

Washington State Department of Transportation

Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection

Version 1.0

Authors: Kathy Prosser, Environmental Information Program, Environmental GIS/GPS Data
Steward

Anni Watkins, Stormwater & Watersheds Program, Stormwater Features Inventory
Data Analyst

Date: July 30, 2012

Reviewers: Elizabeth Lanzer, Environmental Information Program, Program Manager

Cory Simon, Stormwater & Watersheds Program, Stormwater Features Inventory
Coordinator

Date: October 3, 2012

Coordinator/Reviewer: Sarah Burdick, Stormwater & Watersheds Program, Quality Assurance

Date: August 21, 2012

Editor/Reviewer: Rebecca Nichols, Design Policy Standards & Research, Editor

Date: October 10, 2012

QA Approval: Sarah Burdick, Stormwater & Watersheds Program, Quality Assurance

Date: October 17, 2012

The Washington State Department of Transportation (WSDOT) *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* is an independent publication and is not affiliated with, nor has it been authorized, sponsored, or otherwise approved by, a referenced product's parent company or manufacturer.

The Stormwater Features Inventory Database (SFID) was created in response to requirements of WSDOT's NPDES Municipal Stormwater Permit (Ecology, 2009). Instructions presented herein are adapted from published product information or were developed by in-house technical experts. Their primary purpose is for internal use by WSDOT's Stormwater Features Inventory Program. Described procedures may vary from those used by other WSDOT groups.

WSDOT's SFID office data collection procedures do not supplant official published definitions. Distribution of this document does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, software, manufacturers, or suppliers is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the authors or WSDOT.

Although WSDOT follows these standard operating procedures in most cases, there may be instances in which WSDOT uses an alternative methodology, procedure, or process.

Contents

Document Revision History.....	i
Acronyms/Definitions	v
Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection.....	1
1-0 Background	1
1-0.1 Overview of Workflow Manager.....	1
1-0.2 Available Resources	2
1-0.3 Additional Documentation.....	3
1-0.4 Access Requirements and First Steps	3
2.0 Using Workflow Manager (WMX).....	4
2-0.1 Workflow Manager Features	5
3-0 As-Built Job Assignment.....	7
3-0.1 Running the As-Built Job Assignment Workflow	8
4-0 Screen-digitize As-builts.....	13
4-0.1 Running the Screen-digitize As-builts Workflow	14
4-0.1.1 Data Editor: Workflow Processes.....	14
4-0.1.2 Data Steward: Workflow Processes.....	43
4-0.1.3 Data Administrator: Workflow Processes.....	46
5-0 References	47
Appendix A Accessing As-Builts Online	48
A-1 NW Region Plans and Documents Archive database.....	48
A-2 Olympic Region Files	51
A-3 Awarded Contract Files.....	51
A-4 Oracle® IPM database.....	52
Appendix B Working with As-builts.....	56
B-1 Structure Notes.....	56
B-2 Drainage Profile and Drainage Detail Sheets.....	57
Appendix C Handling Problems and Troubleshooting	58
C-1 Adding Holds in WMX	58
C-2 Troubleshooting.....	60

Acronyms/Definitions

AOI	Area of interest
ArcEditor™	Esri® ArcEditor™ 10.0 is one of three ArcGIS for desktop user license levels available. Each license level provides increased GIS functionality as you move from ArcView® to ArcEditor™ to ArcInfo®.
ArcInfo®	See above information for Esri® ArcEditor™.
ArcMap™	Esri® ArcMap™ 10.0 is an application within ArcGIS for Desktop.
ArcView®	See above information for Esri® ArcEditor™.
As-builts	As-built contract plan sets or sheets
BMP	Best management practice
CAE	Computer aided engineering
Coordinator	Stormwater & Watersheds Program, Stormwater Features Inventory Coordinator
Data Administrator	Environmental Information Program, Environmental GIS/GPS Data Steward
Data Editor	Stormwater & Watersheds Program, office data collection staff, which may include interns or staff from the Stormwater Features Inventory Group.
Data Steward	Stormwater and Watersheds Program, SFID Lead/Data Steward
Ecology	Washington State Department of Ecology
ESO	Washington State Department of Transportation, Environmental Services Office
Esri	Environmental Systems Research Institute, Inc.®
GIS	Geographic information system
GPS	Global Positioning System
Highway Features	Highway Features is an agency-wide data store for information about roadside assets, and landscape characteristics owned, maintained, or of interest to WSDOT. It is a clearinghouse for the exchange of data among different lines of business and can accommodate many different types of features.
IPM	Imaging and Process Management
JTX™	Esri® Job Tracking for ArcGIS® (the original name for Workflow Manager) – This abbreviation is still seen on email notifications sent out by Workflow Manager.
Oracle®	Database management system developed and marketed by the Oracle Corporation
mxd	Map exchange document file format
PDF	Portable Document Format
Permit	WSDOT's 2009 NPDES Municipal Stormwater Permit (permit), issued by Ecology
Q:	WSDOT's Stormwater Features Inventory Program's workspace on the WSDOT server – Full path = \\WSDOT.loc\Hq\Group\ESOWaterQual

QA/QC	Quality Assurance and Quality Control
RFIP	Roadside Features Inventory Program
SFI	Stormwater Features Inventory
SFID	Stormwater Features Inventory Database
SOP	Standard operating procedures
SR	State route
TIFF	Tagged Image File Format
WMX	Esri® Workflow Manager for ArcGIS®
WSDOT	Washington State Department of Transportation

Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection

1-0 Background

The *Stormwater Features Inventory Database (SFID): Standard Operating Procedures for Office Data Collection*, was developed in response to WSDOT's 2009 NPDES Municipal Stormwater Permit (permit), issued by the Washington State Department of Ecology (Ecology). Among other elements, the permit requires WSDOT to maintain an ongoing storm sewer system mapping program for areas within the permit's jurisdictional boundaries.

This document outlines standard WSDOT procedures for office data collection of storm sewer system features contained within WSDOT's existing data sources. The intent is for this document to supplement both WSDOT's *Standard Operating Procedures for Stormwater Discharge Point Inventory* (WSDOT, 2012a) and *Stormwater Features Inventory Database: Feature and Attribute Definitions* (WSDOT, 2012b).

Stormwater features inventory activities are managed through WSDOT's Environmental Services Office (ESO), Stormwater and Watersheds Program. Associated operational procedures are administered by the Stormwater Features Inventory (SFI) Group. Associated technical systems are administered by WSDOT's ESO, Environmental Information Program, with direction from the Stormwater and Watersheds Program.

SFID data comes from a variety of sources: scanned and georeferenced as-built drawings; Global Positioning System (GPS) data collected by SFI field crews; GPS data collected by Roadside Features Inventory Program field crews; stormwater feature location and attribute information collected by WSDOT's maintenance program; and computer aided engineering drawings. SFID office data collection involves screen-digitizing features from the scanned and georeferenced as-built drawings, incorporating all other existing data sources as a base when available. The two pieces of software used for office data collection are: Environmental Systems Research Institute (Esri)® ArcGIS® and ArcGIS® Workflow Manager (WMX).

Note: The *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* is a version-controlled document and is subject to modifications that reflect agency needs.

1-0.1 Overview of Workflow Manager

Esri® ArcGIS® Workflow Manager (WMX) software is designed as a tool to document and standardize workflows, allocate people, and track progress in multi-person geographic information system (GIS) projects. There are two components to this software: an administrative piece for managing workflows and a second piece for users.

Users access WMX via **Start | All Programs | ArcGIS Workflow Manager | Workflow Manager** (both Windows XP and Windows 7¹). Either an ArcEditor™ or ArcInfo® license is required to use WMX. Two office mapping workflows currently exist: As-Built Job Assignment and Screen-digitize As-builts. The scanned, georeferenced as-builts are organized by state route (SR) and contract number. *As-Built Job Assignment* office mapping workflow is used to assign contract plan sets to Data Editors. *Screen-digitize As-builts* office mapping workflow is used to: outline needed steps for collecting data from as-built contract plan sets, perform data quality assurance and quality control activities (QA/QC), and incorporate data into WSDOT's Stormwater Features Inventory Database.

1-0.2 Available Resources

Following is a list of available WSDOT resources, for use in compiling stormwater system features from as-built plan sets:

1. A template map exchange document file format (mxd) for editing is stored within WMX. This template opens automatically in one of the WMX office editing workflow steps.
2. Scanned, georeferenced as-builts are located in WSDOT's Stormwater Features Inventory Program's drive location Q:\GeoRefAsBuilts. They are organized by SR, then subsequently by contract number. A contract may have one or more drawings associated with it.
3. Structure Notes and Drainage Details from the as-built plan sheets can be found through:
 - a. Northwest Region Plans and Documents Archive database:
<http://nwweb/pda/plansearch.aspx>
 - b. Olympic Region Files located at the WSDOT internal network path:
<\\orhqtmdfs01\corporate\olympic\sr plans files\state routes>
 - c. Awarded Contract Files located at the WSDOT internal network path:
<\\wsdot.loc\hq\group\302010vault\awardedcontractfiles>
 - d. Oracle® Imaging and Process Management database:
<http://acordeimgprod/ibpmweb/client/framework.asp>

For further details on how to use the above-listed resources, see [Accessing As-builts Online \(Appendix A\)](#) and [Working with As-builts \(Appendix B\)](#). **Note:** It's a good idea to have links or shortcuts to these resources readily available on your desktop.

¹ Windows is a registered trademark of Microsoft Corporation in the United States and other countries. *Stormwater Features Inventory Database: Standard Operating Procedures for Office Data Collection* is an independent publication and is not affiliated with, nor has it been authorized, sponsored, or otherwise approved by, Microsoft Corporation.

1-0.3 Additional Documentation

Additional documentation related to stormwater mapping includes: feature definitions, attribute definitions, and a list of stormwater best management practices (BMPs).

1-0.4 Access Requirements and First Steps

To perform office data collection activities, users must have:

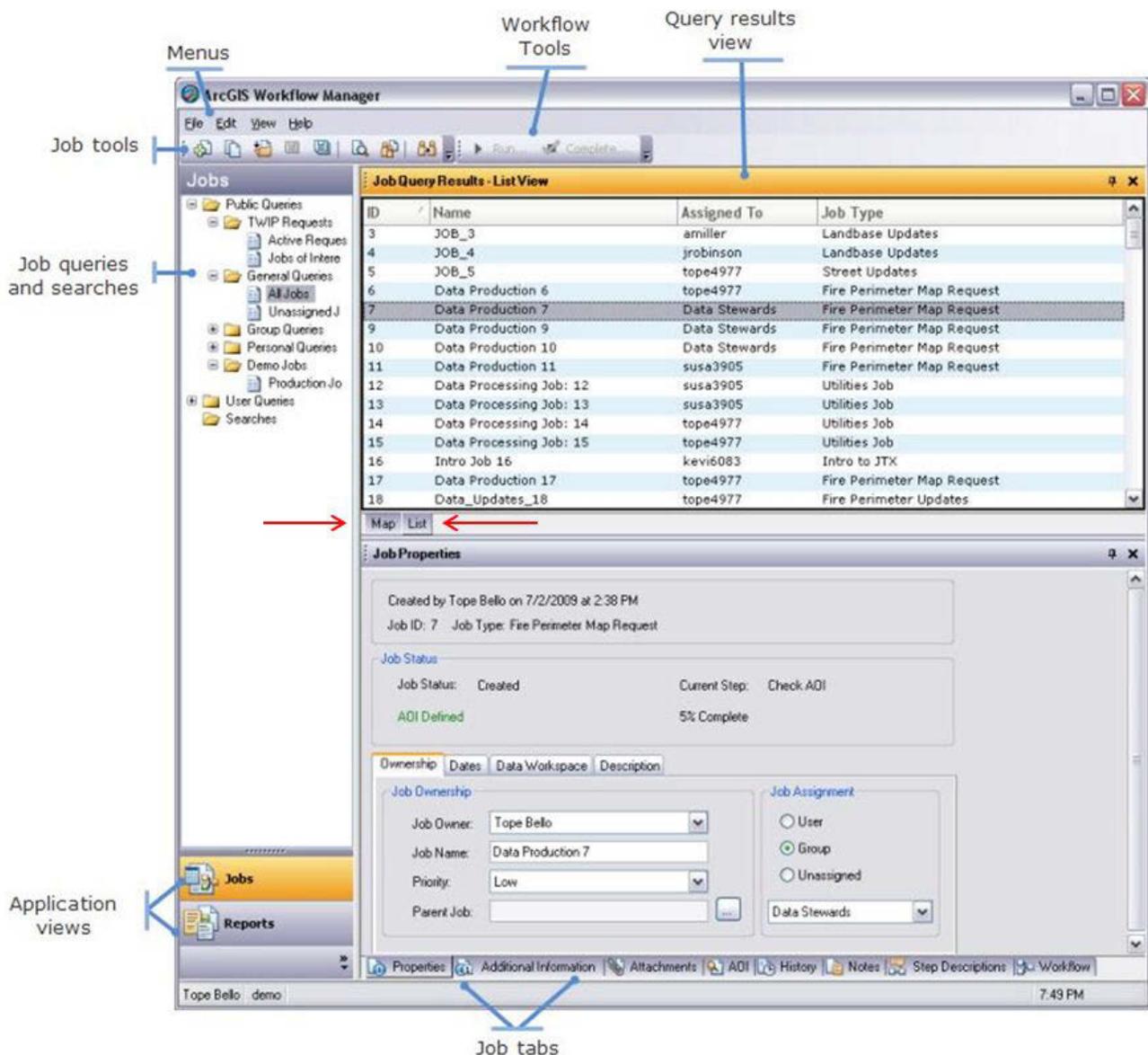
- Access to the WSDOT stormwater and watershed program's drive location (Q:);
- Access to the SFID (production version); and
- Access to the WMX database (production version).

First steps:

- In the WMX Administrator application, each person editing content must be set up as a User in the Security folder;
- Assign the *WMX As-Built Job Assignment* workflow to each person editing content;
- Make sure each person needing to edit content can run the *As-Built Job Assignment* workflow;
- Make sure each person needing to edit content has access to the Oracle® Imaging and Process Management (IPM) database; and
- Keep a project notebook handy where you can jot information, like as-built contract numbers.

2.0 Using Workflow Manager (WMX)

Users access WMX via **Start | All Programs | ArcGIS Workflow Manager | Workflow Manager**. Either an ArcEditor™ or ArcInfo® license is required to use WMX. Here's an overview of WMX, highlighting some of its features.



2-0.1 Workflow Manager Features

Menus

The File Menu contains:

- **New** – Creates new jobs in the system;
- **Save** – Saves job edits on the current job tab;
- **Save All** – Saves job edits from all job tabs containing edits; and
- **Exit** – Exits the application.

The Edit Menu contains:

- **Find Jobs** – Opens the Find Job dialog box.

The Help Menu contains:

- **Help Contents** – Launches the help file.

Job Tools

Job Tools enable users to:



Create new job(s) – Creates a new job;



Save the properties of the modified job – Saves job edits on the current job tab. This is grayed out unless there is something to save;



Save all the modified job properties – Saves job edits from all job tabs containing edits; and



Find jobs in the database – Searches existing jobs.

Workflow Tools

The shortcut for workflow tools allows you to execute and mark steps as done, in the workflow, for the selected job without having to be on the Workflow tab.

Job Queries and Searches

Allows the user to quickly search and list jobs in the Job Query Results window by various queries. Custom folders and queries can be created. Whenever you use the Find Jobs tool, an entry will be added to the Searches folder so you can quickly return to the results later on in your session. These results can be saved as permanent queries by right-clicking on them.

Job Tabs

There are tabs for:

- Properties,
- Extended Properties,
- Linked Properties,
- History,
- Notes,
- Area of interest (AOI),
- Attachments,
- Holds,
- Dependencies,
- Step Descriptions, and
- Workflow.

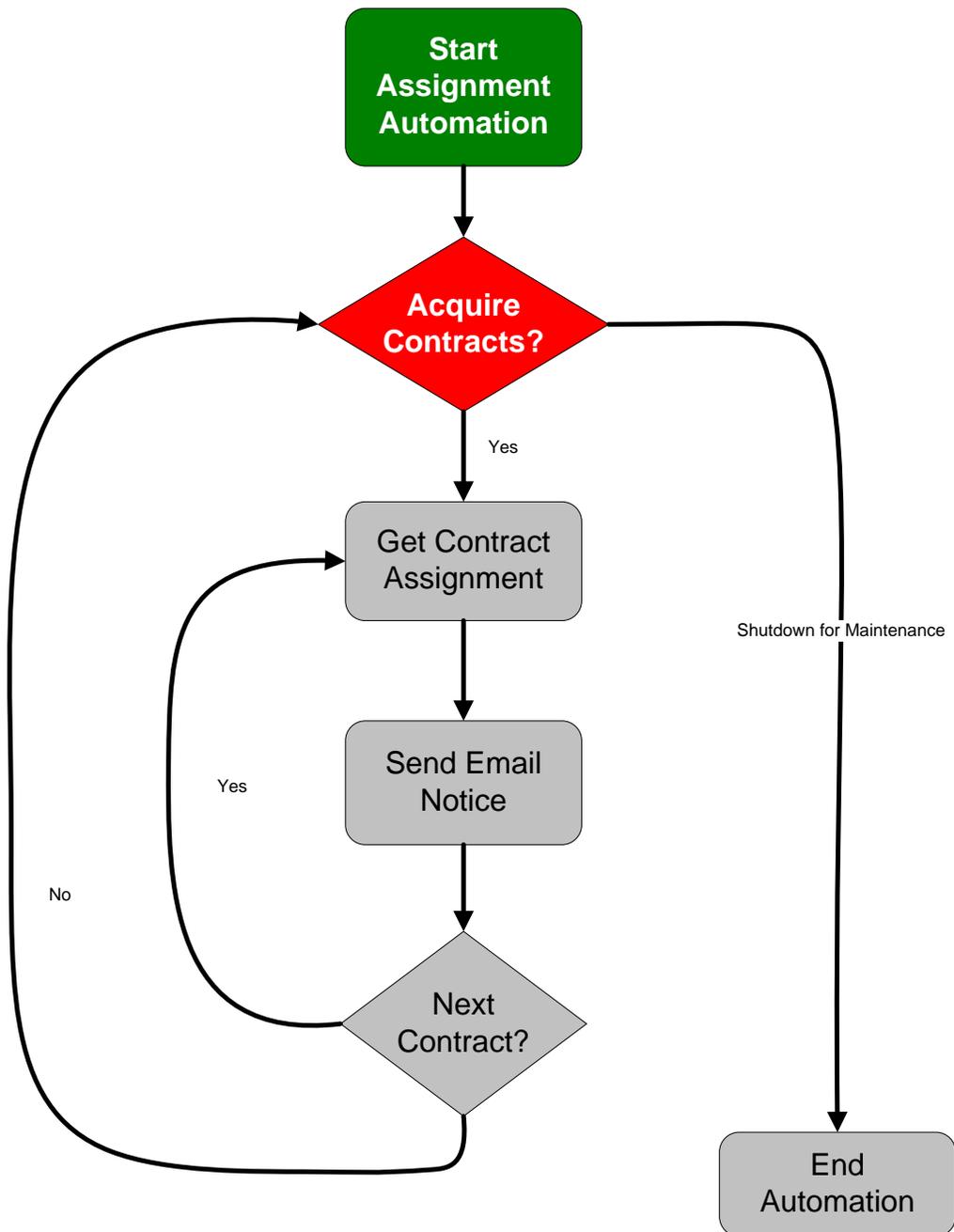
Jobs List or Map View

See the red arrows in the [screen view](#) above. The Jobs List tab displays a list of jobs for the selected query. Map View displays a view of the AOIs for all jobs in the selected query.

3-0 As-Built Job Assignment

This workflow allows users to assign themselves one or more contracts to work on. Each user will have a single instance of the *As-Built Job Assignment* workflow in WMX, which they will reuse as more contract assignments are needed.

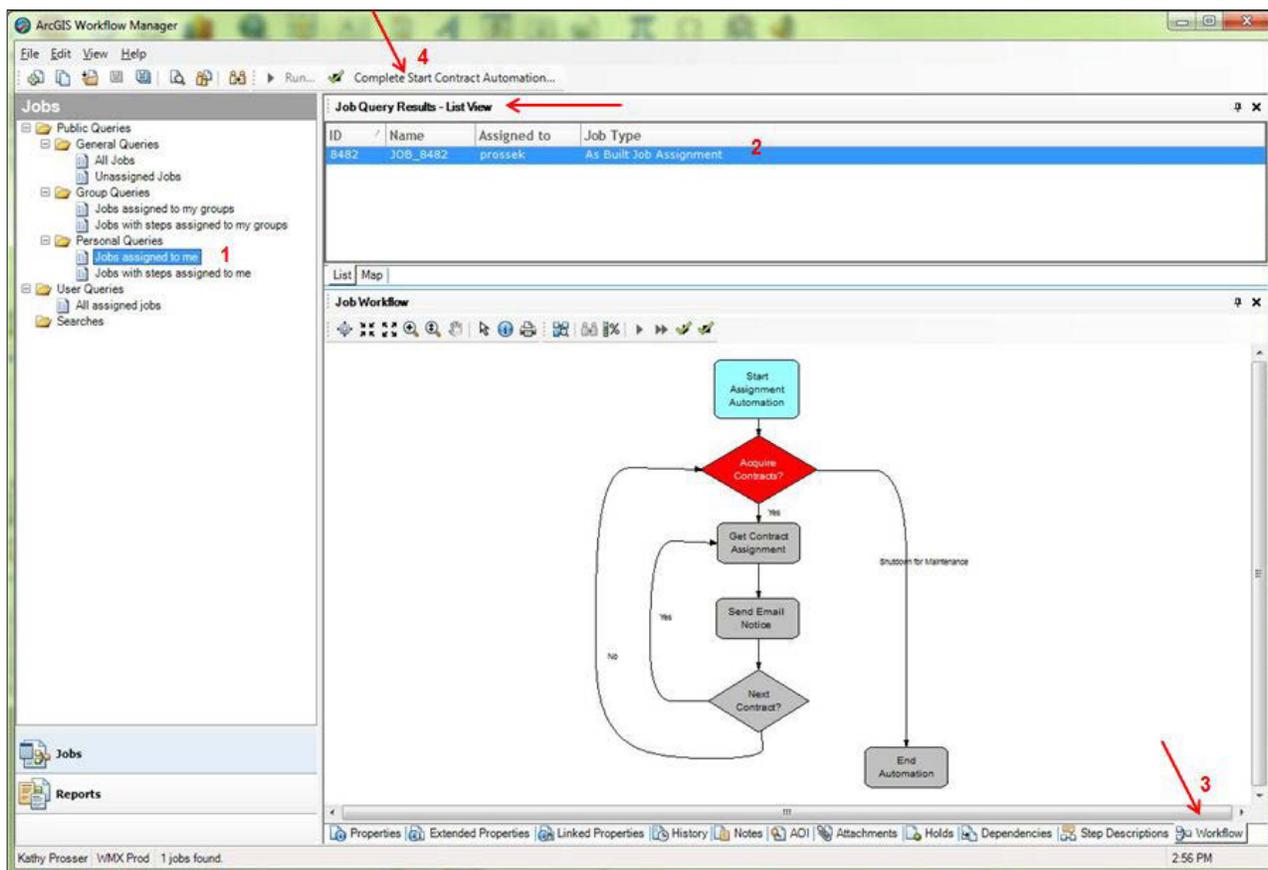
The diagram below shows steps in the *As-Built Job Assignment* workflow. The workflow loops, which allows users to assign themselves one contract or multiple contracts at any given time. The ability of this workflow to loop allows you to reuse it as needed.



