

RED-LINE and AS-BUILT PROCEDURE AND GUIDELINES

The As-Built procedure described below shall be applied by staff and consultants to all projects which involve ADOT oversight to assure ADOT and other stakeholders the deliverance and availability of the As-Built information. As-Built Plans are required on all projects including but not limited to: permit projects, procurement projects, sub-program projects, Transportation Enhancement projects and Local Government projects.

If a project crosses or impacts property owned or maintained by the Central Arizona Water Conservation District (CAWCD), Maricopa Water District (MWD), refer to the Contract Special Provisions.

As-Bid Plans:

The As-Bid Plan Set is the final sealed and signed plans including addendums at bid opening.

Field Red-Line Plans:

The Field Red-Line Plans record the changes that have occurred during construction and are incorporated onto the plans manually and/or electronically prepared by the Construction Administrator. The field Red-Line set and other miscellaneous documents will be provided by the Construction Administrator for the preparation of the As-Built plans.

As-Built Plans:

As-Built Plans are the official record drawing that documents what was constructed. Please refer to ARS32-152 for the official definition.

As-Built Designer:

Is a person in charge of the As-Built Plans for a project who ensures that the Field Red-Line Plans are transferred accurately to the As-Built Plans.

Construction Administrator:

Is the ADOT Resident Engineer or the person who is in charge of administrating the project.

Designer of Record:

Is the professional registrant who is responsible for sealing the plan sheet.

Purpose

The purpose of these guidelines and procedures is to ensure that the As-Built Drawings are created consistently and accurately for all projects.

PROCEDURE

1. The Construction Administrator ensures that all project changes to the As-Bid Plans have been recorded on the Field Red-Line Plans. Use the “Field Red-Lines Construction Inspection Quantlist” (Attachment #1) and the Red-Line Guidelines section of this document.
2. The Construction Administrator completes the Field Red-Line information on the cover sheet (Attachment #2) and coordinates with the ADOT project manager for the delivery of the complete Red-Line package to the As-Built Designer in charge of the project.
3. The As-Built Designer will review the Field Red-Line Plans for legibility and accuracy. During the review process, the As-Built Designer and Construction Administrator must address any discrepancies, resolve any concerns, and establish a schedule for completion of the As-Built Plans. The As-Built set will be completed in a maximum of 60 days from the date the Field Red-Line Plans are received by the As-Built Designer. When the Construction Administrator has confirmation that the As-Built Designer has received the Field Red-Line Plans, they will send an email to Field Reports indicating the date the As-Built Designer received the documents. That email will trigger an entry into the FAST system that will be used to document the completion deadline.
4. The Construction Administrator and the As-Built Designer will consult to determine what process will be used to create the As-Built plans and will inform the project manager of the decision. With all processes the As-Built plans will be created by following the As-Built Guideline section of this document. They can choose one or a combination of the following processes:
 - **Process One** – If the final Field Red-Line Plans are a hand written hard copy and are clean, complete and legible they can be converted to As-Built plans. The document will then be scanned to PDF by the As-Built Designer unless the Construction Administrator chooses to do so.
 - **Process Two** – If the Field Red-Line sheets are in PDF format, red lined electronically, and are clean, complete and legible they can be converted to the As-Built plans by the As-Built Designer unless the Construction Administrator chooses to do so.
 - **Process Three** – The As-Built Designer transcribes all of the Red-Lines electronically onto the plans using the TIFF or PDF file that has been imported into Microstation or Adobe Professional and prepares the As-Built plans.
5. Once the Red-Lines are converted into the As-Built set, the As-Built Designer will return to the Construction Administrator, an electronic copy (PDF) and at the request of the Construction Administrator one (1) hard copy set of half size As-Built plans. The Construction Administrator will complete the final review.

6. The Construction Administrator will notify the ADOT project manager and the As-Built Designer via email that the As-Built plans are complete and approved. They will also send or request that the As-Built Designer send: one (1) hard copy half size set (11" x 17") of As-Built plans and a CD/DVD in PDF format of the As-Built plans to the Statewide Project Management Transportation Engineering Specialist (SWPMTES). The As-Built Designer will notify the Construction Administrator & PM when the plans have been sent to the SWPMTES.
7. The SWPMTES will check that all pages are printed and ensure that the files do not contain un-readable or corrupt file(s) and then will load them into the AIDW. If the As-Built deliverables contain corrupt or unreadable file(s), the SWPMTES will notify the As-Built Designer, project manager and Construction Administrator of the discrepancy and request the delivery of a new file. When the As-Built Plans are checked into the AIDW it will trigger an entry into FAST that will enter the As-Built submittal date and send email notifications to the Construction Administrator & PM. Until this trigger can be put into play the SWPMTES will send notice to Field Reports that he/she has received the As-Built Plans.
8. The SWPMTES will send the As-Built set to Engineering Records and send an email to the Construction Administrator, the As-Built Designer and the project manager stating that the As-Built Plans have been delivered.

