

**DIGITAL TRANSFORMATION OF THE BYDA WORKFLOW FOR
ESSO AUSTRALIA**

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Please note: All data is for demonstration purposes only.

Abstract

The Before You Dig Australia (BYDA) – formerly Dial Before You Dig (DBYD) – internal Esso review and assessment workflow has historically been manual and paper-based with a significant amount of data double-handling. Leveraging Esri Australia’s SmarterWX Automate system and our Esri ArcGIS Online environment, has enabled us to transition this paper-based workflow into a more optimized integrated digital solution.

With SmarterWX, BYDA requests are automatically classified as ‘no impact’ or ‘impact’ (based on business rules). ‘No impact’ events are automatically processed. For ‘impact’ events, a Pipeline Surveillance Officer (PSO) engages with the requestor (or site contact) to assess the request in more detail and to ensure applicable safety standards are met. This may be done over the phone or during a site visit depending on the activity type and proximity to infrastructure.

For ‘impact’ events, PSO’s can now complete these requests dynamically in the field. A mobile mapping application shows active requests and provides spatial context. From this map, a smart survey form is launched (via a custom URL) and BYDA data (job and sequence number, requestor details, etc.) is passed to the survey form along with the request polygon, thus removing manual duplication of data and reducing human error.

Scope, impact, and safety discussions feed directly into the digital survey form, and once complete this survey is exported to a PDF report and emailed to the requestor, closing out the Esso BYDA review and assessment workflow. The end-to-end workflow can be completed entirely on a tablet (or laptop) in the field. All components are cloud hosted allowing access to third party contractors supporting our pipeline surveillance team and work programs.

This digital approach gives us a real-time spatial view of BYDA requests, highlights active requests, and better helps PSO’s manage site visits with their routine field activity. We are also able to integrate BYDA data into our other workflows, particularly routine easement patrols, both ground and aerial. This allows PSO’s to cross-reference data in the field to verify activity and scope as patrols are carried out.

Efficiencies with this integrated digital workflow are seen in time saving for PSO’s, as well as improved data management, visualization, querying, and reporting.

Introduction

Esso Australia operates just over 1000 km of onshore pipeline running through approximately 285 km of easements (Figure 1).

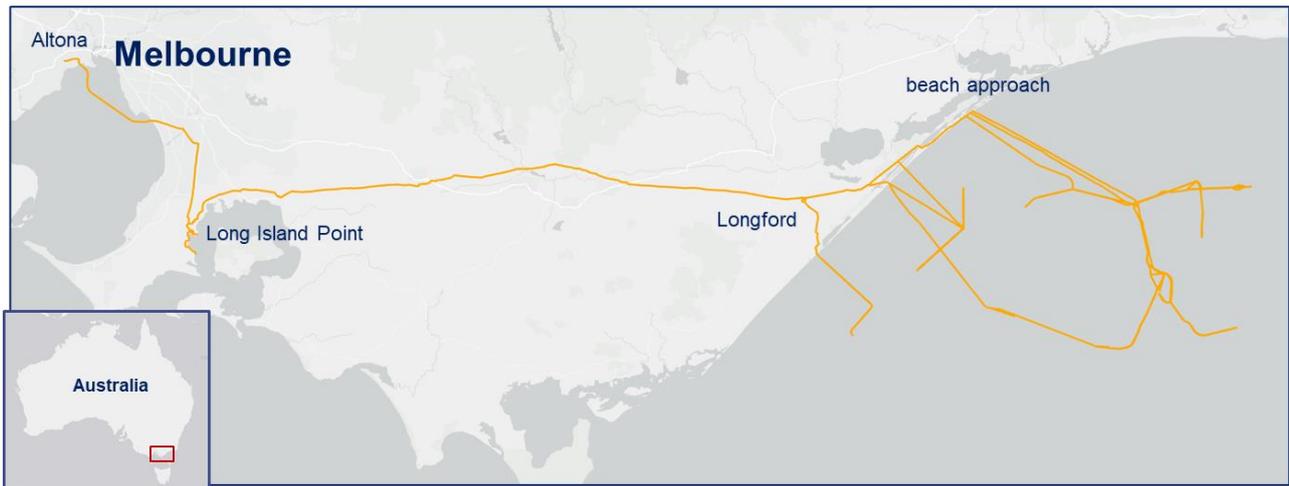


Figure 1: The Esso Australia pipeline network in Victoria

The Esso internal review and assessment workflow (Figure 2) is a formal process enabling Pipeline Surveillance Officers (PSO) to understand the potential risks involved in proposed work request from BYDA.

