

# Design & Operation of Culverts

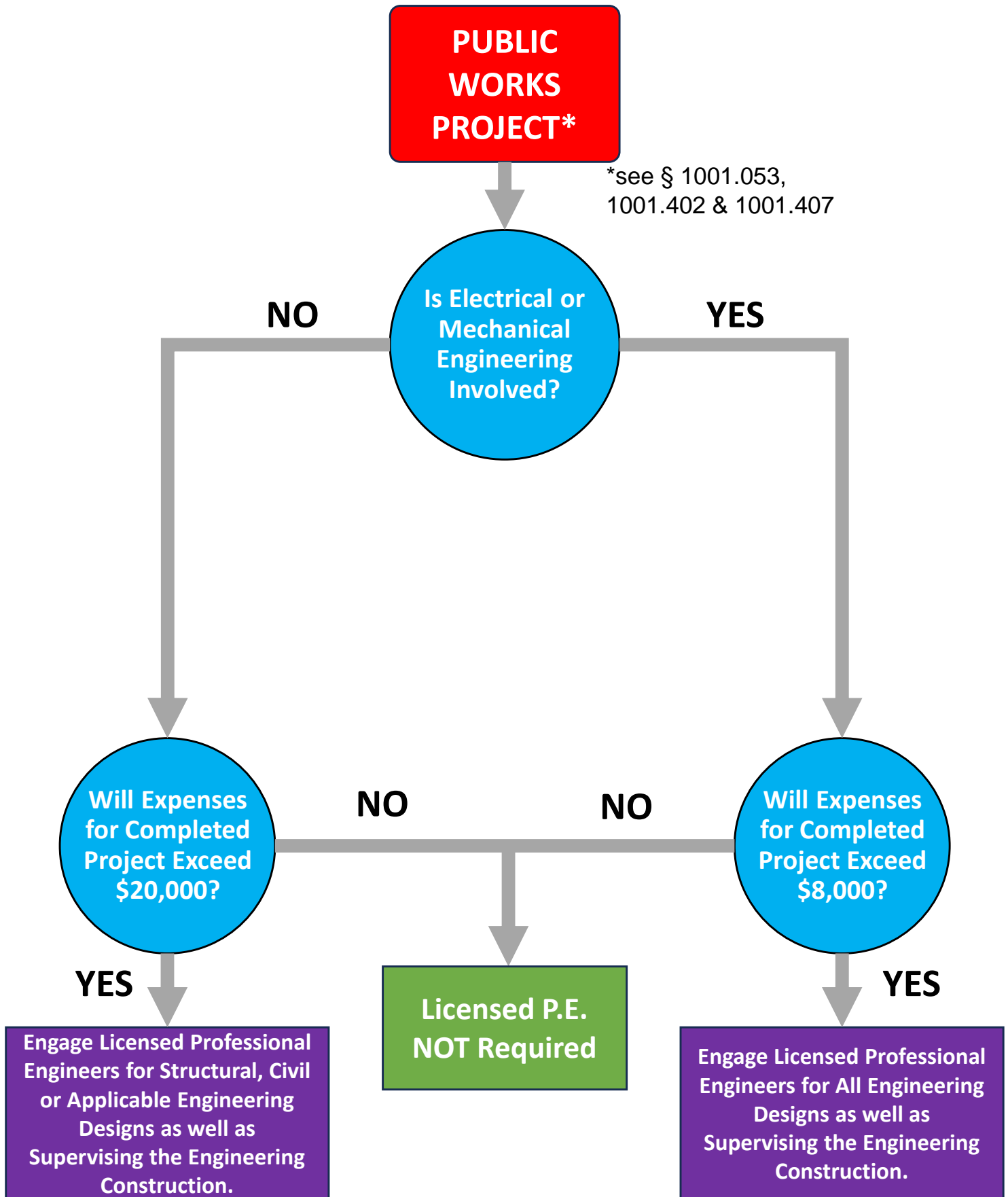
Wayne Gisler, P.E.

Karnes County Road & Bridge Engineer

# PRESENTATION OVERVIEW

- What are you allowed to do without hiring an engineer?
- When to hire an engineer.
- The value of field inventories and what should go into them.
- All projects cost money!
- We aren't just building roads, we're also building careers!
- What Auditors Want....
- Deliverables....

# TEXAS ENGINEERING PRACTICE ACT AND RULES



This flowchart is intended for guidance purposes only and the Texas Engineering Practice Act and Rules govern final interpretation. Local codes and ordinances may be more restrictive as long as not in conflict with the Texas Engineering Practice Act and Rules.