3-0.1 Running the As-Built Job Assignment Workflow

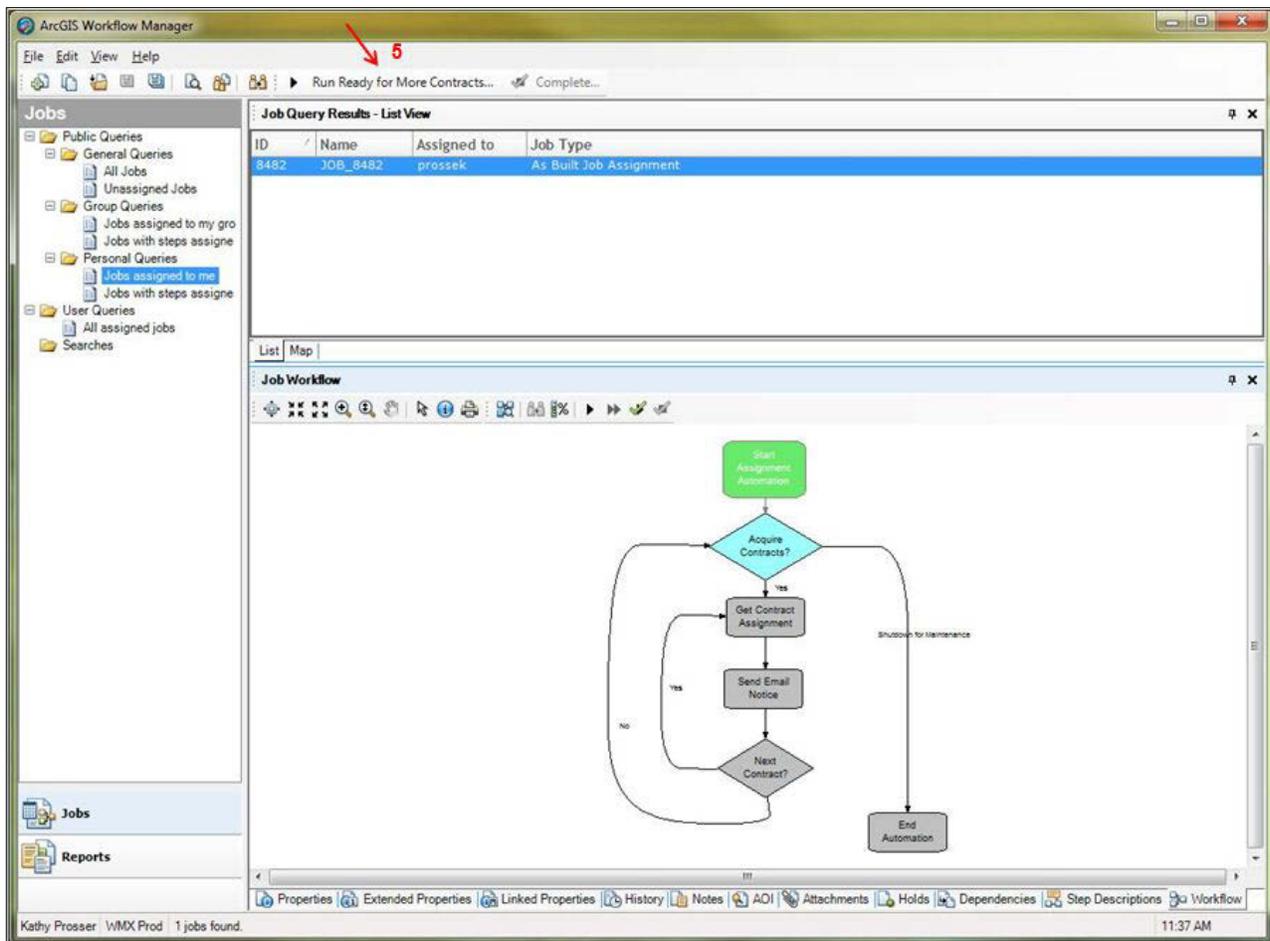
Workflow Steps

1. Click on **Jobs assigned to me** under Personal Queries along the left side of the WMX window (1).
2. Highlight the **As-Built Job Assignment** in the Job Query Results – List View window at the top of the WMX window (2). If the list view has been minimized, see the [Troubleshooting](#) section.



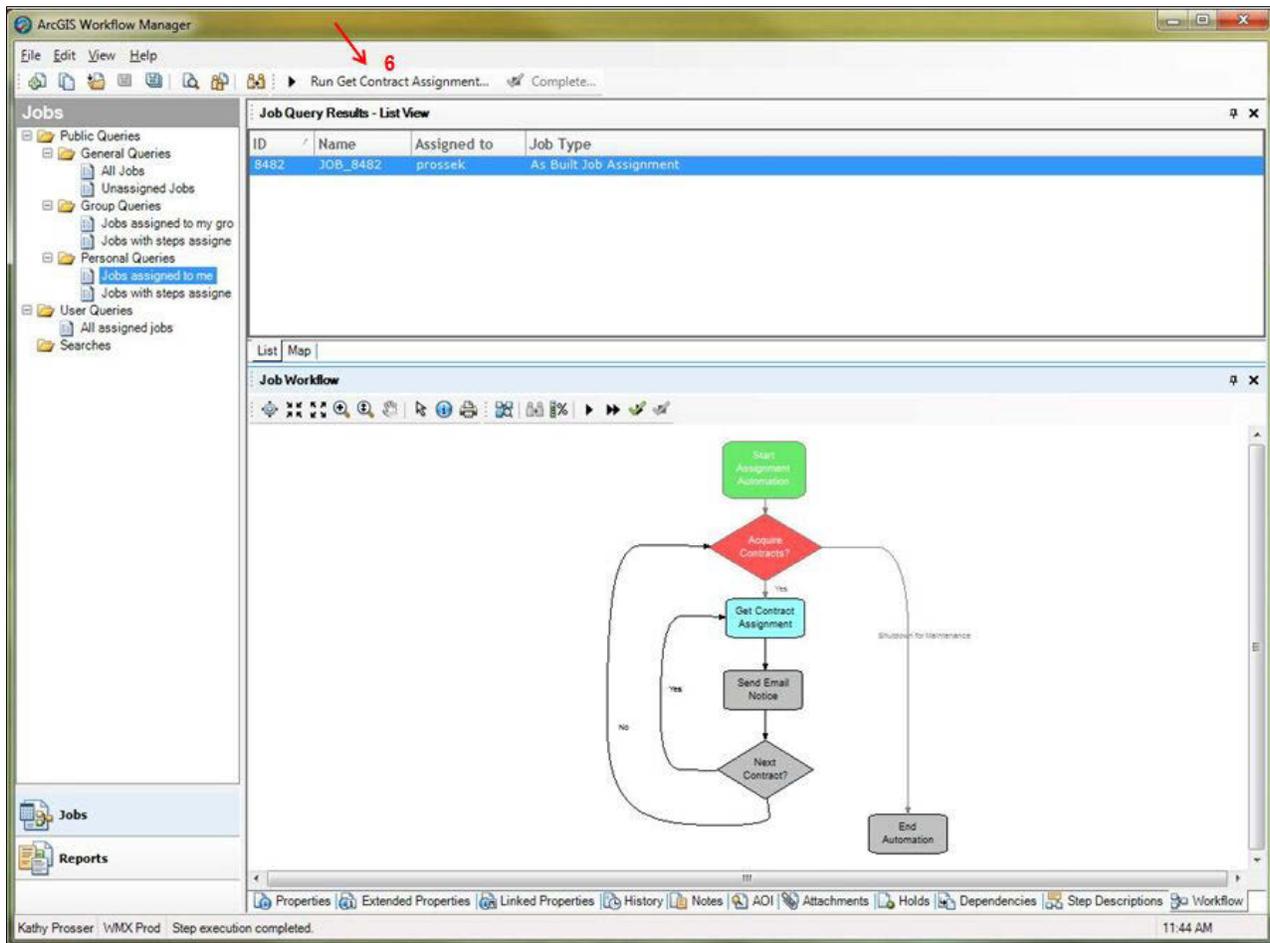
3. Click on the **Workflow tab** at the bottom of the screen (3). The Workflow tab displays the workflow diagram. The current step in the workflow is highlighted in light blue.
4. You can move from step to step in a workflow by using the Workflow Tools shortcut at the top of the WMX window (4), which changes depending on the step you're on.
5. The first time you use this workflow, the first step will be highlighted – Start Assignment Automation. Click **Complete Start Contract Automation...** (4) at the top of the WMX window.

- The “Acquire Contracts?” step highlights next. Click **Run Ready for More Contracts...**(5) at the top of the WMX window.

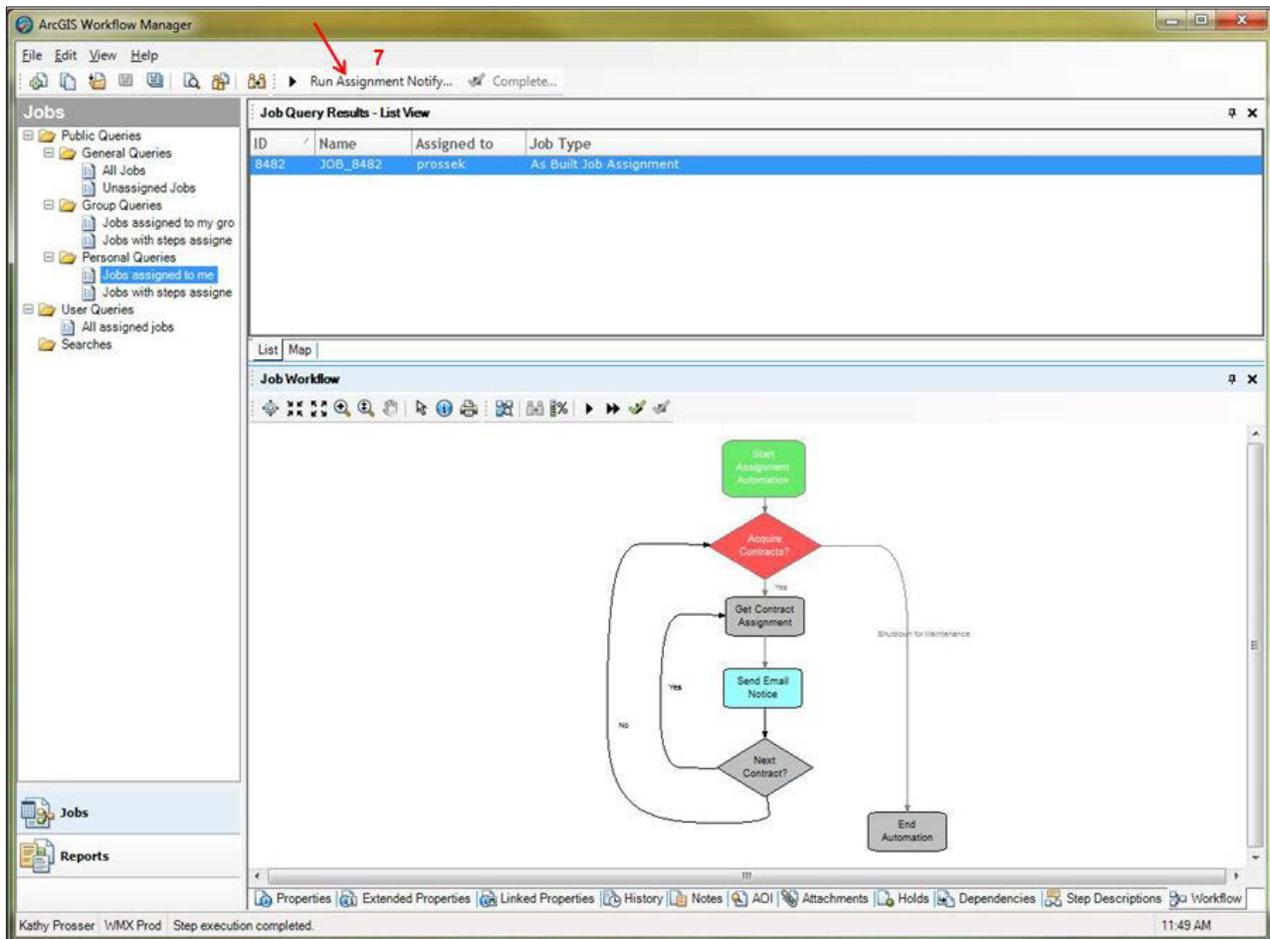


- You’ll be asked if you’re “Ready for contract assignments?” The choices are Yes, Cancel, and Shutdown for Maintenance. Click the **Yes** button to continue.

- The “Get Contract Assignment” step will be highlighted. Click **Run Get Contract Assignment...(6)** at the top of the WMX window.



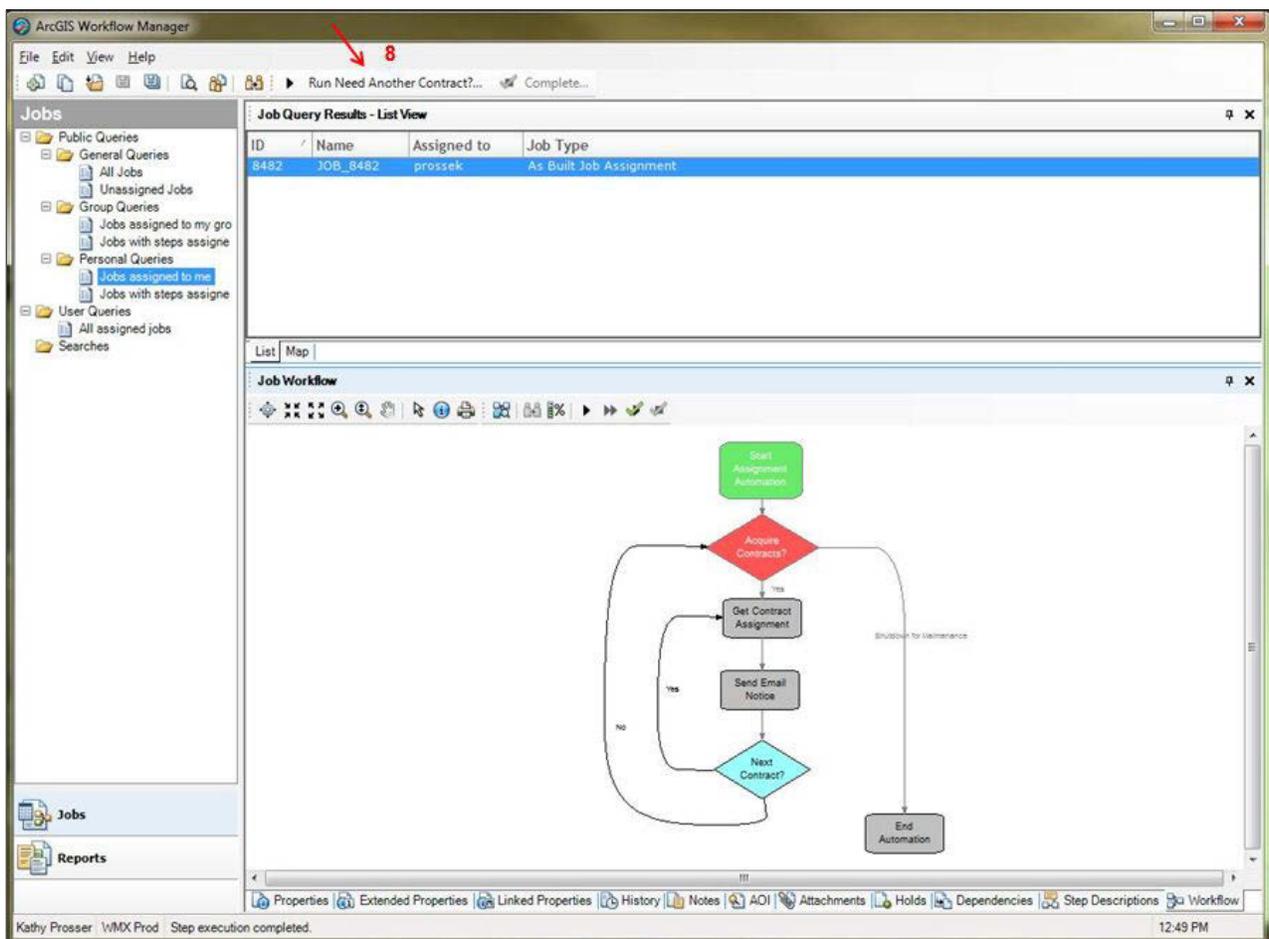
- The “Send Email Notice” step will be highlighted. Click **Run Assignment Notify...** (7) at the top of the WMX window.



This step will send you an email (see example below) from WMX notifying you of the contract number you’ve been assigned. The Stormwater Features Inventory (SFI) Group Data Steward (Data Steward) and the SFI Group Coordinator (Coordinator) will also be notified. **Write down the contract number in your project notebook.**

Contract number 006179 has been assigned to Kathy Prosser from machine HQA6158001. Run Screen-digitize As-builts.

10. The “Next Contract?” step will be highlighted. Click **Run Need Another Contract?... (8)** at the top of the WMX window.



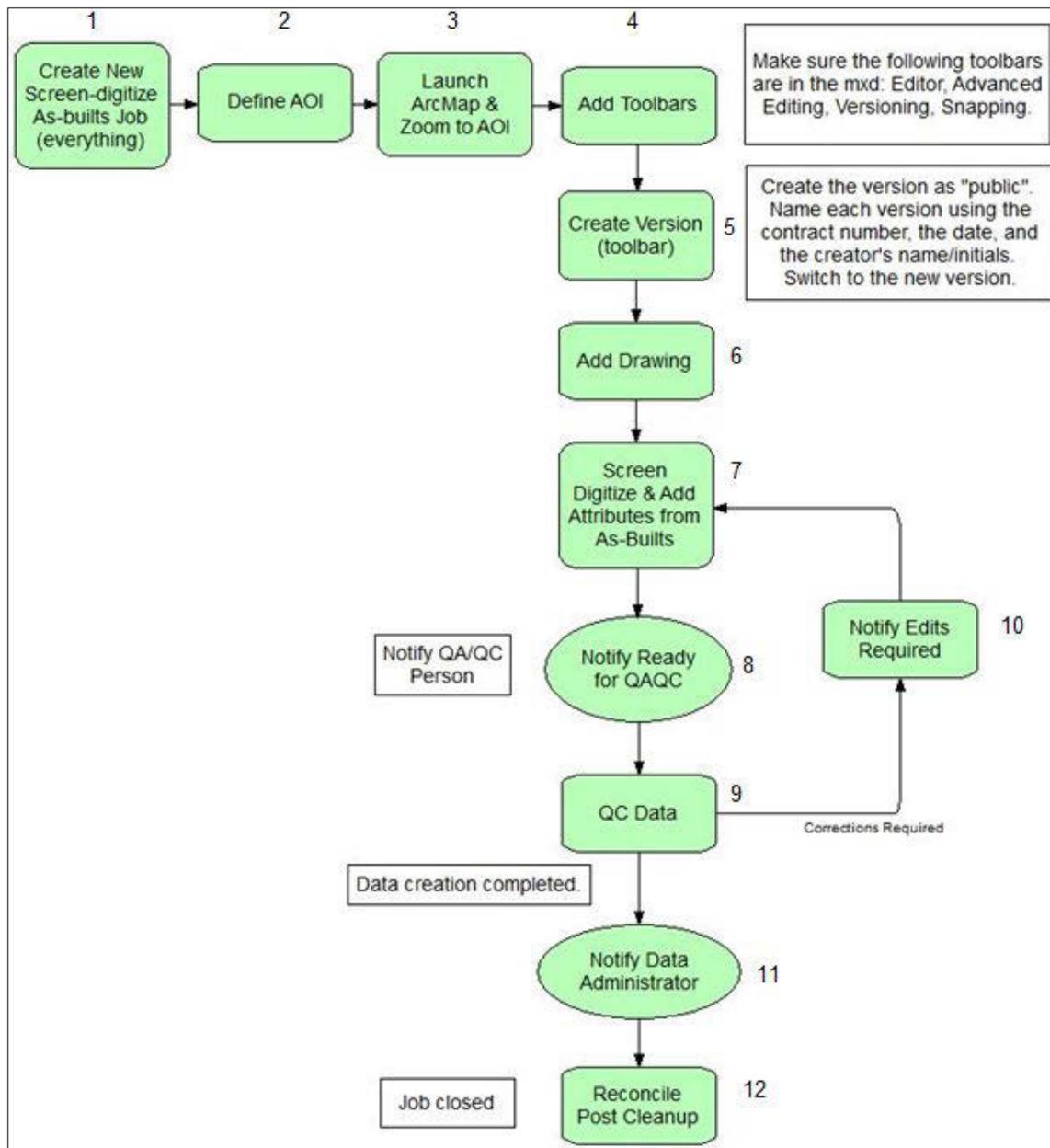
11. You’ll be asked “Do you need another contract number?” Answer **Yes** or **No** as the case may be. If you click the Yes button, the “Get Contract Assignment” step is highlighted and you can proceed around the loop again so multiple contracts can be assigned. If you click the No button, the “Acquire Contracts?” step is highlighted and you can quit the loop by either closing WMX or moving to the *Screen-digitize As-builts* workflow.

12. **Rerun this workflow whenever you need more contracts to work on.** The next time you run this workflow, you’ll start with Step 1, but instead of seeing “Complete Start Contract Automation...” at the top of the WMX screen, you’ll see “Run Ready for More Contracts....” Click **Run Ready for More Contracts...** to start the cycle.

4-0 Screen-digitize As-builts

This workflow guides users through office data collection activities from the scanned, georeferenced as-builts. *Screen-digitize As-builts* workflow processes begin with the creation of a new job in WMX for a new contract, end with new data being reconciled and posted to WSDOT's enterprise GIS database, and the job is subsequently closed. Each contract will be a separate job in WMX.

Processes in this workflow are numbered from 1 to 12 in the diagram below. Processes 1-8 are completed by the Data Editors, Processes 9-11 are completed by the Data Stewards, and Process 12 is completed by the Data Administrator. Each of these processes will be described in the sections that follow.



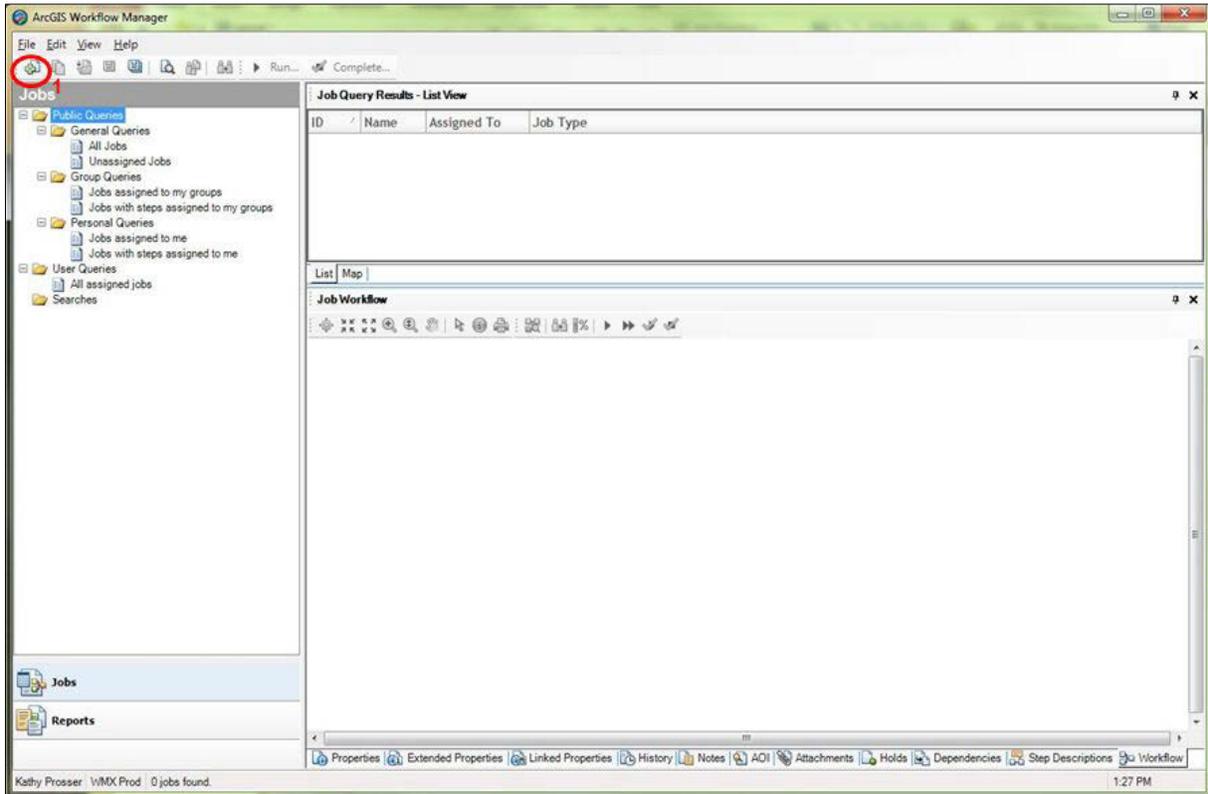
4-0.1 Running the Screen-digitize As-builts Workflow

Screen-digitize As-builts workflow processes occur sequentially (shown in the following sections).

4-0.1.1 Data Editor: Workflow Processes

1. **Create New Screen-digitize As-Builts Job** – The first step in this workflow is the creation of a new WMX job for a newly assigned contract.

- a. Click the **Create new job(s)** button (1) in the WMX toolbar.



