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## Introduction

This document evaluates four industry leading web mapping options<sup>1</sup> available to the State; Microsoft's Bing Maps, Google Maps, ESRI's web mapping solutions, and OpenLayers. This assessment evaluates these solutions against four criteria; 1) type of services provided; 2) development considerations; 3) the cost of the solution; 4) integration with existing state geographic technology investments. This evaluation was conducted at the request of the Vermont Chief Information Officer in order to help state web mapping investments. It was drafted by the Web Mapping Workgroup, a sub-committee of the State Enterprise GIS Consortium (<http://www.vcgi.org/egc/>).

This document does not attempt to definitively recommend one solution over another as there are too many business requirements which may determine the most appropriate option for an organization. Rather this document outlines and organizes each solution into categories to aid in choosing a web mapping solution based on the organization's needs. A "Capabilities Matrix" is included in Appendix A providing a comparison of web mapping functions between products.

All the solutions assessed here offer or can leverage similar map and imagery services, offer geo-coding and routing functionality, and may be developed through a number of application programming interfaces. The primary decision factors which may determine the best option are whether an organization wants to integrate local GIS data and map services, develop advanced geo-processing functions, utilize existing investments in geographic technologies, and pricing/licensing differences.

## Document Scope

This document examines four best in class mapping options available to the state. The scope of this assessment is on third party hosted web map services and web mapping APIs. This document does not cover hardware/software implementations such as [Google Earth Enterprise](#) or [Microsoft MapPoint](#). This document addresses mapping hardware/software ties where a mapping solution integrates with current state investments in geographic system technologies.

## Definitions

API (Application Programming Interface) is an interface that a software program implements in order to allow other software to interact with it, much in the same way that software might implement a user interface in order to allow humans to use it. APIs are implemented by applications, libraries and operating systems to define how other software can make calls to or request services from them. An API determines the vocabulary and calling conventions the programmer should employ to use the services. It may include specifications for routines, data structures, object classes, and protocols used to communicate between the consumer and implementer of the API. (Wikipedia)

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<sup>1</sup> The web mapping options are limited to those that will work within standard web browsers.

**ADF: Application Development Framework.** In computer programming, an application framework or application development framework consists of a software framework used by software developers to implement the standard structure of an application for a specific development environment (such as an operating system or a web application). Programmers find it much simpler to create automatic GUI creation tools when using a standard framework, since this defines the underlying code structure of the application in advance. Developers usually use object-oriented programming techniques to implement frameworks such that the unique parts of an application can simply inherit from pre-existing classes in the framework. (Wikipedia)

**MashUp:** In web development, a mashup is a web page or application that combines data or functionality from two or more external sources to create a new service. The term mashup implies easy, fast integration, frequently using open APIs and data sources to produce results that were not the original reason for producing the raw source data. An example of a mashup is the use of cartographic data to add location information to real estate data, thereby creating a new and distinct web API that was not originally provided by either source. (Wikipedia)

**Geocode/Geocoding:** Geocoding is the process of finding associated geographic coordinates (often expressed as latitude and longitude) from other geographic data, such as street addresses, or zip codes (postal codes). Reverse geocoding is the opposite: finding an associated textual location such as a street address, from geographic coordinates. (Wikipedia)

### Web Mapping Solutions Review

#### **Google Maps**

Google Maps (<http://maps.google.com/>) is a hosted solution for displaying mapping data in web browsers. Google provides multiple technologies and price points based on the needs of the solution and the skill sets of the user creating the maps. Google also promotes a large user community of Google Maps users creating an array of third party solutions for various tasks not supported directly in the API. Many libraries and functions have already been created through the community.

#### Services:

Google Maps provides aerial imagery as well as road data and geographic features. Road and geographic features are provided by TeleAtlas ([www.teleatlas.com](http://www.teleatlas.com)) and MapIT ([www.mapit.co.za](http://www.mapit.co.za)). Imagery is primarily provided by DigitalGlobe ([www.digitalglobe.com](http://www.digitalglobe.com)) and MDA Federal. Imagery is approximately one to three years old. In addition, Google Maps offers terrain maps in the form of shaded relief topography with contours and “street view” (where available) which allows a user to navigate within street-level point of view imagery. Geospatial services include routing (direction) services as well as geo-coding capabilities.