# TEXAS ENGINEERING PRACTICE ACT AND RULES

PUBLIC  
WORKS  
PROJECT\*

\*see § 1001.053,  
1001.402 & 1001.407

Is Electrical or  
Mechanical  
Engineering  
Involved?

NO

YES

Does Project  
Include  
Improvements by  
Contract

## ADOPT STANDARD DETAILS & SPECIFICATIONS

§ 1001.0031(c) of the Texas Administrative Code considers the use of shop drawings and specifications engineering works. If you don't already have a set of roadway standards, consider working with a professional engineer to have regularly used roadway maintenance standards sealed so that Commissioner Court can adopt them as standards details.

Will Expenses  
for Completed  
Project Exceed  
\$20,000?

YES

Engage Licensed Professional Engineers for Structural, Civil or Applicable Engineering Designs as well as Supervising the Engineering Construction.

Licensed P.E.  
NOT Required

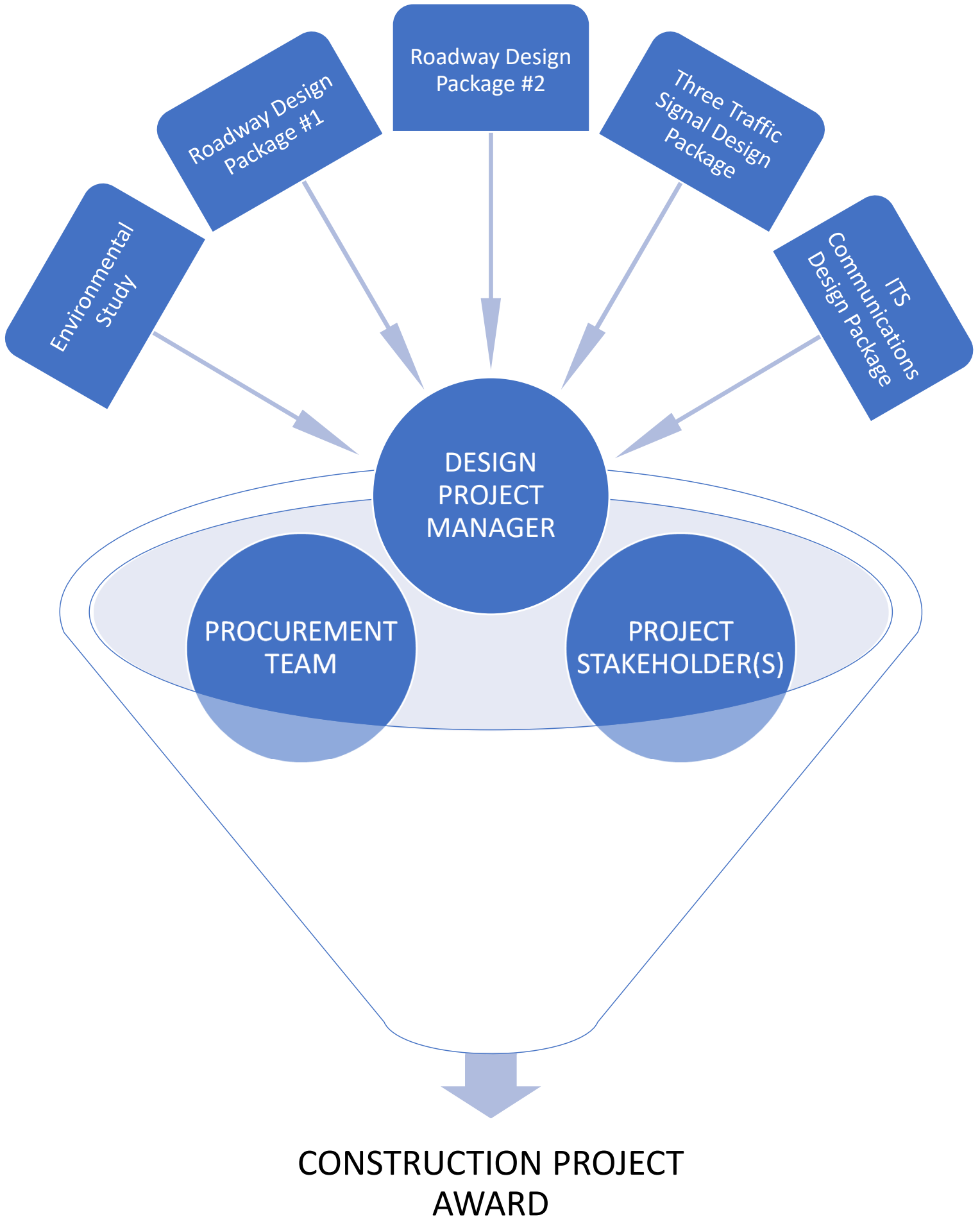
Will Expenses  
for Completed  
Project Exceed  
\$8,000?