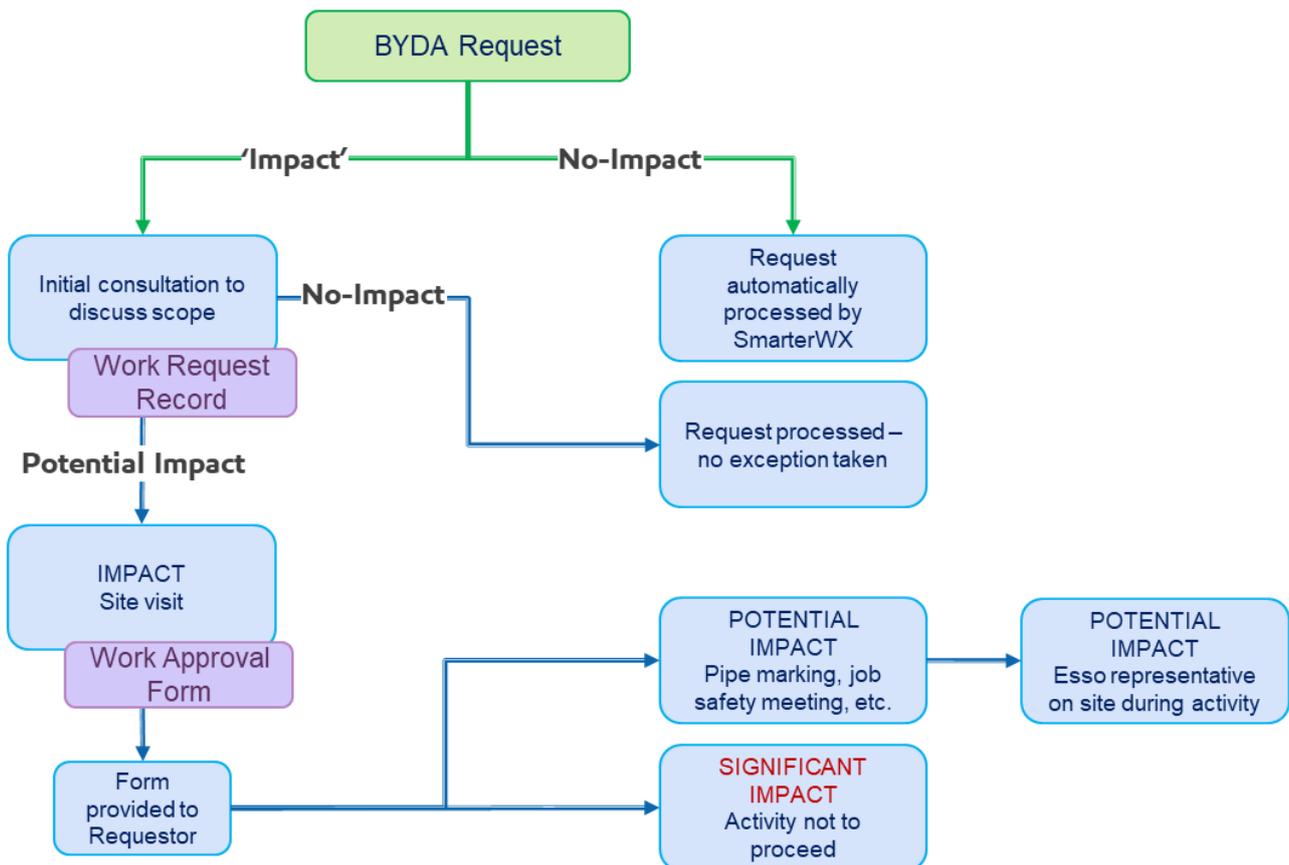


Figure 2: Simplified internal BYDA assessment workflow

Esso directly engages with BYDA requests classified as 'impact' by business rules defined in SmarterWX within up to 1 km of its pipelines (based on pipeline radiation contours) (Figure 3). This is to ensure correct safety measures are undertaken during any work activity, and to discuss the responsibilities (of both parties) relating to a petroleum pipeline easement.



Figure 3: Pipeline radiation contour example showing area of interest either side of pipeline

That is, an Esso representative will review the BYDA request, contact the requestor to discuss the proposed work to review any potential impact and where applicable discuss easement considerations and responsibilities. If there could be a potential impact to pipelines, this is further escalated to a site visit (if not already part of the initial engagement) and more detailed discussion around scope of work and safety requirements.

These engagements were historically captured through carbon copy paper forms (Figure 4), with the **Work Request Record** being required for all ‘impact’ requests, and the **Work Approval Form** required if a site visit and further review deemed necessary.

PIPELINE WORK REQUEST RECORD
 WORK REQUEST NO. **B 00589**
 Esso Australia Pty Ltd
 Longford, VIC 3851

REQUESTED BY:
 NAME
 COMPANY NAME
 ADDRESS
 PHONE / MOBILE
 FAX

PIPELINE WORK APPROVAL FORM
 WORK REQUEST NO. **B 00589**
 Esso Australia Pty Ltd
 Longford, VIC 3851

APPLICABLE TO ALL WORK REQUESTS

Required	Complete
<input type="checkbox"/> Conduct an Esso site visit prior to work date for pre-planning / verification of details	
<input type="checkbox"/> Conduct a Job Safety Review	
<input type="checkbox"/> Toolbox Meeting <input type="checkbox"/> Task Analysis	
Did the party conducting the works participate? <input type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Confirm location of all pipelines in easement (using minimum of 2 methods)	
<input type="checkbox"/> by Esso <input type="checkbox"/> by Party conducting the work with Esso verification	
<input type="checkbox"/> Electronic pipe locator <input type="checkbox"/> Probe to contact pipe <input type="checkbox"/> Exposed pipe	
<input type="checkbox"/> Probe & dig to work depth <input type="checkbox"/> Other method (specify) _____	
<input type="checkbox"/> Locate and peg / paint locations of pipeline(s)	
<input type="checkbox"/> at crossing point(s) <input type="checkbox"/> continuous at _____ m straight sections / _____ m change of direction	
<input type="checkbox"/> Esso supervision at work site	
<input type="checkbox"/> Conducted according to Procedure ONPOM PPL 600-101 Section	
<input type="checkbox"/> Esso Surveillance Officer assigned	

Other special requirements:

Required? **ENDORSEMENT OF PROPOSED WORKS, FOLLOWING LOCATION AND MARKING**

Required	Name	Signature	Date
<input type="checkbox"/> Prepared by			
<input type="checkbox"/> Pipeline Supervisor endorsement		Signature or time of verbal approval	Date

Required? **WORK REQUESTS REQUIRING PERMITS OR WORK PLANS AND ALL MAJOR WORK**

Required?	Status
<input type="checkbox"/> Approved Esso work permits	
<input type="checkbox"/> Excavation <input type="checkbox"/> Hot Work <input type="checkbox"/> Confined <input type="checkbox"/> Space <input type="checkbox"/> General	
<input type="checkbox"/> Review of third party plans	
<input type="checkbox"/> Plans <input type="checkbox"/> Drawings <input type="checkbox"/> Work Procedures <input type="checkbox"/> Safety Procedures	
<input type="checkbox"/> Engineering reviews required (specify) _____	

Required? **ENDORSEMENTS PRIOR TO WORK COMMENCEMENT**

Required	Position name	Signature	Date
<input type="checkbox"/> Engineering endorsement			
<input type="checkbox"/> Major Works endorsement			

Works completed in accordance with ONPOM PPL 600-101

Figure 4: Work Request Record (left) and Work Approval Form (right) carbon copy (paper) forms

Historically the BYDA request would come via email with a GML (Geography Markup Language file for a GIS application) and GIF (image) file representing the spatial nature of the request. Following this email, a discussion would take place with the requestor and the paper form/s completed. Once the form/s were complete, the data would be transcribed into a master spreadsheet (Figure 5).

