# Procedure for Projecting and Transforming American Samoa GIS Data from Stateplane ASD62 to UTM NAD83.

This procedure has been developed in a joint effort between the United States National Geodetic Survey (NGS), the American Samoa Government Department of Commerce (DOC), and the United States National Park Service (NPS). The procedure is designed to convert GIS data in the American Samoa Stateplane Coordinate System and in the American Samoa Datum of 1962 (ASD62) to the Universal Transverse Mercator (UTM) Zone 2 South Coordinate System in the North American Datum of 1983 (NAD83). The process also produces copies of the GIS data in the Geographical Coordinate System for both the ASD62 and NAD83 datums. Users of this procedure will note that projections for files in the NAD83 datum are defined in the WGS84 datum using Arc Toolbox because ESRI software does not yet include a Zone 2 South projection file for the UTM coordinate system in the NAD83 datum (refer to part III). Tests conducted using highly accurate monument point data from the island of Tutuila in both Geographical and UTM coordinate systems (supplied by the NGS, NAD83 datum), displayed minimal error (millimeters) as a result of this conversion procedure. The small degree of error will be inconsequential for most applications.

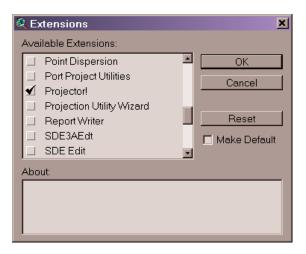
The software required to perform the necessary operations includes ESRI® ArcView 3.2a<sup>™</sup> and ArcToolbox 8.1<sup>™</sup>. The operator will also need the "Projector!" and "ShapeNADCON" tools (extensions) for ArcView. ArcView versions 3.1 and 3.2 should have included the "Projector!" utility as a sample extension. If necessary, copy the extension into the EXT32 folder. From: C:\ESRI\AV\_GIS30\ARCVIEW\Samples\ext\prjctr.avx To: C:\ESRI\AV\_GIS30\ARCVIEW\EXT32\prjctr.avx The "ShapeNADCON" extension was created by the NGS in 2001. Both

extensions can be acquired by contacting the personnel in the GIS section of the DOC. Questions regarding the operation of this procedure can be directed to <u>kcronk@doc.asg.as</u>.

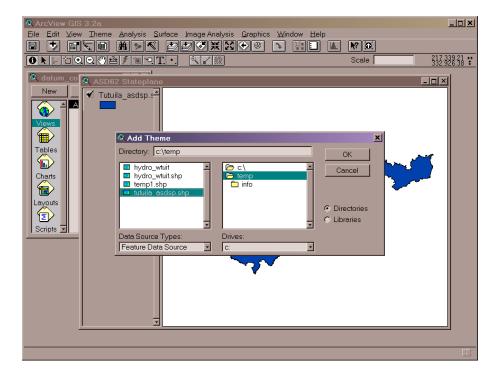
# Procedure for Projecting and Transforming American Samoa GIS Data from Stateplane ASD62 to UTM WGS84.

*Part I* – Project shapefile from American Samoa Stateplane Coordinate System to Geographic Coordinate System (both in the American Samoa Datum of 1962):

1. Open ArcView, go to "File" drop-down menu, select "Extensions", scroll down and check "Projector!" tool extension, and click "OK".



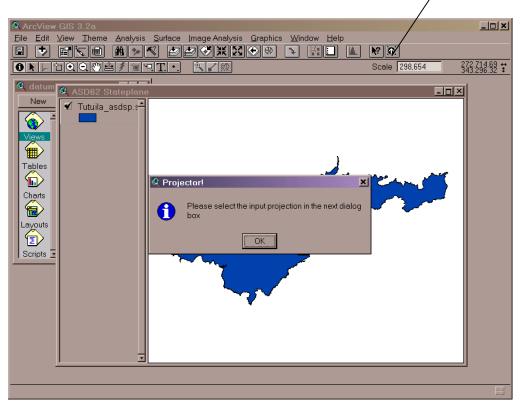
2. Go to "View" drop-down menu, click "Add Theme", browse to directory containing shapefile in the Stateplane Coordinate System in the American Samoa Datum of 1962, select file, and click "OK".



