

# DEVELOPMENT OF WEB MAPPING APPLICATION



Andrew Barley



## Contents

Introduction .....	2
Storyboard and Website Structure .....	2
Web Map Application .....	6
Links to Web mapping Application .....	6
Index.....	6
Prospecting Overview .....	6
Map .....	6
Key Locations.....	6
Compliance to preliminary design principles and alterations.....	6
Bugs.....	11
Future Releases.....	11
Summary .....	12
References.....	13
Tutorials and adapted code.....	13
ArcGIS Server Map Services Data.....	13
Appendix .....	14
Links to Web mapping Application .....	14
Index.....	14
Prospecting Overview .....	14
Map .....	14
Key Locations.....	14
Index Code .....	14
Prospecting Overview Code .....	25
Map Code.....	30
Key Locations Code .....	39

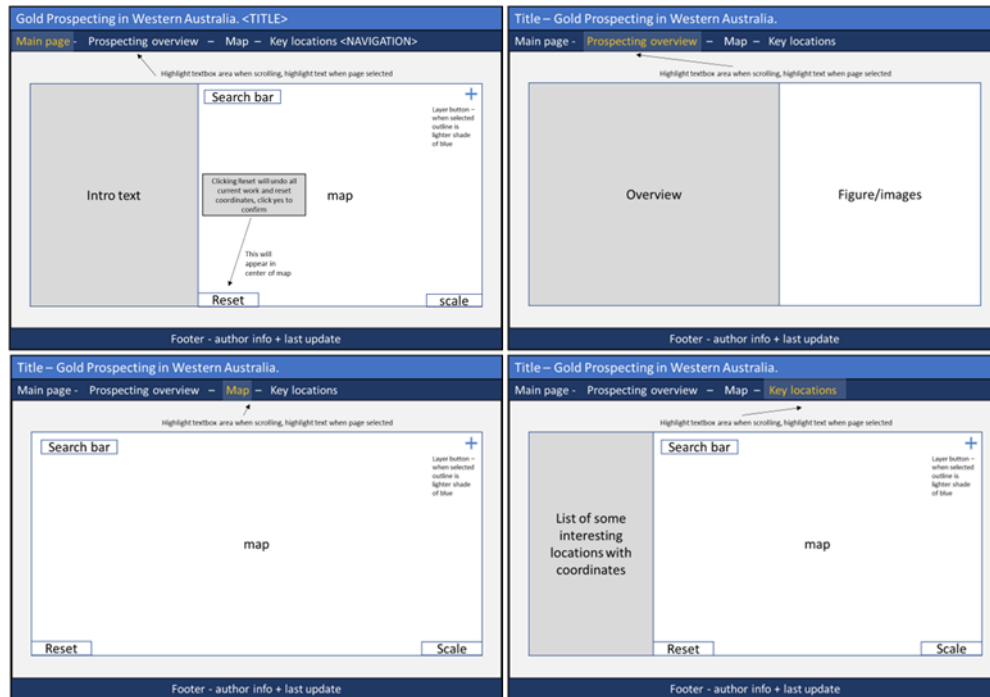
## Introduction

This report comprises the design processes that was implemented in the creation of a web mapping service that provides an easy-to-use interface for educational purposes for introductory level learning for earth science students and prospectors. The purpose is to fill in a current space on the internet which has not been filled, free, easy to interpret geological information. That does not require payment or prior knowledge to navigate, interact with and learn the basics of geology in relation to finding gold. The initial objective of the project was to create a 4-page web mapping service, which provided enough information to spark the curiosity of the target audience (15 – 30 years of age), enabling them to feel the freedom to explore the content further. Through initial research in the preliminary report, it was important to utilise the current knowledge of our target audience. Understanding that younger generations are more adept with using search engines, the goal of the website is not to overload the web mapping service with information that is readily available from the use of a search engine. The emphasis is on clarity of data, minimalism and guiding the user in the right direction, allow the user to take advantage of the service as more of a tool to utilise further learning. With this understanding the design principles primarily used were taken from Jakob Nielsen's ten general principles: Visibility of system status, match between system and the real world, user control and freedom, error prevention and Aesthetic and minimalist design.

## Storyboard and Website Structure

The storyboard structure compiled in the previous report, consisted of the main page, a Prospecting overview page, a map page, and a key location page. To implement the creation of the web mapping service, the key features of the website was prepared. As seen in figure 1, the title, navigation and footer all follow the same structure, a CSS was created as a template to be implemented for all 4 web pages, all four pages contain the same title, navigation, and footer styles. Figure 1 displays an interactive navigation bar, this component of the CSS code was used across the 4 html documents with the incorporation of `nav a:hover` and `nav a.active`, which integrate hovering and an active navigation link (done with `transition: background-color 1s ease`). This functionality in the navigation tab is an important communication feature to the user, with a 1 second transition, it allows the viewer eye to slowly focus to what has been highlighted. Additionally code for the navigation bar was added in the `<nav>` section of the html document (found in appendix), which had the four navigation bar links with the respective html file names, along with the `class=active` attribute which relates to the `a.active` CSS code previously mentioned, which applies the orange colour to the currently selected page. Indicating the users real time location, as the `a:hover` attribute allows the user to interact with the navigation bar

so that when hovering the mouse over the text, the colour will change to light blue on all links which haven't got the class=active feature applied.



**Figure 1.** Preliminary storyboard structure for web mapping application, found in initial report.

With the implementation of the main components of the website complete, the next stage of development was the content and the web mapping service. The two main structural components of the content sections of the website were that three of the four pages used the web mapping application, and three of the four pages had the content split onto the left and right of the page. As the map page consisted just of the map, this was where the web mapping application was created, and most of the troubleshooting and reformatting was completed. The data required for the web mapping service is provided by dataWA (SLIP\_Public\_Services / MapServer), using the ArcGIS Server Map Services the following data was incorporated into the website, Minedex (DMIRS-001), 1:500 000 State interpreted bedrock geology (DMIRS-016) and 1:500 000 State linear structures layer (DMIRS-015). To create the map a JavaScript following the initial CSS code was compiled in the content section of the website. This was done following the steps and code provided by (ArcGIS, 2023), using version 4.26 of the ArcGIS JavaScript API, which imports all the required tools to create a user-friendly web mapping application. It is important to note that in the preliminary report, design structure and layout identified in the learning tools created by Katie Hall was a contributing factor to the use of this API to implement likeness. This was identified when discussing the one of Jakob Nielson's ten general

principles, match between system in real time. These two additions were implemented as a component of the principle of “Visibility of system status”. As ESRI has been the primary software developer for geospatial data systems, utilising the pre-existing ArcGIS API provided (ArcGIS CSS stylesheet & ArcGIS API JavaScript), proven templates to produce an aesthetic and minimalistic design, limiting technical issues when creating functionality. The JavaScript component of the website uses the principles of “User control and freedom” and “Error prevention”. This is the primary use of creating functionality on the website, to give the user control and freedom to change between geological units and look up locations seamlessly, without getting confused or lost.