#### Development:

Google provides basic mapping APIs (<http://code.google.com/intl/en/apis/maps/>) free of charge as long as the user agrees to the Google Maps terms of service (TOS). The TOS states that all maps generated through the free Mapping API must be available to the public free of charge and not used for commercial purposes. The API allows for generation of Google Maps on the fly embedded in non-Google sites. Google does reserve the right to add the Google logo to all generated maps. The free Google APIs are built to allow for the rapid creation of map mashups rather than complex geospatial manipulation. Google maps APIs are structured in such a way whereas the API is fairly basic in its functionality, instead relying on the client website’s JavaScript or Flex code to perform much of the processing.

For purposes that require private maps, commercial maps, or geospatial processing (such as “find nearest” functionality), Google provides the Maps API Premier. Premier supports all functions of the basic API along with guaranteed uptime, account monitoring, and geospatial calculation API functions. It also frees the client site from the Google terms of service requiring all maps to be publically available and free of charge.

Google also provides the “My Maps” function through the maps.google.com site which allows non-technical users to generate maps and mashups using a point and click web interface. Once the map is completed, it may be embedded in a non-Google site using their “link” function,

which generates an iframe HTML fragment that is useable on any site to display your map. The My Maps function also allows for collaboration, saving and sharing of maps through the Google site as well. A user needs to have a free Google account to access this functionality.

### 2009 Pricing:

As noted above Google offers multiple levels of service at various price points based on the organization's businesses requirements. The costs for Google web mapping solutions are:

- Free services:
  - Embedding a Google Maps created Map
  - Google Maps API - Free for up to 500,000 page views (map renderings) per day
  - Utilization of the Google Maps online tool or the Google Maps API requires acceptance of the Google Maps terms of use. These terms state that any map created using these tools must be available for public use free of charge. Mapping tools utilizing the Google API for internal use or for payment or subscription services must use the Google Maps API Premier license.
- Paid services:
  - Google Maps API Premier - Prices vary pending site usage

Pricing (per year-paid in full at signing) is in terms of Page views  
Page View is a single load of the Google Maps JavaScript by the end user's browser

- For External Applications (public facing, non-paid sites):
  - \$10,000 for 1 million page views per year
  - \$20,000 for 2 million page views per year
  - \$30,000 for 3 million page views per year
  - \$40,000 for 5 million page views per year
- For Internal Applications (internal facing applications):
  - \$10,000 for 250K page views per year
  - \$20,000 for 500K views per year
  - \$30,000 for 750K page views per year
  - \$40,000 for 1.5 million page views per year

### State geographic systems technologies/web development integration:

Integration of locally stored GIS information into Google Maps is achieved by publishing KML services, KML files, or GeoRSS feeds via ESRI's ArcGIS Server technology<sup>2</sup> or other similar technology<sup>3</sup>. Point features can also be exported as coordinate or address tables to display as

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<sup>2</sup> At the time of this writing, VTRANS, ANR, ACCD, and VCGI have direct access to ArcGIS Server technology. Other state organizations may have access by joining the State Enterprise GIS Consortium.

<sup>3</sup> Example: GeoServer – <http://geoserver.org/>

geo-coded points in Google Maps. Integration into the State's current web site and content management solutions is straightforward as the Google Maps API utilizes Javascript, iFrames, and XML to integrate Google Maps into web pages.

### Microsoft Bing Maps

Similar to Google Maps, Microsoft's Bing Maps ([www.bing.com/maps](http://www.bing.com/maps)) and Bing Maps for Enterprise (formally known as Live Search Maps and Virtual Earth respectively) is a hosted solution for displaying mapping data in web browsers. Bing Maps also offers a range of map services, development APIs and a cost structure to meet an organization's business requirements. Bing Maps is Microsoft's free consumer solution with access to the APIs for enterprise-wide internal and public-facing websites within the Bing Maps for Enterprise service which includes 24/7 support, geocoding data, and the ability to develop internal-only applications.

#### Services:

Bing maps offers aerial imagery, full street level map data, rooftop and address geocoding accuracy, and full routing (direction) services between any two locations based upon shortest distance or by time. Map data in the USA is provided by NAVTEQ ([www.navteq.com](http://www.navteq.com)), Intermap ([www.intermap.com](http://www.intermap.com)), Pictometry ([www.pictometry.com](http://www.pictometry.com)), DigitalGlobe ([www.digitalglobe.com](http://www.digitalglobe.com)), EarthStar Geographics ([www.es-geo.com](http://www.es-geo.com)), and NASA ([www.nasa.gov](http://www.nasa.gov)). Imagery is generally 1 to 3 years old. Bing Maps also offers 3D maps within the web browser (Internet Explorer and Firefox only) that requires a one-time Silverlight plug-in install onto the client's web browser. 3D mode offers imagery draped over terrain as well as shaded relief terrain. Bird's Eye imagery is offered with the Bing Maps for Enterprise edition for commercial customers.

