NOAA's National Geodetic Survey Positioning America for the Future www.ngs.noaa.gov

OPUS Projects Manager Training

Step 4 : Network Adjustment

ngs.opus.projects@noaa.gov

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I've advanced to the second slide and I'm reading it.

- Can you read this slide and hear me as I read it?
- Can you access the web?
- Is everyone comfortable?
- Does anyone have any questions before we begin?

Outline

- Introduction
- Step 1 : Creating a Project
- Step 2 : Uploading Data
- Step 3 : Session Processing
- **Step 4 : Network Adjustment**

A few words before beginning.

OPUS Projects is a web-based utility implying that access to the internet and use of a web browser are required. JavaScript must be enabled in your browser and pop-up blocking may have to be turned off. If you have difficulty configuring your browser, contact your instructor or the OPUS Projects team.

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The OPUS Projects look and feel.

The overall layout and appearance of OPUS Projects will be very similar to that shown here regardless of the browser you use. For this reason, the browser window's frame is not shown in the figures.

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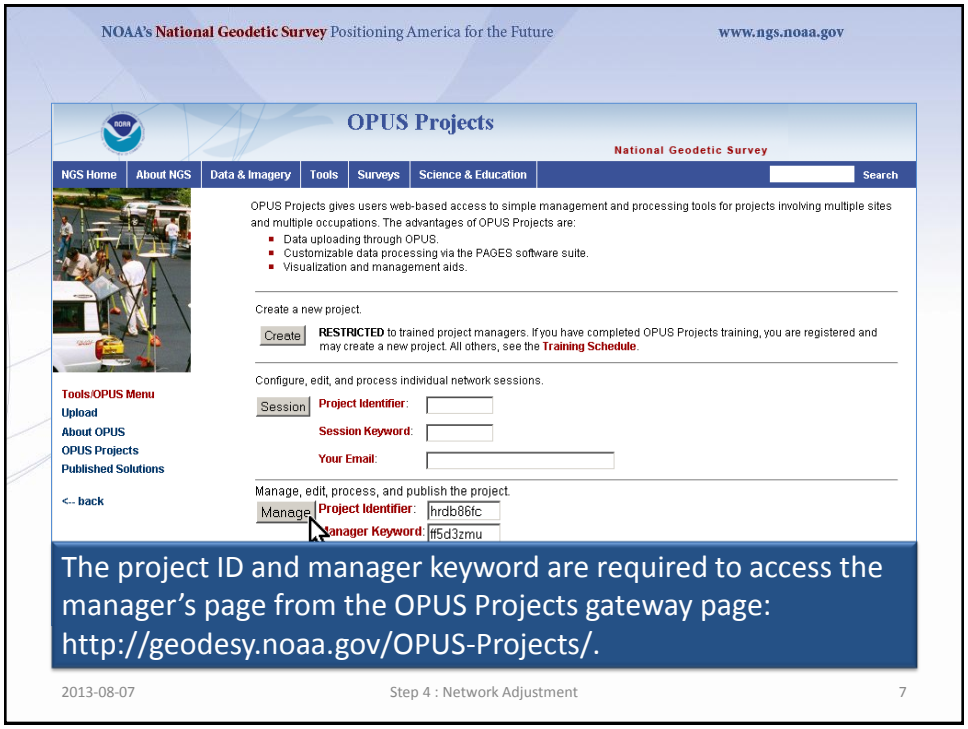
What's in this training?

This presentation begins after all session processing has been completed and describes how to perform a network adjustment. The format is as a series of steps like a cookbook. Like most cookbooks, the justification for and discussion of variations in those steps will be minimal. The intent is to get you started quickly, then leave you free to explore OPUS Projects on your own.



The project ID and manager keyword are required to access the manager's page from the OPUS Projects gateway page: http://geodesy.noaa.gov/OPUS-Projects/.

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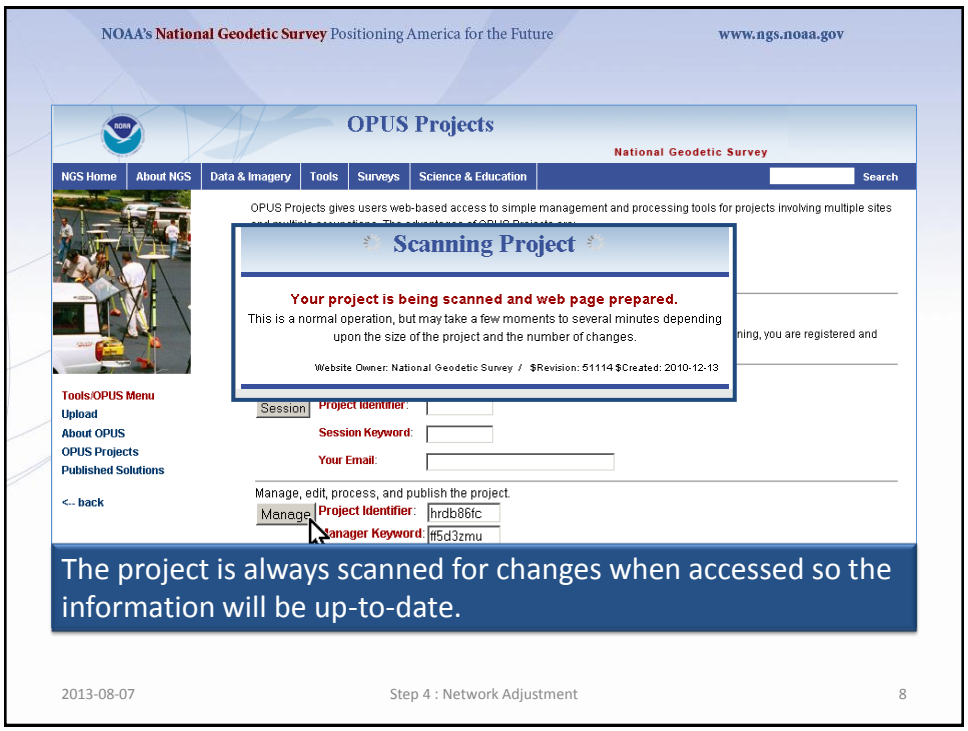

The project is always scanned for changes when accessed so the information will be up-to-date.

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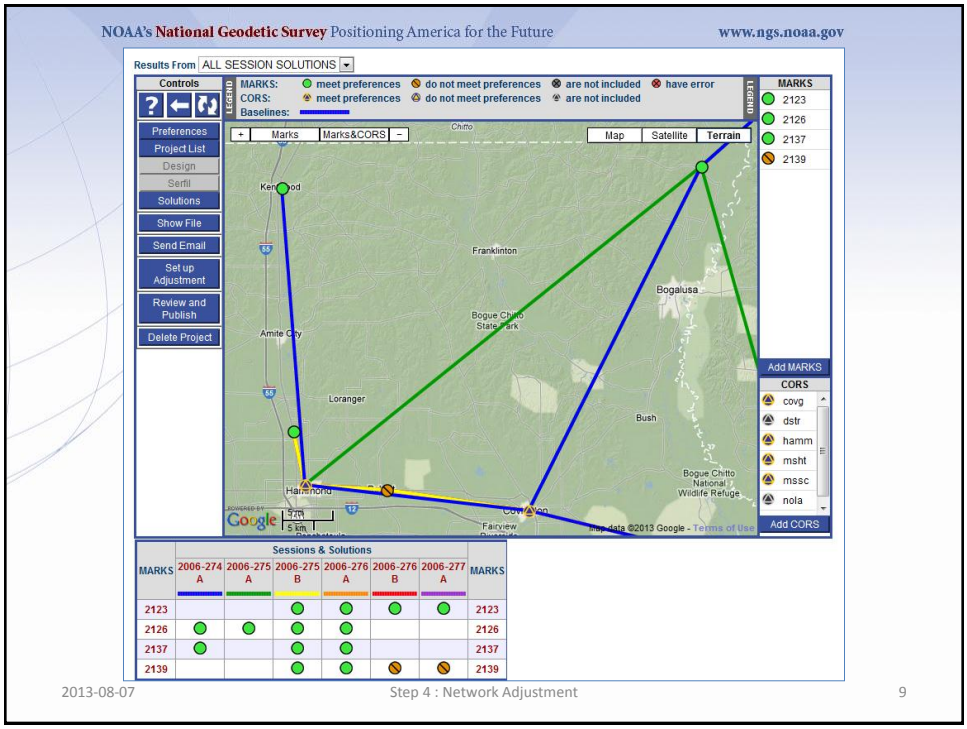
NOAA's National Geodetic Survey Positioning America for the Future
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Results From ALL SESSION SOLUTIONS
Controls
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
Marks Marks&CORS
Map Satellite Terrain
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Add CORS
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Bogalusa
Amite City
Loranger
Bush
Hammond
Covington
Fairview
Bogue Chitto State Park
Bogue Chitto National Wildlife Refuge
Sessions & Solutions
MARKS 2006-274 A 2006-275 A 2006-275 B 2006-276 A 2006-276 B 2006-277 A MARKS
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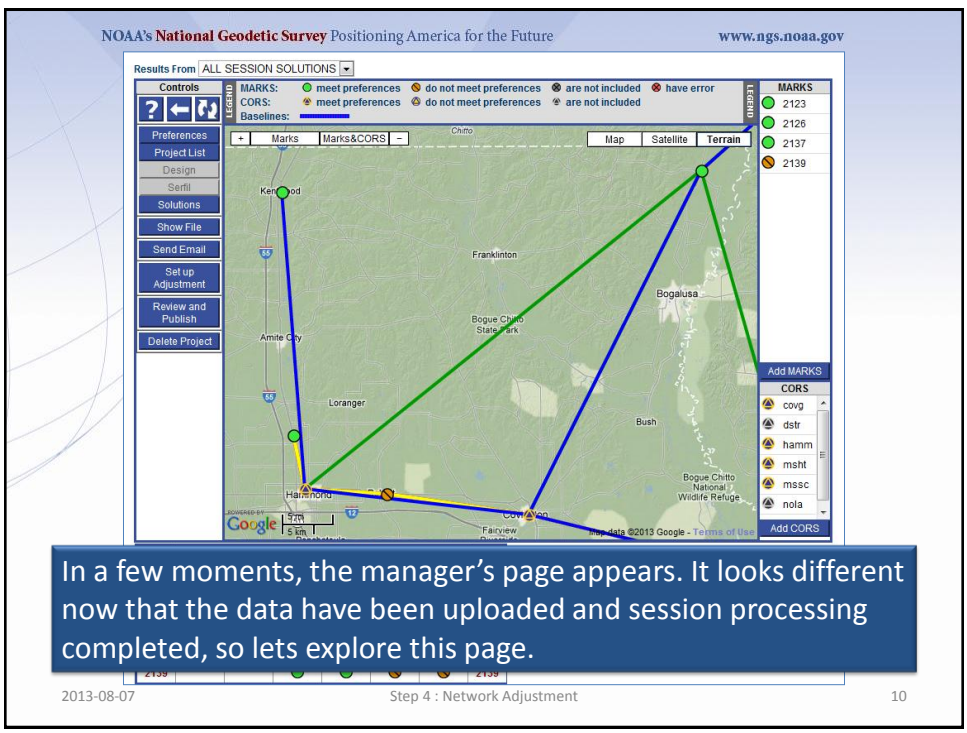
2013-08-07 Step 4 : Network Adjustment 9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Results From ALL SESSION SOLUTIONS
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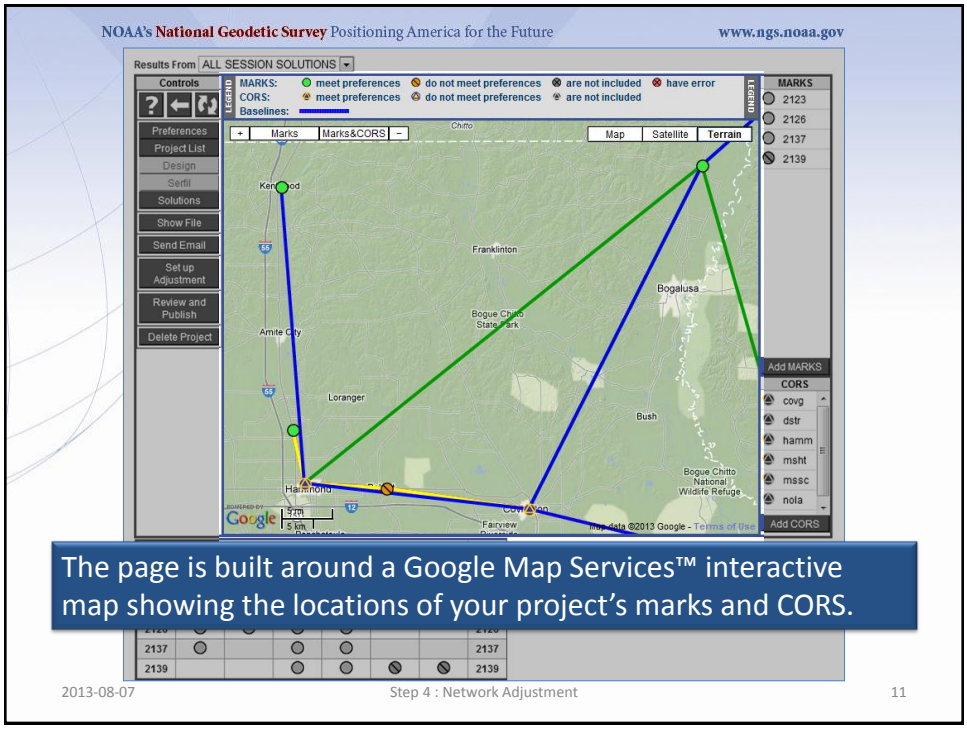
Amite City
Loranger
Bush
Hammond
Covington
Fairview
Bogue Chitto State Park
Bogue Chitto National Wildlife Refuge
In a few moments, the manager's page appears. It looks different now that the data have been uploaded and session processing completed, so lets explore this page.
2013-08-07 Step 4 : Network Adjustment 10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Results From ALL SESSION SOLUTIONS
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Add CORS
Franklinton
Bogalusa
Amite City
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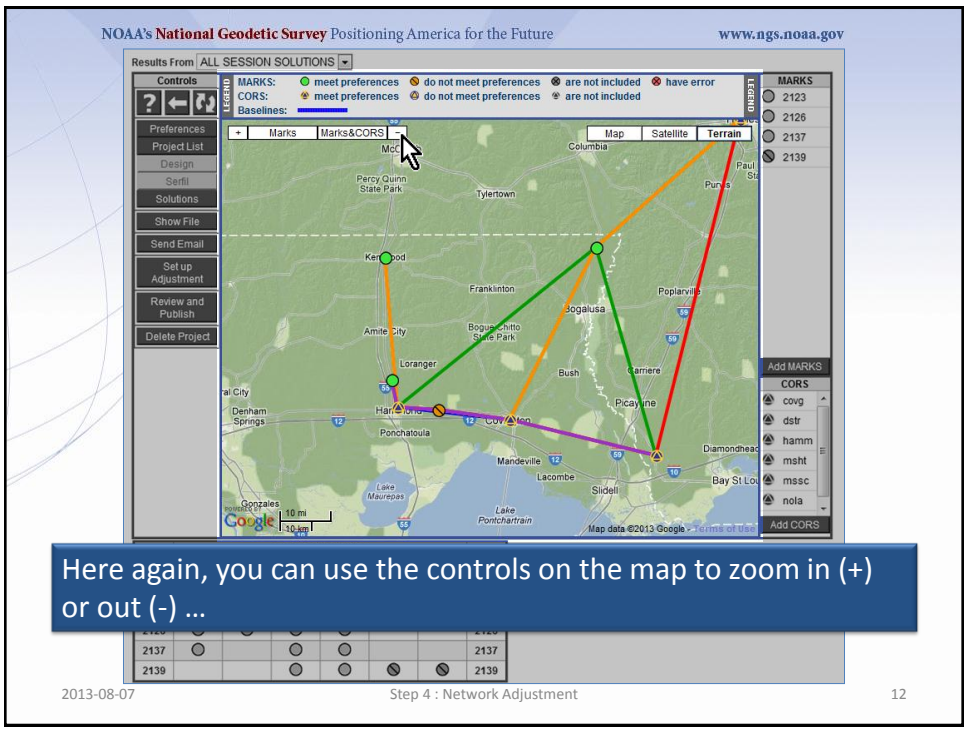
Fairview
Bogue Chitto National Wildlife Refuge
Map data ©2013 Google - Terms of Use
The page is built around a Google Map Services™ interactive map showing the locations of your project's marks and CORS.
2013-08-07 Step 4 : Network Adjustment 11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Results From ALL SESSION SOLUTIONS
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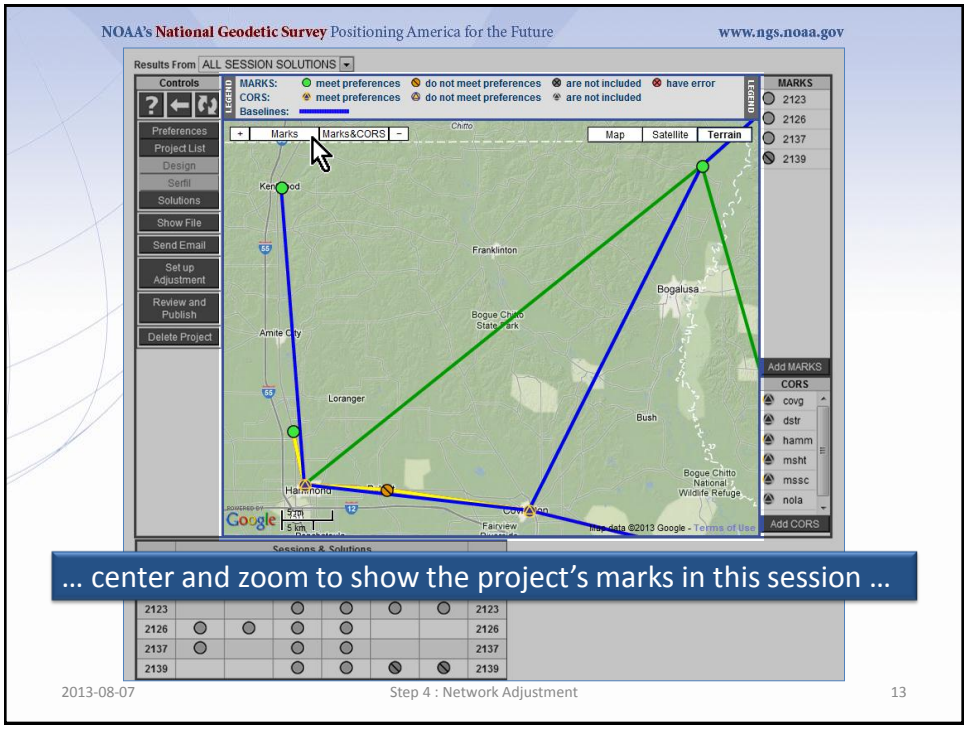
Columbia
Percy Quinn State Park
Tylertown
Franklinton
Poplarville
Bogalusa
Amite City
Loranger
Bush
Denham Springs
Ponchatoula
Mandeville
Lacombe
Slidell
Lake Pontchartrain
Map data ©2013 Google - Terms of Use
Here again, you can use the controls on the map to zoom in (+) or out (-) …
2013-08-07 Step 4 : Network Adjustment 12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Results From ALL SESSION SOLUTIONS
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Add CORS
Franklinton
Bogalusa
Amite City
Loranger
Bush
Hammond
Covington
Fairview
Bogue Chitto National Wildlife Refuge
Google
Map data ©2013 Google - Terms of Use
… center and zoom to show the project's marks in this session …
2013-08-07
Step 4 : Network Adjustment
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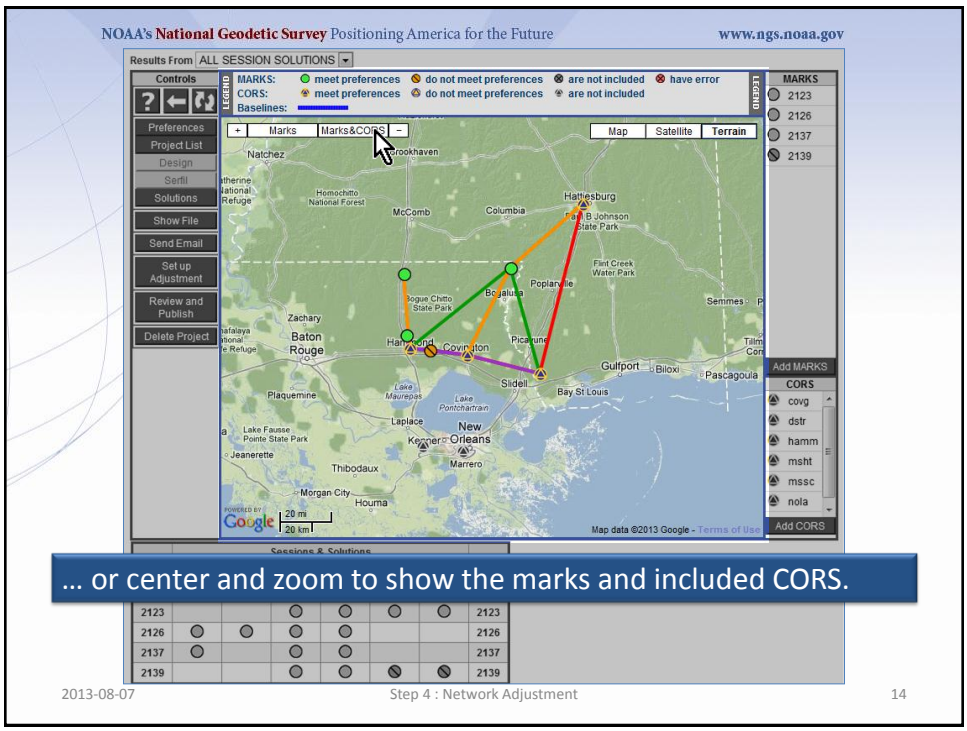
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Hattiesburg
Bogalusa
Poplarville
Semmes
Zachary
Baton Rouge
Hammond
Covington
Picayune
Gulfport
Biloxi
Pascagoula
Slidell
Bay St Louis
Plaquemine
Laplace
New Orleans
Kenner
Marrero
Thibodaux
Morgan City
Houma
Google
Map data ©2013 Google - Terms of Use
… or center and zoom to show the marks and included CORS.
2013-08-07
Step 4 : Network Adjustment
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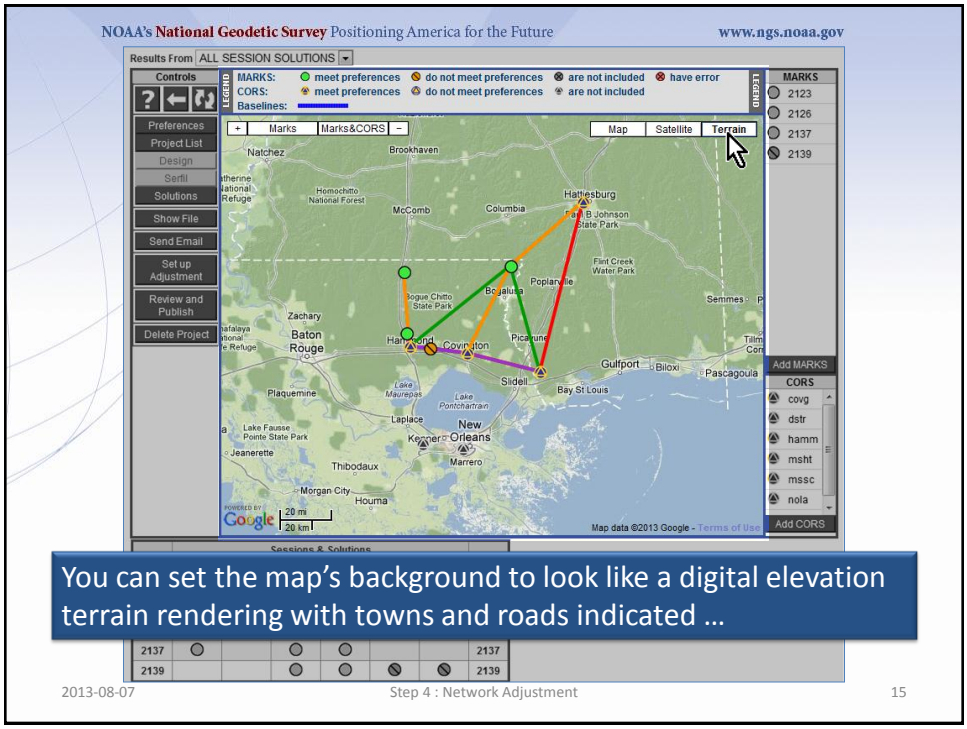
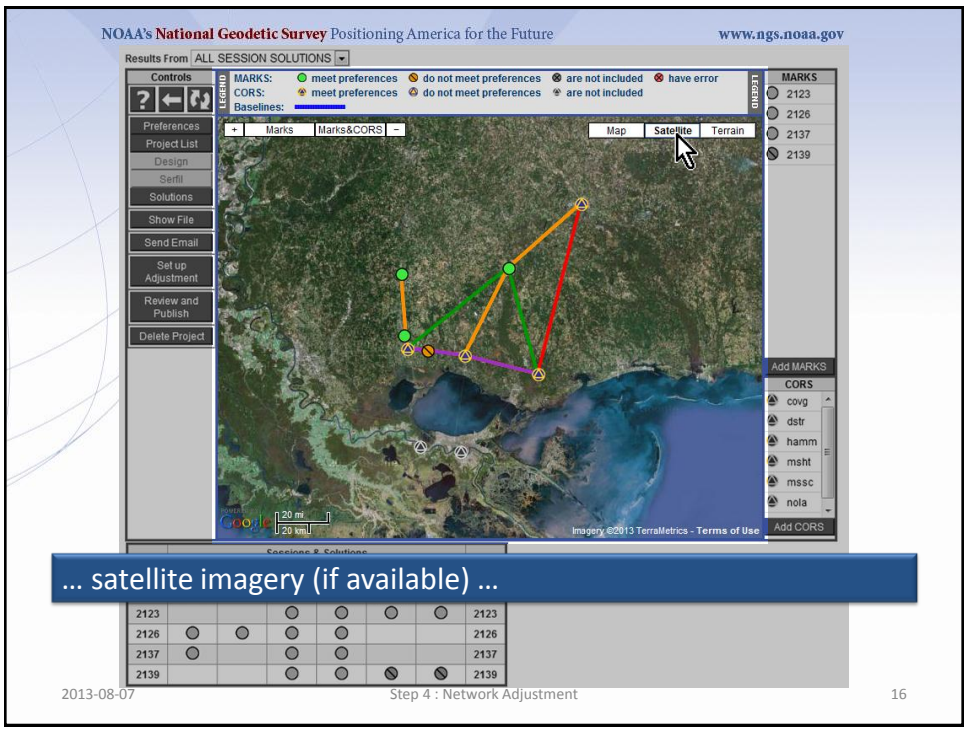
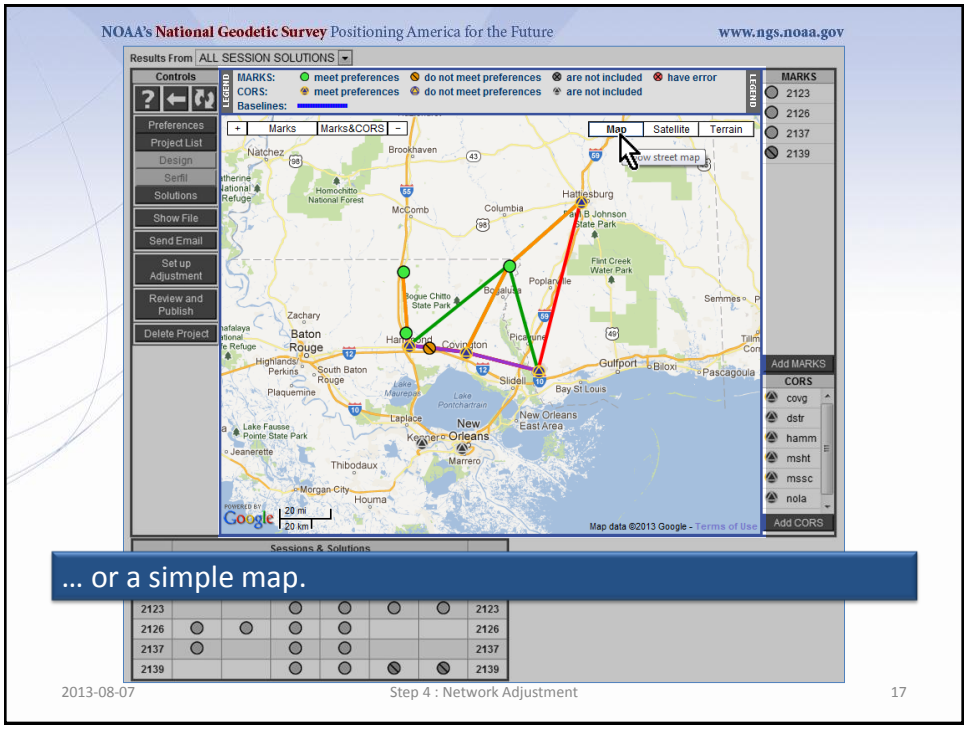


You can set the map's background to look like a digital elevation terrain rendering with towns and roads indicated …