To start the JavaScript the require function from the API is used to bring in the modules required to create the base map and functionality for the map. The modules required are seen in figure 1, following the procedures and code created by ArcGIS Developers (2023), modules are added for the following features, the map, the map view, the legend, the reset button, the search button, a scale bar, and a layer feature. The first function is to create the map with the layers provided by dataWA, this is done creating a function that creates five variables, the map, which is a base map provided by ESRI. The map view, which is what the initial zoom level and coordinates the map is set to. Then three variables are created using the MapImageLayer module which takes the ArcGIS Server Map Services from dataWA and creates a new variable which uses the URL to identify the correct layer ID (the URL provides all the sublayer links; the sublayer links provide all the spatial information for each layer) to be displayed on the map. Code was re used and adapted for this data using a tutorial on MapImageLayer provided by Esri (n.d.). These new MapImageLayer variables are used in a function to create the legend and layer selection.

Creating a function to handle the change event between the layers was done by creating the handleLayerSelection(event) function, this is done with multiple steps as it was the most difficult component of the web mapping application (defining the logic in the body of the function). First, a layer button was created, using the 3 layers, a value was applied to each layer which corresponds to a checkbox type layer feature. With the button layer group identified, the handleLayerSelection(event) function uses Array.from() to convert the selected checkbox of the dataWA layer button to an array of their values that determines the layer that is added to the map. With the Array.from(document.querySelectorAll), the method returns a notelist of the document elements which in this case is the layer buttons (MDN Web Docs, n.d.). A remove all feature is applied (map.removeAll()) to ensure only the selected checkboxes display data. The next step is an if-else

statement, using repurposed code for W3Schools, (n.d.) is applied that will add the map (layer) of each MapImageLayer selected with the checkbox of the layer button. To finalise the functionality of the layer buttons in relation to the dataWA layers, an event listener assignment code, repurposed and adjusted from W3Schools (n.d.), needs to be applied to execute the logic of the handleLayerSelection(event) function. The event listener assignment allows the map to update and allow user interaction with the checkboxes in the layer button, without the assignment, the checkboxes will still visibly indicate change, although the map will not respond to the button interaction. With this functionality now complete, the base map now has three interchangeable overlaying datasets that can be accessed via checkboxes.

With the map functionality compiled, the legend, scale bar, search bar and reset button can be added. To add a reset button, a button id is created which is used in a variable created for the reset button functionality. Just like the functionality of the event listener assignment for the layer button, the same code template is used for the reset button, although this iteration uses mapView.goTo with a set of x, y coordinates and a zoom level value. Using the modules seen in the require function, a series of widgets can now be added to complete the functionality of the JavaScript (ArcGIS, n.d.). Variables are created for the legend, scale bar and search bar, the view for each is set to mapView, which will contain the features to within the map. Using code and tutorials provided API reference from ArcGIS Maps SDK for JavaScript (Esri, n.d.), the example code was reformatted to fit the properties of the web mapping application. With these variables made, to display them on the map, mapView.ui.add was applied with a position for each to display them like seen in figure 1. Of the three pages that have the web mapping application, the Key Locations page is the only page that had direct change to the JavaScript, with the changing of the base map used and the change of the reset button and initial coordinates of the map with are now set to Kalgoorlie, Western Australia. The only page that does not have a JavaScript component is the Prospecting Overview, which just displays text and an image.

With the inclusion of the JavaScript, additional work is needed on the CSS for this new functionality. With the web map tool now complete, a content area style is introduced (seen in appendix) to create the Key locations and Main page. As the two pages have a split at various points in the content area to separate text and the map, a display variable was added with the flex value (creating the left and right side as children), which then allow the width of the left and right side of the content area be adjusted to different percentages. To get the structure to reflect the structure seen in figure 1, a series of percentage values were trailed to determine the optimal amount of space for both the left and right

side of content. Once that was completed, a new html was made for the Prospecting Overview page, which re-used the existing code with the flexibility split, with the JavaScript removed from the right-hand side of the page, replaced with an image. With the structure complete for all the web pages, styles are created for the JavaScript functionality on the map web page, then copied into the other two pages using the web map. Additionally discussed in the next section, a scrolling feature was added to the text boxes to allow the reading of text on smaller screens. This was done in the CSS by adding an overflow feature to the text area and setting it to auto. As there wasn't a detailed description of the appearance of the functionality in the initial report. The additions in the CSS such as box shadows used to increase the contrast in transition between legend and layer button and map. The Z index was added to display the reset button over the map and legend. A cursor pointer was added in the search bar and reset button to indicate the object is clickable.

## Web Map Application

### Links to Web mapping Application

Index

<http://157.245.201.158/~Barley/webapp/Index.html>

Prospecting Overview

<http://157.245.201.158/~Barley/webapp/ProspectingOverview.html>

Map

<http://157.245.201.158/~Barley/webapp/Map.html>

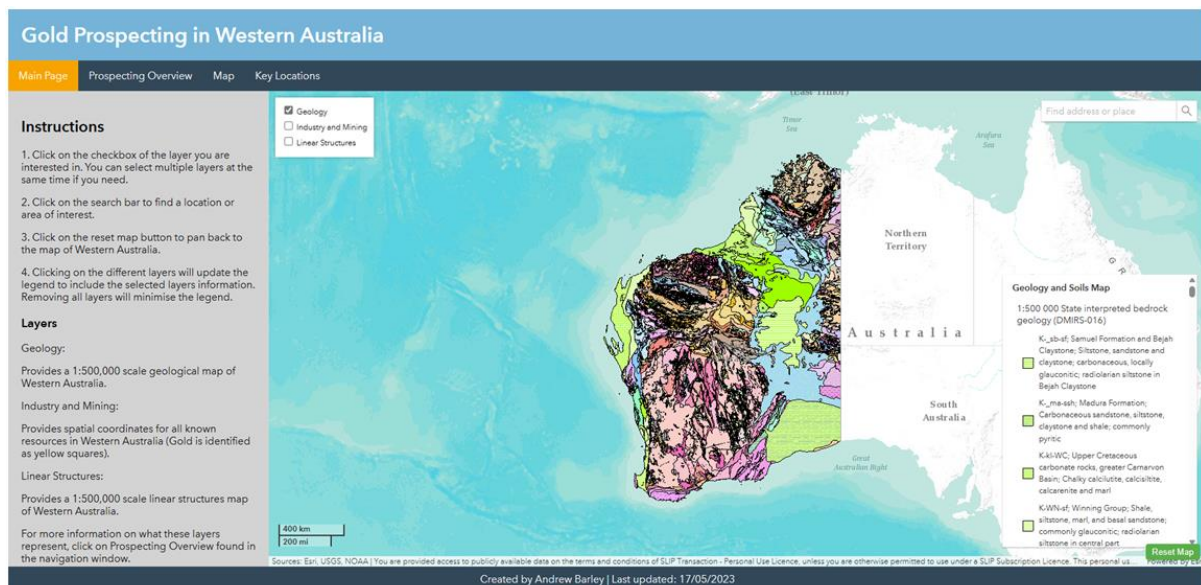
Key Locations

<http://157.245.201.158/~Barley/webapp/KeyLocations.html>

### Compliance to preliminary design principles and alterations

The Storyboard and website structure required emphasis on three design principles, visibility of system status, error prevention and user control and freedom. Alterations made to the initial design of the four pages occurred during the troubleshooting and over the initial iterations of the draft site. This is primary to accommodate the other two principles of focus, match between system and the real world and aesthetic and minimal design. The style of the web mapping application was a major component of the preliminary design principles. As seen in Figure 2, the style of the final design complies with the original design (figure 1) to a high degree. The colour pallet consists of light blue, dark blue, white, orange, and light grey, which was the chosen pallet from the preliminary report. The navigation bar has a highlighting interaction when the user hovers over the text, and the page selected is highlighted in orange. The text complies with the original design, white in the title and navigation to contrast the blue and black in the content sections to contrast the light grey. The use of the ArcGIS CSS light stylesheet provides a default font that is used in all the website components. The stylesheet and colour

pallet are minimalistic and in contrast to the colours provided by the dataset with the terrain base map, the contrast is aesthetic, and the pastel colours are soft and pale, creating a calming experience.