YES

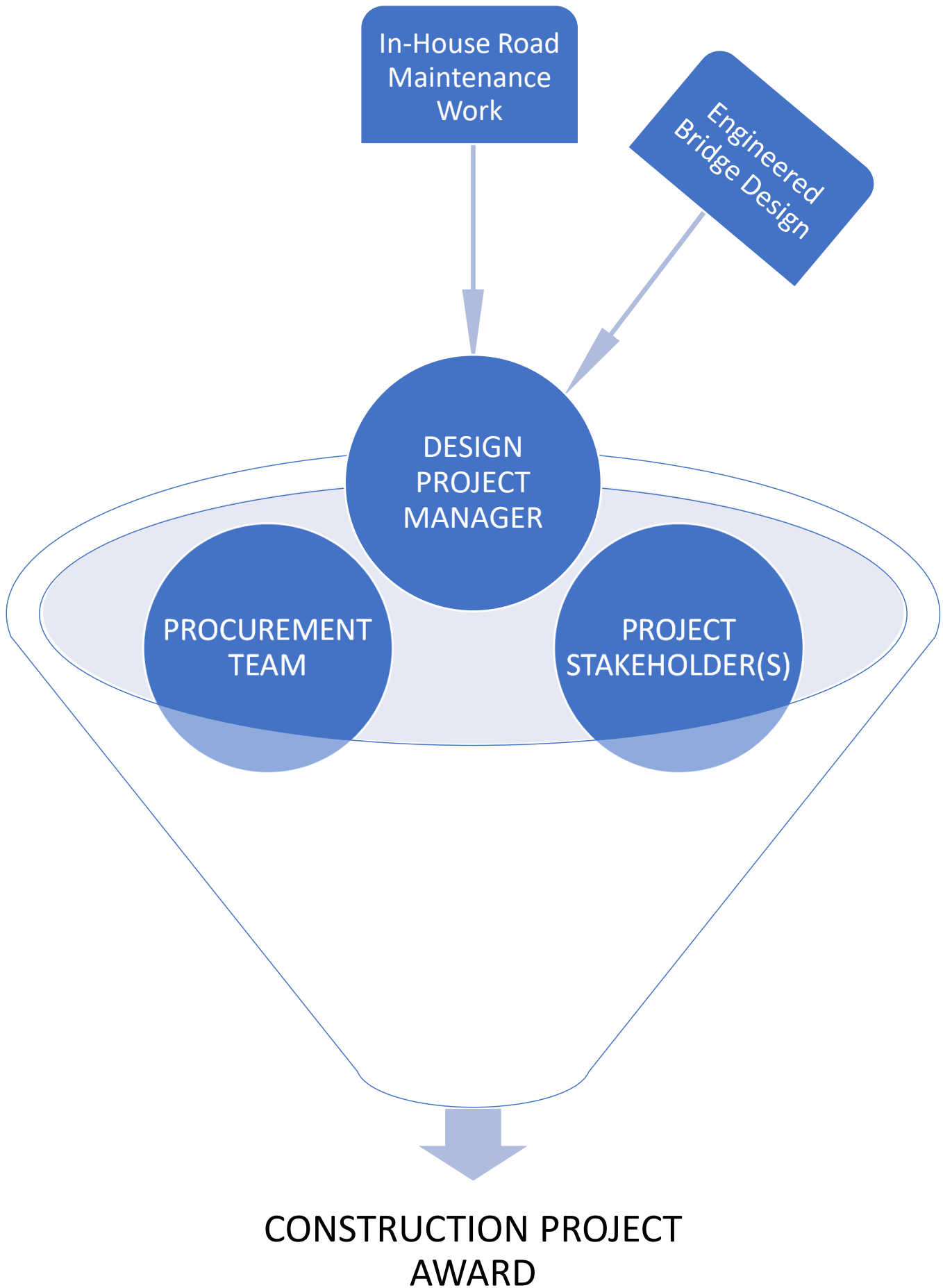
Engage Licensed Professional Engineers for All Engineering Designs as well as Supervising the Engineering Construction.