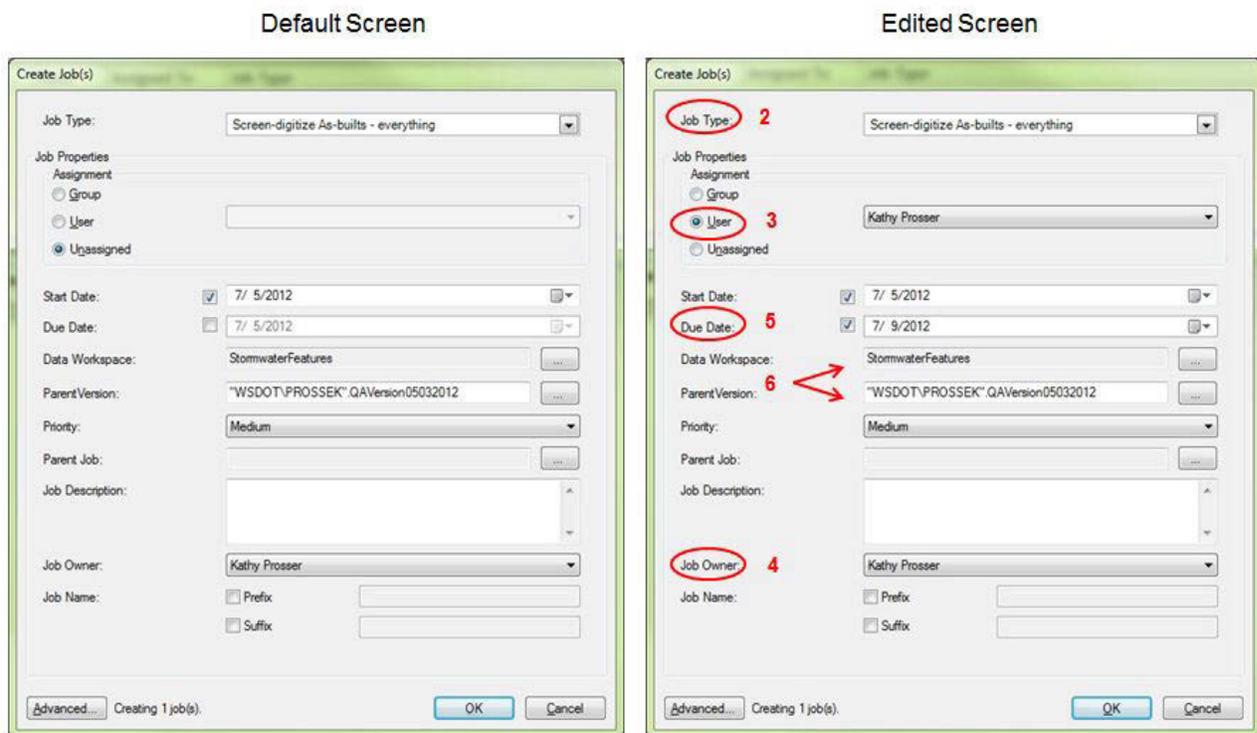
Workflow Strategies

There is a great deal of variability in the drawings. The image scan quality ranges from sharp to blurry. Some drawings are relatively simple with few features and details, and others are a complex network of many overlapping features. Each person editing will develop a flow that allows for accurate digitizing. Some strategies are described below. In each case, it's most efficient to work on one drawing sheet at a time before moving to the next. Suggested strategies are:

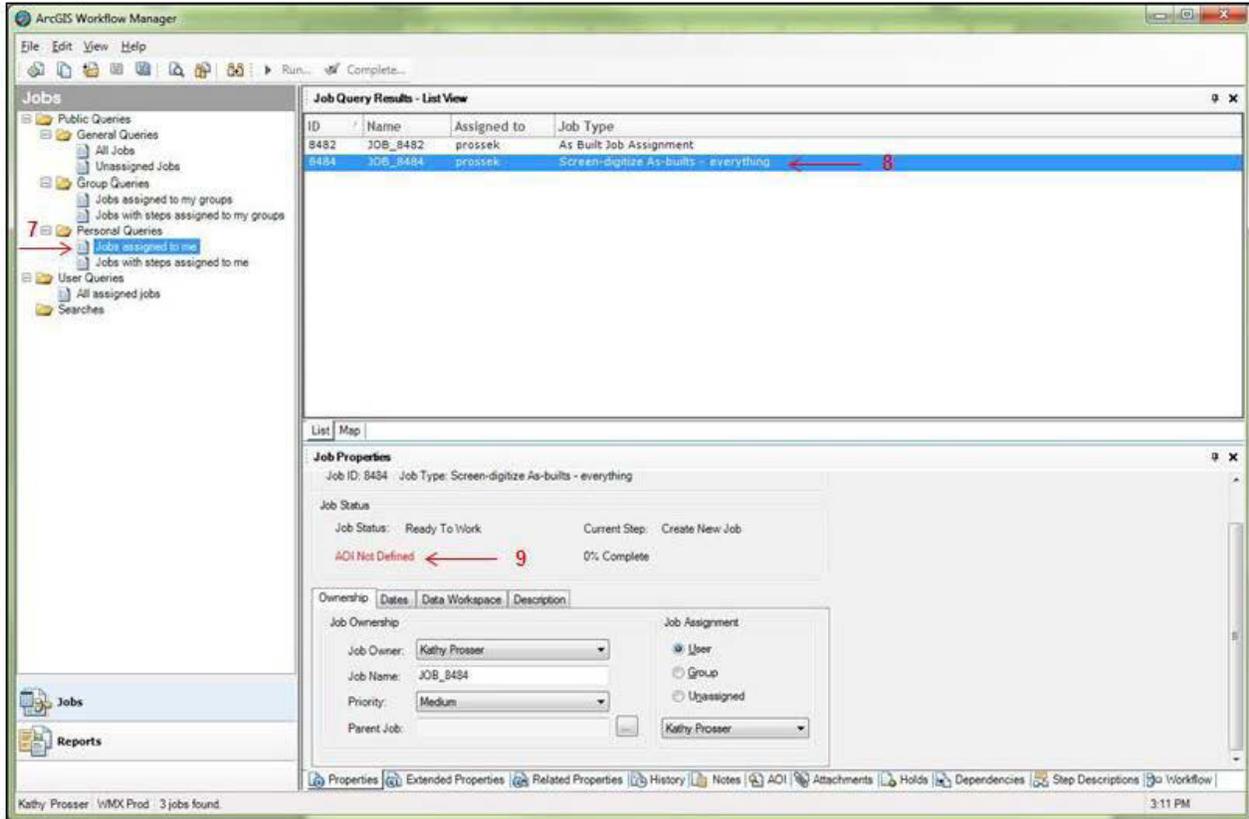
1. Write down information you get from the as-built cover sheet, such as start and end dates, as-built number, and project title. This is useful when filling in default values in the edit templates. It may also be helpful to note which pages in the PDF contain the Structure Notes, Drainage Profiles, and Drainage Detail Sheets.
2. Start with one feature type, i.e., points. Digitize all the point feature classes, filling in the attributes for each point as they are digitized. Then move on to lines, etc.
3. Digitize all features classes. Work across the page, or follow the water flow, digitizing each feature as you come to it and filling in attributes as each feature is created.
4. Digitize features shown on the Drainage Profile Sheet first (where the most information is). Next, digitize the features that have Structure Notes. Then start at one end of the sheet and follow the water flow to fill in the complete system. Starting with features that have the most information in the plan set helps you figure out the stormwater system.

Use thoughtful judgment when digitizing the data; **thoroughness and accuracy are more important than speed.**

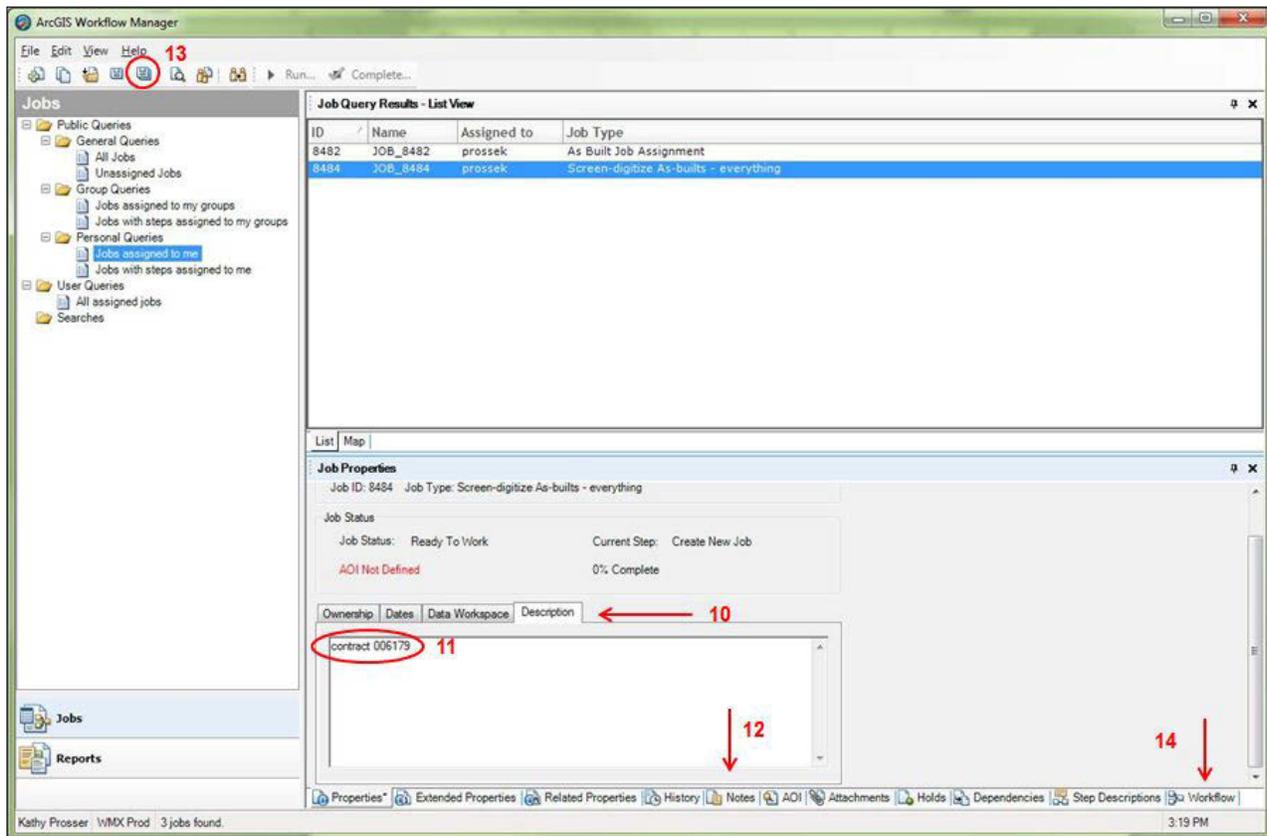
- b. If needed, check and edit the following fields in the Create Job(s) screen.
- The Job Type should be “Screen-digitize As-builts – everything” by default (2). If not, use the drop-down list to select it.
 - In the “Assignment” section, change Unassigned to User, then use the drop-down list to select your name (3).
 - Your name should come in automatically as the Job Owner (4).
 - Put a check in the box associated with “Due Date” to activate this option (5), then use the drop-down arrow to bring up a calendar. Click on a date to select it.
 - The “Data Workspace” and “Parent Version” should come in automatically (6). If not, you can use the Ellipsis button (...) to select them. The Parent Version name will change over time; the format will remain the same (WSDOT\“Version creator’s username”.QAVersion”Date”), but the date will change as data is rolled up to the WSDOT enterprise GIS database. If you have a question about what the Parent Version should be, ask the Data Steward.
 - When finished, click **OK**.



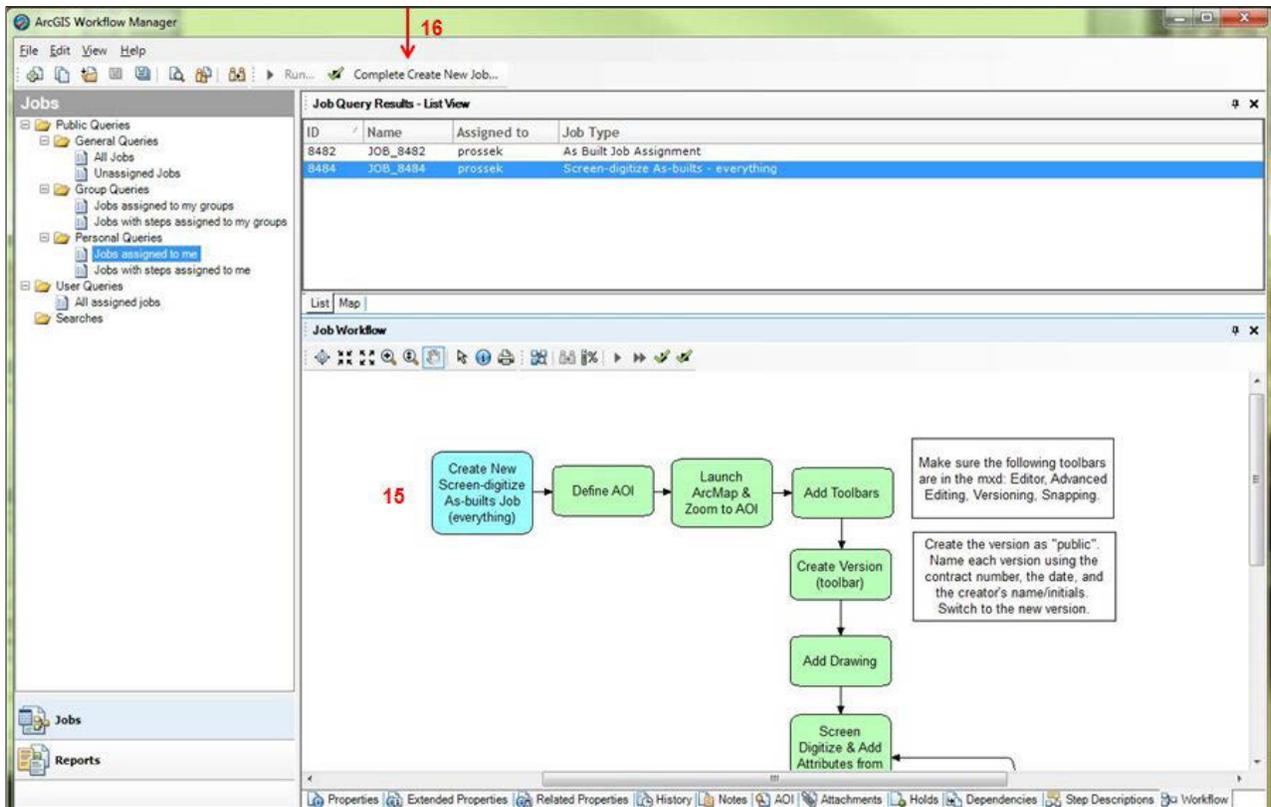
- c. The new job will now appear in “Jobs assigned to me” under Personal Queries (7).
- d. If you highlight the new job in the Job Query Results – List View window (8), you can see in the Job Properties window that the AOI is not defined (9).



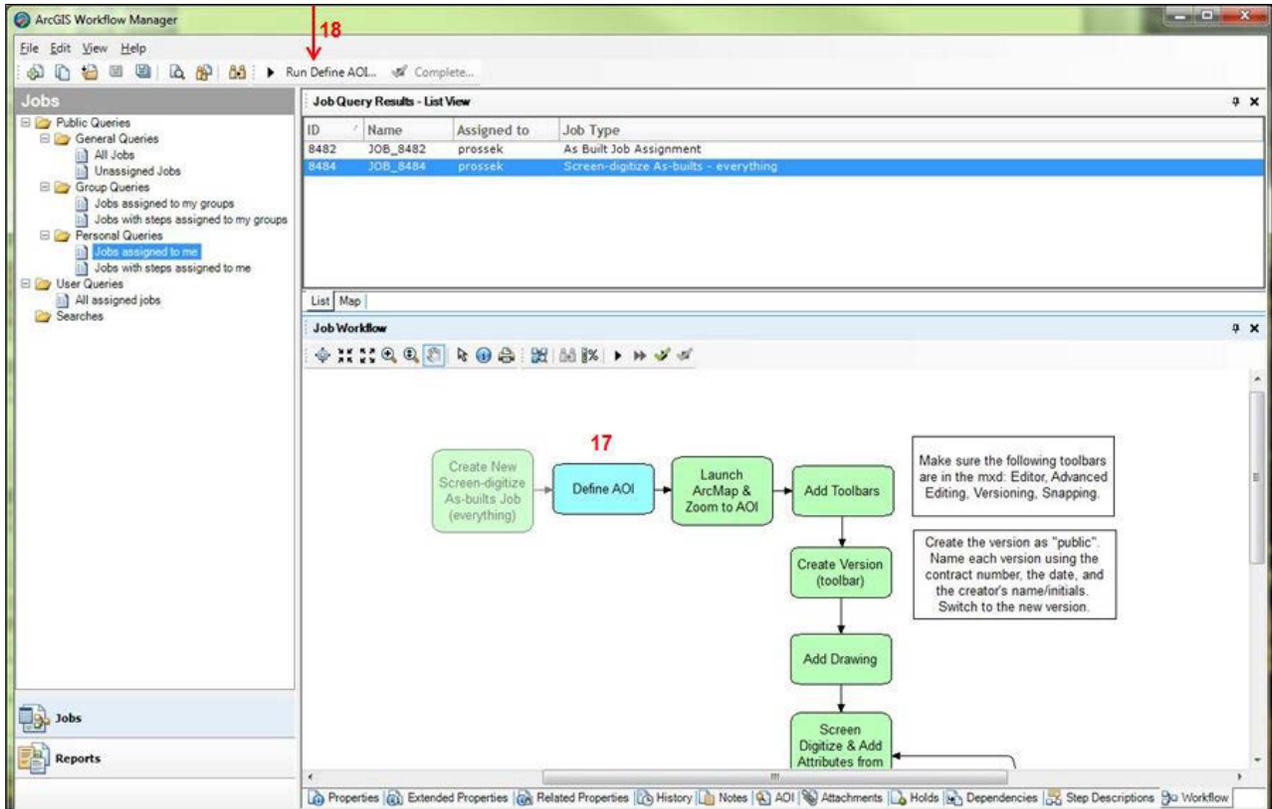
- e. In the Job Properties window Description tab (10), type the **contract number (11)** (which you will get from the email notification sent to you). You must save after doing this. Click **Save all the modified job properties** button (13).
- f. In the lower window, scroll over to and click on the **Workflow tab (14)**.



- g. The “Create New Screen-digitize As-builts Job” (15) step will be highlighted. At the top of the WMX window, click **Complete Create New Job...** (16). The next step will highlight.



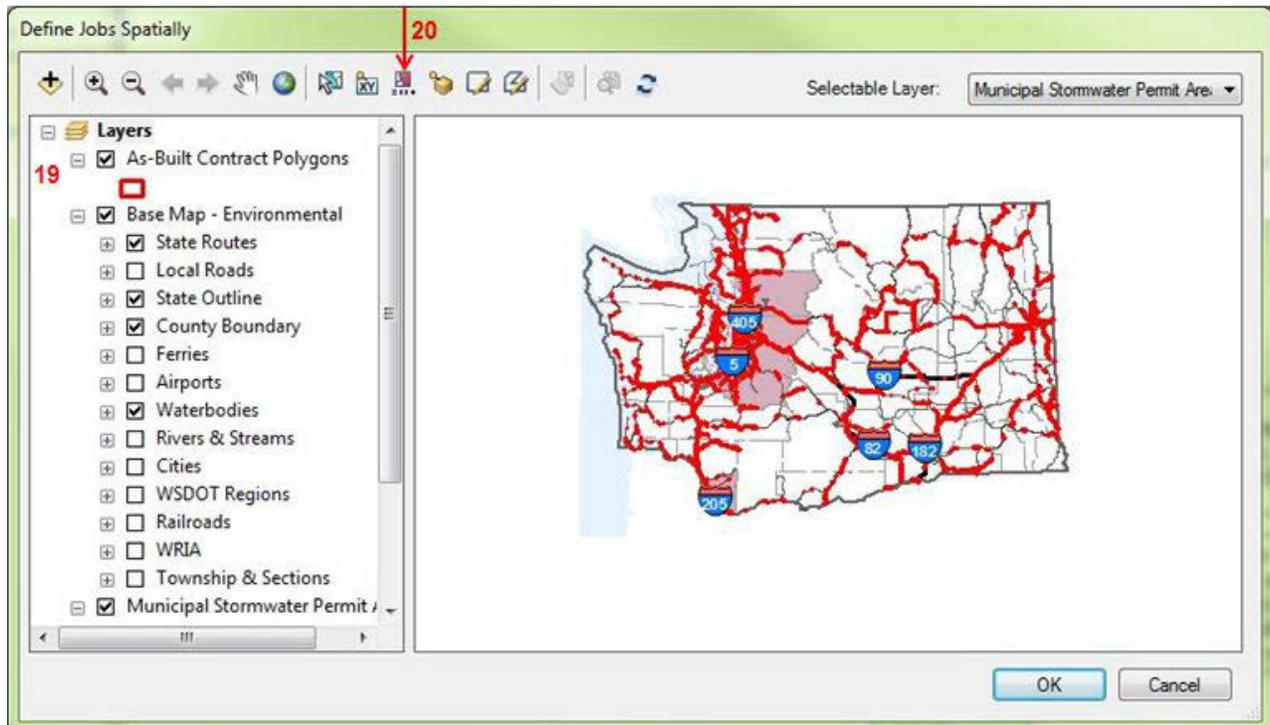
2. **Define AOI** – In this step, the Area of Interest (AOI) for the contract is defined.
 - a. With the “Define AOI” (17) step highlighted in the Job Workflow screen, click **Run Define AOI...** (18) at the top of the WMX window.



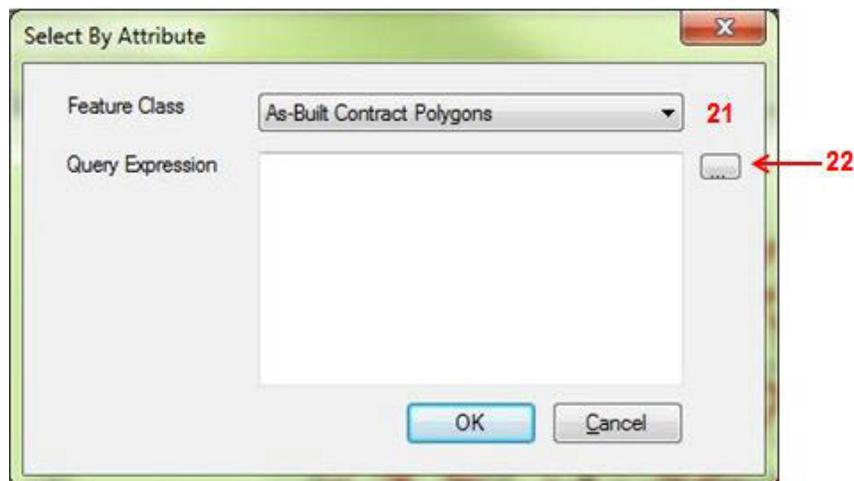
D
a
t
a

E
d
i
t
o
r

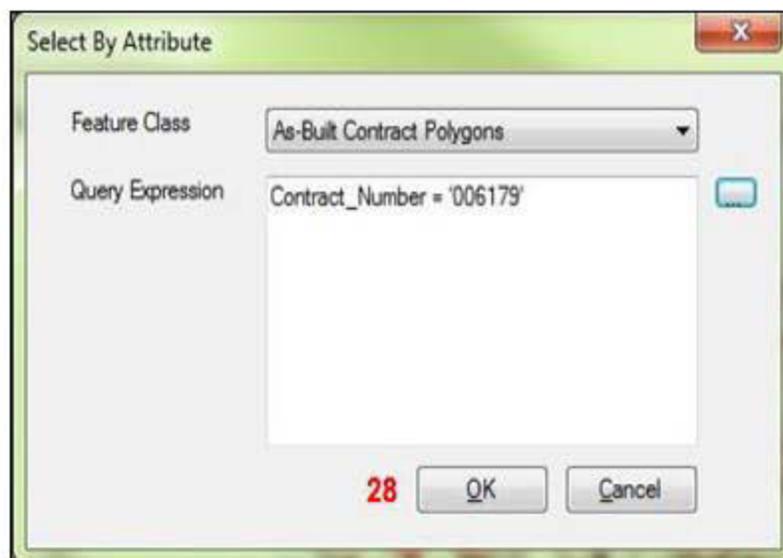
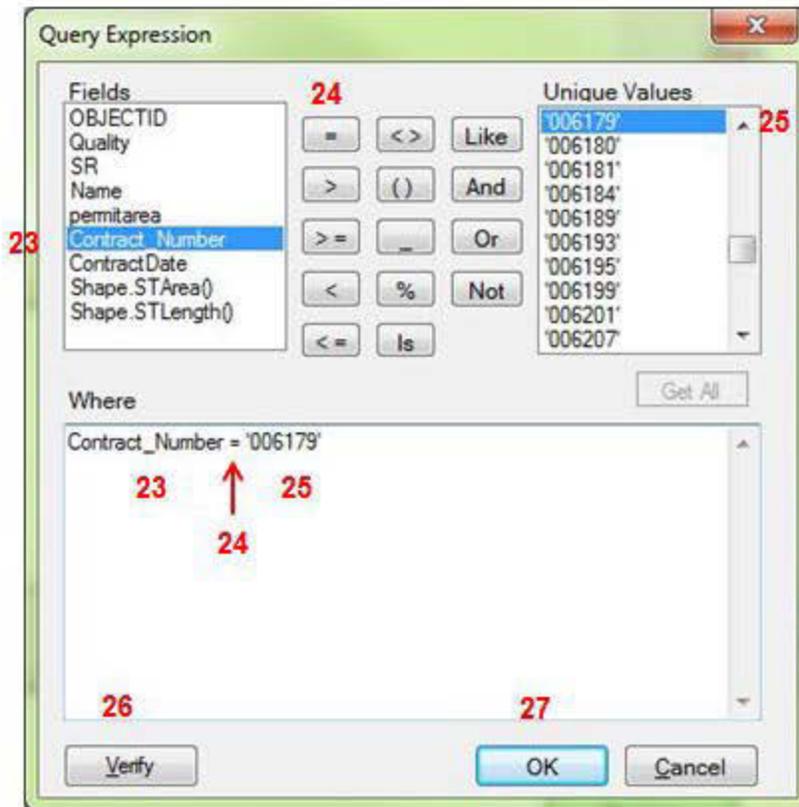
- b. A new window opens up that is titled Define Jobs Spatially. It displays a basemap, which includes a layer of AOIs called As-Built Contract Polygons (19). This layer is based on the available contract as-built plans.
- c. Click on the **Select by Attribute** button (20) in the new window's toolbar. The Select By Attribute window opens.