**Figure 2.** Main Page (index.html) for web mapping application.

The alterations made from the preliminary design to the final design seen in figure 2 in relation to aesthetic design and functionality. The original design was intended to have a satellite base map to provide additional visual context to locations and allow the blues, browns, oranges, and greens to contrast with the style of the website. It was changed to a terrain base map as the blues of the ocean and the white and light greys of the continents provided greater contrast with the website design, the satellite map almost over complicated the display. It was through the process of comparing the dataWA layers on both base map when the decision was made to change to terrain. It provides greater contrast and detail when overlapping the base map with the different geological layer and produces a more user-friendly interface with the increase of light blues and whites. This was further noted when creating a layer button, to keep within the design principles, it was important to simplify the functionality buttons further as the overall purpose of the design is not to overwhelm users and allow users to know what is happening at all points. Having a button symbol that produces a list of layers to use can become monotonous when the user is unfamiliar with a topic or presented with new things it is easy to forget which layers are selected and what layers are selected. Having a visible checkbox in the top left corner of the screen provides an easy to reference location on what is on the screen. It is located in the top left corner of the screen because it is the most important piece of information on the web mapping tool. Therefore a switch was done between the search bar and the layer button, as the layer button provides more functionality in the key location page rather than the main page and the map page. With the map now functioning with all the additional features, it became apparent that



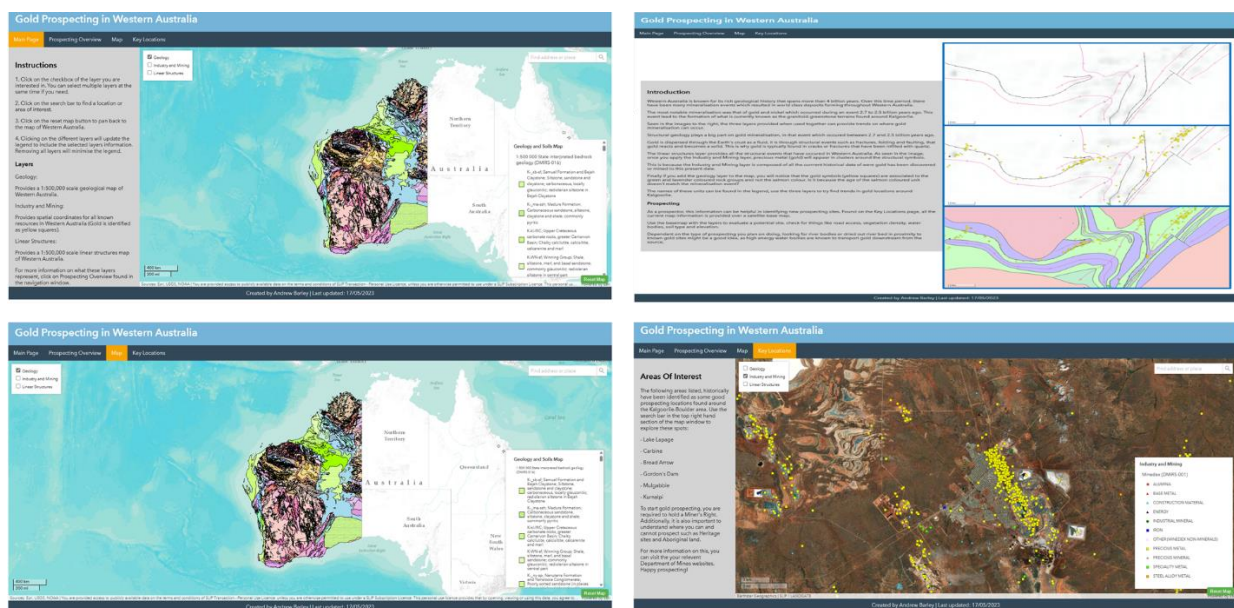
the legend and reset button should both be added to the bottom right of the map window and the scale on the bottom left. This was due to functionality and minimalism in a smaller browser window, as displayed in figure 3.



**Figure 3.** Screenshot of compressed web mapping application (index.html).

Screen size is an important component to consider when rendering a map, as the flex ability providing in the CSS section allows the window to update to represent their respective percentages of the screen, it is important to note that the legend, scale bar, layer button and search bar do not change in size. It is important to provide an accurate representation of the geological data being used. Therefore limiting the number of layers available but providing all the data required to understand the content was prioritized with the web map. This resulted in having a large legend displaying all the rock units, structural units, and mineral sites. It is important to keep the conventional standards the same as the Geological Society of Western Australia, therefore keeping the colour schemes that have historically been used to portray this spatial data. This results in having a content heavy legend area. This does

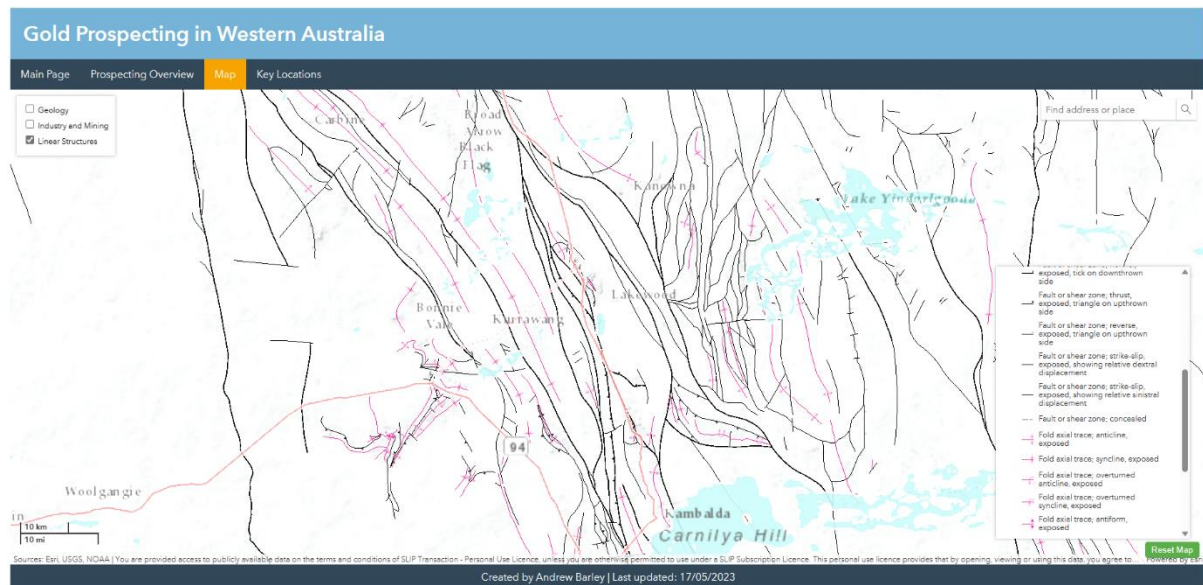
contrast the principal of matching between system and real world, as there is use of technical language within the legend. This feature must be overlooked however, even as a new user, the legend provides the most important information to an entry level geologist or prospector and as an educational tool in general. The addition of the unit code, the rock unit name and a brief definition of the unit type, enough information is provided to be used as a building block for search engines and further study. Therefore it is important to try minimising the clutter in the map window in relation to the website structure to make sure the user isn't overwhelmed by information. With the instructions listed on the left-hand side of the page, having the legend in proximity will clutter the left portion of the page. Moving it to the right along with the reset button, allows the bottom left portion of the map window to be relatively clear of functionality, with a semi-transparent scale bar utilising the space available in the bottom left corner without drawing attention to the text on the left. The other component adjusted in relation to a smaller display screen is including an autoflow feature which allows the text in the grey area to be scrollable (seen in figure 3).