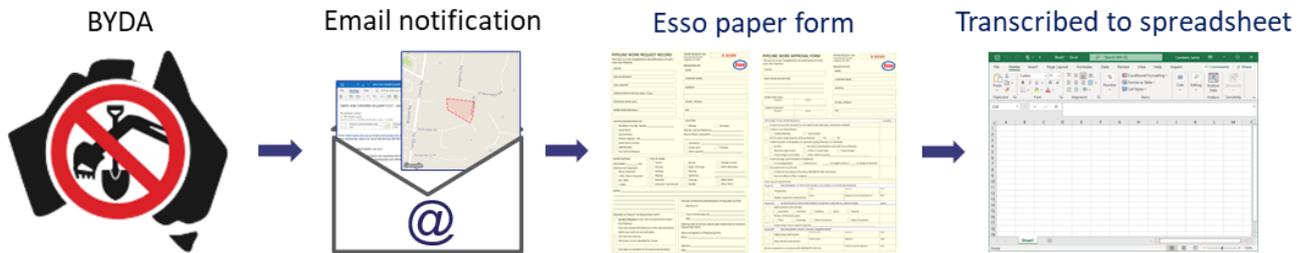


Figure 5: Historical review and approval workflow showing pre-SmarterWX simplified workflow

With the adoption of SmarterWX Automate in 2019, this allowed us to bring the BYDA data into our ArcGIS Online organisation environment (Figure 6) using the ‘write to GIS’ function.

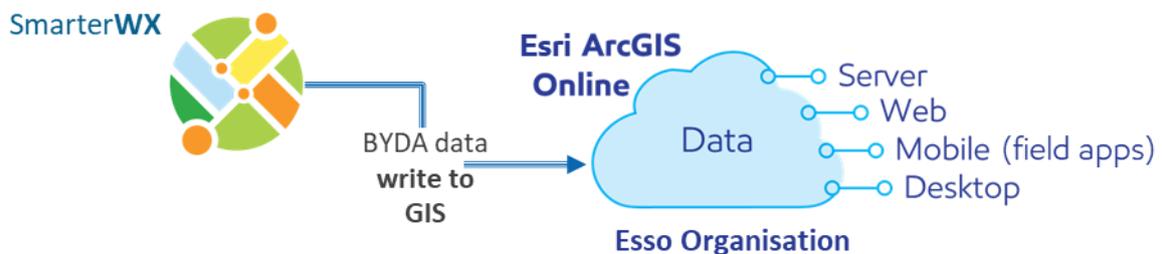


Figure 6: SmarterWX BYDA data feed to Esso ArcGIS Online environment (simplified). Through ArcGIS Online cloud-hosted data is shared across web, mobile, desktop, and server applications.

While improving access and visibility to BYDA data by making it available through digital maps, it did not eliminate the paper forms and manual transcribing from form to spreadsheet (Figure 7).

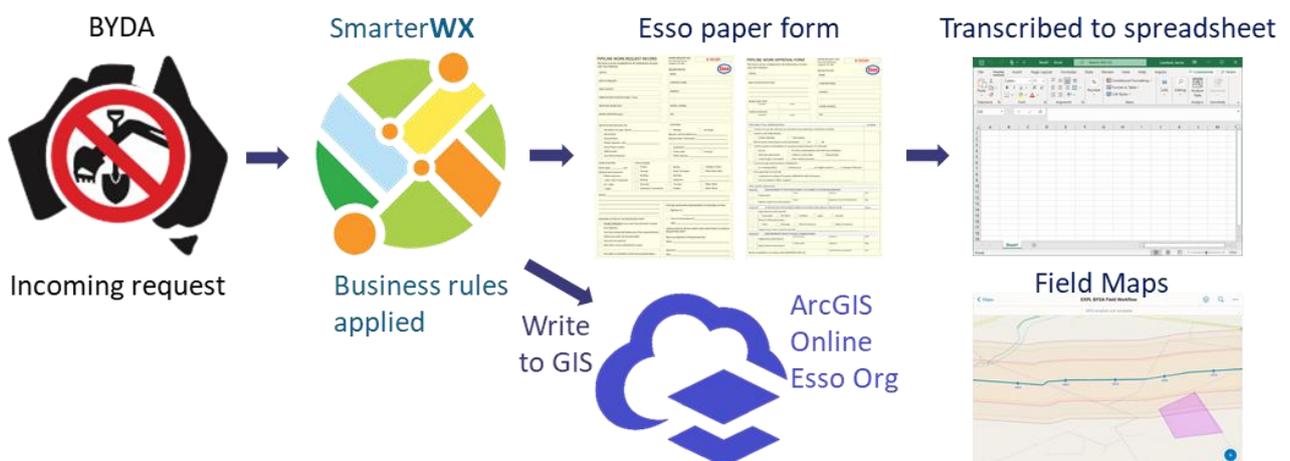


Figure 7: Historical review and approval workflow showing post-SmarterWX, pre-digital forms simplified workflow

With SmarterWX and the ‘write to GIS’ function pushing BYDA requests directly into our ArcGIS Online Organisation site, we were able to begin the digital transformation of our internal review and approval workflow, eliminating paper forms and manual transcribing of data (Figure 8).



Figure 8: The (simplified) data flow originating with a BYDA request which is then processed with SmarterWX and pushed to Esso's ArcGIS Online Organisation where it is pulled into a digital form

Digital Transformation Process

The digital transformation process consisted of three key parts: creating a digital form, creating a PDF report template, and creating and configuring a map for the field.

Review and Assessment Digital Form

The original paper forms were converted to a single digital 'smart' form using ArcGIS Survey123 which uses the XLSForms open standard framework (<https://xlsform.org/en/>) and is configured using Microsoft Excel (Figure 9). There are several advantages to using Survey123; it is integrated into our ArcGIS Online environment and there are several logical functions we can use to optimise the user experience, such as relevance, calculations, and filters. We can also leverage drop-down fields, radio buttons, and check boxes. Survey123 also has extensive URL parameters, allowing us to integrate with other ArcGIS applications to pass attribute and spatial data to the survey form.

