

2008 NSDI Cooperative Agreement Program
Category 2: Best Practices in Geospatial Service Oriented Architecture (SOA)

**Documenting Best Practices in Geospatial SOA:
Wetlands Permitting Solution**

**Use Cases
Version 1.0**

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Status

This Working Draft document is a 2008 NSDI Cooperative Agreement Program, Category 2: Best Practices in Geospatial Service Oriented Architecture (SOA) Use Case Document and is available to members of the 2008 NSDI Cooperative Agreement Program, Category 2 project.

This is a draft document and will be updated during the 2008 NSDI Cooperative Agreement Program, Category 2 project based on the experience and knowledge gained from ongoing engineering and testing activities. It may also be replaced by other documents at any time.

It is inappropriate to use this document as reference material or to cite it as other than a "work in progress".

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1 Introduction and Background

This document captures the “business modeling” step in the development process of the Wetlands Jurisdictional Determination Analysis (JDA) application.

2 EPA and Geospatial SOA

In the “JD potential Waters of the U.S.” concept of operation (Figure 1), the EPA DARTER system receives a “Draft JD Form” from the COE ORM2 system and EPA personnel then begin the process of reviewing that case with the purpose of resolving or escalating issues. The review process involves the use of analytical services, called Web Processing Services (WPS), to perform geospatial intersection and proximity analysis of National Hydrology Data (NHD) and National Wetlands Inventory (NWI) datasets. The results of this analysis provide the reviewer with more detailed information to assist and document the JD. Additional geospatial data layers are also accessed in the SOA framework, specifically terrain “hillshade” layer (derived from LIDAR source), SSURGO (hydric soils) layer, COE Delineated Wetlands layer, and other orthophoto imagery layers made available by partner agencies via online Web Map Services (WMS) and/or Web Feature Services (WFS). When the reviewer has completed their analysis, any findings are saved to the Draft JD Form for subsequent action via the DARTER system.