Red-Line Guidelines

1. The base for Red-Lines will be a copy of the As-Bid Plans.
2. Complete the applicable Red-Line information on the cover sheet (see example Attachment #2).
3. Ensure that every sheet has been sealed and signed by the Engineer of Record.
4. All field revisions to permanent construction will be documented. These revisions include but are not limited to geometric, utilities, underground, guardrail, striping, signage and permanent erosion control.
5. Shop drawings that are unique in nature and are original contractor submitted designs that were not included in the as bid plans, shop drawings that change the design, RFI's and Supplemental Agreements will all be documented. Any additional shop drawing plan sheets will be added at the end of the plan set.
6. Minor Revisions will be drawn on the original sheets.
 - o The Construction Administrator may add sketches that clarify or document new findings or field modifications that need to be recorded.
 - o Construction Administrator should ensure that the Red-Line Plans are readable, without leaving any extraneous data on the plans.
 - o Use red to record your changes. Changes may be clouded at this point if the Construction Administrator chooses to.

7. Major Revisions:

- o If a revised sheet is needed the new sheet shall be sealed and signed by the Designer of Record (PE) making the revision.
- o The original As-Bid sheet is not discarded. An “X” must be drawn from corner to corner of the borders.
- o The line should not be so wide as to obscure any details that should remain visible.
- o The revised sheet is numbered with the same sheet number and includes a revision line with the Revision Number, description, date and initials of the person doing the changes.
- o If a single sheet is being revised several times, an “X” must be drawn on the original sheet and subsequent sheets until the last revised sheet has been submitted. Place the sheets behind the original in chronological order, numbering them using the original sheet number and the Revision Number.
- o The construction field office may Red-Line changes onto the plans. If there were multiple revisions for a single sheet, all revisions should be transferred onto the last revision sheet.
- o If there is no time to prepare an electronic detail, hand drawn sketches sealed and signed by the Professional Registrant responsible for the change may be used. These types of details should be converted to a formal revision to the plans prior to the completion of the construction. (See Attachment #3 and #4).
- o All revisions prepared by the designer will be clouded and if necessary numbered using the triangles legend.

8. Added Plan Sheets:

- o Added plan sheets shall be inserted within the appropriate section. Label the sheet with the sheet number and the next letter in the alpha designation sequence using upper case alpha letters (“18A”, “18B”, etc) in the upper right title block.

As-Built Guidelines

1. The prime consultant or technical group that is the lead for design is also the lead for distributing the Red-Line Plans and compiling the As-Built documents.
2. Complete the As-Built information on the cover sheet (see example Attachment #2)
3. All changes need to be legible. Where drafting of changes is required the As-Built Designer is responsible for producing quality drawings from the Red-Lines provided.
4. All revisions will be clouded. Never remove old values or details, just line or “X” through them. If there is no room for the new value, you can go to the side on the same line or beneath the table and state that value X is being replaced by Y.
5. If sheets are revised, only the original as bid sheet with the X across it and the final revision sheet showing all revisions will be included in the As-Built.
6. Ensure that every sheet has been sealed and signed by the Engineer of Record.
7. The person preparing the As-Built drawings must date every sheet in the upper right hand corner whether or not there are changes in that plan sheet.
8. When the set is complete the sheets are to be numbered consecutively in the lower right corner of the title block.