#### Development Tools:

The Microsoft Bing Maps APIs (<http://msdn.microsoft.com/en-us/library/dd877180.aspx>) include the Bing Maps AJAX Control API, Bing Maps Web Services API, and the Bing Maps Silverlight Control API. Developer's can use the Bing Maps API's in a prototype environment without licensing the Service. In a production service, small volume customers can use Bing Maps as long as the user agrees to the Bing Maps terms of service (TOS). The TOS indicates that use of Bing Maps on a public-facing, non-password protected site is permitted and includes a limit of 125,000 sessions or 500,000 transactions in a 12 month period. Beyond that, Bing Maps for Enterprise allows for the development of internal facing sites, geocoding, enterprise-level support and additional imagery styles.

Like Google Maps, Bing Maps offers a "My Places" function through the [www.bing.com/maps](http://www.bing.com/maps) site which allows non-technical users to generate and draw features on maps using a point and click interface. Once the map is completed a user may export these features as a KML or a GPX file to be used in GPS devices. A user may also share their map by emailing a link. The My

Places function also allows for collaboration, saving and sharing of maps through the consumer-focused Bing Maps site as well. A user needs to have a free Bing account to access this functionality and this option does not require an enterprise customer to license the service.

### 2009 Pricing:

As stated from the Bing Maps website:

The Bing Maps Platform provides options for all types of sites and organizations, including Government agencies. Government agencies using the Bing Maps Platform receive:

- Full choice of Bing Maps APIs
- Aerial, road, hybrid, and 3D views
- Access to user forums, developer documentation, and articles
- Access to product information, including updates and news

### Free Services

- Use of Bing Maps APIs as long as the web applications are public-facing, non-password protected site and a limit of 125,000 sessions or 500,000 transactions in a 12 month period.

### Paid Services

- Bing Map for Enterprise edition. Costs dependent on:
  - Licensing options
    - Volume licensing: With volume licensing, you can license Bing Maps through your current Microsoft agreement.
  - Pricing models
    - Usage based: Payment is based on the number of sessions or transactions, as defined in the Bing Maps SDKs that your site records in any 12 month period.
    - Known user: Payment is based on a set number of users (this option includes unlimited usage/transactions for said known user).
- Per asset: Payment is based on a set number of tracked assets.
- Enterprise/Unlimited: Also available is a Bing Maps Ultimate model which is based upon time, and not usage. With this true enterprise model a customer can use Bing Maps in as many applications as they wish without regard to counting users/ transactions/sessions. This annual fee is affixed to the customer's existing Microsoft enterprise agreement.

### State geographic systems technologies/web development integration:

Integration of locally stored GIS information into Bing Maps is achieved by exporting GIS features as coordinate or address tables to display as geo-coded points in Bing Maps or by leveraging the ArcGIS API for Microsoft Silverlight to consume local geospatial services from ArcGIS Server as well as Bing Maps. Integration into the State's current web site and content

management solutions is achieved by utilizing the four Bing Map APIs; Silverlight Map control, Bing Map AJAX control which lets developers make request using Javascript to an AJAX map object, and Bing Maps Web Services and the MapPoint Web Service API, which uses SOAP XML to communicate with applications. Visual Studio 2008 is required to take advantage of the Silverlight Map control.

### ESRI

ESRI offers a number of map services including a number of free services for internal or non-commercial, non revenue generating use which includes state and local government. Other services are available under the same conditions, but limited to a certain number uses, while other services are available with a paid subscription.

#### Services:

ESRI offers road and geographic feature services in the form of World Street Map service and USA Topographic Map services (<http://resources.esri.com/arcgisonlineservices/>). The World Street Map service is updated twice a year, the USA Topographic Maps services is updated as needed. Additionally, ESRI Solutions are able to utilize services from Google and Microsoft, with additional licensing and costs. ESRI offers a World Imagery service that includes high-resolution (1m i-cubed Nationwide Select) aerial imagery of the U.S. The World Imagery service is updated twice a year. ESRI offers a North American Routing (directions) service that covers the U.S. and Canada. ESRI also offers geocoding services by utilizing the North American Address Locator service that covers the U.S. and Canada. This service performs geocoding (street address to point) and reverse geocoding (point to street address).