- d. From the Feature Class drop-down list, select **As-Built Contract Polygons** (21).
- e. Click the **Ellipsis button (...)** next to the Query Expression window (22) to open a new window where a query can be created.



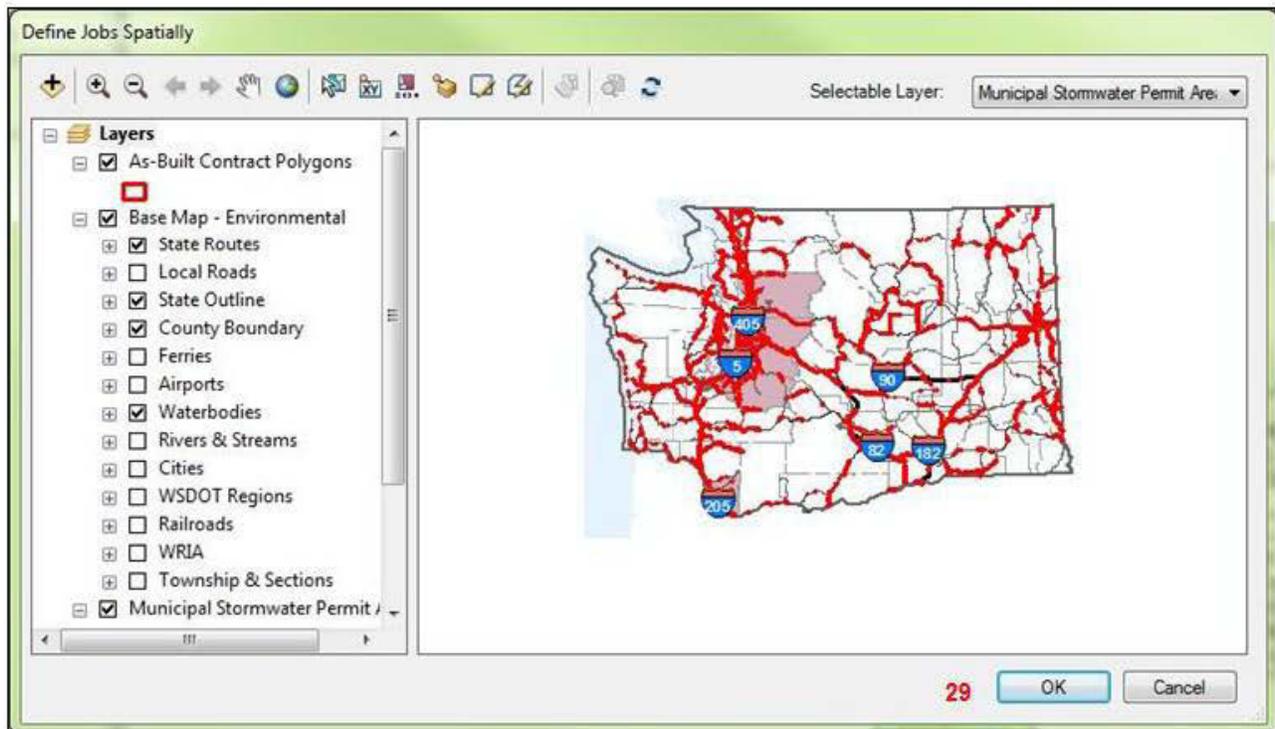
- f. Create a query to select the AOI based on the contract number (23, 24, 25). Click on the **Verify** button (26) to verify the query. Click **OK** (27) once the query is verified, and again to select using the query (28).



D
a
t
a

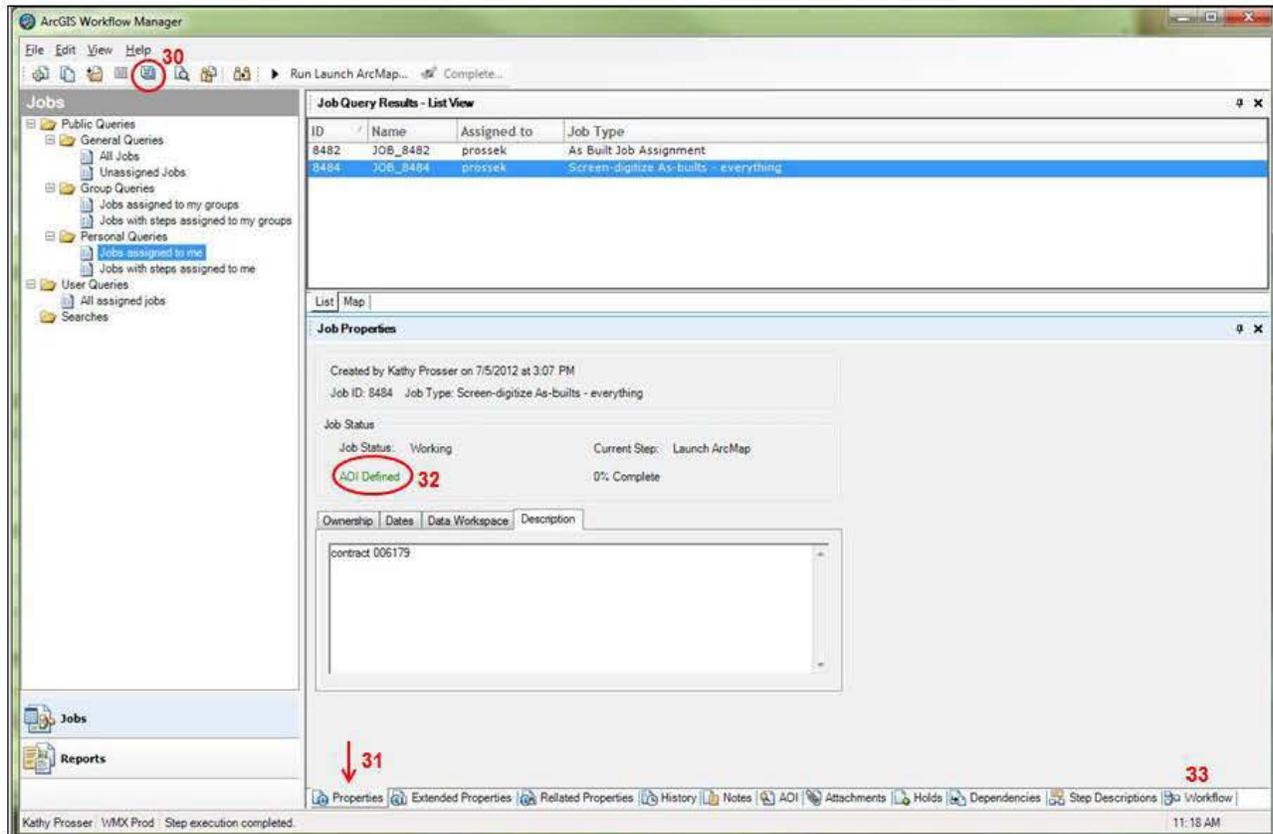
E
d
i
t
o
r

- g. Click **OK** (29) to close the Define Jobs Spatially window.

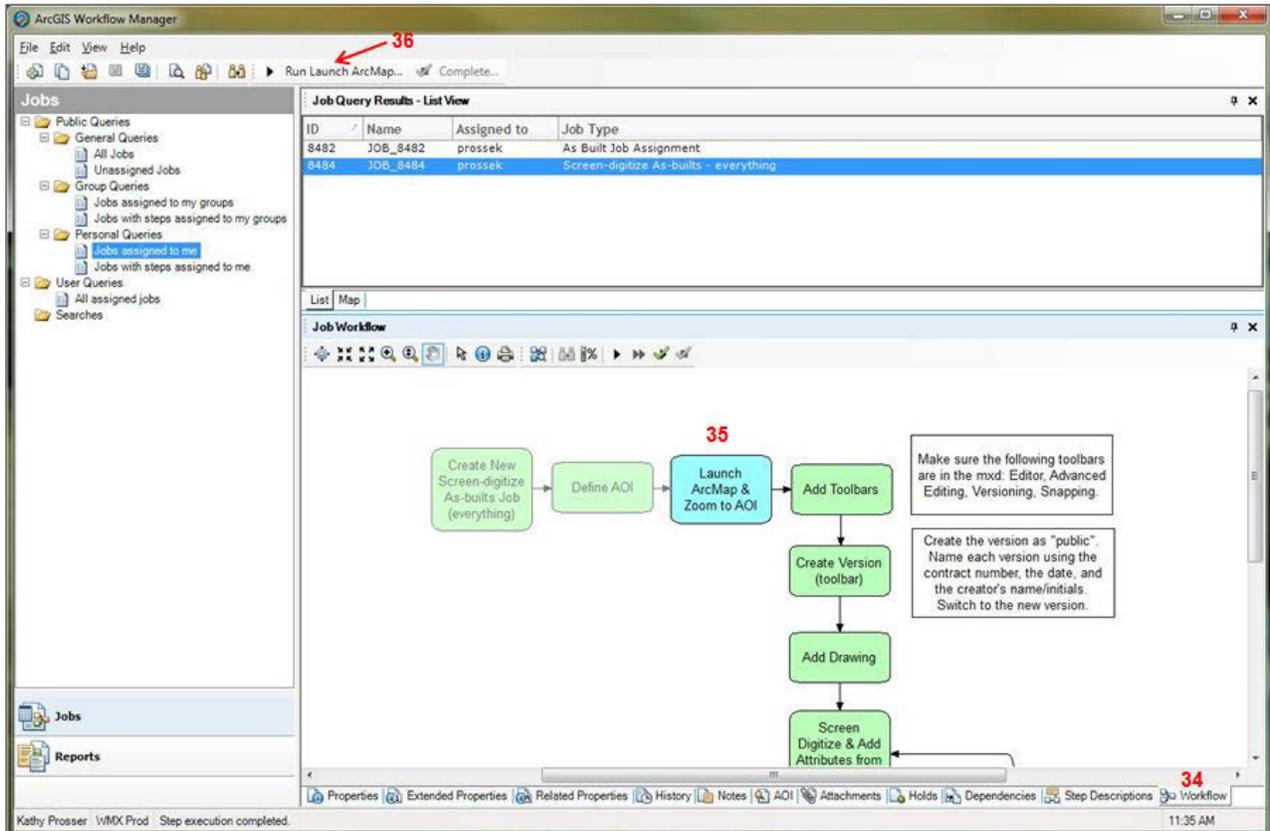


Data Editor

- h. Click the **Save all the modified job properties** button (30) in the WMX toolbar at the top of the window.
- i. When you return to the Job Properties tab (31), the AOI will now be defined (32).
- j. In the Workflow tab (33), the next step in the workflow will be highlighted.

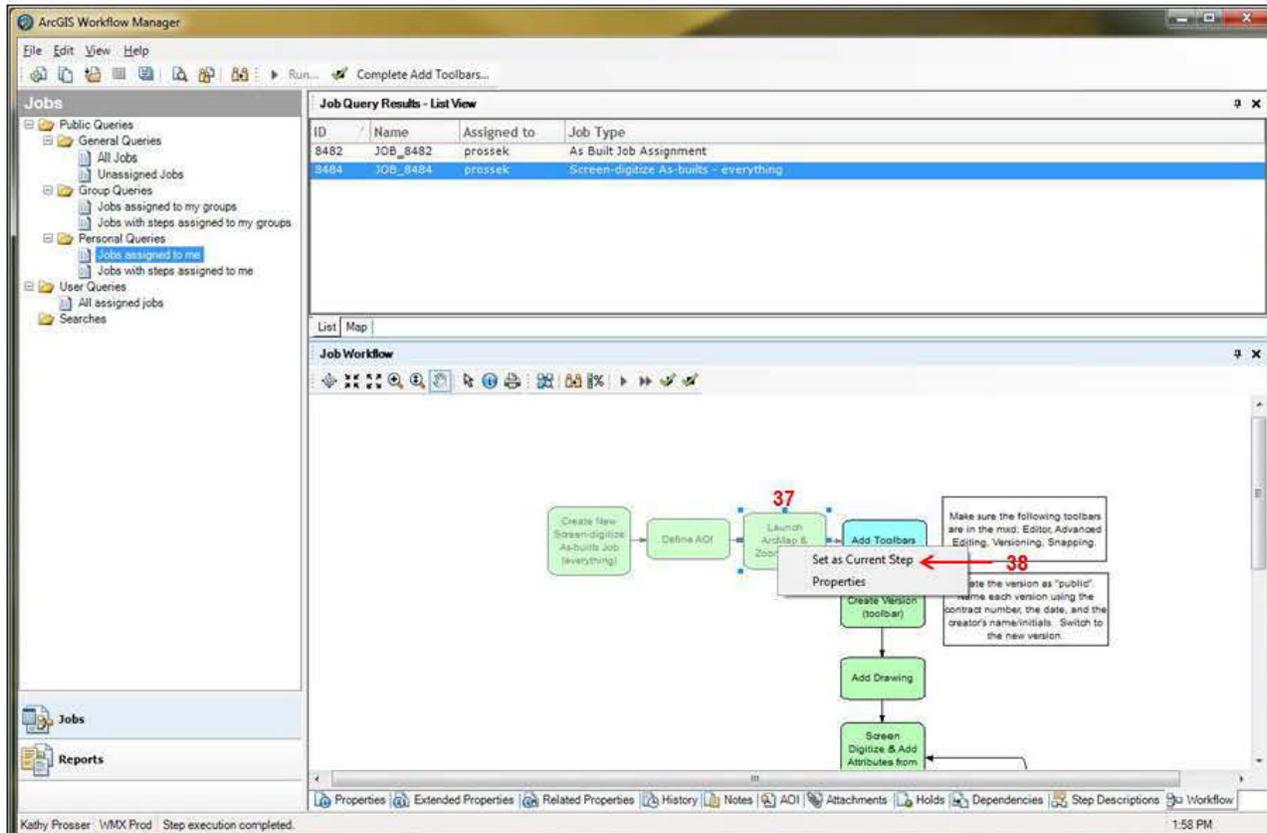


3. **Launch ArcMap™ & Zoom to AOI** – In this step, ArcMap™ is opened with the editing template. The new mxd must be saved to your workspace.
 - a. In the Workflow tab (34), the “Launch ArcMap & Zoom to AOI” step (35) is highlighted.
 - b. Click **Run Launch ArcMap...** (36) at the top of the WMX window.

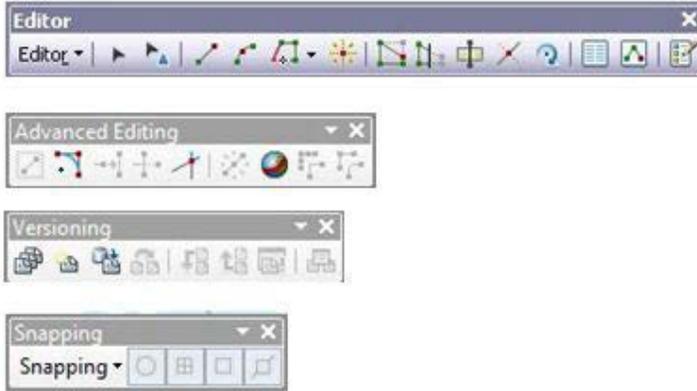


- c. ArcMap™ will open with an mxd designed for the screen-digitizing workflow. By default, the mxd will be named for the current job number (not the contract number) and will zoom to the current AOI.
- d. The first thing you should do after you launch ArcMap™ is a **Save As**. In both Windows XP and Windows 7, the mxd is saved by default to your hard drive. To make the mxd accessible to others, do a **Save As** and save the mxd to your user workspace on: Q:\. Add the Contract Number to the name so it looks like this: **Job_####_Con####**. This provides some context to the mxd. If you forget to do this:
 - In Windows XP, the mxd is saved by default to **C:\Documents and Settings\All Users\Application Data\ESRI\WMX\Jobs**.
 - In Windows 7, the mxd is saved by default to **C:\ProgramData\ESRI\WMX\Jobs**.

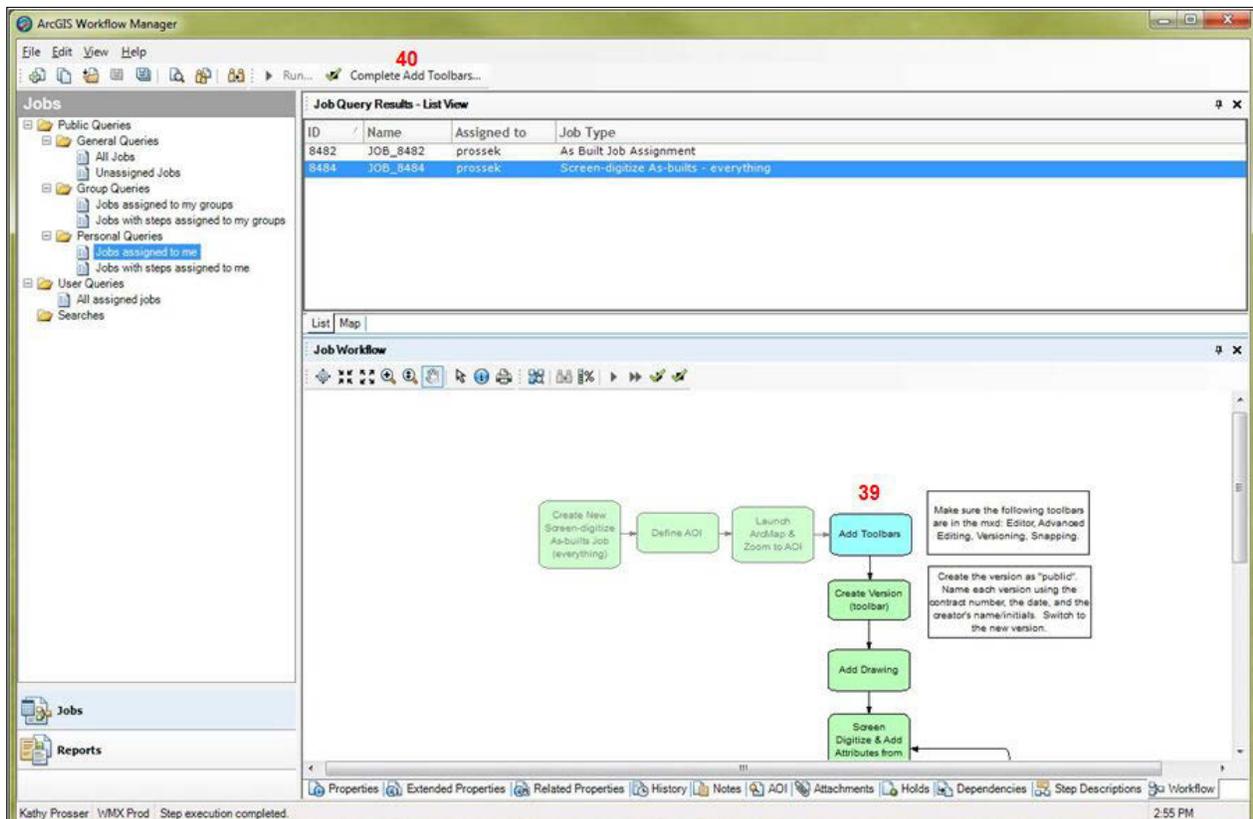
- e. If you have problems launching ArcMap™ and need to cancel out of the process, WMX will usually show this step as completed and highlight the next step “Add Toolbars.” In order to move back a step and retry the “Launch ArcMap” step, right-click on **Launch ArcMap & Zoom to AOI (37)** and click on **Set as Current Step (38)**. Then you can restart at [Step 3b](#).



4. **Add Toolbars** – Once ArcMap™ has successfully opened, the next step is to ensure the toolbars needed for editing are available.
 - a. The toolbars needed for screen-digitizing from as-builts are: Editor, Advanced Editing, Versioning, and Snapping.



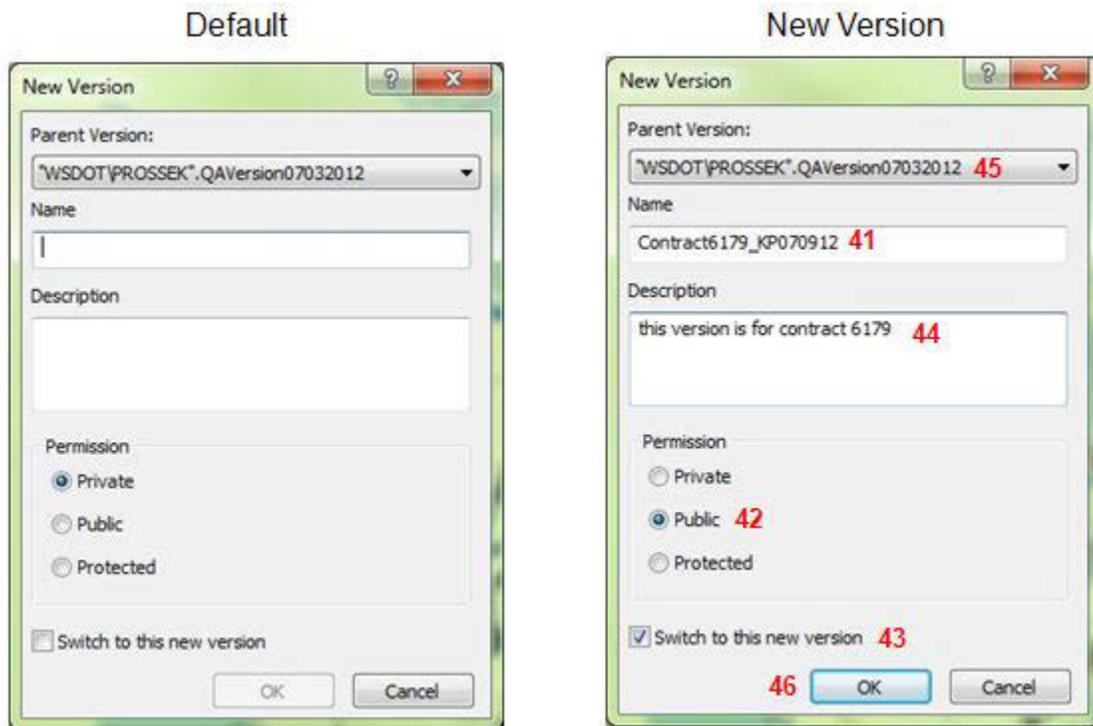
- b. If you need to add any of these toolbars, go to the ArcMap™ menu and click on **Customize**, then click on **Toolbars**, then click on the toolbar(s) needed.
- c. With the “Add Toolbars” (39) step highlighted in WMX, click **Complete Add Toolbars...** (40) at the top of the WMX window.