File Size and Naming Convention

1. The maximum file size is 75 MB which should contain a project of about 580 pages (do not use color PDF or prints as these increase the file size). Most of the projects should fit in one single file, you can obtain the maximum file size by:
 - a. Scanning the 11 x 17 sheets, combining them (be careful, PDF professional does not recognize page numbers and tends to accommodate files according to its format which can result in page 10 to follow page 1) to then optimize and reduce the file size (if necessary). A useful tip is to combine the files as follows; say that by scanning 100 pages you obtained 5 PDFs.
 - i. Open the first one, go to the last page of the file (ae. page 20 of the 1 to 20 scanned pages) and click on “insert pages” (found under “Documents”).
 - ii. In the prompt window you will be prompted to search for the file that contains the next batch of pages (ae. 21 to 40), click on that file so the name shows under “File name” in the prompted window.
 - iii. Click “Select”, you will be prompted with another window (insert pages). Choose “last page” (or “after”) making sure the last page is shown as “page” under “Location” and then click “OK”.

- iv. Your file now contains 40 pages (1 to 40 continuous); repeat this process until you have all the pages of the project.
 - v. Click “Optimize Scanned PDF” found under “Documents”, you may be prompted to save the file; at this point you can give the new file a name and proceed. Choose the “small file size” option instead of the high quality option.
 - vi. Once optimized; then click “Reduce File Size” also found under “Documents” and OK.
 - vii. Save the new file (should be a small size file).
- b. If you are using PDF professional to create the As-Built plans try optimizing and reducing the file size after the prepared As-Built plans are finished to attain similar file size as scanning. Otherwise, scan of the prepared 11” x 17” As-Built sheets to reduce the file size (you may have to follow the above procedure).
- c. If you are using TIFF files to create the As-Built plans, you can:
- i. Try converting the As-Built file into a PDF file, optimizing it and then reducing the file size. Depending on the number of pages in the project it may take several times optimizing ranges of pages and reducing the file size of these ranges prior to combining them into one single file size and once again optimize and reduce file size. This method is **HIGHLY DISCOURAGED** because it may cause your computer to either slow down considerably or freeze, plus the process take too much time.
 - ii. A faster way to obtain one file after working with TIFF files (that have been imported in Microstation) is to scan the prepared 11” X 17” As-Built plans into a single PDF (see “a” above).
2. If your project contains more than 1 volume (including change orders) and/or includes shop drawings; break down the project into volumes (if they have not been broken down already) and name them accordingly (see examples below).
3. Naming of files should use the follow format (Use underscore between information and do not leave gaps, see examples):

For ALL projects:

Tracs Number, Volume Number (use a, b, c if necessary), Page Range (includes change orders) in parenthesis, “As-Built”, File Extension.

For projects that contain shop drawings use:

Tracs Number, Volume Number, Page range in parenthesis, “Shop Drawings”, File Extension.

EXAMPLES (For the purpose of these examples, it is assumed that the change orders, standards, face sheet and additional pages were also counted as part of the page count).

Example 1, Simple project (up to 580 pages):

A project contains 400 pages (ae. 395 original pages and 5 change orders), the file should be named:

H100001C_voll(pgs1to400of400)_As-Builts.pdf

Example 2, Large Project (more than 580 pages):

A project that contains 700 pages, should be broken down and named in the following format:

H100001C_voll(pgs1to500of700)_As-Builts.pdf

H100001C_volla(pgs501to700of700)_As-Builts.pdf

NOTE: Try to make the break were there is a discontinuity from one technical group to another [for purpose of example 2, pages going from Traffic (page 460 to 500) to Bridge plans (from 501 to 700) or as described in examples 3 and 4.

Example 3 (separating a project): (Example 3 and 4 applies to projects that have 2 volumes in the set and identifies as such in their respective face sheets)

A project contains 1050 pages, the project had 2 volumes and shop drawings (70 pages total for both volumes) corresponding to both volumes (page numbering is continuous to reach to page 1050). Volume one: 670 pages which contains 2 bridge plans towards the end (pages 581 to 670); volume 2: 380 pages. The project should be broken down and named as follows:

H100001C_voll(pgs1to580of1050)_As-Builts.pdf

H100001C_volla(pgs581to670of1050)_As-Builts.pdf

H100001C_vol2(pgs671to1050of1050)_As-Builts.pdf

H100001C_voll(pgs1to50of50)_ ShopDrawings.pdf

H100001C_vol2(pgs1to20of20)_ ShopDrawings.pdf

Note: If there are more than 580 pages of shop drawings, they should be also broken down to their corresponding volume (use a,b,c also); see example 5 below.

