Held: Mic @ INTX WABASH AVE.S/RAINIER AVE.S
For Location: Y For Azimuth: Y
Monument (2) Held: INTX WABASH AVE.S/CLOVERDALE PL.S
For Location: N For Azimuth: Y
Monument (3) Held: NA
For Location: N For Azimuth: N

Bench (1) Fieldbook/Page: FBK 2438–RR/PG.3 (ELEV=27.20) (Pt.#5)—Basis of ELEV.
Bench (2) Fieldbook/Page: FBK 2439–II/PG.61 (ELEV=32.26), FBK 2466–YY/PG.71 (ELEV=32.19), MSD.ELEV=32.46 (Pt.#7)
City Datum/NAVD88 Difference: Brass Cap#2523 NAVD88 ELEV=42.57–33.18 (City of Seattle Datum MSD.ELEV)=-9.39 (Pt.#8)

Project Number: C301425
Alt. Project Number:


Reference Documents: Vault Maps #82–82,#88–19

Street Stationing: 0+00 @ WABASH AVE.S/RAINIER AVE.S (see comments)
Street Stationing FBK/Plan: FBK 2438 PG.15

Date: 6–05–2001 Initials: EAN

Georegistration Notes: TILE#183(NW35–24–4),TILE#179(NE34–24–4)

Comments: Stationing increases along centerline of Wabash Ave.S. to SE

City of Seattle
Seattle Public Utilities

Datum Block
From Survey

Figure No.
121

Scale: 1"=NA
NOTE:
DRAW A CONSTRUCTION LINE AT THE INVERT ELEVATION. OFFSET THE PIPE WALL THICKNESS DOWN THEN OFFSET THE OUTSIDE PIPE DIAMETER UP.
WHEN CALLOUTS ARE TOO CLOSE TOGETHER, USE THE FANNED OUT METHOD

KNOWN LOCATIONS
INVERT ELEVATION CALLOUTS ON A PROFILE
WESTLAKE AVE N
VIEWING EASTERLY
FROM APPROX VACATED PROSPECT ST TO VACATED WARD ST
AND FROM THE MH 180’ N OF MH 035–127 TO MH 035–129
SCALE: H 1” = 20’  V 1” = 10’

Scale: 1” = 20
Appendix 3

Base Map Group Documents and Forms

The Base Map Group uses several document and forms for map production. Appendix 3 is a collection of these forms.

Table of Contents

<table>
<thead>
<tr>
<th>Figure #</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASE GROUP FORMS</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Base Map Checklist (also presented as Appendix 1)</td>
</tr>
<tr>
<td>2</td>
<td>Estimate Form</td>
</tr>
<tr>
<td></td>
<td>Instructions: Estimate.doc</td>
</tr>
<tr>
<td></td>
<td>Example: Estimate.xls</td>
</tr>
<tr>
<td></td>
<td>Template: Estimate.xls</td>
</tr>
<tr>
<td>2a</td>
<td>Example: Breakdown.xls</td>
</tr>
<tr>
<td></td>
<td>Template: Breakdown.xls</td>
</tr>
<tr>
<td>3</td>
<td>Planform</td>
</tr>
<tr>
<td></td>
<td>Instructions: Planform.doc</td>
</tr>
<tr>
<td></td>
<td>Template Planform.xls</td>
</tr>
<tr>
<td>4</td>
<td>Etag (See Section 5.14 of Guide)</td>
</tr>
<tr>
<td></td>
<td>Instructions: ETAG.doc</td>
</tr>
<tr>
<td>5</td>
<td>Archiving Base Maps</td>
</tr>
<tr>
<td></td>
<td>Instructions: Archiving Base Maps</td>
</tr>
<tr>
<td><strong>OTHER SUPPORTING DOCUMENTS</strong></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>No Figure 7</td>
</tr>
<tr>
<td>8</td>
<td>Utility Books and Map</td>
</tr>
<tr>
<td></td>
<td>Instructions: Utility Book Numbering.doc</td>
</tr>
<tr>
<td>9</td>
<td>No Figure 9</td>
</tr>
<tr>
<td>10</td>
<td>Read a Side Sewer Card (See Section 6.8 of Guide)</td>
</tr>
<tr>
<td></td>
<td>Instructions: Read a Side Sewer Card.doc</td>
</tr>
<tr>
<td>11</td>
<td>Electronic Survey/Base Map Request Form</td>
</tr>
<tr>
<td>11a</td>
<td>Link</td>
</tr>
<tr>
<td>12</td>
<td>No Figure 12</td>
</tr>
<tr>
<td>Figure #</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>13</td>
<td>Survey Point List</td>
</tr>
<tr>
<td></td>
<td>Instructions: Survey Point List.doc</td>
</tr>
<tr>
<td>14</td>
<td>No Figure 14</td>
</tr>
<tr>
<td>15</td>
<td>No Figure 15</td>
</tr>
<tr>
<td>16</td>
<td>Pipe Chart (in SPU Help) (See Section 5.6 of Guide)</td>
</tr>
<tr>
<td></td>
<td>Link: Pipe Size Chart.doc</td>
</tr>
<tr>
<td>17</td>
<td>Gas Map Request Form</td>
</tr>
<tr>
<td></td>
<td>PSE Gas Map Request Form.xlsx</td>
</tr>
<tr>
<td>18</td>
<td>Engineering Records Index: Historic Water Records</td>
</tr>
<tr>
<td></td>
<td>Instruction: Engineering Records Index.doc</td>
</tr>
</tbody>
</table>
Appendix 3

Figure 2 and 2A

Instructions - Base Map Estimate Form

This section on Figure 2 and 2A contains two forms used in the base map estimating process. A filled out example and the template version of each of forms is provided. Both of these estimating forms are located in our common directory at “P:\TR\Atr\BASEMAP\estimating”.

The first form is used to estimate the time it takes to create a base map and is named “BM_Estimate.xls”.

The second form takes the estimated time from “BM_Estimate.xls” and then creates a breakdown into base map tasks and their related increments of time and percentages of completion during the base map project. When this form is used it makes the task of reporting work progress on a base map project very easy. This form is named “BM_estimate_breakdown.xls”.

Baseline Estimate

Job Title: S. Hill St.
Job Number: C102589
Date: June 30, 2003
Estimator: Dean Huber
Designer: Paul Kimani
Quarter Section(s): NE 8-24-4
Water book page number: 
Description of project limits: S. Hill St. from 13th Ave. S to 15th Ave.S and 14th Ave S. from S. Hill to S. Plum

The following table is a tool for estimating the hours to create basemaps and profiles.

<table>
<thead>
<tr>
<th>complexity</th>
<th>40 or less</th>
<th>60</th>
<th>75</th>
<th>100</th>
<th>more</th>
<th>profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-street</td>
<td>0.04</td>
<td>0.05</td>
<td>0.08</td>
<td>0.11</td>
<td>0.13</td>
<td>0.004</td>
</tr>
<tr>
<td>residential</td>
<td>0.06</td>
<td>0.09</td>
<td>0.11</td>
<td>0.13</td>
<td>0.16</td>
<td>0.007</td>
</tr>
<tr>
<td>arterial</td>
<td>0.10</td>
<td>0.12</td>
<td>0.15</td>
<td>0.17</td>
<td>0.20</td>
<td>0.015</td>
</tr>
<tr>
<td>downtown</td>
<td>0.14</td>
<td>0.16</td>
<td>0.19</td>
<td>0.22</td>
<td>0.24</td>
<td>0.020</td>
</tr>
</tbody>
</table>

Base Map Estimate:
Assumptions:
1. The base map will extend from R/W to R/W and will include all surface and underground features.
2. The base map will be created from current survey information. The survey hours are not included in this estimate.
(enter street length in feet and complexity factor from chart above)

<table>
<thead>
<tr>
<th>Street</th>
<th>length (feet)</th>
<th>complexity factor</th>
<th>hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Hill St. from 13th Ave. S to 15th Ave.S</td>
<td>740</td>
<td>0.09</td>
<td>66.6</td>
</tr>
<tr>
<td>14th Ave S. from S. Hill to S. Plum</td>
<td>463</td>
<td>0.09</td>
<td>41.67</td>
</tr>
<tr>
<td>13th Ave S at S Hill St intersection</td>
<td>160</td>
<td>0.09</td>
<td>14.4</td>
</tr>
<tr>
<td>15th Ave S at S Hill St intersection</td>
<td>160</td>
<td>0.09</td>
<td>14.4</td>
</tr>
<tr>
<td>S Plum St at 14th Ave S intersection</td>
<td>110</td>
<td>0.09</td>
<td>9.9</td>
</tr>
</tbody>
</table>

Total Time: 146.97 Workdays: 18

Profile Estimate: (enter street length in feet and complexity factor from chart above)

<table>
<thead>
<tr>
<th>Street</th>
<th>length (feet)</th>
<th>complexity factor</th>
<th>hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Hill St. 13th Ave. S to 15th Ave.S</td>
<td>740</td>
<td>0.007</td>
<td>5.18</td>
</tr>
<tr>
<td>14th Ave S. From S. King to S. Plum</td>
<td>463</td>
<td>0.007</td>
<td>3.241</td>
</tr>
</tbody>
</table>

Total Time: 8.421 Workdays: 1 and Total Time: 155.391 Total Workdays: 19
## Basemap Labor Breakdown

<table>
<thead>
<tr>
<th>Activity</th>
<th>% of total</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research</td>
<td>11.0%</td>
<td>17</td>
</tr>
<tr>
<td>Drafting</td>
<td>60.0%</td>
<td>93</td>
</tr>
<tr>
<td>Supervision &amp; Coordination</td>
<td>15.0%</td>
<td>23</td>
</tr>
<tr>
<td>Checking and Quality Control</td>
<td>14.0%</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>155</strong></td>
</tr>
</tbody>
</table>
The following table is a tool for estimating the hours to create basemaps and profiles.

<table>
<thead>
<tr>
<th>Hours Per Lineal Foot</th>
<th>Right of Way Width (interpolate for intermediate widths)</th>
</tr>
</thead>
<tbody>
<tr>
<td>complexity</td>
<td>40 or less</td>
</tr>
<tr>
<td>non-street</td>
<td>0.04</td>
</tr>
<tr>
<td>residential</td>
<td>0.06</td>
</tr>
<tr>
<td>arterial</td>
<td>0.10</td>
</tr>
<tr>
<td>downtown</td>
<td>0.14</td>
</tr>
</tbody>
</table>

**Base Map Estimate:**

Assumptions:
1. The base map will extend from R/W to R/W and will include all surface and underground features.
2. The base map will be created from current survey information. The survey hours are not included in this estimate.