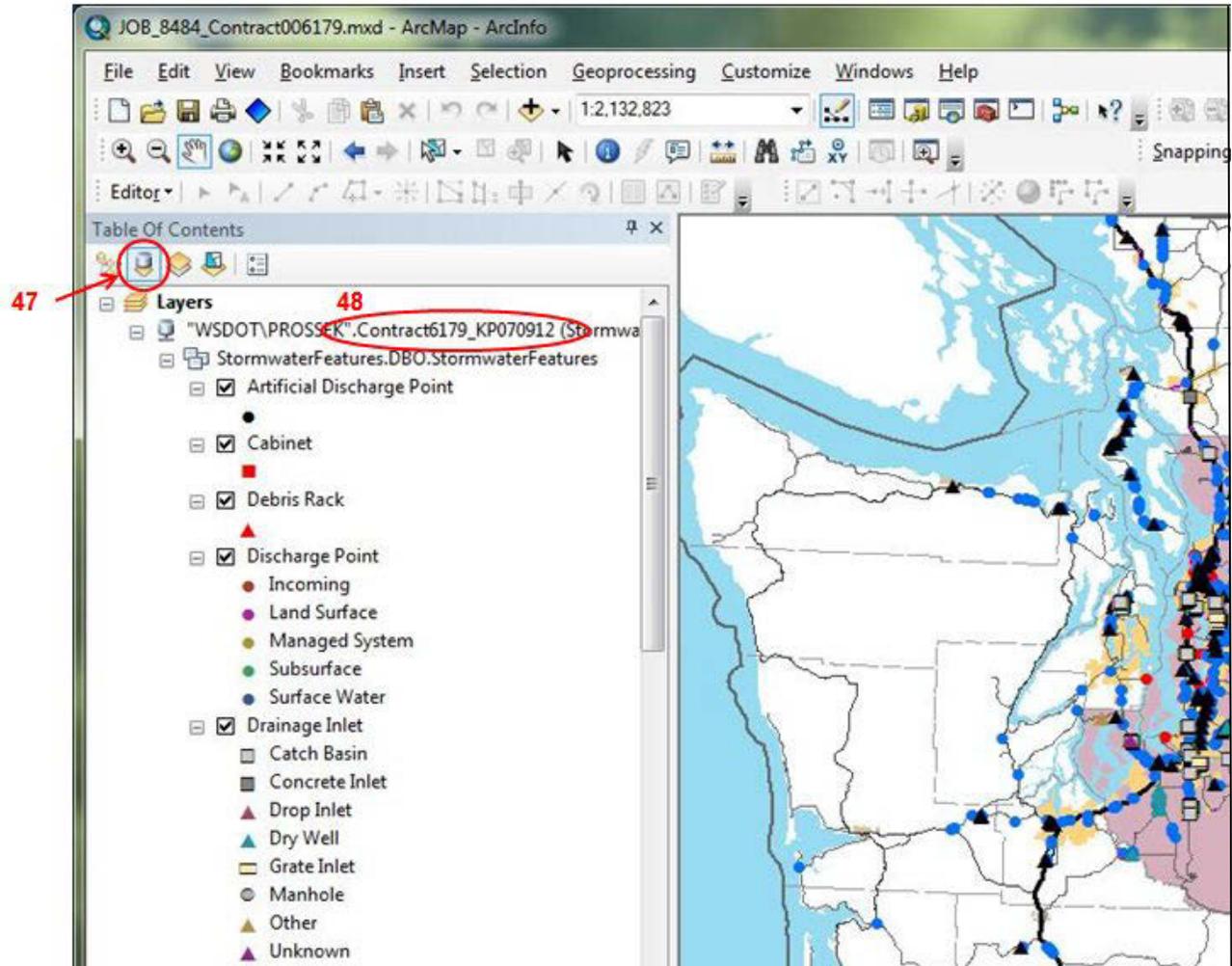
5. **Create Version** – In this step, you’ll create and name a version for the edits associated with the current job’s contract. Each contract will have its own version. All edits will be made in a version of the production SFI geodatabase. An ArcEditor™ or ArcInfo® license is required for editing a version.



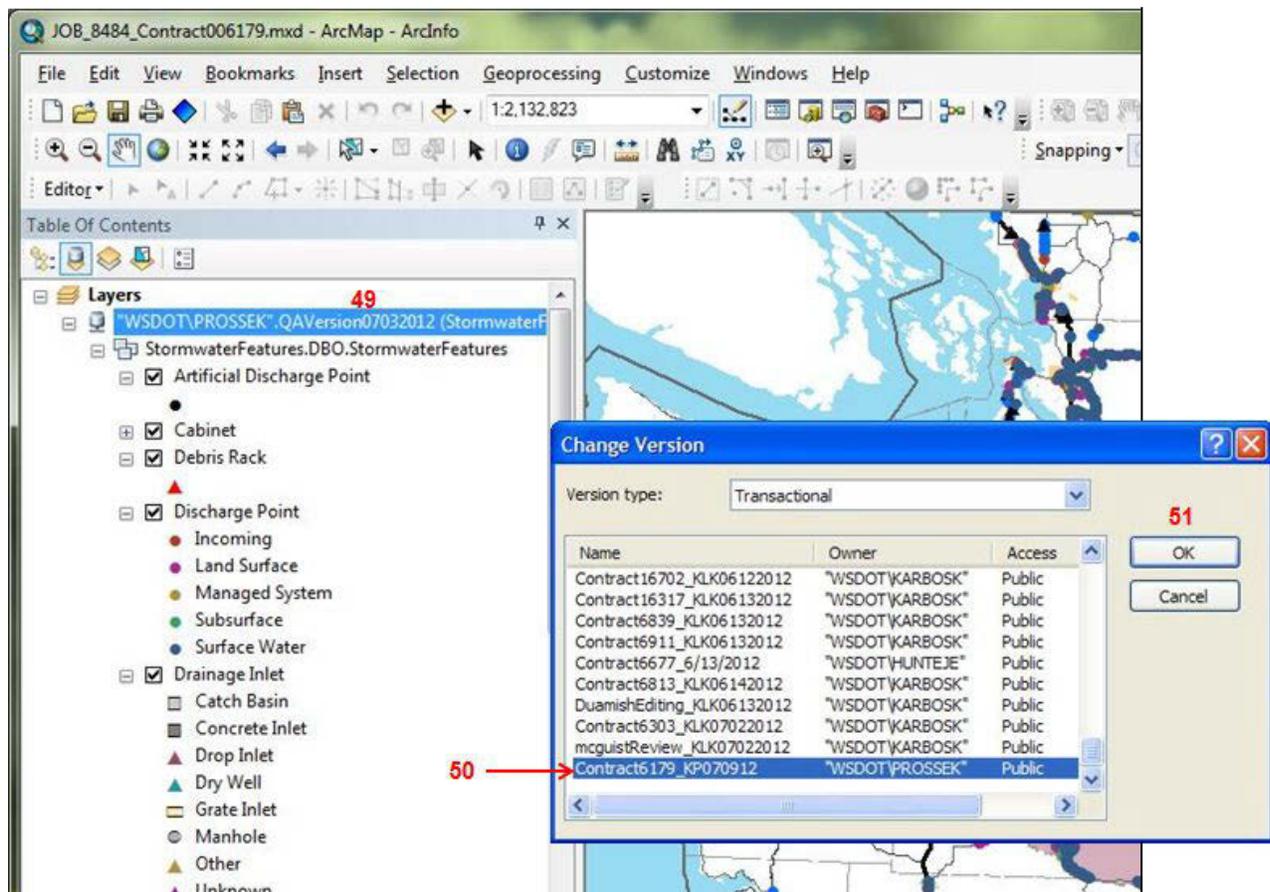
- a. In ArcMap™, click the **Create New Version** button on the Versioning toolbar.
- b. In the New Version window, name the version starting with the word **Contract**, then the **contract number, underscore, your initials, and the date the version was created (41)**. Change the Permission from **Private** to **Public (42)**. Check **Switch to this new version (43)**. A description may be useful **(44)**, but isn’t required. The Parent Version will be different, starting with “QAVersion” followed by the date **(45)**.
- c. Click **OK (46)**.



- d. After creating and switching to a new version, double-check the data in your mxd to make sure you're actually using the versioned data. Check by using the **List by Source** view in the Table Of Contents (47). The source for the Stormwater Features should be the version you just created (48). Save **mxd**.

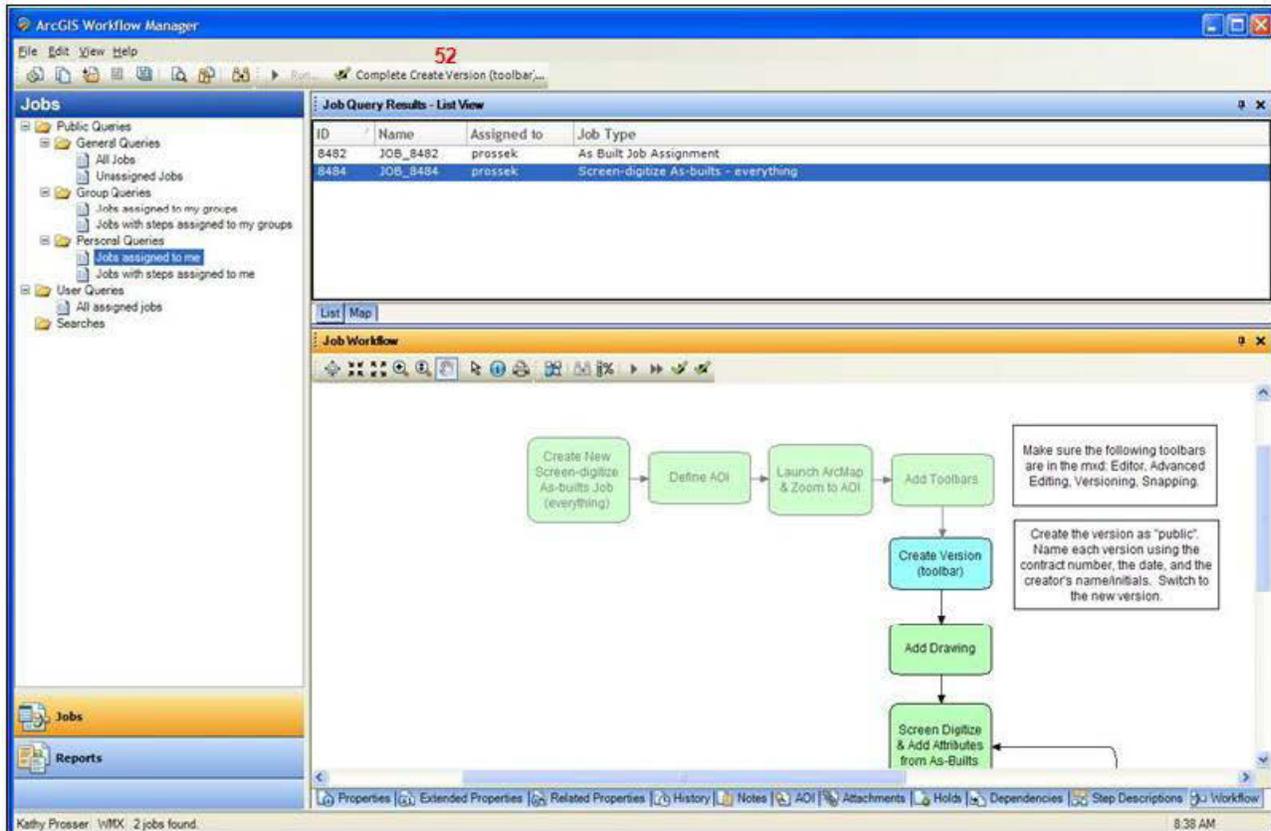


- e. If you create a new version but forget to switch to it in [Step 5b](#), the “List by Source” view is where you can remedy the situation. Right-click on the **source name of the Stormwater Features**, in this case QAVersion07032012 (49). Three options come up. Select **Change Version**. The Change Version Window opens. Scroll through the versions listed until you find the version you just created. Click on the **version name** (50), then click **OK** (51). Save mxd.

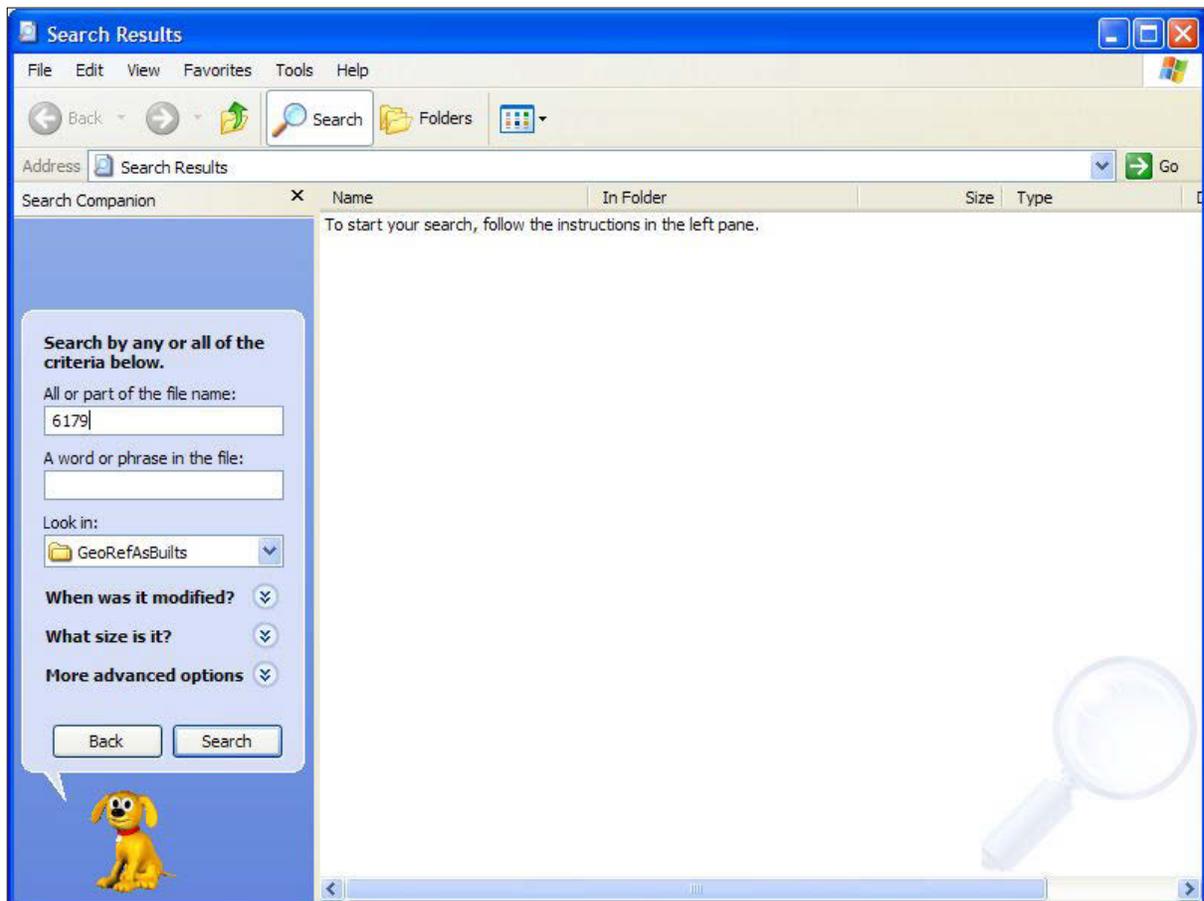


Data Editor

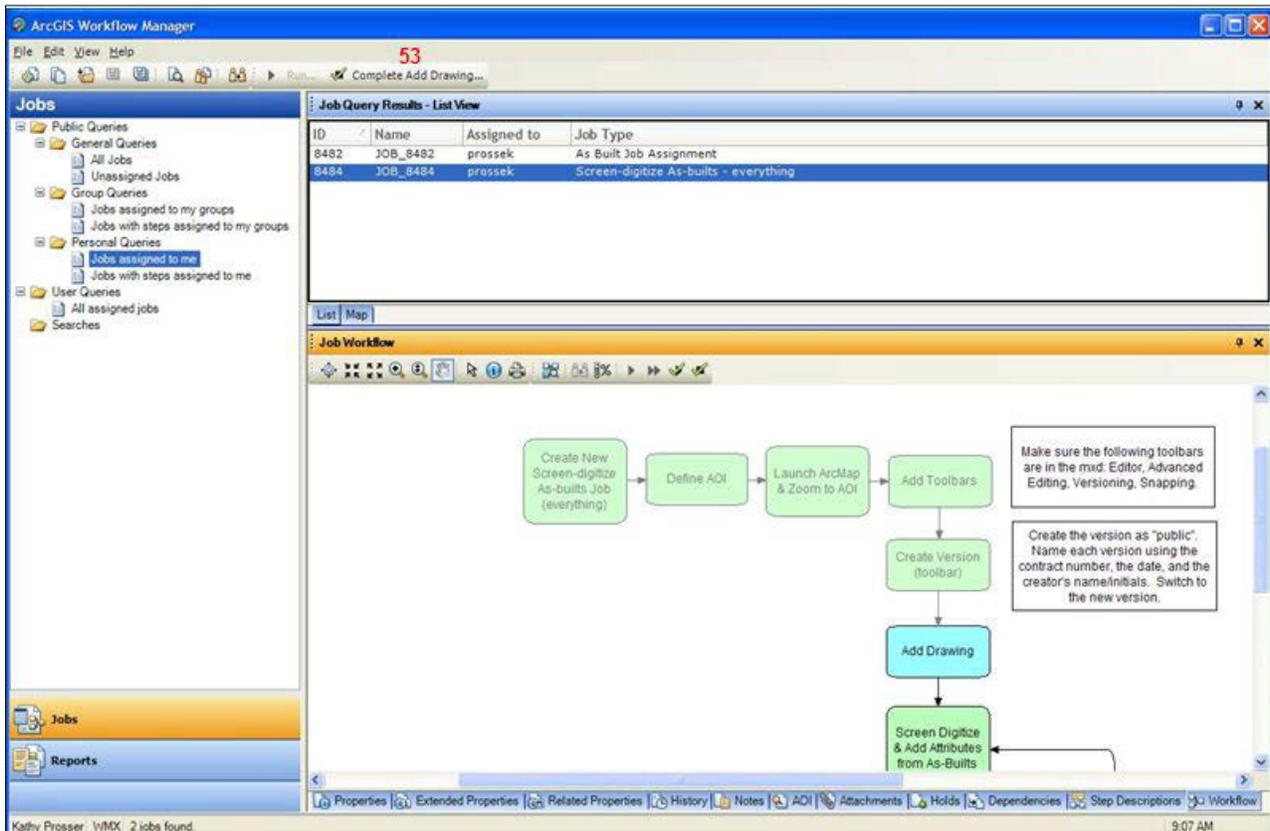
- f. In WMX, click **Complete Create Version (toolbar)...** (52) at the top of the WMX window.



6. **Add Drawing** – Add the contract as-built drawings to the new mxd.
 - a. The scanned, georeferenced as-builts can be found in Q:\GeoRefAsBuilts. They are organized by state route (SR) and then by contract. A contract may have one or more drawings associated with it. When loading the as-builts (TIFFs), if you see images with letters appended to the end of their names, such as 3522_D9.TIF vs. 3522_D9a.TIF and 3522_D9b.TIF, select the images with the letters (in this case 3522_D9a.TIF and 3522_D9b.TIF). Contract folders may also contain a Tagged Image File Format (TIFF) of the project’s vicinity map.
 - b. To add the as-builts, you must first locate them. You will frequently know the SR where you’ll be working because the mxd will be zoomed to the AOI. However, if the contract covers a large area, it may not be clear. If you don’t know the SR (or, in some cases, SR and milepost) for your contract, the easiest way to find the as-builts is to do a file search (Ctrl + F is a keyboard shortcut while in the folder) in Q:\GeoRefAsBuilts using the contract number. An example is shown below. Then use the + button in ArcMap™ to add the drawings associated with a contract to the new mxd.

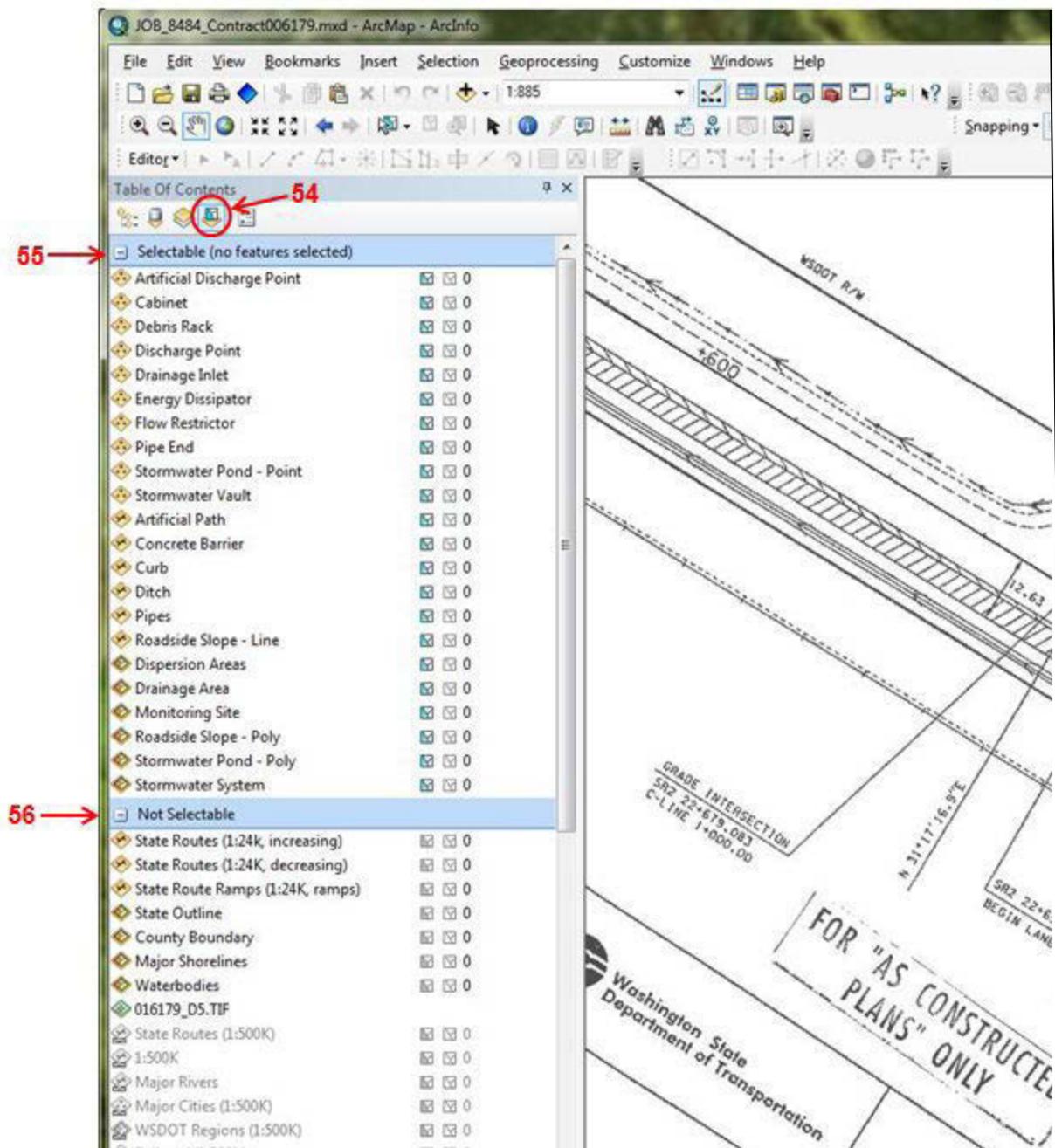


- c. In WMX, click **Complete Add Drawing...** (53) at the top of the WMX window.



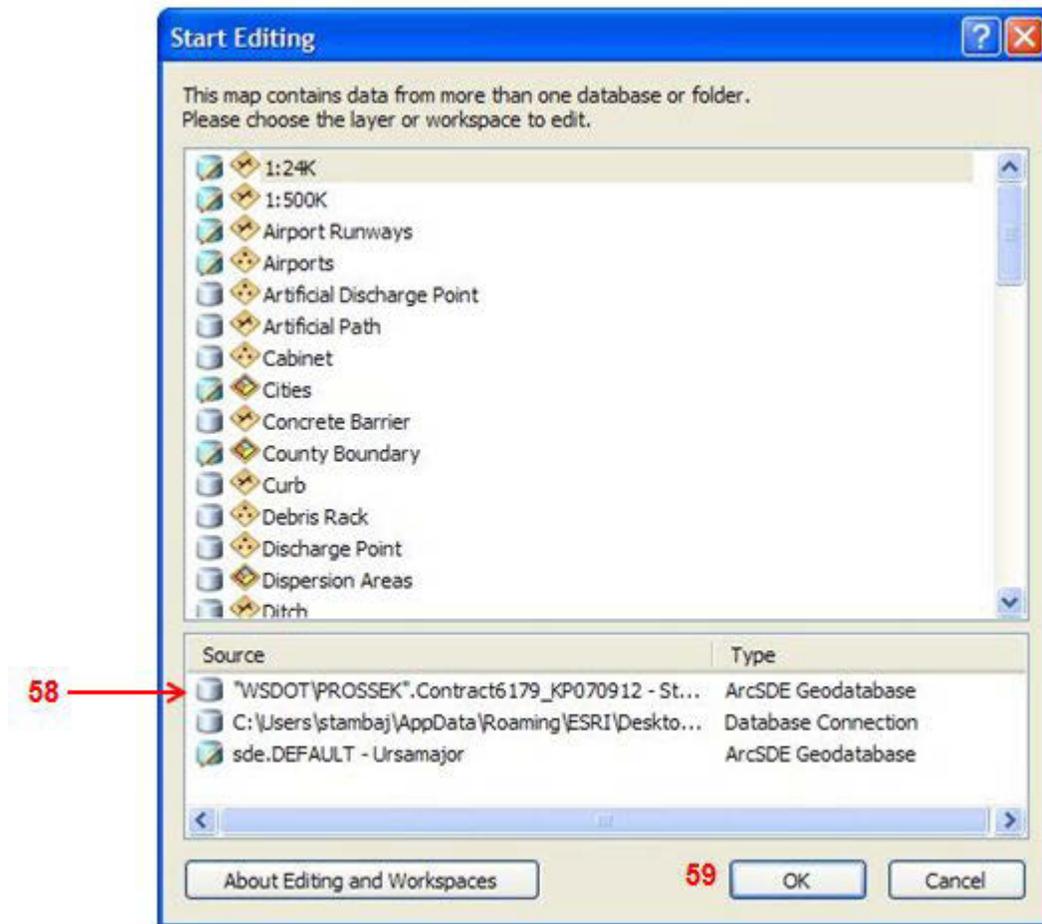
- d. The *Screen Digitize & Add Attributes from As-Built*s will be highlighted in WMX.
- e. At this point, it's probably a good idea to close WMX because it tends to slow everything down once ArcMap™ is launched and you aren't actively using WMX. You can open it later to mark steps completed. **Note: Don't just close the WMX application; check to see if the extension is turned on, in your mxd, by going to the ArcMap™ "Customize" menu and clicking on Extensions. If it is turned on, turn it off by unchecking it. Since there are a limited number of WMX licenses, turning off the extension allows others to use the application.**
- f. Before continuing with *Screen Digitize & Add Attributes from As-Built*s, review the section "Working with As-Built" ([Appendix B](#)).