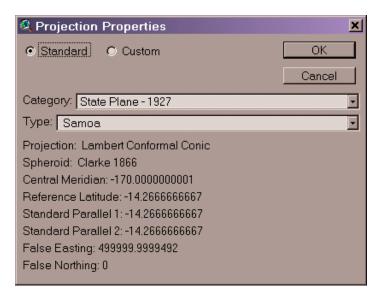
3) Go to the "View" drop-down menu, select "Properties", set "Map Units" to feet, and click "OK".

| 🍳 View Properties  |                      | ×        |
|--|----------------------|----------|
| Name: ASD62 Stateplane                                   |                      | OK       |
| Creation Date: Jesday, February                          | 12, 2002 03:02:26 PM | Cancel   |
| Creator:   |                      |          |
| Map Units: <mark>feet</mark><br>Distance Units: Junknown | v<br>v               |          |
| Projection   | Area Of Interest     |          |
| Background Color:  | Select Color         |          |
| Comments:  |                      |          |
|  |                      | 4<br>  Y |

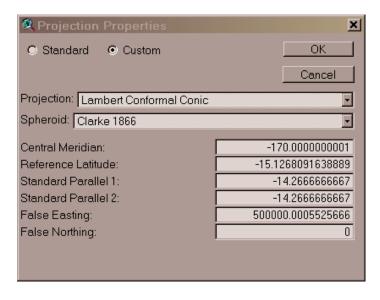
4. Make sure the theme is active, click on the "Projector!" button , and click "OK".



5. Select "Category: State Plane – 1927" and Select "Type: Samoa" and then click on the "Custom" radio button.



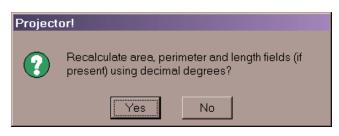
6. Change "Reference Latitude" to -15.1268091638889 and click "OK".



7. Pick output units - select "decimal degrees" and click "OK".



8. Recalculate area, perimeter....? Select "Yes".



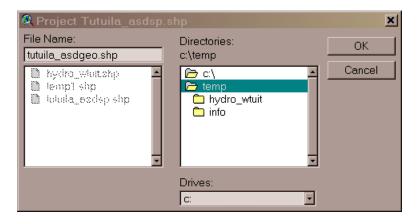
9. Add projected shapefile(s) as theme(s) to a view? Select "Yes".



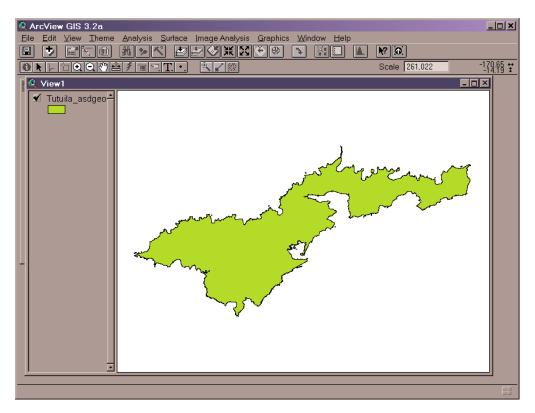
10. Add Theme to: select "<New View>" and click "OK".



11. Browse to directory where you want to store the new shapefile (that will be in American Samoa Datum and the Geographic Coordinate System), give the shapefile an appropriate name, and click "OK".

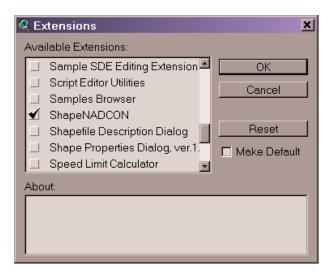


12. The new ASD62 Geographic shapefile will now appear in a separate view window.



# *Part II* – Convert shapefile from American Samoa Datum of 1962 (ASD62) to North American Datum of 1983 (NAD83):

1. Open ArcView, go to "File" drop-down menu, select "Extensions", scroll down and check "ShapeNADCON" tool extension, and click "OK".