(enter street length in feet and complexity factor from chart above)

<table>
<thead>
<tr>
<th>Street</th>
<th>length (feet)</th>
<th>complexity factor</th>
<th>hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Total Time: 0 Workdays: 0

**Profile Estimate:** (enter street length in feet and complexity factor from chart above)

<table>
<thead>
<tr>
<th>Street</th>
<th>length (feet)</th>
<th>complexity factor</th>
<th>hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Total Time: 0 Workdays: 0

Grand Total Time: 0 Total Workdays: 0
<table>
<thead>
<tr>
<th>Basemap Labor Breakdown</th>
<th>% of total</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research</td>
<td>11.0%</td>
<td>0</td>
</tr>
<tr>
<td>Drafting</td>
<td>60.0%</td>
<td>0</td>
</tr>
<tr>
<td>Supervision &amp; Coordination</td>
<td>15.0%</td>
<td>0</td>
</tr>
<tr>
<td>Checking and Quality Control</td>
<td>14.0%</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>
## Estimated Basemap Hours Breakdown

### Project Start Up

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Estimate</td>
<td>1.0%</td>
<td>3.3</td>
<td>0.9%</td>
<td>3.0</td>
</tr>
<tr>
<td>Project Familiarization</td>
<td>4.0%</td>
<td>13.2</td>
<td>3.6%</td>
<td>12.0</td>
</tr>
<tr>
<td>Create planform</td>
<td>0.5%</td>
<td>1.6</td>
<td>0.3%</td>
<td>1.0</td>
</tr>
<tr>
<td>Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vault</td>
<td>2.0%</td>
<td>6.6</td>
<td>1.5%</td>
<td>5.0</td>
</tr>
<tr>
<td>Street Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Sewers</td>
<td>0.5%</td>
<td>1.6</td>
<td>0.5%</td>
<td>1.5</td>
</tr>
<tr>
<td>Franchise Utilities</td>
<td>1.0%</td>
<td>3.3</td>
<td>0.9%</td>
<td>3.0</td>
</tr>
<tr>
<td>Pull Plans</td>
<td>0.5%</td>
<td>1.6</td>
<td>0.6%</td>
<td>2.0</td>
</tr>
<tr>
<td>Fill-in planform</td>
<td>1.0%</td>
<td>3.3</td>
<td>0.6%</td>
<td>2.0</td>
</tr>
<tr>
<td>Final Estimate</td>
<td>0.5%</td>
<td>1.6</td>
<td>0.5%</td>
<td>1.5</td>
</tr>
<tr>
<td>Supervision &amp; Coordination</td>
<td>8.0%</td>
<td>26.3</td>
<td>7.6%</td>
<td>25</td>
</tr>
</tbody>
</table>

### Basemap production

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check control and R/W</td>
<td>1.0%</td>
<td>3.3</td>
<td>1.0%</td>
<td>3.2</td>
</tr>
<tr>
<td>Check Topo and points</td>
<td>6.0%</td>
<td>19.7</td>
<td>4.6%</td>
<td>15.0</td>
</tr>
<tr>
<td>Draw research</td>
<td>32.0%</td>
<td>105.2</td>
<td>28.0%</td>
<td>92.0</td>
</tr>
</tbody>
</table>

### Field Check (2 people at 3.5% each)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead checking</td>
<td>7.0%</td>
<td>23.0</td>
<td>4.9%</td>
<td>16.0</td>
</tr>
<tr>
<td>Draft field check items</td>
<td>3.0%</td>
<td>9.9</td>
<td>2.7%</td>
<td>9.0</td>
</tr>
<tr>
<td>Supervision &amp; Coordination</td>
<td>3.0%</td>
<td>9.9</td>
<td>2.4%</td>
<td>8.0</td>
</tr>
<tr>
<td>Self-check</td>
<td>7.0%</td>
<td>23.0</td>
<td>5.5%</td>
<td>18.0</td>
</tr>
</tbody>
</table>

### Final drafting

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Final checking</td>
<td>2.0%</td>
<td>6.6</td>
<td>1.8%</td>
<td>6.0</td>
</tr>
<tr>
<td>Final drafting</td>
<td>1.0%</td>
<td>3.3</td>
<td>0.6%</td>
<td>2.0</td>
</tr>
<tr>
<td>Basemap Closeout &amp; Archive</td>
<td>4.0%</td>
<td>13.2</td>
<td>3.0%</td>
<td>10</td>
</tr>
</tbody>
</table>

### Supervision & Coordination

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>vault</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>street use</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>side sewers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>franchise utilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pull plans</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fill-in planform</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>final estimate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>supervision &amp; coordination</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Grand Total

<table>
<thead>
<tr>
<th>Est. %</th>
<th>Est. Hrs</th>
<th>Act. %</th>
<th>Act. Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.0%</td>
<td>36.1724</td>
<td>11.1%</td>
<td>31</td>
</tr>
<tr>
<td>60.0%</td>
<td>197.304</td>
<td>58.7%</td>
<td>163.2</td>
</tr>
<tr>
<td>15.0%</td>
<td>49.326</td>
<td>15.5%</td>
<td>43</td>
</tr>
<tr>
<td>14.0%</td>
<td>46.0376</td>
<td>14.7%</td>
<td>41.0</td>
</tr>
</tbody>
</table>

### Actual vs. Estimated: 84.60%

---

### 20th Ave NE

- **C301317**
- **Jason Graham**

---

### Task List

- Preliminary Estimate
- Project Familiarization
- Create planform
- Research
- Vault
- Side Sewers
- Franchise Utilities
- Pull Plans
- Fill-in planform
- Final Estimate
- Supervision & Coordination
- Check control and R/W
- Check Topo and points
- Draw research
- Lead checking
- Final drafting
- Final check
- Basemap Closeout & Archive
- Supervision & Coordination

---

### Project Locations

- 20th Ave NE
- C301317
- Vault
- Street Use
- Side Sewers
- Franchise Utilities
- Pull Plans
- Final Estimate
- Supervision & Coordination

---

### Franchise Utilities

<table>
<thead>
<tr>
<th>Task</th>
<th>Est. Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull Plans</td>
<td>26.3</td>
</tr>
<tr>
<td>Franchise Utilities</td>
<td>26.3</td>
</tr>
</tbody>
</table>

---

### Fees

- Supervision & Coordination
- vault
- street use
- side sewers
- franchise utilities
- pull plans
- final estimate
- supervision & coordination

---

### Project Familiarization

<table>
<thead>
<tr>
<th>Task</th>
<th>Est. Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>vault</td>
<td></td>
</tr>
<tr>
<td>street use</td>
<td></td>
</tr>
<tr>
<td>side sewers</td>
<td></td>
</tr>
<tr>
<td>franchise utilities</td>
<td></td>
</tr>
<tr>
<td>pull plans</td>
<td></td>
</tr>
<tr>
<td>final estimate</td>
<td></td>
</tr>
<tr>
<td>supervision &amp; coordination</td>
<td></td>
</tr>
</tbody>
</table>

---

### 20th Ave NE

- **C301317**
- **Jason Graham**

---

### Task List

- Preliminary Estimate
- Project Familiarization
- Create planform
- Research
- Vault
- Street Use
- Side Sewers
- Franchise Utilities
- Pull Plans
- Fill-in planform
- Final Estimate
- Supervision & Coordination
- Check control and R/W
- Check Topo and points
- Draw research
- Lead checking
- Final drafting
- Final check
- Basemap Closeout & Archive
- Supervision & Coordination

---

### 20th Ave NE

- **C301317**
- **Jason Graham**

---

### Task List

- Preliminary Estimate
- Project Familiarization
- Create planform
- Research
- Vault
- Side Sewers
- Franchise Utilities
- Pull Plans
- Fill-in planform
- Final Estimate
- Supervision & Coordination
- Check control and R/W
- Check Topo and points
- Draw research
- Lead checking
- Final drafting
- Final check
- Basemap Closeout & Archive
- Supervision & Coordination

---

### 20th Ave NE

- **C301317**
- **Jason Graham**

---

### Task List

- Preliminary Estimate
- Project Familiarization
- Create planform
- Research
- Vault
- Street Use
- Side Sewers
- Franchise Utilities
- Pull Plans
- Fill-in planform
- Final Estimate
- Supervision & Coordination
- Check control and R/W
- Check Topo and points
- Draw research
- Lead checking
- Final drafting
- Final check
- Basemap Closeout & Archive
- Supervision & Coordination
# Estimated Basemap Hours Breakdown

*(fill in areas)*

<table>
<thead>
<tr>
<th>(Project Name)</th>
<th>(Project No.)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(Drafter)</th>
<th>Est. total hrs =</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preliminary Estimate</td>
<td>D25 1.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Familiarization</td>
<td>D25 4.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create planform</td>
<td>D25 0.5%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>D25 2.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vault</td>
<td>D25 0.5%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Street Use</td>
<td>D25 1.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side Sewers</td>
<td>D25 0.5%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Franchise Utilities</td>
<td>D25 1.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pull Plans</td>
<td>D25 0.5%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fill-in planform</td>
<td>D25 1.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Estimate</td>
<td>D25 0.5%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision &amp; Coordination</td>
<td>D28 8.0%</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td>19.0%</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
</tbody>
</table>

| Basemap production | |
|-------------------|--------|----------|--------|-----------|
| Check control and R/W | D26 1.0% | 0.0 | | |
| Check Topo and points | D26 6.0% | 0.0 | | |
| Draw research | D26 32.0% | 0.0 | | |
| **Sub-Total** | 39.0% | 0.0 | 0.0 |

| Field Check (2 people at 3.5% each) | |
|--------------------------------------|--------|----------|--------|-----------|
| Draft field check items | D26 7.0% | 0.0 | | |
| Supervision & Coordination | D26 3.0% | 0.0 | | |
| Self-check | D28 3.0% | 0.0 | | |
| **Lead checking** | D29 12.0% | 0.0 | | |
| **Final drafting** | D26 3.0% | 0.0 | | |
| **Final check** | D29 2.0% | 0.0 | | |
| Basemap Closeout & Archive | D26 1.0% | 0.0 | | |
| Supervision & Coordination | D28 4.0% | 0.0 | | |
| **Grand Total** | 42.0% | 0.0 | 0.0 |

<table>
<thead>
<tr>
<th>Estimated %</th>
<th>Est. Hrs.</th>
<th>Actual %</th>
<th>Actual Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D25 11.0%</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D26 60.0%</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D28 15.0%</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D29 14.0%</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>100.0%</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Actual vs. Estimated:**
Appendix 3

Figure 3

Instructions - Planform

This section covers the form used to log and organize research documents used in the creation of a base map. It is called “PLANFORM.xls” and can be found in our common directory at P:\Tr\ATr\BASEMAP\Research.

“Planform” contains two primary parts. One is the “Base Map Info” portion and the other is the “Research Plans” portion. Each one has its own blank/template and example all contained within the same document. These features can be identified as the booklet tabs located at the bottom of the document.

The “Base Map Info” portion provides general project information. The “Research Plans” portion is where the research documents are logged in.

The following are simplified directions to get started using “Planform”.

1. Open in “Planform” in Excel at the location mentioned above. Refer to the tabs (booklets) marked “example”.

2. Fill out the fields in the excel booklet “Basemap Info”. This information will transfer to the “Research Plans” booklet.

3. Fill out the “Research Plans” booklet. This will be the primary booklet to be worked out of and printed. All plans and utility books will be logged here.