Row	Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J	Column K	Column L	Column M	Column N	Column O	Column P
96	begin_group	SEC2	<center> PIPELINE WORK APPROVAL FORM </center>	4	appearance	required	required	default		calculations		checkboxes	choice_filter		bindcontrolType	
97	begin_group	Checklist	Available To All Work Requests	4	12	horizontal										esriFieldTypeString
98	Select_one_yes_no	SiteVisit	Conduct an Esso site visit prior to work date for pre-plans	4	12	horizontal										esriFieldTypeString
99	Select_multiple_job	JobSafetyReview	Conduct a job safety review	4	12	horizontal										esriFieldTypeString
100	Select_one_yes_no	JobSafetyParticipation	Did the party conducting the work participate?	4	12	horizontal										esriFieldTypeString
101	Select_one_pipe1	ConfirmationOfLocation	Confirmation of location of all pipelines in the easement	4	12	horizontal										esriFieldTypeString
102	Select_multiple_pipe2	DetectionMethods1	Which methods were used (at least 2 types required)	4	12	compact 3										esriFieldTypeString
103	text	DetectionMethods2	Other	4	12											esriFieldTypeString
104	text	DetectionMethods3	Which methods were used (at least 2 types required)	4	12	hidden										esriFieldTypeString
105	Select_one_marking	MarkPipeline	Locate and peg / paint location of all pipelines	4	12	horizontal										esriFieldTypeString
106	decimal	MarkSpacingStraight	Spacing for straight sections (m)	4	6											esriFieldTypeDouble
107	decimal	MarkSpacingChange	Spacing for change of direction (m)	4	6											esriFieldTypeDouble
108	Select_one_supervision	EssoSupervisorAtSite	Esso supervision at work site	4	12	horizontal										esriFieldTypeString
109	end_group															
110	begin_group	Permits	Work Requests Requiring Permits or Work Plans and All Major Y	4	12											
111	Select_multiple_permits	ApprovedEssoPermits	Approved Esso work permits	4	12	horizontal										esriFieldTypeString
112	Select_multiple_plans	Review3rdPartyPlans	Review of third party plans	4	12	horizontal										esriFieldTypeString
113	end_group															
114	begin_group	Endorsements	Endorsements Prior to Work Commencement	4	12											
115	Select_one_yes_no	EngineeringEndorsement	Engineering endorsement	4	12	horizontal										esriFieldTypeString
116	Select_one_endorsement	EngineeringEndorsementType	Type of approval	4	12	compact										esriFieldTypeString
117	text	EngineerEndorser	Engineer endorser	4	6											esriFieldTypeString
118	date	EngineerDate	Endorsement date	4	6											esriFieldTypeDate
119	Select_one_yes_no	MajorWorksEndorsement	Major works endorsement	4	12	horizontal										esriFieldTypeString
120	Select_one_endorsement	MajorWorksEndorsementType	Type of approval	4	12	compact										esriFieldTypeString
121	text	MajorWorksEndorser	Major works endorser	4	6											esriFieldTypeString
122	date	MajorWorksDate	Endorsement date	4	6											esriFieldTypeDate
123	text	EndorsementsRequired	Endorsements required (specify)	4	12	multiline										esriFieldTypeString
124	end_group															
125	begin_group	Approvals	Works Completed in Accordance with ODFOM PPL 600-101	4	12											
126	Select_one_final_approval	WorkApproval	Approval as per above documentation	4	12											esriFieldTypeString
127	text	WorkApprovalNotes	Approval status notes	4	12	multiline										esriFieldTypeString
128	end_group															
129	begin_group	Signoff	Sign Off	4	12											
130	Select_one_contact	ContactType	Contact type	4	12	horizontal										esriFieldTypeString
131	text	WorkApprovalPipelineSu	Pipeline supervisor	4	12											esriFieldTypeString
132	dateTime	WorkApprovalDate	Approval Date	4	12											esriFieldTypeDate
133	image	WorkApprovalSignature	Esso PLO signature (EssoContactName)	4	12	signature										esriFieldTypeImage
134	note		Verification of details above and conditions of work by	4	12											
135	text	RequestorNameSignoff	Requestor / Site Contact	4	6											esriFieldTypeString
136	dateTime	RequestorDateSignoff	Date	4	6											esriFieldTypeDate
137	image	RequestorSignatureSign	Requestor / Site Contact signature	4	12	signature										esriFieldTypeImage
138	end_group															
139	Select_one_yes_no	ReportSent	Report sent to Requestor	4	6	horizontal										esriFieldTypeString
140	Select_one_report	ReportSent	Report sent to Requestor	4	7	horizontal										esriFieldTypeString
141	date	ReportSentDate	Date report was sent	4	12											esriFieldTypeDate
142	hidden	PRO		4	12											
143	hidden	SmarterWX_GlobID	SmarterWX GlobalID	4	12											esriFieldTypeString
144	end_group															
145	begin_group	Support		4	12	compact										
146	note		Support	4	12											

Figure 9: Configuration of a Survey123 form via a spreadsheet using Survey123 Connect

Combining the paper forms into one smart form allowed for the removal of duplication between the two forms and ensured one record per BYDA request. Treating the forms as a single form also allowed for better flow between sections, with visibility of questions managed through relevance or skip logic, and a single sign-off rather than one for each section.

The first section of the digital form, the 'Pipeline Work Request Record' (Figure 10), captures the BYDA request information, which gets passed directly to the form from the SmarterWX feed, including the polygon information representing the request area. Also captured here as part of the discussion with the requestor is additional detail and/or clarification on the proposed work. In addition to this, an option to attach images to the record is included for reference. These images would then be tied directly to the relevant record in the database.

The screenshot shows a digital form titled 'Esso BYDA Review' with a sub-header '--- PIPELINE WORK REQUEST RECORD ---'. The form is organized into several sections:

- Job Information:** Fields for Job ID, Sequence ID, Esso Request ID, Date of request (Date and Time), Proposed start date, Proposed completion date, No. days, Actual work date, Actual completion date, and No. days.
- Requestor Details:** Fields for Requested by, Contact mobile, Contact phone, Email, Company name, and Company type.
- Site Contact:** Fields for Site Contact and Site Contact no.
- Esso Contact:** Fields for Esso contact (Pipeline Surveillance Officer) and Esso contact no. An Esso emergency number (1800 633 971 / 1800 653 438) is also displayed.
- Location Details:** Fields for Location, Street address, Suburb, State, Postcode, Parcel type, and Landowner name.
- Site photo:** A section for uploading a site photo.
- Work Details:** Fields for Work depth (mm) and Distance from easement. A large text area for Activity description (from BYDA) is provided.
- Type of work:** A grid of checkboxes for various work types: Blasting, Horizontal Boring, Vertical Boring, Mechanical Excavation, Manual Excavation, Non-Destructive Digging, Pole Reinforcing, Road or Driveway, Conveyancing, Planning & Design, Subdivision, Tendering, and other.
- Change in cover:** Radio buttons for Yes/No and Domestic/Commercial.
- Crossing easement:** Radio buttons for Crossing/Parallel and Major work/Minor work.
- Work Request notes:** A text area for additional notes.
- Required Action:** A section with a red border containing radio buttons for 'DO NOT PROCEED site visit & work approval required' and 'Esso takes no exception to the work proposed above'.
- Sign Off:** Fields for Contact type (In-person/By phone), Pipeline Surveillance Supervisor, Approval Date, and Esso Pipeline Surveillance Officer signature.
- Report Sent to Requestor:** Radio buttons for Review complete? (Yes/No) and Report sent to Requestor (Yes/No/N/A).