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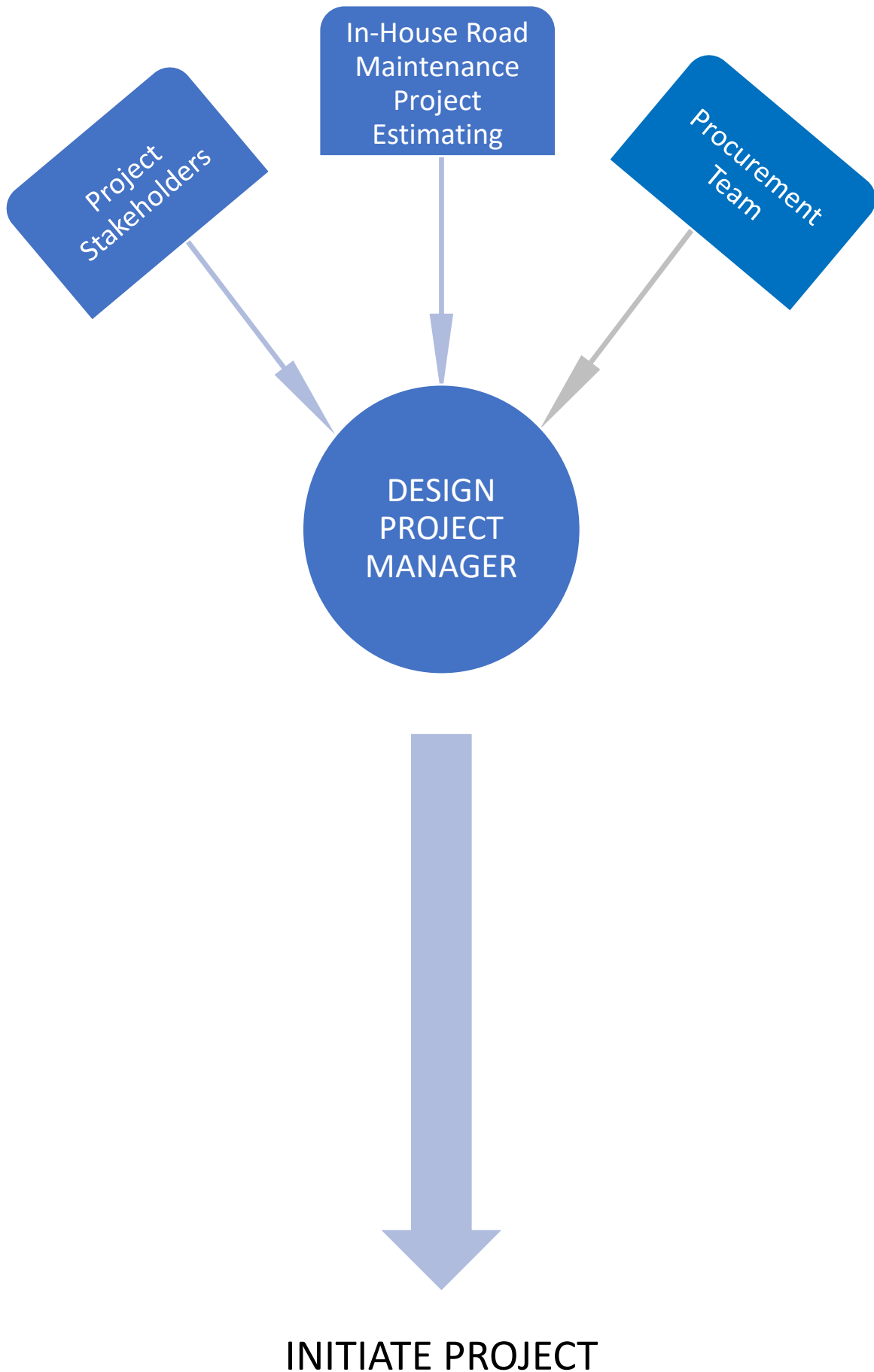
# MULTI-DISCIPLINARY CONSTRUCTION PROJECT



# PROJECT WITH MIX OF ENGINEERING WORK AND MAINTENANCE WORK



# COMMISSIONER COURT ROAD MAINTENANCE WORK

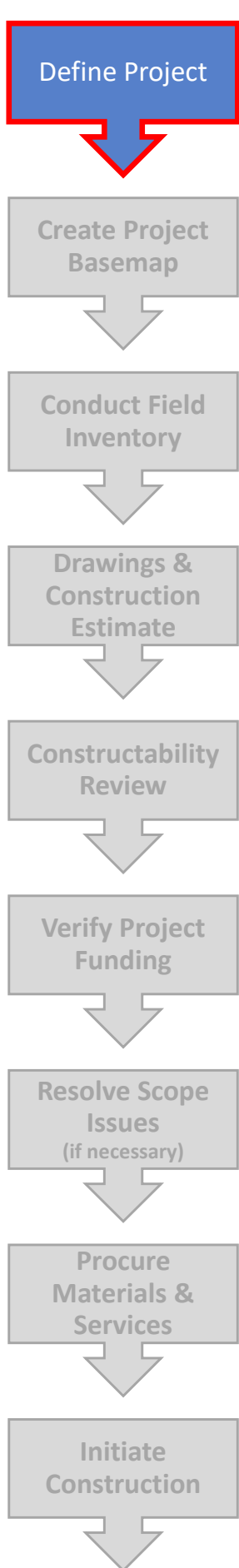


# PROJECT DEVELOPMENT PROCESS





# PROJECT DEVELOPMENT PROCESS



## MAINTENANCE PROJECTS

- Roadway Cross-Section Maintenance
- Roadside Ditch / Culvert Maintenance
- Seal-Coat / Overlay Projects
- Other work that the Texas Board Of Professional Engineers considers “...road maintenance or improvement undertaken by the commissioners court of a county...” (§ 1001.053(3))