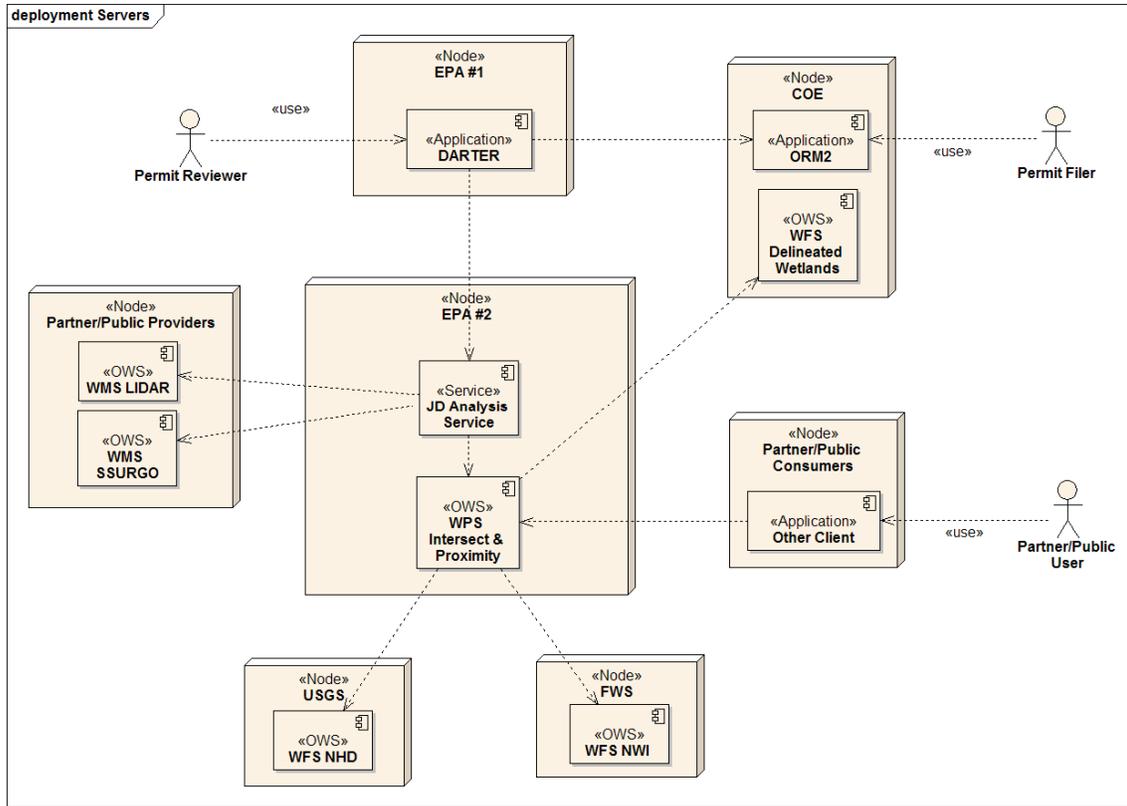


Figure 1. JD SOA Analysis CONOP

Note: USACE Delineated Wetlands are more current and more accurate than NWI but are more sparse in terms of national coverage.

3 JD Concept of Operation

The specific business-process steps and the actors of the “JD of potential Waters of the U.S.” concept of operation are identified in the use-case diagram below (Figure 2).