Figure 10: Digital form section 1: Pipeline Work Request Record

If the proposed work raises no exception, the internal assessment process ends here. Where a more detailed review and site visit is required, we progress to the second section of the digital form, the 'Pipeline Work Approval Form' (Figure 11). In this section, specifics of the activity are captured, as well as safety discussions, procedures, and work permits. As part of the engagement between Esso and the requestor, both parties can sign off on the discussion and agree to any required actions, or the proposed activity can be declined where appropriate.

Esso BYDA Review

Required Action

Work Request required action of the requesting party *

- DO NOT PROCEED site visit & work approval required
- Esso takes no exception to the work proposed above

--- PIPELINE WORK APPROVAL FORM ---

Applicable To All Work Requests

Conduct an Esso site visit prior to work date for pre-planning / verification of details

Yes No

Conduct a job safety review

Toolbox meeting Task analysis

Did the party conducting the work participate?

Yes No

Confirmation of location of all Esso pipelines in the easement by Esso

NOTE: Non Esso pipelines will require separate approval by relevant Operator

By Esso

Which methods were used (at least 2 types required)

Electronic pipe locator Probe to contact pipe Probe & dig to work depth

Exposed pipe GPS (survey grade) other

Locate and peg / paint location of all pipelines

At crossing points Continuous

Spacing for straight sections (m)

Spacing for change of direction (m)

Esso supervision at work site

Conducted according to Procedure ONPOM PPL 600-101 Section

Work Requests Requiring Permits or Work Plans and All Major Work

Approved Esso work permits

Excavation Hot works Confined space Critical General

Review of third party plans

Plans Drawings Work procedures Safety procedures

Endorsements Prior to Work Commencement

Engineering endorsement *

Yes N/A

Major works endorsement *

Yes N/A

Works Completed in Accordance with ONPOM PPL 600-101

Approval as per above documentation *

Esso takes no exception to the work proposed above

DO NOT PROCEED - request declined

Sign Off

Contact type *

In-person By phone

Pipeline Surveillance Supervisor *

Approval Date

Date Time

Esso Pipeline Surveillance Officer signature ()

Verification of details above and conditions of work by requesting party

Requestor / Site Contact

Date

Date Time

Requestor / Site Contact signature

Report Sent to Requestor

Review complete? *

Yes No

Report sent to Requestor *

Yes No N/A

Figure 11: Digital form, section 2: Pipeline Work Approval Form

PDF Report Template

The data captured for the Esso assessment and review process is only available in a form format when viewed in the Survey123 app. To output a final report for the requestor, a template is created using a Microsoft Word document which references attributes in the feature dataset (Figure 12) and is applied when generating a PDF report from the Survey123 website (Figure 13). Two templates were created. The first only had the Pipeline Work Request Record section and the second had the Pipeline Work Request Record and Pipeline Work Approval Form sections.

Job Reference		
Job ID:	Sequence ID:	Esso ID:
`\${JobID}`	`\${SequenceID}`	`\${EssoID}`
User reference:	Date of request:	
`\${UserRef}`	`\${DateOfRequest}`	
Proposed work date:	Proposed completion date:	Proposed duration:
`\${ProposedWorkDate}`	`\${ProposedComplDate}`	`\${ProposedDuration}` days

Location Details	
`\${Location size:300:0}`	
Street:	
`\${LocationStreet}`	
Suburb:	
`\${LocationSuburb}`	
State:	Post Code:
`\${LocationState}`	`\${LocationPCode}`
Landowner name:	
`\${LandownerName}`	
Parcel type:	
`\${ParcelType}`	

Figure 12: Example configuration of a section of a Survey123 report template referencing attributes from the dataset



Pipeline Surveillance Group
Esso Australia Pty Ltd
Level 1, 64-66 Foster St, Sale
PO Box 372, Sale, Victoria, 3850
General Enquiries no. 03 5143 4443
Emergency no. 1800 633 971
1800 653 438

Esso BYDA Enquiry

PIPELINE WORK REQUEST RECORD

Job Reference		
Job ID:	Sequence ID:	Enquirer ID:
12345678	123456789	
User reference:	Date of request:	
A001	November 1, 2021 10:00 AM	
Proposed work date:	Proposed completion date:	Proposed duration:
November 9, 2021	November 10, 2021	2 days

Requestor Details			
Requested by:	Mobile:		
Jane Smith	0412345678		
Email:	Phone:		
jsmith@email.com.au			
Company name:	Company type:		
Company ABC	Residential building		
Street:	Suburb:	State:	P/Code:
1 Street	Docklands	VIC	3008
Site contact:	Site contact number:		
Alan	0412345678		

Esso Contact	
Esso contact:	Contact number:
Trent	0412345678



Vicmap, Esri, HERE, Garmin, USGS
Powered by Esri

Location Details	
Street:	664 Collins Street
Suburb:	Docklands
State:	Post Code:
VIC	3008
Landowner name:	
Jane	
Parcel type:	Pipeline License:
Private	PL001

Report Date:24/08/2022 6:10 PM
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Pipeline Surveillance Group
Esso Australia Pty Ltd
Level 1, 64-66 Foster St, Sale
PO Box 372, Sale, Victoria, 3850
General Enquiries no. 03 5143 4443
Emergency no. 1800 633 971
1800 653 438

Esso BYDA Enquiry

PIPELINE WORK APPROVAL FORM

Conduct an Esso site visit prior to work date for pre-planning / verification of details:
 Yes No