*If in doubt about a particular type of work activity, consult the Texas Board Of Professional Engineers.*

## TAILOR PROJECTS TO IN-HOUSE STAFF

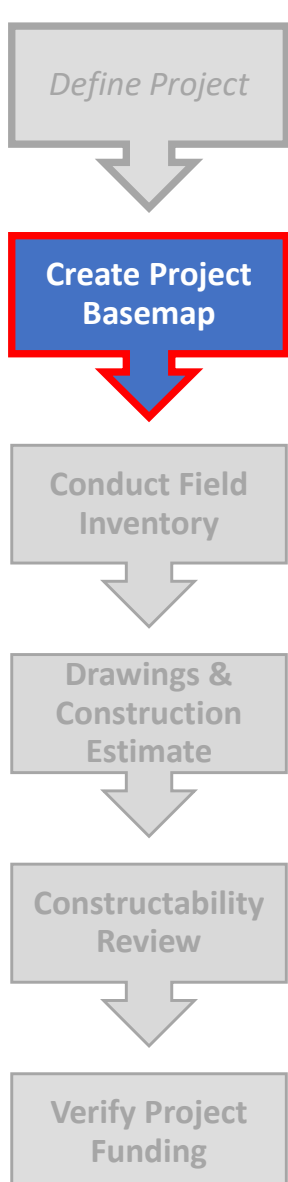
- Project Manager – Able to compile all technical elements of a project from the field through procurement through construction completion.
- Constructability Review Team
- Construction Inspection
- Construction Phase Services Agreements

## ADOPT STANDARD DETAILS & SPECIFICATIONS

§ 1001.0031(c) of the Texas Administrative Code considers the use of shop drawings and specifications engineering works. If you don't already have a set of roadway standards, consider working with a professional engineer to have regularly used roadway maintenance standards sealed so that Commissioner Court can adopt them as standards details.

**If you aren't a P.E. and your project has engineered elements, you MUST provide for oversight by an Engineer throughout the construction phase of a project.**

# PROJECT DEVELOPMENT PROCESS



## When & Why

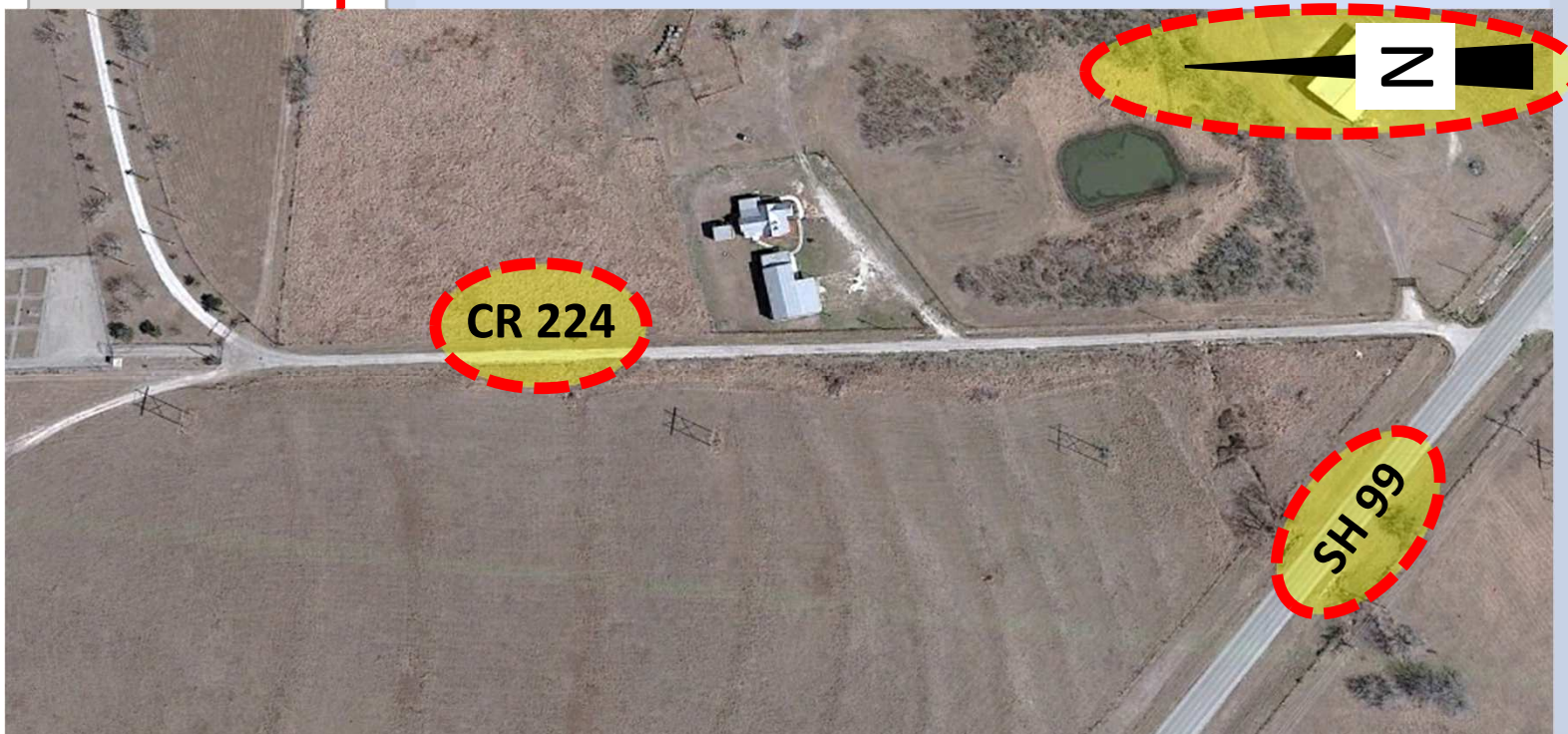
1. For EVERY project!
2. Clear and concise communication
3. Bus accidents
4. Documentation