7. **Screen Digitize & Add Attributes from As-Built** – In this step you’ll start an edit session in ArcMap™ and add features and attributes from the as-builts.
 - a. First, in the “List By Selection” view in the Table Of Contents (54), double-check to make sure the SFID feature classes are selectable (55) and all the other feature classes are not selectable (56).

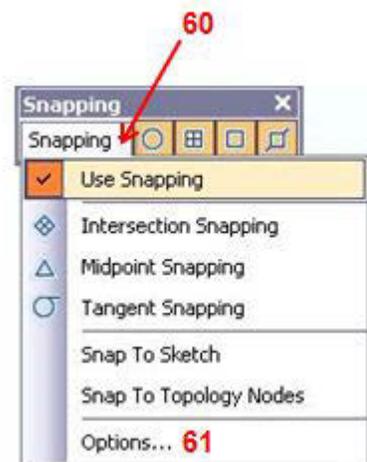


Data Editor

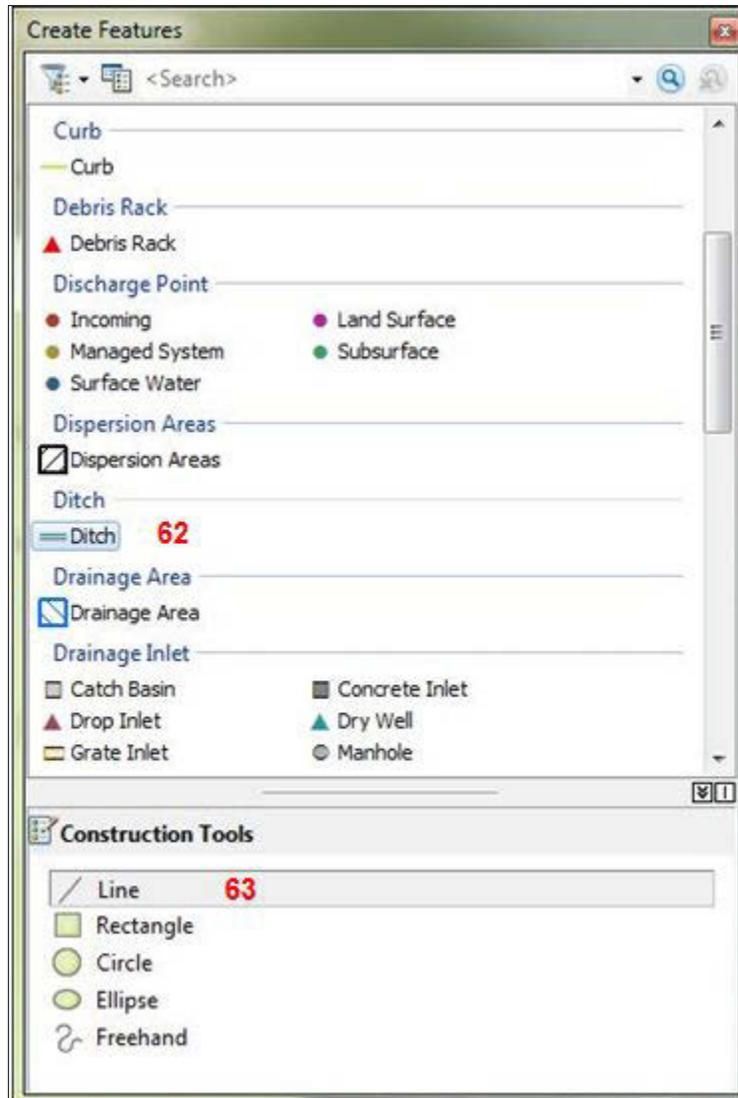
- If you start editing via the Editor toolbar, select the version you created for the current contract as the Source in the Start Editing window (58), then click **OK** (59). You may be warned if there are layers you cannot edit, but these won't include the stormwater features. Click **Continue**. The Create Features window opens with the editing templates (discussed in Step d).



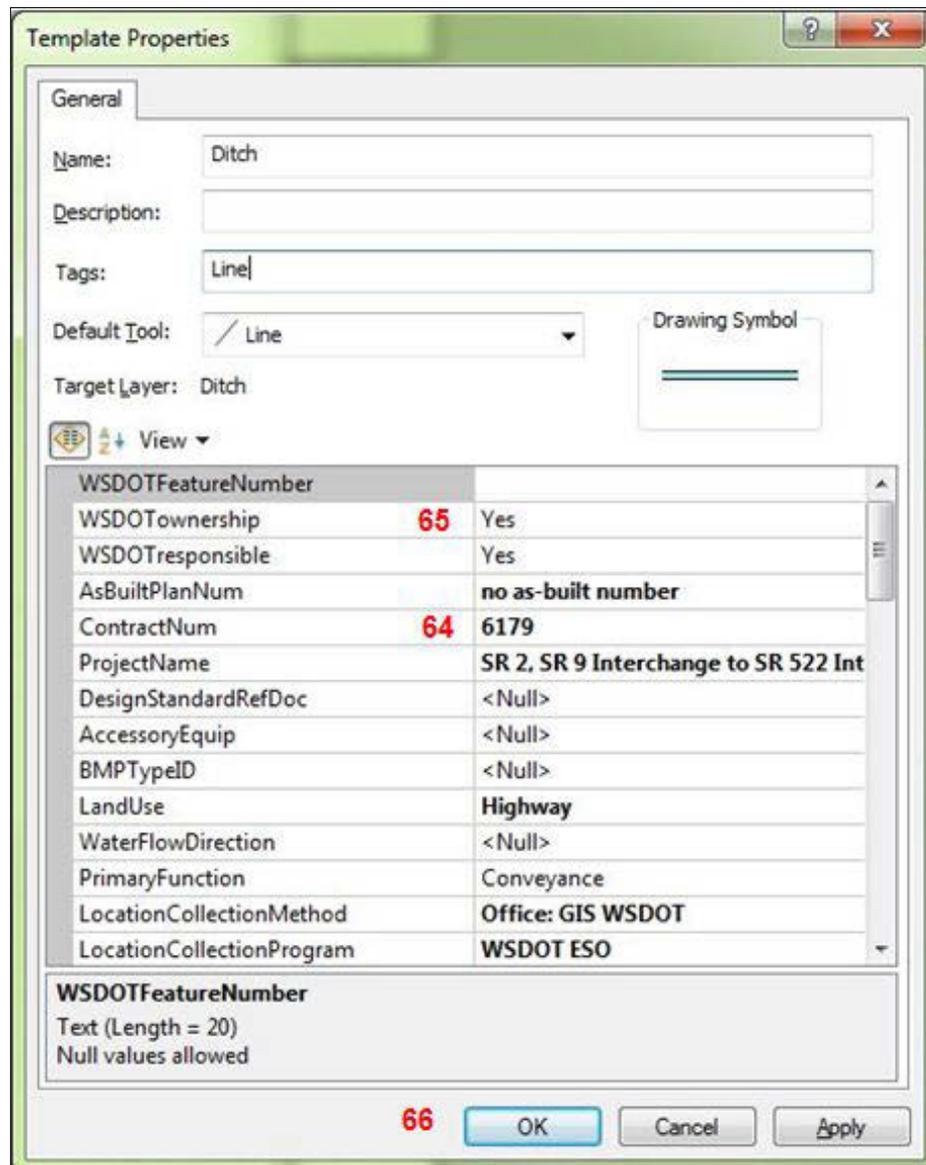
- c. Before creating features, snapping needs to be enabled, and tolerances adjusted if needed, to ensure clean connected data. In the Snapping toolbar, click on the drop-down arrow (60) and turn on **Use Snapping**. Snapping tolerance, or how close to a feature your point must be to snap, is typically set to 10 pixels. To adjust, click on the **drop-down arrow** and go to **Options...** (61). The Snapping Options window will open and you can adjust the snapping tolerance. Five to ten pixels is typical.



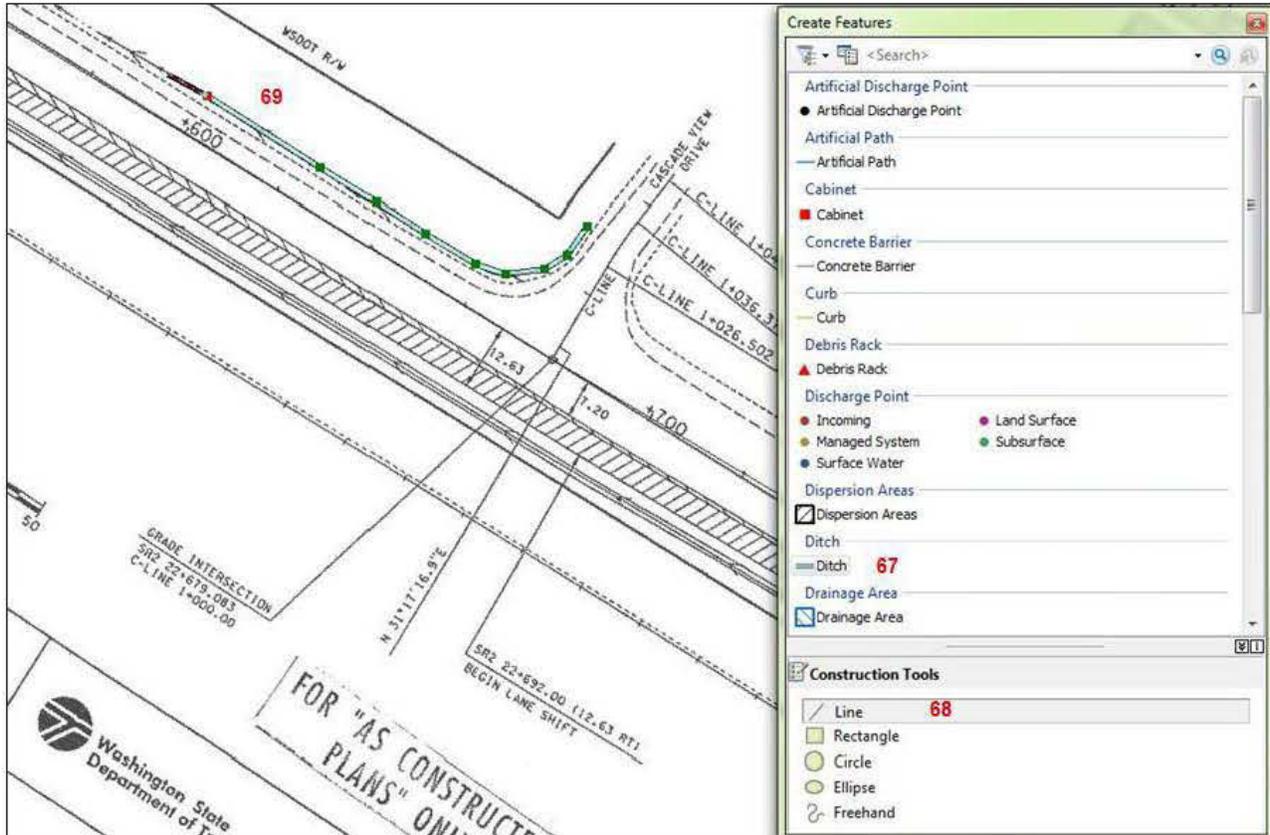
- d. Now that snapping is enabled, select the **appropriate feature template** from the Create Features window. When a target class is selected in the Create Features window (62), the Construction Tools will become visible at the bottom of the Create Features window with the default tool highlighted (63). **Make sure the stormwater features are turned on in the Table Of Contents before you start editing**, otherwise the edit templates won't show up.



- e. Edit templates can be a big time-saver; they allow you to easily store default attribute values for a feature class or subtype. This is useful for values that won't change over a contract, such as: Contract Number, Location Collection Method, and Location Collection Program. The first time you edit each feature class for a particular contract, open the Template Properties window (double-click or right-click on the feature in the Create Features window) and enter any default values you will be using for that contract, such as ContractNum, AsBuiltPlanNum, LocationCollectionMethod, and LocationCollectionProgram. Defaults set by the editor have bold font (64). Some defaults may already be set in the geodatabase; they won't be in bold font (65). Click **OK** (66) when you're done settings defaults.

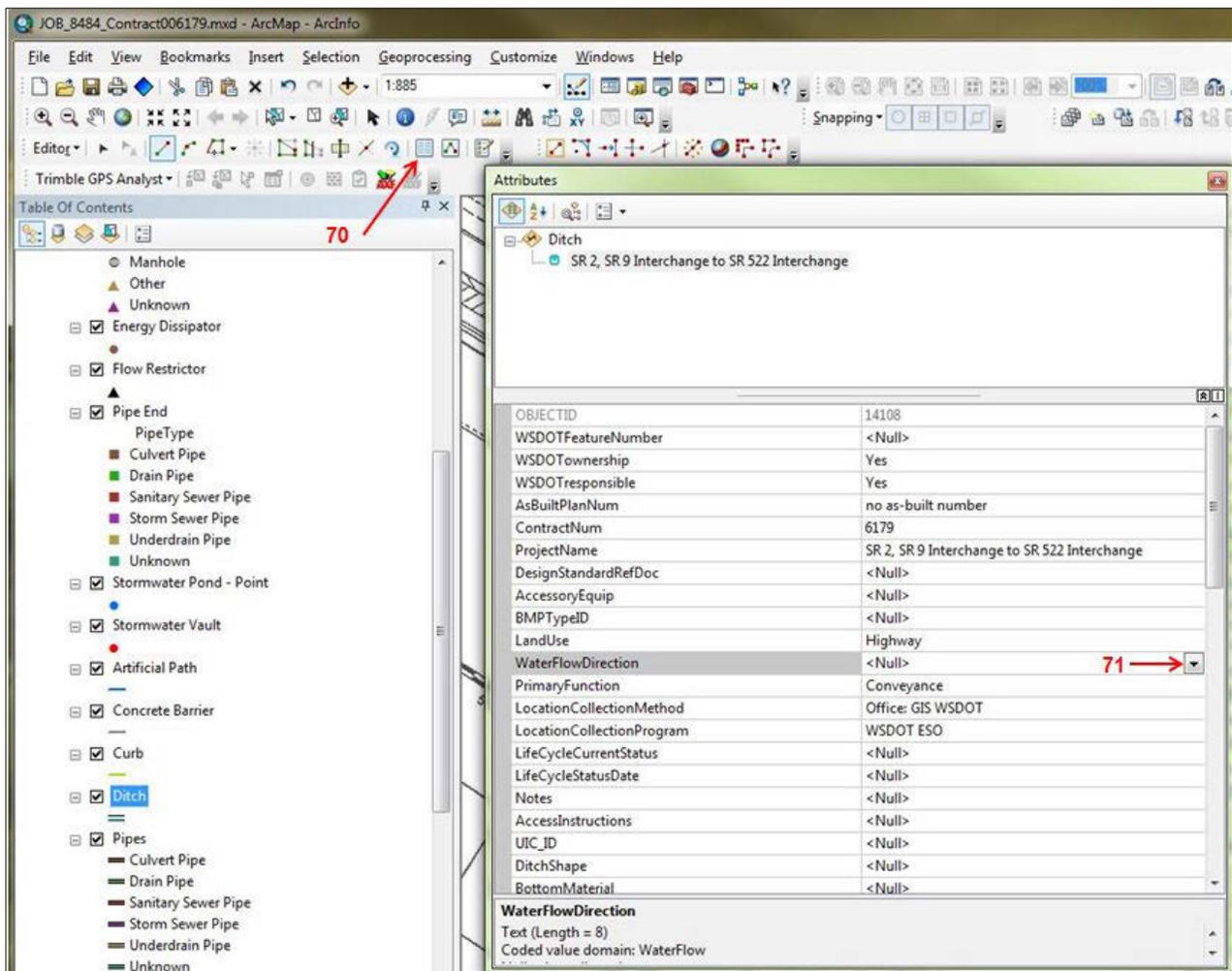


- f. To start screen digitizing, make sure the feature class you want to create is highlighted in the Create Features window (67) and click on the **appropriate construction tool** at the bottom of the window (68). Screen-digitize a target feature (69).



Data Editor

- g. **Update Attributes** – Click on the **Attributes** button (70) in the Editor toolbar to open the Attributes editing window, if it's not already open or pinned to the side. Add any information you can glean from the drawing, Structure Notes, Drainage Profile, or Drainage Detail Sheets (see [Appendix B Working with As-builts](#)). Some attributes, such as WaterFlowDirection, have associated coded value domains. If that is the case, a drop-down list appears when you click in the cell (71) next to the attribute. Only attributes applicable to office data collection will be visible during editing; attributes specific to field data collection will be hidden.
- h. Repeat. Collect all stormwater features from all the drawings associated with a contract.
- i. **Save Edits often.**
- j. Stop Editing when the edit session is over.



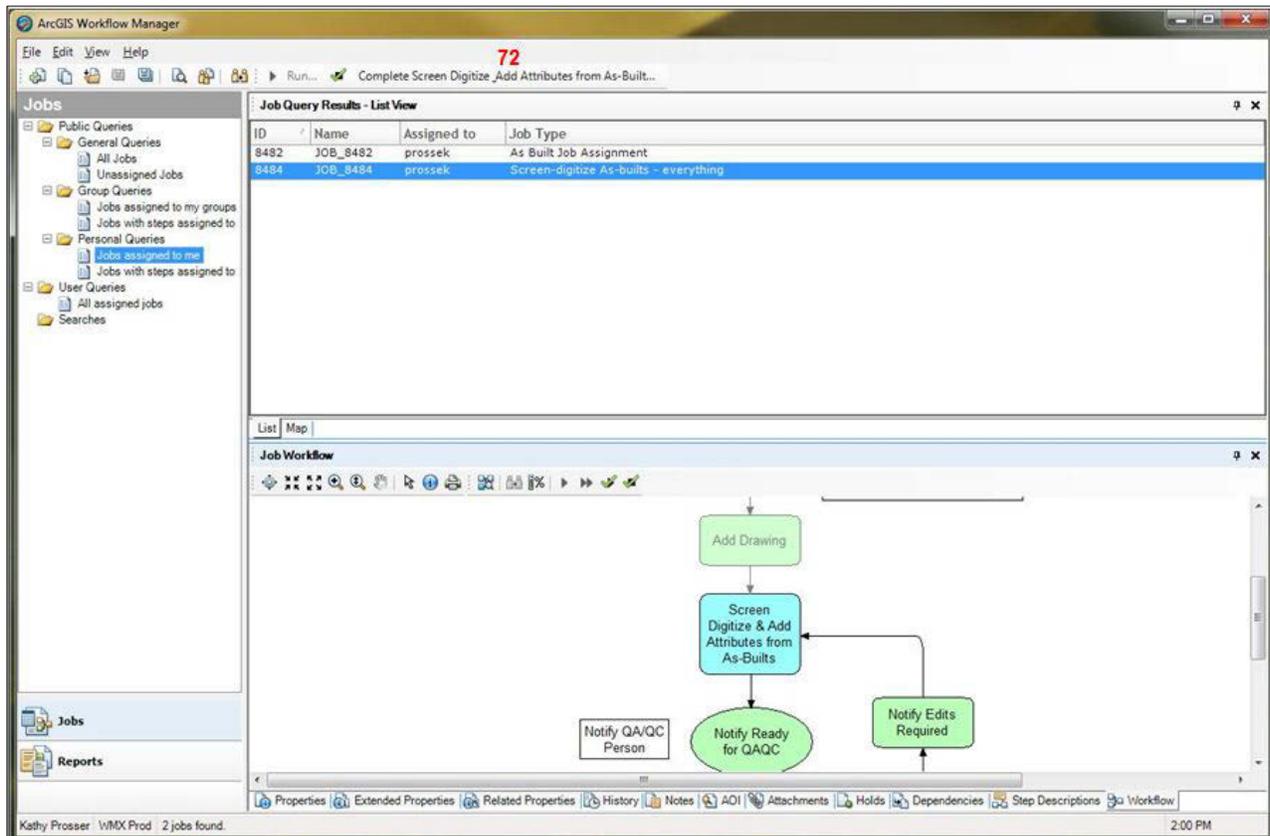
Data Editor

k. Features we don't need from as-builts:

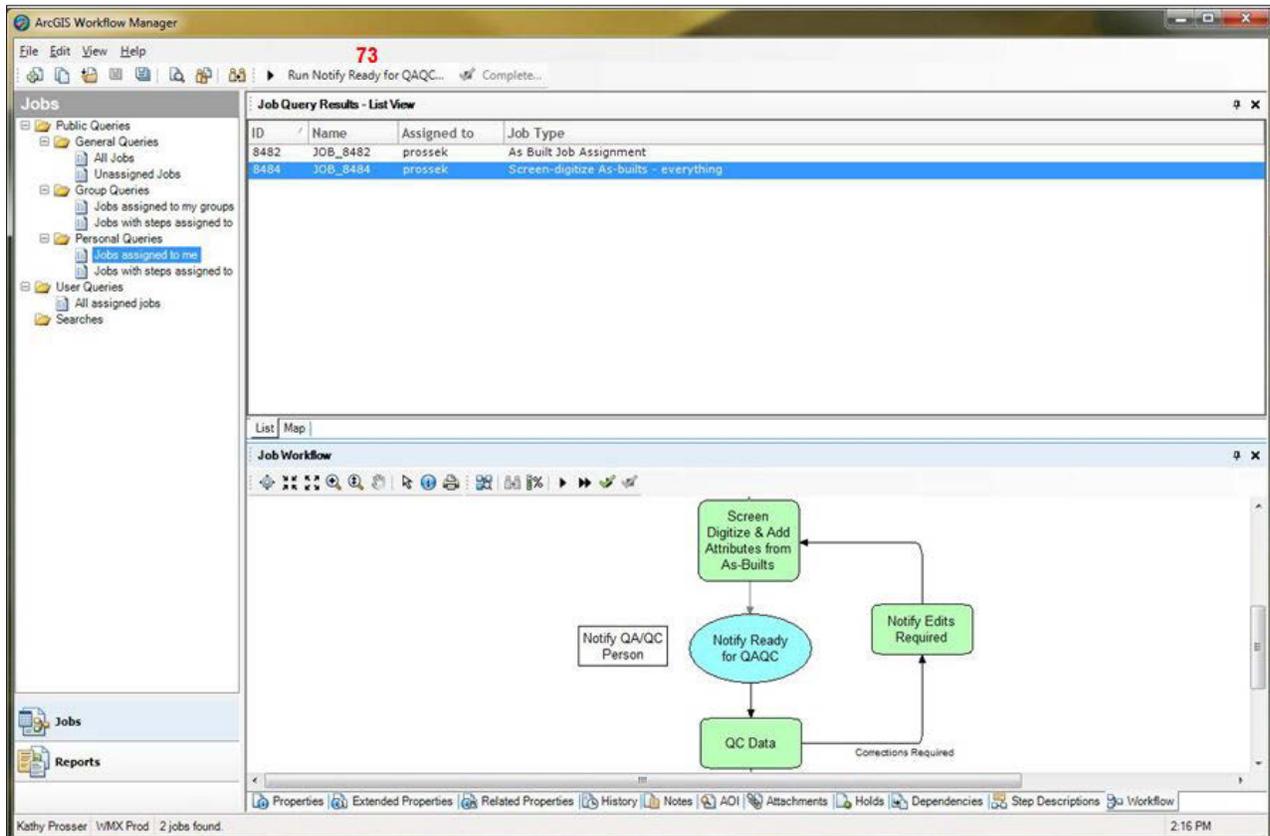
- Box culverts (they're not associated with stormwater)
- Gutter drains (they're not associated with stormwater)
- Quarry spalls (unless associated with a discharge point feature; then these are considered energy dissipaters)
- Rock pad (unless associated with a discharge point feature; then these are considered energy dissipaters)
- Straw bales
- Curbs (they'll be collected in the field, where it can be determined whether they're participating in stormwater flow)
- Concrete barriers (they'll be collected in the field, where it can be determined whether they're participating in stormwater flow)

l. When editing is completed for a contract, open WMX and go to the Workflow tab. The *Screen Digitize & Add Attributes from As-Builts* step will still be highlighted.

m. In WMX, click **Complete Screen Digitize _Add Attributes from As-Built... (72)** at the top of the WMX window.