4. The side sewer booklet may be filled out if desired. This is a good idea for larger jobs.

Plans are normally logged in arbitrarily and then sorted chronologically after as the example illustrates.
### Basemap Info Sheet

<table>
<thead>
<tr>
<th>Job Name</th>
<th>NW 107TH ST DRAINAGE IMPROVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job #</td>
<td>C300329</td>
</tr>
<tr>
<td>Location</td>
<td>PALATINE AVE N, 1ST AVE NW, 2ND AVE NW, 4TH AVE NW, PHINNEY AVE N</td>
</tr>
<tr>
<td>Drafter(s)</td>
<td>DEAN HUBER</td>
</tr>
<tr>
<td>1/4 Section(s)</td>
<td>SE 25-26-3 TILE 359, SW 30-26-4 TILE 402</td>
</tr>
<tr>
<td>Existing Base Map(s)</td>
<td>201-7-47</td>
</tr>
<tr>
<td>VPI #</td>
<td>12</td>
</tr>
<tr>
<td>Utility Map #</td>
<td>520</td>
</tr>
<tr>
<td>Survey Field Book(s)</td>
<td>2081-O</td>
</tr>
<tr>
<td>Stationing Field Book(s)</td>
<td>2076 pg 41</td>
</tr>
<tr>
<td>Other source(s)</td>
<td></td>
</tr>
<tr>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>Start date</td>
<td>August 12, 2001</td>
</tr>
<tr>
<td>Completion date</td>
<td>September 22, 2001</td>
</tr>
</tbody>
</table>

### Side Sewer Card List

<table>
<thead>
<tr>
<th>Card #</th>
<th>Used?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2737-9</td>
<td>Y</td>
<td>1ST AVE NW</td>
</tr>
<tr>
<td>2749-7</td>
<td>Y</td>
<td>2ND AVE NW</td>
</tr>
<tr>
<td>2749-8</td>
<td>Y</td>
<td>2ND AVE NW</td>
</tr>
<tr>
<td>2749-9</td>
<td>Y</td>
<td>2ND AVE NW</td>
</tr>
<tr>
<td>2779-7</td>
<td>Y</td>
<td>4TH AVE NW</td>
</tr>
<tr>
<td>4340-9</td>
<td>Y</td>
<td>GREENWOOD AVE N</td>
</tr>
<tr>
<td>4340-10</td>
<td>Y</td>
<td>GREENWOOD AVE N</td>
</tr>
<tr>
<td>5252-7</td>
<td>Y</td>
<td>PALATINE AVE N</td>
</tr>
<tr>
<td>5252-8</td>
<td>Y</td>
<td>PALATINE AVE N</td>
</tr>
<tr>
<td>5252-9</td>
<td>Y</td>
<td>PALATINE AVE N</td>
</tr>
<tr>
<td>1944-22A</td>
<td>N</td>
<td>N 107TH ST</td>
</tr>
<tr>
<td>1944-22B</td>
<td>Y</td>
<td>N 107TH ST</td>
</tr>
<tr>
<td>1944-25A</td>
<td>Y</td>
<td>N 110TH ST</td>
</tr>
<tr>
<td>5289-7</td>
<td>N</td>
<td>PHINNEY AVE N</td>
</tr>
<tr>
<td>5289-8</td>
<td>N</td>
<td>PHINNEY AVE N</td>
</tr>
<tr>
<td>5289-9</td>
<td>N</td>
<td>PHINNEY AVE N</td>
</tr>
<tr>
<td>2779-6</td>
<td>Y</td>
<td>4TH AVE NW</td>
</tr>
<tr>
<td>Plan/Book/page/Permit #</td>
<td>Year As-built or Inspected</td>
<td>Area</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>777-402</td>
<td>1939</td>
<td>Greenwood Ave N</td>
</tr>
<tr>
<td>KC53-55A</td>
<td>1939</td>
<td>Greenwood Ave N</td>
</tr>
<tr>
<td>777-404</td>
<td>1947</td>
<td>Alley of Palatine</td>
</tr>
<tr>
<td>806-52</td>
<td>1948</td>
<td>Greenwood Ave N/107th</td>
</tr>
<tr>
<td>806-54</td>
<td>1948</td>
<td>Pinney</td>
</tr>
<tr>
<td>777-103</td>
<td>1949</td>
<td>S of 110th</td>
</tr>
<tr>
<td>777-104</td>
<td>1949</td>
<td>N of 110th</td>
</tr>
<tr>
<td>6C-A</td>
<td>1950</td>
<td>Whole Area</td>
</tr>
<tr>
<td>844-17</td>
<td>1952</td>
<td>3rd Ave NW</td>
</tr>
<tr>
<td>Water 2408</td>
<td>1953</td>
<td>NW 110th/4th Ave NW</td>
</tr>
<tr>
<td>43T-39</td>
<td>1954</td>
<td>Greenwood Ave N/110th</td>
</tr>
<tr>
<td>146-169</td>
<td>1956</td>
<td>Pinney</td>
</tr>
<tr>
<td>154-70</td>
<td>1957</td>
<td>2nd Ave /107th</td>
</tr>
<tr>
<td>811-75</td>
<td>1958</td>
<td>Whole Area</td>
</tr>
<tr>
<td>811-92</td>
<td>1958</td>
<td>Whole Area</td>
</tr>
<tr>
<td>850-92</td>
<td>1959</td>
<td>Greenwood Ave N</td>
</tr>
<tr>
<td>852-81</td>
<td>1961</td>
<td>3rd Ave NW, westside</td>
</tr>
<tr>
<td>856-85</td>
<td>1965</td>
<td>Whole Area</td>
</tr>
<tr>
<td>Plan Book/Page/Permit #</td>
<td>Year As-built or Inspected</td>
<td>Area</td>
</tr>
<tr>
<td>-------------------------</td>
<td>---------------------------</td>
<td>------</td>
</tr>
<tr>
<td>856-93</td>
<td>1965</td>
<td>Whole Area Profiles</td>
</tr>
<tr>
<td>857-11</td>
<td>1966</td>
<td>X Phinney</td>
</tr>
<tr>
<td>856-86</td>
<td>1967</td>
<td>X Whole Area</td>
</tr>
<tr>
<td>856-94</td>
<td>1967</td>
<td>X NW 110th St Profile</td>
</tr>
<tr>
<td>188-122</td>
<td>1967</td>
<td>X 1st Ave NW</td>
</tr>
<tr>
<td>43FF-32</td>
<td>1967</td>
<td>X Greenwood Ave N</td>
</tr>
<tr>
<td>203-75</td>
<td>1967</td>
<td>X NW 110th St/1st Ave NW 2&quot;G</td>
</tr>
<tr>
<td>201-136</td>
<td>1967</td>
<td>X Palatine Ave N</td>
</tr>
<tr>
<td>43NN-20</td>
<td>1969</td>
<td>X Greenwood Ave N/107th Tele Vault</td>
</tr>
<tr>
<td>72AT26-34</td>
<td>1976</td>
<td>X 107th, 1st NW, Phinney</td>
</tr>
<tr>
<td>43AC-157</td>
<td>1977</td>
<td>X N 110th St/Greenwood 2&quot;TCD</td>
</tr>
<tr>
<td>428-14</td>
<td>1978</td>
<td>X 3rd Ave NW Resurfacing</td>
</tr>
<tr>
<td>870-58</td>
<td>1978</td>
<td>X 3rd Ave NW Asph Walk</td>
</tr>
<tr>
<td>72AS-56</td>
<td>1979</td>
<td>X 1st Ave NW/107th 3&quot;ECD</td>
</tr>
<tr>
<td>777-282</td>
<td>1980</td>
<td>X Greenwood Ave N Arterial Street Lighting</td>
</tr>
<tr>
<td>239-140</td>
<td>1980</td>
<td>X 2nd Ave NW/110th 2&quot;G, 1 1/4&quot; in 2&quot;G</td>
</tr>
<tr>
<td>870-145</td>
<td>1985</td>
<td>X Greenwood Ave N Signal Interconnect</td>
</tr>
<tr>
<td>43AM-136</td>
<td>1986</td>
<td>X Greenwood Ave N</td>
</tr>
<tr>
<td>873-51</td>
<td>1987</td>
<td>X Alley east of Palatine 6&quot;Conc, 30&quot;PSD, 6&quot;SD</td>
</tr>
<tr>
<td>777-354</td>
<td>1988</td>
<td>X Greenwood Ave N Asph Overlay</td>
</tr>
<tr>
<td>43AO-65</td>
<td>1988</td>
<td>X Greenwood Ave N/107th 2&quot;TCD</td>
</tr>
<tr>
<td>872-98</td>
<td>1988</td>
<td>X Greenwood Ave N</td>
</tr>
<tr>
<td>874-54</td>
<td>1989</td>
<td>X Alley east of Palatine(107th)</td>
</tr>
<tr>
<td>260-4</td>
<td>1991</td>
<td>X Phinney/110th 2&quot;G</td>
</tr>
<tr>
<td>43AW-20.22</td>
<td>1993</td>
<td>X Greenwood Ave N 18&quot;X12&quot;TD</td>
</tr>
<tr>
<td>271-147.148</td>
<td>1997</td>
<td>X Phinney 2&quot;G</td>
</tr>
<tr>
<td>275-8</td>
<td>1998</td>
<td>X 4th Ave NW/107th 2&quot;G</td>
</tr>
<tr>
<td>91SS-151</td>
<td>1998</td>
<td>X Palatine Ave N/110th Pedestal, 7ECD to pole</td>
</tr>
<tr>
<td>275-53.54.55</td>
<td>1999</td>
<td>X Palatine Ave N/107th 2&quot;G</td>
</tr>
<tr>
<td>883-87</td>
<td>2001</td>
<td>X Greenwood Ave N</td>
</tr>
<tr>
<td>777-568</td>
<td>2002</td>
<td>X NW 110th St</td>
</tr>
<tr>
<td>154-68</td>
<td>2002</td>
<td>X Phinney</td>
</tr>
<tr>
<td>154-18</td>
<td>2002</td>
<td>X NW 110th St 2&quot;G</td>
</tr>
</tbody>
</table>
Appendix 3
Figure 4
Instructions – “Etag”

Etag is a custom routine used to automate the process of adding plan and utility book references to base map callouts. “Etag” is an attributed ACAD block. The plan and utility book references are invisible when plotted for final use.

1. Use this routine by typing “i” for the “insert” command while in LDT or ACAD.
2. Hit the “browse” button next to name.
3. Browse to P:\CaddSupport\Blocks\P-Common\Etag.dwg.
4. Do not redefine the block.
5. Pick the insertion point.
6. Type in the pipe of utility callout.
7. Then type in the plan or utility book reference(s).
Appendix 3  
Figure 5  
Instructions – Archiving Base Maps into the Technical Resources Inventory Database

1. Open database: P:\BasemapArchive\Basemap_Inventory.mdb.  
2. Select “Add or Edit Basemap Records”.  
3. Select “Add CAD Basemap”.  
4. Select tile for location of basemap to be archived.  
5. Accept assigned basemap number.  
6. Enter basemap extents description. Ex: 22nd Ave NE from NE 127th St to NE 125th St.  
7. Enter Topo/Survey field book number(s).  
8. Enter Stationing Control field book number(s).  
9. Enter project number.  
10. Enter alternate project number, if there is one.  
11. Enter revised date. This is the date the basemap was last revised.  
12. Enter “Revised By” person’s initials.  
13. Enter current date.  
14. Enter “Archived By” person’s initials.  
15. Select either “Scanned From Mylar” or “Full Base Map”.  
16. Add any comments that are needed.  
17. Select the georeference button:  

18. GeoReferencing may be done in a number of ways. Please select the method that best fits your basemap. In the case of an alley, which the database will not recognize, use the nearest street. If the basemap covers more than one site, select the “Multiple Site” box and then select the “ADD SITE” button to georeference the additional sites.  
19. Once all basemap sites have been georeferenced, select the “Save” button and then the “Exit” button. This will return you to the Basemap Inventory page.  
20. Select the “Save” button.  
21. If you have additional basemaps to archive, select “Add CAD Basemap” button and repeat above procedure for each basemap to archive.  
22. Once all basemaps are entered, at the Basemap Inventory page, Select the “Exit” button to return to the starting page, select the “Backup Database” button and then select the “Exit” button to exit the database.
Appendix 3  
Figure 6  
Instructions – Interpreting Utility Book & Utility Map Information

Utility Books

37 Series
- ALPHANUMERIC: Books in this series are numbered 37A through approximately 37G.
- Contents: Old Steam, Electrical, and some OLD Telephone and TV

39 Series
- ALPHANUMERIC: Books in this series are numbered 39A through 37E.
- Contents: Old Steam, Electrical, and some OLD Telephone and TV

43 Series
- ALPHANUMERIC: Books in this series are numbered 43A through 43Z, then 43AA through 43ZZ, then 43AB, 43AC, and so on.
- Contents: Telephone & TV

72 Series
- ALPHANUMERIC: Books in this series are numbered 72A through 72Z, then 72AA through 72ZZ, then 72AB through 72AZ, and then 72BA through approximately 72BU and so on.
- Contents: Electrical (City Light)

91 Series
- ALPHANUMERIC: Books in this series are numbered 91A through 91Z, then 91AA through 91ZZ, then 91AB through approximately 91AZ and so on.
- Contents: Work done by Private Contractors. Utilities included are Electrical, Telephone, and TV.
Gas Books

- **Numeric:**
  Books in this series are numbered, starting at book 1 through approximately 281 and so on.