… satellite imagery (if available) …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Results From ALL SESSION SOLUTIONS
Controls
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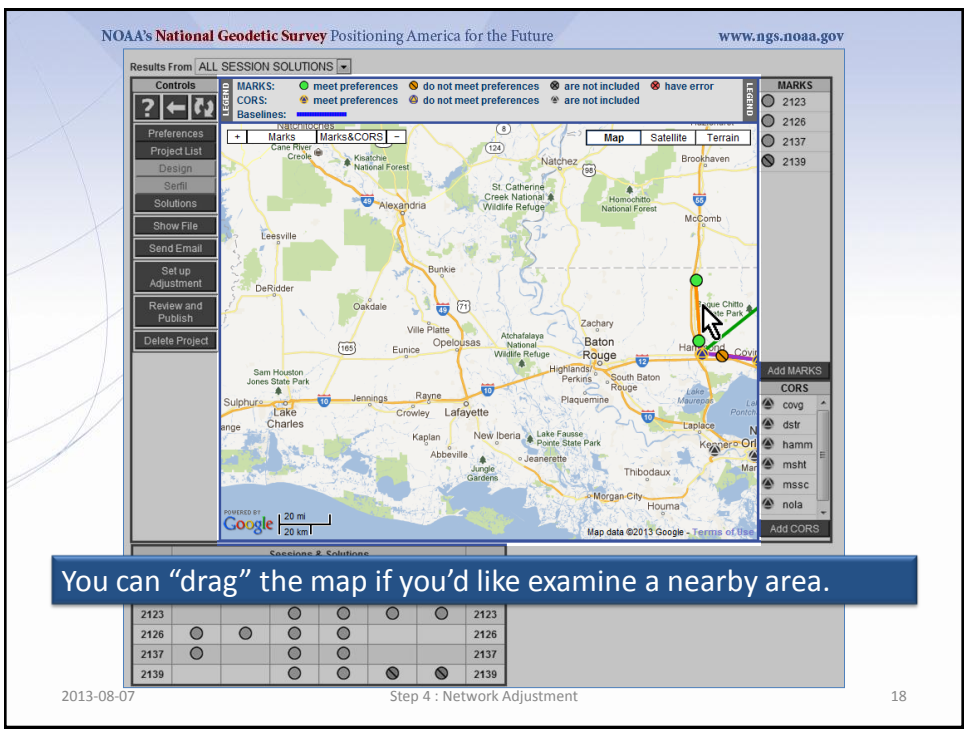
Sessions & Solutions
… or a simple map.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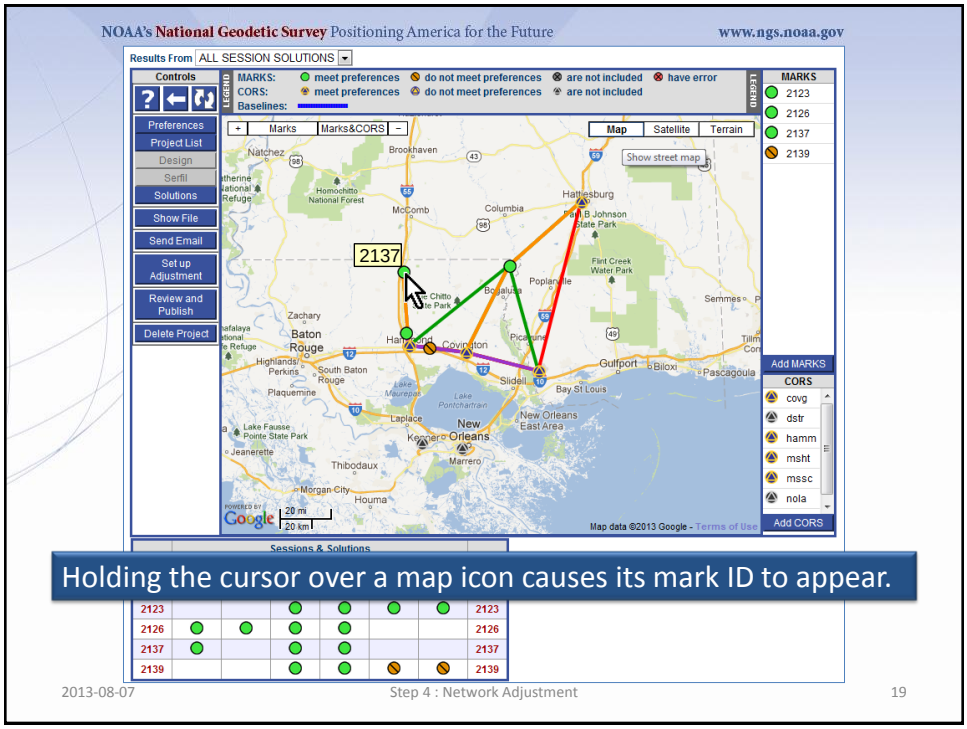
Sessions & Solutions
You can "drag" the map if you'd like examine a nearby area.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Results From ALL SESSION SOLUTIONS
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MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
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Add CORS
Sessions & Solutions
Holding the cursor over a map icon causes its mark ID to appear.
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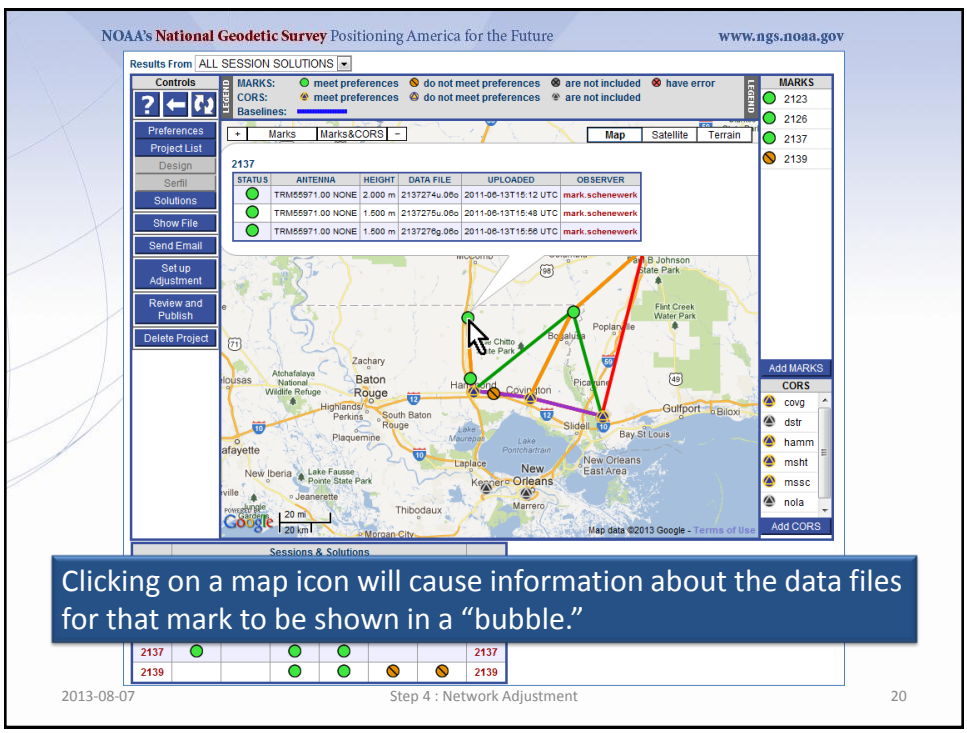
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Results From ALL SESSION SOLUTIONS
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MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
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Project List
Design
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Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
Marks Marks&CORS
Map Satellite Terrain
2137
STATUS ANTENNA HEIGHT DATA FILE UPLOADED OBSERVER
TRM55971.00 NONE 2.000 m 2137274u.06o 2011-06-13T15:12 UTC mark.schenewerk
TRM55971.00 NONE 1.500 m 2137275u.06o 2011-06-13T15:48 UTC mark.schenewerk
TRM55971.00 NONE 1.500 m 2137276g.06o 2011-06-13T15:56 UTC mark.schenewerk
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Add MARKS
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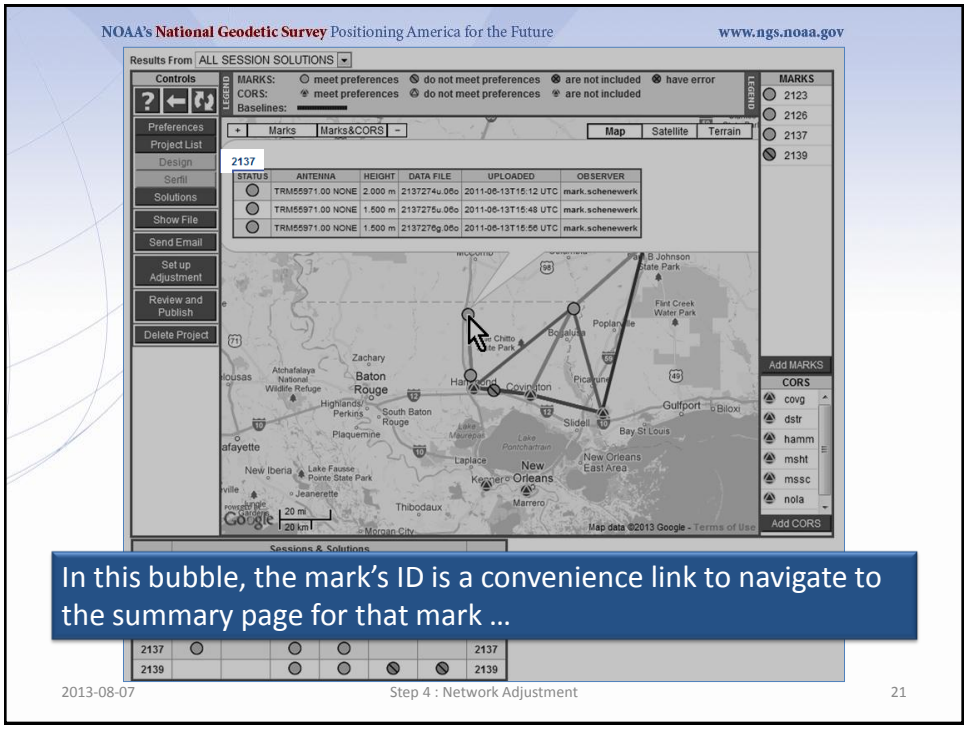
Add CORS
Sessions & Solutions
Clicking on a map icon will cause information about the data files for that mark to be shown in a "bubble."
2013-08-07 Step 4 : Network Adjustment 20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Results From ALL SESSION SOLUTIONS
Controls
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
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Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
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2137
STATUS ANTENNA HEIGHT DATA FILE UPLOADED OBSERVER
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TRM55971.00 NONE 1.500 m 2137275u.06o 2011-06-13T15:48 UTC mark.schenewerk
TRM55971.00 NONE 1.500 m 2137276g.06o 2011-06-13T15:56 UTC mark.schenewerk
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Add MARKS
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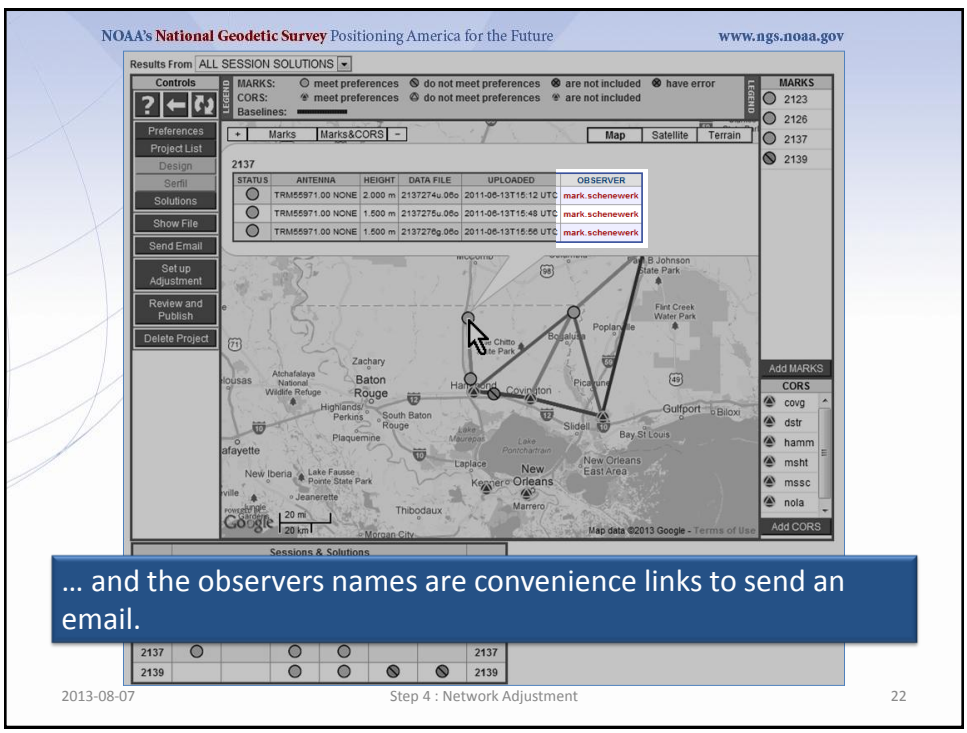
Map data ©2013 Google - Terms of Use
Sessions & Solutions
In this bubble, the mark's ID is a convenience link to navigate to the summary page for that mark …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Review and Publish
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2137
STATUS ANTENNA HEIGHT DATA FILE UPLOADED OBSERVER
TRM55971.00 NONE 2.000 m 2137274u.06o 2011-06-13T15:12 UTC mark.schenewerk
TRM55971.00 NONE 1.500 m 2137275u.06o 2011-06-13T15:48 UTC mark.schenewerk
TRM55971.00 NONE 1.500 m 2137276g.06o 2011-06-13T15:56 UTC mark.schenewerk
MARKS
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nola
Add CORS
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… and the observers names are convenience links to send an email.

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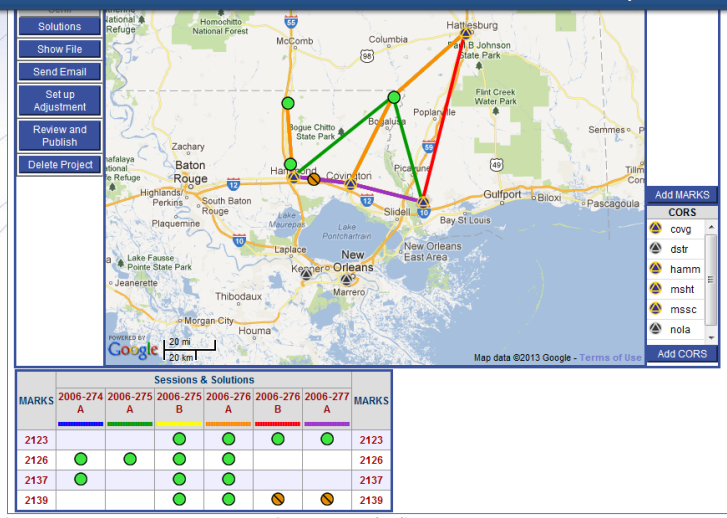
The brightly colored lines on the map represent baselines used in the processing. Note that the processing solutions are associated with line colors in the table below the map.



Sessions & Solutions

MARKS	2006-274 A	2006-275 A	2006-275 B	2006-276 A	2006-276 B	2006-277 A	MARKS
2123			●	●	●	●	2123
2126	●	●	●	●			2126
2137	●		●	●			2137
2139			●	●	⊘	⊘	2139

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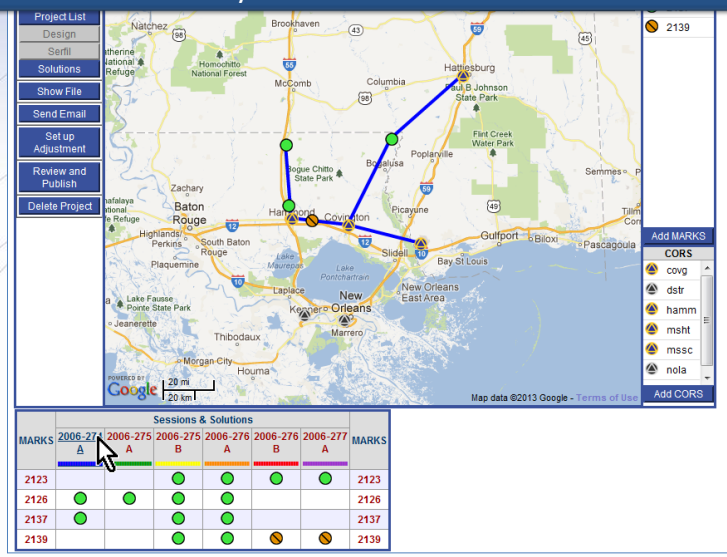
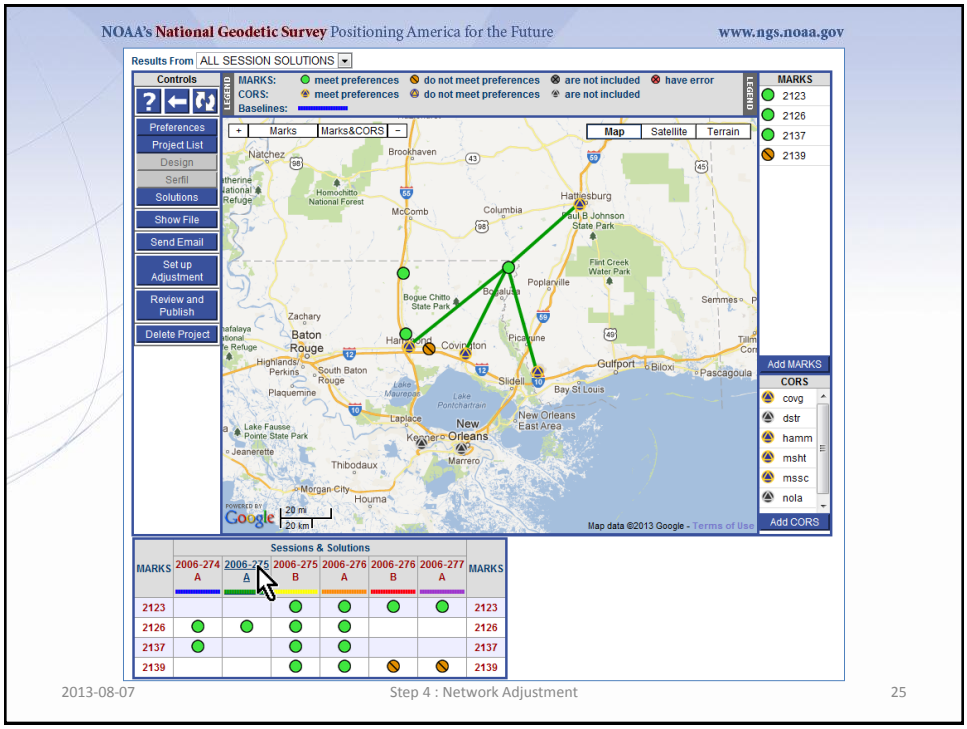
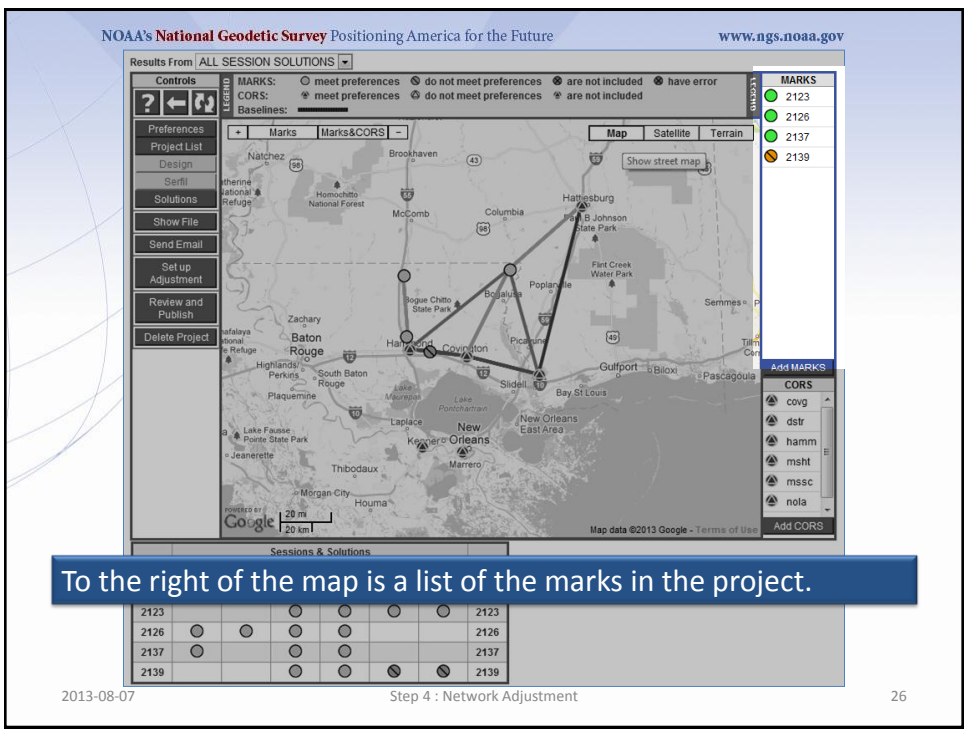
In the case of session solutions, moving the cursor over the label in the table causes only those baselines to be shown.



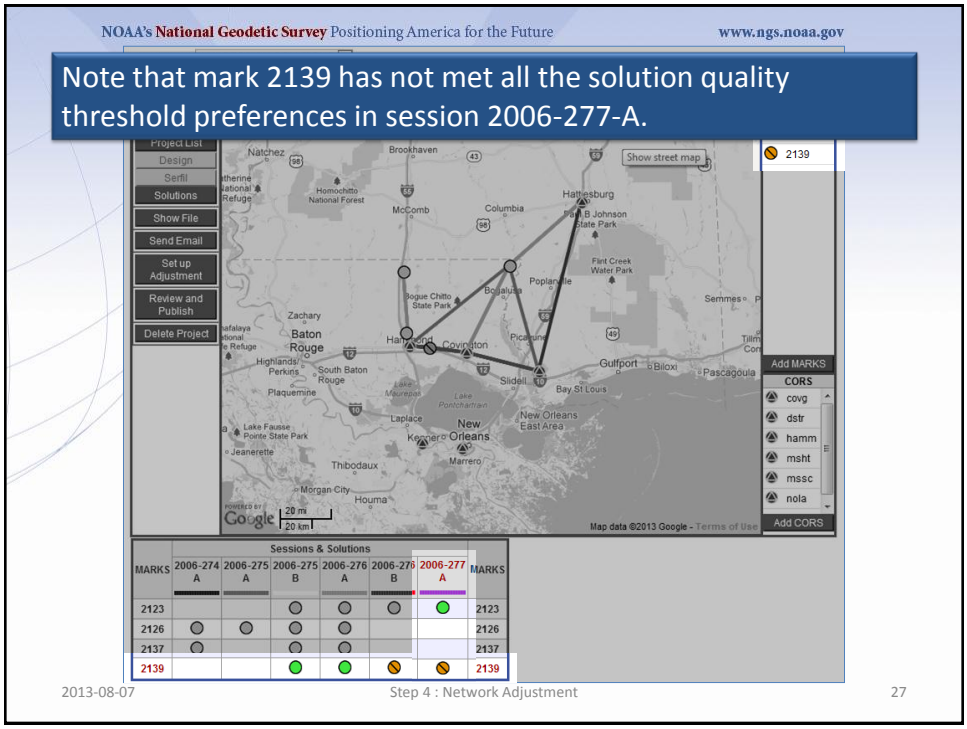
Sessions & Solutions

MARKS	2006-274 A	2006-275 A	2006-275 B	2006-276 A	2006-276 B	2006-277 A	MARKS
2123			●	●	●	●	2123
2126	●	●	●	●			2126
2137	●		●	●			2137
2139			●	●	⊘	⊘	2139





To the right of the map is a list of the marks in the project.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Note that mark 2139 has not met all the solution quality threshold preferences in session 2006-277-A.
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
Show street map
2139
Add MARKS
CORS
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nola
Add CORS
Map data ©2013 Google - Terms of Use
Sessions & Solutions
MARKS
2006-274 A
2006-275 A
2006-275 B
2006-276 A
2006-278 B
2006-277 A
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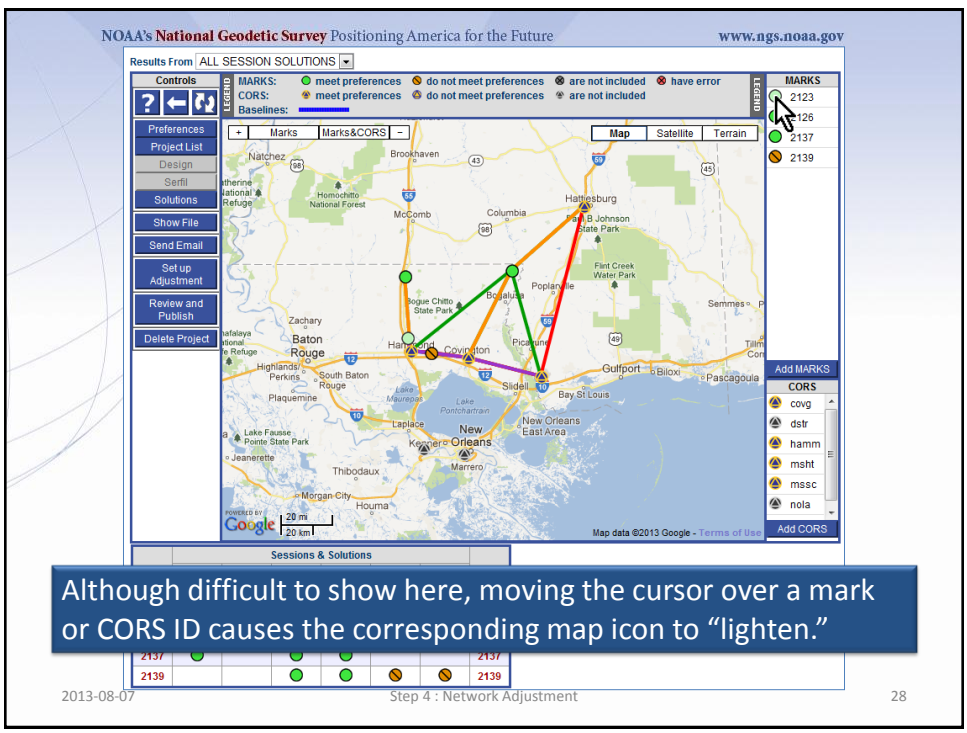
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Add CORS
Map data ©2013 Google - Terms of Use
Sessions & Solutions
Although difficult to show here, moving the cursor over a mark or CORS ID causes the corresponding map icon to "lighten."
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Step 4 : Network Adjustment
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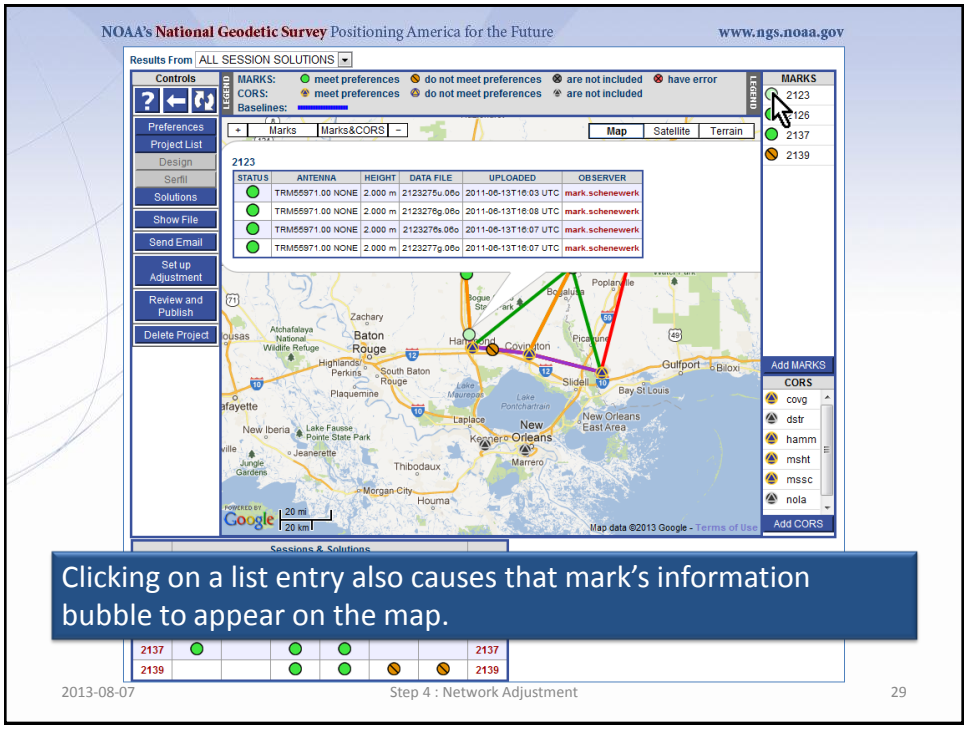
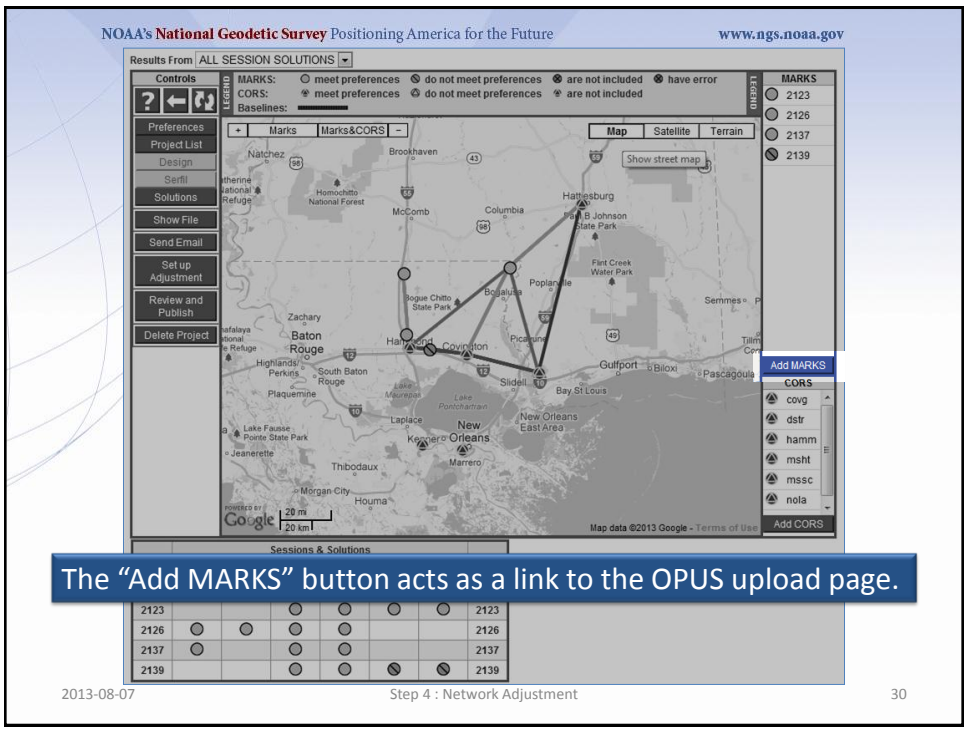

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Clicking on a list entry also causes that mark's information bubble to appear on the map.
2013-08-07
Step 4 : Network Adjustment
29