Example 4 (separating by file size):

A project contains 1038 pages total, has 2 volumes and shop drawings corresponding to each volume [volume 1 (657 pages) and 62 pages of shop drawings; volume 2 (381 pages) and 20 pages of shop

drawings]. Further, the project's volume 1 contained plans for a city pump station plans towards the end (pages 551 to 657). The project should be broken down as follows:

- a. Volume 1 (657 pages), file size: 72.0 MB; naming should be:
H100001C_vol1(pgs1to550of1038)_As-Builts.pdf
- b. Volume 1, Pump Station Drawings (102 pages), file size: 10.74 MB; named:
H100001C_vol1a(pgs551to657of1038)_As-Builts.pdf
- c. Volume 2 (381 pages), file size: 36.5 MB ; named:
H100001C_vol2(pgs581to1038of1038)_As-Builts.pdf
- d. Shop Drawings for volume 1 (62 pages), file size: 4.85 MB
H100001C_vol1(pgs1to62of62)_ ShopDrawings.pdf
- e. Shop Drawings for volume 2 (20 pages), file size: 2.33 MB
H100001C_vol2(pgs1to20of20)_ ShopDrawings.pdf

NOTE: As mentioned in example 2, consider the proper place to make a break.

Example 5 (General large size project):

A project contains 10,000 pages total (counted continuously); has 5 volumes and shop drawings corresponding to each volume [volume 1 (2000 pages) and 800 pages of shop drawings; volume 2 (3000 pages) and 600 pages of shop drawings, volume 3 (2000 pages) and 200 shop drawings; volume 4 (1500 pages) and 150 shop drawings and finally volume 5 (1500 pages) and 150 shop drawings. The project should be broken down as follows:

PLANS

H100001C_vol1(pgs1to580of10000)_As-Builts.pdf

H100001C_vol1a(pgs581to1060of10000)_As-Builts.pdf

H100001C_vol1b(pgs1061to1740of10000)_As-Builts.pdf

H100001C_vol1c(pgs1741to2000of10000)_As-Builts.pdf

H100001C_vol2(pgs2001to2580of10000)_As-Builts.pdf

H100001C_vol2a(pgs2581to3160of10000)_As-Builts.pdf

...

H100001C_vol2e(pgs4901to5000of10000)_As-Builts.pdf

H100001C_vol3(pgs5001to5580of10000)_As-Builts.pdf

...

H100001C_vol3c(pgs6741to7000of10000)_As-Builts.pdf

H100001C_vol4(pgs7001to7580of10000)_As-Builts.pdf

...

H100001C_vol4b(pgs8161to8500of10000)_As-Builts.pdf

H100001C_vol5(pgs8501to9080of10000)_As-Builts.pdf

...

H100001C_vol5b(pgs9661to10000of10000)_As-Builts.pdf

SHOP DRAWINGS

H100001C_vol1(pgs1to580of800)_ ShopDrawings.pdf

H100001C_vol1a(pgs581to800of800)_ ShopDrawings.pdf

H100001C_vol2(pgs1to580of600)_ ShopDrawings.pdf

H100001C_vol2a(pgs581to600of600)_ ShopDrawings.pdf

H100001C_vol3(pgs1to200of200)_ ShopDrawings.pdf

H100001C_vol4(pgs1to150of150)_ ShopDrawings.pdf

H100001C_vol5(pgs1to150of150)_ ShopDrawings.pdf

Example 6 , Other documents to be included:

For projects that contain any other type of information use:

Tracs Number, Document type, Page range in parenthesis, “As-Builts”, File Extension.

H100001C_vol1(pgs1to400of400)_VEStudy.pdf

4. The naming convention for CD/DVD cover is:

Top portion of the CD/DVD:

Project Name

Complete Project Number

Federal Project Number

Bottom portion of the CD/DVD:

Tracs Number, Number of Volumes, Page Range in parenthesis and File Content (ae. As-Built plans, Shop drawings etc).

Inside of the CD/DVD:

Tracs Number

Note: Do not mark off the “Read Only” option or any other property. Also, do not put any passwords on the files nor “finalize” the CD.

The cover should be white background and black letters (do not add any other type of background pictures, colors or disclaimers as they do not contrast with the project information and makes the project information hard to read).