#### Development:

ESRI web mapping solutions may be developed in a variety of environments (<http://resources.esri.com/arcgisserver/index.cfm?fa=applications>). The MS.NET and Java ADF is ESRI's flagship development framework for feature rich web mapping applications. It couples maximum flexibility with advanced GIS functionality. Out of the box, it has a basic map application designer that is capable of most basic map mashup functions. This platform is primarily intended for full powered web mapping applications that require editing capabilities. It is only available with an ArcGIS Server license.

ESRI also offers lighter weight APIs for Adobe Flex, Javascript, and Microsoft Silverlight. These APIs are available for internal or non-commercial, non-revenue generating use for free. They do not require an ArcGIS Server installation for serving map mashups. This means mashups can be built using the ESRI APIs and any remote map services that may be available, including Google Maps and Bing Maps as well as others available at ArcGISOnline (<http://resources.esri.com/arcgisonlineservices/>). It should be noted that the ability to integrate local map services requires a GIS map service server like ArcGIS Server. The Adobe Flex API requires the client side Flash plug-in to run and requires Adobe Flex Builder 3

(<http://www.adobe.com/products/flex/>) for development beyond the available free Flex templates. The MS Silverlight API requires the client side Silverlight plug-in and requires MS Visual Studio 2008 for development (<http://www.microsoft.com/visualstudio/en-us/default.mspx>). The JavaScript API requires that JavaScript be enabled on the client and makes use of the Dojo toolkit for development. Using the Dojo toolkit (<http://www.dojotoolkit.org/>) does not generally require additional training and does provide additional features, but can potentially create hurdles or conflicts when used with other JavaScript toolkits or other AJAX-based technologies.

### 2009 Pricing:

- Free Services
  - ESRI base map and imagery services are free for non-commercial/non revenue generating use (state and local governments).
  - Routing services are free for non-commercial/non-revenue generating use up to 5000 routes per year, including 10 route stops and 25 barriers per route.
  - Geocoding/reverse geocoding services are free for non-commercial/non-revenue generating use for single street address per request. Requests up to 1000 addresses/points per year are available for free.
  - APIs are available for free. Use of custom or local map services requires ArcGIS Server license.
- Paid Services
  - ESRI premium basemap and imagery services \$200 annual subscription
  - Google basemap and imagery services \$10,000 per 1 million page views
  - Microsoft Bing basemap and imagery services \$250/100,000 transactions<sup>4</sup>
  - Routing services over 5000 routes is \$50 per 5000 routes including 20 stops and 250 barriers
  - Geocoding services is \$50 per 25,000 batched addresses/points

### State geographic systems technologies/web development integration:

Given the four development options (MS.NET Web ADF and the Javascript, Flex, and Silverlight APIs) and the fact that the State is heavily invested in ESRI geographic information technologies, the integration of local GIS data is straightforward. State organizations that have access to ArcGIS Server technologies<sup>5</sup> can publish and expose local geospatial services through any of the

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<sup>4</sup> Transactions are defined as follows: Eight 256 x 256 map tiles = 1 map transaction; Eight 128 x 128 map tiles = 1 map transaction (mobile device); Eight 64 x 64 map tiles = 1 map transaction (mobile device); One geocode = 1 transaction; One local search = 1 transaction; One point-to-point route = at least 4 transactions (1 map, 2 geocodes, 1 route).

<sup>5</sup> At the time of this writing, VTRANS, ANR, ACCD, and VCGI have access to ArcGIS Server technology. Other state organizations may have access by joining the State Enterprise GIS Consortium.

four development options. Integration into the State's current web site and content management solutions is achieved through the APIs. The range of API options covers the skill sets and current web development environments the state is utilizing. Adobe Flex is required to create Flex web applications. Visual Studio 2008 is required to utilize the MS.NET Web ADF. Because the state is already invested in ESRI GIS technologies, including ArcGIS Server, there may be cost advantages to purchase geospatial services through ESRI especially when a major business requirement includes integration of locally stored GIS data.