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
The "Add MARKS" button acts as a link to the OPUS upload page.
2013-08-07
Step 4 : Network Adjustment
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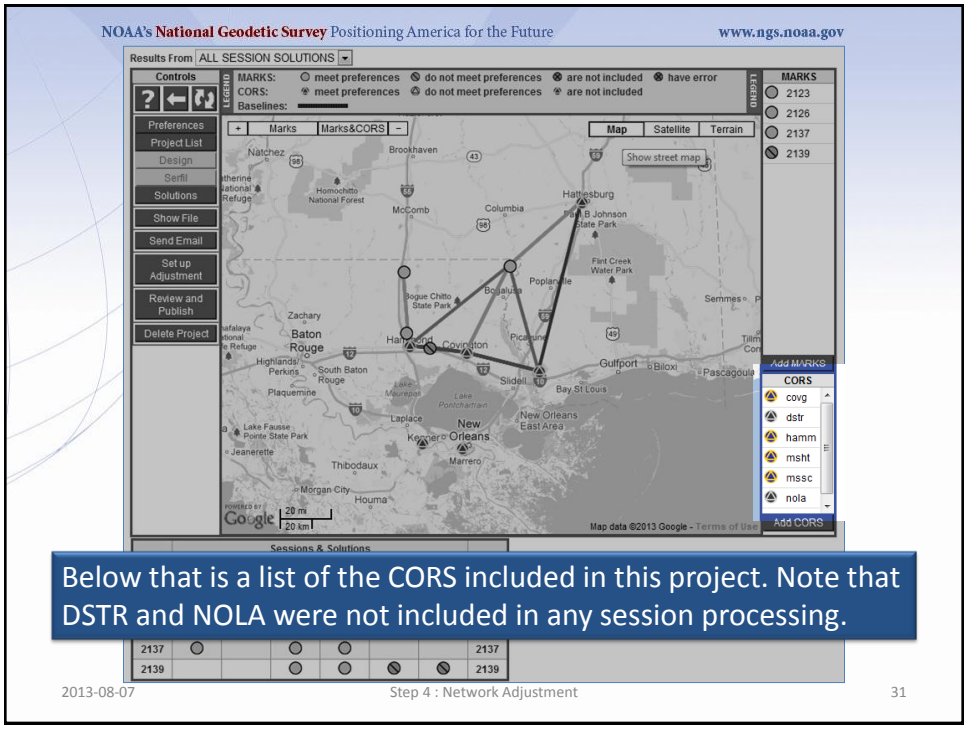
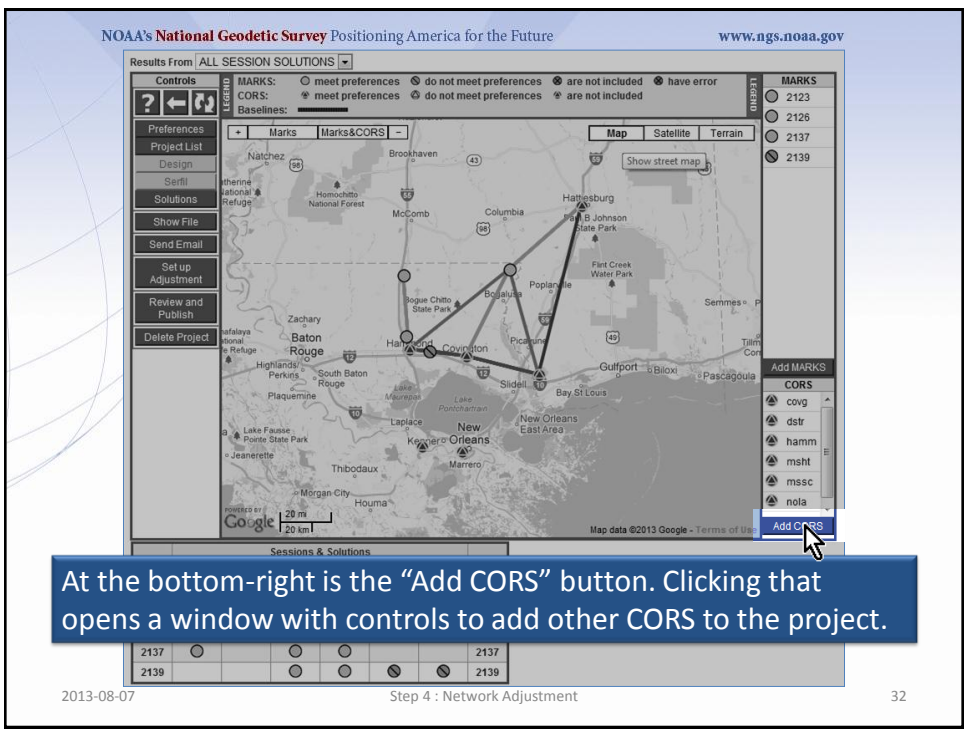
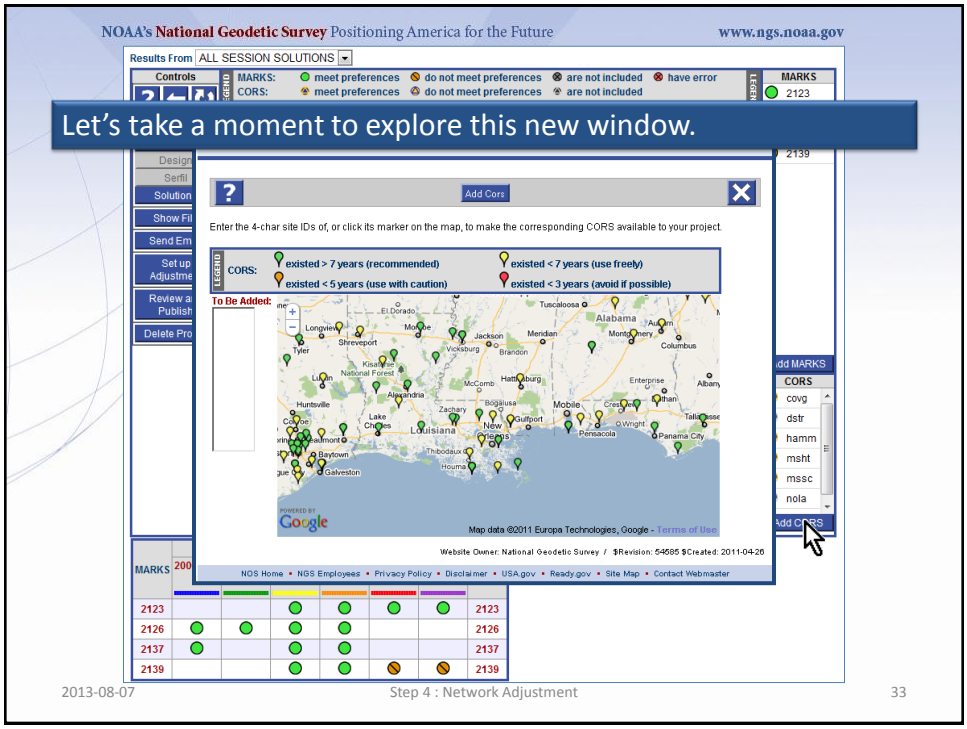
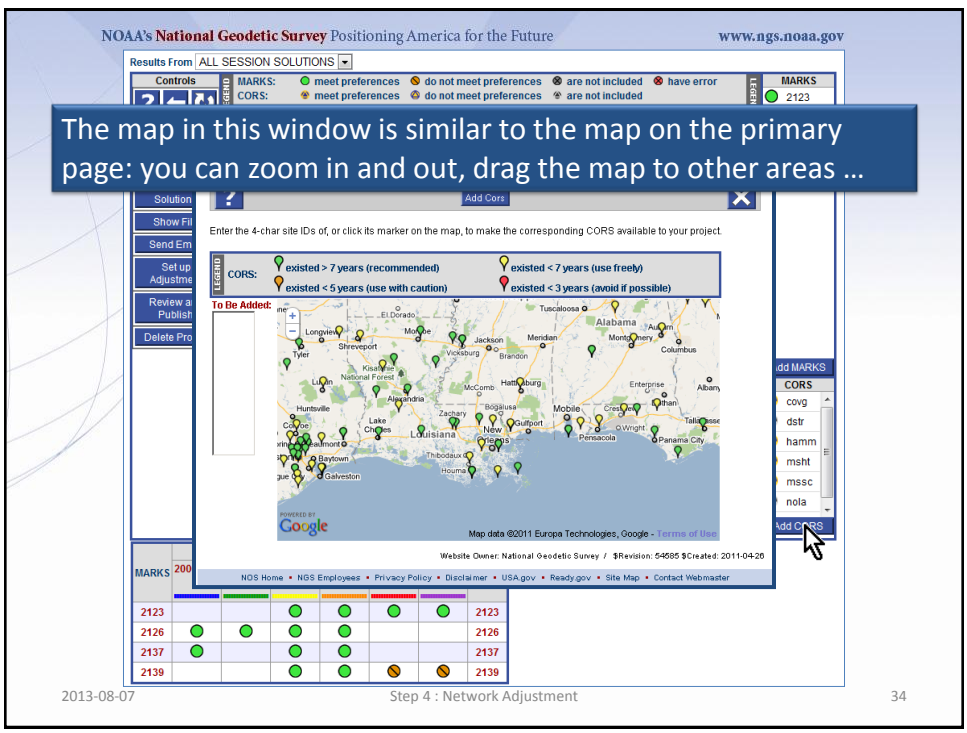

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Results From ALL SESSION SOLUTIONS
Controls
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
Marks
Marks&CORS
Map
Satellite
Terrain
Show street map
MARKS
2123
2126
2137
2139
Add MARKS
CORS
covg
dstr
hamm
msht
mssc
nola
Add CORS
Sessions & Solutions
Below that is a list of the CORS included in this project. Note that DSTR and NOLA were not included in any session processing.
2013-08-07 Step 4 : Network Adjustment 31

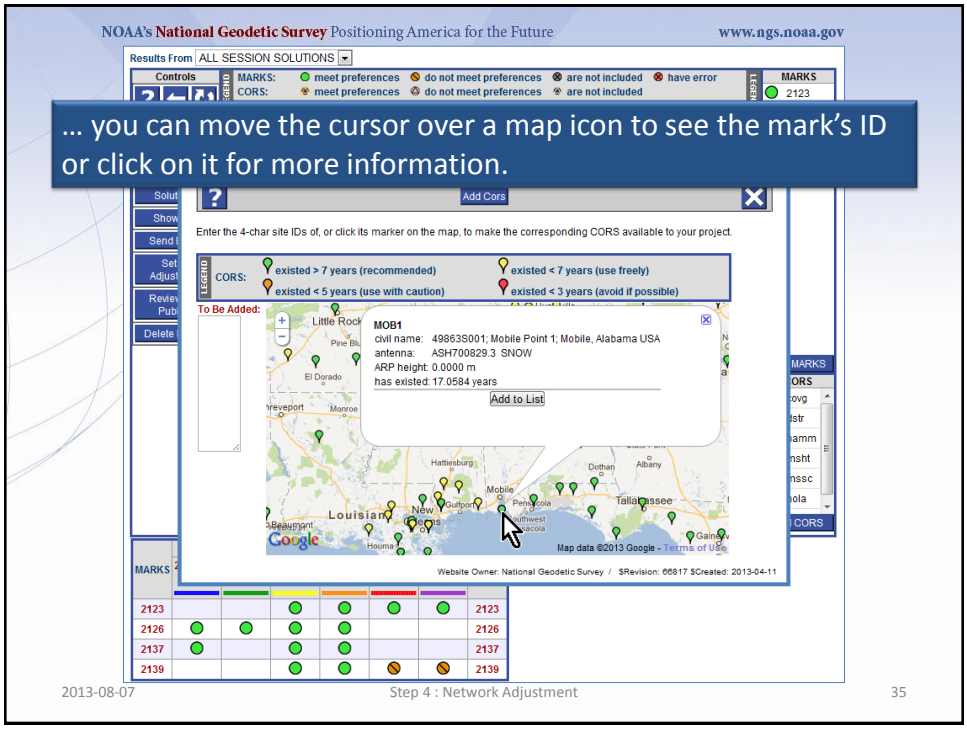

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Results From ALL SESSION SOLUTIONS
Controls
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
Marks
Marks&CORS
Map
Satellite
Terrain
Show street map
MARKS
2123
2126
2137
2139
Add MARKS
CORS
covg
dstr
hamm
msht
mssc
nola
Add CORS
Sessions & Solutions
At the bottom-right is the "Add CORS" button. Clicking that opens a window with controls to add other CORS to the project.
2013-08-07 Step 4 : Network Adjustment 32

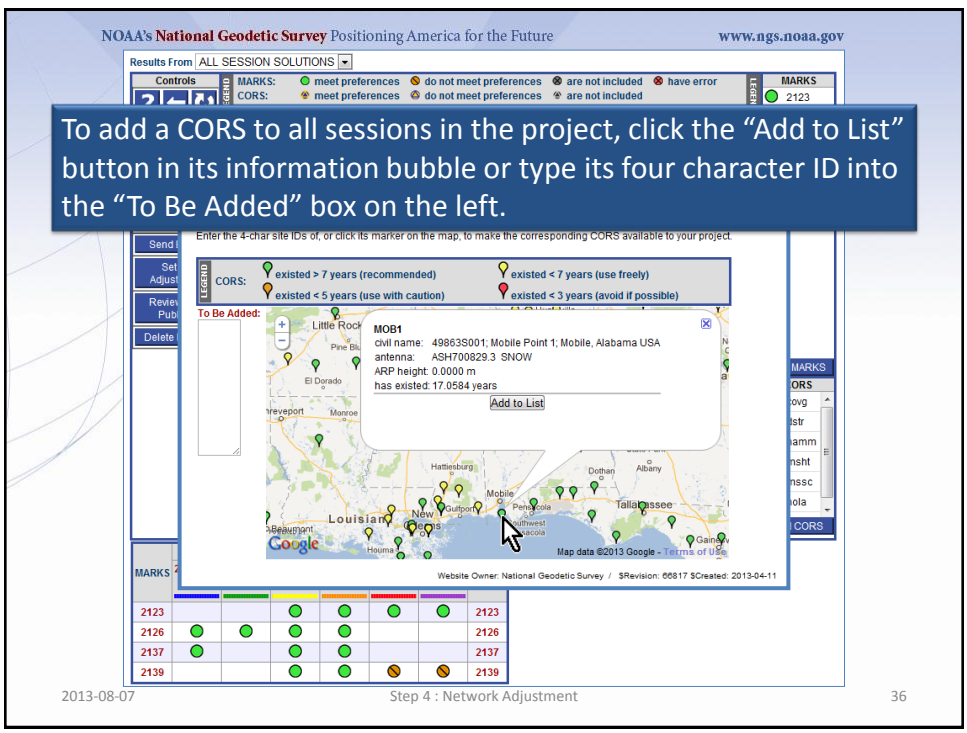


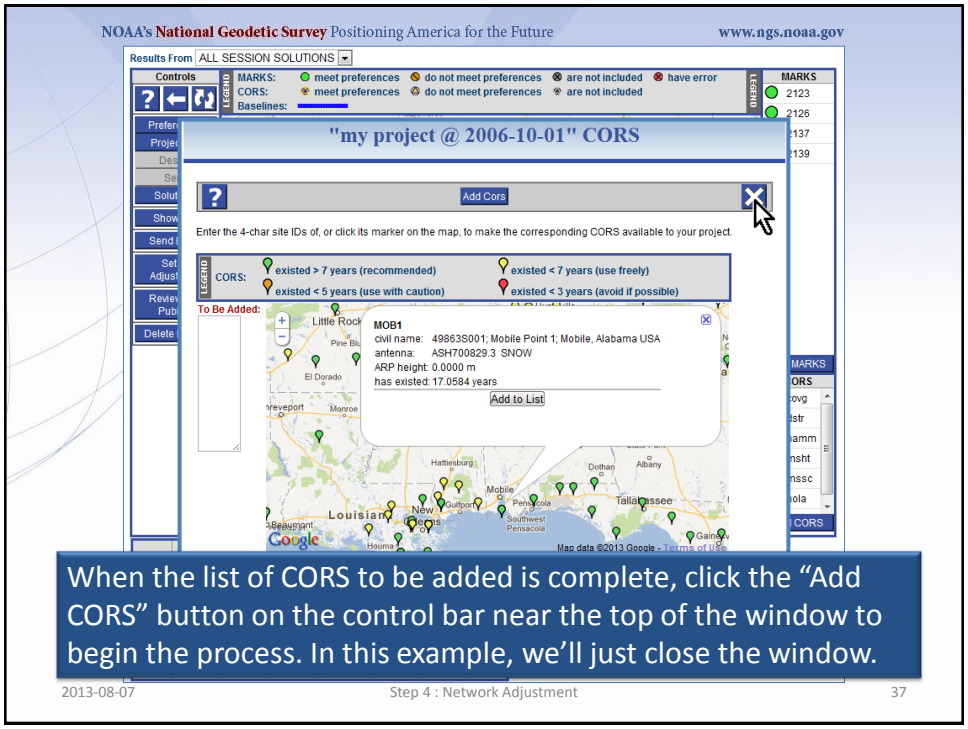
2013-08-07 Step 4 : Network Adjustment 33



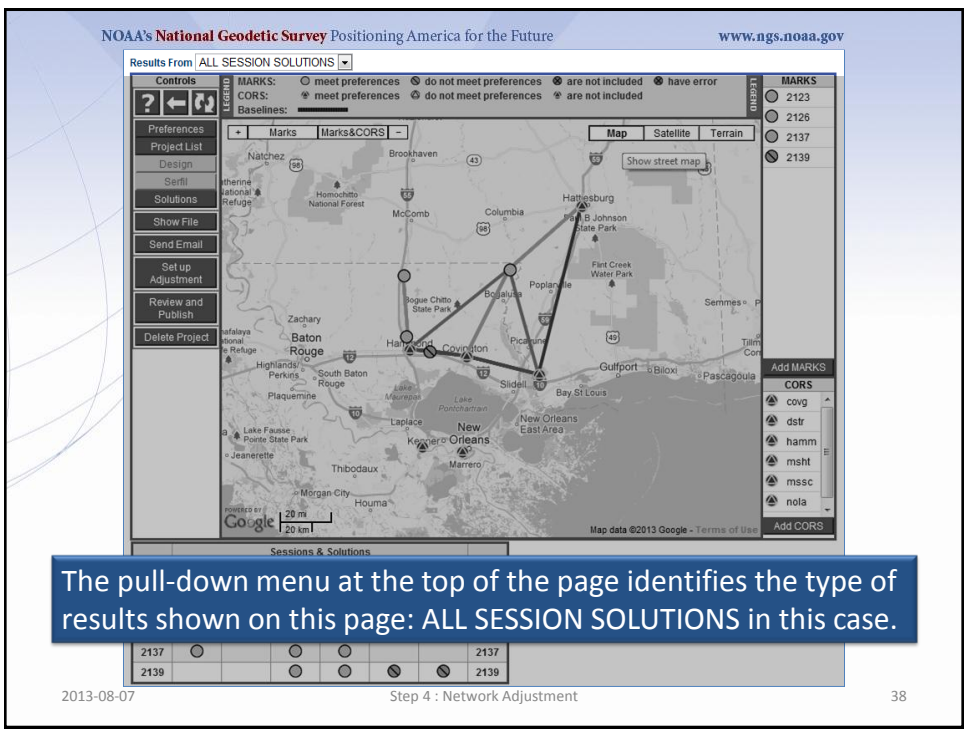
2013-08-07 Step 4 : Network Adjustment 34


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
… you can move the cursor over a map icon to see the mark's ID or click on it for more information.
Add Cors
Enter the 4-char site IDs of, or click its marker on the map, to make the corresponding CORS available to your project.
CORS:
existed > 7 years (recommended)
existed < 7 years (use freely)
existed < 5 years (use with caution)
existed < 3 years (avoid if possible)
To Be Added:
MOB1
civil name: 49863S001; Mobile Point 1; Mobile, Alabama USA
antenna: ASH700829.3 SNOW
ARP height: 0.0000 m
has existed: 17.0584 years
Add to List
Map data ©2013 Google - Terms of Use
Website Owner: National Geodetic Survey / $Revision: 66817 $Created: 2013-04-11
2123
2126
2137
2139
2013-08-07
Step 4 : Network Adjustment
35

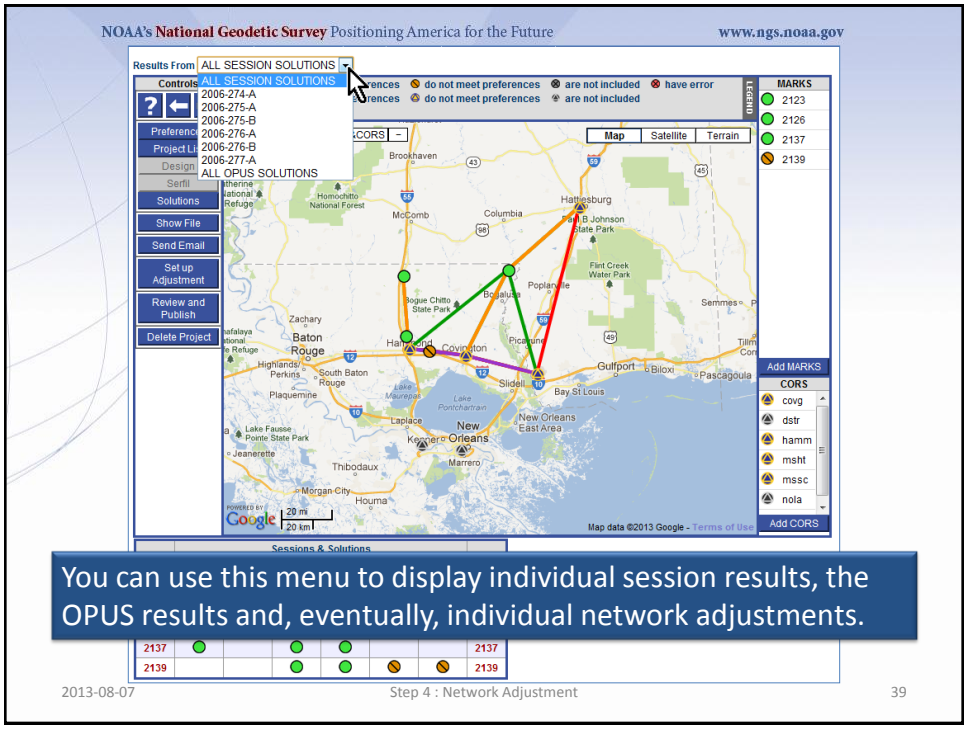

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
To add a CORS to all sessions in the project, click the "Add to List" button in its information bubble or type its four character ID into the "To Be Added" box on the left.
Enter the 4-char site IDs of, or click its marker on the map, to make the corresponding CORS available to your project.
CORS:
existed > 7 years (recommended)
existed < 7 years (use freely)
existed < 5 years (use with caution)
existed < 3 years (avoid if possible)
To Be Added:
MOB1
civil name: 49863S001; Mobile Point 1; Mobile, Alabama USA
antenna: ASH700829.3 SNOW
ARP height: 0.0000 m
has existed: 17.0584 years
Add to List
Map data ©2013 Google - Terms of Use
Website Owner: National Geodetic Survey / $Revision: 66817 $Created: 2013-04-11
2123
2126
2137
2139
2013-08-07
Step 4 : Network Adjustment
36



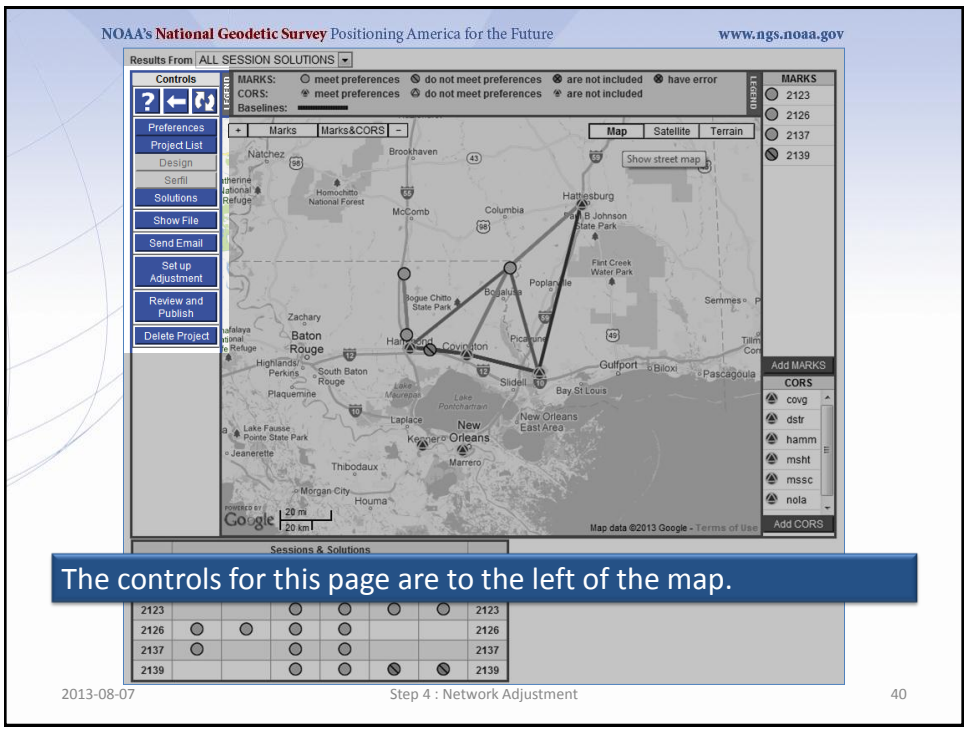
When the list of CORS to be added is complete, click the "Add CORS" button on the control bar near the top of the window to begin the process. In this example, we'll just close the window.



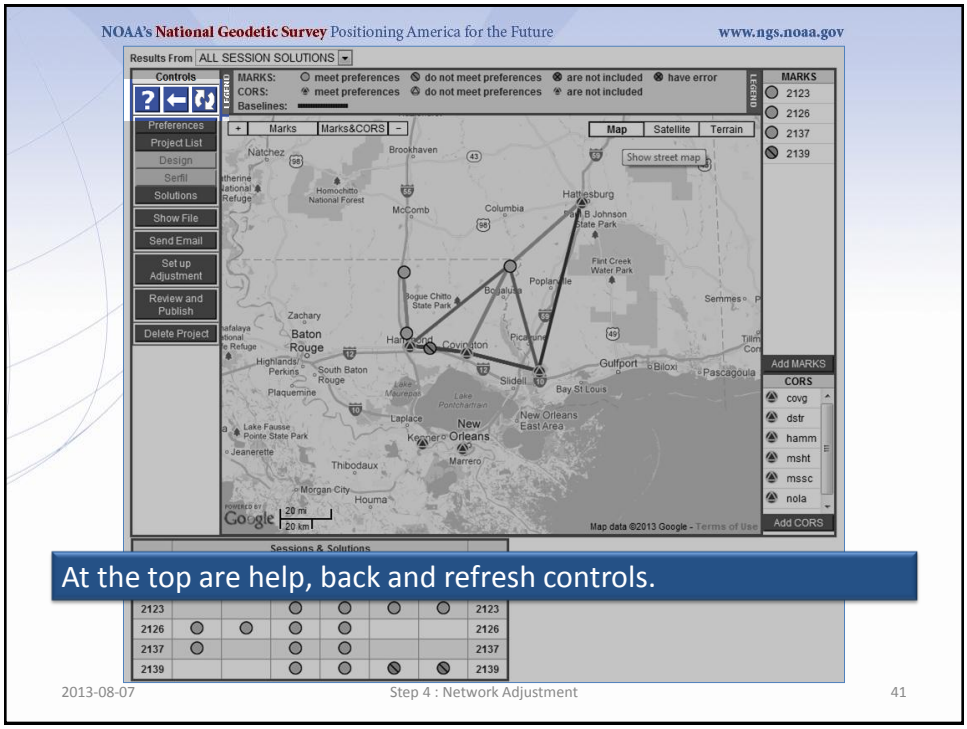
The pull-down menu at the top of the page identifies the type of results shown on this page: ALL SESSION SOLUTIONS in this case.



You can use this menu to display individual session results, the OPUS results and, eventually, individual network adjustments.



The controls for this page are to the left of the map.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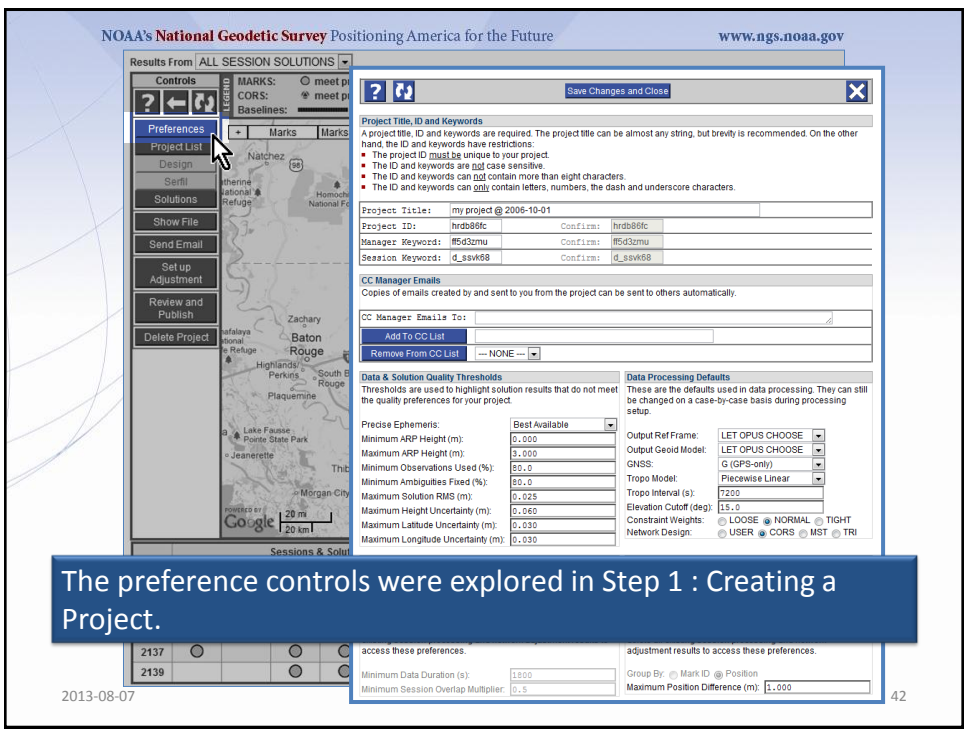
Results From ALL SESSION SOLUTIONS
Controls
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
Marks
Marks&CORS
Map
Satellite
Terrain
Show street map
MARKS
2123
2126
2137
2139
Add MARKS
CORS
covg
dstr
hamm
msht
mssc
nola
Add CORS
Sessions & Solutions
At the top are help, back and refresh controls.
2013-08-07
Step 4 : Network Adjustment
41