Example: Only volume that has been separated in 2 portions

Upper portion:

“Anthem Way to New River Road”

“017 MA 229 H760401C”

“IM-017-A(208)B”

Bottom portion:

H760401C: 1 vol. (pgs 1 to 1050), As-Built plans

Example: More than 1 volume separated in portions

Upper portion:

“Anthem Way to New River Road”

“017 MA 229 H760401C”

“IM-017-A(208)B”

Bottom portion:

H760401C: 2 vol. (pgs 1 to 1050 and 1 to 350), As-Built plans

“2 vol. (pgs 1 to 50 and 1 to 85), Shop Drawings

“1 vol. (pgs 1 to 20), VE study

Inside the CD:

“H100001C”

Note: Prepared [As-Built example plans](#) and/or [Questions and Answers](#) in PDF format can be found in the Statewide Project Management’s website under Project Development Process forms.

ARIZONA DEPARTMENT OF TRANSPORTATION
 INTERMODAL TRANSPORTATION DIVISION

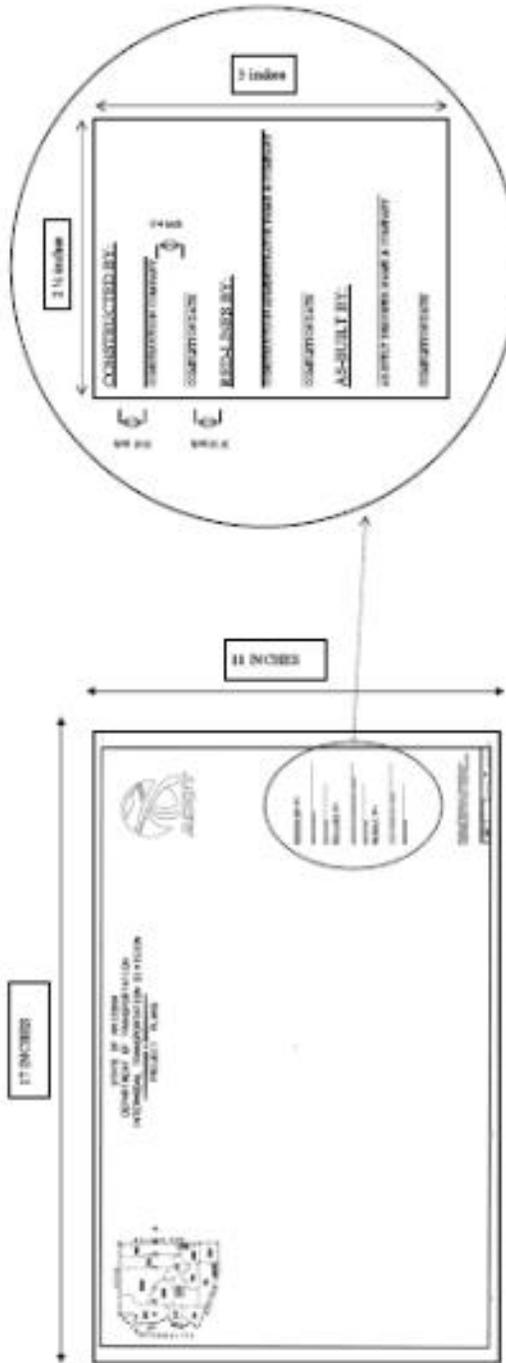
Construction Inspection Quantlist
 General Provisions Division 1 Field Red-Lines

Version: 12072009

Project Number:		Tracs Number:	
Reviewer:		Contractor:	
Begin Date:		Completion Date:	
Bid \$ Amount:		Final \$ Amount:	

Conforming?	Attributes
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	1. All Field Red-Lined changes are recorded onto a hardcopy (Half or Full size) or electronic image of the Original As-Bid plans.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	2. Field Red-Line submittal set includes all As-Bid plan sheets, addendums, shop drawings (only if unique in nature) and any redesigned plan sheet (submitted by any Professional) including the properly "Xed" out original sheets.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	3. Field Red-Line information is complete and includes location, (stationing, elevations, offsets etc.), dimensions, and item name.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	4. Field Red-Lines include all plan's modifications whether by field adjustments, supplemental agreements or RFIs and findings that differ from the conditions shown on the as-bid plans.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	5. Field Red lines include all utility work (gas, water, CAP, electric, communications, irrigation, railroad, etc.) moved, added or abandoned as part of the construction project.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	6. Field Red-Lines include only information relevant to the modifications. (Insure inspector's field notes are not included.)
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	7. Field Red-Lines are legible; drawings and text are done neatly and print size is adequate.
	Comment:

Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	8. Supplemental pages containing plan modification sketches have been sealed and signed by the registrant author of those sketches (ae. Designer, RE or contractor’s registrant who is providing the sketches).
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	9. Field Red-Lines have been checked for accuracy prior to submittal to the As-Built designer.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	10. Field Red-Lines ready for submittal is a complete set and are in a correct sequential order.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	11. The Construction Administrator has completed the Field Red-Lines Information on the front page of the Red-line set.
	Comment:
Y <input type="checkbox"/> N <input type="checkbox"/> NA <input type="checkbox"/>	12. Construction Administrator submits Field Red-Lines to As-Built designer (including Consultant, internal ADOT & Local Government administered projects) within 45 days of project final acceptance. (cc submittals to PM)
	Comments:



PART A: Typical Half-Size plan sheet example

NOTE

The As-Built block and/or page can be found at: www.roadwaygroup.com's website:

http://www.roadwaygroup.com/roadway_group/Products/Ready_Design/CRMS/Features/CRMS.asp.

Under "facsimile.tif" which is a Micro-station B2M file.

For anyone unable to access the file, the following information should be taken as recommended dimensions and sizes to be used to create the block and information required on the first sheet of the As-Built plan.

Dimensions shown in part B are in reference to a half size (11 by 17 inch) plan sheet as shown.

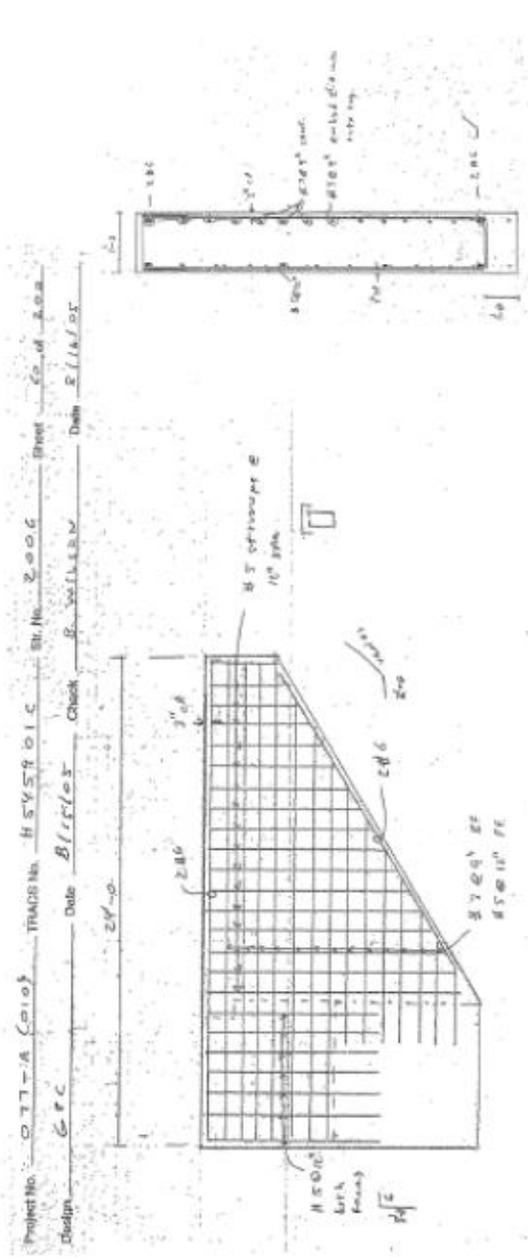
Adjustments will be necessary for full size plan and if using PDF professional.