Conduct a job safety review:
 Toolbox meeting Task analysis

Did the party conducting the work participate?
 Yes No

Confirmation of location of all Esso pipelines in the easement by:
 NOTE: Non-Esso pipelines will require separate approval by relevant Operator
 Yes

Which methods were used (at least 2 types required):
 Electronic pipe locator Exposed pipe
 Probe to contact pipe GPS (survey grade)
 Probe & dig to work depth Other:

Locate and peg / paint location of all pipelines:
 At crossing points Continuous

Spacing for straight sections: 4.5 m Spacing for change of direction: 2 m

Esso supervision at work site:
 Conducted according to Procedure ONPOM PPL 600-101 Section

Works Completed in Accordance with ONPOM PPL 600-101

Approval as per above documentation:
Esso takes no exception to the work proposed above

Sign Off	
Contact type:	In-person
Pipeline Surveillance Supervisor:	Peter
Esso Representative:	
Trent	
November 1, 2021 2:48 PM	
Verification of details above and conditions of work by requesting party:	
Alan	
November 1, 2021 2:48 PM	

Report Date:24/08/2022 6:10 PM
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Figure 13: Example output PDF report using a report template created with the Survey123 website in ArcGIS Online

Field Map Configuration

With the digital version of the forms complete, the next step was to configure the map through ArcGIS Online Map Viewer (Figure 14) to enable integration with the survey form. As well as the value of data integration, the map view also allows the PSO to understand the spatial context to the request.

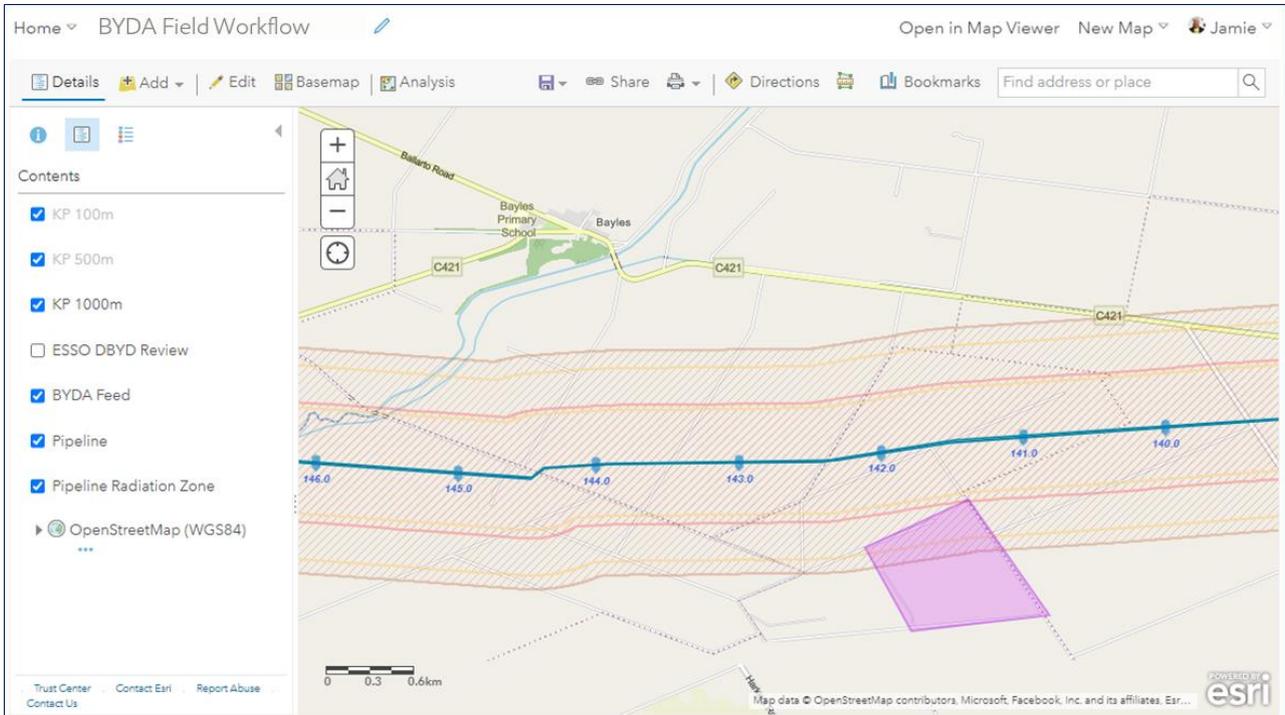


Figure 14: Field map configuration within ArcGIS Online Map Viewer

Within Map Viewer, the feature layer populated by the BYDA data feed from SmarterWX is filtered for 'activity type = impact' to show only 'impact' events and has an Arcade expression applied that converts the request polygon to a text string (Figure 15) allowing it to be passed to Survey123 (via a URL) and used as the input to build the polygon within the survey form. Arcade is an expression language specifically for ArcGIS.

Expression

```

1 var geom = Geometry($feature);
2 var firstpart = geom.rings[0];
3 var outparts = [];
4 var counter = 0;
5 for (var pt in firstpart){
6   var ptstr = Concatenate(firstpart[pt].y, " ", firstpart[pt].x);
7   outparts[counter]= ptstr;
8   counter = counter + 1;
9 }
10 return Concatenate(outparts, ";")
11

```

Result	Value
Result	-38.19907754 145.47614599;-38.19799649 145.47876624;-38.19881843 145.48454725;-38.19940237 145.48436402;-38.20023967 145.48230737;-38.20221077 145.48359255;-38.20345037 145.48057718;-38.19907754 145.47614599

Figure 15: Arcade expression to convert polygon feature geometry to text string

With the map configured and the Arcade expression in place, the BYDA feature layer pop-up dialogue box needs to be configured with a custom URL that will launch Survey123, pass data from the selected map feature to the specified survey form, including the string representing the polygon, and finally take the PSO to the Survey 123 web site to generate the PDF report upon form submission (Table 1). Emailing the final report to the requesting party closes out the review and assessment workflow.