- **Contents:**
  Gas Mains

**100 Scale Utility Map/Color Code:**

- Black: TV & Electrical
- Green: Telephone
- Red: Gas

**10 Scales of Downtown/Color Code:**

- Red: Telephone
- Green: Gas
- Orange: Electrical
- Brown: Sewers & Storm Drains
- Yellow: Steam
- Black: Television
Appendix 3
Figure 7
Instructions – How to Read a Side Sewer Card

Definitions:
Unless otherwise noted, all measurements on side sewer cards are drawn to scale 1” = 50’ and all measurements were taken using engineers tape which measures tenths and hundredths of a foot instead of inches. Example: 6.5 The # 6 is feet and the # 5 are tenths of feet or 9.37 the # 9 is feet and the #37 are hundredths of feet.

1) Indicates this is Lake City Card # 636 (LC-636). Lake City sewer district S/S Cards (Side Sewer Cards) on microfiche is a subset to the rest of the City S/S Cards. Look on your 400-scale map for the boundary.

2) This is the North Directional Marker.

3) Indicates this card provides information for the sewers ON 35th Ave NE. Looking at the street intersection to the north & south, you will note that this card covers the sewer system from NE 120th street to NE 123rd street.

4) This means that the elevations provided used County datum. To convert to the City of Seattle datum add 5.96’ to elevations given.

5) Indicates the pipe in this run is Rubber Gasket Joints only.

6) This dashed line represents the location of the curb line. It may or may not exist in the street.

7) This line is known as the property line.

8) Dyed Conn. means that sewer dye was introduced into this buildings side sewer line to verify the existence of a connection into the city sewer main.

9) The dotted line from 12020 to the main sewer indicates that the side sewer was installed without an inspection and/or it is not known exactly where the side sewer runs. The dotted line is a close guess.

10) The 214 means that the side sewer intersects the property line here at 214 feet. This measurement was obtained by measuring directly over the 16” main sewer from the centerline of D/S M/H north for 214’ then project a line 90° off the main line toward the property line. (see example below)

11) The number 6.5d indicates the side sewer is buried 6.5 feet deep at its intersection with the curb line. Measurement recorded at time of installation.

12) These numbers are invert elevation’ rim elevation (above or below sea level) as measured at the M/H. The smaller # (150) is the M/H invert elevation. The larger # (167.2) is the top of the M/H casting rim elevation. To determine the depth of a M/H from the side sewer card simply subtract the invert elevation from the rim elevation. The difference is the M/H depth. (example: 167.2 - 150 = 17.2 )

13) Identifies this is as a 16” A.C. San. (or 16” diameter Asbestos Cement, Sanitary only Sewer) generally the pipe diameter will be noted above or below a line segment. Pipe type (in this case A.C.) may be shown next, followed by the pipe's function (in this case san) see the glossary of symbols for other designations.

Note: Not all side sewer cards note the pipe type and function.
14) This measurement, underlined twice, is the distance between M/Hs. In this example 345 feet, and is noted next to the U/S M/H. The circle to the left of the # is the symbol for a M/H.

Note: Distances measured along any pipe segment begin at the centerline of the D/S M/H or structure, unless otherwise indicated.

15) This is commonly known as a stub-out from the M/H. It may be of any length but in general it will not be more than 100 feet.

Note: If you find any stub-outs longer than 50 feet, report it to your crew chief. We will probably plan to add a M/H at the end of it.

16) This indicates an unused wye or tee at 311 feet from D/S of M/H. As you can see it does not connect to any building, but is available for future connection.

17) Here is one way to determine the direction of flow in the line notice the angle at which the side sewer connects to the main. In a gravity flow line this angle points to D/S or direction of flow. Another method is to compare invert elevations at U/S & D/S M/Hs, sewage flows toward the lower elevation. Also, flows are directed at larger diameter pipes.

18) This side sewer would be referred to as a community side sewer since it serves more than one building, in this example 12027 & 12023. The term common side sewer is more commonly used.

19) This shows that the side sewer from 12018 is connected to the 16” A.C. SAN. at 200’ measured from the centerline of D/S M/H.

20) Here the 7d indicates that at the time the side sewer was installed, it was buried 7 feet deep at its intersection with the property line.

21) This Maintenance Hole with the letters DMH beside it indicates this is a Drop Maintenance Hole. Drop Maintenance Hole denoting an extreme change in the grade where sewage takes a sudden and extreme drop then leaves the M/H through pipes set at lower elevations. (see examples of inside & outside drops)

22) This is a reference to another 8/8 Card - No. LC 1259. In this example the address 12055 35th Ave NE has its side sewer connected to the main that is located on NE 123rd street. You will need to see that card for side sewer info.

23) This is the address of the building drawn here. Addresses are not always correct since sometime they are changed, however the building location is probably the best way to orient yourself if the address is different. For example you are looking at the fourth house from the street corner and the side sewer shows four houses, you probably have the right building, the address on the side sewer card has probably not been updated.

24) This line indicates the building’s original foundation outline, and may or may not include later additions.

25) This is an engineering scale, to get the most accurate measurement use this one to make measurement on this 8/8 Card. Often reproductions create slight differences in scale so simply cut off the scale on the 8/8 Card and use it to take measurements.
Symbols on a Side Sewer Card

D/S  Down Stream
U/S  Up Stream
D/M/H Drop Maintenance Hole
M/H  Maintenance Hole
STD/P  Stand Pipe (or standing connection)
S/S  Side Sewer
S/D  Storm Drain
C/B  Catch Basin
P/S  Piped Sewer (Combination)
PSS  Piped sanitary Sewer
PSD  Piped Storm Drain
P/L  Property Line
S/P  Soil Pipe - Where cast iron comes through the house.
L/T  Laundry Tray
D.I.P.  Ductile Iron Pipe
FM  Force Main
BBF  below Bottom Floor
ABS  Plastic sewer pipe
CIP  Cast Iron Pipe
AC  Asbestos Cement (Transit)
CWA  Civil Works Administration - A King County Program (1920's-1935) to verify locations of sewers - Do not assume locations of side sewers are valid as methods of locating are unknown.
PE  Polyethylene Pipe (Plastic)
PVC  Polyvinyl Chloride (Plastic)
C/L  Center Line
SSD  Sub-Surface Drain
Side Sewer Card
Outside Drop Connection

STANDARD PLAN NO 233a

NOTES:
1. CONCRETE FOR DROP CONNECTION SUPPORT SHALL BE CL 5 (1/2)
2. DUCTILE IRON PIPE SHALL BE ANSI/AWWA C151/A21.51 CL 50. DUCTILE IRON FITTINGS SHALL BE ANSI/AWWA C111/A21.11
3. BACKFILL AND COMPACT SPACE AROUND DROP CONNECTION WITH SELECTED MATERIAL OR TYPE 17 MINERAL AGGREGATE
4. DROP CONNECTIONS SHALL BE USED WHERE DROP IS NOT MORE THAN 20'-0"
5. ADDITIONAL PIPES MAY BE REQUIRED FOR DROP CONNECTION TO ENTER MANHOLE STRUCTURE (SEE DRAWINGS)

DUCTILE IRON OUTSIDE DROP CONNECTION

REF STD SPEC SEC 7-08
Flush Tank
Lamp Hole

STANDARD PLAN NO 280

NOTE:
USE ONLY FOR SIDE SEWER AND SERVICE DRAINS

CAST IRON FRAME & COVER

PLUG SHALL BE SEALED IN SAME MANNER AS MAIN SEWER JOINTS

REF STD SPEC SEC 7-19

City of Seattle

NOT TO SCALE

8" CLEAN-OUT
Standing Connection

STANDARD PLAN NO 234

NOTES:
1. PIPE AND FITTINGS SHALL BE PVC PER ASTM D 3034 SDR 35.
2. ALL PIPES AND FITTINGS ARE TO BE THE SAME DIAMETER.
3. PVC TEE INSERTS SHALL BE BY "INSERT A TEE" OR EQUAL
   AND SHALL INCLUDE RUBBER SLEEVE, PVC ADAPTER HUB AND
   STAINLESS STEEL BAND. INSERT SHALL BE INSTALLED IN A
   CORE DRILLED HOLE PER MANUFACTURER'S INSTRUCTIONS.
   INSERT SHALL BE FLUSH WITH THE INSIDE WALL OF THE MAIN.
4. LOCATE EDGE OF CORE DRILLED HOLE 1'-0" MINIMUM FROM
   EXISTING PIPE JOINT AND 2'-0" FROM THE EDGE OF ANY
   EXISTING MANHOLE CONNECTIONS.
5. VERTICAL CONNECTION SHALL NOT BE USED UNLESS DEPTH
   FROM SURFACE TO TOP OF PIPE IS 20'-0" OR GREATER.
6. VERTICAL CONNECTIONS ON MAINS OTHER THAN CONCRETE, CLAY
   OR BRICK CONSTRUCTION SHALL BE PER DRAWINGS.
7. CONCRETE HAUNCHING IS TO BE CLASS 5 (11/A) CONCRETE

REF STD SPEC SEC 7-08 & 7-17

City of Seattle

6" OR 8" VERTICAL CONNECTION

NOT TO SCALE
Standard Locations
Parshall Flume
Glossary of Terms
Common to Wastewater Collection System Maintenance

Abandoned (a-BAN-und)
A length, section or portion of a collection system no longer in service and left in place underground. A typical example is where a sewer line is being replaced and removing the old line is too costly, unnecessary and is often capped. Sometimes filled with grout.

Aerobic
A condition in which atmospheric or dissolved oxygen is present in the aquatic (water) environment

Air Blower
A device used to ventilate maintenance structures and lift stations

Air Gap
An open vertical drop or vertical empty space, between a drinking (potable) water supply and the point of use

Air Test
A method of inspecting pipes for leaks. Inflatable or similar plugs are placed in the line and the space between these plugs is pressurized with air. A drop in pressure indicates the line or run being tested has leaks

Anaerobic
A condition in which atmosphere or dissolved molecular oxygen is NOT present in the aquatic (water) environment

Angle of Repose
The angle between a horizontal line and the slope or surface of unsupported material such as gravel, sand or loose soil. Also called the NATURAL SLOPE, this is the condition at which no slough occurs and in general deals with excavations.

Appurtenance (a-PURR-ten-nans)
Machinery, appliances, structures and other parts of the main structure necessary to allow it to operate as intended but not considered part of the main structure.

Arch
The curved top of a sewer pipe or conduit.

Asphyxiation
An extreme condition often resulting in death due to a lack of oxygen and excess carbon dioxide in the blood from any cause

Auger
A sharp tool used to go through and break up or remove various materials that become lodged in sewers. Generally corkscrew in shape

Back fill
(1) Material used to fill a trench or excavation.
(2) The act of filling a trench or excavation usually after a pipe or some type of structure has been in the trench or excavation.
Backwater Gate
A device installed at the end of a drain or outlet pipe to prevent the backward flow of water or wastewater. Generally used on sewer outlets into streams to prevent flow during times of flood or high tide. Also called a TIDE GATE.

Backwater Valve
Also called a BACKFLOW PREVENTER. This device is installed on side sewer lines generally to prevent a surcharge in the main line from rising up into buildings.

Balling
A method of hydraulically cleaning a sewer or storm drain by using the pressure of a water head to create a high cleansing velocity of water around the ball. In normal operation, a cable restrains the ball while water washes past the ball at high velocity. Special sewer cleaning balls have an outside tread that causes them to spin or rotate, resulting in a “scrubbing” action of the flowing water along the pipe wall.

Bar Rack
A screen composed of parallel bars (either vertical or inclined) placed in a sewer or the waterway to catch debris. The screening may be raked from it either by hand or automatically.