## A Good Basemap...

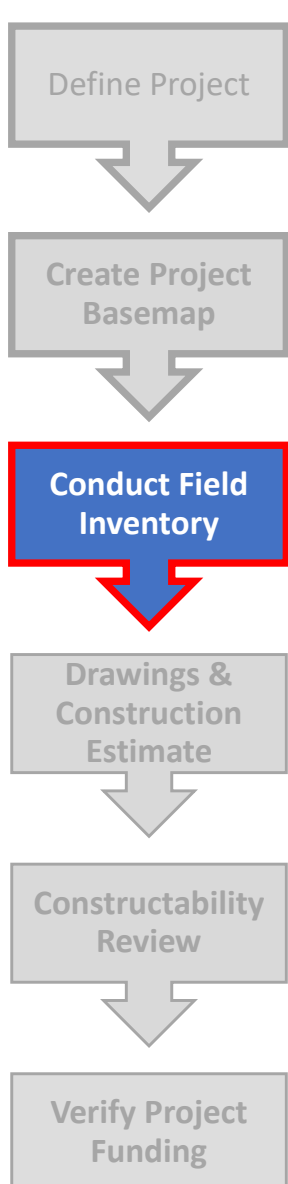
- Identified roads
- Provides cardinal direction

## Tools Used

- Google Earth
- PowerPoint



# PROJECT DEVELOPMENT PROCESS



## The value of field inventories...

- *Historical overview...*
- *Justify and document existing conditions...*
- *Document what was constructed...*
- *People will be people...*

## ...and what should go into them.

- *Every driveway and gate*
  - *Every crossing culvert*
  - *Every low spot that is going to hold water*
  - *Road / pavement widths*
  - *Right-Of-Way widths*
  - *A legend that shows what will and will not be improved*
- A DESCRIPTION OF WHAT EXISTS AT EACH LOCATION**



# PROJECT DEVELOPMENT PROCESS

Define Project

FIELD NOTES: Start of drainage project

Create Budget

Construct

FIELD NOTES: Private property entrance with swale

6	CONTRACTOR - REMOVE >24IN TO 48IN CMP [2640]	EACH	2	\$400.00	\$800.00	FIELD NOTES: Existing crosspipe (2) 36" X 20' no headwalls remove and replace with (3) 36" X 20' with parallel headwalls
6	CONTRACTOR - Furnish and install CMP (GAL STL 36IN) [2190]	LINEAR FOOT	60	\$150.00	\$9,000.00	Construction Note: Install three 20' culverts
6	Furnish and install CAST-IN-PLACE HEADWALL (CH-PW-0)(Triple)(DIA=36IN) complete in place in accordance with drawings and specifications [0000]	Each	2	\$8,500.00	\$17,000.00	Construction Note: Narrow ROW requires use of parallel headwalls
6	CONTRACTOR - F&I 5IN THICK CONCRETE RIP-RAP (KCRB) [3204]	SQUARE YARD	60	\$140.00	\$8,400.00	Construction Note: This is a field measured item that will be constructed if directed by KCRB Inspectors.
6	KCRB - Yellow OM2-2V Delineator [9946]	EACH	2	\$12.88	\$25.76	Construction Note: KCRB will install these materials
6	KCRB - Delineator Support (1.12lb per foot U-Channel) [9945]	EACH	2	\$17.11	\$34.22	Construction Note: KCRB will install these materials

Resource

FIELD NOTES: Pasture entrance that is rarely used. Trees growing into gate.

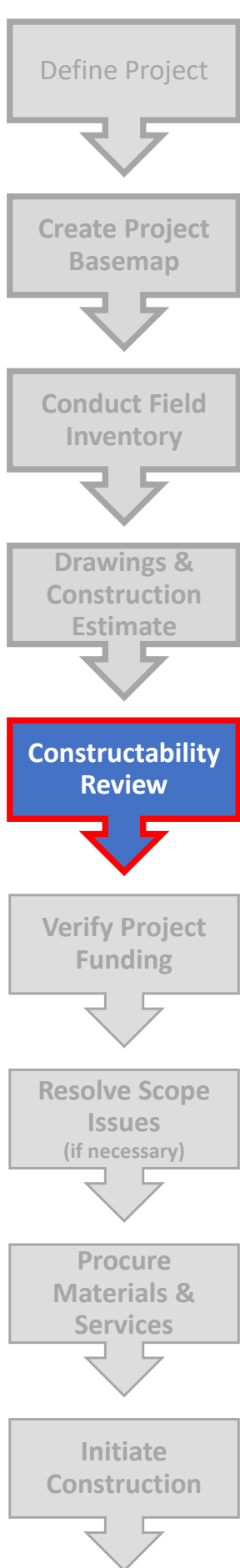
Project Management

FIELD NOTES: Permitted private property entrance with culvert and SETs.

Initiate Construction

8	No Improvements Required	N.A.	1	\$0.00	\$0.00	
B	No Improvements Required	N.A.	1	\$0.00	\$0.00	
B	No Improvements Required	N.A.	1	\$0.00	\$0.00	FIELD NOTES: End of drainage project
				<b>TOTAL \$35,259.98</b>		

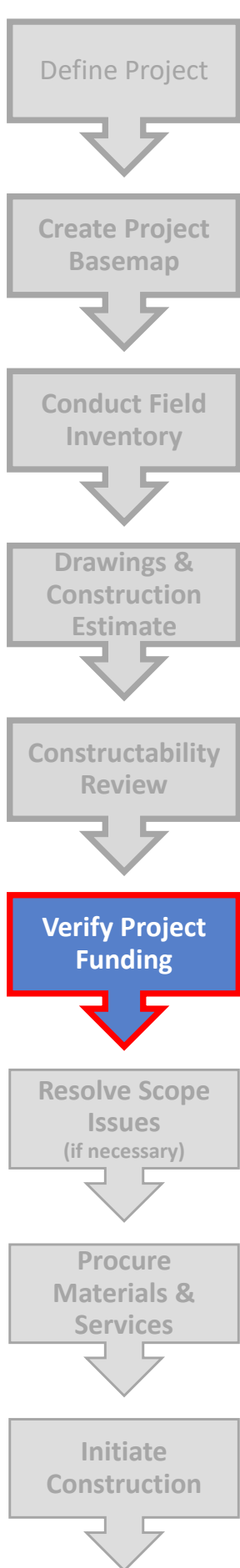
# PROJECT DEVELOPMENT PROCESS



## Requirements for Constructability Reviews....

- *Take a set of drawings and copy of the cost estimate to the field.*
- *Put at least one new set of eyes on the project...preferably a set of eyes with some construction experience.*
  - Great cross training opportunity
  - Great team-building opportunity
  - Eliminates finger-pointing
- *Consider taking the contractor or the guy in-house that is going to do the work.*
- *Come to an agreement as a group on every location. Document any changes to the drawings and cost estimate to take back to the office.*
- ***KEEP AN OPEN MIND!** This is a team activity and there is usually more than one decision that will work for each location.*

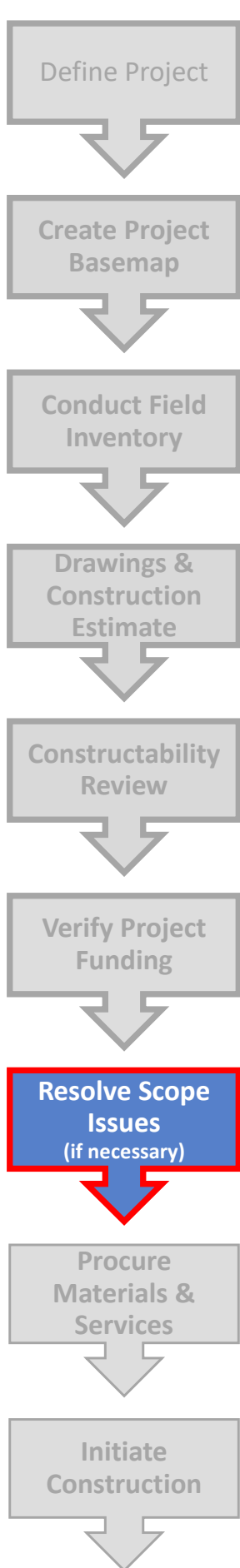
# PROJECT DEVELOPMENT PROCESS



## Project Funding

- *Revise drawings to reflect decisions made as part of the constructability review.*
- *Revise the estimated cost of the improvements.*

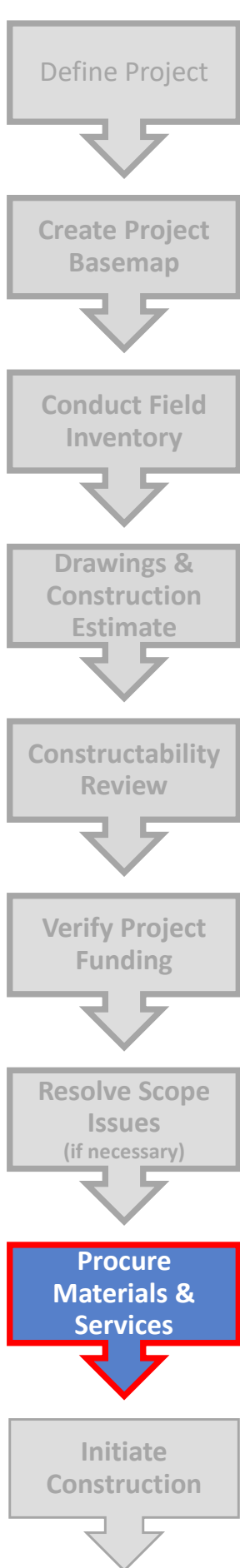
# PROJECT DEVELOPMENT PROCESS



## Project Funding

- *Revise drawings to reflect decisions made as part of the constructability review.*
- *Revise the estimated cost of the improvements.*
- *Make sure you haven't changed the scope of the work such that:*
  - You are outside of what the Commissioner Court approved
  - You haven't busted your budget
  - Commissioner Court approval for a change-in-contract is needed (if outsourcing to get the work done)
  - Engineered works have not been introduced into the project

# PROJECT DEVELOPMENT PROCESS



## Project Funding

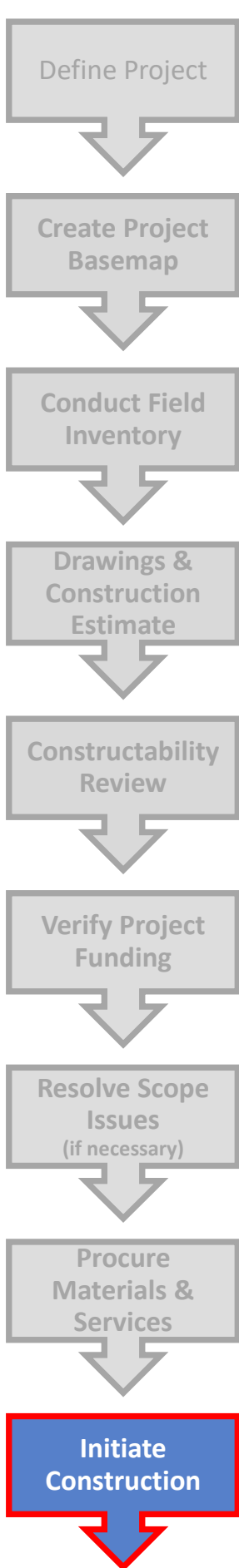
- *Revise drawings to reflect decisions made as part of the constructability review.*
- *Revise the estimated cost of the improvements.*
- *Make sure you haven't changed the scope of the work such that:*
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## Procurement

- *Streamline cost estimates by developing standardized item description and part codes for materials and services you regularly use.*
- *Incorporate those items into spreadsheets that can be used to easily develop project cost estimates.*



# PROJECT DEVELOPMENT PROCESS



*THANKS FOR YOUR  
TIME AND FOR YOUR  
SERVICE TO YOU  
COMMUNITIES!*

**QUESTIONS?**