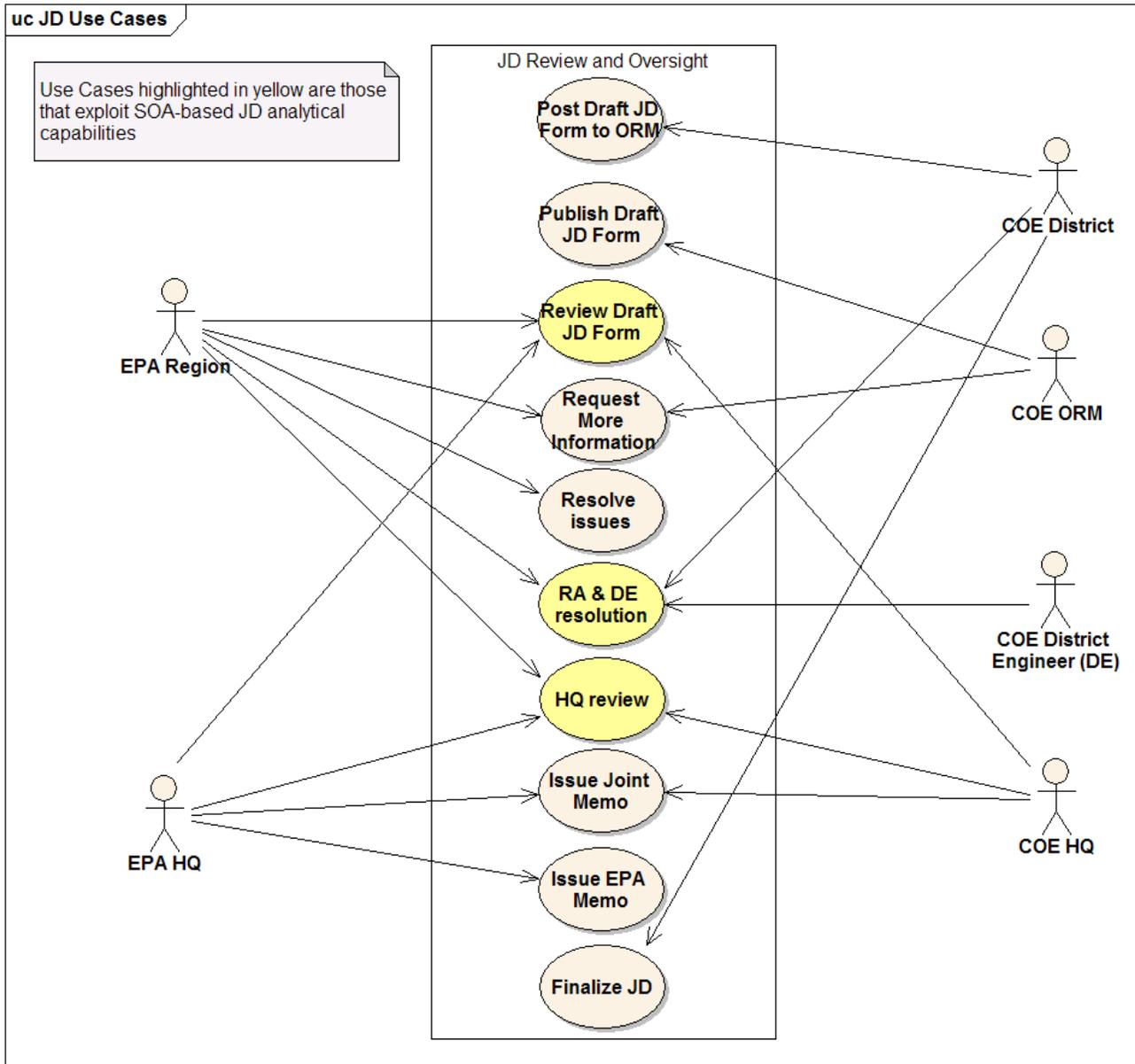


Figure 2. JD of Potential “Waters of the U.S.”

3.1 Actors

External actors of the system include:

COE District

Performs Initial JD Evaluation, and posts basis for decision to ORM. Receives notification from EPA Region, RA, or HQ, and finalizes JD accordingly.

COE ORM

Receives, manages, and delivers documents and notices related to wetland permitting.

EPA Region

Reviews Jurisdictional Determinations made by COE Districts, may comment, not comment, request additional information, and/or elevate review to the EPA Regional Administrator.

EPA Regional Administrator (RA)

Works with the COE District Engineer to resolve the issue, or elevates to EPA HQ if not resolved.

COE District Engineer (DE)

Works with the EPA RA to resolve the issue, or notifies COE HQ if not resolved.

COE HQ

Works with EPA HQ for interagency agreement.

EPA HQ

Works with COE HQ for interagency agreement, or prepares joint decision memo and provides to EPA and COE Field Offices.

4 Geoanalytical Use Case Overview

The Use Cases described in this document capture the expected way users will interact with the system. The steps taken to accomplish a required task using the system are identified.