NOAA's National Geodetic Survey Positioning America for the Future
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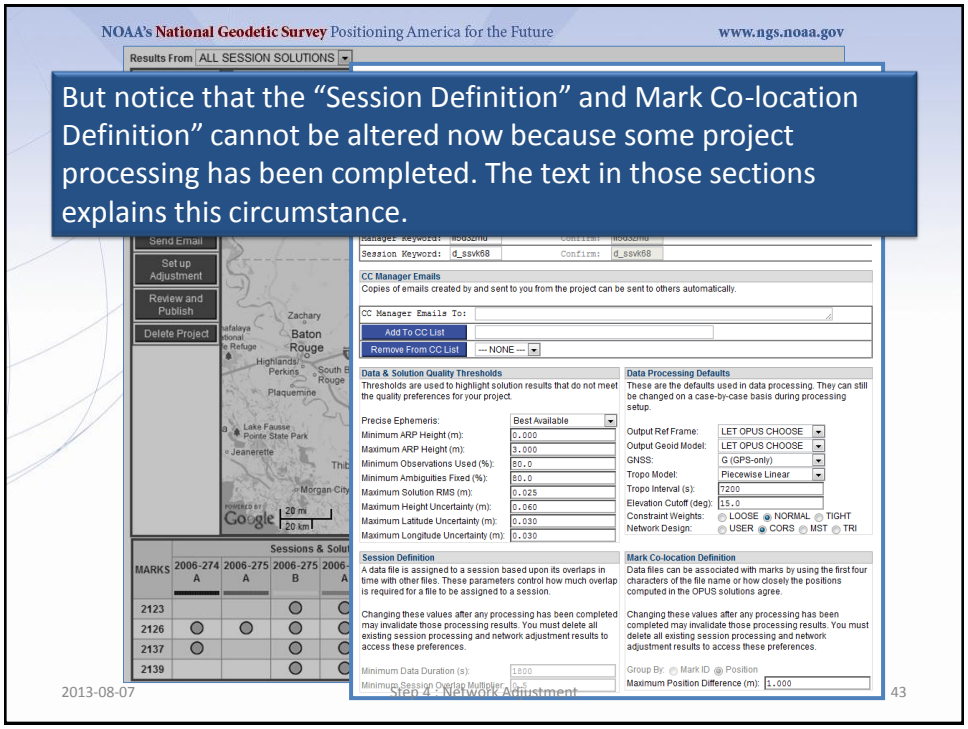
Results From ALL SESSION SOLUTIONS
Controls
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
Save Changes and Close
Project Title, ID and Keywords
A project title, ID and keywords are required. The project title can be almost any string, but brevity is recommended. On the other hand, the ID and keywords have restrictions:
The project ID must be unique to your project.
The ID and keywords are not case sensitive.
The ID and keywords can not contain more than eight characters.
The ID and keywords can only contain letters, numbers, the dash and underscore characters.
Project Title: my project @ 2006-10-01
Project ID: hrdb86fc
Manager Keyword: ff5d3zmu
Session Keyword: d_ssvk68
CC Manager Emails
Copies of emails created by and sent to you from the project can be sent to others automatically.
CC Manager Emails To:
Add To CC List
Remove From CC List
--- NONE ---
Data & Solution Quality Thresholds
Thresholds are used to highlight solution results that do not meet the quality preferences for your project.
Precise Ephemeris: Best Available
Minimum ARP Height (m): 0.000
Maximum ARP Height (m): 3.000
Minimum Observations Used (%): 80.0
Minimum Ambiguities Fixed (%): 80.0
Maximum Solution RMS (m): 0.025
Maximum Height Uncertainty (m): 0.060
Maximum Latitude Uncertainty (m): 0.030
Maximum Longitude Uncertainty (m): 0.030
Data Processing Defaults
These are the defaults used in data processing. They can still be changed on a case-by-case basis during processing setup.
Output Ref Frame: LET OPUS CHOOSE
Output Geoid Model: LET OPUS CHOOSE
GNSS: G (GPS-only)
Tropo Model: Piecewise Linear
Tropo Interval (s): 7200
Elevation Cutoff (deg): 15.0
Constraint Weights: LOOSE NORMAL TIGHT
Network Design: USER CORS MST TRI
Minimum Data Duration (s): 1800
Minimum Session Overlap Multiplier: 0.5
Group By: Mark ID Position
Maximum Position Difference (m): 1.000
The preference controls were explored in Step 1 : Creating a Project.
2013-08-07
42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But notice that the "Session Definition" and Mark Co-location Definition" cannot be altered now because some project processing has been completed. The text in those sections explains this circumstance.
2013-08-07
Step 4 : Network Adjustment
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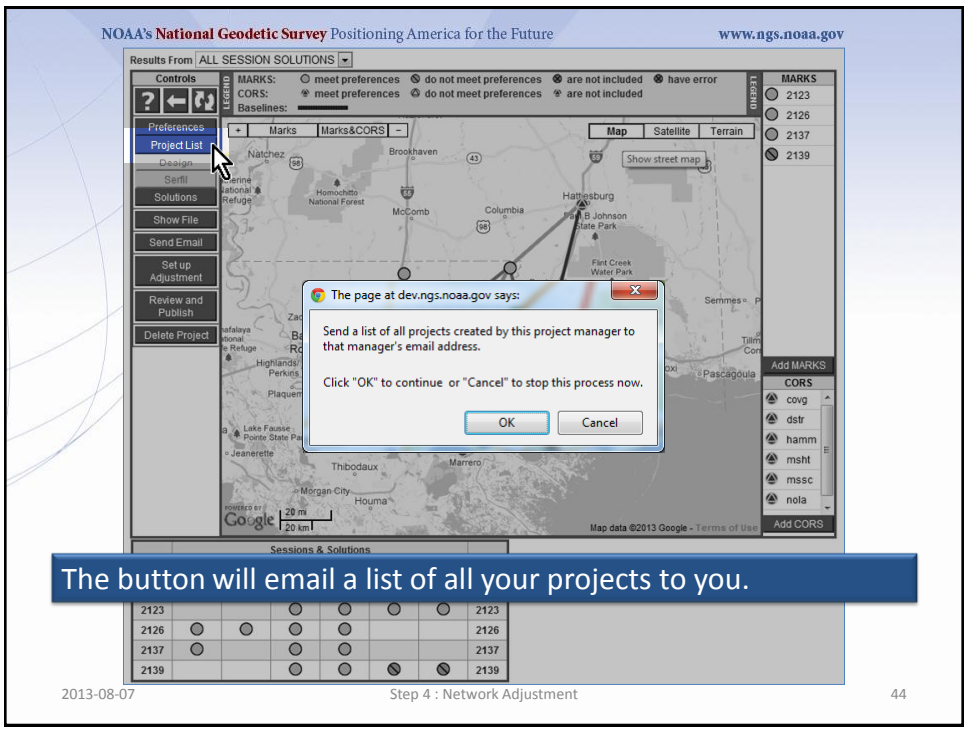
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The button will email a list of all your projects to you.
2013-08-07
Step 4 : Network Adjustment
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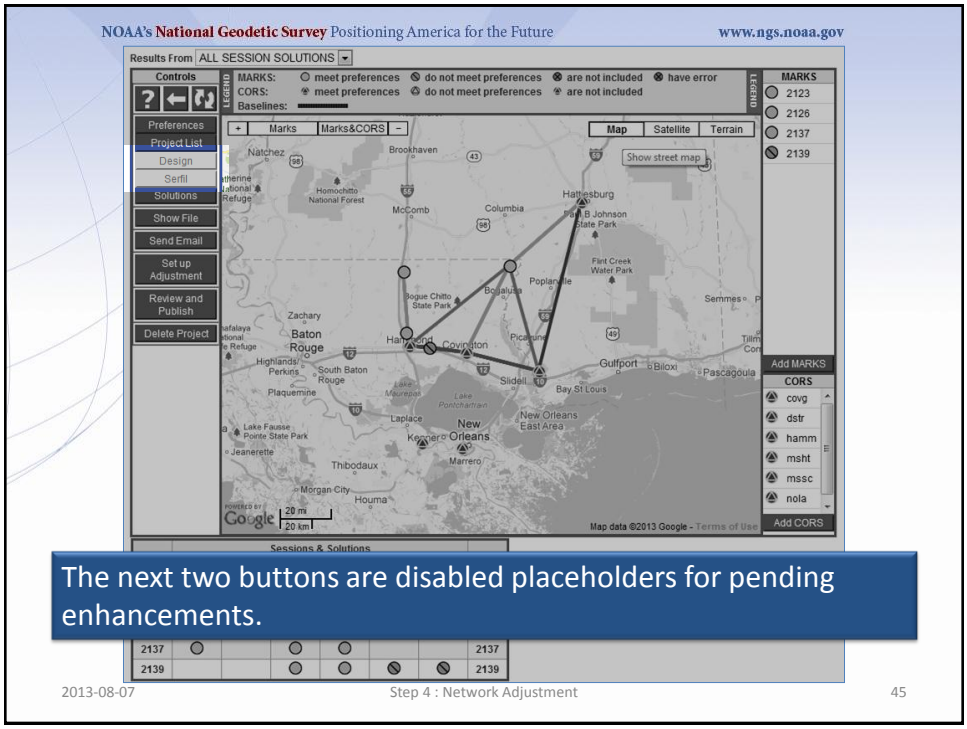
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Results From ALL SESSION SOLUTIONS
Controls
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
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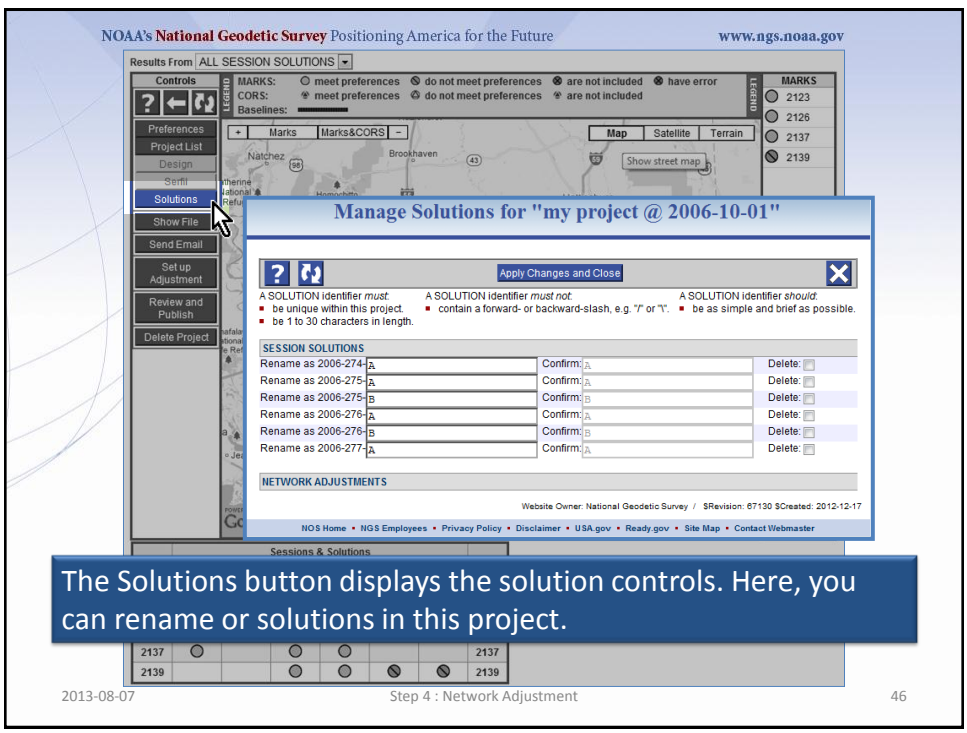
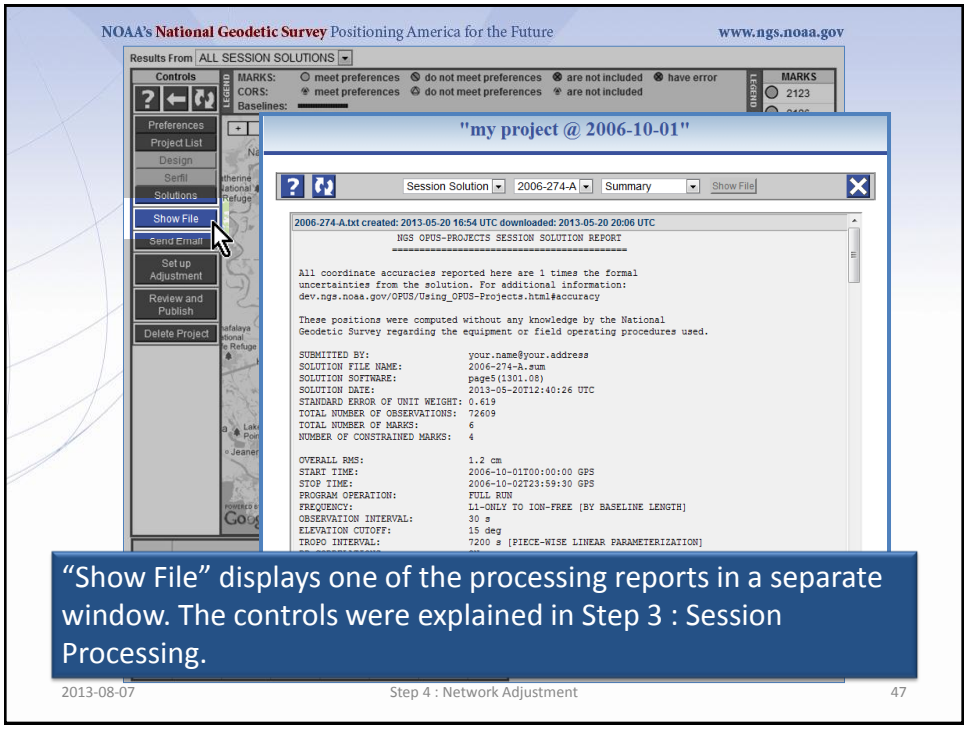
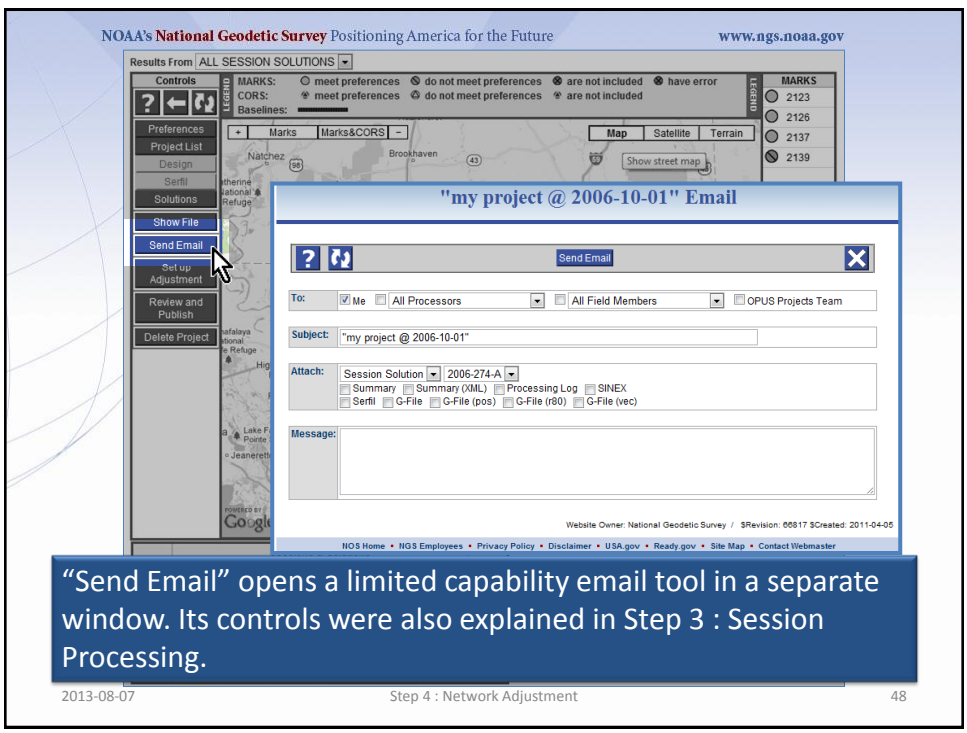
MARKS:
CORS:
Baselines:
meet preferences
do not meet preferences
are not included
have error
Marks
Marks&CORS
Map
Satellite
Terrain
Show street map
MARKS
2123
2126
2137
2139
Add MARKS
CORS
covg
dstr
hamm
msht
mssc
nola
Add CORS
Sessions & Solutions
The next two buttons are disabled placeholders for pending enhancements.

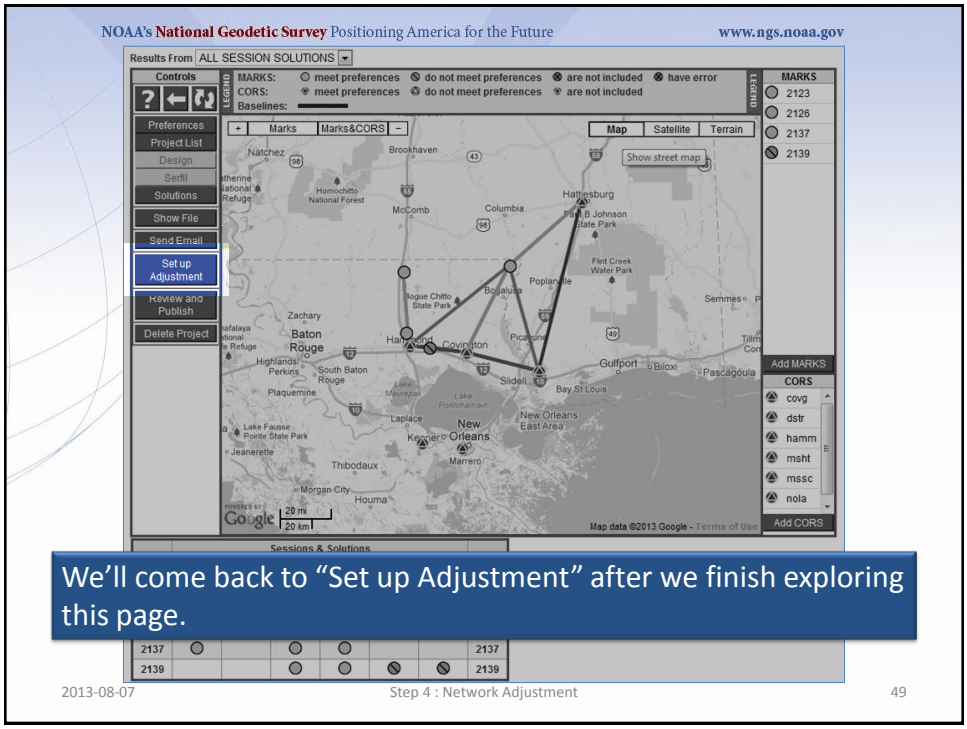

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Results From ALL SESSION SOLUTIONS
Solutions
Manage Solutions for "my project @ 2006-10-01"
Apply Changes and Close
A SOLUTION identifier must:
be unique within this project.
be 1 to 30 characters in length.
A SOLUTION identifier must not:
contain a forward- or backward-slash, e.g. "/" or "\".
A SOLUTION identifier should:
be as simple and brief as possible.
SESSION SOLUTIONS
Rename as 2006-274-A
Rename as 2006-275-A
Rename as 2006-275-B
Rename as 2006-276-A
Rename as 2006-276-B
Rename as 2006-277-A
Confirm:
Delete:
NETWORK ADJUSTMENTS
Website Owner: National Geodetic Survey / $Revision: 67130 $Created: 2012-12-17
NOS Home • NGS Employees • Privacy Policy • Disclaimer • USA.gov • Ready.gov • Site Map • Contact Webmaster
The Solutions button displays the solution controls. Here, you can rename or solutions in this project.



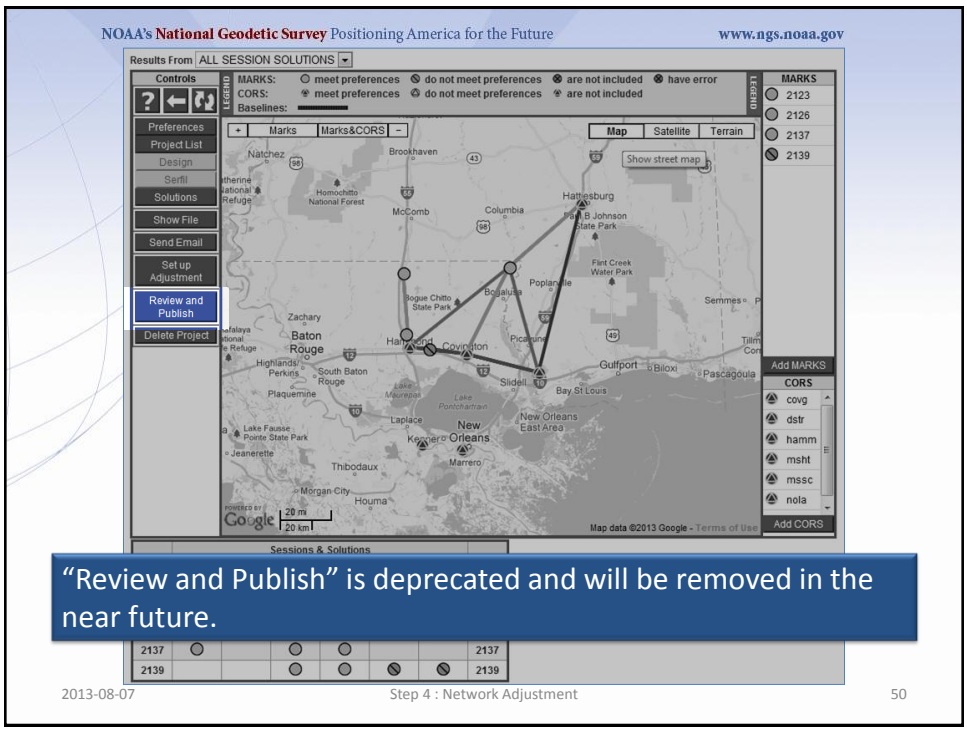
"Show File" displays one of the processing reports in a separate window. The controls were explained in Step 3 : Session Processing.



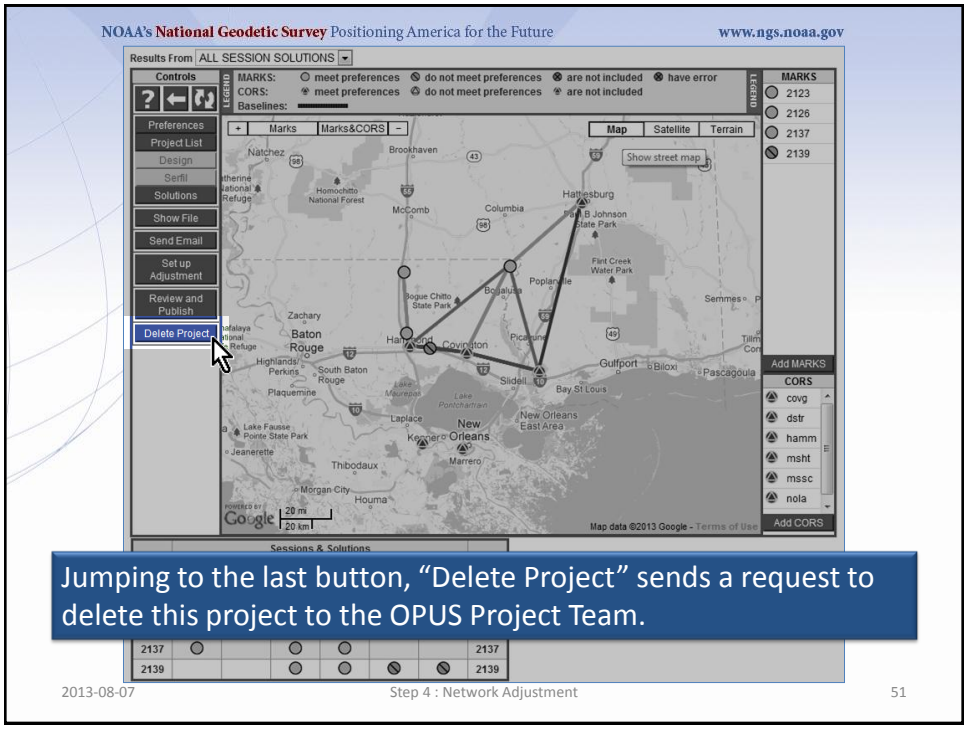
"Send Email" opens a limited capability email tool in a separate window. Its controls were also explained in Step 3 : Session Processing.



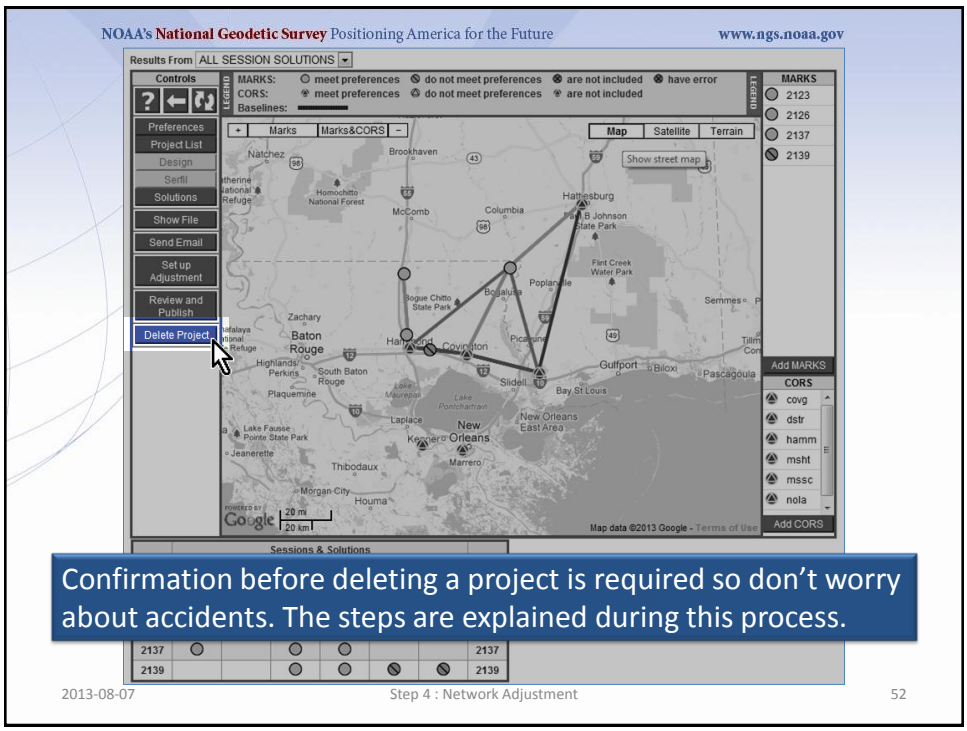
We'll come back to "Set up Adjustment" after we finish exploring this page.



"Review and Publish" is deprecated and will be removed in the near future.



Jumping to the last button, "Delete Project" sends a request to delete this project to the OPUS Project Team.



Confirmation before deleting a project is required so don't worry about accidents. The steps are explained during this process.

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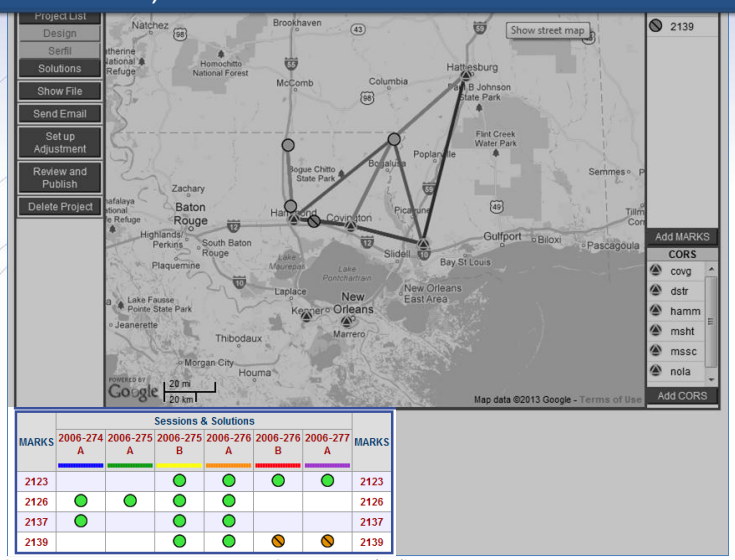
The table at the bottom of the page is a terse summary of the project sessions, solutions and marks.



Sessions & Solutions

MARKS	2006-274 A	2006-275 A	2006-275 B	2006-276 A	2006-276 B	2006-277 A	MARKS
2123			●	●	●	●	2123
2126	●	●	●	●			2126
2137	●		●	●			2137
2139			●	●	⊘	⊘	2139

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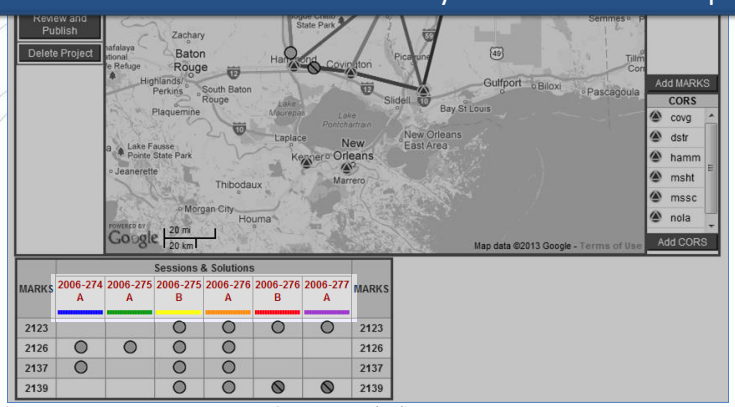
The column headers across the top of the table name all the sessions, session solutions and network adjustments (no network adjustments exist yet). Session solutions and network adjustments show a baseline indicator below; sessions that haven't been processed do not. Session and session solution headers are convenience links to take you to that session's page.



Sessions & Solutions

MARKS	2006-274 A	2006-275 A	2006-275 B	2006-276 A	2006-276 B	2006-277 A	MARKS
2123			○	○	○	○	2123
2126	○	○	○	○			2126
2137	○		○	○			2137
2139			○	○	⊘	⊘	2139

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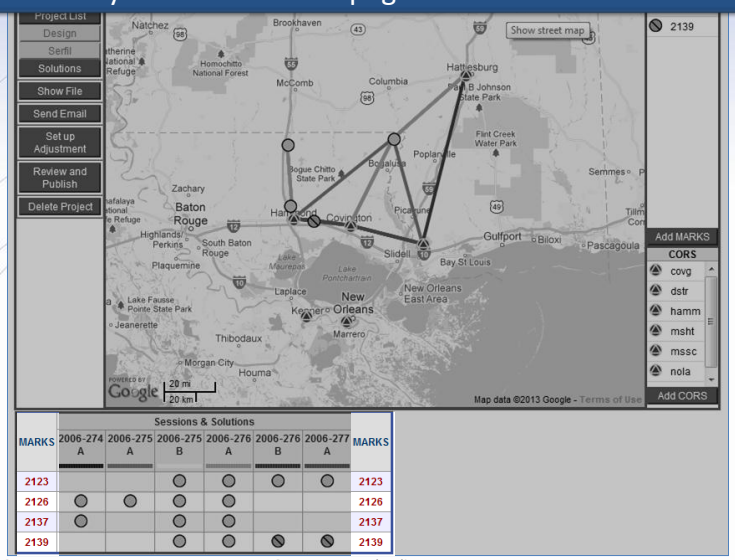
The row headers list all the project's marks and are convenience links to take you to that mark's page.



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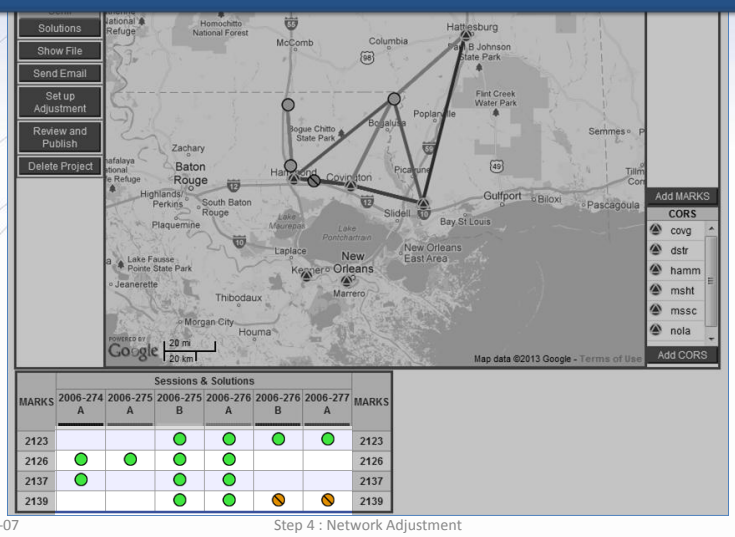
A mark's inclusion in a session or solution is indicated by the icons in the table. The specific icon used depends upon its solution results.



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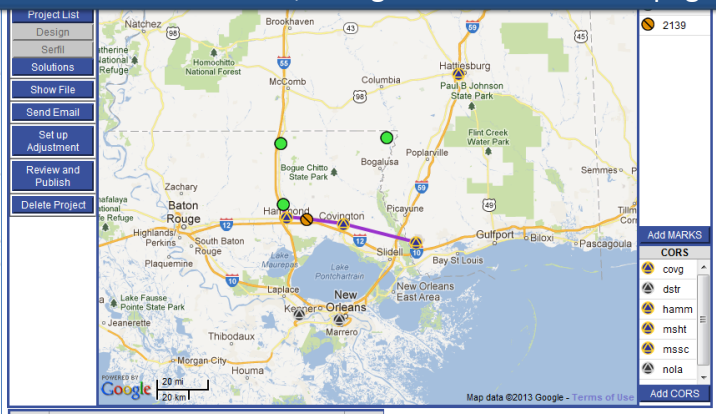
Let's use this table to investigate the possible problem with 2139 in session 2006-277-A. First, let's go to the 2006-277-A page.



Sessions & Solutions

MARKS	2006-274 A	2006-275 A	2006-275 B	2006-276 A	2006-276 B	2006-277 A	MARKS
2123			●	●	●	●	2123
2126	●	●	●	●			2126
2137	●		●	●			2137
2139			●	●	⊘	⊘	2139

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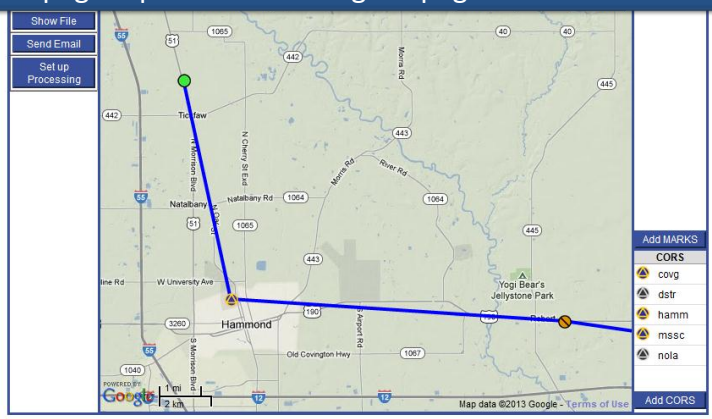
In a few moments, longer for larger projects, the 2006-277-A session page replaces the manager's page.