**Figure 4.** All 4 finalised webpages for web mapping application.

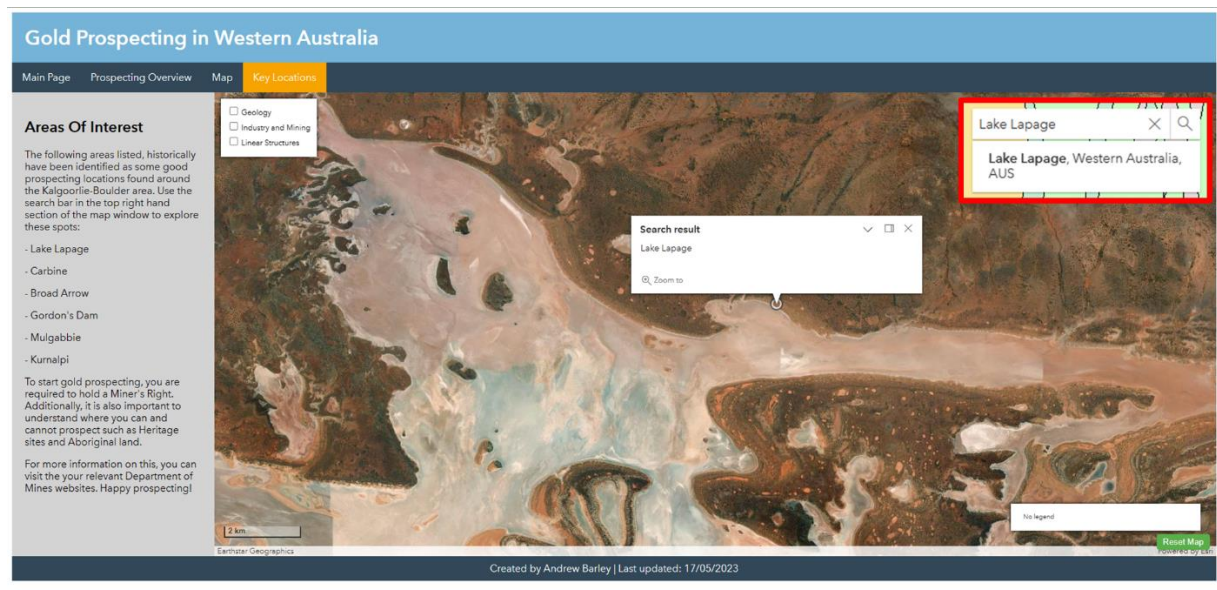
Seen in figure 4, the remaining alterations made from the preliminary report is that the key locations section kept the satellite base map and rather than the text highlighted in orange, the text box is highlighted in orange to show the user which page is active. The use of the satellite base map in the key location section is because it is more relevant than the terrain base map. The search bars primarily purpose for this tool is to search the names suggested in the areas of interest, found in the text box on the left of the webpage. All these locations are identifiable with the search bar, therefore looking at historical prospecting sites which have proven to have sustained success with prospector should be done via satellite imagery. This provides contextual information on what the terrain looks like in the

area, what the access is like to the site and any other information that can be provided via satellite. Whereas seen in figure 5, having the terrain background (with labels) allows clarity when analysing more precise data like the linear structures layer or as seen in figure 3 and 4, when displaying the geological layers, provides better contrast better with the geological colour scheme. The change from the orange text to orange text box was done as it provided easier recognition of which page was active, as well as providing more contrast in the navigation bar.



**Figure 5.** Map layer displaying linear structures.

Finally, the last of the alterations was done with the Reset Map button and search bar, the green colour for the reset button was chosen once the map was completed, with so much blue saturation throughout the website, green was chosen to have the button stand out, as well as match the colours presented in the geological layer, as seen in figure 2, 3 and 4. In the initial report the reset button provided a pop up window asking the user if they'd like to resent, this idea was removed as it would become tedious and user interaction was created with the button using a change in mouse pointer when hovering over the button. The search bar initially designed to have highlighted borders to tell a user they are actively using the layer, was changed no highlighted border, like the reset button a change in mouse pointer on the search icon, as the widget provides a pop-up list of locations related to the written text (seen in figure 6). This feature in the widget, allows the user to filter through possible layers and provides more freedom in a search feature.



**Figure 6.** Search feature displayed on the Key Locations page.

The text found on the main page, key locations page and the prospecting overview page has an emphasis on using simplified terminology. As seen in the Prospecting Overview, a brief history of gold formation and how to locate gold is simple and relates to the layers used and the images seen on the right side of the content area. This related to matching between system and the real world. As the terminology found in the legend could not be avoided, the only terminology used a layperson would not initially understand can be easily described with the use of a search engine.

## Bugs

The issues remaining with the website is in relation to CSS formatting of the Prospecting Overview page. The formatting of the content area was an issue, as the resolution of the imaging and the text box area would not scale in relation to browser window size, leaving the text box or image bigger than the other. Unsure whether this issue is related to pixel size (resolution) of the image. Once uploaded using FTP client the navigation bar did not register, the fix was to update href links needed to be updated to include the URL of the server.

## Future Releases

Future improvements for the web mapping application would be ideally identified via user interaction. Creating a “Contact Us” page available in the navigation or provide an “contact us at this email address:” section in the footer, would provide user feedback on how to optimise the web mapping application or to be notified of bugs users are experiencing. Following this user feedback, as the tool was designed for educational purposes, provide more iterations of the tool specified to school, reach



out to educators about what they'd like from an educational web mapping service and ask how it would be implemented in a classroom environment. Once there has been identifiable trends found by user interaction or no interaction further development can be made. Ideally, the identification of more historical locations for prospecting would be added to the key locations page. Additional pages regarding the processes involved in getting a Miner's Right and where/were not to prospect. Exploring other available geological layers that can added to the map or create other webpages which have different tools that can be utilised in geological learning. This could be done using the other sublayers available for DMIRS-016, or alternative dataWA datasets. Removing the tenement layer from this iteration of the web mapping service was due to its lack of meaningful impact. Tenement information can be difficult to interpret, and other web services provide more in depth and clear information on tenements therefor it was removed, although, there could be a section of the page which goes into the intro level information on acquiring a tenement.

## Summary

The principles initially identified in the preliminary report that became the foundational pieces of this web mapping application have been sufficiently met. All functionality of the web mapping features and website navigation show visibility of system status. Terminology and language were designed for the target audience, using simplified definitions of geological processes, and limiting geological jargon. User control and freedom was emphasized using available sublayers which provided easy to navigate data which could be used to interpret rather than interact, providing a simple to use overlaying mapping tool that can easily be reset. Error prevention was reduced using ArcGIS's extensive API JavaScript, stylesheet and with widget features, these enabled the creation of easy-to-use features which are difficult to misuse as they utilise universal trends in online map making. Combined into a website that displays contrasts between shades of blue with whites and greys to provide clarity when reading with the calming effect of pastel colours found in the base map and geological layers. The Website ultimately provides a tool that should interest younger students with its simplicity and interest teachers, students, and prospectors on how easy and available this data can be. The way the website is structured allows further development, with the ability to add new layers relatively easily through the functions created in the JavaScript.