2. Open a view window (any view window will do) to make the "ShapeNADCON" button active, click the button, and then click "OK".

| ArcView GIS 3.2a              |   |  | <u>_0×</u>                          |
|-------------------------------|---|--|-------------------------------------|
| Eile Edit View Iheme Analysis |   | Help ShapeNADCON                                       |                                     |
|                               |   | Scale 261,022  | -170.55 <b>↔</b><br>-14.19 <b>↓</b> |
| ASD62 Geographic              | 1 | 83 to (NAD27/Island De C<br>Browse<br>Browse<br>Browse |                                     |
|                               |   |  | ===                                 |

3. Click on the upper "Browse" button in the "ShapeNADCON" window, browse and select the ASD62 shapefile to be converted to NAD83.

| AreView GIS 3 2a<br>Ede Edit View Theme Analysis Surfa   | n Janana Anal a                         | is <u>G</u> raphics <u>Window</u> Help ShapeNADCON   |                  | دلمله     |
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| My Notwork Pla   | File name.<br>Files of type:            | tutuile_asdgeoshp<br>ESRIShapeFiles (*shp)<br>Copen as read only   | Open     Cancel  |           |
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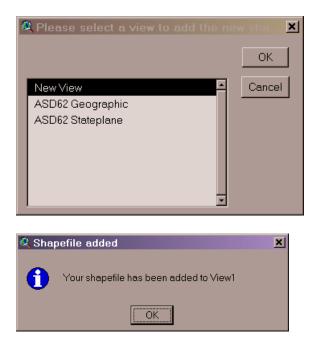
4. Click on the lower "Browse" button in the "ShapeNADCON" window, browse to the directory where the new NAD83 file will be stored, type an appropriate name for the shapefile into the "File name" box and click on "Save".

| ArcView GIS 3.2a          |   |   |            |
|---------------------------|---|---|------------|
|                           | rface Image Analysis Graphics Window Help ShapeNADCON       |   |            |
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|                           | Save as type: ESRI ShapeFiles (*.shp)                       | Cancel  |            |
|                           |   |   |            |
|                           |   |   |            |
|                           |   |   | 111        |

5. Ensure that the radio button "Datum (NAD27/Island Datum) to NAD83 is selected and click "OK". Then click "OK" on the "Success!" message window.

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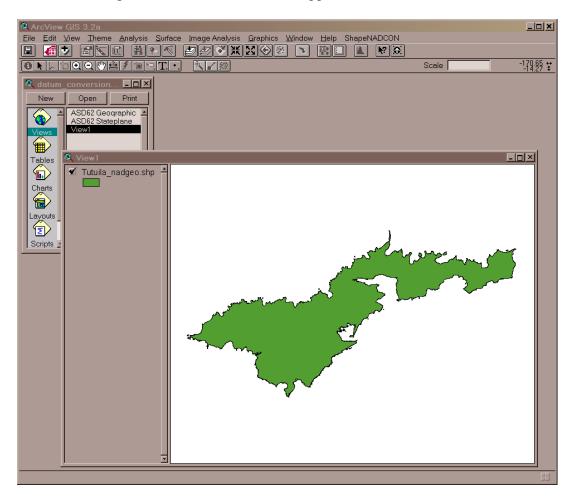
6. Select "New View" and click "OK". Click "OK" on "Shapefile added" message window.



7. Click on the "Quit" button in the "ShapeNADCON" window.

| ShapeNADCON        | <u>&gt;</u>   | ٢ |
|--------------------|---|---|
| Convert:           |   |   |
| Datum (NAD27/Islar | nd Datum) to NA 💿 Datum NAD83 to (NAD27/Island Datum)       |   |
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| Output Shapefi     | C:\temp\tutuila_nadgeo.shp Browse                           |   |
|                    | Note: Output shapefiles will be in Latitude/Longitude       |   |
| Help               | OKQuit  |   |

8. The new shapefile in NAD83 datum will appear in a new view window.



### *Part III* – Project shapefile from Geographic Coordinate System to UTM Zone 2 South Coordinate System (both in the North American Datum of 1983):

### Step 1: 'Defining the Projection'

1. Open ArcGIS 8.1 ArcToolbox, click on "Projections", and double-click on "Define Projection Wizard (shapefiles, geodatabase)"



2. Click on "Browse" button and select the desired shapefile in Geographical Coordinates and the NAD83 datum. Click "Next".

|  | a, geodatabase)<br>Int to assign a coordinate system<br>pefiles and geodatabase feature classes and | ×<br>t |  |  |
|--|---|--------|--|--|
| Data   | Coordinate System   | ×      |  |  |
| C\GIS\tutuila\base_maps\tutuila_nadge                          | GCS_Assumed_Geographic_1  |        |  |  |
| Data in this list will be assigned the same coordinate system. |   |        |  |  |
|  | <back next=""> (</back>   | Cancel |  |  |