Bedding
The prepared base or bottom of a trench or excavation on which a pipe or other underground structure is supported. Refers to the type of granular material placed directly around the pipe.

Bell and spigot Joint
A form of joint used on pipes that have an enlarged diameter or bell at one end. a spigot at the other that fits into and is laid in the bell. The joint is then made tight by lead, cement, rubber O-ring or other jointing compounds or materials.

Blockage
(1) When a collection system becomes plugged and the flow backs up it is said to have a BLOCKAGE.

(2) The place and cause of a blockage, Example: Fifty-one feet from a specific maintenance hole and a grease blockage.

(3) Partial or complete interruption of flow because of some obstruction in a sewer.

By-Pass
A pipe, valve, gate, weir, trench or other device designed to allow all or part of a wastewater flow to be diverted from usual channels of flow. Sometimes refers to a special line to allow conveying flow around a facility or device that needs maintenance or repair. Generally accomplished with aid from pumps but may also be done by gravity and/or head pressure.

Catch Basin
A chamber or well used with storm or combined sewer for removing grit that might otherwise enter and be deposited in sewers. Also, see STORM-WATER INLET and CURB INLET.

Cleanout Two-way
A Cleanout designed for rodding or working a snake into a pipe in either direction. Most often application is in building lateral pipes (side sewers) at or near a property line.

Collapsed pipe
A pipe that has one or more points in its length that have been crushed or partially crushed by exterior pressures or impacts.
**Combined Sewer or system**
A sewer or wastewater collection system intended to receive both sanitary wastewater and storm or surface water runoff.

**Commercial contribution**
Liquid and liquid carried wastes generated by commercial establishments and dumped into the wastewater collection system. Used in this context, commercial contributions are distinct from domestic and industrial sources of wastewater contributions. Examples of high yield commercial sources are laundries, restaurants and hotels.

**Concentric M/H Cone section**
Cone tapers uniformly from barrel to M/H cover.

**Contamination**
Introduction into water of any microorganisms, chemical, wastes or wastewater in a concentration that makes the water unfit for its intended use.

**Confine Space**
A space that:

1. Is large enough and configured that an employee can bodily enter and perform assigned tasks
2. Has limited or restricted means for entry or exit (for example, Tanks, silos. Storage bins, hoppers, vaults and pits are spaces that have limited means of entry.
3. Is not designed for continuous employee occupancy

**Cross Connection**
(1) A connection between a storm drain system and a sanitary collection system.

(2) Less frequently used, a connection between two sections of a collection system to handle anticipated overloads of one system.

(3) A connection through which a supply of potable water could be contaminated or polluted.

**Crown**
Refers to the highest point of the inside diameter of a pipe, laid horizontally.

**Curb Inlet**
A chamber or well built at the curbline of a street to admit gutter flow to the storm water drainage system.

**Dead End Maintenance Hole (D/E M/H)**
The upstream most M/H on a given collection system branch.

**Deflected**
1. Pipe that has been forced out of round by external pressure. Mainly applicable to fiber and plastic pipes where backfill compaction has resulted in unequal pressures to pipe wall.
2. Pipe whose direction has been changed either to the left, right, up or down

**Degradation (de-grah-DAY-shun)**
The conversion of a substance to simpler compounds. For example: the degradation of organic matter to carbon dioxide and water.
**Destroyed Pipe**
Pipe that has been damaged, decomposed, deflected, crushed or collapsed to a point that it must be replaced.

**Detention**
The delay or holding of the flow of water and water carried wastes in a pipe system. This can be due to a restriction in the pipe, a stoppage or a dip. Also the time water is held or stored in a basin or wet well.

**Detritus (de-TRY-tus)**
The heavy coarse material carried by wastewater. Also, called GRIT.

**Downspout**
In plumbing the water conductor from the roof gutters or roof catchment to the storm drain or other means of disposal. Also, called a ROOF LEADER or ROOF DRAIN.

**Downstream (D/S)**
The direction of water flow toward the lower part of a sewer collection system.

**Dragline**
A machine that drags a bucket down the intended line of a trench to dig or excavate the trench. Also used to dig holes and move soil or aggregate.

**Drop Joint**
A sewer pipe joint where one part has dropped out of alignment. Also called a VERTICAL OFFSET or OFFSET JOINT

**Drop Maintenance Hole (DMH)**
Where an inlet pipe to a maintenance hole enters the maintenance hole structure, above the bottom or invert of the M/H and the flow from the pipe is allowed to fall or drop into the M/H. Usually the flow drops through a pipe into the M/H's channel via an inside or outside drop pipe. (See schematics) **Dry Well**
A dry-room or compartment in a lift station near or below the water level where the pumps are located.

**Eccentric Manhole Cone**
Cone tapers non-uniformly from barrel to manhole cover with one side usually vertical

**Effluent (EF-lou-ent)**
Wastewater or other liquid-raw partially or completely treated-flowing from a basin, treatment process or treatment plant.

**Egress**
A term used to describe the 1st pipe on the downstream side (outflow) of a maintenance structure

**Ex-filtration (EX-£ill-TRAY-shun)**
Liquid wastes and liquid carried wastes that unintentionally leak out of a sewer pipe system and into the environment.

**Flow Line**
1. The top of the wetted line, The water surface or the hydraulic grade line of water flowing in an open channel or partially full conduit
**Force Main**
A pipe that conveys wastewater under pressure from the discharge side of a pump to a point of gravity flow.

**Grade**
(1) The elevation of an invert at the bottom of a pipeline, canal, culvert, sewer, or similar conduit.

(2) The inclination or slope of a sewer, conduit, stream channel, or natural ground surface. Usually expressed in terms of the ratio, percentage numbers, units, vertical rise or fall per unit of horizontal distance.

**Gravity Flow**
Water or wastewater flowing from a higher elevation to a lower elevation due to the force of gravity. The water does not flow due to energy provided by a pump. Whenever possible wastewater collection systems are designed to use the force of gravity to convey waste liquids and solids.

**Ground Water**
Subsurface water occupying the saturation zone, from which wells and springs are fed. In a strict sense the term applies only to water below the water table. Also called *pyretic* water and/or *pleuritic* water.

**Ground Water Depth**
The distance of the ground water table below the surface at any selected location.

**Ground Water Elevation**
The elevation of the groundwater table above mean sea level at any selected location.

**Ground Water Table**
The average depth or elevation of the ground water over a selected area.

**Handhole Trap**
A device made of pipefitting used to prevent sewer gases from escaping the branch or lateral sewer and entering into a building sewer.

**Head**
A term used to describe the height or energy of water above a point. A head of water may be measured in either height (feet) or pressure (pounds per square inch PSI).

**Hydro-Brake**
A device placed at the discharge end of a storage structure (egress) to control the release of water or wastewater into the D/S portion of the system.

**Ingress**
A term used to describe the 1st pipe on the upstream side (inflow) of a maintenance structure

**Infiltration**
The seepage of ground water into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joint, connection or manhole walls.

**Invert**
The lowest point of the channel inside a pipe or M/H

**Kite**
A devise for hydraulically cleaning sewer lines. Resembling an airport windsock and constructed of canvas-type material, the kite increases the velocity of a flow at its outlet to wash debris ahead of it. Also called a parachute
**Lamp Hole**
A small vertical pipe or shaft extending from the surface of the ground to a sewer. A light (or lamp) may be lowered down the pipe for the purpose of inspecting the sewer.

**Lamping**
Using reflected sunlight or a powerful light beam to inspect a sewer between two adjacent manholes. The light is directed down the pipe from one manhole. If it can be seen from the next manhole, it indicates that the line is open and straight.

**Lateral Sewer**
Also known as SIDE SEWER. This pipe collects wastewater from individual homes or buildings. Then discharges into a branch or other sewer on its way to the sewage treatment plant.

**Lift station**
Is a wastewater pumping station that lifts the wastewater to a higher elevation when the continuance of the sewer at reasonable slopes would involve excessive depths of a trench. It also raises wastewater from areas too low to drain into available sewers. These stations may be equipped with air-operated ejectors or centrifugal pumps. Sometimes called PUMP STATIONS, the term PUMP STATION is usually reserved for a similar type of facility that is discharging into a long FORCE MAIN. While a lift station has a discharge line or a force main only up to the D/S gravity sewer.

**Longitudinal Crack**
A crack in a pipe or pipe section that runs lengthwise along the pipe.

**Lubriflushing**
Bearings are grease lubricated, the relief plug is removed and a proper amount of lubricant is added to the bearing at the lubrication fitting. Run the pump and expel excess lubricant.

**Main Line**
Branch sewer that collects wastewater from building sewers and service lines.

**Mandrel (MAN-drill)**
(1) A special tool used to push bearings in or to pull sleeves out.

(2) A gauge is used to measure for excessive deflection in a flexible conduit.

**Maintenance Hole (M/H)**
An opening in a sewer provided for permitting workers or equipment to enter or leave a sewer.

**Maintenance Hole casting (or frame)**
A metal ring or frame with a ledge to accommodate the cover or lid and is usually at the surface of the ground or street.

**Outfall**
(1) The point location or structure where wastewater or drainage discharges from a sewer, drain or other conduit.

(2) The conduit leading to the ultimate disposal area.

**Parshall flume**
A specially constructed flume of channel used to measure flows in open channels.
Root, Sewer
Any part of a root system of a plant or tree that enters a collection system.

Root curtain
Refers to roots (of a plant or tree) hanging down from the arch of the pipe similar to a curtain.

Sand Catcher Maintenance Structure
A structure in which the inflow line drops sewage and heavier materials into a sump. The heavier material displaces the lighter sewage, which continues downstream. Occasional removal of the heavier material is required.

Smoke Test
A method of blowing smoke into a closed off section of a sewer system to locate sources of inflow.

Snake
A Stiff Flexible cable that is inserted into sewers to clear stoppages.

Soap Cake or Soap Build Up
A combination of detergents and greases that accumulate in sewer systems and build up over a period of time. Which in turn causes sewer restrictions and/or blockages.

Soil Displacement,
Generally accompanies silt ing of a sewer system. Where infiltration is taking place and silt is carried into a sewer system. Such silt or soil is removed from the ground around the sewer pipe and the result is soil displacement.

Soil Pipe
A type of wastewater or service connection pipe made of a low grade of cast iron usually found at the foundation of a residential or commercial property.

Static Head
When water is not moving the vertical distance (in feet) from a point to the water surface.

Stoppage
(1) When a sewer system becomes plugged and the flow backs up it is said to have a stoppage. See BLOCKAGE.

Storm Collection System
A system of gutters, catch basins, yard drains, culverts and pipes for collecting and transporting storm waters from one point to another. Excluding domestic and industrial wastes.

Storm Runoff
That portion of the total runoff that reaches the point of measurement within a relatively short period of time after the occurrence of precipitation. Also called DIRECT RUNOFF.

Storm Sewer
A sewer that carries storm waters and surfaces street wash and other wash waters or drainage. Excluding domestic wastewater and industrial wastes. Also called a STORM DRAIN.

Storm Water
The excess water running off from the surface of a drainage area during and immediately after a period of rain. It is that portion of the rainfall and resulting surface flow more than that can be absorbed through the infiltration capacity of the surface of the catch basin.
**Storm Water Inlet**
A device that admits surface waters to the storm water drainage system. Also see **CURB INLET** and **CATCH BASIN**.

**Stringers**
Horizontal shoring members’ usually square rough cut timbers that are used to hold solid sheeting, braces or vertical shoring members in place. See **WALERS**.

**Surcharge**
Sewers are surcharged when the surface of the wastewater in maintenance holes is above the top or crown of the sewer pipe. The sewer is under pressure or a head, rather than at atmospheric pressure.

**Surfaced Void**
Where silting has taken place to a degree that a void is caused in the subsoil, and through successive cave-ins the void reaches the surface of the ground.