Solution Quality Indicators

MARKS	ANTENNA		HEIGHT (m)	EPH TYPE	OBS (%)	FIXED (%)	RMS (m)	LAT (m)	LON (m)	HGT (m)
2123 ●	TRM55971.00	NONE	2.000	precise	95.5	84.6	0.009	0.004	0.002	0.004
2139 ⊘	TRM55971.00	NONE	2.000	precise	79.8	100.0	0.021	0.004	0.002	0.004
PREFERENCES:				Best Available	≥80.0	≥80.0	≤0.025	≤0.030	≤0.030	≤0.060

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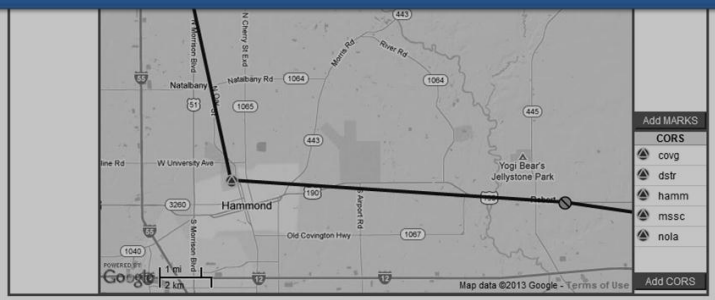
We can quickly see that the percentage of observations included in this session solution from the 2139 data file is slightly below our preferred threshold. The other solution quality control values are acceptable (although the post-fit residual RMS is near its maximum based upon our preferences).



Solution Quality Indicators

MARKS	ANTENNA		HEIGHT (m)	EPH TYPE	OBS (%)	FIXED (%)	RMS (m)	LAT (m)	LON (m)	HGT (m)
2123	TRM55971.00	NONE	2.000	precise	95.5	84.6	0.009	0.004	0.002	0.004
2139	TRM55971.00	NONE	2.000	precise	79.8	100.0	0.021	0.004	0.002	0.004
PREFERENCES:				Best Available	≥80.0	≥80.0	≤0.025	≤0.030	≤0.030	≤0.060

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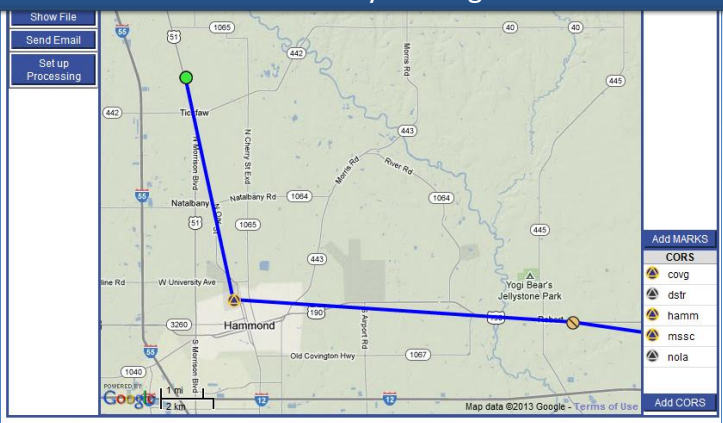
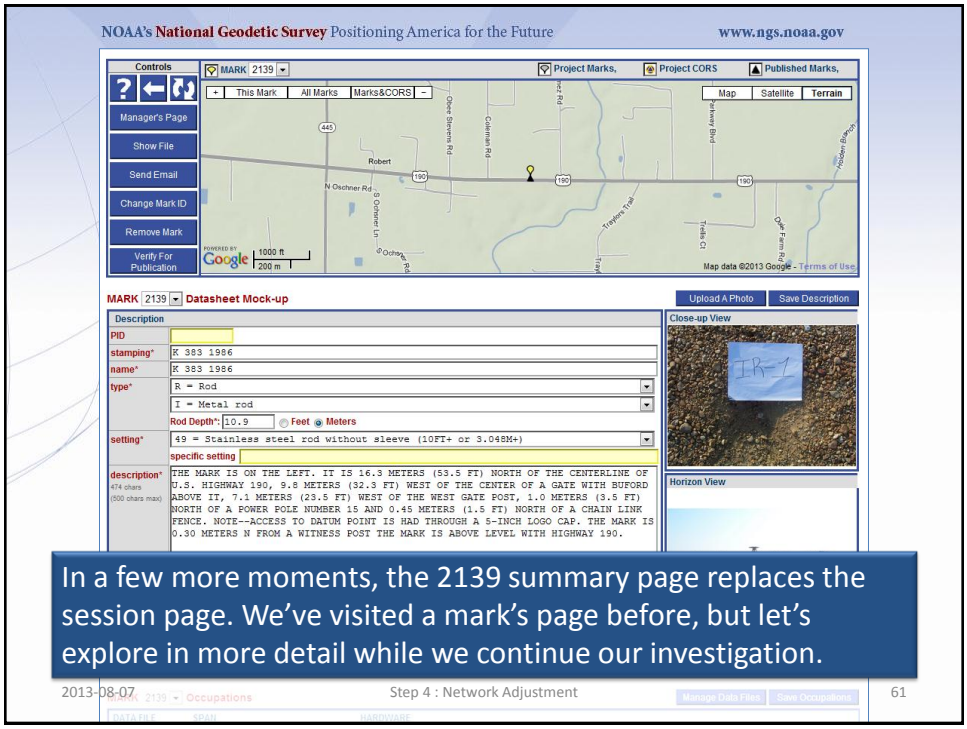
Let's continue this investigation by going to 2139's page. Remember that we can do that by clicking on the row header.

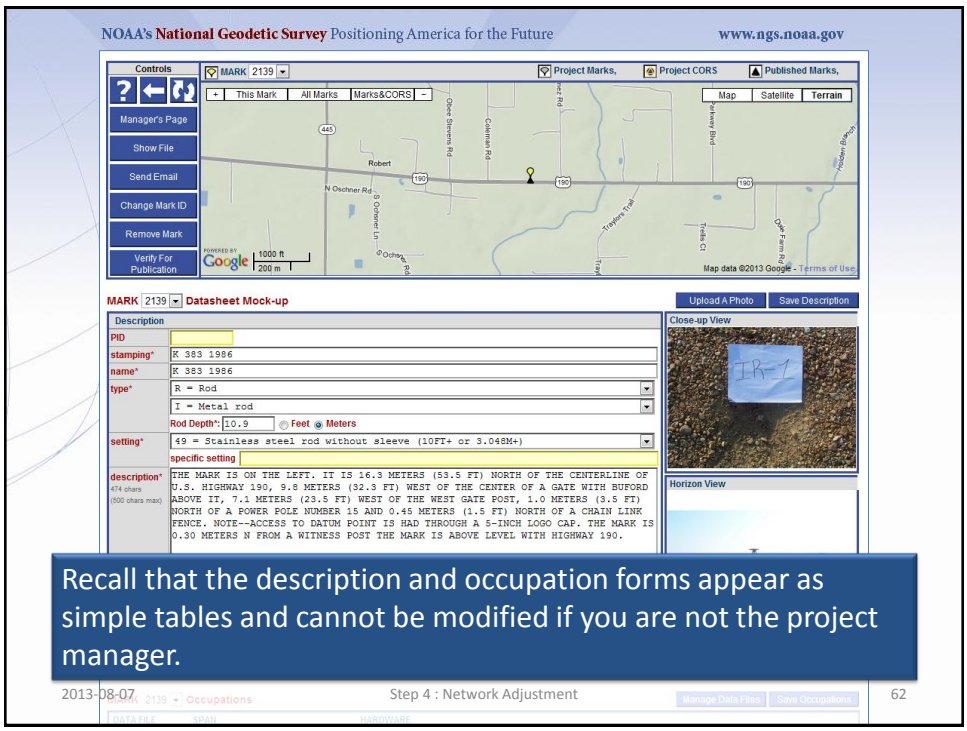


Solution Quality Indicators

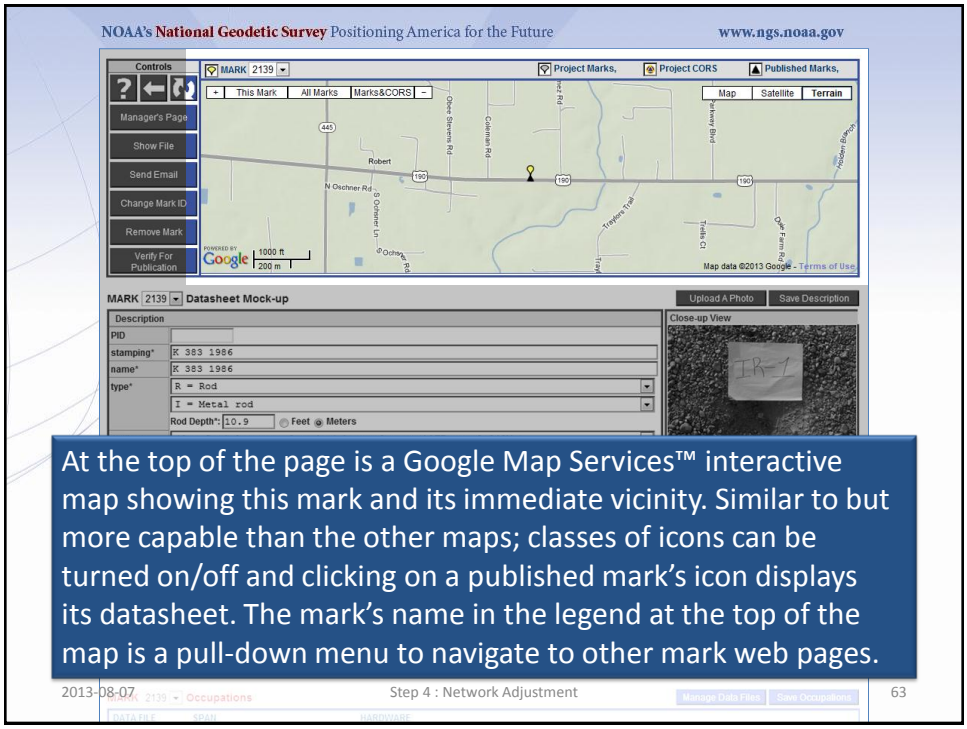
MARKS	ANTENNA		HEIGHT (m)	EPH TYPE	OBS (%)	FIXED (%)	RMS (m)	LAT (m)	LON (m)	HGT (m)
2123	TRM55971.00	NONE	2.000	precise	95.5	84.6	0.009	0.004	0.002	0.004
2139	TRM55971.00	NONE	2.000	precise	79.8	100.0	0.021	0.004	0.002	0.004
PREFERENCES:				Best Available	≥80.0	≥80.0	≤0.025	≤0.030	≤0.030	≤0.060



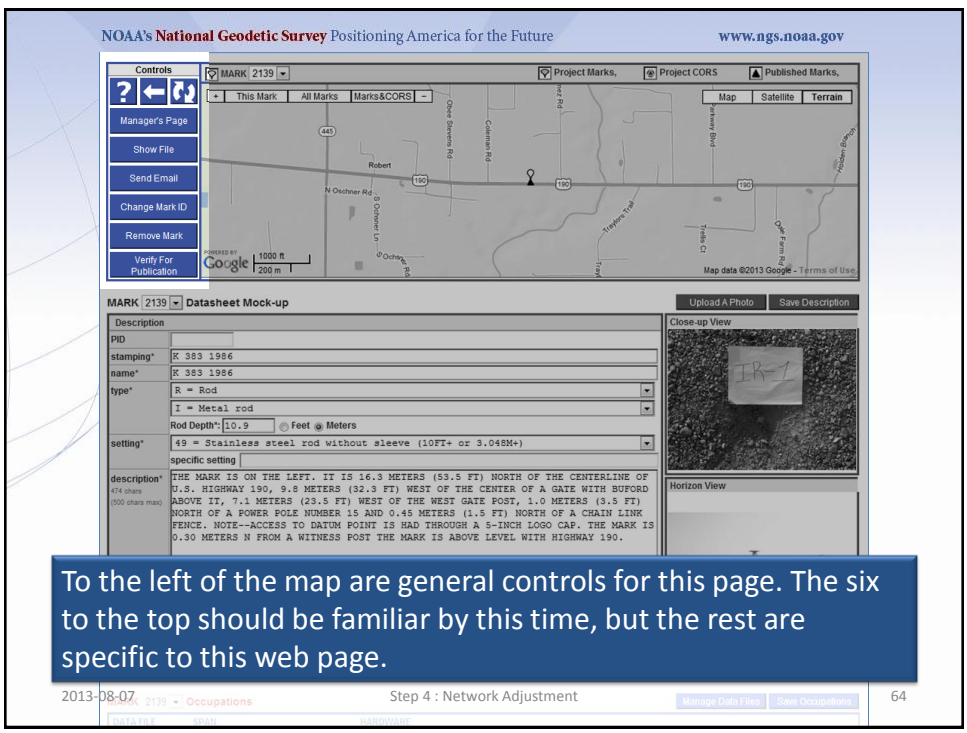
In a few more moments, the 2139 summary page replaces the session page. We've visited a mark's page before, but let's explore in more detail while we continue our investigation.



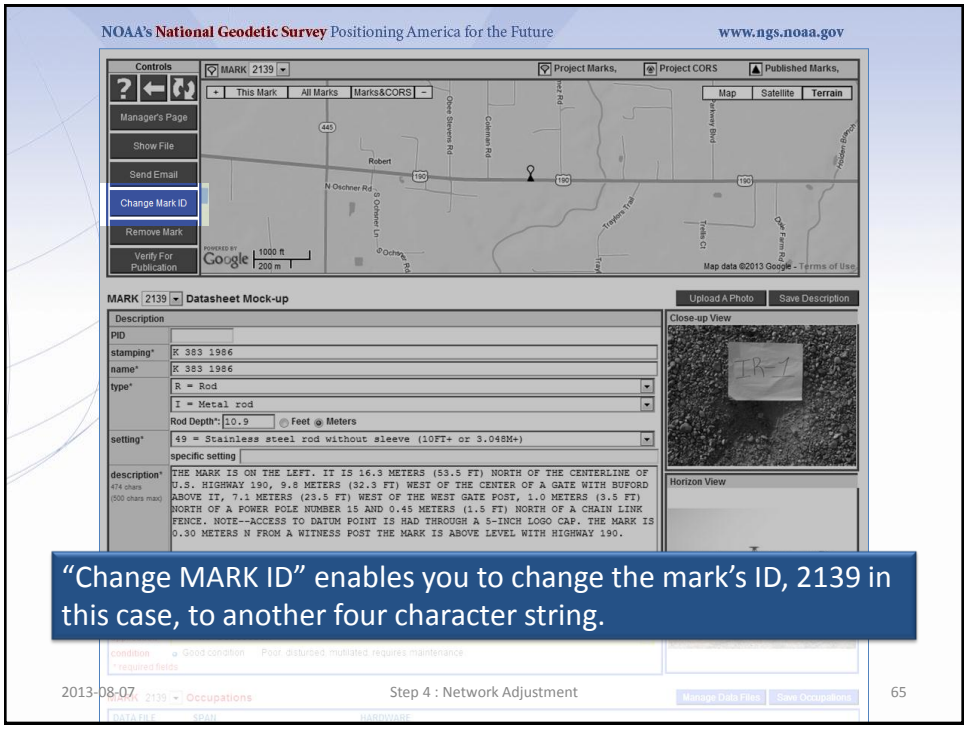
Recall that the description and occupation forms appear as simple tables and cannot be modified if you are not the project manager.



At the top of the page is a Google Map Services™ interactive map showing this mark and its immediate vicinity. Similar to but more capable than the other maps; classes of icons can be turned on/off and clicking on a published mark's icon displays its datasheet. The mark's name in the legend at the top of the map is a pull-down menu to navigate to other mark web pages.

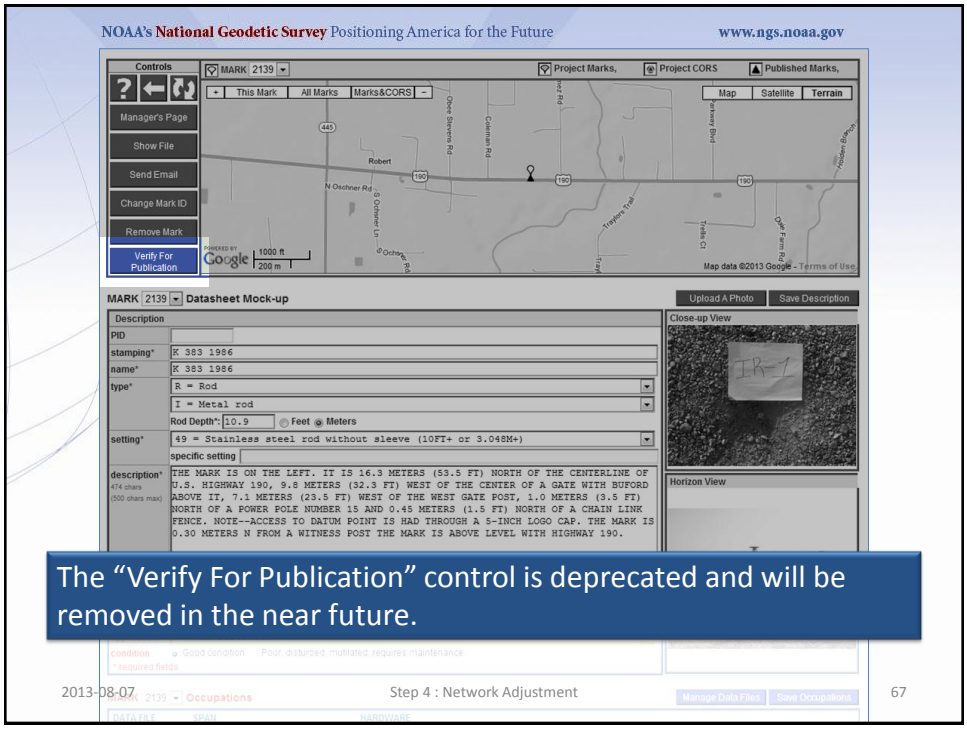


To the left of the map are general controls for this page. The six to the top should be familiar by this time, but the rest are specific to this web page.



"Change MARK ID" enables you to change the mark's ID, 2139 in this case, to another four character string.

"Remove Mark" irrevocably removes this mark and its data from this project after confirming the instruction to do so.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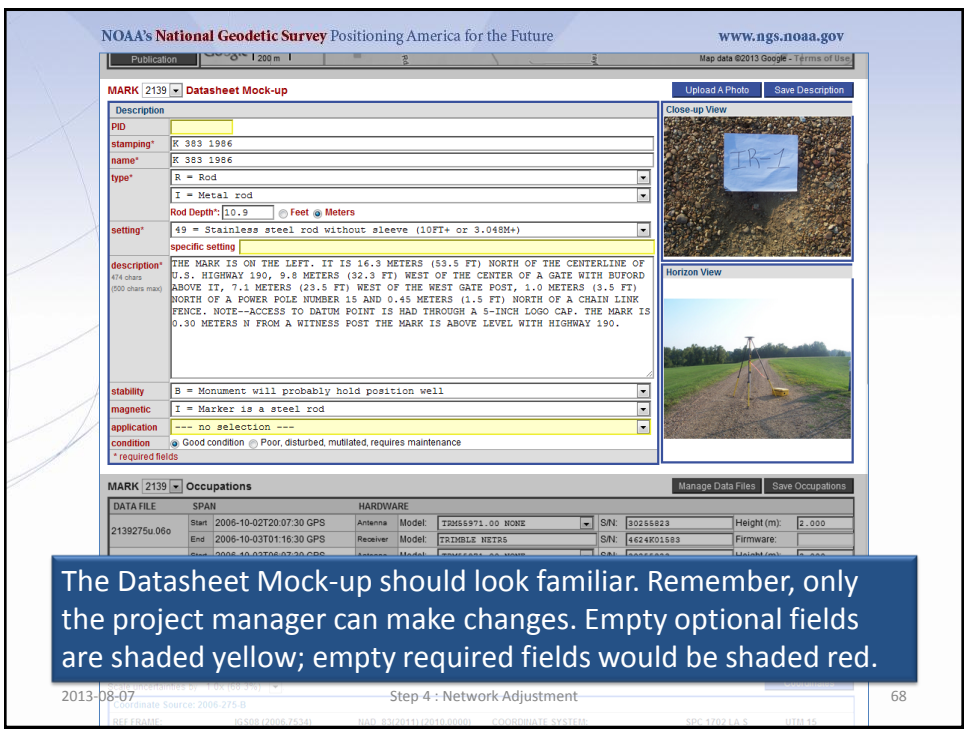
Controls
Manager's Page
Show File
Send Email
Change Mark ID
Remove Mark
Verify For Publication
MARK 2139
Project Marks,
Project CORS
Published Marks,
This Mark
All Marks
Marks&CORS
Map
Satellite
Terrain
MARK 2139 Datasheet Mock-up
Upload A Photo
Save Description
Description
PID
stamping*
K 383 1986
name*
K 383 1986
type*
R = Rod
I = Metal rod
Rod Depth*: 10.9
Feet
Meters
setting*
49 = Stainless steel rod without sleeve (10FT+ or 3.048M+)
specific setting
description*
THE MARK IS ON THE LEFT. IT IS 16.3 METERS (53.5 FT) NORTH OF THE CENTERLINE OF U.S. HIGHWAY 190, 9.8 METERS (32.3 FT) WEST OF THE CENTER OF A GATE WITH BUFORD ABOVE IT, 7.1 METERS (23.5 FT) WEST OF THE WEST GATE POST, 1.0 METERS (3.5 FT) NORTH OF A POWER POLE NUMBER 15 AND 0.45 METERS (1.5 FT) NORTH OF A CHAIN LINK FENCE. NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP. THE MARK IS 0.30 METERS N FROM A WITNESS POST THE MARK IS ABOVE LEVEL WITH HIGHWAY 190.
Close-up View
Horizon View
The "Verify For Publication" control is deprecated and will be removed in the near future.
2013-08-07
Step 4 : Network Adjustment
67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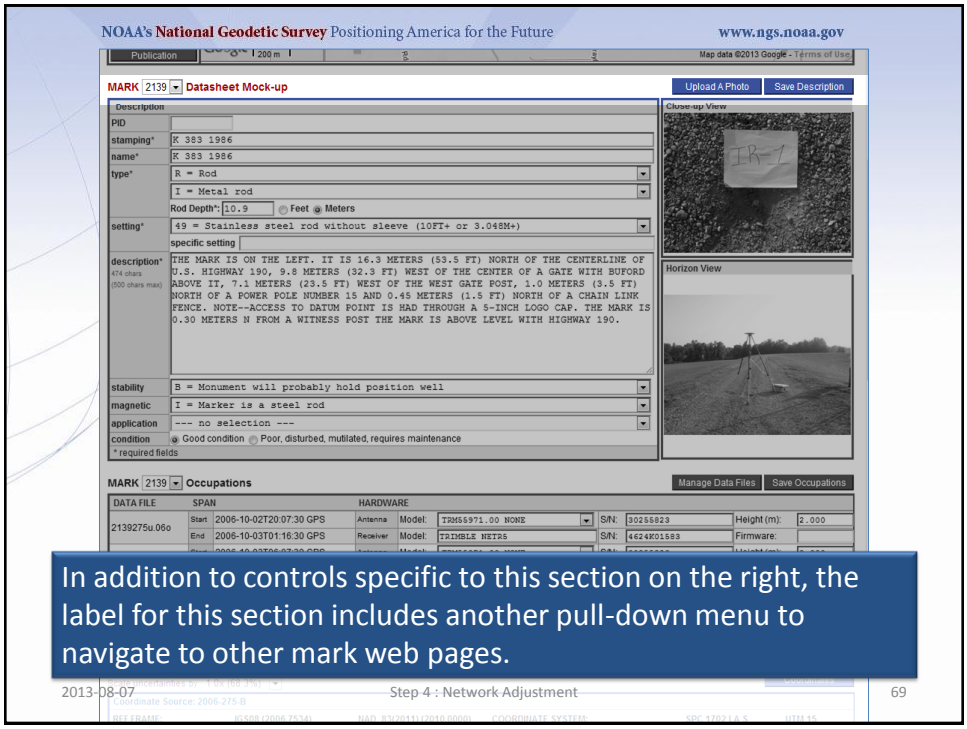
MARK 2139 Datasheet Mock-up
Upload A Photo
Save Description
Description
PID
stamping*
K 383 1986
name*
K 383 1986
type*
R = Rod
I = Metal rod
Rod Depth*: 10.9
Feet
Meters
setting*
49 = Stainless steel rod without sleeve (10FT+ or 3.048M+)
specific setting
description*
THE MARK IS ON THE LEFT. IT IS 16.3 METERS (53.5 FT) NORTH OF THE CENTERLINE OF U.S. HIGHWAY 190, 9.8 METERS (32.3 FT) WEST OF THE CENTER OF A GATE WITH BUFORD ABOVE IT, 7.1 METERS (23.5 FT) WEST OF THE WEST GATE POST, 1.0 METERS (3.5 FT) NORTH OF A POWER POLE NUMBER 15 AND 0.45 METERS (1.5 FT) NORTH OF A CHAIN LINK FENCE. NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP. THE MARK IS 0.30 METERS N FROM A WITNESS POST THE MARK IS ABOVE LEVEL WITH HIGHWAY 190.
stability
B = Monument will probably hold position well
magnetic
I = Marker is a steel rod
application
--- no selection ---
condition
Good condition
Poor, disturbed, mutilated, requires maintenance
* required fields
Close-up View
Horizon View
MARK 2139 Occupations
Manage Data Files
Save Occupations
DATA FILE
SPAN
HARDWARE
2139275u.06o
Start 2006-10-02T20:07:30 GPS
End 2006-10-03T01:16:30 GPS
Antenna Model: TRM55971.00 NONE
Receiver Model: TRIMBLE NETR5
S/N: 30255823
S/N: 4624K01583
Height (m): 2.000
Firmware:
The Datasheet Mock-up should look familiar. Remember, only the project manager can make changes. Empty optional fields are shaded yellow; empty required fields would be shaded red.
2013-08-07
Step 4 : Network Adjustment
68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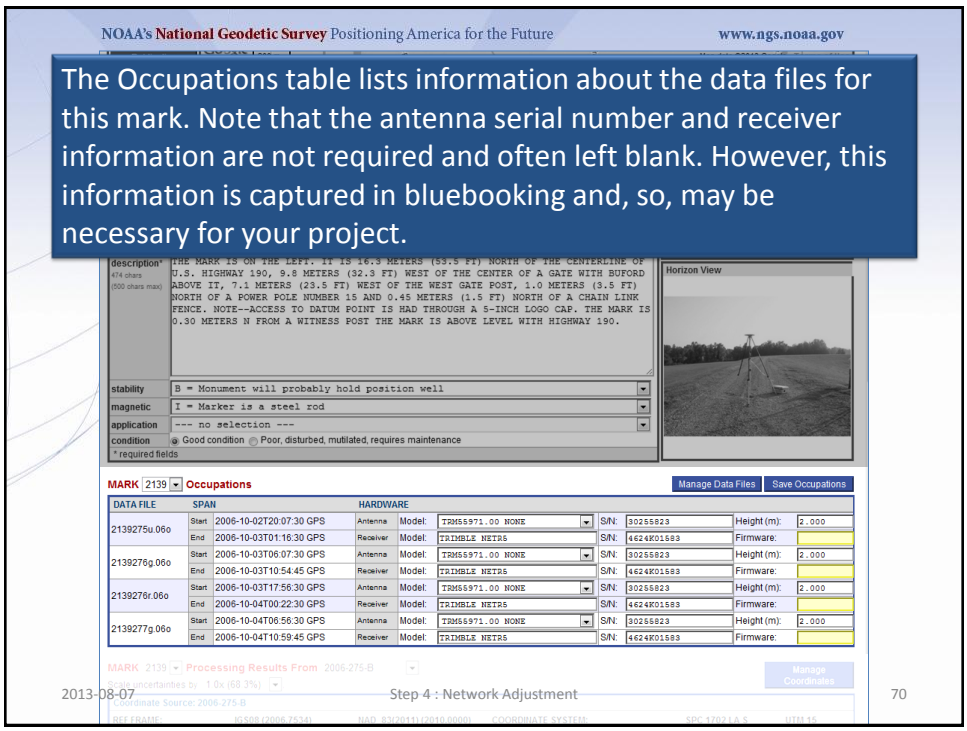
MARK 2139 Datasheet Mock-up
Upload A Photo
Save Description
Close-up View
Horizon View
MARK 2139 Occupations
Manage Data Files
Save Occupations
In addition to controls specific to this section on the right, the label for this section includes another pull-down menu to navigate to other mark web pages.
2013-08-07
Step 4 : Network Adjustment
69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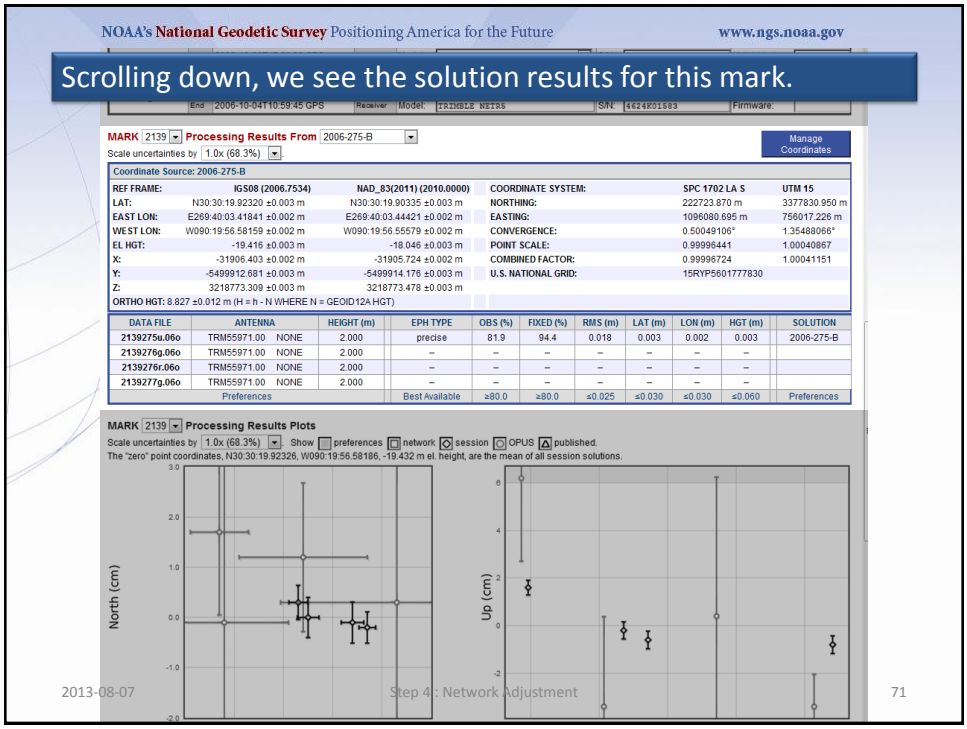
The Occupations table lists information about the data files for this mark. Note that the antenna serial number and receiver information are not required and often left blank. However, this information is captured in bluebooking and, so, may be necessary for your project.
MARK 2139 Occupations
Manage Data Files
Save Occupations
2013-08-07
Step 4 : Network Adjustment
70