3. Click the "Select Coordinate System" button.

| ۶ | > Define Projection Wizard (shapefiles, geodatabase)       |  |  |  |  |
|---|--|--|--|--|--|
|   | Select the coordinate system you want assigned to the data |  |  |  |  |
|   | Details:   |  |  |  |  |
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|   | Select Coordinate System                                   |  |  |  |  |
|   |  |  |  |  |  |
|   | <back next=""> Cancel</back>                               |  |  |  |  |
|   |  |  |  |  |  |

4. Click the "Select" button.

| Spatial Reference | Properties  | × |
|-------------------|---|---|
| Coordinate System |   | _ |
| Name: Unknor      | wn  |   |
| Details:          |   |   |
|                   | ×   |   |
|                   |   |   |
|                   |   |   |
|                   |   |   |
|                   |   |   |
|                   | <b>y</b>  |   |
| Select            | Select a predefined coordinate system.  |   |
| Import            | Import a coordinate system and X/Y, Z and M<br>domains from an existing geodataset (e.g.,<br>feature dataset, feature class, raster). |   |
| New +             | Create a new coordinate system.   |   |
| Modify            | Edit the properties of the currently selected<br>coordinate system.   |   |
| Clear             | Sets the coordinate system to Unknown.  |   |
| Save As           | Save the coordinate system to a file.   |   |
|                   | OK Cancel Apply   |   |

5. Select the "Geographic Coordinate System" folder.

| Browse for Co | ordinate System X                      |
|---------------|--|
| Look in:  🕅   | Coordinate Systems 💽 🕒 🗊 😁 🧱 🗰 🕮       |
|               | ordinate Systems<br>Coordinate Systems |
| Name:         | Geographic Coordinate Systems Add      |
| Show of type: | Spatial references Cancel              |

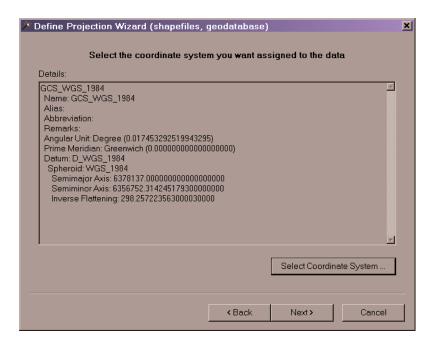
6. Click on "World" and then select "WGS 1984.prj". Click "Add".

| Browse for Cod   | rdinate System     |         | ×      |
|--|--------------------|---------|--------|
| Look in: 🛄   | Vorld              | • • • • |        |
| © WGS 1984.pi<br>© WGS 1972.pi<br>© WGS 1972 T<br>© WGS 1966.pi<br>© NSWC 9Z-2.p | j<br>BE.prj<br>j   |         |        |
| Name:  |                    |         | Add    |
| Show of type:  | Spatial references | ×       | Cancel |

# 7. Click "Apply" and then "Ok".

| Spatial Reference   | Properties   |   | ×       |
|---|--|---|---------|
| Coordinate System   |  |   |         |
| Name: GCS_V   | VGS_1984   |   |         |
| Datum: D_WGS_1<br>Spheroid: WGS_1<br>Semimajor Axis:<br>Semiminor Axis: | eenwich (0.0000000)<br>184   | 00000000000)<br>1000000000<br>300000000 | Ĩ       |
| Select  | Select a predefin  | ed coordinate sys                       | tem.    |
| Import  | Import a coordinate system and X/Y, Z and M<br>domains from an existing geodataset (e.g.,<br>feature dataset feature class, raster). |   |         |
| New -   | Create a new coo   | rdinate system.                         |         |
| Modify Edit the properties of the currently selected coordinate system. |  |   | elected |
| Clear Sets the coordinate system to Unknown.                            |  |   |         |
| Save As   | Save the coordina  | ate system to a file                    | 9.      |
|   | ОК   | Cancel                                  | Apply   |

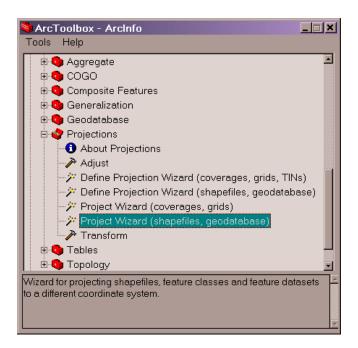
8. Click "Next" and then "Finish".