**Suspended Solids**
Solids that either float on the surface of or are in suspension in water, wastewater, or other liquids that are largely removable by laboratory filtering.

**Tag Line**
A line, rope or cable that follows equipment through a sewer so the equipment can be pulled back out if it encounters an obstruction or becomes stuck. Equipment is pulled forward with a pull line.

**Tap**
A small hole in a sewer where a wastewater service line from a building is connected (tapped) into a lateral or branch sewer.

**Telemetering Equipment**
Equipment that translates physical measurements into electrical impulses that are transmitted to dials or recorders.

**Tide Gate**
A gate with a flap suspended from a free-swinging horizontal hinge. Usually placed at the end of a conduit discharging into a body of water having a fluctuating surface elevation. The gate is usually closed because of outside water pressure but when the water head inside the pipe is large enough to overcome the water pressure, the weight of the flap or the friction of the hinge the gate will then open. Also called a **BACKWATER GATE**.

**Tide Valve (Red Valve)**
One-piece construction (stiff rubber type material) formed so that one end fits over the end of a pipe and the other end is flat but centered. Usually placed on the end of a conduit discharging into a body of water having a fluctuating surface elevation. The valve is usually closed because of if its design and/or outside water pressure, but will open when the water head inside the pipe is large enough to overcome pressure. (**RED VALVE** is a product name)

**Trap**
(1) In a wastewater collection system of building plumbing codes require every drain connection from an appliance or fixture to have a trap. The trap in this case is a gooseneck that holds water to prevent vapors or gases from a collection system from entering a building.
Various other types of special traps are used in collection systems such as a **GRIT TRAP** or **SAND TRAP**.

**Trunk Sewer**
A sewer that receives many tributaries branches and serves a large territory. See **MAIN SEWER**.

**Turbidity**
(1) A condition in water or wastewater caused by the presence of suspended matter. Resulting in the scattering and absorption of light rays.

(2) An analytical quantity usually reported in arbitrary turbidity units figured out by measurements of light diffraction.

**Undermined**
(1) A condition where the bedding support under a pipe or M/H is removed or washed away. Conditions leading to or causing this are believed to be the presence of excess water during backfill. Other causes are horizontal boring operations, excavations adjacent to the pipe or maintenance hole and ex filtration or infiltration at drop joints.

(2) Where a broken section of pipe is carrying away soil leaving a void. The surfaces are said to be **UNDERMINED**.

**Undisturbed Soil**
Soil at any depth that has not been excavated or disturbed by excavation or construction.

**Uprights**
Vertical shoring members that are part of a shoring system used to prevent cave-ins of excavations.

**Upstream (U/S)**
The direction against the flow of water or toward the higher part of a sewer or collection system.

**Walers (WAY-lers)**
Horizontal shoring members usually square rough cut timbers that are used to hold solid sheeting, braces or vertical shoring members in place. See **STRINGERS**.

**Wastewater**
The used water and water-carried solids from a community that flow to a treatment plant. Storm water, surface water and ground water infiltration also must be included in the wastewater that enters a plant. The term **SEWAGE** usually refers to household wastes but this word is being replaced by the term **WASTEWATER**.

**Wayne Ball**
A spirally grooved inflatable semi-hard rubber ball designed for hydraulic cleaning of sewer pipes. See **BALLING** or **SEWER BALL**.

**Well Point**
A perforated metal tube or screen attached to a jetting or driving head end designed to permit the entrance of water. A well point is jetted or driven into place. Well points are generally used to pull ground water levels down so that excavations can be performed.

**Wet Well**
A compartment or room in which wastewater is collected and the suction pipe of a pump may be connected. Also a submersible pump may be located in a wet well.
Appendix 3  
Figure 8  
Base Map Work Orders

The intent of Figure 11 is to provide access to the online base map work orders. They should be used for informational purposes only and added to every base map research file.

The following is an excerpt from the instructions for administrators to login to the SPU Engineering Support online survey/base map work orders. These instructions are intended to allow base map supervisors or leads to add input the work orders. DO NOT MAKE CHANGES TO THESE BASE MAP WORK ORDERS.

*** It is anticipated that a read only version will be created in the near future.

Login in as an Administrator

Browse to: http://www.nobleconsulting.net/Workorder/

Begin by entering the Username: admin and the password: 1234.
Appendix 3
Figure 9
Instructions – Printing a Survey Point List

The survey point list may be printed out while working in an LDT session. Go to the “Points” pulldown menu. Go to “Point Management” and then “Point Group Manager.” Open your point group. Click on “Manager”, then “Print”.
Appendix 3  
Figure 10  
Pipe Size Chart

This section provides pipe size charts that cover most of the circumstances encountered while creating a base map. One chart covers sizes of ductile iron pipe and the other covers concrete pipe.

Class 52 Ductile Iron Pipe

<table>
<thead>
<tr>
<th>Size</th>
<th>Wall Thickness</th>
<th>OD</th>
<th>10 scale</th>
<th>20 scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>inches</td>
<td>feet</td>
<td>inches</td>
<td>feet</td>
<td>inches</td>
</tr>
<tr>
<td>4</td>
<td>0.33</td>
<td>0.29</td>
<td>0.024</td>
<td>4.80</td>
</tr>
<tr>
<td>6</td>
<td>0.50</td>
<td>0.31</td>
<td>0.026</td>
<td>6.90</td>
</tr>
<tr>
<td>8</td>
<td>0.67</td>
<td>0.33</td>
<td>0.027</td>
<td>9.05</td>
</tr>
<tr>
<td>10</td>
<td>0.83</td>
<td>0.35</td>
<td>0.029</td>
<td>11.10</td>
</tr>
<tr>
<td>12</td>
<td>1.00</td>
<td>0.37</td>
<td>0.031</td>
<td>13.20</td>
</tr>
<tr>
<td>14</td>
<td>1.17</td>
<td>0.39</td>
<td>0.032</td>
<td>15.30</td>
</tr>
<tr>
<td>16</td>
<td>1.33</td>
<td>0.40</td>
<td>0.033</td>
<td>17.40</td>
</tr>
<tr>
<td>18</td>
<td>1.50</td>
<td>0.41</td>
<td>0.034</td>
<td>19.50</td>
</tr>
<tr>
<td>20</td>
<td>1.67</td>
<td>0.42</td>
<td>0.035</td>
<td>21.60</td>
</tr>
<tr>
<td>24</td>
<td>2.00</td>
<td>0.44</td>
<td>0.037</td>
<td>25.80</td>
</tr>
<tr>
<td>30</td>
<td>2.50</td>
<td>0.47</td>
<td>0.039</td>
<td>32.00</td>
</tr>
<tr>
<td>36</td>
<td>3.00</td>
<td>0.53</td>
<td>0.044</td>
<td>38.30</td>
</tr>
<tr>
<td>42</td>
<td>3.50</td>
<td>0.59</td>
<td>0.049</td>
<td>44.50</td>
</tr>
<tr>
<td>48</td>
<td>4.00</td>
<td>0.65</td>
<td>0.054</td>
<td>50.80</td>
</tr>
<tr>
<td>54</td>
<td>4.50</td>
<td>0.73</td>
<td>0.061</td>
<td>57.10</td>
</tr>
</tbody>
</table>
### Concrete Pipe

<table>
<thead>
<tr>
<th>ID</th>
<th>Wall Thickness</th>
<th>OD</th>
<th>10 scale</th>
<th>20 scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>inches</td>
<td>feet</td>
<td>inches</td>
<td>feet</td>
<td>inches</td>
</tr>
<tr>
<td>6</td>
<td>0.50</td>
<td>1.00</td>
<td>0.08</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>0.667</td>
<td>1.005</td>
<td>0.088</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>0.835</td>
<td>1.25</td>
<td>0.104</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>1.00</td>
<td>2.00</td>
<td>0.17</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>1.25</td>
<td>2.25</td>
<td>0.19</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>1.50</td>
<td>2.50</td>
<td>0.21</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>1.75</td>
<td>2.75</td>
<td>0.23</td>
<td>-</td>
</tr>
<tr>
<td>24</td>
<td>2.00</td>
<td>3.00</td>
<td>0.25</td>
<td>-</td>
</tr>
<tr>
<td>30</td>
<td>2.50</td>
<td>3.50</td>
<td>0.29</td>
<td>-</td>
</tr>
<tr>
<td>36</td>
<td>3.00</td>
<td>4.00</td>
<td>0.33</td>
<td>-</td>
</tr>
<tr>
<td>42</td>
<td>3.50</td>
<td>4.50</td>
<td>0.375</td>
<td>-</td>
</tr>
<tr>
<td>48</td>
<td>4.00</td>
<td>5.00</td>
<td>0.42</td>
<td>-</td>
</tr>
<tr>
<td>54</td>
<td>4.50</td>
<td>5.50</td>
<td>0.46</td>
<td>-</td>
</tr>
<tr>
<td>60</td>
<td>5.00</td>
<td>6.00</td>
<td>0.50</td>
<td>-</td>
</tr>
<tr>
<td>66</td>
<td>5.50</td>
<td>6.50</td>
<td>0.54</td>
<td>-</td>
</tr>
<tr>
<td>72</td>
<td>6.00</td>
<td>7.00</td>
<td>0.58</td>
<td>-</td>
</tr>
<tr>
<td>78</td>
<td>6.50</td>
<td>7.50</td>
<td>0.63</td>
<td>-</td>
</tr>
<tr>
<td>84</td>
<td>7.00</td>
<td>8.00</td>
<td>0.67</td>
<td>-</td>
</tr>
<tr>
<td>90</td>
<td>7.50</td>
<td>8.50</td>
<td>0.71</td>
<td>-</td>
</tr>
<tr>
<td>96</td>
<td>8.00</td>
<td>9.00</td>
<td>0.75</td>
<td>-</td>
</tr>
</tbody>
</table>
Appendix 3

Figure 11

PSE Gas Map Request Form

This section discusses the excel document used to order gas maps. A copy of an example and the template is provided for reference.

The template is located in our common directory and can be found under “P:\Tr\ATr\BASEMAP\Research”. The document name is “PSE Gas Map Request Form.xls”

Open the file and fill out the information. Then email to the address specified on the document. When a request area exceeds more than one ¼ section, use the second workbook named “PSE Request Page 2”. It can be accessed by clicking the tab located on the bottom left of the document.
External Request Form

Please allow 3 to 8 working days delivery.

Date 9/16/2004

Utility Information Requested: ________ Electric ________ Gas

Contact Name: Dean Huber
Contact email: dean.huber@seattle.gov
Agency/Firm: City of Seattle Public Utilities
Address: 700 5th Ave, Suite 4900 PO Box 34018
Seattle, WA 98124-4018

Project Type: ________ X Public Improvement ________ Private Development ________ Other

Is Project Related to Sound Transit? ________ Yes ________ X No

Project Name: Golden Gardens Slide Area

Project Location/Site Address: Please include cross street before and after requested address:
Golden Gardens Dr NW from Loyal Ave NW to park entrance. View Ave NW from Loyal Ave NW
to Golden Gardens Dr NW.

County: King [Required: City & Zip Code] Seattle 98117

City Zip

REQUIRED* 1/4 Sec(s), Township, Range: can be found in The Thomas guide

1/4 Section SE 34 Township 26 Range 3

Example SW 30 T29N R5E

If more than one Section fill out attached sheet -- see page 2.

Detail Project Description (i.e., road widening with stormwater improvement: Residential Plat; etc.)

Drainage improvements to eliminate roadway slide.

Utility relocation required for project? (Yes, No or Unknown) ________ unknown ________

Delivery: ________ X Mail ________ Call when ready -- Will Pick-Up
External Request Form

Please allow 3 to 8 working days delivery.