8. **Notify Ready for QA/QC** – This step sends the Stormwater Features Inventory Group Data Steward (Data Steward) an email notifying her/him that the data in this job is ready for QA/QC. The versioned data is reviewed by the Data Steward before being posted to WSDOT’s enterprise GIS database.
 - a. Click **Run Notify Ready for QA/QC... (73)** at the top of the WMX window.



- b. This step will send the Data Steward an email (see example below) from WMX. You will also receive a copy of the email.

Data collection for Job 8484 has been completed by Kathy Prosser. The data is ready for QA/QC.

- c. The Data Steward’s QA/QC of the data may turn up errors or omissions that need to be addressed by the Data Editor. If this happens, the Data Editor receives an email notification from WMX (see example below). The Data Editor repeats Steps 7 and 8.

Edits are required for Job 8484 after the QA/QC process. See Data Reviewer table and/or additional notes for details.

4-0.1.2 Data Steward: Workflow Processes

9. **QC Data** – Review the data and then decide whether it needs additional edits or it’s ready for WSDOT’s enterprise GIS database.
 - a. Perform visual checks of the data plus use Data Reviewer for automated spatial and attribute checks. (See Data QA/QC document for additional information.)
 - b. Once the “QC Data” step is completed, choose one of two possible workflow paths: Notify Edits Required or Notify Data Administrator (shown in [Step 9e](#)).
 - c. The “QC Data” step is assigned to the Data Steward Group, not an individual. In order to choose either of the above two paths in WMX, first assign the “QC Data” step to yourself. Then query for the job in question in WMX. In the Properties tab, change the Job Assignment from Group to User, and pick your name from the drop-down list available. The modified job properties must be saved.
 - d. In the Workflow tab, click **Complete QC Data... (74)** at the top of the WMX window.

The screenshot displays the ArcGIS Workflow Manager interface. The top toolbar includes a red number '74' and a button labeled 'Complete QC Data...'. The 'Jobs' panel on the left shows a tree view with 'Jobs assigned to me' selected. The main window is divided into two panes:

Job Query Results - List View

ID	Name	Assigned to	Job Type
8482	JOB_8482	prosek	As Built Job Assignment
8484	JOB_8484	prosek	Screen-digitize AS-builts - everything

Job Workflow

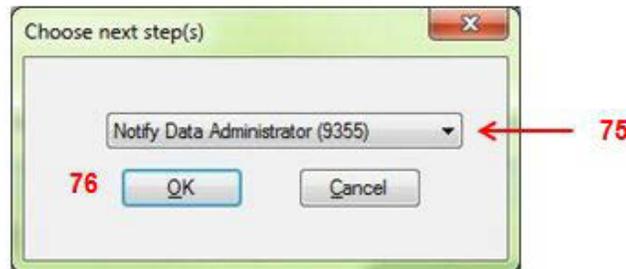
The workflow diagram shows the following steps:

- Screen Digitize & Add Attributes from As-Builts (green rounded rectangle)
- Notify Ready for QA/QC (green oval)
- QC Data (blue rounded rectangle)
- Notify Edits Required (green rounded rectangle)
- Notify QA/QC Person (white rounded rectangle)

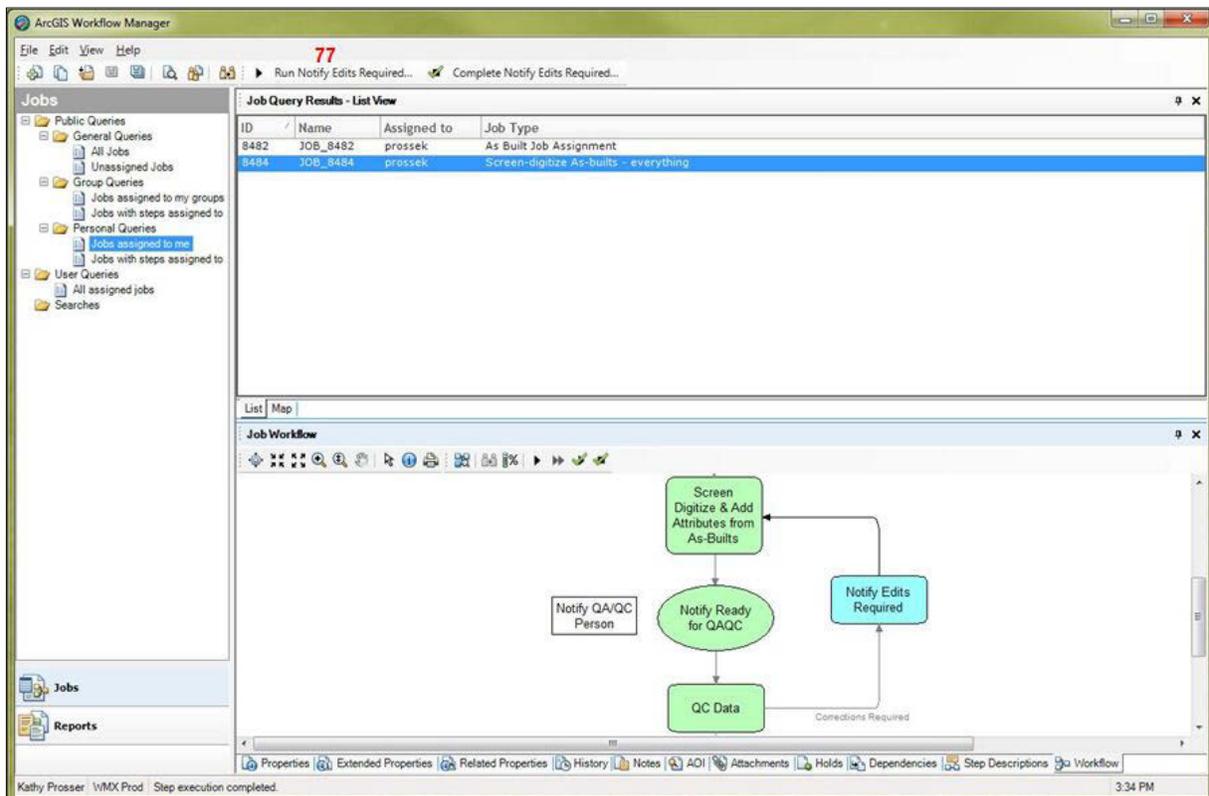
Flow arrows indicate the sequence: Screen Digitize & Add Attributes from As-Builts → Notify Ready for QA/QC → QC Data → Notify Edits Required → Notify QA/QC Person. A feedback loop arrow labeled 'Corrections Required' points from QC Data back to Notify Edits Required.

The status bar at the bottom reads: 'Kathy Prosser WMX Prod Step execution completed. 3:20 PM'.

- e. The Choose next step(s) window opens. Click the **drop-down arrow** (75) to view the choices: Notify Data Administrator and Notify Edits Required. Select **Notify Data Administrator** if the data for the current job passes QA/QC. Select **Notify Edits Required** if the data requires additional editing. After selecting the appropriate choice, click **OK** (76).



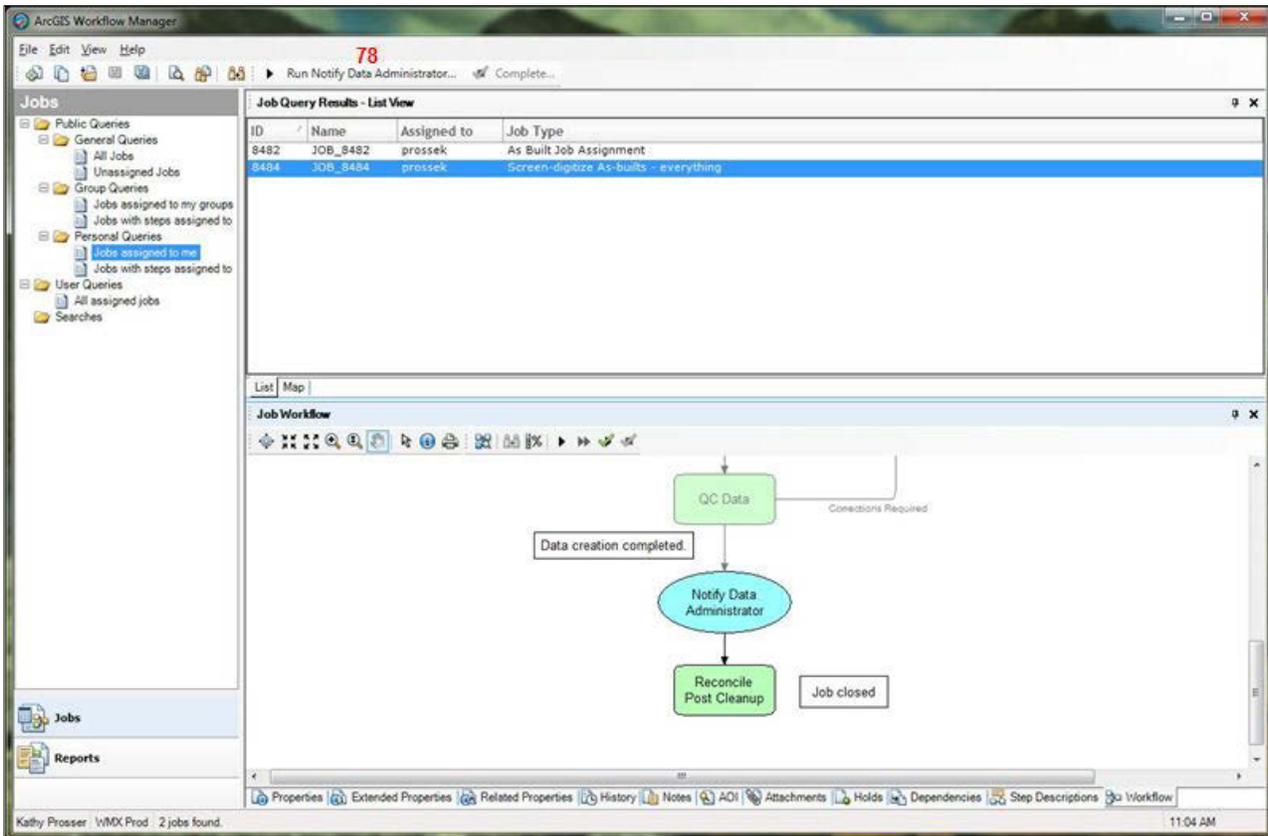
10. **Notify Edits Required** – Select this option if you determine the data requires additional editing. The workflow loops back to the Data Editor for editing.
 - a. Click **Run Notify Edits Required...** (77) at the top of the WMX window.



- b. When Notify Edits Required is run, a notification (see example below) is sent to the data editor, Data Steward, and Coordinator.

Edits are required for Job 8484 after the QA/QC process. See Data Reviewer table and/or additional notes for details.

- c. The Data Steward must then click **Complete Notify Edits Required...** at the top of the WMX window.
 - d. In order for the editor to be able to continue using WMX for this job, the Data Steward must **reassign the job back to the editor**. In the Properties tab, the Data Steward must **change the Job Assignment User to the editor**. The modified job properties must be saved.
 - e. The Data Editor repeats Steps 7 and 8.
 - f. You will repeat Step 9.
11. **Notify Data Administrator** – When the data for the current job has passed QA/QC, **select this option**. The Stormwater Features Inventory Data Administrator (Data Administrator) is notified that the data is ready to reconcile and post to WSDOT’s enterprise GIS database.
- a. Click **Run Notify Data Administrator... (78)** at the top of the WMX window.



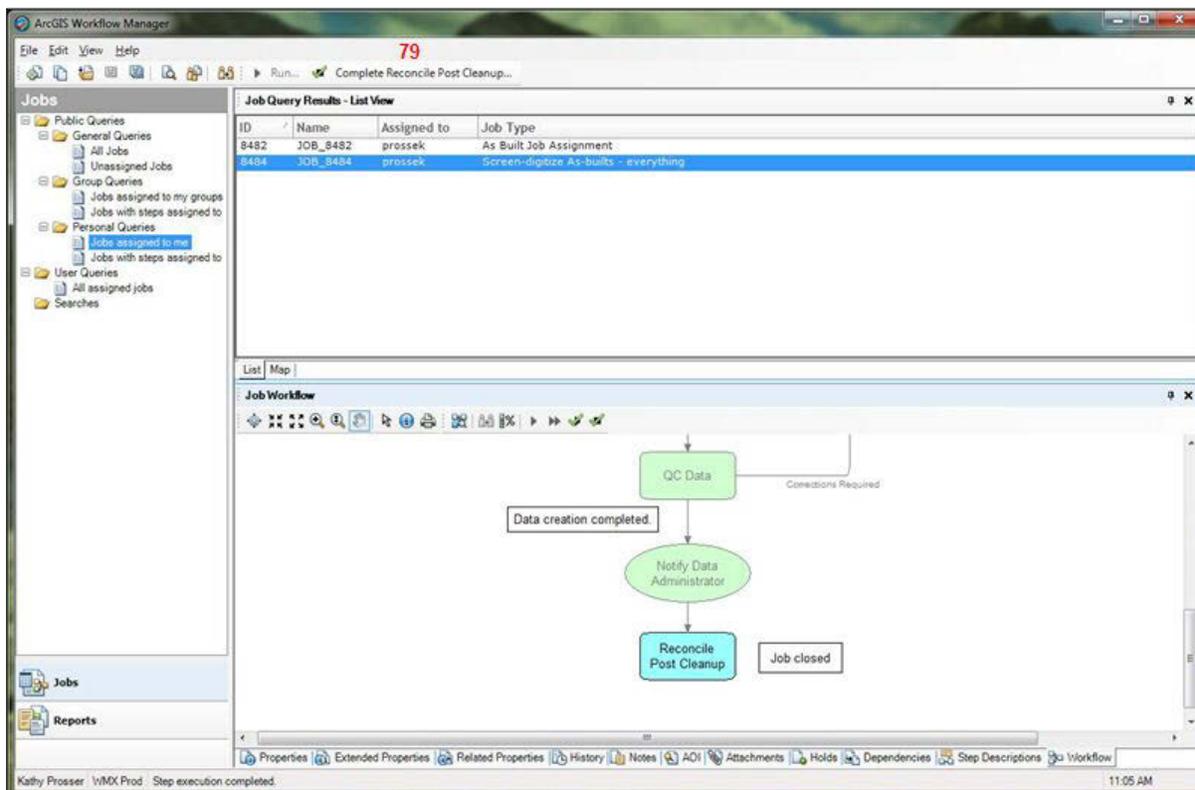
- b. When Notify Data Administrator is run, a notification (see example below) is sent to the Data Steward and the Data Administrator.

QA/QC on Job 8484 has been completed by Kathy Prosser. The data is ready to reconcile and post.

4-0.1.3 Data Administrator: Workflow Processes

12. Reconcile, Post, Cleanup –

- a. Reconcile and post the data to WSDOT’s enterprise GIS database. (See additional documentation for this step.)
- b. Clean up the ArcMap™ mxd and other documentation associated with the job.
- c. Close out the job in WMX.
- d. Before the job can be closed out, you must assign the “Reconcile Post Cleanup” step to yourself. In WMX, query for the job in question. In the Properties tab, you must change the Job Assignment User, selecting your name from the drop-down list available. Save the modified job properties.
- e. Click **Complete Reconcile Post Cleanup... (79)** at the top of the WMX window.



- f. This closes the current job. An email notification (see example below) is sent to the Data Administrator and the Stormwater Features Inventory Coordinator.

Job 8484 has been closed by Kathy Prosser.

Input from Users

We would appreciate input from users concerning:

1. **New steps** – Are new steps needed in WMX?
2. **Removing steps** – Are there steps that can be removed from WMX?
3. **Help** – Are there workflow steps that require more or better Help?
4. **Other changes to WMX** – Are there other changes to WMX that you would recommend? For example, are changes needed to the Notifications, Holds, AOI dataset, or WMX editing template mxd?
5. **Schema changes** – Are there any additional fields or field domain changes that need to be made?
6. **Default attribute values** – Any defaults you would recommend?
7. **General rules** that need to be documented.
8. **Problems** that need to be added to the Troubleshooting section.

5-0 References

- Ecology. 2009. *Washington State Department of Transportation Municipal Stormwater Permit, National Pollution Discharge Elimination System and State Waste Discharge Permit for Large and Medium Municipal Separate Storm Sewer Systems*. Washington State Department of Ecology. Olympia, Washington. Permit No. WAR043000A. Issuance Date February 4, 2009.
- WSDOT. 2012a. *Stormwater Features Inventory: Standard Operating Procedures for Stormwater Discharge Point Inventory*. Washington State Department of Transportation, Environmental Services Office, Stormwater and Watersheds Program. November, 2012.
- WSDOT. 2012b. *Stormwater Features Inventory Database: Feature and Attribute Definitions*. Washington State Department of Transportation, Environmental Services Office, Stormwater and Watersheds Program. November, 2012.

Appendix A Accessing As-Builts Online

There are multiple places to find scanned As-Built plan sheets: the NW and Olympia regions have their own collection databases, and there are statewide collection databases (Oracle® IPM and AwardedContractFiles). These are described in the following sections. You may need to search more than one of these databases; they don't necessarily contain the same projects, or they may contain the same projects, but the scans may be of different quality. It's recommended that you try the regions first and make Oracle® IPM the last option. It's also recommended that you make shortcuts for these resources on your desktop. To figure out which WSDOT region you're in, turn on the WSDOT Regions layer in the GISWorkbench basemap with labels turned on.

A-1 NW Region Plans and Documents Archive database

<http://nwweb/pda/PlanSearch.aspx>

1. In the Plan Search window:

- Check on the Contract No option (1).
- Enter the contract number in the text field by Word: (2).
- Click the Search button (3).

Washington State Department of Transportation

Intranet Home Human Resources Search Site Index WSDOT Internet

Plans and Documents Archive - PDA

Library: Right of Way Plans Contract Plans Channelization Plans Interchange Plans

Category: 'ALL'

Type: 'ALL'

Area: Region: 'ALL*' County: 'ALL*' **3**

Highways: L, U.S., SR: 'ALL*' Begin MP: End MP: 'ALL*' **1. Plan Search**

Location: Township: Range: Section:

Word: **2**

Title Plan ID No Reel No
 SubTitle Contract No **1**
 Notes OSC File No SEQ

Date: Begin Date: End Date:

Designer: Designer: 'ALL*' Name:

Reference: Ref Type: 'ALL*' Number:

Work: 'ALL*' Abandon Existing Manhole Abutment Bearing Modification Abutment(s) Access Hatches Access Road

Press Ctrl to select multiple items

Index: Chan Plans - Detail.pdf [Print](#)

To Search for a plan, enter search criteria. Click: "Search" to display search results. "Clear" to reset search criteria. "Preview" to show record count.

- The Plan List window shows projects associated with the contract number (4) used for the search (5).

Washington State Department of Transportation | Intranet Home | Human Resources | Search | Site Index | WSDOT Internet | Welcome ProesseK

Plans and Documents Archive - PDA

2. Plan List | New Search | Modify Search | Page Size: 10 | Plan List | Highway List | Download

Search Criteria: Contract No: 1454 (5)
Records Found: 1-5 out of 5 Sorted by Title

Detail	CAE	Library	Title	Contract	County	I,US,SR	Beg MP	End MP	Date	Dwr	Seg
46		Contract	Aurora Avenue Bridge 99/560 Repair	014547	King	099	034.17	034.73	9/23/1996		
181		Contract	Eastbound SR 526 To Southbound SR 5 HOV Bypass	014540	Snohomish	005	186.50	188.89	5/9/1996		
		Contract	Pierce Co. Line To Tukwila HOV and Climbing Lane	014546	King	005	152.26	154.40			
58		Contract	Portage Creek Br. To Jct. SR 548 Guide Sign Replacement	014542	Snohomish Skagit Whatcom	005 005 005	208.00 208.00 208.00	276.00 276.00 276.00	4/20/1995		
408		Contract	Tukwila To Lucile St. HOV and SC & DI - Stage 2	014543	King	005	155.98	158.32	11/23/1999		

- Click on the project title (6) or contract number (7) to see the documents associated with a particular contract.

Washington State Department of Transportation | Intranet Home | Human Resources | Search | Site Index | WSDOT Internet | Welcome ProesseK

Plans and Documents Archive - PDA

2. Plan List | New Search | Modify Search | Page Size: 10 | Plan List | Highway List | Download

Search Criteria: Contract No: 1454
Records Found: 1-5 out of 5 Sorted by Title

Detail	CAE	Library	Title	Contract	County	I,US,SR	Beg MP	End MP	Date	Dwr	Seg
46		Contract	Aurora Avenue Bridge 99/560 Repair	014547	King	099	034.17	034.73	9/23/1996		
181		Contract	Eastbound SR 526 To Southbound SR 5 HOV Bypass (6)	014540 (7)	Snohomish	005	186.50	188.89	5/9/1996		
		Contract	Pierce Co. Line To Tukwila HOV and Climbing Lane	014546	King	005	152.26	154.40			
58		Contract	Portage Creek Br. To Jct. SR 548 Guide Sign Replacement	014542	Snohomish Skagit Whatcom	005 005 005	208.00 208.00 208.00	276.00 276.00 276.00	4/20/1995		
408		Contract	Tukwila To Lucile St. HOV and SC & DI - Stage 2	014543	King	005	155.98	158.32	11/23/1999		

- In the Plan Detail window, you can look at the entire plan document in Portable Document Format (PDF), or open individual pages as TIFFs, by clicking on the PDF (8) or sheet name (9). You also have the option to save the PDF or TIFF files. Please save the pages to your work area. Create a folder for each contract. It may be helpful to print a copy of the Structure Notes as well as the Legend, which may change from contract to contract. If there is only one contract associated with the search criteria, the NW Region Plans and Documents Archive skips the Plan List window and goes straight to the Plan Detail window.

3. Plan Detail

[New Search](#) [Modify Search](#) [Plan List](#) [Documents](#)

Selected Plan		Sheet Info		Location Info	
Region:	NWR / UCO	Approved:		DWR / SEQ:	
Library:	Contract Plans	Sheets:		Reel No:	
Category:	Contract Plans	Beg Sta:		OSC File No:	
Type:	As Built	End Sta:		Plan ID No:	4519

Plan Info		Contract Info	
Title:	Eastbound SR 526 To Southbound SR 5 HOV Bypass	Contract No:	014540
SubTitle:		Began:	Nov 29, 1994
Notes:		Completed:	May 09, 1996
		Amount:	\$1,564,632.55

County	I, US SR	Beg MP	End MP	Notes
Snohomish	005	186.50	188.89	

Township	Range	Section	Description of Work	Reference	Reference Number
28N	4E	25	Barrier(s)	Work Order No	0L1944
28N	5E	7	Catch Basin	Work Order No	0L1986
28N	5E	17	Channelization	Job No	94W065
28N	5E	18	Culvert	Fed Aid No	ACSTPUL-005-4(223)

Design	Designed By	Approve	Approved By	Date
Contractor	KLB Construction, Inc.	Proj Eng	Lenssen, Marlin J.	

4. Plan Documents Page Size: 25 [Top](#)

Show Plan Document, PDF files [Bridge](#)

AsBuilt.014540.pdf **8**

No Plan CAE Archive files.

1 2 3 4 5 6 7 8

Show	Sheet	Approved	Revised	Notes	Bridge
	0000			Title Block 9	
	0001			Index	
	0002			Vicinity Map	
	0003			Summary of Quantities	
	0004			Summary of Quantities	

A-2 Olympic Region Files

\\Orhqtmdfs01\Corporate\Olympic\SR Plans Files\State Routes

In this internal WSDOT network folder, you'll find the Copy of As-Built Index shortcut (10) and the \Cont & As-Builts folder (11). The index lists available data, which may then be found in \Cont & As-Builts. Another strategy is to do a search of all folders and files for the contract in question. The network folder \Cont & As-Builts contains PDFs of plan sheets and specifications as well as folders with plan sheets as TIFFs.