### OpenLayers

OpenLayers (<http://www.openlayers.org/>) is a pure JavaScript library for displaying map data in most modern web browsers, with no server-side dependencies. OpenLayers implements a JavaScript API for building rich web-based geographic applications, similar to the Google Map and Bing Map APIs. OpenLayers can utilize geospatial services from many other sources including OGC Web Map & Feature Services, Google Maps, Open Street Map, Bing Maps, Yahoo! Maps, Map Server, MapGuide Open Source, GeoServer, ka-Map, and World Wind Servers.

#### Services:

Any of those provided by other map service providers mentioned above.

#### Development:

As an application development framework (ADF), OpenLayers is intended to separate map *tools* from map *data* so that all the tools can operate on all data sources. This separation breaks the proprietary silos typical of many vendor implementations. The OpenLayers library provides a JavaScript API which makes it easy to incorporate maps from a variety of sources into a webpage. The OpenLayers library can be referenced directly off the OpenLayers.org server by adding a JavaScript source "include" into a web page, or alternatively by downloading the source library and deploying it on another production server. OpenLayers does not require the developer to use specialized IDEs such as Microsoft Studio. A simple text editor is all that is required.

#### 2009 Pricing:

- Free (excluding any licensing costs associated with services consumed by OpenLayers such as Google, Bing, and ESRI).

#### State geographic systems technologies/web development integration:

Integration of locally stored GIS information into OpenLayers can be achieved through numerous methods, including OGC WMS/WFS, GeoRSS, ESRI ArcIMS and ArcGIS Server, KML, GPX, GML, and many others. Integration into the State's current web site and content management solutions is straightforward as the OpenLayers API utilizes Javascript, iFrames, and XML to integrate geospatial data layers and services into web pages.

### Summary

Google Maps, Bing Maps, ESRI's web mapping solutions, and OpenLayers all offer or can leverage similar map and imagery services, offer geo-coding and routing functionality, and may be developed through a number of application programming interfaces. For the purposes of making broad recommendations, web mapping applications are organized into two categories; lightweight web mapping and advanced web mapping applications.

- Lightweight web mapping applications are those that offer basic map navigation, geoprocessing tasks limited to out-of-the-box geo-coding or routing services, and do not allow for the direct integration of local GIS data formats.
- Advanced web mapping applications include the potential to integrate locally managed native GIS data and imagery formats, custom geoprocessing tasks, geo-spatial data editing, and custom client interaction with the map; this includes drawing features, saving maps and importing or exporting features onto or from the map through a desktop browser interface.

#### Lightweight Web Mapping Recommendations:

Google Maps, Bing Maps, ESRI solutions, and OpenLayers all are capable lightweight web mapping solutions. Each offers an API that allows for the quick deployment and integration of maps to web sites. Creating mashups is fairly straightforward. Each offers free basemap, imagery, geocoding, and routing services which may meet basic business requirements. Aside from OpenLayers, the free services provided by Google Maps, Bing Maps and ESRI mapping solutions all have terms of service or transaction limits which need to be taken into consideration based on the scope and scale of the web mapping application.

Google Maps are an excellent choice for simple mashup web site maps and for displaying point mapping data. Google Maps flexibility and integration with other common mapping solutions including Google Earth and third party APIs along with their large development support community makes Google mapping solutions a favorable choice for website mashup maps. However, the restrictiveness of the Google Terms of Service should be taken in to consideration as well as the need for client-side JavaScript or Flex programming to do more complex mapping functions.

Similar to Google Maps, Microsoft's Bing Maps platform is a solid choice for creating mashup web sites and displaying point mapping data. Bing Maps has restrictive terms of services which need to be considered. Bing Maps exposes its mapping services through several APIs which may allow for better integration into other Microsoft technologies.

The ESRI JavaScript, Flex, or Silverlight APIs are suitable for lightweight web map solutions. They allow for quick development and deployment of map mashups. These can integrate map services from Google Maps, Bing Maps, and ESRI's online map services as well as locally hosted ArcGIS map services. In addition, the ESRI APIs are able to consume a wider range of geospatial data formats than the other APIs reviewed here.

OpenLayers is also a good web map solution. It is able to leverage the widest range of geospatial services, including Bing, Google, and Open Source. However, its capabilities are slightly more limited than what Google, Bing, and ESRI have to offer. In most cases OpenLayers will leverage services provided by these vendors, therefore it should be seen as part of the solution, as opposed to an all-in-one solution.