Block 2 1/4 inches wide by 3 inches high

FONT SIZES

"CONSTRUCTED BY:" Times Roman 11 or similar

"COMPLETION DATE:" Times Roman 7 or similar



NOT TO SCALE
FOR REFERENCE

Arizona Department of Transportation
As-Built Preparation Estimate

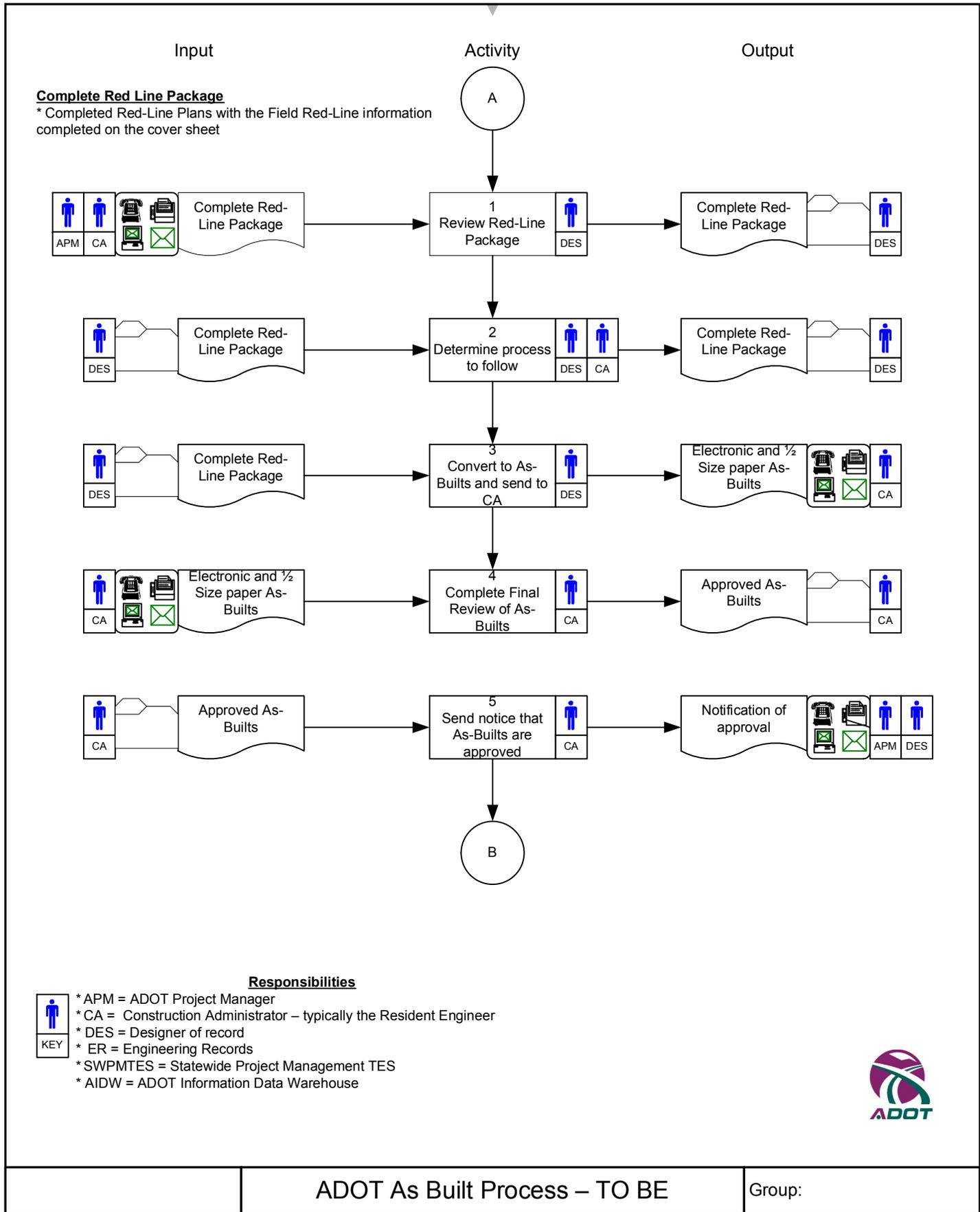
Project Number:
Resident Engineer's name:

TRACS No.
Date:

Enter your data in all yellow fields DO NOT CHANGE THESE FIELDS	Unit	Number of sets	Estimated minutes / sheet	Total estimated time	Total estimated time
				minutes	Hours