Name	Date modified	Type
Approved IC&IS Plans	7/10/2012 5:30 PM	File folder
11 Cont & As Builts	6/25/2012 4:21 PM	File folder
Limited Access	6/1/2011 3:29 PM	File folder
Maps	6/1/2011 3:29 PM	File folder
Olympic Region Bridges & Structures	5/3/2011 12:50 PM	File folder
Reclamation Plans	5/30/2012 2:18 PM	File folder
SR-RofW	2/8/2011 9:11 AM	File folder
SR-RofW Underlying Hanging Historical	10/21/2010 10:53 ...	File folder
Sundry_Sites	11/17/2010 6:43 AM	File folder
Work	2/3/2012 2:58 PM	File folder
10 Copy of As-Blt Index	3/4/2010 8:54 AM	Shortcut
Indian Hills.TIF	2/12/2010 2:45 PM	TIFF image
Shortcut to Cont & As Builts	10/28/2010 5:10 PM	Shortcut

A-3 Awarded Contract Files

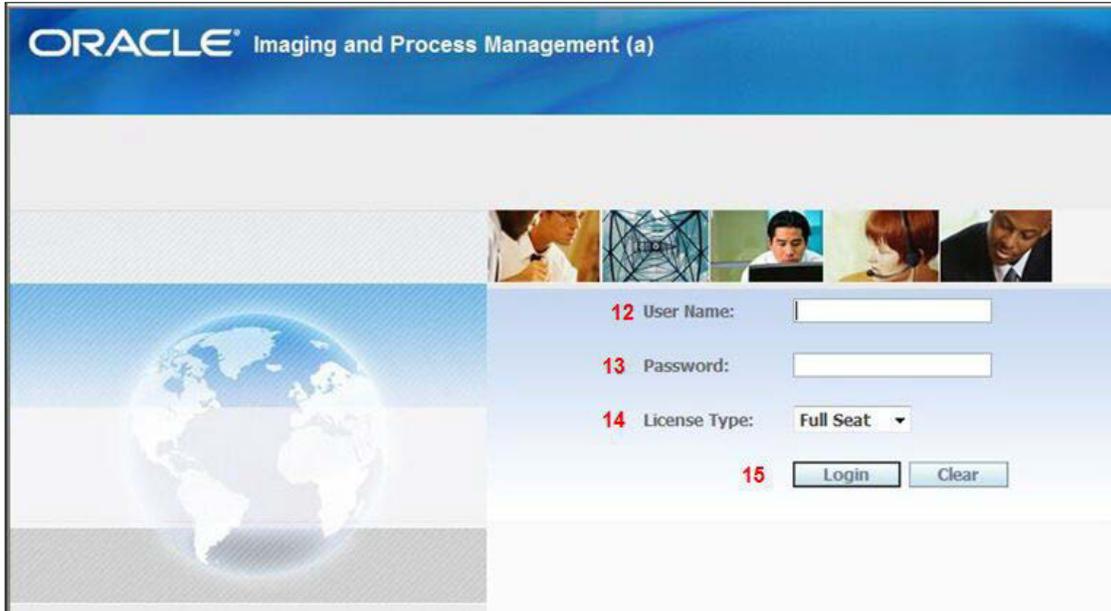
\\wsdot.loc\hq\Group\302010Vault\AwardedContractFiles

In this internal WSDOT network folder, you'll find folders for awarded contracts by contract number. Most documents are in PDF format. One strategy is to do a search of all folders and files for the contract in question.

A-4 Oracle® IPM database

<http://acordeimprod/IBPMWeb/Client/Framework.asp>

1. To use this database to search for as-builts you need to be added as a user. Once this is complete, fill in **User Name** (12) and **Password** (13) using the current WSDOT network login process. Leave the License Type (14) as Full Seat. Click **Login** (15).



ORACLE® Imaging and Process Management (a)

12 User Name:

13 Password:

14 License Type: Full Seat

15 Login Clear

2. In the Welcome window, under Search | Saved Searches, click on **Asbuilt Index Search** (16).



ORACLE® Imaging and Process Management (a)

My Workplace

- Favorite Links
- Favorite Searches

Search

- Saved Searches
 - Asbuilt 16
 - Index Search
 - Right of Way Plans: Active
- Search Results

General

Welcome

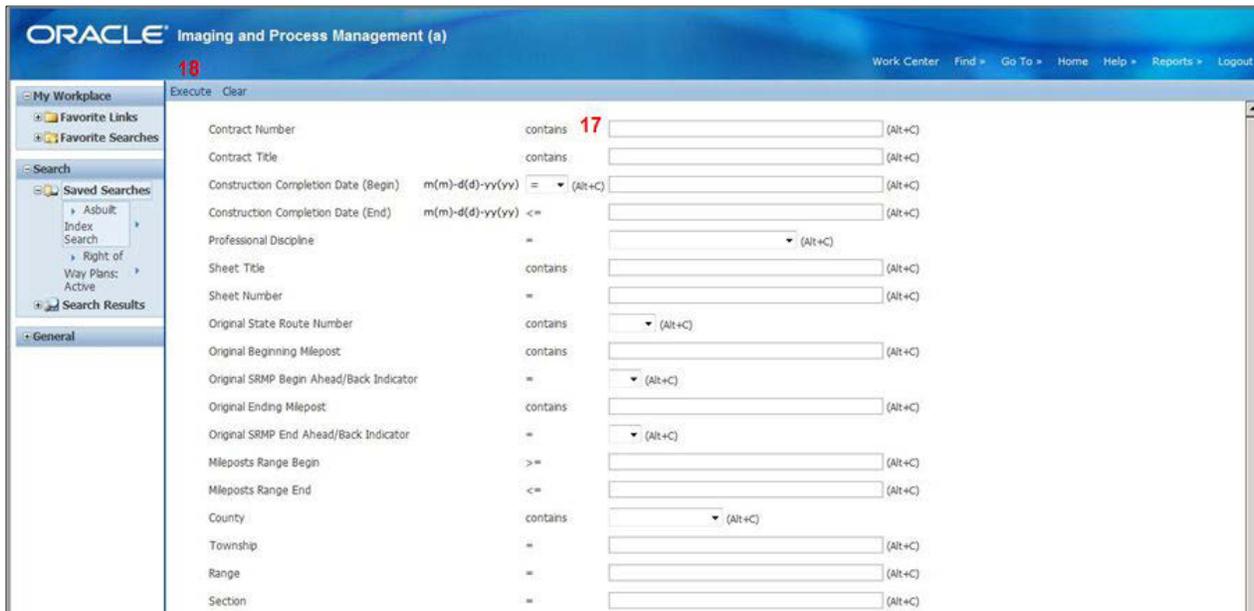
Get Started
Click here to get to work

My Workplace
Your own personalized workplace

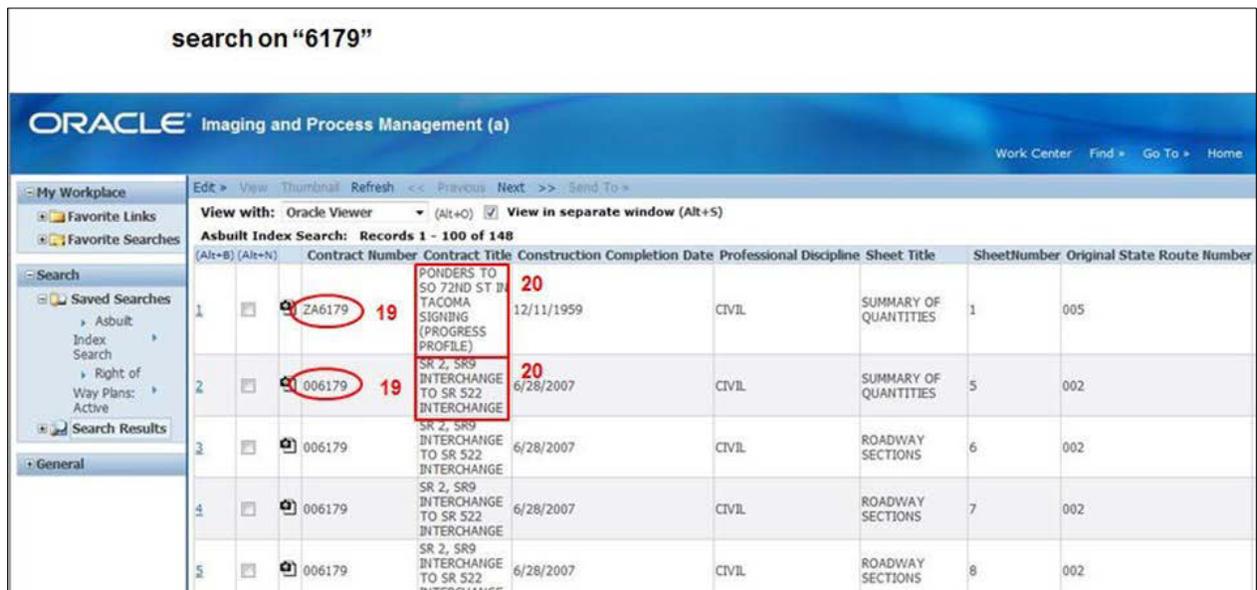
Customize Your Work Space
Customize your preferences

Help
Imaging and Process Management help and information

3. Enter the contract number in the Contract Number field (17).
4. In the upper left corner of the window, click **Execute** (18).



5. A new window opens up containing all images associated with the contract number entered in Step 3 (19). These images can actually be associated with different projects, so double-check the Contract Title field (20) to make sure you select only images associated with your project area.



6. To view an image, select it by clicking the **check box in the second column (21)** and then clicking the **number in the first column (22)**. You can only view one image at a time.

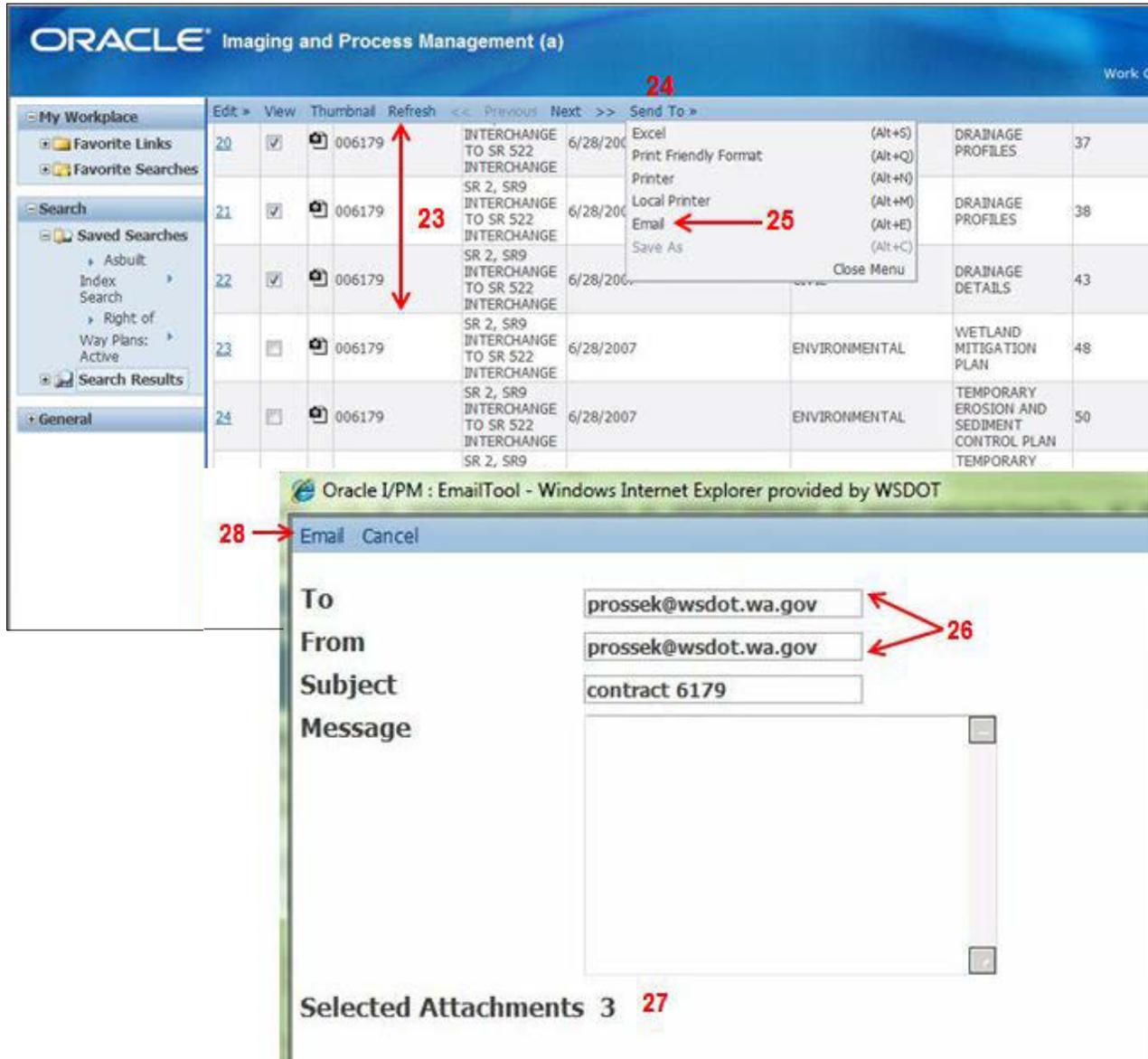
ORACLE® Imaging and Process Management (a) Work Center

Edit » View Thumbnail Refresh << Previous Next >> Send To »

Item #	Check Box	Thumbnail	ID	Description	Date	Category	Plan Name	Page #
10	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	CIVIL	PAVING AND DRAINAGE PLAN	32
11	<input checked="" type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	CIVIL	DRAINAGE DETAILS	44
12	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	CIVIL	DRAINAGE DETAILS	45
13	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	ENVIRONMENTAL	WETLAND MITIGATION PLAN	46
14	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	ENVIRONMENTAL	WETLAND MITIGATION PLAN	47
15	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	CIVIL	CHANNELIZATION AND STRIPING PLAN	61
16	<input type="checkbox"/>		006179	SR 2, SR9 INTERCHANGE TO SR 522 INTERCHANGE	6/28/2007	CIVIL	CHANNELIZATION AND STRIPING PLAN	62

My Workplace
 Favorite Links
 Favorite Searches
 Search
 Saved Searches
 Asbuilt
 Index
 Search
 Right of
 Way Plans: Active
 Search Results
 General

- You can select one or more images and email them to yourself for reference. After selecting one or more images (23), click on **Send To >** (24) in the menu at the top of the window. Select the **Email** option (25). You need to fill in both the **To** and **From** fields (26). You'll be able to see how many attachments there are below the message box (27). Click **Email** (28) in the upper left corner of the window to send.



- Save the pages to your work area.** Create a folder for each contract. It may be helpful to print a copy of the Structure Notes as well as the Legend, which may change from contract to contract.

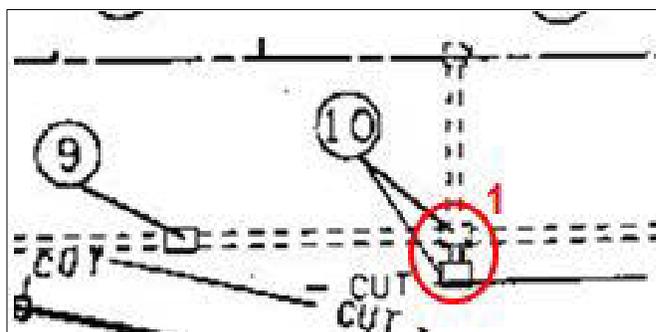
Appendix B Working with As-builts

In ArcMap™, turn on the as-builts one at a time and spend some time looking at each drawing's stormwater features. Legends should be on the first page of the as-builts; in newer contracts, the legend will be on each page. Looking at the air photos and as-builts together may help you figure out what's going on in a drawing. Information can be gleaned from the as-built itself, as well as the Structure Notes, Drainage Profile, and Drainage Details. Structure Notes, Drainage Profile, and Drainage Details may be found in the project plan sheets. Structure Notes are great for finding the physical properties of stormwater features; however, details such as elevations and pond types may be found on the Drainage Profile and in the Drainage Details.

B-1 Structure Notes

Structure Notes are a great source of information. A drawing legend may indicate that a feature on a drawing is a Culvert or a Catch Basin/Grate Inlet. The Structure Notes may give more detailed information, such as "Schedule A Culvert Pipe 300 mm diameter" or "Grate Inlet, Type 1." The drawings tend to depict most types of pipes as culverts. The Structure Notes may tell you it's actually "Concrete Storm Sewer Pipe, 300 mm diameter." Use the information in the Structure Notes when available.

In this example, the legend says drainage feature 10 (1) is an existing catch basin and a new catch basin/grate inlet, which are connected by a new culvert.



Since drainage feature 10 is found on sheet number 1, it is associated with Structure Note D1-10 (2). The Structure Notes indicate that it was actually a concrete inlet that was removed (3), a grate inlet Type 1 or 2 that was added (4), and the new culvert was Schedule A culvert pipe 300 mm in diameter (5).

NOTE: THE FIRST NUMBER OF THE "CODE DESIGNATION" BELOW REFERS TO THE SHEET NO. OR THE SHEET REFERENCE NO. SHOWING THE DRAINAGE FEATURE. THE SECOND NUMBER REFERS TO THE DRAINAGE FEATURE FOUND ON THAT SHEET.		CO. # IF HEADWALLS FOR CULVERT PIPES	REMOVING CATCH BASIN	REMOVING CONC. INLET	DITCH EXCAVATION INCL. HAUL	RETENTION POND EXCAVATION INCL. HAUL	GRATE INLET TYPE 1 OR 2	QUARRY SPALLS	UNDERDRAIN PIPE 200 MM DIAM.	INSTALL SCHEDULE A CULV. PIPE 300 MM DIAM.
CODE	LOCATION	EACH	EACH	EACH	M3	M3	EACH	TONNE	M	M
D1-1	SR 5 189+045 (23.6M LT.)									966.1
D1-2	SR 5 189+130 (25.3M LT.)									
D1-3	SR 5 189+220 (27.1M LT.)									
D1-4	SR 5 189+310 (28.9M LT.)									
D1-5	SR 5 189+310 (20.03M LT.)									
D1-6	SR 5 189+402 (20.03M LT.)-189+407.6 (20.01M LT.)						1(+1)			
D1-7	NS-W 1+062 (7.17M LT.)							32.5		
D1-8	NS-W 1+123 (7.17M LT.)							32.5		
D1-9	SR 5 189+390 (21.4M RT.)						1			
D1-10	SR 5 189+422.9 (21.1M RT.)			1			1			2.3

B-2 Drainage Profile and Drainage Detail Sheets

Look over the Drainage Profile and Drainage Detail sheets carefully for information and details not found in the Structure Notes. You can get information on length, elevation, diameter, etc. These drawings also provide context for the structures.

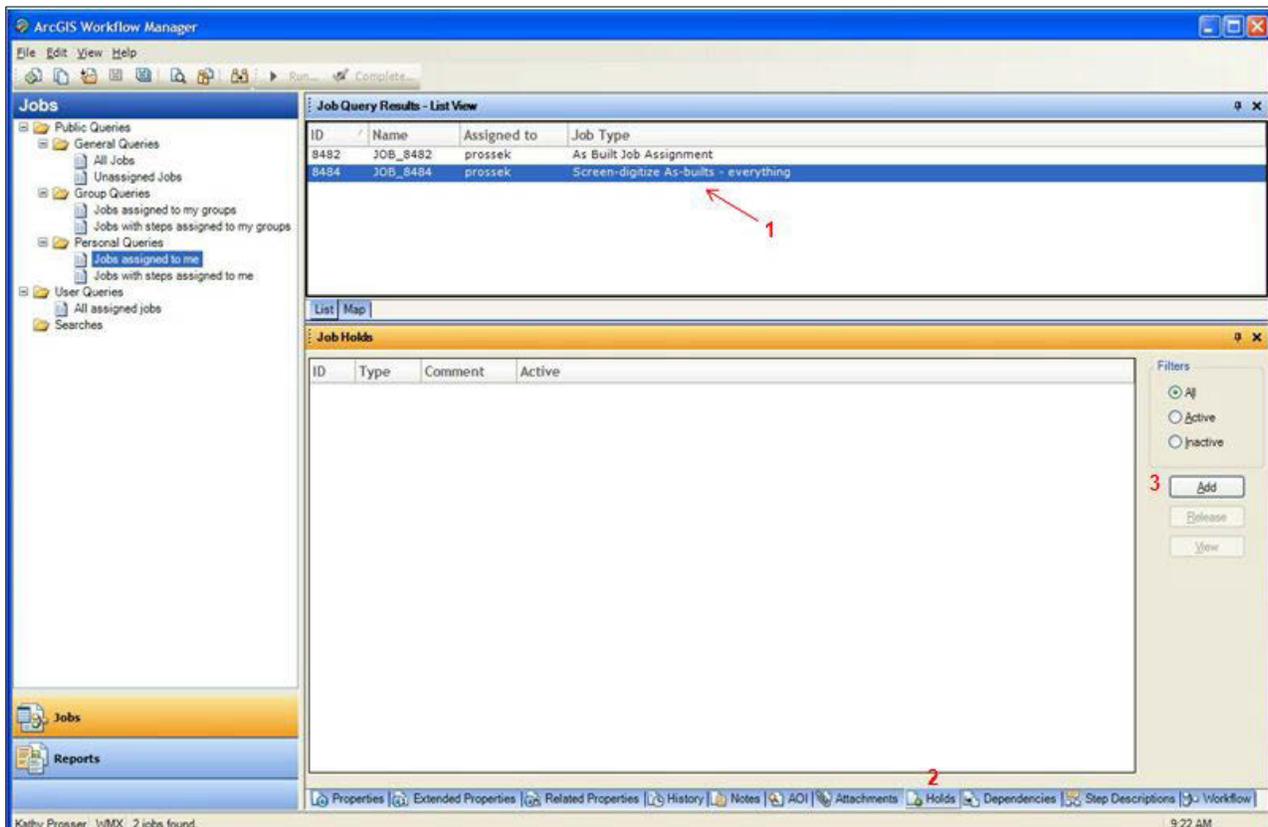
Appendix C Handling Problems and Troubleshooting

This section covers common problems and how to deal with them. Some problems you may be able to resolve yourself, while others may require help from other Stormwater and Watersheds Program staff. Problems that aren't quickly resolved can be logged using WMX's Hold function, which is described in the following section. The Troubleshooting section describes problems you may encounter and their solutions.

C-1 Adding Holds in WMX

Questions or problems that aren't easily resolved and are impacting the current job can be handled using WMX's Hold function.

1. Open WMX if needed and select the job needing a hold (1).
2. Go to the Holds tab (2).
3. To add a hold, click the Add button (3) along the right edge of the Job Holds window.

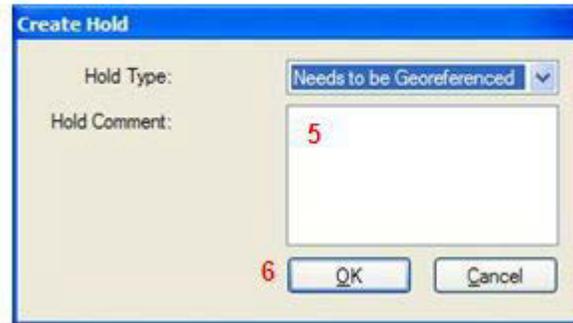


4. The Create Hold window opens. Click the drop-down arrow next to Hold Type (4) to select the appropriate option. There is also a place to add comments if needed (5). Click OK (6).



5. There are currently eight options available for Holds:

- **Budget Hold:** Won't be used by the typical WMX user; reserved for management.
- **Manager Approval:** Unlikely to be used by the typical WMX user.
- **Missing Data:** This Hold can be used when Structure Notes or other required data are missing.



- **Needs to be Georeferenced:** Use this Hold when you run across an as-built that isn't georeferenced or when the georeferencing process needs to be redone.
- **Overlapping Area of Interest (AOI):** Use this Hold when the AOI of the current contract overlaps with the AOI of a contract someone else is concurrently working on. We want to avoid people adding data in the same location at the same time.
- **Question:** Use this Hold when a question can't be addressed in a timely manner, preventing further work on a contract.
- **Resource:** Use this Hold when a lack of office resources can't be addressed in a timely manner, preventing further work on a contract.
- **Technical:** Use this Hold when technical difficulties can't be addressed in a timely manner, preventing further work on a contract.

More Hold types can be added to help distinguish different problem types.

6. Once a Hold is added, an email (see example below) is automatically sent to the Data Steward and the Data Administrator to notify them of problems to resolve.

Hold 814 added by Kathy Prosser to Job 8484

7. If the current job has a Hold, you cannot advance to the next step in WMX. The Hold must be released before progress can continue.

C-2 Troubleshooting

1. If you find TIFFs that aren't georeferenced, or if the georeferencing process needs to be redone, add a "Needs to be Georeferenced" Hold. An email is automatically sent to the Data Steward and the Data Administrator. (See [Adding Holds in WMX.](#))
2. If the list view has been minimized (1), click on **List** (2) to expand the window, then click on the **push-pin icon** (3) to keep the list view open.