## References

### Tutorials and adapted code

ArcGIS. (2023). Get started with ArcGIS API for JavaScript. Retrieved from

<https://developers.arcgis.com/javascript/latest/get-started/>

ArcGIS Developers. (2023). Display a map. Retrieved from

<https://developers.arcgis.com/javascript/latest/display-a-map/#reference-the-api>

Esri. (n.d.). MapImageLayer Class | ArcGIS API for JavaScript. Retrieved from

<https://developers.arcgis.com/javascript/latest/api-reference/esri-layers-MapImageLayer.html>

MDN Web Docs. (n.d.). Document.querySelectorAll(). Retrieved from

<https://developer.mozilla.org/en-US/docs/Web/API/Document/querySelectorAll>

W3Schools. (n.d.). JavaScript if, else and else if statement. Retrieved from

[https://www.w3schools.com/js/js\\_if\\_else.asp](https://www.w3schools.com/js/js_if_else.asp)

W3Schools. (n.d.). Document.addEventListener() Method. Retrieved from

[https://www.w3schools.com/jsref/met\\_document\\_addeventlistener.asp](https://www.w3schools.com/jsref/met_document_addeventlistener.asp)

ArcGIS. (n.d.). Widget overview. Retrieved from [https://doc.arcgis.com/en/web-](https://doc.arcgis.com/en/web-appbuilder/latest/create-apps/widget-overview.htm)

[appbuilder/latest/create-apps/widget-overview.htm](https://doc.arcgis.com/en/web-appbuilder/latest/create-apps/widget-overview.htm)

Esri. (n.d.). ScaleBar Widget. Retrieved from [https://developers.arcgis.com/javascript/latest/api-](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-ScaleBar.html)

[reference/esri-widgets-ScaleBar.html](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-ScaleBar.html)

Esri. (n.d.). Search Widget. Retrieved from [https://developers.arcgis.com/javascript/latest/api-](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-Search.html)

[reference/esri-widgets-Search.html](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-Search.html)

Esri. (n.d.). Legend Widget. Retrieved from [https://developers.arcgis.com/javascript/latest/api-](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-Legend.html)

[reference/esri-widgets-Legend.html](https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-Legend.html)

### ArcGIS Server Map Services Data

Department of Mines, Industry Regulation and Safety (DMIRS). (n.d.). Mineral Exploration Reports

(MINEDEX) [Data set]. DataWA Catalogue. <https://catalogue.data.wa.gov.au/dataset/minedex-dmirs-001>

Department of Mines, Industry Regulation and Safety (DMIRS). (n.d.). 1:500,000 State Interpreted Bedrock Geology [Data set]. DataWA Catalogue. <https://catalogue.data.wa.gov.au/dataset/1-500-000-state-interpreted-bedrock-geology-dmirs-016>

Department of Mines, Industry Regulation and Safety (DMIRS). (n.d.). 1:500,000 State Linear Structures Layer [Data set]. DataWA Catalogue. Retrieved from <https://catalogue.data.wa.gov.au/dataset/1-500-000-state-linear-structures-layer-dmirs-015>

## Appendix

### Links to Web mapping Application

Index

<http://157.245.201.158/~Barley/webapp/Index.html>

Prospecting Overview

<http://157.245.201.158/~Barley/webapp/ProspectingOverview.html>

Map

<http://157.245.201.158/~Barley/webapp/Map.html>

Key Locations

<http://157.245.201.158/~Barley/webapp/KeyLocations.html>

### Index Code

```
<!DOCTYPE html>
```

```
<html>
```

```
<head>
```

```
<title style="background-color: #6bb4d6; color: white">Gold Prospecting in WA</title>
```

```
<style>
```

```
/* Navigation bar styles */
```

```
nav {
```

```
background-color: #2f4858;
```

```
overflow: hidden;
```

```
}
```

```
nav a {  
    float: left;  
    display: block;  
    color: white;  
    text-align: center;  
    padding: 14px 16px;  
    text-decoration: none;  
}
```

```
nav a:hover {  
    background-color: #6bb4d6;  
    color: white;  
    transition: background-color 1s ease;  
}
```

```
nav a.active {  
    background-color: orange;  
    color: white;  
}
```

```
/* Page header styles */  
h1 {  
    background-color: #6bb4d6;  
    color: white;  
    text-align: center;  
    padding: 20px;  
    margin: 0;  
}
```

```
/* Footer styles */
```



```
footer {  
    background-color: #2f4858;  
    color: white;  
    text-align: center;  
    padding: 10px;  
}
```

```
/* Content area styles */
```

```
#content {  
    display: flex;  
    height: calc(95vh - 150px);  
    margin: 0 auto;  
    overflow: hidden;  
}
```

```
/* Left side text area styles */
```

```
#text-area {  
    width: 20%;  
    background-color: lightgrey;  
    padding: 20px;  
    overflow: auto;  
}
```

```
/* Right side map and widgets styles */
```

```
#map-container {  
    width: 80%;  
    position: relative;  
}
```

```
/* Legend styles */
```

```
#legend {
```

```
position: absolute;
bottom: 10px;
right: 10px;
background-color: white;
padding: 10px;
box-shadow: 0 0 5px rgba(0, 0, 0, 1);
font-size: 10px;
        z-index: 1;
}
```

```
/* Search bar styles */
```

```
#search-input {
    width: 300px;
    padding: 5px;
    border: 1px solid #ccc;
    border-radius: 4px;
}
```

```
#search-button {
    padding: 5px 10px;
    background-color: #4CAF50;
    color: white;
    border: none;
    border-radius: 4px;
    cursor: pointer;
}
```

```
/* Reset button styles */
```

```
#reset-button {
    position: absolute;
    bottom: 10px;
```

```
right: 10px;
padding: 5px 10px;
background-color: #4CAF50;
color: white;
border: none;
border-radius: 4px;
cursor: pointer;
z-index: 1;
}
```

```
/* Layer button group styles */
#layer-button-group {
  position: absolute;
  top: 10px;
  left: 10px;
  background-color: white;
  padding: 10px;
  box-shadow: 0 0 5px rgba(0, 0, 0, 1);
  font-size: 12px;
}
```

```
#layer-button-group label {
  display: block;
  margin-bottom: 5px;
}
```

```
</style>
```

```
  <link rel="stylesheet" href="https://js.arcgis.com/4.26/esri/themes/light/main.css">
```

```
</head>
```

```
<body>
```

```
<h1 style="text-align: left;">Gold Prospecting in Western Australia</h1>
```

```
<nav>
```

```
<a href="http://157.245.201.158/~Barley/webapp/Index.html" class="active">Main Page</a>
    <a href="http://157.245.201.158/~Barley/webapp/ProspectingOverview.html">Prospecting
Overview</a>
    <a href="http://157.245.201.158/~Barley/webapp/Map.html">Map</a>
    <a href="http://157.245.201.158/~Barley/webapp/KeyLocations.html">Key Locations</a>
```

```
</nav>
```

```
<div id="content">
```

```
<!-- Left side -->
```

```
<div id="text-area">
```

```
<h2>Instructions</h2>
```

```
<p>
```