NOAA's National Geodetic Survey Positioning America for the Future
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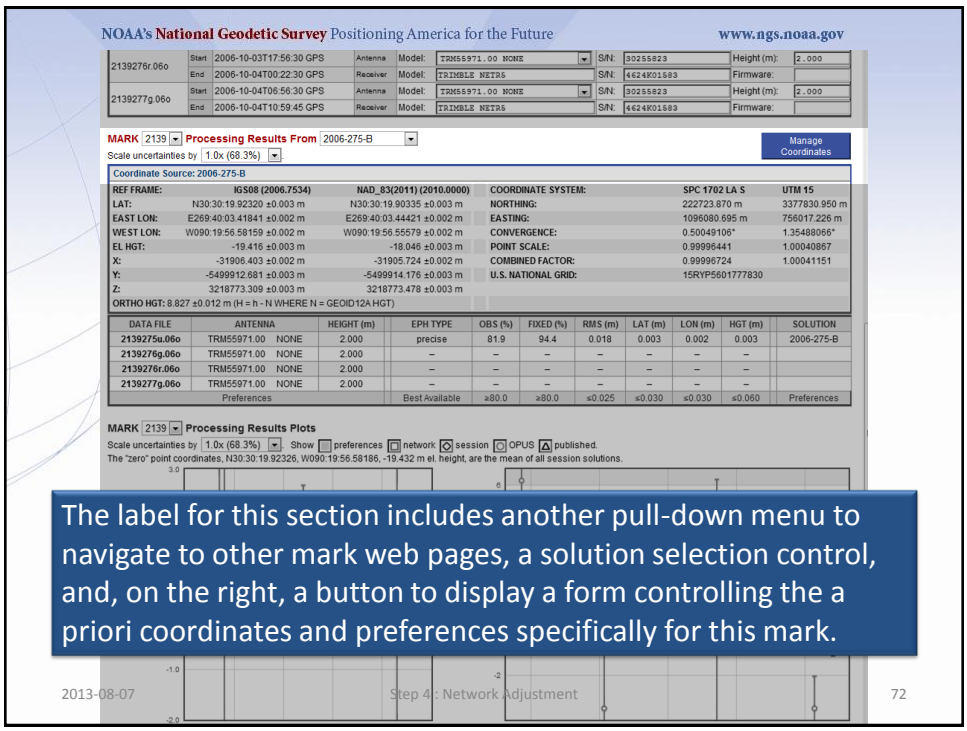
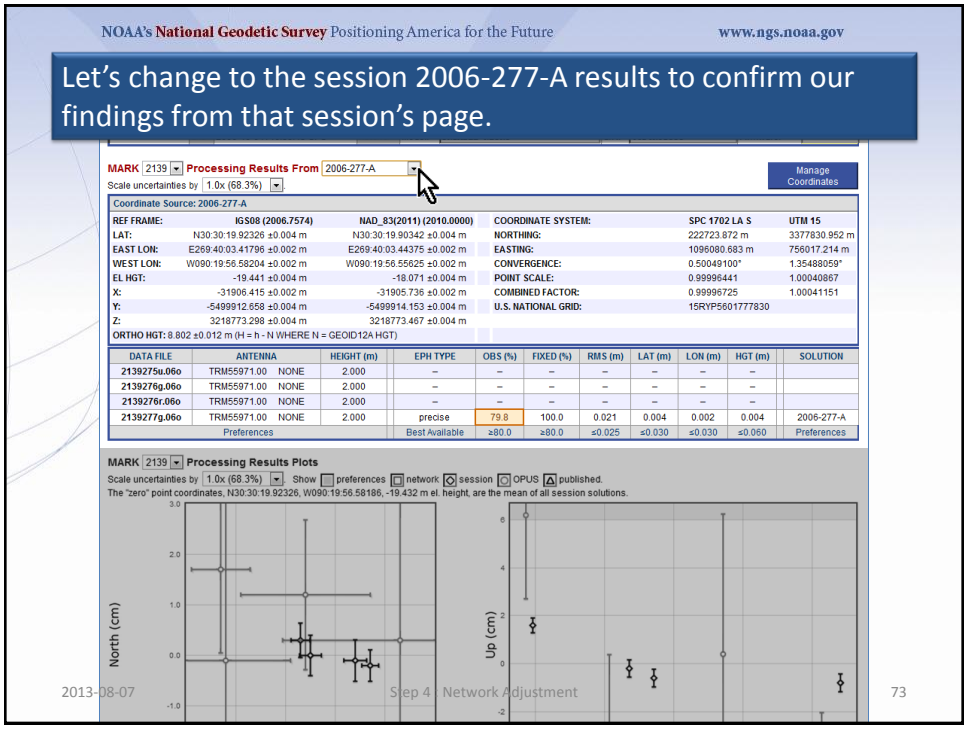
Scrolling down, we see the solution results for this mark.
MARK 2139 Processing Results From 2006-275-B
Scale uncertainties by 1.0x (68.3%)
Manage Coordinates
Coordinate Source: 2006-275-B
REF FRAME: IGS08 (2006.7534) NAD_83(2011) (2010.0000)
LAT: N30:30:19.92320 ±0.003 m N30:30:19.90335 ±0.003 m
EAST LON: E269:40:03.41841 ±0.002 m E269:40:03.44421 ±0.002 m
WEST LON: W090:19:56.58159 ±0.002 m W090:19:56.55579 ±0.002 m
EL HGT: -19.416 ±0.003 m -18.046 ±0.003 m
X: -31906.403 ±0.002 m -31905.724 ±0.002 m
Y: -5499912.681 ±0.003 m -5499914.176 ±0.003 m
Z: 3218773.309 ±0.003 m 3218773.478 ±0.003 m
ORTHO HGT: 8.827 ±0.012 m (H = h - N WHERE N = GEOID12A HGT)
COORDINATE SYSTEM: SPC 1702 LA S UTM 15
NORTHING: 222723.870 m 3377830.950 m
EASTING: 1096080.695 m 756017.226 m
CONVERGENCE: 0.50049106° 1.35488066°
POINT SCALE: 0.99996441 1.00040867
COMBINED FACTOR: 0.99996724 1.00041151
U.S. NATIONAL GRID: 15RYP5601777830
DATA FILE ANTENNA HEIGHT (m) EPH TYPE OBS (%) FIXED (%) RMS (m) LAT (m) LON (m) HGT (m) SOLUTION
2139275u.06o TRM55971.00 NONE 2.000 precise 81.9 94.4 0.018 0.003 0.002 0.003 2006-275-B
2139276g.06o TRM55971.00 NONE 2.000 – – – – – – –
2139276r.06o TRM55971.00 NONE 2.000 – – – – – – –
2139277g.06o TRM55971.00 NONE 2.000 – – – – – – –
Preferences Best Available ≥80.0 ≥80.0 ≤0.025 ≤0.030 ≤0.030 ≤0.060 Preferences
MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
North (cm)
Up (cm)
2013-08-07 Step 4: Network Adjustment 71


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
2139276r.06o Start 2006-10-03T17:56:30 GPS Antenna Model: TRM55971.00 NONE S/N: 30255823 Height (m): 2.000
End 2006-10-04T00:22:30 GPS Receiver Model: TRIMBLE NETR5 S/N: 4624K01583 Firmware:
2139277g.06o Start 2006-10-04T06:56:30 GPS Antenna Model: TRM55971.00 NONE S/N: 30255823 Height (m): 2.000
End 2006-10-04T10:59:45 GPS Receiver Model: TRIMBLE NETR5 S/N: 4624K01583 Firmware:
MARK 2139 Processing Results From 2006-275-B
Scale uncertainties by 1.0x (68.3%)
Manage Coordinates
Coordinate Source: 2006-275-B
REF FRAME: IGS08 (2006.7534) NAD_83(2011) (2010.0000)
LAT: N30:30:19.92320 ±0.003 m N30:30:19.90335 ±0.003 m
EAST LON: E269:40:03.41841 ±0.002 m E269:40:03.44421 ±0.002 m
WEST LON: W090:19:56.58159 ±0.002 m W090:19:56.55579 ±0.002 m
EL HGT: -19.416 ±0.003 m -18.046 ±0.003 m
X: -31906.403 ±0.002 m -31905.724 ±0.002 m
Y: -5499912.681 ±0.003 m -5499914.176 ±0.003 m
Z: 3218773.309 ±0.003 m 3218773.478 ±0.003 m
ORTHO HGT: 8.827 ±0.012 m (H = h - N WHERE N = GEOID12A HGT)
COORDINATE SYSTEM: SPC 1702 LA S UTM 15
NORTHING: 222723.870 m 3377830.950 m
EASTING: 1096080.695 m 756017.226 m
CONVERGENCE: 0.50049106° 1.35488066°
POINT SCALE: 0.99996441 1.00040867
COMBINED FACTOR: 0.99996724 1.00041151
U.S. NATIONAL GRID: 15RYP5601777830
DATA FILE ANTENNA HEIGHT (m) EPH TYPE OBS (%) FIXED (%) RMS (m) LAT (m) LON (m) HGT (m) SOLUTION
2139275u.06o TRM55971.00 NONE 2.000 precise 81.9 94.4 0.018 0.003 0.002 0.003 2006-275-B
2139276g.06o TRM55971.00 NONE 2.000 – – – – – – –
2139276r.06o TRM55971.00 NONE 2.000 – – – – – – –
2139277g.06o TRM55971.00 NONE 2.000 – – – – – – –
Preferences Best Available ≥80.0 ≥80.0 ≤0.025 ≤0.030 ≤0.030 ≤0.060 Preferences
MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
The label for this section includes another pull-down menu to navigate to other mark web pages, a solution selection control, and, on the right, a button to display a form controlling the a priori coordinates and preferences specifically for this mark.
2013-08-07 Step 4: Network Adjustment 72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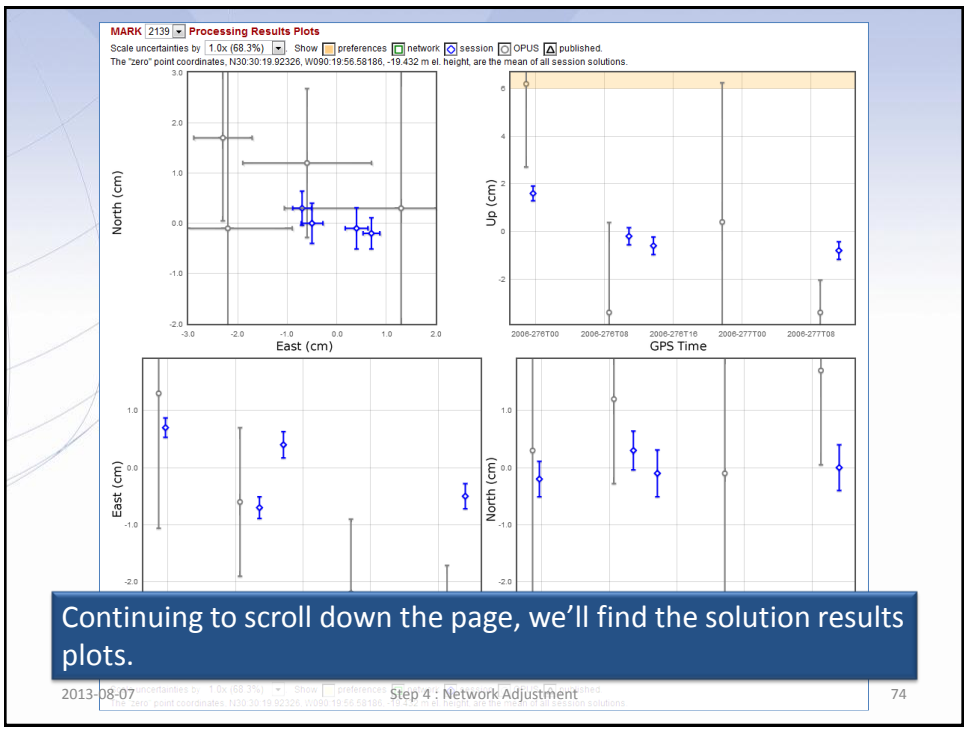
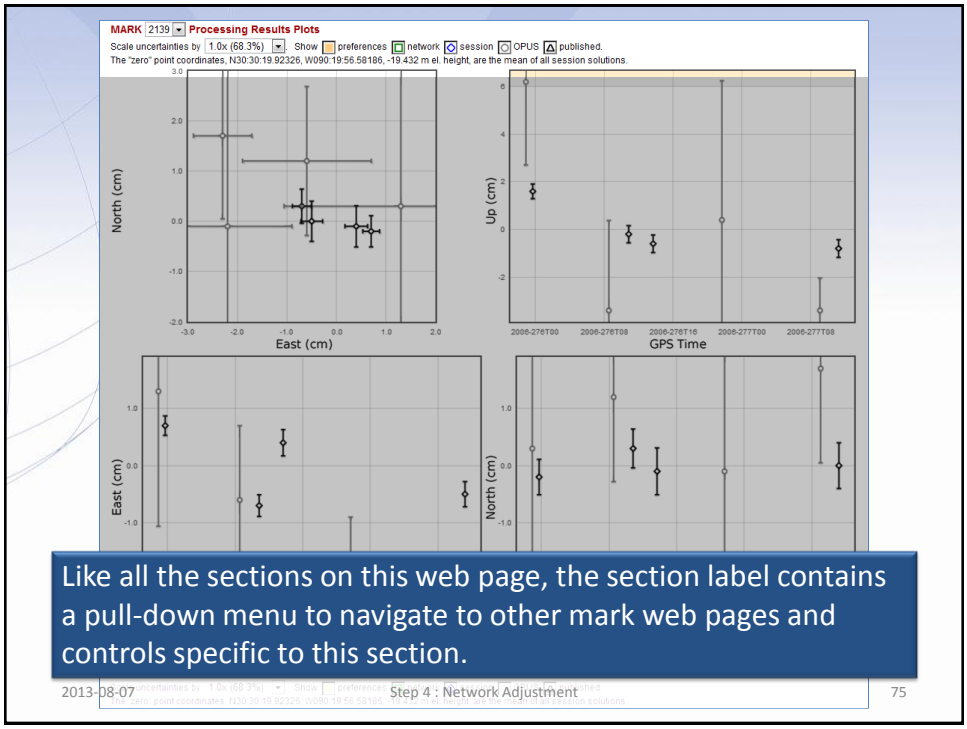
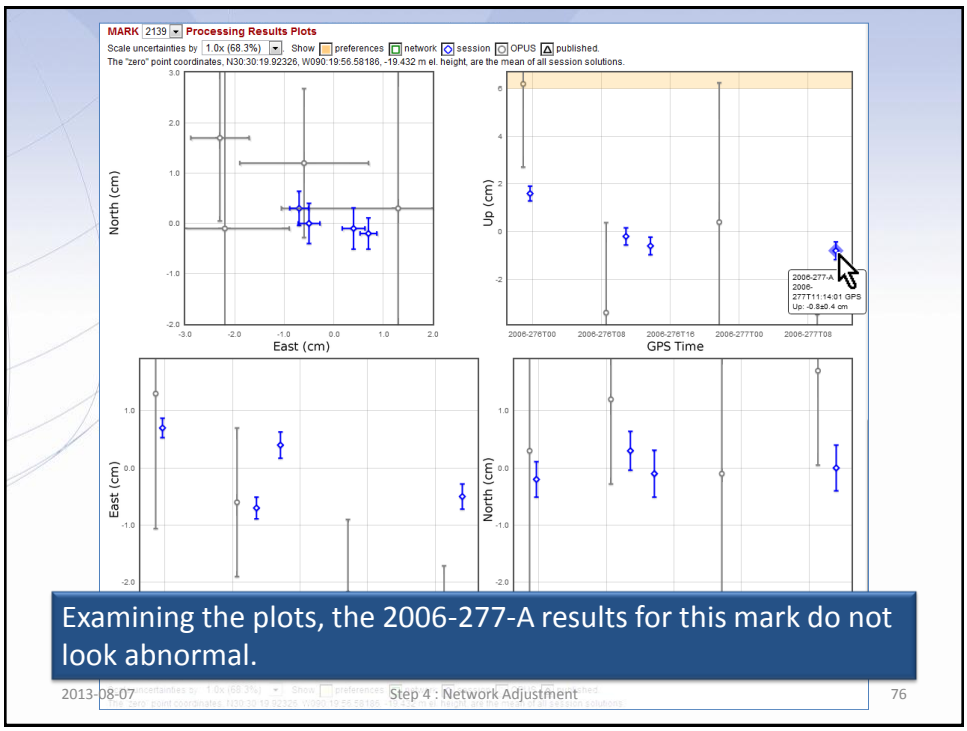
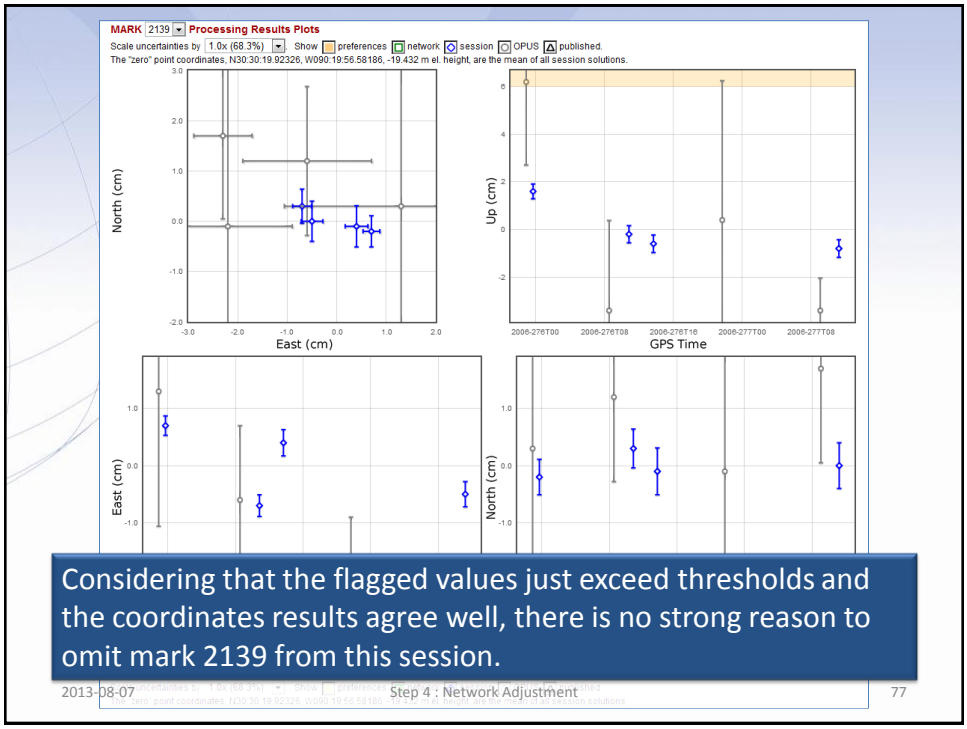
Let's change to the session 2006-277-A results to confirm our findings from that session's page.
MARK 2139 Processing Results From 2006-277-A
Scale uncertainties by 1.0x (68.3%)
Manage Coordinates
Coordinate Source: 2006-277-A
REF FRAME: IGS08 (2006.7574) NAD_83(2011) (2010.0000)
LAT: N30:30:19.92326 ±0.004 m N30:30:19.90342 ±0.004 m
EAST LON: E269:40:03.41796 ±0.002 m E269:40:03.44375 ±0.002 m
WEST LON: W090:19:56.58204 ±0.002 m W090:19:56.55625 ±0.002 m
EL HGT: -19.441 ±0.004 m -18.071 ±0.004 m
X: -31906.415 ±0.002 m -31905.736 ±0.002 m
Y: -5499912.658 ±0.004 m -5499914.153 ±0.004 m
Z: 3218773.298 ±0.004 m 3218773.467 ±0.004 m
ORTHO HGT: 8.802 ±0.012 m (H = h - N WHERE N = GEOID12A HGT)
COORDINATE SYSTEM: SPC 1702 LA S UTM 15
NORTHING: 222723.872 m 3377830.952 m
EASTING: 1096080.683 m 756017.214 m
CONVERGENCE: 0.50049100° 1.35488059°
POINT SCALE: 0.99996441 1.00040867
COMBINED FACTOR: 0.99996725 1.00041151
U.S. NATIONAL GRID: 15RYP5601777830
DATA FILE ANTENNA HEIGHT (m) EPH TYPE OBS (%) FIXED (%) RMS (m) LAT (m) LON (m) HGT (m) SOLUTION
2139275u.06o TRM55971.00 NONE 2.000 – – – – – – –
2139276g.06o TRM55971.00 NONE 2.000 – – – – – – –
2139276r.06o TRM55971.00 NONE 2.000 – – – – – – –
2139277g.06o TRM55971.00 NONE 2.000 precise 79.8 100.0 0.021 0.004 0.002 0.004 2006-277-A
Preferences Best Available ≥80.0 ≥80.0 ≤0.025 ≤0.030 ≤0.030 ≤0.060 Preferences
MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
North (cm)
Up (cm)
2013-08-07 Step 4 Network Adjustment 73

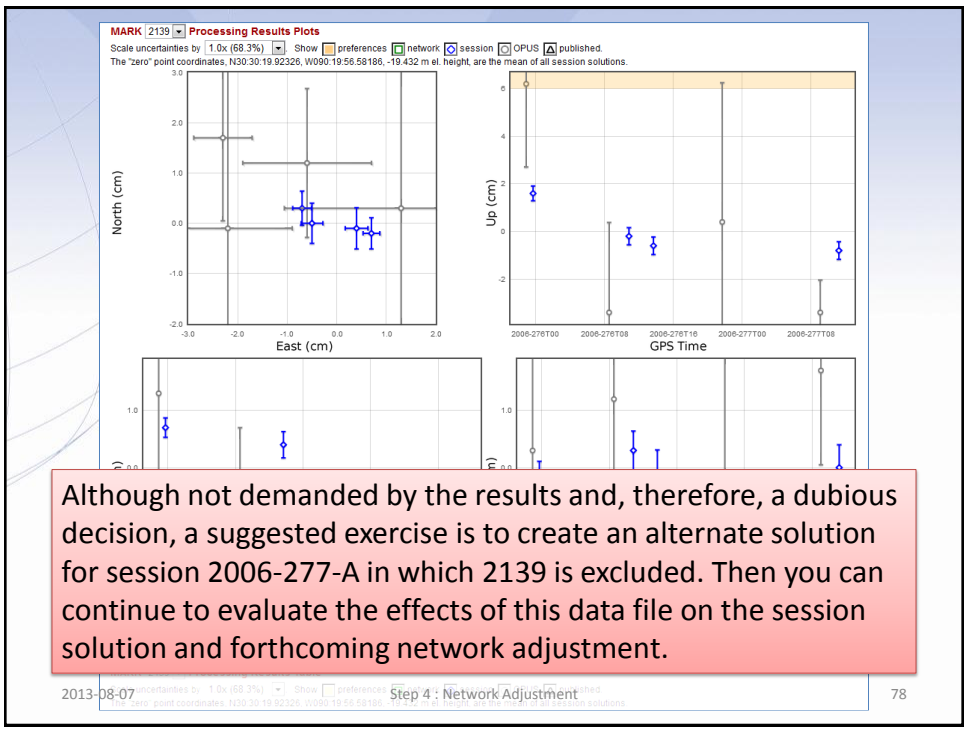

MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
North (cm)
East (cm)
Up (cm)
GPS Time
East (cm)
North (cm)
Continuing to scroll down the page, we'll find the solution results plots.
2013-08-07 Step 4 : Network Adjustment 74


MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
North (cm)
East (cm)
Up (cm)
GPS Time
East (cm)
North (cm)
Like all the sections on this web page, the section label contains a pull-down menu to navigate to other mark web pages and controls specific to this section.
2013-08-07 Step 4 : Network Adjustment 75

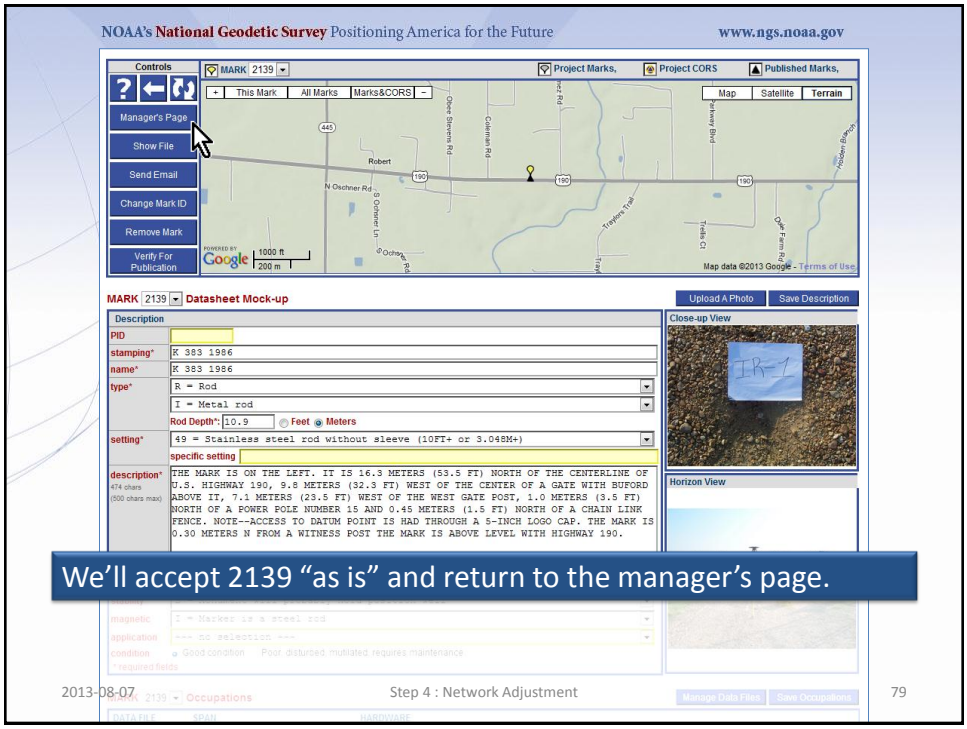

MARK 2139 Processing Results Plots
Scale uncertainties by 1.0x (68.3%) Show preferences network session OPUS published.
The "zero" point coordinates, N30:30:19.92326, W090:19:56.58186, -19.432 m el. height, are the mean of all session solutions.
North (cm)
East (cm)
Up (cm)
GPS Time
2006-277-A
2006-277T11:14:01 GPS
Up: -0.8±0.4 cm
East (cm)
North (cm)
Examining the plots, the 2006-277-A results for this mark do not look abnormal.
2013-08-07 Step 4 : Network Adjustment 76



Considering that the flagged values just exceed thresholds and the coordinates results agree well, there is no strong reason to omit mark 2139 from this session.