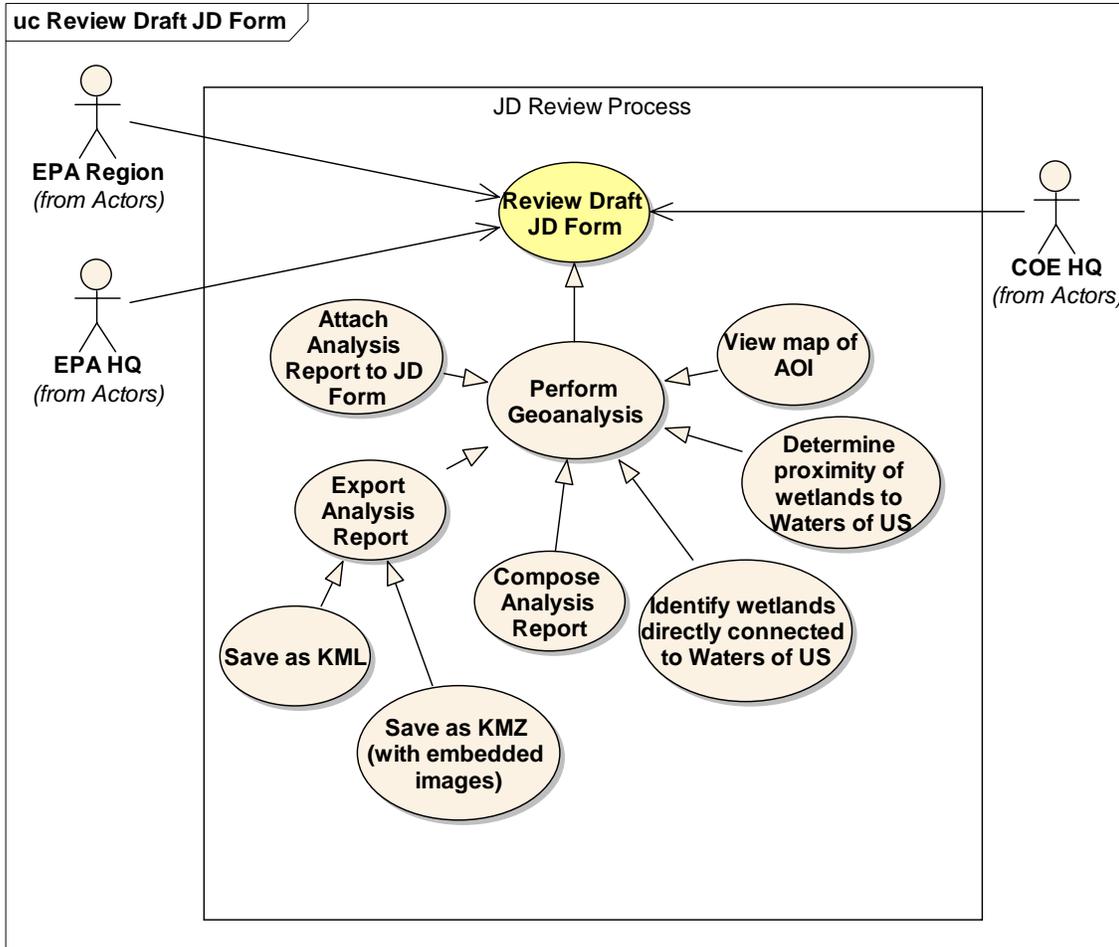


Figure 3. Perform Geoanalysis Use Case

A logical grouping of sub-use cases is shown (Figure 3) in clockwise order starting with the “View Map of AOI” use case

5 Geoanalytical Use Cases

5.1 UC-1: View Map of AOI

Name of use-case	View map of Area of Interest (AOI)
Actors	A Wetlands Analyst with access to computer, browser software, Internet connection.
Description	Interact with a Map Viewer tool to construct a map (comprised of several data layers) within a browser-based application from a PC or laptop.
Pre-conditions	<ol style="list-style-type: none"> 1. One or more Draft JD Form folders are available to the system. 2. The AOI for the submitted Draft JD Form is known. 3. The system has a Map Viewer tool that allows the user to zoom, pan and control visibility of layers, measure distances, lay-down annotations on the map, invoke analytical services, and view results of analytical services. 4. Access to map layers via external WMS endpoints (National Map base layers, SSURGO hydric soils from USDA, LIDAR hillshade from USGS, hi-res orthoimagery from USGS, NHD from USGS, NWI from FWS and Delineated Wetlands from USACE, NLCD from USGS and/or state-level landcover).
Flow of events	<ol style="list-style-type: none"> 1. User connects to the system 2. System presents a list of available Draft JD Forms. 3. User views the list of Draft JD Forms and selects one. 4. System updates the Map View to display default layers at a scale that envelopes the AOI (the permit area from the Draft JD Form). Note: System centers AOI on point position in Draft JD Form and displays map layers at default scale (e.g., 1:24000) 5. User uses map controls to zoom and pan within the Map View. 6. System updates the Map View. 7. User uses the measure tool to measure distances (feet, meters, miles and/or kilometers). 8. System reports measured distance in user-specified units. 9. User invokes Analytical Services for determining JD.
Post-conditions	System presents a Map View comprised of user-selected/created layers (NHD water, NWI wetland polygons, hydric soils, terrain, annotations, and highlights the analytical results.

5.2 UC-2: Determine Proximity of Wetlands to Waters of the U.S.

Wetlands analyst is interested in making jurisdictional determination, by answering questions like these: “Are a particular set of one or more wetlands in proximity to “Waters of the U.S.?” How far away from a NHD stream segment is the closest NWI polygon? What are the nearest NHD stream segments to this NWI polygon? For EPA analysts, it is best if this work is done within the DARTER software system. The NWI and NHD digital data are used as inputs to a geoanalytical processing capability to answer this question. It is advantageous if the analyst does not have to create/manage local data store of NWI and NHD data. It is also advantageous if the analysis does not need to move between desktop applications (e.g., ArcGIS), and can use a simple browser-based tool to perform the operation.