1. Click on the checkbox of the layer you are interested in. You can select multiple layers at the same time if you need.

```
</p>
```

```
<p>
```

2. Click on the search bar to find a location or area of interest.

```
</p>
```

```
<p>
```

3. Click on the reset map button to pan back to the map of Western Australia.

```
</p>
```

```
<p>
```

4. Clicking on the different layers will update the legend to include the selected layers information. Removing all layers will minimize the legend.

```
</p>
```

```
<h3>Layers</h3>
```

```
<p>
```

Geology:

```
</p>
```

```
<p>
```

Provides a 1:500,000 scale geological map of Western Australia.

```
</p>
```

```
<p>
  Industry and Mining:
</p>

<p>
  Provides spatial coordinates for all known resources in Western Australia
  (Gold is identified as yellow squares).
</p>

<p>
  Linear Structures:
</p>

<p>
  Provides a 1:500,000 scale linear structures map of Western Australia.
</p>

<p>
  For more information on what these layers represent, click on Prospecting Overview
  found in the navigation window.
</p>
</div>

<!-- Right side -->
<div id="map-container">
  <div id="map"></div>

  <button id="reset-button">Reset Map</button>

  <div id="layer-button-group">
    <label>
      <input type="checkbox" name="layer" value="geology" checked> Geology
    </label>
    <label>
      <input type="checkbox" name="layer" value="gold"> Industry and Mining
    </label>
```

```
<label>
    <input type="checkbox" name="layer" value="structural"> Linear Structures
</label>
</div>

<div id="legend"></div>
</div>
</div>

<footer>
    Created by Andrew Barley | Last updated: 17/05/2023
</footer>

<!-- JavaScript code -->
<script src="https://js.arcgis.com/4.26/"></script>
<script>
    require(["esri/Map", "esri/views/MapView", "esri/widgets/Legend", "esri/widgets/Search",
    "esri/widgets/ScaleBar", "esri/layers/MapImageLayer"], function(Map, MapView, Legend, Search,
    ScaleBar, MapImageLayer) {

        var map = new Map({
            basemap: "terrain"
        });

        var mapView = new MapView({
            container: "map-container",
            map: map,
            zoom: 5,
            center: [122, -25]
        });
```

```
var geologyServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Geology_and_Soils_Map/  
    MapServer",  
    sublayers: [  
        {  
            id: 4  
        }  
    ]  
});
```

```
var goldServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Industry_and_Mining/Map  
    pServer",  
    sublayers: [  
        {  
            id: 0  
        }  
    ]  
});
```

```
var structuralServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Geology_and_Soils_Map/  
    MapServer",  
    sublayers: [  
        {  
            id: 1  
        }  
    ]  
});
```

```
    }  
  ]  
});
```

```
function handleLayerSelection(event) {  
  var selectedLayers =  
    Array.from(document.querySelectorAll('input[name="layer"]:checked')).map(function (checkbox) {  
      return checkbox.value;  
    });  
}
```

```
map.removeAll();
```

```
selectedLayers.forEach(function (selectedLayer) {  
  if (selectedLayer === "geology") {  
    map.add(geologyServiceLayer);  
  } else if (selectedLayer === "gold") {  
    map.add(goldServiceLayer);  
  } else if (selectedLayer === "structural") {  
    map.add(structuralServiceLayer);  
  }  
});  
}
```

```
var layerCheckboxes = document.getElementsByName("layer");  
layerCheckboxes.forEach(function (checkbox) {  
  checkbox.addEventListener("change", handleLayerSelection);  
});
```



```
var legend = new Legend({  
    view: mapView,  
    container: "legend"  
});
```

```
mapView.ui.add(legend, {  
    position: "bottom-right"  
});
```

```
var searchWidget = new Search({  
    view: mapView  
});
```

```
mapView.ui.add(searchWidget, {  
    position: "top-right"  
});
```

```
var scaleBar = new ScaleBar({  
    view: mapView,  
    unit: "metric"  
});
```

```
mapView.ui.add(scaleBar, "bottom-left");
```

```

var resetButton = document.getElementById("reset-button");

resetButton.addEventListener("click", function () {

    mapView.goTo({
        center: [122, -25],
        zoom: 5
    });
});

    handleLayerSelection();
});
</script>
</body>
</html>

```

### Prospecting Overview Code

```

<!DOCTYPE html>

<html>

<head>

    <title style="background-color: #6bb4d6; color: white">Gold Prospecting in WA</title>

    <style>

        /* Navigation bar styles */

        nav {

            background-color: #2f4858;

            overflow: hidden;

        }

        nav a {

```

```
float: left;

display: block;

color: white;

text-align: center;

padding: 14px 16px;

text-decoration: none;

}
```

```
nav a:hover {

    background-color: #6bb4d6;

    color: white;

    transition: background-color 1s ease;

}
```

```
nav a.active {

    background-color: orange;

    color: white;

}
```

```
/* Page header styles */

h1 {

    background-color: #6bb4d6;

    color: white;

    text-align: center;

    padding: 20px;
```

```
margin: 0;  
}
```

```
/* Footer styles */
```

```
footer {  
  
    background-color: #2f4858;  
  
    color: white;  
  
    text-align: center;  
  
    padding: 10px;  
}
```

```
    /* Content area styles */
```

```
    .content {  
  
display: flex;  
  
align-items: center;  
  
justify-content: space-between;  
  
padding: 20px;  
    }
```

```
    .text-box {  
  
width: 50%;  
  
    background-color: lightgrey;  
  
    padding: 20px;  
    }
```

```
    .image-box {
```

width: 50%;

}

.image-box img {

max-width: 100%;

}

</style>

<link rel="stylesheet" href="https://js.arcgis.com/4.26/esri/themes/light/main.css">

</head>

<body>

<h1 style="text-align: left;">Gold Prospecting in Western Australia</h1>

<nav>

<a href="http://157.245.201.158/~Barley/webapp/Index.html">Main Page</a>

<a href="http://157.245.201.158/~Barley/webapp/ProspectingOverview.html"  
class="active">Prospecting Overview</a>

<a href="http://157.245.201.158/~Barley/webapp/Map.html">Map</a>

<a href="http://157.245.201.158/~Barley/webapp/KeyLocations.html">Key Locations</a>

</nav>

<div class="content">

<div class="text-box">

<h2>Introduction</h2>

<p>Western Australia is known for its rich geological history that spans more than 4 billion years. Over this time period, there have been many mineralisation events which resulted in world class deposits forming throughout Western Australia.</p>

<p>The most notable mineralisation was that of gold and nickel which occurred during an event 2.7 to 2.5 billion years ago. This event lead to the formation of what is currently known as the granitoid-greenstone terrains found around Kalgoorlie.</p>

<p>Seen in the images to the right, the three layers provided when used together can provide trends on where gold mineralisation can occur.</p>

<p>Structural geology plays a big part on gold mineralisation, in that event which occured between 2.7 and 2.5 billion years ago. </p>

<p>Gold is dispersed through the Earth's crust as a fluid, it is through structural events such as fractures, folding and faulting, that gold reacts and becomes a solid. This is why gold is typically found in cracks or fractures that have been infilled with quartz. </p>

<p>The linear structures layer provides all the structural events that have occurred in Western Australia. As seen in the image, once you apply the Industry and Mining layer, precious metal (gold) will appear in clusters around the structural symbols.</p>

<p>This is because the Industry and Mining layer is composed of all the current historical data of were gold has been discovered or mined to this present date.</p>