URL Parameter	Function
arcgis-survey123://?itemID=form ID	Launch Survey123 application and open correct form
&field:target1={source1}&field:target2={source2}	Pass attributes from SmarterWX feed to survey form
&field:target={expression/expr0}	Reference the expression (Figure 15) to convert vertices to text string and pass to Survey123 to build feature geometry
&callback=https://survey123.arcgis.com/surveys/form ID	Upon submission of survey form, launch the Survey123 website

Table 1: Map pop-up URL parameters

Additional attributes can be passed as required using the convention [&field:target={source}](#). The resulting URL added to the feature pop-up looking like the following example:

[arcgis-survey123://?itemID=8552d862d2d647028c38c5d3a4878586&field:JobID={job_id}&field:SequenceID={sequence_id}&field:ActivityType={activity_description}&field:Location={expression/expr0}&callback=https://survey123.arcgis.com/surveys/8552d862d2d647028c38c5d3a4878586/data](#)

This URL is added to the feature pop-up (Figure 16) and once the map is saved, available to users in their mobile map (ArcGIS Field Maps). Starting with the map, the digital workflow can now be executed from the field or the office using a smart device or laptop.

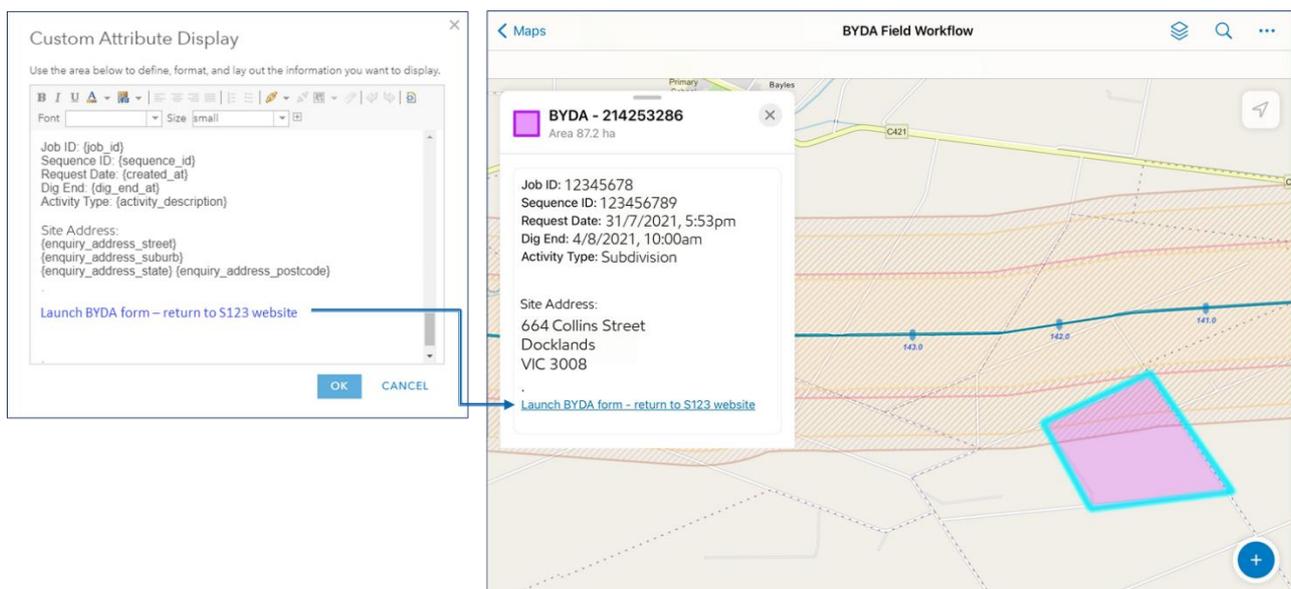


Figure 16: Feature pop-up with custom URL; configuration and map view (ArcGIS Field Maps)

Results

Averaging over 1500 records (classified as impact) per year over the last two years for manual review, streamlining of this workflow and transitioning to digital end-to-end (Figure 17) adds tremendous value from an efficiency and timeliness perspective.