Name of use-case	Identify Wetlands that are close to Waters of U.S.
Actors	A Wetlands Analyst with access to computer, browser software, Internet connection.
Description	Perform geospatial proximity analysis to determine Wetlands areas that are close to Waters of the U.S.
Pre-conditions	<ol style="list-style-type: none"> 1. Access to a WPS analysis Web Service for computing proximity 2. A WFS endpoint is available online for accessing and filtering FWS NWI polygons and/or USACE Delineated Wetlands polygons. 3. A WFS endpoint is available online for accessing and filtering the USGS NHD river network dataset. 4. The system has user-controls for invoking the Intersection geoanalysis function, 5. The system has a Map View interface that allows the user to specify the wetland feature(s) of interest by drawing a box around it (them) or a point within it (them). 6. User has connected to system, selected the Draft JD Folder, and has set the Map View AOI (per UC-1)
Flow of events	<ol style="list-style-type: none"> 1. User selects “Wetlands Proximity” action to activate proximity analysis processing. 2. System prompts user to choose a Wetlands Polygon layer for analysis: FWS NWI polygons or USACE Delineated Wetlands polygons. 3. User chooses the Wetlands Polygon layer from the list 4. System prompts user to identify Wetlands Polygons of interest by one of two ways: a) drawing a BoundingBox or b) clicking on a point and entering a radius (distance in feet, meters, miles, kilometers). 5. User uses mouse to draw BoundingBox or point location and radius. then enters the search distance and units. 6. System highlights the selected Wetlands Polygons on the map.¹ 7. User selects the Proximity Analysis button to invoke the geoanalysis process. 8. System performs the WPS Proximity Analysis process and returns valid results: <ol style="list-style-type: none"> a) a new map layer identifying the Wetland Polygons and NWI Stream Segments that intersect the specified distance (wrt BoundingBox or point & radius). b) the geometry, represented as GML, of those Wetland Polygons and NWI Stream Segments that intersect the specified distance (wrt BoundingBox or point &

¹ System uses the BoundingBox form of search to find only those Wetland Polygons touching the BoundingBox. System uses the point+radius form of search to find only those Wetland Polygons touching the “circle”.

radius).

- c) a report listing for each Wetland Polygon, the polygon ID and other properties of the polygon (e.g., NWI Code, area in sq. meters, etc), and the distance to the closest NHD Stream Segment and its properties (COM-ID, hydrographic category, etc.).
9. User selects a column to sort in the report rows by (in ascending or descending order) (e.g., distance to closest NWI stream)
10. System sorts the rows in the table by the chosen column and sort order
11. User clicks on a row in the table report
12. System highlights the corresponding feature in the Map View
13. User clicks on a feature in the Map View
14. System highlights the corresponding row in the table report.

Post-conditions

The system presents the results of Proximity Analysis as part of an Analysis Report showing those Wetlands in proximity to Waters of the U.S.

5.3 UC-3: Identify Wetlands Directly Connected to Waters of U.S.

Wetlands analyst is interested in making jurisdictional determination, by answering the question: “*Are a particular set of one or more wetlands directly connected to “Waters of the U.S.?”*” For EPA analysts, it is best if this work is done within the DARTER software system. The NWI and NHD digital data are used as inputs to a geoanalytical processing capability to answer this question. It is advantageous if the analyst does not have to create/manage local data store of NWI and NHD data. It is also advantageous if the analysis does not need to move between desktop applications (e.g., ArcGIS), and can use a simple browser-based tool to perform the operation.

Name of use-case	Identify Wetlands Directly Connected to Waters of U.S.
Actors	A Wetlands Analyst with access to computer, browser software, Internet connection.
Description	Perform geospatial intersection analysis to determine Wetlands areas in direct contact with Waters of the U.S.
Pre-conditions	<ol style="list-style-type: none"> 1. Access to a WPS analysis Web Service for computing intersection 2. A WFS endpoint is available online for accessing and filtering FWS NWI polygons and/or USACE Delineated Wetlands polygons. 3. A WFS endpoint is available online for accessing and filtering the USGS NHD river network dataset. 4. The system has user-controls for invoking the Intersection geoanalysis function, 5. The system has a Map View interface that allows the user to specify the wetland feature(s) of interest by drawing a box around it (them) or a point within it (them). 6. User has connected to system, selected the Draft JD Folder, and has set the Map View AOI
Flow of events	<ol style="list-style-type: none"> 1. User select “Wetlands Intersection” action to activate intersection analysis processing. 2. System prompts user to choose a Wetlands Polygon layer for analysis: FWS NWI polygons or USACE Delineated Wetlands polygons. 3. User chooses the Wetlands Polygons layer 4. System prompts user to identify Wetlands Polygons of interest by: a) drawing a BoundingBox or b) clicking on a point and entering a radius (distance in feet, meters, miles, kilometers). 5. User uses mouse to draw BoundingBox or point location and enters the search distance and units . 6. System highlights the selected Wetlands Polygons features on the map.¹ 7. User selects the Intersection Analysis button to invoke the geoanalysis process. 8. System performs the WPS Intersection process and returns valid results: <ol style="list-style-type: none"> a. a new map layer identifying the NHD Stream Segments and Wetland Polygons that intersect the search area. Note: the stream segments are clipped to the geometry of the Wetlands Polygons. b. the geometry, represented as GML, of those Wetland Polygons and NWI Stream Segments that intersect the specified search area (i.e., BoundingBox or point & radius). Note: the stream segments are clipped to the geometry of the Wetlands Polygons. c. a report listing all Wetland Polygons that intersect a NHD stream segment, the NWI IDs, and NWI area (sq meters), the the list of each NHD Stream Segment with its NHD COM-ID,

hydrographic category, and intersected segment length properties reported.

9. User selects a column to sort rows by (in ascending or descending order) (e.g., distance to closest NWI stream)
10. System sorts the rows in the table by the chosen column and sort order
11. User clicks on a row in the table report
12. System highlights the corresponding feature in the Map View
13. User clicks on a feature in the Map View
14. System highlights the corresponding row in the table report.

Post-conditions

The system presents the results of Intersection Analysis as part of an Analysis Report showing those Wetlands directly connected to Waters of the U.S.

5.4 UC-4: Compose Analysis Report

Wetlands analyst composes an Analysis Report, including annotation markup of Map View and a narrative of findings..

Name of use-case	Compose Analysis Report.
Actors	A Wetlands Analyst with access to computer, browser software, Internet connection.
Description	User composes a map and adds markup annotations and narrative to highlight key findings.
Pre-conditions	<ol style="list-style-type: none"> 1. User has connected to system, selected the Draft JD Folder, and has set the Map View AOI 2. The geoanalysis for JD has been performed and resulting Analysis Report (see UC-2 and UC-3) is being viewed.
Flow of events	<ol style="list-style-type: none"> 1. System presents user with actions for creating/editing/deleting map annotations in the Analysis Report 2. User selects Map Annotation controls to create/edit/delete annotation objects. 3. System displays saved/existing annotation objects in Analysis Report in the Map View and in an “annotations” List View. 4. User repeats step 2. 5. Using Map View controls, the user sets the Map View centerpoint, scale, and the map layers (and their opacity) to display. 6. System updates the Map View 7. User enters a descriptive narrative to describe and support his/her findings. 8. User chooses to save updates of the Analysis Report to the Draft JD Folder
Post-conditions	The Analysis Report (i.e., the results of geoanalysis and the user’s markup of the findings) are saved to the Draft JD Form.

5.5 UC-5: Export Analysis Report

Wetlands analyst exports Analysis Report to standard formats for use by external applications and tools..

Name of use-case	Export Analysis Report
Actors	A Wetlands Analyst with access to computer, browser software, Internet connection.
Description	User chooses an Analysis Report and the desired format to export.
Pre-conditions	<ol style="list-style-type: none"> 1. User has connected to system, selected the Draft JD Folder 2. The user has selected a saved Analysis Report to be opened
Flow of events	<ol style="list-style-type: none"> 1. System presents user with a list of Draft JD Folder instances to open. 2. User selects Draft JD Folder 3. System presents list of Analysis Report attachments to choose 4. User selects an Analysis Report to view and export 5. User chooses to export the Analysis Report in one of these formats: <ol style="list-style-type: none"> a. XML file (using native/internal report schema) b. KML file 6. System prompts user to specify location on local system for exported results. Note: The Browser may be configured to recognize a particular file format (e.g., KML) and automatically open the file. 7. Use selects filename and location 8. System saves the exported representation of the Analysis Report to the local filesystem using the chosen format.
Post-conditions	The Analysis Report is exported in a format compatible for use by external applications and tools.