<p>Finally if you add the geology layer to the map, you will notice that the gold symbols (yellow squares) are associated to the green and lavender coloured rock groups and not the salmon colour. Is it because the age of the salmon coloured unit doesn't match the mineralisation event?</p>

<p>The names of these units can be found in the legend, use the three layers to try find trends in gold locations around Kalgoorlie. </p>

### <h3>Prospecting</h3>

<p>As a prospector, this information can be helpful in identifying new prospecting sites. Found on the Key Locations page, all the current map information is provided over a satellite base map.</p>

<p>Use the basemap with the layers to evaluate a potential site, check for things like road access, vegetation density, water bodies, soil type and elevation. </p>

<p>Dependant on the type of prospecting you plan on doing, looking for river bodies or dried out river bed in proximity to known gold sites might be a good idea, as high energy water bodies are known to transport gold downstream from the source.</p>

```
        </div>

        <div class="image-box">

        </div>

    </div>

<footer>

    Created by Andrew Barley | Last updated: 17/05/2023

</footer>

</script>

</body>

</html>
```

## Map Code

```
<!DOCTYPE html>

<html>

<head>

    <title style="background-color: #6bb4d6; color: white">Gold Prospecting in WA</title>

    <style>

        /* Navigation bar styles */

        nav {

            background-color: #2f4858;

            overflow: hidden;

        }

        nav a {

            float: left;

            display: block;

            color: white;
```

```
    text-align: center;
    padding: 14px 16px;
    text-decoration: none;
}
```

```
nav a:hover {
    background-color: #6bb4d6;
    color: white;
    transition: background-color 1s ease;
}
```

```
nav a.active {
    background-color: orange;
    color: white;
}
```

```
/* Page header styles */
h1 {
    background-color: #6bb4d6;
    color: white;
    text-align: center;
    padding: 20px;
    margin: 0;
}
```

```
/* Footer styles */
footer {
    background-color: #2f4858;
    color: white;
    text-align: center;
    padding: 10px;
```



```
}
```

```
/* Content area styles */
```

```
#content {  
    width: 100%;  
    height: calc(95vh - 150px);  
    margin: 0 auto;  
    position: relative;  
    overflow: hidden;  
}
```

```
/* Legend styles */
```

```
#legend {  
    position: absolute;  
    bottom: 10px;  
    right: 10px;  
    background-color: white;  
    padding: 10px;  
    box-shadow: 0 0 5px rgba(0, 0, 0, 1);  
    font-size: 10px;  
    z-index: 1;  
}
```

```
/* Search bar styles */
```

```
#search-input {  
    width: 300px;  
    padding: 5px;  
    border: 1px solid #ccc;  
    border-radius: 4px;  
}
```

```
#search-button {  
    padding: 5px 10px;  
    background-color: #4CAF50;  
    color: white;  
    border: none;  
    border-radius: 4px;  
    cursor: pointer;  
}
```

```
/* Reset button styles */
```

```
#reset-button {  
    position: absolute;  
    bottom: 10px;  
    right: 10px;  
    padding: 5px 10px;  
    background-color: #4CAF50;  
    color: white;  
    border: none;  
    border-radius: 4px;  
    cursor: pointer;  
    z-index: 1;  
}
```

```
/* Layer button group styles */
```

```
#layer-button-group {  
    position: absolute;  
    top: 10px;  
    left: 10px;  
    background-color: white;  
    padding: 10px;  
    box-shadow: 0 0 5px rgba(0, 0, 0, 1);
```

```
font-size: 12px;
}
```

```
#layer-button-group label {
display: block;
margin-bottom: 5px;
}
```

```
</style>
```

```
<link rel="stylesheet" href="https://js.arcgis.com/4.26/esri/themes/light/main.css">
```

```
</head>
```

```
<body>
```

```
<h1 style="text-align: left;">Gold Prospecting in Western Australia</h1>
```

```
<nav>
```

```
<a href="http://157.245.201.158/~Barley/webapp/Index.html">Main Page</a>
```

```
<a href="http://157.245.201.158/~Barley/webapp/ProspectingOverview.html">Prospecting
Overview</a>
```

```
<a href="http://157.245.201.158/~Barley/webapp/Map.html" class="active">Map</a>
```

```
<a href="http://157.245.201.158/~Barley/webapp/KeyLocations.html">Key Locations</a>
```

```
</nav>
```

```
<div id="content" style="position: relative;">
```

```
<div id="map-container"></div>
```

```
<button id="reset-button">Reset Map</button>
```

```
<div id="layer-button-group">
```

```
<label>
```

```
<input type="checkbox" name="layer" value="geology" checked> Geology
```

```
</label>
```

```
<label>
```

```

        <input type="checkbox" name="layer" value="gold"> Industry and Mining
    </label>

    <label>

        <input type="checkbox" name="layer" value="structural"> Linear Structures
    </label>
</div>


<div id="legend"></div>
</div>


<footer>

    Created by Andrew Barley | Last updated: 17/05/2023
</footer>


<!-- JavaScript code -->

<script src="https://js.arcgis.com/4.26/"></script>

<script>

    require(["esri/Map", "esri/views/MapView", "esri/widgets/Legend", "esri/widgets/Search",
    "esri/widgets/ScaleBar", "esri/layers/MapImageLayer"], function(Map, MapView, Legend, Search,
    ScaleBar, MapImageLayer) {

        var map = new Map({

            basemap: "terrain"

        });

        var mapView = new MapView({

            container: "content",

            map: map,

            zoom: 5,

            center: [122, -25]

```

```
});
```

```
var geologyServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Geology_and_Soils_Map/  
    MapServer",  
    sublayers: [  
        {  
            id: 4  
        }  
    ]  
});
```

```
var goldServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Industry_and_Mining/MapServer",  
    sublayers: [  
        {  
            id: 0  
        }  
    ]  
});
```

```
var structuralServiceLayer = new MapImageLayer({  
    url:  
    "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Geology_and_Soils_Map/MapServer",  
    sublayers: [  
        {
```

```
        id: 1
      }
    ]
  });
```

```
map.add(geologyServiceLayer);
```

```
function handleLayerSelection(event) {
  var selectedLayers =
    Array.from(document.querySelectorAll('input[name="layer"]:checked')).map(function (checkbox) {
      return checkbox.value;
    });
}
```

```
map.removeAll();
```

```
selectedLayers.forEach(function (selectedLayer) {
  if (selectedLayer === "geology") {
    map.add(geologyServiceLayer);
  } else if (selectedLayer === "gold") {
    map.add(goldServiceLayer);
  } else if (selectedLayer === "structural") {
    map.add(structuralServiceLayer);
  }
});
}
```

```
var layerCheckboxes = document.getElementsByName("layer");
layerCheckboxes.forEach(function (checkbox) {
    checkbox.addEventListener("change", handleLayerSelection);
});
```

```
var scaleBar = new ScaleBar({
    view: mapView,
    unit: "metric"
});
mapView.ui.add(scaleBar, "bottom-left");
```

```
var resetButton = document.getElementById("reset-button");
resetButton.addEventListener("click", function () {
    mapView.goTo({
        center: [122, -25],
        zoom: 5
    });
});
```

```
var searchWidget = new Search({
    view: mapView
});
```

```
mapView.ui.add(searchWidget, {
    position: "top-right"
});
```

```

var legend = new Legend({
    view: mapView,
    container: "legend"
});

mapView.ui.add(legend, {
    position: "bottom-right"
});
});
</script>
</body>
</html>