Although not demanded by the results and, therefore, a dubious decision, a suggested exercise is to create an alternate solution for session 2006-277-A in which 2139 is excluded. Then you can continue to evaluate the effects of this data file on the session solution and forthcoming network adjustment.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Controls
Manager's Page
Show File
Send Email
Change Mark ID
Remove Mark
Verify For Publication
MARK 2139
Project Marks,
Project CORS
Published Marks,
Map
Satellite
Terrain
MARK 2139 Datasheet Mock-up
Upload A Photo
Save Description
Description
Close-up View
Horizon View
PID
stamping*
name*
type*
Rod Depth*:
Feet
Meters
setting*
specific setting
description*
THE MARK IS ON THE LEFT. IT IS 16.3 METERS (53.5 FT) NORTH OF THE CENTERLINE OF U.S. HIGHWAY 190, 9.8 METERS (32.3 FT) WEST OF THE CENTER OF A GATE WITH BUFORD ABOVE IT, 7.1 METERS (23.5 FT) WEST OF THE WEST GATE POST, 1.0 METERS (3.5 FT) NORTH OF A POWER POLE NUMBER 15 AND 0.45 METERS (1.5 FT) NORTH OF A CHAIN LINK FENCE. NOTE--ACCESS TO DATUM POINT IS HAD THROUGH A 5-INCH LOGO CAP. THE MARK IS 0.30 METERS N FROM A WITNESS POST THE MARK IS ABOVE LEVEL WITH HIGHWAY 190.
We'll accept 2139 "as is" and return to the manager's page.
2013-08-07
Step 4 : Network Adjustment
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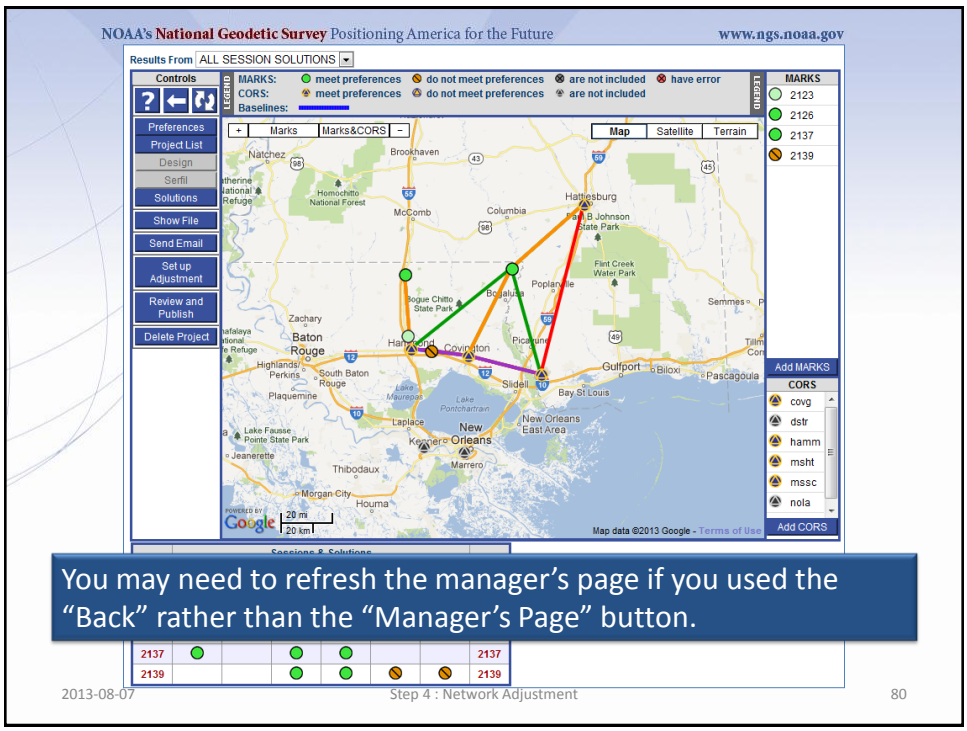
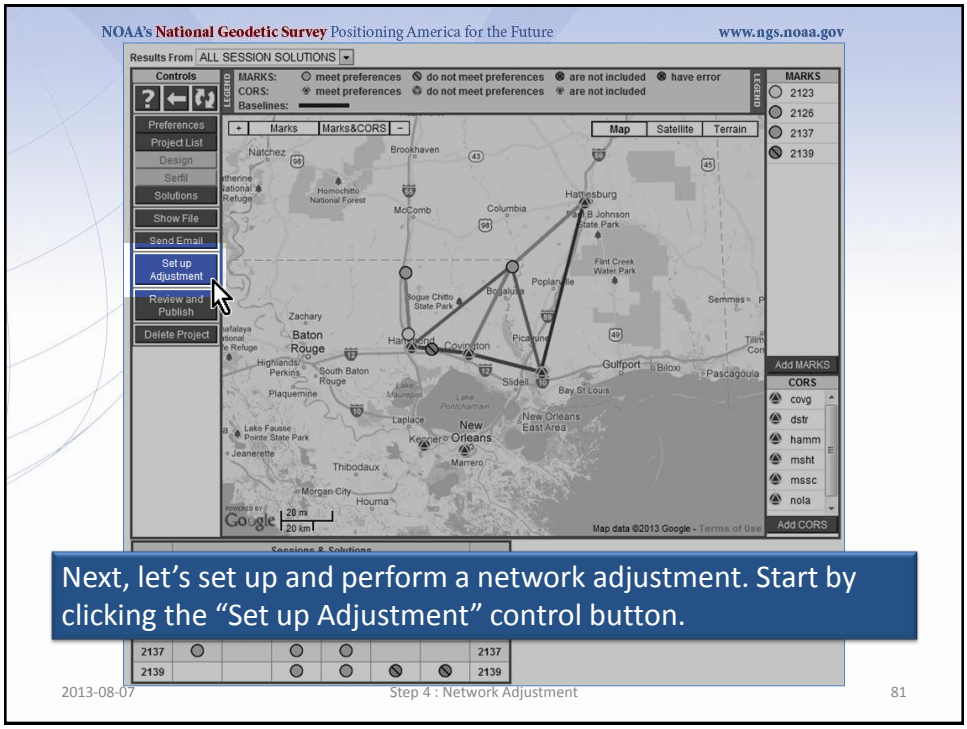
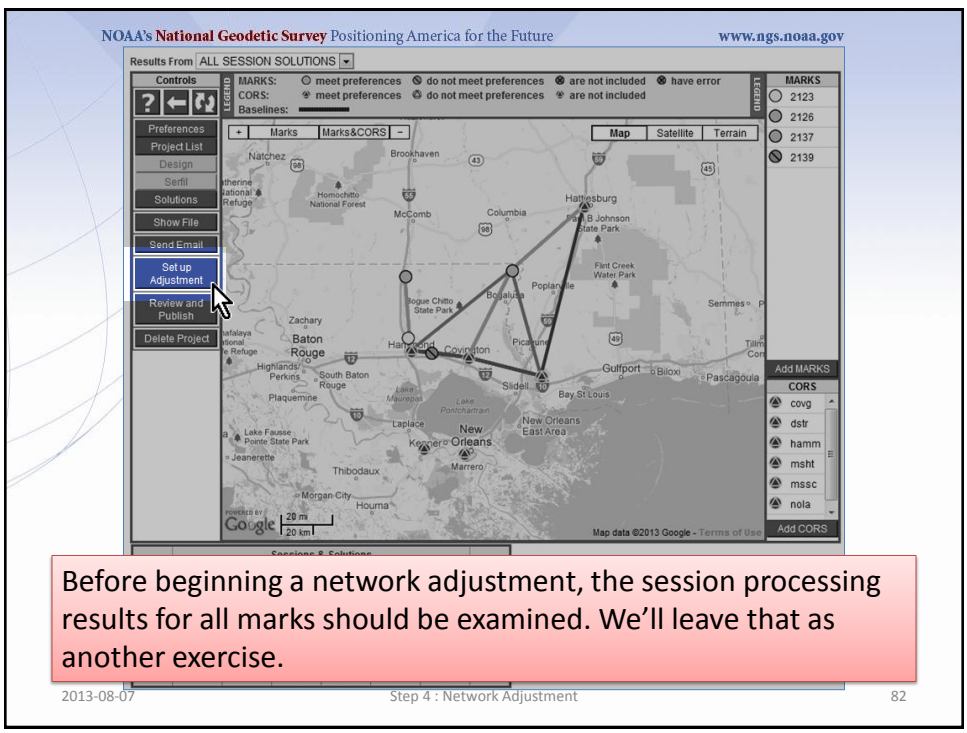
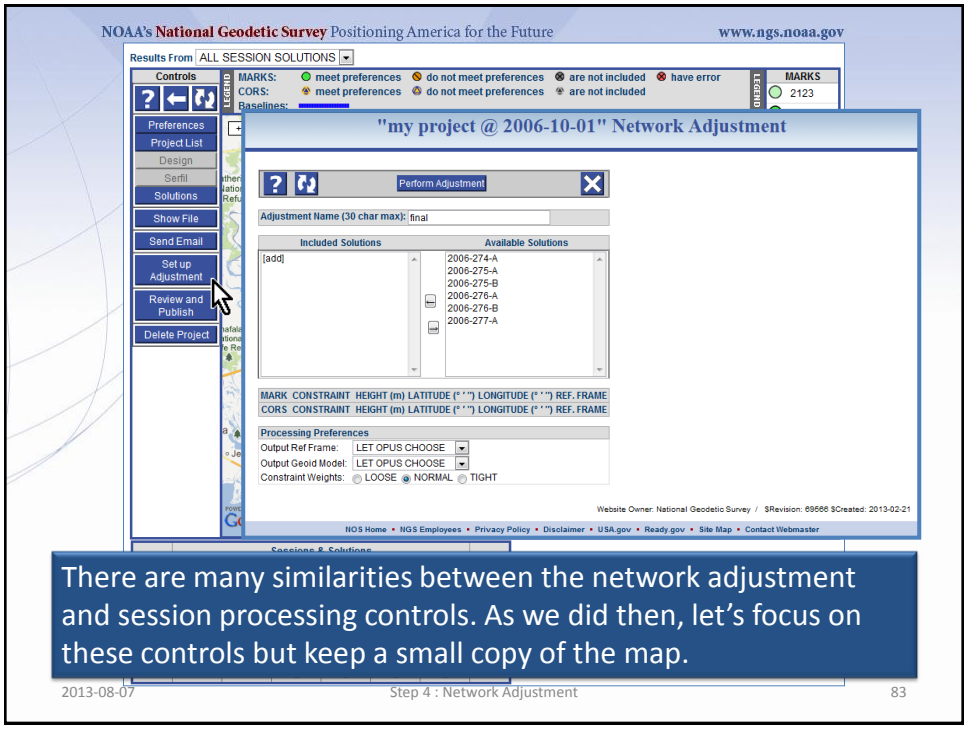

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Results From ALL SESSION SOLUTIONS
Controls
Preferences
Project List
Design
Serfil
Solutions
Show File
Send Email
Set up Adjustment
Review and Publish
Delete Project
MARKS: meet preferences do not meet preferences are not included have error
CORS: meet preferences do not meet preferences are not included
Baselines:
Marks
Marks&CORS
Map
Satellite
Terrain
MARKS
2123
2126
2137
2139
Add MARKS
CORS
covg
dstr
hamm
mshit
mssc
nola
Add CORS
Map data ©2013 Google - Terms of Use
You may need to refresh the manager's page if you used the "Back" rather than the "Manager's Page" button.
2137
2139
2013-08-07
Step 4 : Network Adjustment
80



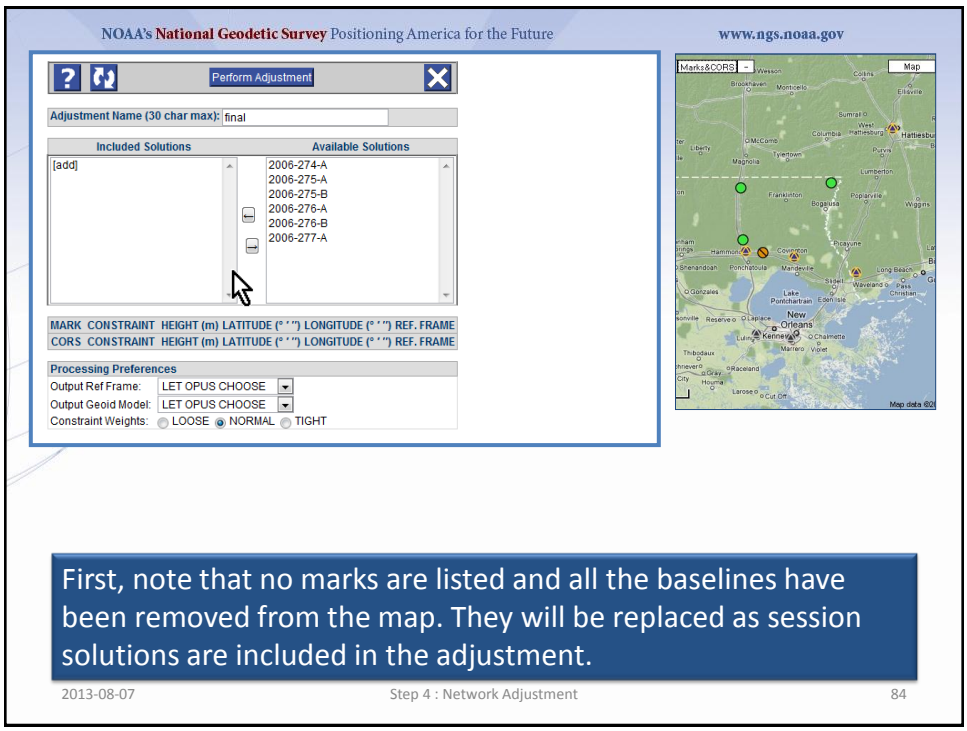
Next, let's set up and perform a network adjustment. Start by clicking the "Set up Adjustment" control button.



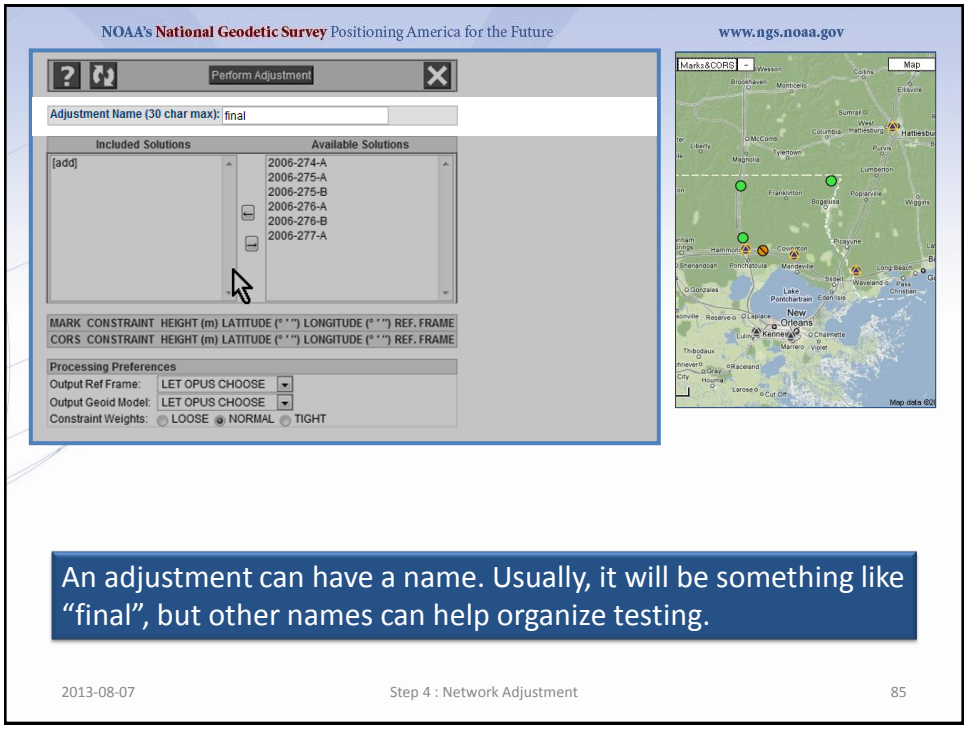
Before beginning a network adjustment, the session processing results for all marks should be examined. We'll leave that as another exercise.



There are many similarities between the network adjustment and session processing controls. As we did then, let's focus on these controls but keep a small copy of the map.



First, note that no marks are listed and all the baselines have been removed from the map. They will be replaced as session solutions are included in the adjustment.


NOAA's National Geodetic Survey Positioning America for the Future
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Perform Adjustment
Adjustment Name (30 char max): final
Included Solutions
Available Solutions
[add]
2006-274-A
2006-275-A
2006-275-B
2006-276-A
2006-276-B
2006-277-A
MARK CONSTRAINT HEIGHT (m) LATITUDE (° ' ") LONGITUDE (° ' ") REF. FRAME
CORS CONSTRAINT HEIGHT (m) LATITUDE (° ' ") LONGITUDE (° ' ") REF. FRAME
Processing Preferences
Output Ref Frame: LET OPUS CHOOSE
Output Geoid Model: LET OPUS CHOOSE
Constraint Weights: LOOSE NORMAL TIGHT
Marks&CORS
Map
An adjustment can have a name. Usually, it will be something like "final", but other names can help organize testing.
2013-08-07
Step 4 : Network Adjustment
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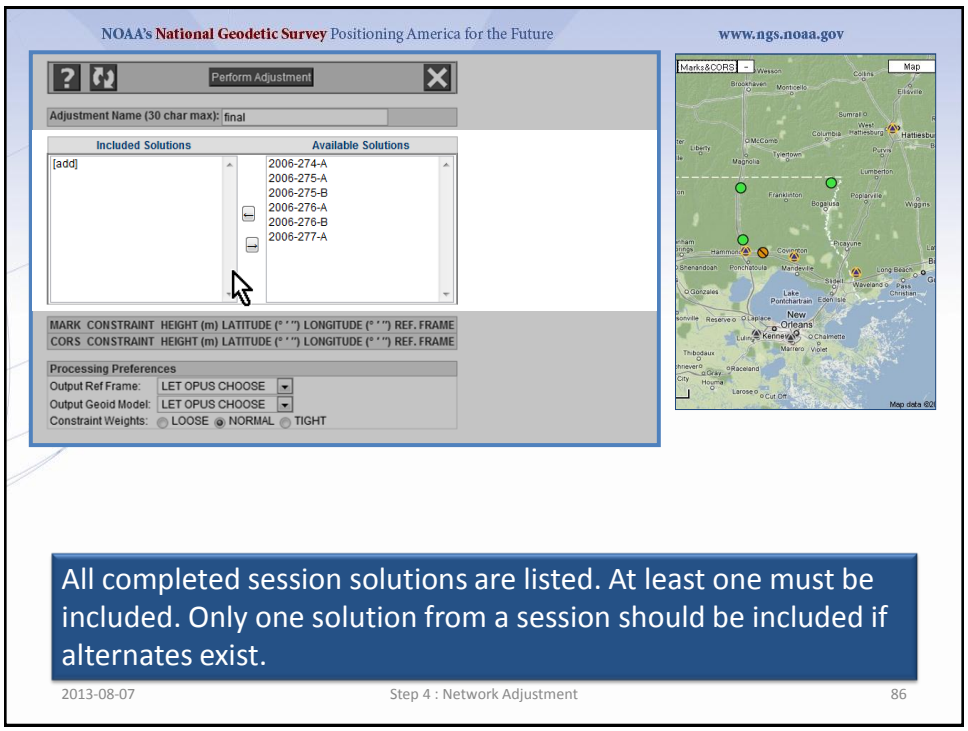
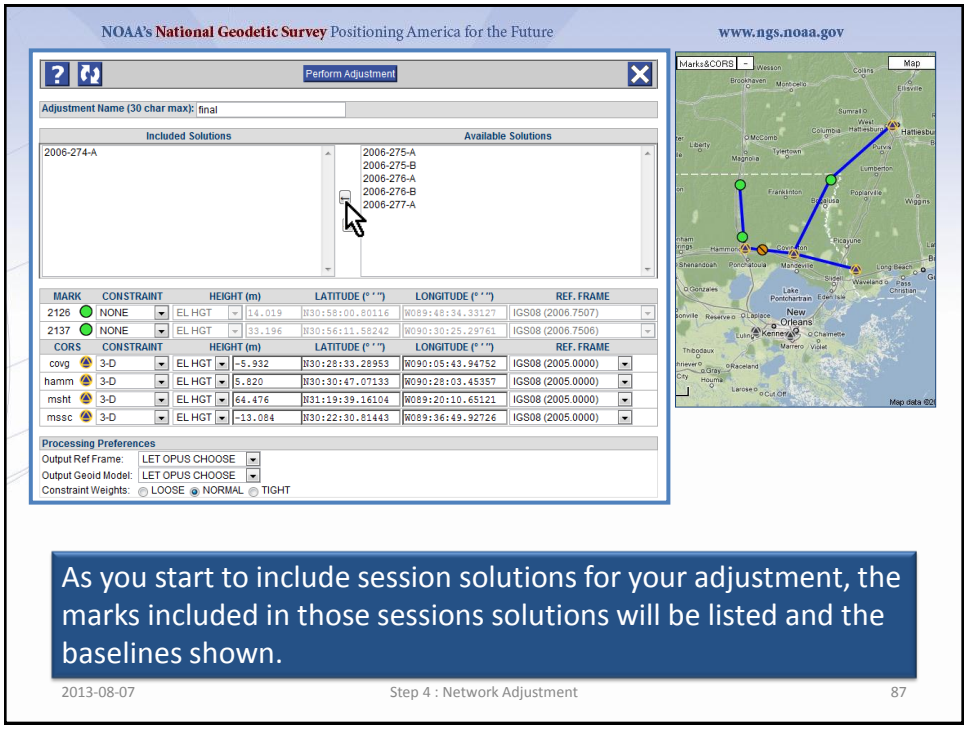
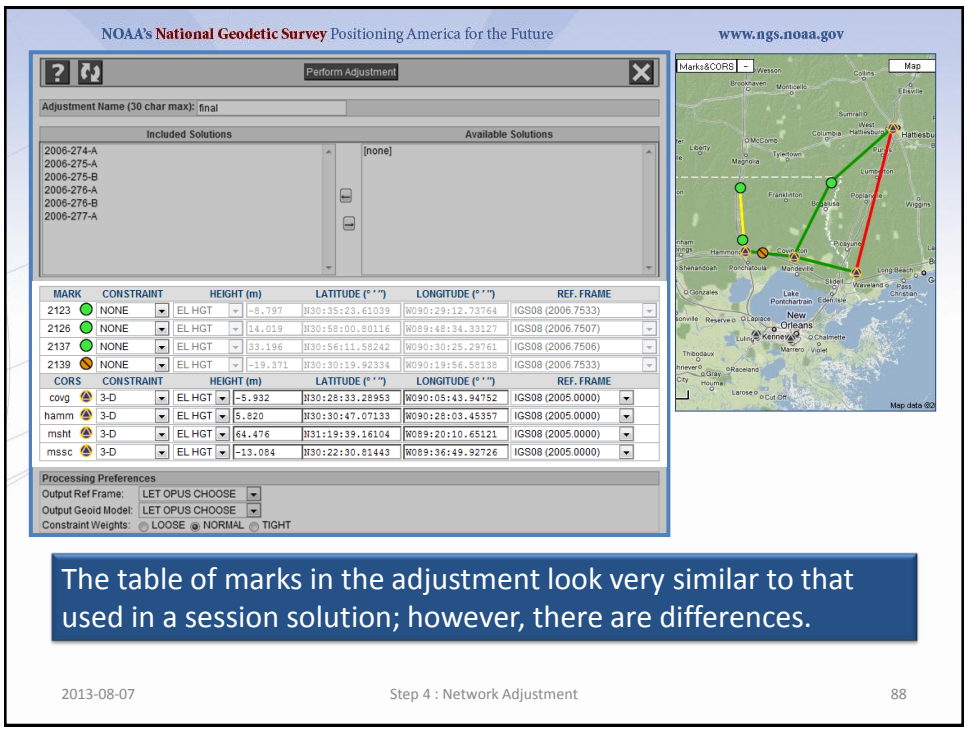
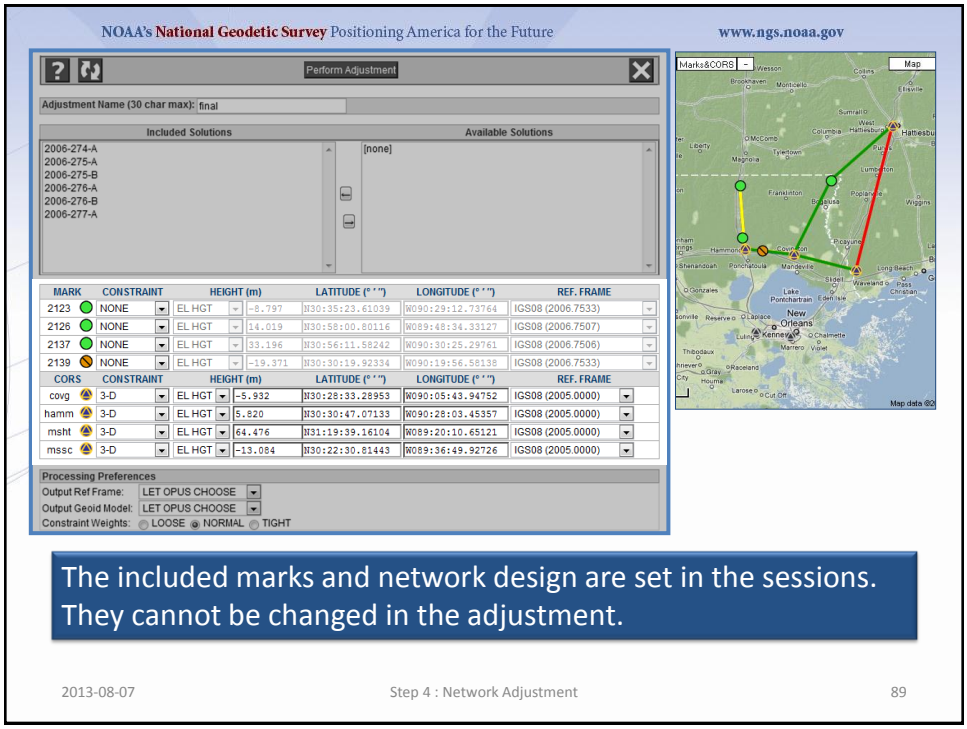

NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
Perform Adjustment
Adjustment Name (30 char max): final
Included Solutions
Available Solutions
[add]
2006-274-A
2006-275-A
2006-275-B
2006-276-A
2006-276-B
2006-277-A
MARK CONSTRAINT HEIGHT (m) LATITUDE (° ' ") LONGITUDE (° ' ") REF. FRAME
CORS CONSTRAINT HEIGHT (m) LATITUDE (° ' ") LONGITUDE (° ' ") REF. FRAME
Processing Preferences
Output Ref Frame: LET OPUS CHOOSE
Output Geoid Model: LET OPUS CHOOSE
Constraint Weights: LOOSE NORMAL TIGHT
Marks&CORS
Map
All completed session solutions are listed. At least one must be included. Only one solution from a session should be included if alternates exist.
2013-08-07
Step 4 : Network Adjustment
86



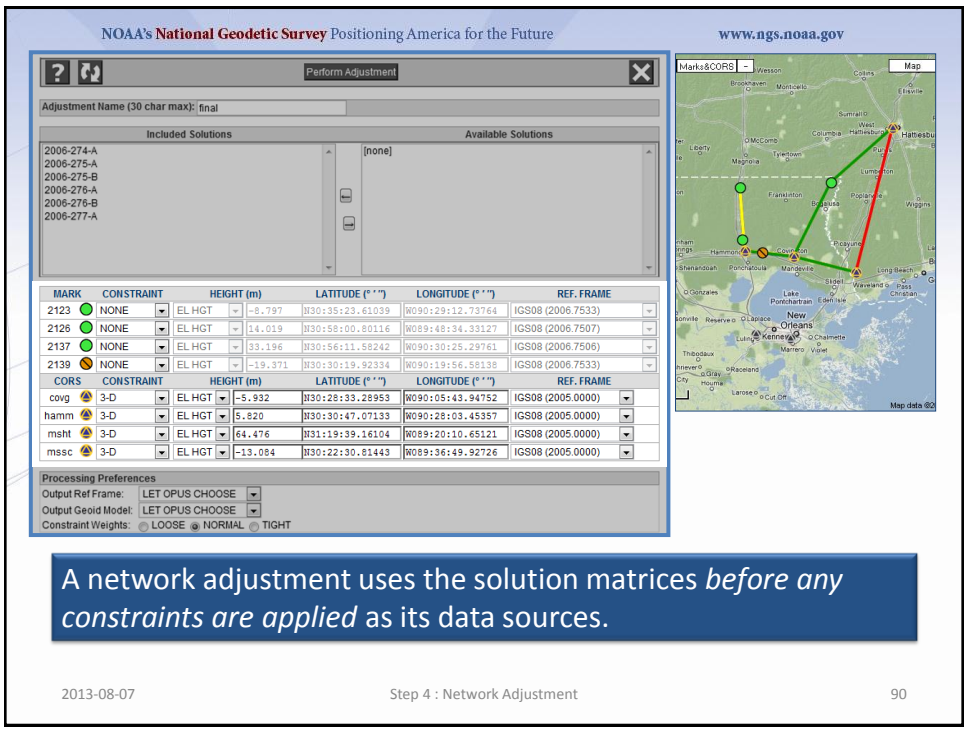
As you start to include session solutions for your adjustment, the marks included in those sessions solutions will be listed and the baselines shown.



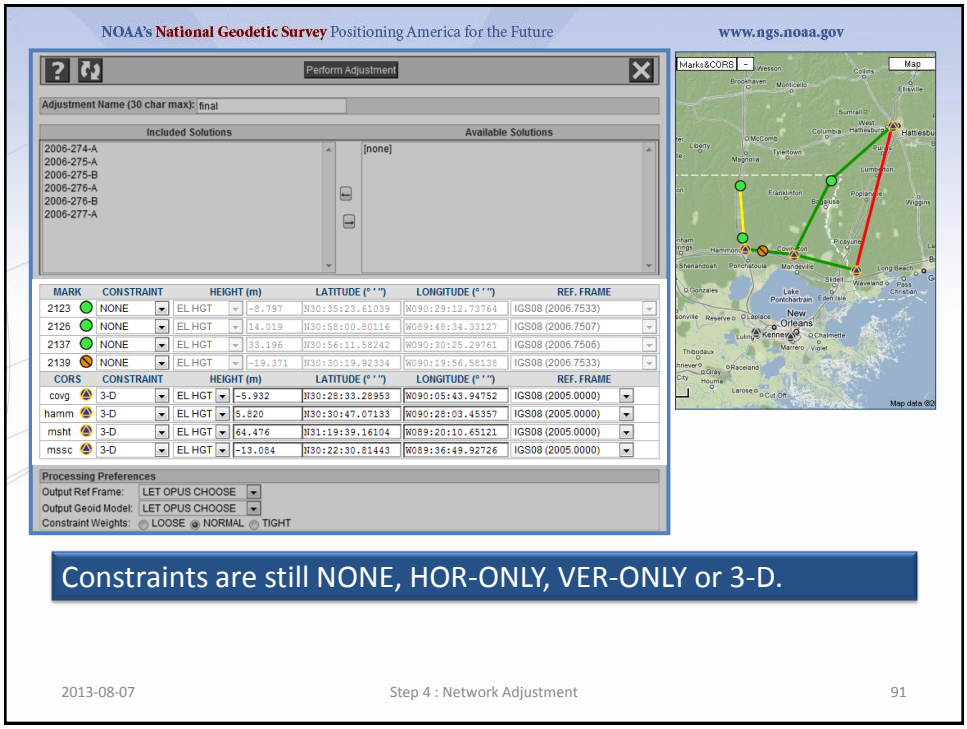
The table of marks in the adjustment look very similar to that used in a session solution; however, there are differences.



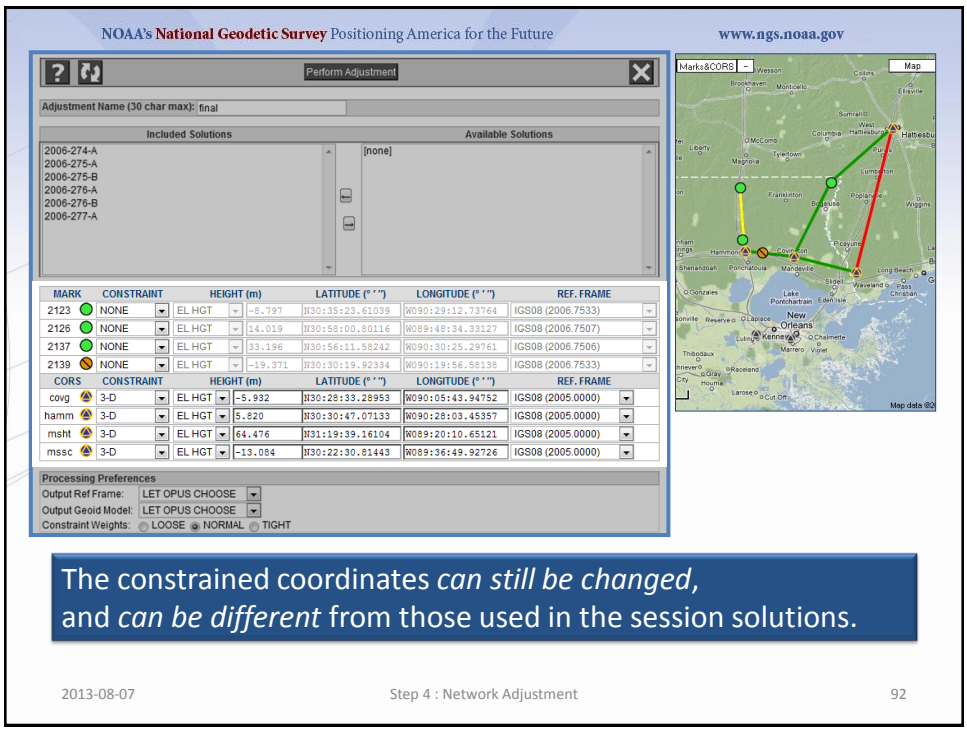
The included marks and network design are set in the sessions. They cannot be changed in the adjustment.



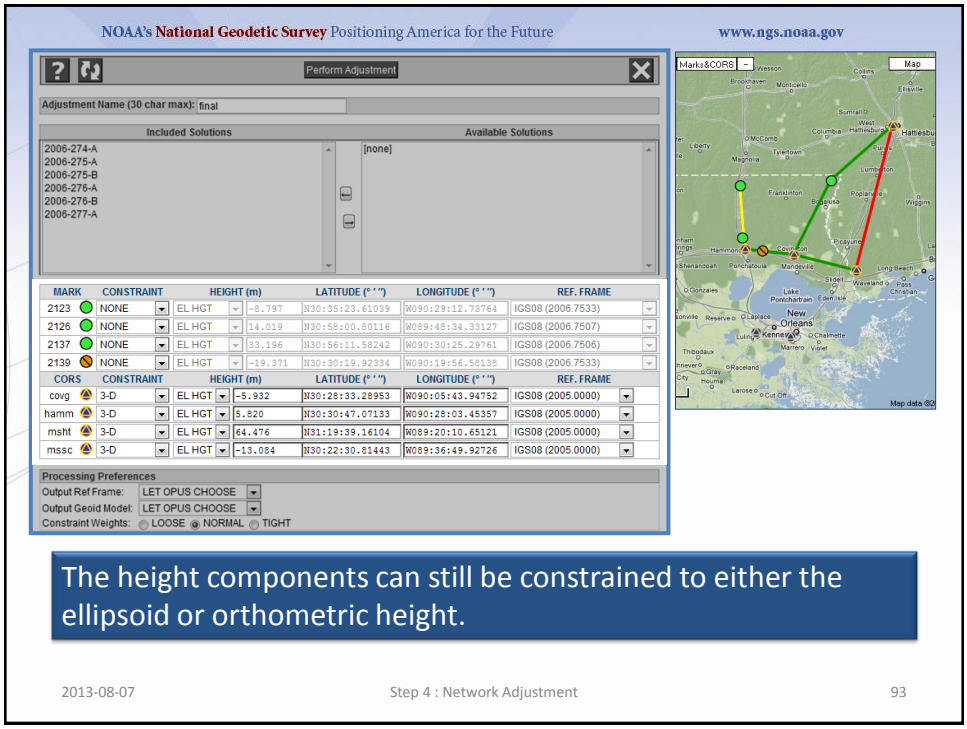
A network adjustment uses the solution matrices *before any constraints are applied* as its data sources.