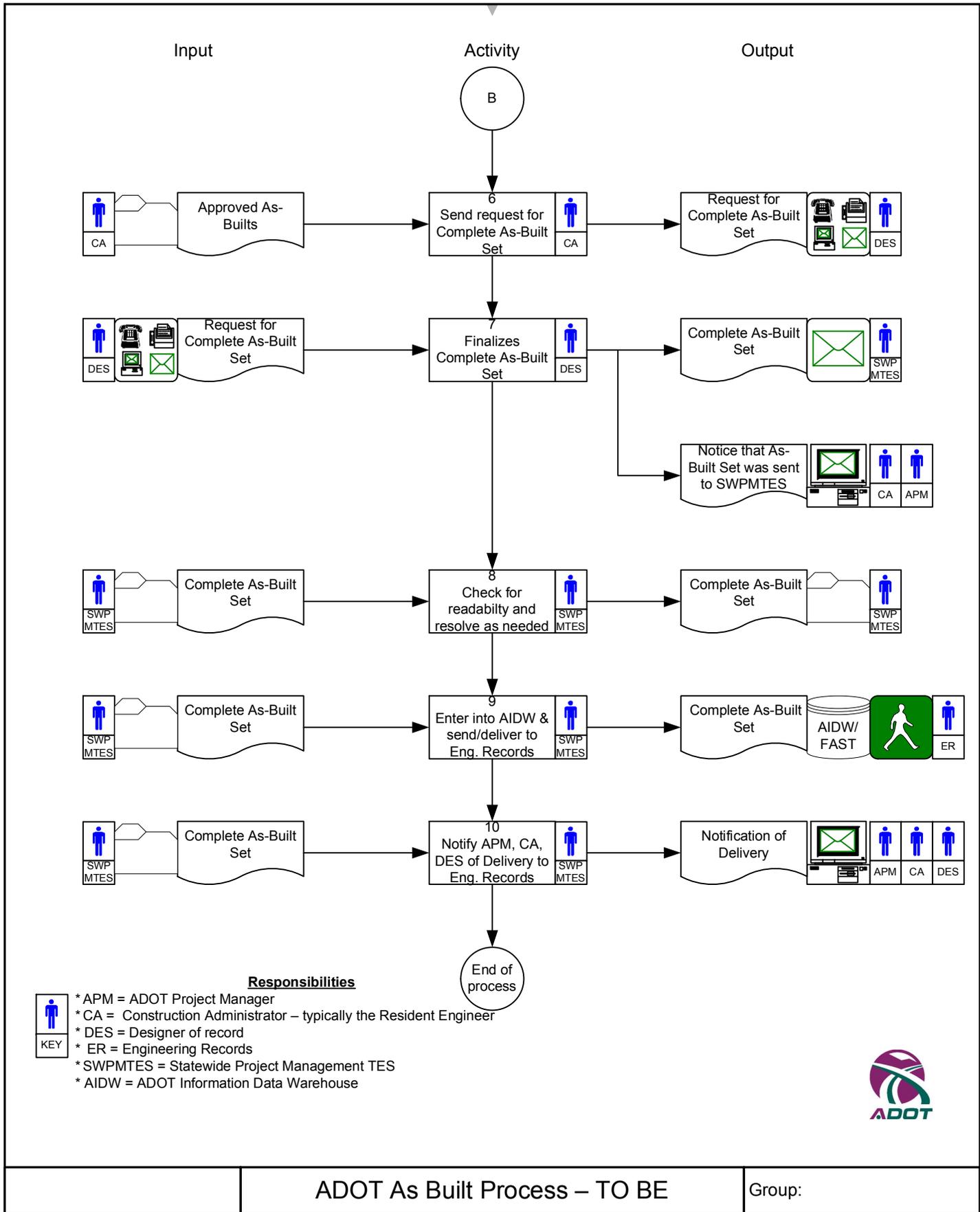
Number of sheets in plan set	573	sheets				
Number of sheets with no revisions (no redlines) including check of seal and signature (1 min/sheet)	300	sheets	1	1.00	300	5
(*) Number of sheets with limited revisions (minor edit redline changes) (15 min/sheet).	200	sheets	1	15.00	3000	50
(*) Number of sheets with extensive revisions (some drawings need to be either created or edited) (40 min/sheet)	73	sheets	1	40.00	2920	49
Number of extra sheets to confirm that all pages are signed (1 min/sheet)	273	sheets	1	1.00	273	5
print half-size sets (1 check, 1 final) (10 sec/sheet)	573	sheets	2	0.17	191	3
scan and copy set for CD (2 min/sheet .pdf)	573	sheets	2	2.00	2292	38
Administration (contract estimate, QC etc)						16
<p align="center">Check number of pages against breakdown of changes ok</p>				Total Project Hours =		166
				Equivalent to (min/sheet) =		17

(*) Note: Some major changes may need more time to re-draw some details. If that is the situation in your project then add 5 to 10% total hours or consult with the As-Built Statewide Project Management Specialist



ADOT As Built Process – TO BE

Group:



ADOT As Built Process – TO BE

Group: