An Integrative Approach to Web GIS for Local Building Departments

A CASE STUDY IN PERMITTING AND INSPECTIONS

Presenter: Dave Ostrander
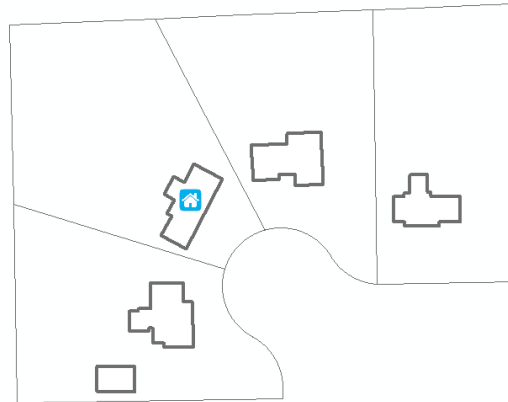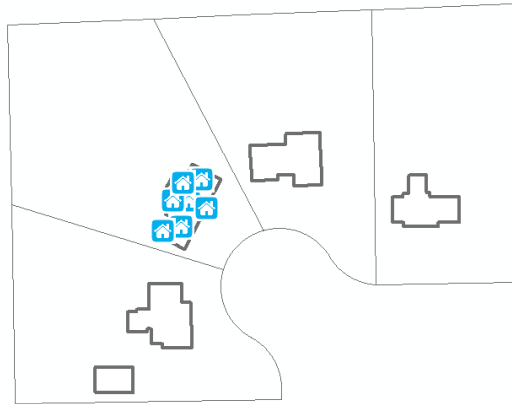Advisor: Dr. James O'Brien

Background…

- States grant local governments (e.g., counties and municipalities) the authority to regulate construction activities to encourage the health, safety, and well-being of their residents (55 Illinois Compiled Statute 5/5-12).

- Current building department permitting and building inspection practices rely on paper-based system for issuing permits and conducting building inspections.

- Communicating permit approvals and building inspection results requires in-person office visits, phone calls, or written correspondences.

- Building permit files are compiled and then maintained in physical storage spaces and some is manually transcribed into a digital format.

Key Features of a Web GIS System:

- **E-permitting**
  - Online Permit Submission
  - Online Permit Review

- **Integrating Applications**
  - Benefits
  - Easy to do

- **Data Collection Applications**
  - Survey123 for ArcGIS- Form-Centric
  - Collector for ArcGIS- Map-Centric

- **Leveraging Webhooks**
  - Automate Back-End Processes
  - Adds Fail-Safe

- **Smart Layers**
  - Definition Query Based Services
  - View Based Services

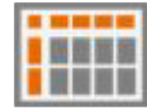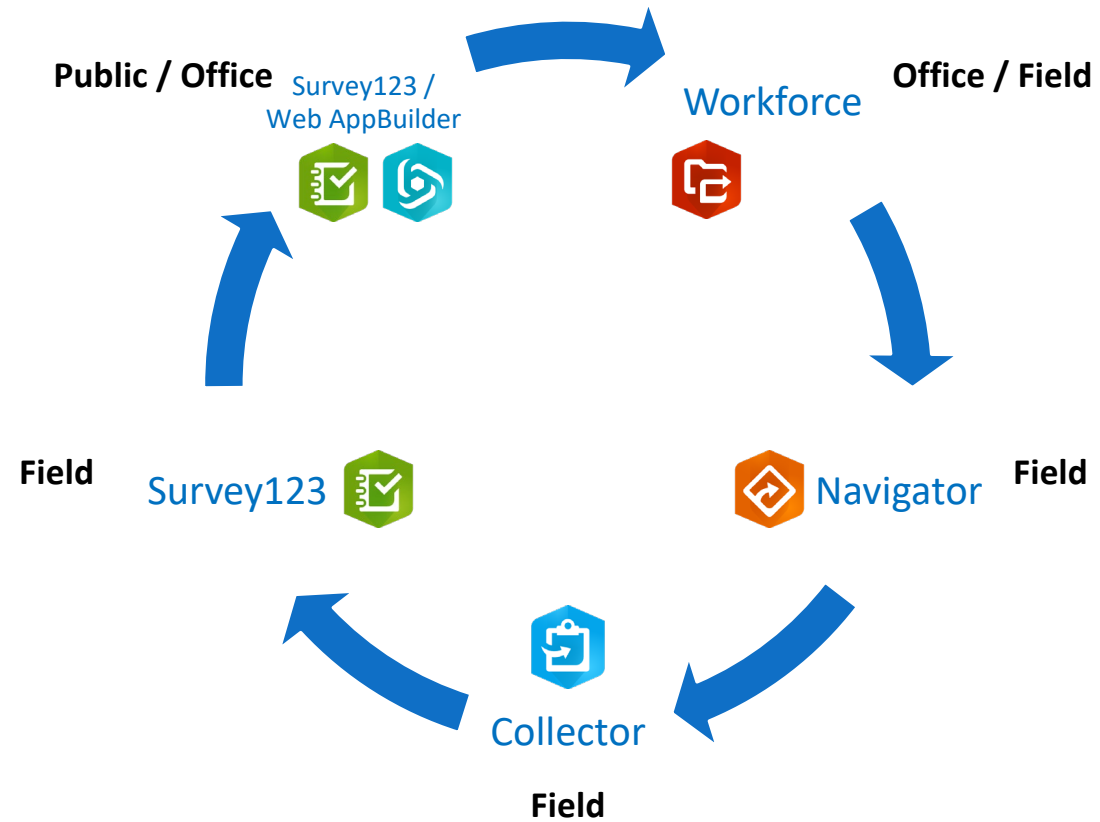# A Use Case Scenario:

Using GIS to Conduct Building Inspections

Inspection Surveys

Building
Permit

Why Integrate?

Public / Office — Survey123 / Web AppBuilder

Office / Field — Workforce

Field — Navigator

Field — Collector

Field — Survey123

Data Collection Applications

Survey123:

- Released in 2016
- Form centric (Surveys)
- Surveys are created via the web or a spreadsheet editor
- Surveys are published as feature services
- Supports editing new and existing data
- Supports smart forms
- Supports disconnected editing
- Supports anonymous access
- iOS, Android, Windows (7, 8, 10), Mac, Linux, Web
- Supported by Esri

Collector:

- Released in 2013
- Map Centric (points, lines, polygons)
- Data collection maps are created using AGOL or Portal
- Data is published as feature services
- Supports editing new and existing data
- Supports disconnected editing
- iOS, Android, Windows 10
- Supported by Esri

What do these terms really mean?

FORM CENTRIC

✓ Data Collection that is more Concerned with Questions

- Attribute data centric
- Best suited for complex attribute collection
- Geo-Capable, but not the focus

MAP CENTRIC

✓ Data Collection that is more Concerned with the Where

- Geospatial data centric
- Best suited for simple attribute collection
- Attribute capable, but not the focus

Using Survey123 with Existing Feature Services

The easiest way:

- Publish data as a hosted feature service or to an ArcGIS Server that is federated with Portal for ArcGIS
- Launch Survey123 Connect > choose New Survey > click the radio button "Feature Service" > choose your feature service > Create Survey
- Surveys From Related Tables
  - Delete Questions Not Found in Related Table
  - Fill in the form_id property with name of the related table in the settings tab of your spreadsheet
- http://doc.arcgis.com/en/survey123/desktop/create-surveys/survey123withexistingfeatureservices.htm

The harder way:

- Publish data to non-federated ArcGIS Server
- http://support.esri.com/technical-article/000014793

URL Scheme

Provides a protocol for launching apps and invoking actions:

- Launching the Survey123 app from Collector
- Opening a specific survey
- Prepopulating survey questions

Launches
Survey123

Opens
Specific Survey

Populates
Survey Fields

arcgis-survey123://?itemID=d6141937cfe740eaa144a817fd3b26&field:BldPerm={PermitNum}&Owner={TaxName}&Inspector={PlumbInspect}

Leveraging Webhooks

Edit webhook

A POST request will be sent to the payload URL below with selected details of any subscribed events.

Name *

Multipurpose Inspection Form (MS Flow)

Payload URL *

https://prod-110.westus.logic.azure.com:443/workflows [_____] /triggers/manual/paths/invoke?api-version=2016-06-01&s|

Trigger events

✔ New record submitted   ✔ Existing record edited

Event data

Include following information in the payload

☐ Survey info ?   ☐ Server response ?   ✔ Submitted record ?
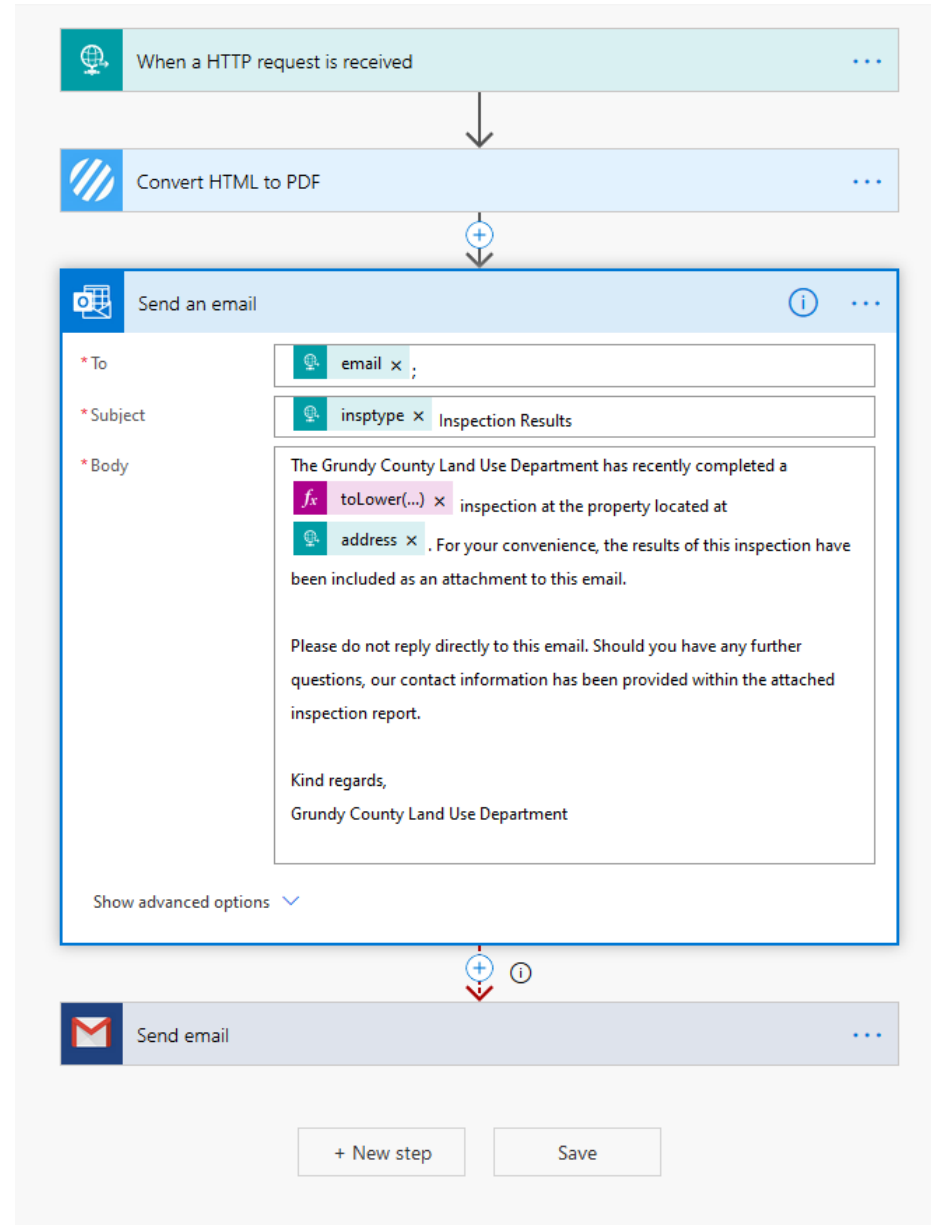
✔ User info ?   ☐ Portal info ?

Status

⬤ On

[Save]   [Cancel]

Integrate Survey123 with these services

ABRA FlexiBee
Adobe Sign
Anabix CRM
APIWHA
Archive
Autotask
Bank of America
Beds24
Bitly
Blogger
Box
Buffer
California Bank & Trust
Caspio
ClickFunnels
ClickSend
CloudConvert
Constant Contact
coreBos
Customer.io
DataBox
Discord
Drift
D7SMS
Egnyte
Emercury
Eventbrite
Facebook
Facebook Messenger
FAPI
Fio Banka
Flickr
Formstack Documents
Freshsales
GatewayAPI
Gist
Global Payments WebPay
Google Calendar
Google Contacts
Google Forms
Google Maps

ActiveCampaign
Airtable
Android
Apple iOS
Asana
AWeber
Barcodes
BeLazy
Bitstamp
BlueLink
Broker Toolbox CRM
BulkGate
Campaign Monitor
Citibank
ClickSend
Coda (beta)
Converter
CraftQL
Česká spořitelna veřejná data
Data store
Disqus
Drip
Ecomail.cz
Elasticsearch
Encryptor
Evernote
Facebook Custom Audiences
Facebook Offline Conversions
Feedly
Firebase Cloud Messaging
Flow
Foursquare
Freshservice
GetResponse
GitHub
Gmail
Google Cloud Print
Google Data Studio
Google Groups
Google Photos

ActiveTrail
Alexa Internet
Apifier
Apple Push Notifications
Attendance GIRITON
AWS Redshift
Basecamp 2
Bitbucket
Bittrex
Bolt IoT
BTCC
Caflou
Canny
Citrix ShareFile
ClickUp
Cognito Forms
ConvertKit
CSV
ČVUT Grades
Data24-7
Docupilot
Dropbox
E-conomic
Eledo PDF generator
Energomonitor
EverWebinar
Expedia
Facebook Groups
Facebook Pages
Fieldbook
Flarum
Focuster
FreshBooks
Front
Ghost
GitLab
Google+
Google Cloud Speech
Google Docs
Google Hangouts Chat
Google Photos (beta)

Acuity Scheduling
amoCRM
Apify
Apple Safari
Autopilot
AWS S3
Basecamp 3
Bitfinex
BizMachine
Botsify
Bubble
Calendly
Capsule CRM
Clearbit
Clockify
Coinbase Pro Integrations
Copper
Currency
ČVUT KOS
DigitalOcean Spaces
Domotron control
Dropbox Business
EET
Email
Etsy
Expedia
Facebook Lead Ads
Fakturoid
Figma
Flashyapp
Formstack
Freshdesk
FTP
GIPHY
Gitter
Google Analytics
Google Cloud Vision
Google Drive
Google Chrome
Google Sheets

Google Shopping
Google Translate
Harvest
HTML/CSS to Image
Chase
Image
Instagram
ISO
JSON
Knack
Lemlist
Magento
MailChimp
Markdown
Mautic
MeisterTask
Microsoft Teams
Mixpanel
MongoDB
NeoGate
Office 365 Calendar
OneDrive
OpenWeatherMap
Patreon
PDF
Pipedrive CRM
Plivo
Podio
Process Street
RabbitMQ
Rebrandly
Revolut Business
RSS
Segment
Sendy
Shopio
SigParser
Slack
SmartTask
SOAP
SSH

Google Slides
GoSMS
Help Scout
HTTP
Chatfuel
ImgBB
Intercom
iÚčto.cz
Kartra
Komerční banka
LinkedIn
Magento 2
Mail Komplet
Marketo
Mavenlink
Merk
Microsoft To-Do (Beta)
Mocean
Moosend
Ninox
Office 365 Email
OneDrive for Business
Optimy
PayPal
Phaxio
Pipefy
Plotly
Plutio
Poloniex
Pushbullet
Raiffeisenbank
Recurly
RingCentral
Runkeeper
SendGrid
SFTP
Short.cm
SingleCase
Smaily
Směnné kurzy ČNB
SoundCloud
Spotify
StackExchange

Google Tasks
Gravity Forms
HipChat
HubSpot CRM
iDoklad
Infusionsoft
Invoice Ninja
JIRA Server
KissFlow
Landbot
LionDesk
MailerLite
Mandrill
Math
Medium
MessageBird
Microsoft Word Templates
monday.com
Mustache
Numverify
Office 365 Excel
OneNote
Paperform
PayPal Classic
Phone number
Placeholder
Pocket
PostgreSQL
PrestaShop
Pushcut
Rav Messer
reddit
Robolytix
Salesflare
SendinBlue
ShipStation
ScheduleOnce
Site Search 360
SmartEmailing
Smoove
Square
Status Hero

Google Team Drive
G Suite
Hootsuite
IFTTT
Insightly CRM
IQDial
JotForm
Klaviyo
Leady
LiveWebinar
Mailgun
ManyChat
Mattermost
Meetup
Microsoft SQL Server
YouTube
MIME
Monday v2
MySQL
OfficeGuy
Office 365 People
SuiteCRM 7/SugarCRM 6 CE
Survey Anyplace
Teamwork Projects
The Keys
PayPal Payflow Pro
Pinterest
Platformly
Trello
Twist
Uber
UpViral
Wasabi
Webhooks
Wild Apricot
WP Webhooks
Xero
Yoobic
Zapier
Zoho Books
Zoho Forms
Zoho Projects

Stripe
SuperManager
Teamgate CRM
Textbelt
Todoist
TradeGecko
Tumblr
Twitter
UnionBank
Vimeo
Weather
Wells Fargo
WooCommerce
Wufoo
Yahoo
Zammad
Zendesk Guide
Zoho CRM
Zoho Invoice
Zoom.us
Zoho Sign
Superfaktura
Survey Monkey
Telegram Bot
The Keys Pro
Toodledo
Tools
Trustpilot
Twitch
Unbounce
Userflow
Wave
WebinarJam
Wix Answers
Wrike
XML
YouCanBook.me
Zendesk
Zoho Creator
Zoho Mail

SugarCRM 7/8
SuperSaaS
Teamwork Desk
Text parser
Toggl
Trakt.tv
Twilio
Typeform
Units
VTiger CRM
Webflow
WeMo
WordPress
Wunderlist
Yodel.io
Zammad
ZeroBounce
Zoho Desk
Zoho Mail

Webhook Usage Example:

Incoming Survey123 payload

Use HTML and payload attributes to dynamically create a consistent and polished report that is then converted to PDF format on the fly

When a HTTP request is received · · ·

Convert HTML to PDF · · ·

Send an email ⓘ · · ·

Send boilerplate email making use of the payload attributes and include PDF report from previous step as an attachment

* To   email ✕ ;

* Subject   insptype ✕ Inspection Results

* Body

The Grundy County Land Use Department has recently completed a ƒx toLower(...) ✕ inspection at the property located at address ✕ . For your convenience, the results of this inspection have been included as an attachment to this email.

Please do not reply directly to this email. Should you have any further questions, our contact information has been provided within the attached inspection report.

Kind regards,
Grundy County Land Use Department

Show advanced options ⌄

If the process fails immediately send email notifying GIS staff of the problem

Send email · · ·

+ New step   Save

Completed Building Inspection Forms

Form 1

COUNTY OF GRUNDY
Land Use Department
1320 Union St. Morris, Illinois 60450

Building Inspection Form:

This form documents a recent building inspection that was performed at the property located at 3560 East Grand Ridge, Mazon. Should you have any questions please contact the Grundy County Land Use department by phone at (815) 941-3228, or by email at bpazely@grundyco.org. Please see below for the details regarding your inspection:

NAME: Jon Stoja
PERMIT: 20-B-07
ADDRESS: 3560 East Grand Ridge, Mazon
INSPECTION: Setbacks
INSPECTOR: Bob Pazely
DATE: 02/14/2020

PASS / FAIL: PASS

PASS WITH COMMENTS: Yes

COMMENTS:
Call for a final inspection when work is completed

Form 2

Grundy County Land Use Department
1320 Union St.
Morris, Illinois 60450

ROUGH FRAME AND MECHANICAL REPORT

Date: 01/31/2020
Permit #: 19-SFR-010
Name: Tom Jebens
Address: 11996 North OBrien Road, Minooka
Inspection: Rough Frame and Mechanical
Inspector: Bob Pazely

Yes	Pressure treated sill plate	Yes	Roof knee wall (when necessary)
Yes	Sill Sealer	Yes	2nd floor stair headroom (6' 8")
Yes	Sill plate properly anchored	Yes	2nd floor stair width 36" min.
Yes	Corner bracing (type)	Yes	2nd floor stair tread 9" n. to n. 73/4 riser
Yes	Sheathing (condition of)	Yes	Landings not less than 36" x 36"
Yes	Exterior weather and insect barrier	Yes	Hallway width min. 36"
	(felt paper or Tyvek)	NA	Access to whirlpool
Yes	Spacing of lookouts	Yes	Tempered glass required less than 60"
Yes	Joist spans in garage		in bathtub, bottom of window less than 18"
Yes	Roof truss bracing		above floor, storm doors, patio doors,
Yes	Garage scuttle (22x30") joist hangers		ingress or egress door or panes
Yes	Attic light above scuttle		greater than 9 sq. ft.
Yes	Bridging at 10' intervals	Yes	Bathroom vent fans to soffit or outside
Yes	Wall alignment (bad or bowed studs)	No	Range hood vented to outside
Yes	Notching of floor joist, studs & plates	No	Attic ventilation 1 sq. ft. per 150 sq. ft.
Yes	Top plates overlap at corners	NA	Crawl space access 18 x 24"
Yes	Lintels above windows & doors	NA	Crawl space venting 1 sq. ft. per 150 sq. ft.
	when masonry is used	Yes	Firestopping between floors
Yes	Fire wall between garage & living	Yes	Fire caulk around any penetration
	area with 5/8 type x drywall		between floors and attic
Yes	Windows over 4 ft. 2 (2x4 on the sills)	Yes	Dryer vent to outside, max. length 25 ft.
Yes	Bedroom sill height not more than 44"	Yes	Fireplace safety strip, fire stop in chase,
Yes	Bedroom window openings 22H x 20W		gas valve location, hearth extensions
Yes	Floor joist spans min. lap of 3" at girder		16" in front and 8" beyond each side,
Yes	Double joist under parallel		6' opening - 20" in front and 12" beyond
	bearing partitions		each side
Yes	Main support beam post (type)	Yes	Smoke detectors each floor, basement,
Yes	Vertical ridge supports		each bedroom, hall next to bedrooms,
Yes	Collar ties		120V with battery backup
Yes	Lights in all closets, except linen	NA	All stair railings returned, guardrails 30"
Yes	Gas ledge in garage min. 4"		with enclosures on 4" centers
Yes	Electric receptacle spacing around walls	NA	Insulation Min. Walls R-13, ceilings R-30
Yes	GFI recept's in all locations as per NEC		

PASS / FAIL: PASS

PASS WITH COMMENTS: Yes

Form 3

Grundy County Land Use Department
1320 Union St.
Morris, Illinois 60450

FINAL OCCUPANCY INSPECTION FORM

Date: 02/14/2020
Permit #: 18-sfr-021
Name: Marty Steep
Address: 6703 West Dupont Rd. Morris
Inspection: Final Building
Inspector: Bob Pazely

MISCELLANEOUS & OUTSIDE

Yes	Driveway	Yes	Paint & Caulk	Yes	Addresses
Yes	Sidewalks	No	Gutters and Downspouts	Yes	Wall Penetration Closure
Yes	Outside Light Fixtures	Yes	Doors and Weatherstrip	Yes	Foundation Exposed
Yes	Stairs & Entry	No	Masonry/Siding	Yes	Railings/Rails
NA	Landscaping	Yes	Roofing	Yes	Window/Wells
Yes	Chimney	No	Soffit/Facia	Yes	Weep Holes
Yes	Gas Curb Garage	Yes	Vent Dampers	Yes	Garage Firewall

CARPENTRY INSIDE

Yes	Caulk Vanity Tops	Yes	Door & Trim	Yes	Egress Windows
Yes	Door Hardware	Yes	Painting	Yes	Railings
Yes	Floor Covering	Yes	Windows	Yes	Handrails

HVAC & BASEMENT

Yes	Vent Covers	Yes	Rim Joist Insulation	Yes	Beam Bolts
Yes	Dryer Vent	Yes	J-Bolts/Nuts	Yes	Central AC
Yes	Fire/Draft Stop	Yes	Sump Cover Sec.	Yes	Furnace and Ducts
Yes	Bridging	Yes	Solid Block Beam	Yes	Vents and Flue
Yes	Bathroom Exhaust	Yes	Beam Pockets		

ELECTRICAL

Yes	Hallway Receptacles	Yes	Switched Openings	Yes	Sump Circuit
Yes	Smoke Detectors	Yes	Panel Labeling	Yes	Ground Fault: Panel
Yes	Interlocked Battery	Yes	Wire and Breaker Sizing	Yes	Ground Fault: Bath
Yes	Light Fixtures	Yes	Fluorescent/Recessed	Yes	Ground Fault: Kitchen
Yes	Min. (2) Appliance	Yes	Closet Lights	Yes	Ground Fault: Garage
	Circuits for Kitchen	Yes	Grounding Waterline	Yes	Ground Fault: Hot Tub
Yes	Laundry Outlet 20 Amp	Yes	Grounding Tag	Yes	Ground Fault Front
Yes	Dishwasher/Disp. Cir.	Yes	Grounding Pan. Bond	Yes	Ground Fault Rear
Yes	Micro Circuit	Yes	Attic/Crawl Lights/Access		

PASS / FAIL: PASS

PASS WITH COMMENTS: Yes

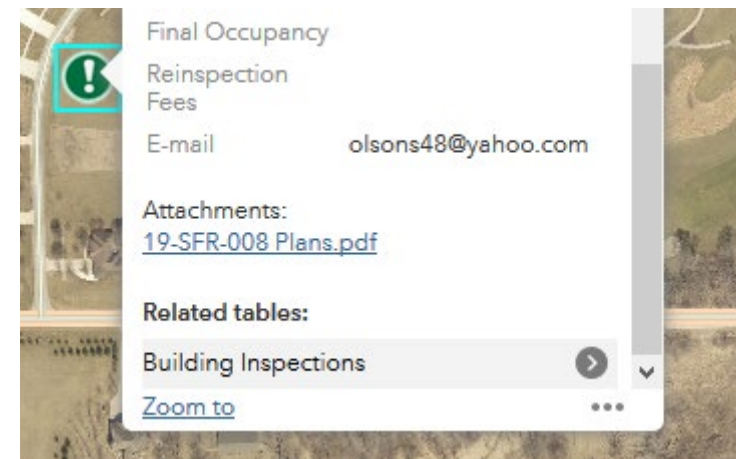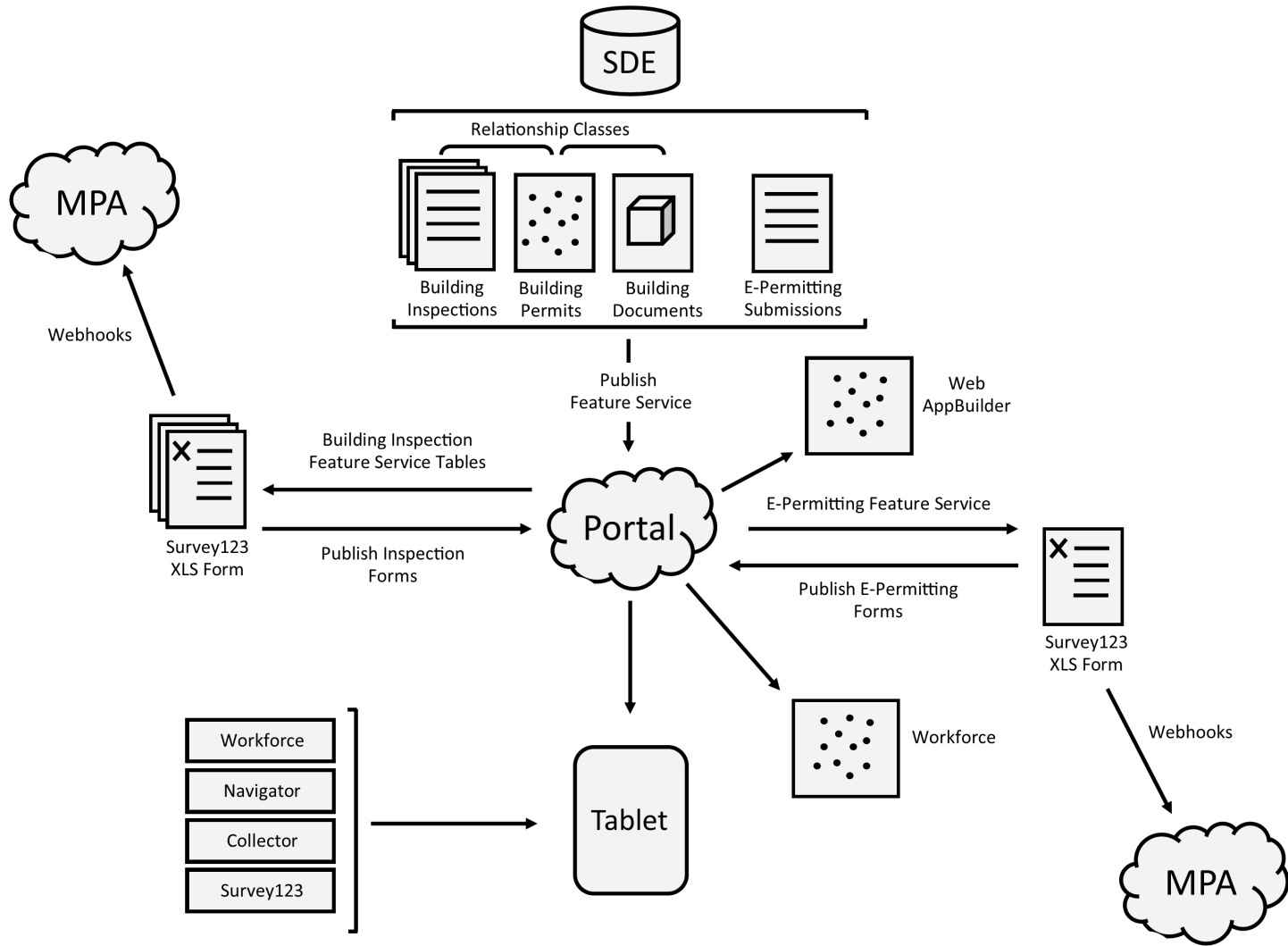# Feature Layers Published with Definition Queries

Map Image Layer Published Using a Geodatabase View

Popup Without View
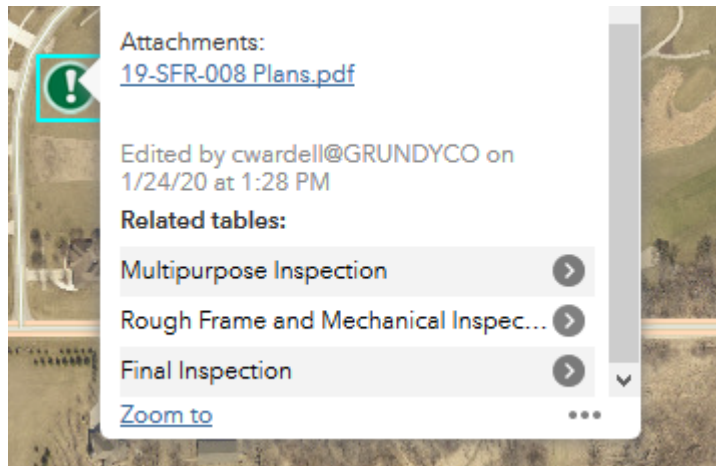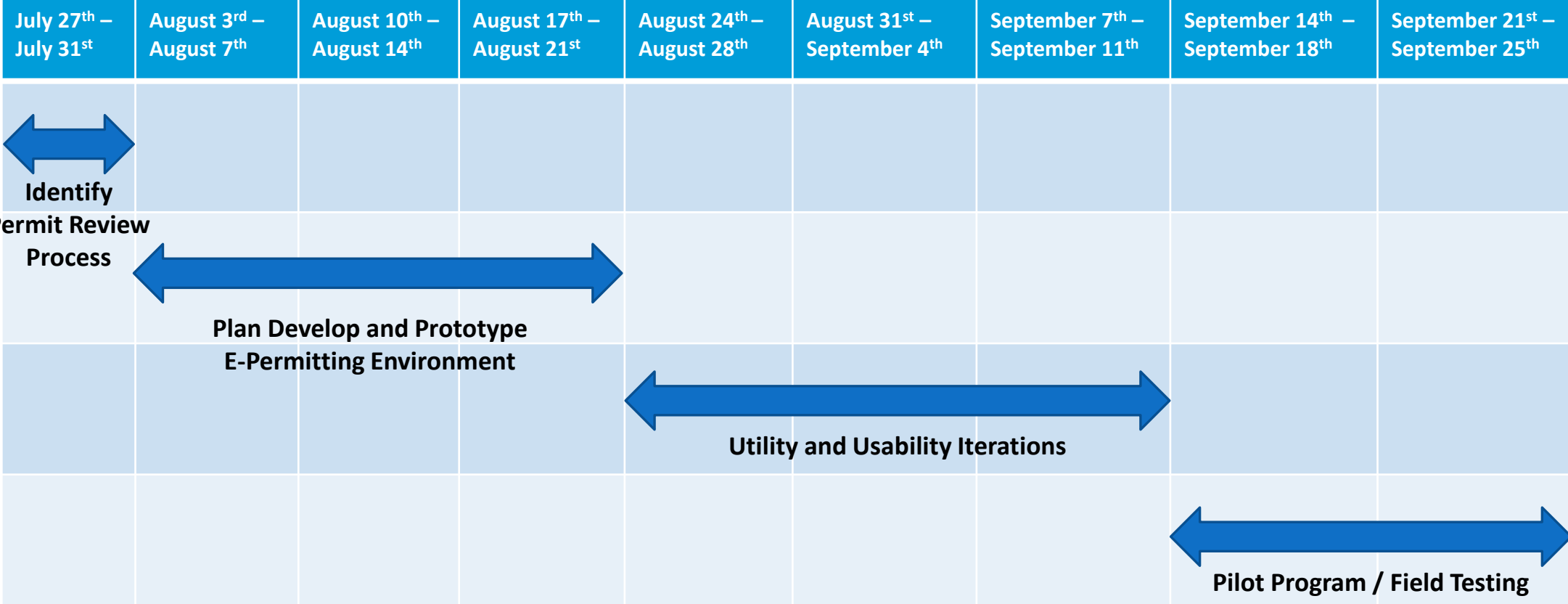

Popup With View

Software Demonstration:
Building Department Office Staff...

(Not included in slide deck due to file size limitations)

Software Demonstration:
Building Department Field Staff...

(Not included in slide deck due to file size limitations)

Timeline

July 27th – July 31st	August 3rd – August 7th	August 10th – August 14th	August 17th – August 21st	August 24th – August 28th	August 31st – September 4th	September 7th – September 11th	September 14th – September 18th	September 21st – September 25th

↔ Identify Permit Review Process

↔ Plan Develop and Prototype E-Permitting Environment

↔ Utility and Usability Iterations

↔ Pilot Program / Field Testing

Thank You!