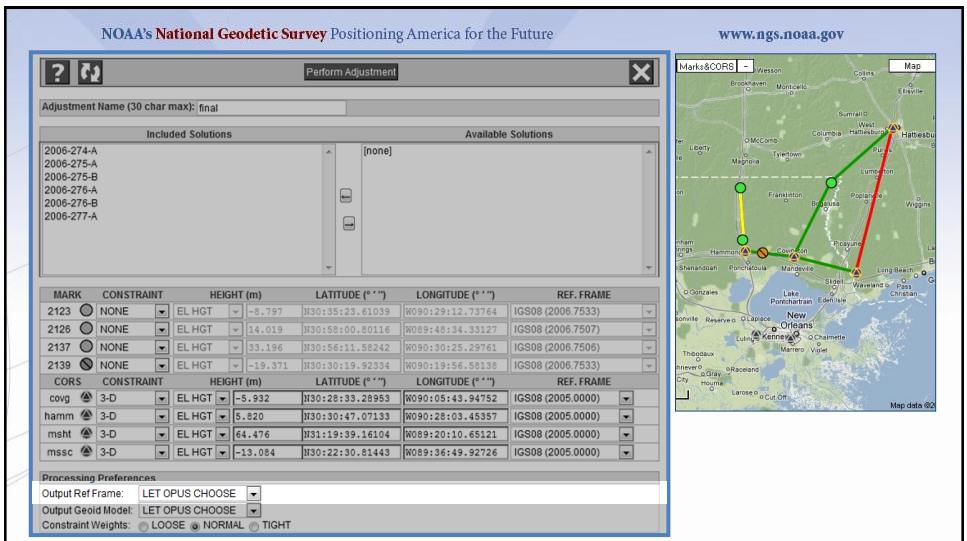
Constraints are still NONE, HOR-ONLY, VER-ONLY or 3-D.



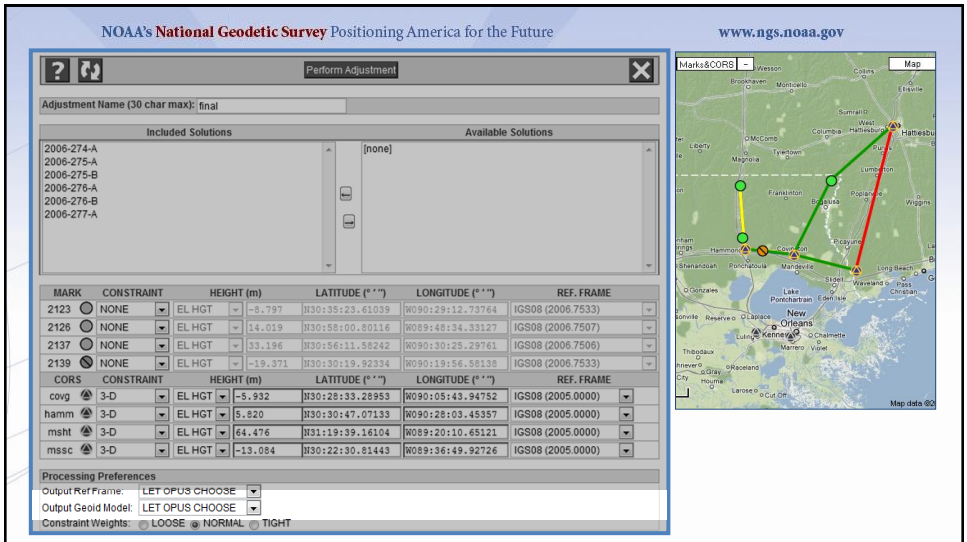
The constrained coordinates *can still be changed*, and *can be different* from those used in the session solutions.



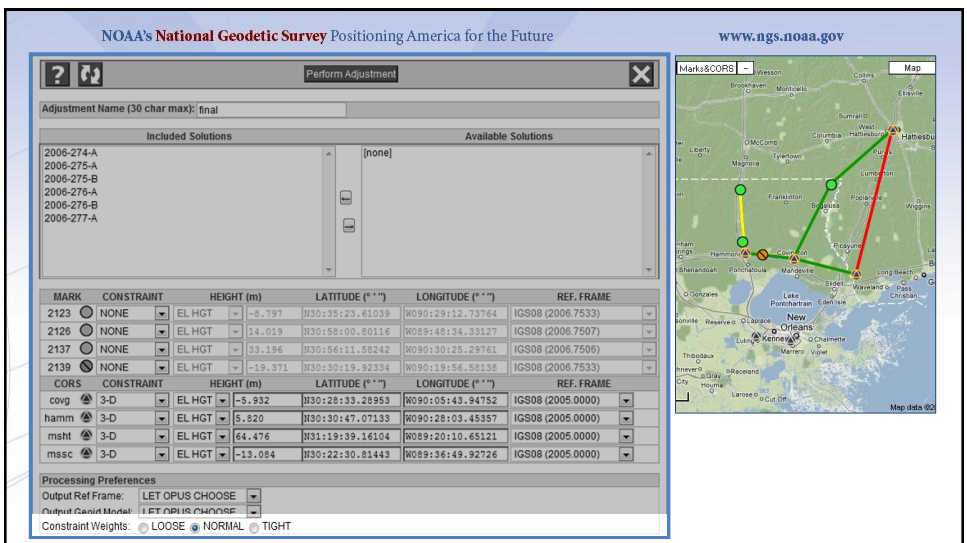
The height components can still be constrained to either the ellipsoid or orthometric height.



All processing remains in the ITRF, but an alternate reference frame can be selected. If possible, the ITRF coordinates will be transformed into the output frame and reported, …



… the geoid or hybrid-geoid model used to compute the orthometric heights given in the reports can be specified …



… and the constraint weight selected:
LOOSE ≈ 1 m, NORMAL ≈ 1 cm , TIGHT≈ 0.1 mm.

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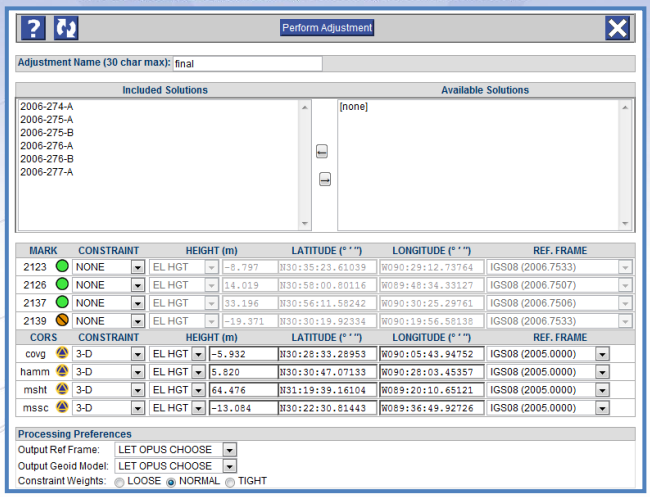

When the selections are complete, click the "Perform Adjustment" button in the control bar at the top of the window.

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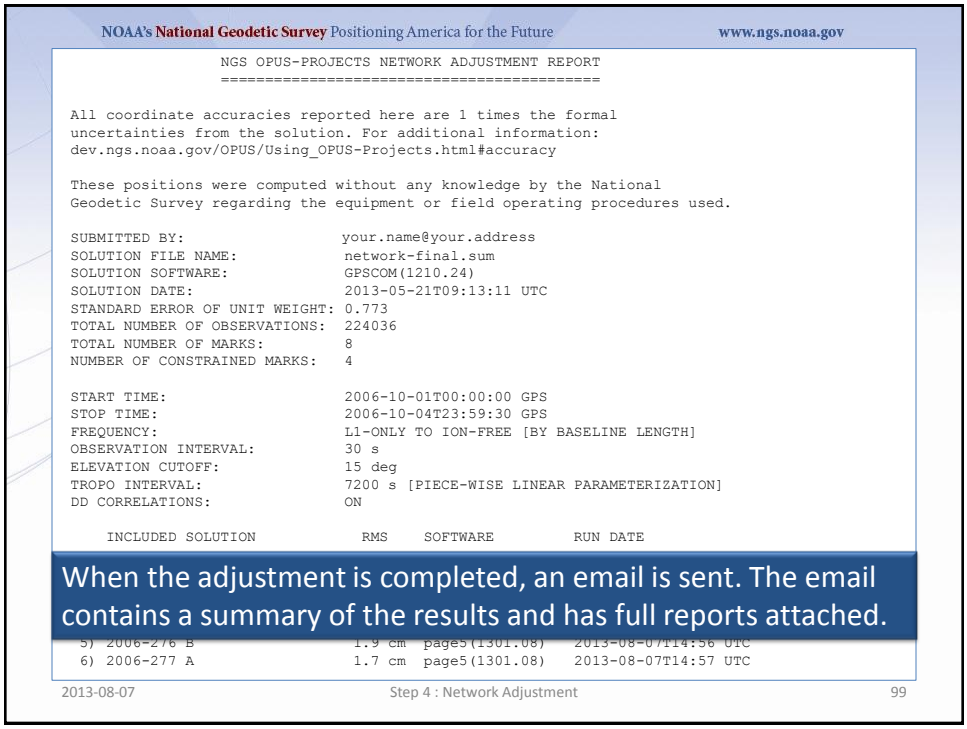
OPUS Projects Processing Queue Confirmation

```
The network adjustment "final" was queued at 2013-05-21T13:10:34 UTC.
When the processing is completed, a solution summary and other reports will
be emailed to mark.schenewerk@noaa.gov.

There are 0 processing requests in queue before yours.
The estimated time to processing completion is 1 minute.
Please be aware that this message was created when the request was queued
and the time to completion will not be updated by refreshing this page.

6 solutions were selected containing 8 marks in total.
Of these marks, 4 marks were unconstrained and 4 marks were constrained.

Source Solutions: 2006-274-A, 2006-275-A, 2006-275-B, 2006-276-A,
  2006-276-B, 2006-277-A

Unconstrained marks
  2126, 2137, 2123, 2139

Constrained marks
  covg 3-D      N30:28:33.28953 W090:05:43.94752 -5.932 m EL HGT IGS08 (2005.0000)
  hamm 3-D      N30:30:47.07133 W090:28:03.45357 5.820 m EL HGT IGS08 (2005.0000)
  msht 3-D      N31:19:39.16104 W089:20:10.65121 64.476 m EL HGT IGS08 (2005.0000)
  mssc 3-D      N30:22:30.81443 W089:36:49.92726 -13.084 m EL HGT IGS08 (2005.0000)

The network design, observation elevation cut-off and
```

At that time, the selections are checked, inserted in the processing queue and a printable summary is created. The adjustment rarely takes more than a few minutes once it reaches the top of the queue.


NOAA's National Geodetic Survey Positioning America for the Future
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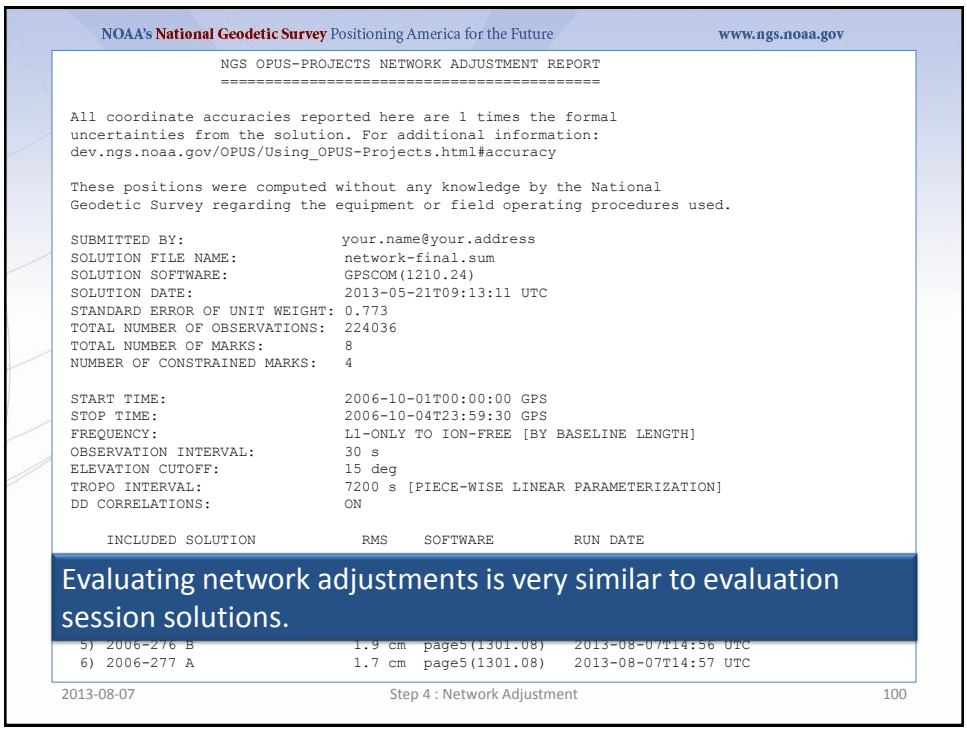
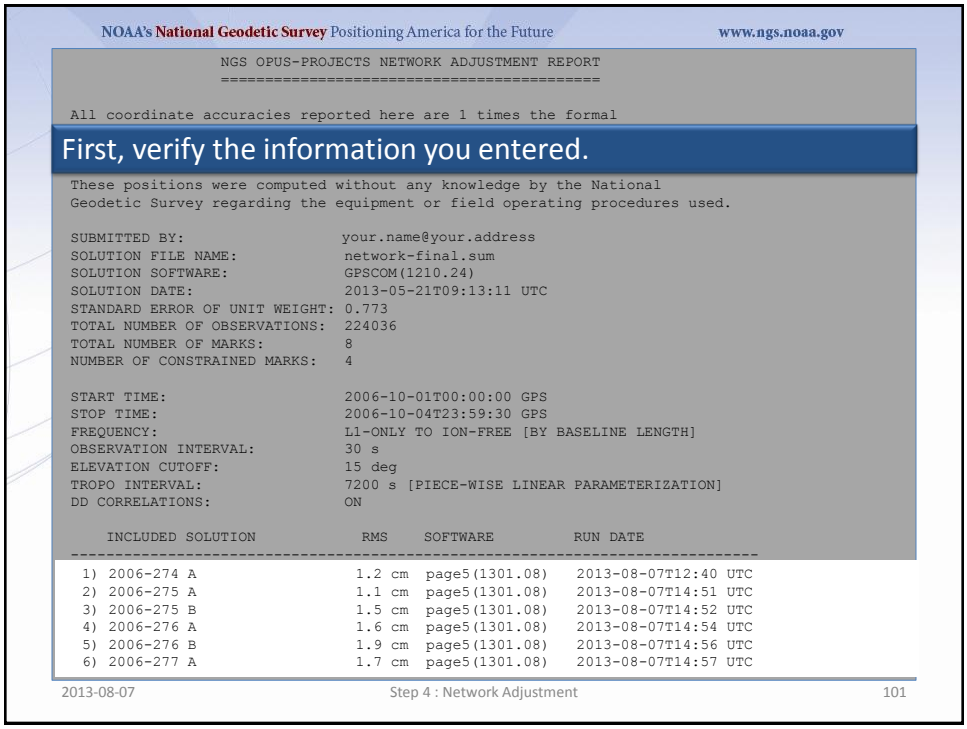
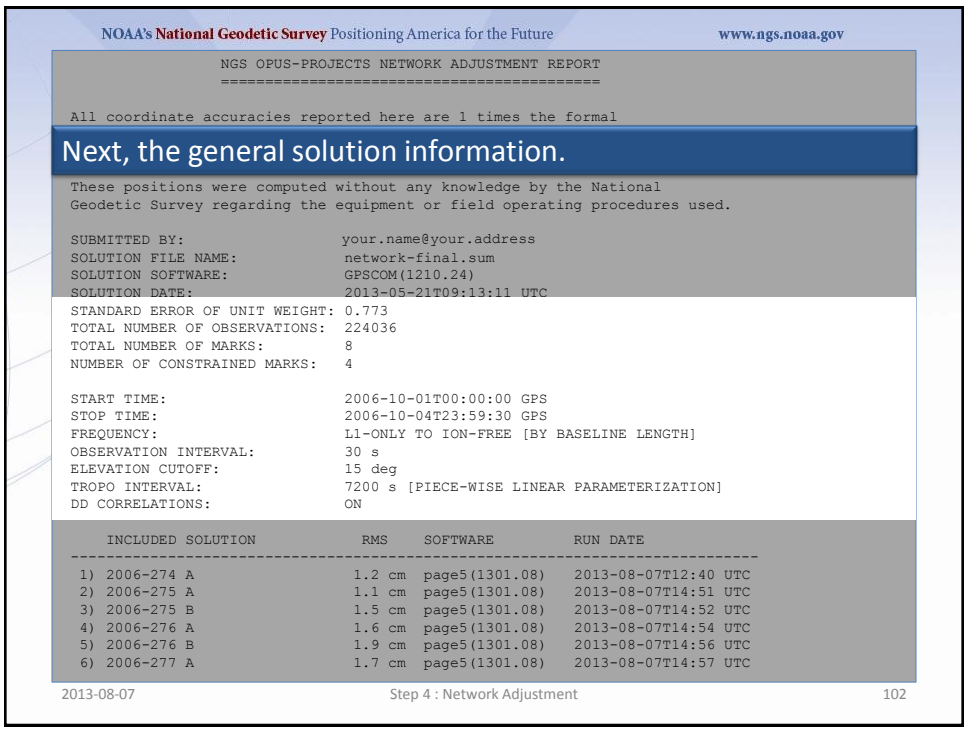
NGS OPUS-PROJECTS NETWORK ADJUSTMENT REPORT
All coordinate accuracies reported here are 1 times the formal
uncertainties from the solution. For additional information:
dev.ngs.noaa.gov/OPUS/Using_OPUS-Projects.html#accuracy
These positions were computed without any knowledge by the National
Geodetic Survey regarding the equipment or field operating procedures used.
SUBMITTED BY: your.name@your.address
SOLUTION FILE NAME: network-final.sum
SOLUTION SOFTWARE: GPSCOM(1210.24)
SOLUTION DATE: 2013-05-21T09:13:11 UTC
STANDARD ERROR OF UNIT WEIGHT: 0.773
TOTAL NUMBER OF OBSERVATIONS: 224036
TOTAL NUMBER OF MARKS: 8
NUMBER OF CONSTRAINED MARKS: 4
START TIME: 2006-10-01T00:00:00 GPS
STOP TIME: 2006-10-04T23:59:30 GPS
FREQUENCY: L1-ONLY TO ION-FREE [BY BASELINE LENGTH]
OBSERVATION INTERVAL: 30 s
ELEVATION CUTOFF: 15 deg
TROPO INTERVAL: 7200 s [PIECE-WISE LINEAR PARAMETERIZATION]
DD CORRELATIONS: ON
INCLUDED SOLUTION RMS SOFTWARE RUN DATE
When the adjustment is completed, an email is sent. The email contains a summary of the results and has full reports attached.
5) 2006-276 B 1.9 cm page5(1301.08) 2013-08-07T14:56 UTC
6) 2006-277 A 1.7 cm page5(1301.08) 2013-08-07T14:57 UTC
2013-08-07 Step 4 : Network Adjustment 99


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
NGS OPUS-PROJECTS NETWORK ADJUSTMENT REPORT
All coordinate accuracies reported here are 1 times the formal
uncertainties from the solution. For additional information:
dev.ngs.noaa.gov/OPUS/Using_OPUS-Projects.html#accuracy
These positions were computed without any knowledge by the National
Geodetic Survey regarding the equipment or field operating procedures used.
SUBMITTED BY: your.name@your.address
SOLUTION FILE NAME: network-final.sum
SOLUTION SOFTWARE: GPSCOM(1210.24)
SOLUTION DATE: 2013-05-21T09:13:11 UTC
STANDARD ERROR OF UNIT WEIGHT: 0.773
TOTAL NUMBER OF OBSERVATIONS: 224036
TOTAL NUMBER OF MARKS: 8
NUMBER OF CONSTRAINED MARKS: 4
START TIME: 2006-10-01T00:00:00 GPS
STOP TIME: 2006-10-04T23:59:30 GPS
FREQUENCY: L1-ONLY TO ION-FREE [BY BASELINE LENGTH]
OBSERVATION INTERVAL: 30 s
ELEVATION CUTOFF: 15 deg
TROPO INTERVAL: 7200 s [PIECE-WISE LINEAR PARAMETERIZATION]
DD CORRELATIONS: ON
INCLUDED SOLUTION RMS SOFTWARE RUN DATE
Evaluating network adjustments is very similar to evaluation session solutions.
5) 2006-276 B 1.9 cm page5(1301.08) 2013-08-07T14:56 UTC
6) 2006-277 A 1.7 cm page5(1301.08) 2013-08-07T14:57 UTC
2013-08-07 Step 4 : Network Adjustment 100


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
NGS OPUS-PROJECTS NETWORK ADJUSTMENT REPORT
All coordinate accuracies reported here are 1 times the formal
First, verify the information you entered.
These positions were computed without any knowledge by the National
Geodetic Survey regarding the equipment or field operating procedures used.
SUBMITTED BY: your.name@your.address
SOLUTION FILE NAME: network-final.sum
SOLUTION SOFTWARE: GPSCOM(1210.24)
SOLUTION DATE: 2013-05-21T09:13:11 UTC
STANDARD ERROR OF UNIT WEIGHT: 0.773
TOTAL NUMBER OF OBSERVATIONS: 224036
TOTAL NUMBER OF MARKS: 8
NUMBER OF CONSTRAINED MARKS: 4
START TIME: 2006-10-01T00:00:00 GPS
STOP TIME: 2006-10-04T23:59:30 GPS
FREQUENCY: L1-ONLY TO ION-FREE [BY BASELINE LENGTH]
OBSERVATION INTERVAL: 30 s
ELEVATION CUTOFF: 15 deg
TROPO INTERVAL: 7200 s [PIECE-WISE LINEAR PARAMETERIZATION]
DD CORRELATIONS: ON
INCLUDED SOLUTION RMS SOFTWARE RUN DATE
1) 2006-274 A 1.2 cm page5(1301.08) 2013-08-07T12:40 UTC
2) 2006-275 A 1.1 cm page5(1301.08) 2013-08-07T14:51 UTC
3) 2006-275 B 1.5 cm page5(1301.08) 2013-08-07T14:52 UTC
4) 2006-276 A 1.6 cm page5(1301.08) 2013-08-07T14:54 UTC
5) 2006-276 B 1.9 cm page5(1301.08) 2013-08-07T14:56 UTC
6) 2006-277 A 1.7 cm page5(1301.08) 2013-08-07T14:57 UTC
2013-08-07 Step 4 : Network Adjustment 101


NOAA's National Geodetic Survey Positioning America for the Future
www.ngs.noaa.gov
NGS OPUS-PROJECTS NETWORK ADJUSTMENT REPORT
All coordinate accuracies reported here are 1 times the formal
Next, the general solution information.
These positions were computed without any knowledge by the National
Geodetic Survey regarding the equipment or field operating procedures used.
SUBMITTED BY: your.name@your.address
SOLUTION FILE NAME: network-final.sum
SOLUTION SOFTWARE: GPSCOM(1210.24)
SOLUTION DATE: 2013-05-21T09:13:11 UTC
STANDARD ERROR OF UNIT WEIGHT: 0.773
TOTAL NUMBER OF OBSERVATIONS: 224036
TOTAL NUMBER OF MARKS: 8
NUMBER OF CONSTRAINED MARKS: 4
START TIME: 2006-10-01T00:00:00 GPS
STOP TIME: 2006-10-04T23:59:30 GPS
FREQUENCY: L1-ONLY TO ION-FREE [BY BASELINE LENGTH]
OBSERVATION INTERVAL: 30 s
ELEVATION CUTOFF: 15 deg
TROPO INTERVAL: 7200 s [PIECE-WISE LINEAR PARAMETERIZATION]
DD CORRELATIONS: ON
INCLUDED SOLUTION RMS SOFTWARE RUN DATE
1) 2006-274 A 1.2 cm page5(1301.08) 2013-08-07T12:40 UTC
2) 2006-275 A 1.1 cm page5(1301.08) 2013-08-07T14:51 UTC
3) 2006-275 B 1.5 cm page5(1301.08) 2013-08-07T14:52 UTC
4) 2006-276 A 1.6 cm page5(1301.08) 2013-08-07T14:54 UTC
5) 2006-276 B 1.9 cm page5(1301.08) 2013-08-07T14:56 UTC
6) 2006-277 A 1.7 cm page5(1301.08) 2013-08-07T14:57 UTC
2013-08-07 Step 4 : Network Adjustment 102

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```
 hamm-2126      80.640 km       1.0 cm      2471      2.3%    100.0%     2
 msht-mssc     108.867 km       1.9 cm     15604      5.2%     93.4%     5

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

Finally, the individual mark results.

```
MARK:       2123 (2123     1)

REF FRAME:         NAD_83(2011) (2010.0000)                 IGS08 (2006.7552)
X:                   -46694.793 m     0.002 m            -46695.473 m     0.002 m
Y:                 -5495064.269 m     0.002 m          -5495062.776 m     0.002 m
Z:                  3226832.869 m     0.003 m           3226832.701 m     0.003 m
LAT:            30 35 23.59014       0.003 m        30 35 23.61003       0.003 m
E LON:         269 30 47.28881       0.002 m       269 30 47.26283       0.002 m
W LON:          90 29 12.71119       0.002 m        90 29 12.73717       0.002 m
EL HGT:                 -7.427 m     0.002 m                -8.793 m     0.002 m
ORTHO HGT:              19.630 m     0.012 m  (H = h - N WHERE N = GEOID12A HGT)

                  UTM COORDINATES     STATE PLANE COORDINATES
                   UTM (Zone 15)          SPC (1702 LA S)
NORTHING (Y)        3386842.988 m          231955.819 m
EASTING (X)          740977.315 m         1081182.819 m
CONVERGENCE         1.27952553 deg         0.42324530 deg
POINT SCALE         1.00031642             0.99997843
COMBINED FACTOR     1.00031759             0.99997960

US NATIONAL GRID DESIGNATOR: 15RYP4097786842 (NAD 83)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

MARK:       2126 (2126     1)

REF FRAME:         NAD_83(2011) (2010.0000)                 IGS08 (2006.7523)
```


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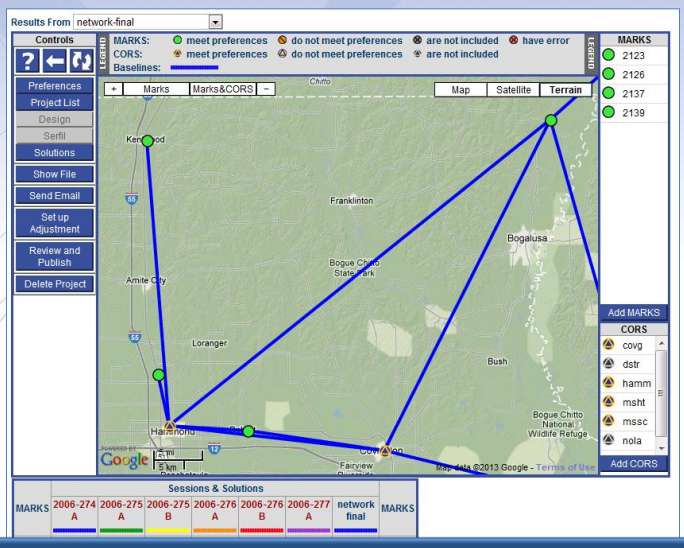
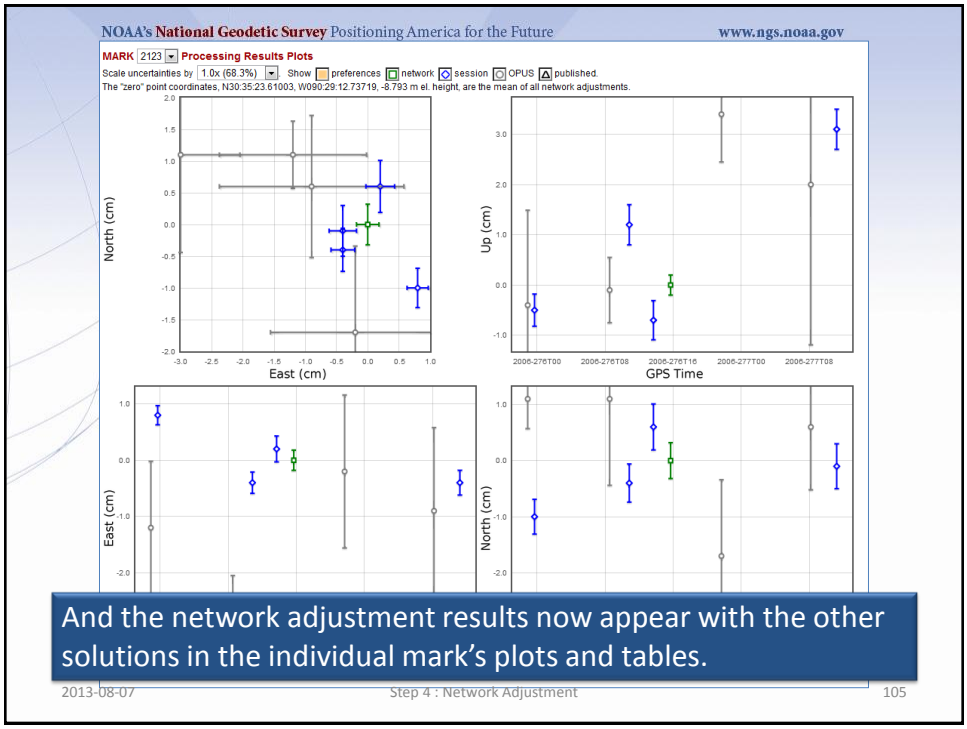
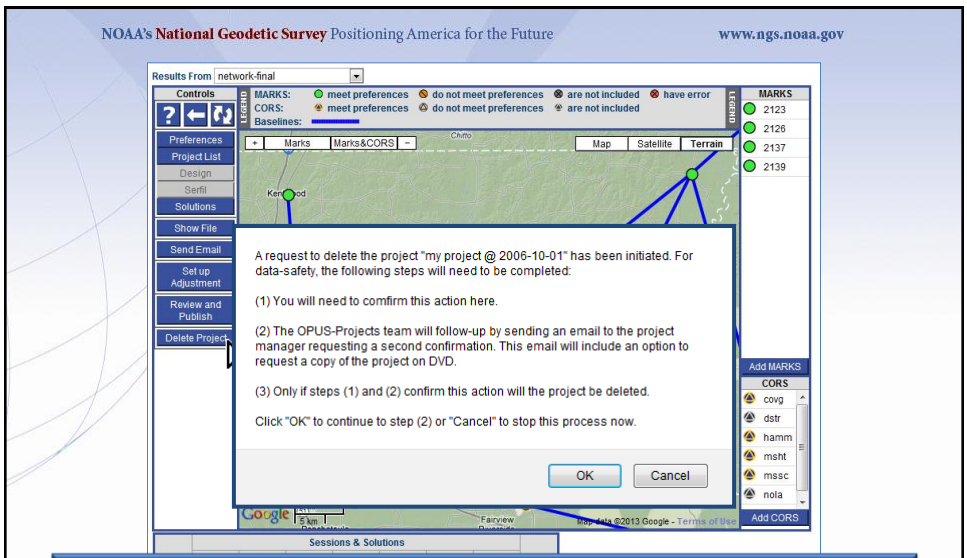


Returning to the manager's page, the network adjustment is now available for review .



And the network adjustment results now appear with the other solutions in the individual mark's plots and tables.



The last step is always to delete your project. You can keep your project on-line for as long as needed, but be courteous and "delete when complete."

OPUS Projects Manager Training

Step 4 : Network Adjustment

Dr. Mark Schenewerk
mark.schenewerk@noaa.gov
816-994-3067