```

### Key Locations Code

```

<!DOCTYPE html>

<html>

<head>

<title style="background-color: #6bb4d6; color: white">Gold Prospecting in WA</title>

<style>

/* Navigation bar styles */

nav {

    background-color: #2f4858;

    overflow: hidden;

}

nav a {

    float: left;

    display: block;

    color: white;

```



```
text-align: center;
padding: 14px 16px;
text-decoration: none;
}
```

```
nav a:hover {
    background-color: #6bb4d6;
    color: white;
    transition: background-color 1s ease;
}
```

```
nav a.active {
    background-color: orange;
    color: white;
}
```

```
/* Page header styles */
h1 {
    background-color: #6bb4d6;
    color: white;
    text-align: center;
    padding: 20px;
    margin: 0;
}
```

```
/* Footer styles */
footer {
    background-color: #2f4858;
    color: white;
    text-align: center;
    padding: 10px;
```

```
}
```

```
/* Content area styles */
```

```
#content {  
    display: flex;  
    height: calc(95vh - 150px);  
    margin: 0 auto;  
    overflow: hidden;  
}
```

```
/* Left side text area styles */
```

```
#text-area {  
    width: 15%;  
    background-color: lightgrey;  
    padding: 20px;  
    overflow: auto;  
}
```

```
/* Right side map and widgets styles */
```

```
#map-container {  
    width: 85%;  
    position: relative;  
}
```

```
/* Legend styles */
```

```
#legend {  
    position: absolute;  
    bottom: 10px;  
    right: 10px;  
    background-color: white;  
    padding: 10px;
```

```
    box-shadow: 0 0 5px rgba(0, 0, 0, 1);  
    font-size: 10px;  
    z-index: 1;  
}
```

```
/* Search bar styles */
```

```
#search-input {  
    width: 300px;  
    padding: 5px;  
    border: 1px solid #ccc;  
    border-radius: 4px;  
}
```

```
#search-button {  
    padding: 5px 10px;  
    background-color: #4CAF50;  
    color: white;  
    border: none;  
    border-radius: 4px;  
    cursor: pointer;  
}
```

```
/* Reset button styles */
```

```
#reset-button {  
    position: absolute;  
    bottom: 10px;  
    right: 10px;  
    padding: 5px 10px;  
    background-color: #4CAF50;  
    color: white;  
    border: none;
```

```

border-radius: 4px;

cursor: pointer;

z-index: 1;
}

/* Layer button group styles */
#layer-button-group {
    position: absolute;
    top: 10px;
    left: 10px;
    background-color: white;
    padding: 10px;
    box-shadow: 0 0 5px rgba(0, 0, 0, 1);
    font-size: 12px;
}

#layer-button-group label {
    display: block;
    margin-bottom: 5px;
}
</style>

<link rel="stylesheet" href="https://js.arcgis.com/4.26/esri/themes/light/main.css">
</head>
<body>
<h1 style="text-align: left;">Gold Prospecting in Western Australia</h1>
<nav>
    <a href="http://157.245.201.158/~Barley/webapp/Index.html">Main Page</a>
    <a href="http://157.245.201.158/~Barley/webapp/ProspectingOverview.html">Prospecting
Overview</a>
    <a href="http://157.245.201.158/~Barley/webapp/Map.html">Map</a>

```

[Key Locations](http://157.245.201.158/~Barley/webapp/KeyLocations.html)

Areas Of Interest

The following areas listed, historically have been identified as some good prospecting locations found around the Kalgoorlie-Boulder area. Use the search bar in the top right hand section of the map window to explore these spots:

- Lake Lapage

- Carbine

- Broad Arrow

- Gordon's Dam

- Mulgabbie

- Kurnalpi

To start gold prospecting, you are required to hold a Miner's Right. Additionally, it is also important to understand where you can and cannot prospect such as Heritage sites and Aboriginal land.

</p>

<p>

For more information on this, you can visit the your relevant Department of Mines websites. Happy prospecting!

</p>

</div>

<!-- Right side -->

<div id="map-container">

<div id="map"></div>

<button id="reset-button">Reset Map</button>

<div id="layer-button-group">

<label>

<input type="checkbox" name="layer" value="geology" checked> Geology

</label>

<label>

<input type="checkbox" name="layer" value="gold"> Industry and Mining

</label>

<label>

<input type="checkbox" name="layer" value="structural"> Linear Structures

</label>

</div>

<div id="legend"></div>

</div>

</div>

<footer>

Created by Andrew Barley | Last updated: 17/05/2023

</footer>

<!-- JavaScript code -->

<script src="https://js.arcgis.com/4.26/"></script>

<script>

require(["esri/Map", "esri/views/MapView", "esri/widgets/Legend", "esri/widgets/Search",  
"esri/widgets/ScaleBar", "esri/layers/MapImageLayer"], function(Map, MapView, Legend, Search,  
ScaleBar, MapImageLayer) {

var map = new Map({

basemap: "satellite"

});

var mapView = new MapView({

container: "map-container",

map: map,

zoom: 12,

center: [121.4689, -30.7500]

});

var geologyServiceLayer = new MapImageLayer({

url:

"https://services.slip.wa.gov.au/public/rest/services/SLIP\_Public\_Services/Geology\_and\_Soils\_Map/  
MapServer",

sublayers: [

{

id: 4

```
    }  
  ]  
});
```

```
var goldServiceLayer = new MapImageLayer({  
  url:  
  "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Industry_and_Mining/MapServer",  
  sublayers: [  
    {  
      id: 0  
    }  
  ]  
});
```

```
var structuralServiceLayer = new MapImageLayer({  
  url:  
  "https://services.slip.wa.gov.au/public/rest/services/SLIP_Public_Services/Geology_and_Soils_Map/MapServer",  
  sublayers: [  
    {  
      id: 1  
    }  
  ]  
});
```

```
function handleLayerSelection(event) {  
  var selectedLayers =  
  Array.from(document.querySelectorAll('input[name="layer"]:checked')).map(function (checkbox) {  
    return checkbox.value;  
  });  
}
```



```
});
```

```
map.removeAll();
```

```
selectedLayers.forEach(function (selectedLayer) {  
    if (selectedLayer === "geology") {  
        map.add(geologyServiceLayer);  
    } else if (selectedLayer === "gold") {  
        map.add(goldServiceLayer);  
    } else if (selectedLayer === "structural") {  
        map.add(structuralServiceLayer);  
    }  
});  
}
```

```
var layerCheckboxes = document.getElementsByName("layer");  
layerCheckboxes.forEach(function (checkbox) {  
    checkbox.addEventListener("change", handleLayerSelection);  
});
```

```
var legend = new Legend({  
    view: mapView,  
    container: "legend"  
});
```

```
mapView.ui.add(legend, {
```

```
        position: "bottom-right"
    });
```

```
var searchWidget = new Search({
    view: mapView
});
```

```
mapView.ui.add(searchWidget, {
    position: "top-right"
});
```

```
var scaleBar = new ScaleBar({
    view: mapView,
    unit: "metric"
});
```

```
mapView.ui.add(scaleBar, "bottom-left");
```

```
var resetButton = document.getElementById("reset-button");
resetButton.addEventListener("click", function () {
    mapView.goTo({
        center: [121.4689, -30.7500],
        zoom: 12
    });
});
```

```
        handleLayerSelection();  
    });  
</script>  
</body>  
</html>
```