Fax ____________________
Date ________________ Phone ____________________ Ext. ______

Utility Information Requested: ________ Electric ________ Gas

Contact Name ____________________________________________
Contact email: ____________________________________________
Agency/Firm ____________________________________________
Address: ________________________________________________

Project Type: ________ Public Improvement ________ Private Development ________ Other

Is Project Related to Sound Transit? ________ Yes ________ No

Project Name: ____________________________________________

Project Location/Site Address: Please include cross street before and after requested address:
__________________________________________________________________________

County: ____________________________ City ___________ Zip ___________

REQUIRED* 1/4 Sec(s), Township, Range: can be found in The Thomas guide

1/4 Section __________________________ Township __________________________ Range _______________

Example SW 30 T29N R5E

If more than one Section fill out attached sheet -- see page 2.

Detail Project Description (i.e., road widening with stormwater improvement: Residential Plat; etc.)
__________________________________________________________________________

Utility relocation required for project? (Yes, No or Unknown) ____________________________________________

Delivery: ________ Mail ________ Call when ready -- Will Pick-Up
Appendix 3
Figure 12
Instructions – Engineering Records Index

The Engineering Records Index, formerly known as the Water Department Improvement Database can be found at N:\ERI\Eri.mdb.

Program opening window:
Main Menu:

**ENGINEERING RECORDS INDEX**

**MAIN MENU**

- Access Records
- Reports
- Data Entry
- Exit Application

“Access Records”, opens the window for doing searches.
“Reports”, opens window for printing the entire Engineering Records Index.
“Data Entry”, opens window for entering new data into Index. (Requires password.)
“Exit Application”, closes the program.

**Access Records:**
This is where you enter the items you want to search for.

Enter one or more of the following fields to search on:

- Job:
- LID:
- Title (contains):
- Serial:
- Ordinance:
- Comments (contains):
- File:
- Year (i.e. 1997):
- SWD File:
- SED Plan:

Choose how to view results:
- Form View
- Table View

Run Search
Cancel
Description of items:

Job – A project number that was assigned under the old system (sometimes referred to as “4-digit job numbers”), or a project number assigned under the new CFMS system (CIP & Non-CIP numbers, 88xxxx or 8x.xxx)

LID – Local Improvement District number; projects funded and constructed by an LID will have a number assigned. Projects are no longer added to this system.

Title – The project title or, in some cases, the geographic location of the project. Most project titles include the geographic location and the actual work involved (ie: Install Hyd, Cut & Cap WM, etc…) This index is mainly concerned with geographic location when it comes to the title. In the case of projects having to do with facilities (ie: Maple Leaf PS, Interbay PS, etc…) the facility name appears in the title. Some project files and drawings deal with pipe and appurtenance specifics and a geographic location does not apply. In these cases, the basic item appears first in the title with a description following (Ex. – a 6” CIP, for 16” Wood Pipe”).

Serial: Serial numbers are only assigned if a drawing number has been assigned (see below).

Ordinance: ordinance number; projects constructed under an ordinance will have a number assigned. Some ordinance numbers are considered “blanket” numbers and will have several projects constructed under it. Project files are no longer added to this system.

Comments (contains): This field should contain any information that will clarify the project in any way. This could be information concerning the geographic location of the project or specifics about the actual construction, design or study of a project. Cross-references to other projects and other file “types” should also be included in this field.

File: A designation code which can be used to physically locate a project file or drawing.

- A = Facilities file (filed alphabetically)
- D = Drawing file
- J = Job number file (old system)
- L = LID file
- O = Ordinance file
- W = General WM & Appurtenance file (CIP, Non-CIP, miscellaneous)

Year: The year that the project came into service or the year that the study was done, etc…

SWD File: This number is assigned to drawings in the drawing file. The number itself may contain a combination of numbers and letters used to locate and retrieve a drawing.

SED Plan: SED (Seattle Engineering Dept.) Vault Plan number (VPI); assigned to original plans that are filed in the vault.
Doing Search:
You can enter search criteria in any box or combination of boxes. When entering data into multiple boxes the search will only return those items that match all search criteria exactly. Wild card characters do not work in searches and search text is not case sensitive.

Any boxes requiring a number, only return an exact match while the boxes that accept text will return all records with the included text. Example entering “22” for “Job:” will only find job number 22. Entering “roy” in the “Title” box will return all records containing the characters “roy”, including “Roy”, “Fauntleroy” and “McElroy”.

There are two ways to view the search results, Form View and Table View.

Form View:

Form View gives you the ability to move forwards and backwards through the results while viewing one record at a time.
Table View gives you a list of all the search results:

<table>
<thead>
<tr>
<th>Project Year</th>
<th>Title</th>
<th>Job No.</th>
<th>Ordinance</th>
<th>SED Plan</th>
<th>SWD Plan</th>
<th>Comments</th>
<th>LID</th>
<th>File Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>4TH AVE, SENEDA ST</td>
<td>584</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>HYDRAULIC VALVE FOR GREENUP SPRAY SERVICE</td>
<td>971</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>TAYLOR DR., REDSKY CREEK</td>
<td>549</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, SENEDA ST</td>
<td>541</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, UNENORMET</td>
<td>542</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>5TH AVE, E OF 50TH AVE S</td>
<td>544</td>
<td>90277</td>
<td>1986-02</td>
<td>REMOVED, REPAIR</td>
<td>SED ID #724, SEE A FILE</td>
<td>642</td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>NW 350TH ST, 12TH AVE NW</td>
<td>545</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>UMBRELLA INLET FS 1970</td>
<td>546</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>HYDRAULIC VALVE FOR SPRAY SERVICE FOR PS PTL</td>
<td>547</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>SEDERAL LIFT STATIONS, VARIOUS LOCATIONS</td>
<td>548</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td>SED ID #227-THRU #300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>W MAIN, NW CORNER OF 50TH ST</td>
<td>549</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>LAKE YOUNG RD, TUNNEL BLK, 4TH AVE SE</td>
<td>550</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, UNIVERSITY ST</td>
<td>551</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>S BRIGHT, S MARSHALL WAY</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>ELLIOTT AVE INTERCEPTOR, SECTION 3</td>
<td>553</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td>METRO PLAN #550</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>5TH AVE, N.E. CORNER OF 50TH ST</td>
<td>554</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>WATER QUALITY BLDG, ACCESS RD, SOUTH END</td>
<td>555</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>NW 35TH ST, PS EDGEMONT</td>
<td>556</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>S BRIGHT, S MARSHALL WAY</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td>SED ID #5627, DFO #5393</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>15TH AVE, N.E. CORNER OF 4TH ST</td>
<td>557</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, N.E. CORNER OF 4TH ST</td>
<td>557</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, N.E. CORNER OF 50TH ST</td>
<td>557</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>5TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4TH AVE, S MARSHALL ST</td>
<td>552</td>
<td>90944</td>
<td>ACC</td>
<td>RECORD ONLY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table View includes the following data: Project Year, Project Title, Job No., Ordinance No., SED Plan No., SWD Plan No., Comments, LID No., File Code and Sort Code.
## Appendix 4
### Research Resources