### Advanced Web Mapping Recommendations:

ESRI's web mapping solutions may be considered the most suitable advanced web mapping solution. The distinction being drawn is the ability to easily integrate locally managed native GIS data formats, online geospatial data editing, and geoprocessing tasks. The State has invested in ESRI geographic information technologies, standardized on spatial data formats, and has formed hardware\software partnerships between state organizations. Four state organizations currently utilize ArcGIS Server, ESRI's GIS web server software. This software coupled with ESRI's web mapping solutions provides the most seamless solution for integrating the State's managed geospatial data and operations.

### Conclusion

Regardless of whether business requirements suggest the need for lightweight or advanced web mapping capabilities, four major factors will steer one towards the appropriate solution:

1. Integration of locally managed GIS data and geospatial services
2. In-house or vendor provided skill sets
3. Current investments in web mapping and geographic information technologies
4. Costs dictated by service selection and web volume considerations

Business requirements will ultimately drive the direction agencies chose for their web mapping solutions.

**Appendix A**

Capabilities and Solutions Matrix

Map Services

Capabilities	Google Map	Bing Map	ESRI Map	Open Source	VT GIS
Basemap services	US/National	US/National	US/National	US/National*6	VT only
Imagery services	US/National	US/National	US/National	-	VT only
Routing services	US/National	US/National	US/National	-	
Geocoding services	US/National	US/National	US/National	-	VT only

Basic Web Maps (Mashups)

Capabilities	Google Solutions	Bing Solutions	ESRI Solutions*7	OpenLayers*8
MS .NET API option	-	X	X	-
Adobe Flex API option	X	-	X	-
Javascript API option	X	X	X	X
MS Silverlight option	-	X	X	-
Fast draw speed	X	X	X	NA*9
Map Zoom	X	X	X	X
Map Pan	X	X	X	X
Id feature on map	X	X	X	X
Mouse over "map tips"	X	X	X	X
Print basic maps	X	X	X	X
Find feature	X	X	X	-

<sup>6</sup> OpenStreetMaps.org

<sup>7</sup> Refer to Appendix B for additional details

<sup>8</sup> OpenLayers is an open source (provided under a modified BSD license) JavaScript library for displaying map data in web browsers. It provides an API for building rich web-based geographic applications similar to Google Maps and MSN Virtual Earth.

<sup>9</sup> OpenLayers is an API which leverages other services such as Bing, Google, and ESRI.

within driving distance	(Available as an API call in Premier API only)			
Cross-browser support	X	X	X	X
Routing	X	X	X	-
Reporting	X	X	X	X
KML support	X	X	X	X
State CMS integration	X (Javascript API)	X (Javascript API)	X (Javascript API)	X (Javascript API)

**Advanced Web Maps**

Capabilities	Google Solutions	Bing Solutions	ESRI Solutions*10	OpenLayers
Directly read and integrate existing VT GIS data in its native format*11	-	-	Shapefile Geodatabase ArcSDE	-
Directly read and integrate business data in its native format*12	XML JSON	.NET API - All MS formats -DBF  Javascript API - XML	.NET API/Silverlight - All MS formats - DBF -JSON Web Services -SOAP  Flex API -Web Services -SOAP  Javascript API - XML -JSON Web Services -SOAP	XML JSON

<sup>10</sup> Refer to Appendix B for additional details

<sup>11</sup> Native VT GIS data formats under consideration are limited to: ESRI shapefile, ESRI geodatabase (file or personal), or ESRI ArcSDE

<sup>12</sup> Native business data formats under consideration are limited to: MS Access, MS Excel, MS SQL Server 2000+, XML, and DBF.

# State Web Mapping Assessment

Enterprise GIS Consortium (EGC)

State of Vermont



Geoprocessing* <sup>13</sup>	X (Available in Premier API only)	X	X	X
Extract geospatial data	KML GML JSON	KML GPX	KML GML Shapefile Geodatabase	KML GML JSON
GPS data (client upload)* <sup>14</sup>	GPX (supported by using a third party API to convert to KML)	-	GPX	GPX
Zoom to scale	-	-	X	X
Print advanced map	-	-	X	-
Save map session	X	X	x <sup>15</sup>	X
Geospatial (GIS) formats that can be edited online	KML JSON	-	Shapefile ArcSDE Geodatabase	GML KML JSON

<sup>13</sup> "geoprocessing" includes the ability to perform basic and advanced geospatial operations. Examples include "find all features within a specified linear distance", "find points within a polygon", etc.

<sup>14</sup> GPS eXchange Format (GPX) format only

<sup>15</sup> With Geocortex Essentials Add-On