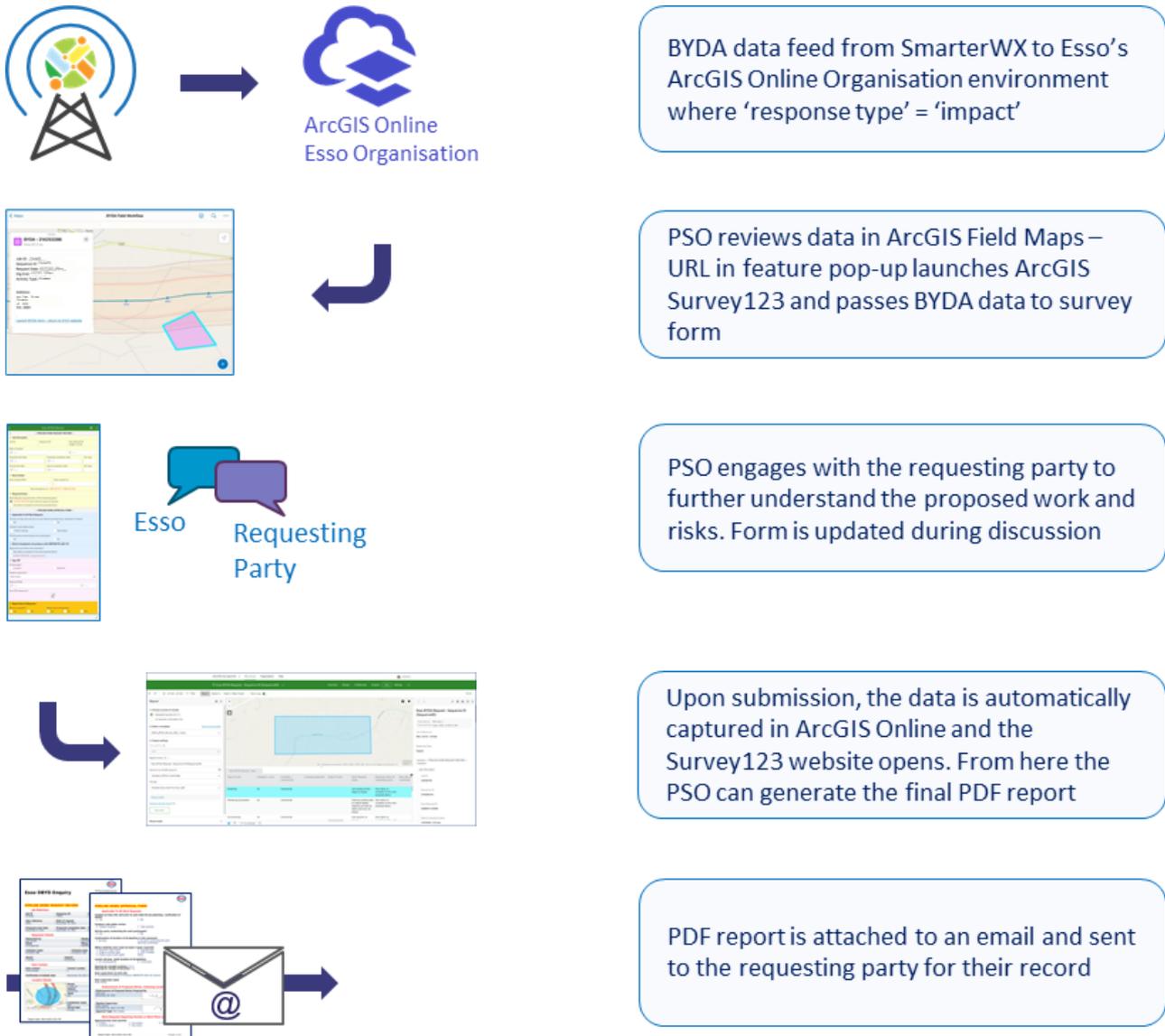


Figure 17: Summary of resulting review and assessment digital workflow

Overall savings are estimated at between 0.08 to 0.1 FTE or 40 to 50 minutes per day, and further efficiencies are seen in improved data management, data visualization, data querying, and reporting. Data is also enriched with spatial information (the request polygon), site photos as required, and passing additional attributes not previously captured by the forms. The additional spatial and attribute data is automated and is no extra effort on the part of the PSO.

Reducing or removing manual data entry also reduces the potential for human error. This has been achieved through enhancements in the form such as passing data digitally and using lists, and by eliminating the need to transcribe records. Also eliminating any potential confusion reading handwriting or damaged paper documents.

Physical forms no longer need to be carried, stocked, or archived (going forward). The digital form is more agile and can be updated dynamically then pushed to users as soon as updates are complete without disrupting workflows. Additionally, the output PDF can easily be shared from the requestor to other team members as required (for example, site lead, surveyors, builders, etc.) so all team members are informed.

Building the workflow within ArcGIS Online offers the advantages of a GIS environment (spatially aware, spatial analytics, visualisation of multiple datasets, etc.) as well as integration between data and applications. Moving between apps is automated in most cases through URL parameters. Simplification of the workflow enhances the user experience and minimizes the training required - essentially the user only needs to access the correct map within Field Maps and most of the workflow (launching the Survey123 mobile app, populating BYDA data, navigating to the Survey123 web site) is managed through the custom URL. The integration between data and application delivers a streamlined user experience.

Data is stored in a more robust database (versus Excel) and supports both text and spatial queries. Data can be accessed by multiple applications: web, mobile, desktop, and server and readily visualized. The internal assessment workflow can be tracked via ArcGIS Dashboards for example (Figure 18), with the dashboard highlighting status and overdue assessments. This can also be used to aid in KPI and regulatory reporting.

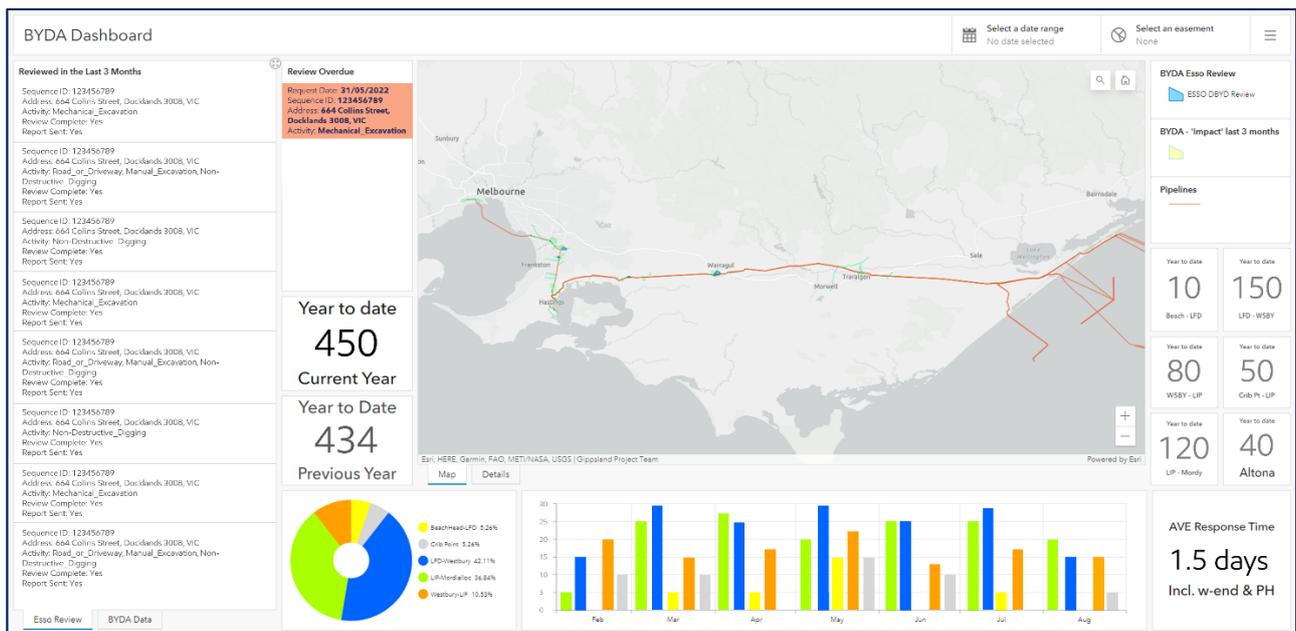


Figure 18: Example Esso review and assessment tracking dashboard using ArcGIS Dashboards

Applications and data are accessible to all users in real-time. The same data is available to office and field workers (including 3rd parties with credentials) providing a single source of truth.

This digital approach gives us a real-time spatial view of BYDA requests, highlights active requests, and better helps PSO's coordinate site visits with routine activity. We are also able to integrate BYDA data into our other workflows, particularly easement patrols, both ground and aerial, for validation and review. Review and assessment requests can be completed as part of routine patrols or opportunistically with equal ease. Additionally, this improved data access and visibility helps enhance the engagement with the requestor and other stakeholders.