<table>
<thead>
<tr>
<th>Resource</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Vault</td>
<td>SPU InWeb</td>
<td>Accessed thru Internet Explorer icon on SPU desktop.</td>
</tr>
<tr>
<td>Plans</td>
<td>Virtual Vault or Engineering Records Vault</td>
<td>• Vault Plan Index (VPI) maps are located on the wall.</td>
</tr>
<tr>
<td></td>
<td>47th Floor KT</td>
<td>• Note black Page # in the square</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check each page for plan #s within a few blocks of your base map location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Make a Vault Check-out slip for each plan (see Appendix 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Locate plans and replace with check-out slips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If a plan is missing, check for a microfilm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If plan is checked out, call number on slip and ask to copy it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Option: Submit list of plans to Vault staff and ask them to pull plans</td>
</tr>
<tr>
<td>Existing Manually-drawn</td>
<td>Virtual Vault or Engineering Records Vault</td>
<td>• Base Map Index book is located in Vault</td>
</tr>
<tr>
<td>Base Maps</td>
<td>47th Floor KT</td>
<td>• Find base map location page # on index at front of book</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Note base map reference # of any existing maps in base map location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Copy existing base maps on scanner (ask for help if needed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Carefully re-file existing base map (or leave on cabinet for re-filing by staff)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Option: Existing base maps can also be found using the Virtual Vault</td>
</tr>
<tr>
<td>Existing CAD</td>
<td>Virtual Vault or P:\Drive</td>
<td>• P:\BasemapArchive\Basemap_Inventory.mdb for existing CAD base map. CAD base maps are filed by region in P:\BasemapArchive\Region? The index map for base map regions is found in front of existing base maps book (see above)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Most existing CAD base maps have been added to the Virtual Vault</td>
</tr>
<tr>
<td>Engineering Plans</td>
<td></td>
<td>• VPI maps are located on wall.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Note black Page # in square</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check each page for plan numbers within few blocks of base map location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Make a Vault Check-out slip for each plan (see Appendix 3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Locate plans and replace with check-out slips</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If a plan is missing, check for a microfilm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If plan is checked out, call number on slip and ask to copy it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Option: Submit your list of plans to the Vault staff and have them pull plans</td>
</tr>
<tr>
<td>Microfilm of Engineering</td>
<td>Virtual Vault or Engineering Records Vault</td>
<td>• All plans Vault are also available on microfilm</td>
</tr>
<tr>
<td></td>
<td>47th Floor KT</td>
<td>• All Survey Field books are available on microfilm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If you need help using microfilm machine, ask Vault staff for assistance</td>
</tr>
<tr>
<td>Resource</td>
<td>Source</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| City of Seattle 1/4 Section Maps | Engineering Records Vault    | • 1/4 section index maps are located behind the vault counter  
• 1/4 section maps are located in filing cabinets behind the vault counter  
• If the folder is empty, request missing maps from the attendant  
• Notify the attendant if you take the last map |
|                                  | 47th Floor KT or Tiff images on P:\Qsec |                                                                                                                                         |
| Cloth Water Maps                 | Engineering Records Vault    | • These plans show very old watermains that could still be there. There is no index for these plans. You just have to guess  
• Ask vault staff or Steve Law for assistance |
|                                  | 47th Floor KT                |                                                                                                                                         |
| Side Sewer Cards                 | Street Use 37th Floor KT     | • Drawers are behind the customer counter on 37th floor  
• Locate a Side Sewer Card for each block in your base map location  
• Locate both sides of each side street that intersects your base map location  
• If Side Sewer Card ends at an intersection, pull card for next block  
• Replace card with a burnt-orange card from very front each drawer  
• Copy front and back of each card, being careful to keep pairs of copies together. Use duplex feature of copier if possible.  
• Place cards in box at east end of drawers for re-filing by staff  
• Two good sources for additional help with side sewer cards are Joe Taskey and Joe Caasi in Street Use |
|                                  |                               |                                                                                                                                              |
| Side Sewer Permits               | Street Use 22nd Floor KT     | Any type of side sewer work involves a permit from the City. Often with the permit is additional information including sketches and drawings. The backside of the side sewer card lists permits related to that portion of street. These permits are kept on file by the City on the 37th floor and can be pulled and copied |
|                                  |                               |                                                                                                                                              |
| Sewer Maps                       | Engineering Records Vault    | • These maps are located in Vault  
• Use 1/4 section map numbers  
• Use these maps for reference only  
• These maps have vault index references, but not been recently updated |
|                                  | 47th Floor KT                |                                                                                                                                         |
| Drainage Maps                    | Engineering Records Vault    | • These maps are located in Vault  
• Use 1/4 section map numbers  
• Use these maps for reference only  
• These maps have vault index references, but not been updated in years |
|                                  | 47th Floor KT                |                                                                                                                                         |
| Sewer & Drainage Map             | Engineering Records Vault    | • These books look like water book  
• There is an index on first page of book  
• Go to your page. Drainage is on left side and sewers are on right side  
• These pages come from GIS |
<p>|                                  | 47th Floor KT                |                                                                                                                                         |</p>
<table>
<thead>
<tr>
<th>Resource</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Survey Books      | Engineering Records Vault 47th Floor KT | Use 3 ways to locate Survey Field Books for your base map area  
1. From surveyor who did base map survey. They have pulled Field Books for area  
2. Find Survey Field Book # on ¼ section map for base map area  
3. Use Survey Field Book index cards in the Vault. Filed by street location, they locate all Field books for an area  
If you cannot locate Field Book in Vault, look for checkout card in space where the Field Book is filed. Arrange either to borrow Field book from whomever checked it out or check to see if Field Book is available on microfilm.  
*(Include survey description codes list from LDD manual.)* |
| Inspector’s Books | Engineering Records Vault 47th Floor KT | • Some of inspector’s books are located in the vault  
• The rest of the books are located in a different place. You must ask Vault staff to order it. It takes 1 day.  
• Many City’s plans have construction inspector’s record books on file. Plans have inspector’s book number listed in title block area. Book contains daily notes by inspector during construction. May also be sketches and drawings |
| Plat Books        | 8th Floor Municipal Bldg         | Use for locating specific information on plats within the city.                                                                                                                                               |
| Utility Index Maps| Street Use 37th Floor KT Behind counter | • North and south pull-down maps with numbers located next to utility books.  
• Pull the numbered utility 1/4 section map from the cubbies.  
• Copy the utility 1/4 section map, and label the copy with its map number.  
• If map is missing, check with Curtis Marsten to see if he has it or can locate it. |
| Utility Books     | Street Use 37th Floor KT Behind counter | • Pull books referenced on map  
• Fill out and replace with a check-out card  
• If you copy and label the referenced pages (rather than take the book), be sure to copy 1st page of job (with description and date). Label each page with the book #. And color copies to identify work properly  
• Ask Fred White or Rex Straton if any new utility permits have been recorded  
• If book is missing, check with Ernesto to see if he has it |
<p>| Utility Index Cards| Street Use 37th Floor KT     | This is an additional record of franchise utilities. Located in Street Use near Utility maps. Ask Fred White or Rex Stanton where they are. Organized by street, they list older utilities that may or may not be on other utility maps/books |
| 10 Scale Downtown Utility Maps | Street Use 37th Floor KT | Because utilities are so dense in the downtown area, there are special 1”=10’ utility maps for the downtown area. |</p>
<table>
<thead>
<tr>
<th>Resource</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sky bridges, Utilidors, Underground Tunnels, Fiber Optic Systems</td>
<td>Street Use 37th Floor KT</td>
<td>These are records of other miscellaneous utilities. Located in Street Use near the Utility maps. Ask Fred White or Rex Stanton where they are.</td>
</tr>
</tbody>
</table>
| Profiles | Engineering Records Vault 47th Floor KT | • Find the location on the VPI maps on the wall.  
• Note the black page # in square.  
• In the VPI plans book locate that page # for “Profiles”.  
• Note all profiles needed.  
• Make a Vault check-out slip for each profile (see Appendix 3)  
• Locate profile(s) and replace with check-out slips, or ask attendant  
• If a profile is missing, check for a microfilm in the drawers |
| Area Ways | Street Use 37th Floor KT | If questions about area ways, contact John Zavis or SDOT Structural |
| Private Contract Inspection | Street Use 37th Floor KT | Used as a secondary resource |
| Water Book | Engineering Records Vault 47th Floor KT | • The water book is located in Vault  
• In front of book is an index. Use it find your area  
• Undo book screw locks  
• Carefully remove page  
• Copy and label base map location area |
| Ordinance/Easement Books | City Clerk’s Office | • Typically provided by Survey  
• On a rare occasion we will have to put in the ordinance or easement |
| Aerial Topography Map | Engineering Records Vault 47th Floor KT | • These will eventually be scanned and added to Virtual Vault.  
• Use the quarter section map numbers.  
• Copy and label aerial photo location  
• Leave map on drawers for re-filing by staff.  
• Images taken in 1970 must be superceded by 1999 photos |
<table>
<thead>
<tr>
<th>Resource</th>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Aerial Photos      | ArcView                                                                | • These will eventually be scanned and added to Virtual Vault.  
• Seattle was aerial color photographed in 1999. Images are available using either Mr Sid program or ArcView on your computer. From Mr Sid, you can save image as a TIF file for importing into AutoCAD |
| Engineering Records Index | SPU6\VOL1\APP SiProd\SPUmdb\ERI\eri.mdb | Formerly known as Water Dept. Improvement Database. Engineering Records Index allows searching and listing projects by many criteria. Plans for projects are stored in Dexter Horton, 6th floor vault area. **See Appendix 3, Figure 18.** |
| Gas Maps           | Puget Sound Energy                                                    | PSE company handles natural gas for Seattle area. PSE keeps updated maps of their natural gas system. Copies of these maps are available from PSE by sending a Gas Map Request form. See form attached. |
| GIS                | GIS Map Counter                                                       |                                                                                                                                                                                                           |
| King County Metro Plans | King Street Center                                                   | For any plans or information regarding with Metro contact Jeff Suiter at 684-1302                                                                                                                      |
| King County Plans  | King County Admin Building                                           | For any plans or information for King County contact Minnie at 296-6548                                                                                                                                |
| WSDOT Plans        | 15700 Dayton Ave N Seattle, WA 98133-9710                             | • For plans or info about state ROW plans: contact Jim Johnson at 206 440-4026. You must have an appointment.  
• Seattle lies within WSDOT’s Northwest District. The district office is located at 15700 Dayton Avenue North, Seattle, WA 98133-9710, (206) 440-4000. WSDOT plans are available from the district office |
| Seattle City Light | 36th Floor KT                                                         | For any plans or information about SCL contact Norm Dodge at 684-3945                                                                                                                                    |
| Amtrak             | National Railroad Passenger Dept 303 S Jackson St Seattle, WA 98104   | For any plans or info about railroad: contact Fred Fielder at 382-4146                                                                                                                                |
| Seattle Steam      | 1325 4th Ave Suite 1440 Seattle, WA 98101                              | For any plans or info about steam: contact Randy Erickson at 623-63                                                                                                                                 |
| SDOT Intersections | 39th Floor KT                                                         |                                                                                                                                                                                                           |
| Traffic Circles    | Susan Almachar                                                        |                                                                                                                                                                                                           |
| Parks Dept         | RDA Bldg 3rd Flr 800 Maynard Ave Seattle, WA 98104                    | For any plans or information regarding parks department contact Jim Deymonaz at 684-8826 or contact Rex Allen at 684-7034                                                                                                                                 |
Glossary

- **ABANDON (ABAN)**  A pipe or a structure that is no longer in use.
- **AS BUILT**  A term normally applied to documentation and design plans following completion of construction reflecting the final modifications to the original design.
- **BASEMAP**  A map of existing conditions.
- **CASTING**  A covering and access for manholes or vaults, usually visible at ground level.
- **CAPITAL IMPROVEMENT PROJECTS (CIP)**  Projects that improve the City’s interests.
- **CONCENTRIC**  Having a common center.
- **CONTROL**  The arrangement of imaginary lines from a known position to a known position that manage the location of items in a given area.
- **CONTROL LINES**  Imaginary lines that are located between control points.
- **CONTROL POINTS**  Markers placed in the ground by survey in relationship to other known and established survey markers.
- **COORDINATE SYSTEM**  The expression of location by the number of units, up or down and left or right of a known origin.
- **WORLD COORDINATE SYSTEM**  For the purpose of base mapping, the “World” coordinate system is used, where the up and down are north and south and left and right are east and west.
- **CULVERT**  A pipe like structure that drainage water passes through. Its ends are usually visible above the ground.
- **DATUM**  Any numerical or geometrical quantity or set of such quantities which serve as a reference or base for other quantities.
- **DESCRIPTOR**  The description of a surveyed point.
- **DUCT**  For base map terminology, a duct is a pipe like structure containing numerous conduits and encased in concrete or a like substance.
- **EASEMENT**  A nonpossessing interest held by one person in land of another whereby the first person is accorded partial use of such land for a specific purpose. An easement restricts but does not abridge the rights of the fee owner to the use of his land.
- **EASTING**  The X value of coordinates in the world coordinate system.
- **FIELD CHECK**  A visual check of a base map project area conducted for the purpose of verifying the surveyed points, clarifying the surveyed points, and locating any features that may have been missed.
- **UTILITY BOOKS**  An as-built record of utility improvements that are permitted
- **UTILITY PERMITS**
- **GIS**  Geographical Information Systems - A computer mapping program where land characteristics and/or demographic information stored in a database can be displayed and plotted with specific features assigned unique colors, linetypes, text styles, etc.
- **INSPECTORS BOOK**  A book containing notes and data collected by construction inspectors during construction.
• **INVERT ELEVATION**  A measurement taken at the inside bottom of a pipe in a sewer/drainage system.

• **LUMBERMAN’S CRAYON**  A piece of waxy chalk used for marking temporary control points on sidewalks while conducting a field check.

• **LUMINARE**  The light on the end of a light pole.

• **MEASURE DOWN**  A measurement taken from the top of the rim on a structure to the top of a pipe or valve.

• **MONUMENTS**  A permanently placed survey marker such as a stone shaft sunk into the ground to mark a survey point.

• **NORTING**  The Y value of coordinates in the world coordinate system.

• **PLANFORM**  A spreadsheet used to catalogue research documents.

• **POINT DATABASE**  Survey point data stored in LDT (our survey software).

• **PROFILE VIEW**  A vertical section taken along a proposed alignment that shows existing grade, existing underground utilities, and the proposed design.

• **PUBLIC-RIGHT-OF-WAY**  Land dedicated to public use and ownership.

• **QUARTER SECTION MAP**  One-fourth of a normal section as defined by the (USPLS) United States Public Land Survey, formed by dividing a section into four parts by lines connecting the opposite quarter section corners, and containing 160 acres as near as may be.

• **RESEARCH FOLDERS**  

• **RESEARCH RESOURCES**  

• **RIGHT OF WAY**  The strip of land over which facilities such as highways, roadways, or power lines are built.

• **SCOPE**  A document used at the project’s inception to define it’s intent, the area to be improved, the cause or need for the improvement, and the course of action to be taken along with other pertinent information.

• **SIDE SEWER CARDS**  Cards that show side sewer connections from the main line to the property line.

• **SPU ENGINEERING RECORDS VAULT**  The location of SPU’s Engineering Records

• **SPU VIRTUAL VAULT**  The automated version of the SPU’s Engineering Records Vault

• **STATIONING**  The assignment of a linear measurement from a control point (survey marker) to a control point along a control line.

• **SURVEY**  The orderly process of determining data relating to the physical characteristics of the earth.

• **SURVEY CONTROL LINES**  Survey control lines provide the horizontal or vertical position data.

• **SURVEY CONTROL MARKERS**  A material object such as a monument or a tack that marks the location of a survey control point.

• **TIC**  A symbol we use to indicate that a pipe ends.

• **TILDE**  A symbol we use to indicate that a pipe continues on.

• **TOE**  A survey shot at the bottom of a slope.
• **TOP** A survey shot at the top of a slope.

• **TOPOGRAPHICAL FEATURES** Graphic representation of the surface features of a place or region on a map, indicating their relative position and elevations.

• **TRIANGULATION** A method used on field checks to find an object by using two known objects.

• **UTILITY EASEMENT** A nonpossessing interest held by one party (The City) in the land of another for the purpose of accessing, maintaining or improving a subsurface utility.

• **VACATION ORDINANCE** A City ordinance that vacates the land for public use.

• **VIRTUAL VAULT** The online source of finding plans, base maps, and condominium plans.

**WHITE SPACE** An open area on your drawing that you put text in.