#### Part III - Step 2: "Project the data to UTM Zone 2 South WGS84\*."

\*in reality, the data will be in the NAD83 datum (see author's notes in the beginning).

9. Open ArcGIS 8.1 ArcToolbox, click on "Projections", and double-click on "Project Wizard (shapefiles, geodatabase)".



10. Click on "Browse" button *i*, select the shapefile whose projection was defined in the previous step and click "Next".

| 2 | Project Wizard (shapefiles, geodatabase)                       |                     |                      |            |  |  |
|---|--|---------------------|----------------------|------------|--|--|
|   | Select the dat<br>You can project shapefiles and geodatabas    | ta you want to pro  |                      | is wizard  |  |  |
|   |  |                     |                      | <b></b>    |  |  |
|   | Data   | Coordinate System   | n                    |            |  |  |
|   | C:\GIS\tutuila\base_maps\tutuila_nadge                         | GCS_WGS_1984        |                      |            |  |  |
|   | Data in this list will be projected to the same (<br>location. | coordinate system a | and stored in the se | ame output |  |  |
|   |  | < Back              | Next >               | Cancel     |  |  |

11. Click on "Browse" button select an appropriate destination folder to store the shapefile (the new projected UTM file) and specify a name. Click "Next".

| 🎾 Project Wizard (shapefiles, geodataba   | ise)              |           |         | × |
|---|-------------------|-----------|---------|---|
| Specify the feature of  | class that will b | e created |         |   |
| You have selected a single feature class or sh<br>feature dataset or folder to store the output. Yo |                   |           |         |   |
| Output location:  |                   |           |         |   |
| C:\GIS\tutuila\base_maps\UTM_WGS84\tutui  | la_utmwgs.shp     |           | <b></b> |   |
|   |                   |           |         |   |
|   |                   |           |         |   |
|   | < Back            | Next >    | Cancel  |   |

12. Click on the "Select Coordinate System" button.

| Project Wizard (shapefiles, geodatabase) |   |  |  |  |  |
|--|---|--|--|--|--|
|  | Select the coordinate system you want to assign to the data |  |  |  |  |
| Details:                                 |   |  |  |  |  |
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|  | Select Coordinate System                                    |  |  |  |  |
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# 13. Click the "Select" button.

| Spatial Reference       | Properties 🛛 🖬 🔝 🔀  |
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| Coordinate System       |   |
| Name: Unkno<br>Details: | wn  |
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| ,                       | _   |
| Select                  | Select a predefined coordinate system.  |
| Import                  | Import a coordinate system and X/Y, Z and M<br>domains from an existing geodataset (e.g.,<br>feature dataset, feature class, raster). |
| New •                   | Create a new coordinate system.   |
| Modify                  | Edit the properties of the currently selected coordinate system.  |
| Clear                   | Sets the coordinate system to Unknown.  |
| Save As                 | Save the coordinate system to a file.   |
|                         | OK Cancel Apply   |

14. Select "Project Coordinate Systems" folder.

| Browse for Coo | rdinate System                   | × |
|----------------|----------------------------------|---|
| Look in: 🕞 C   | ioordinate Systems 💽 🕒 🕥 🏾 📺 🎬 🏭 |   |
|                | oordinate Systems                |   |
| Name:          | Projected Coordinate Systems Add |   |
| Show of type:  | Spatial references Cancel        |   |

# 15. Select the "UTM" folder.

| Browse for   | Coordinate System                            |
|--|--|
| Look in:   | 📮 Projected Coordinate Systems 💽 🕒 🛐 🍘 📸 🔠 🕮 |
| World<br>Utm<br>State Pla<br>Polar<br>National<br>Gauss Kr<br>Continen | Grids<br>ruger                               |
| Name:  | Utm  |
| Show of type   | e: Spatial references Cancel                 |

# 16. Select the "WGS 1984" folder.

| Browse for C  | coordinate System  |      | ×      |
|---------------|--------------------|------|--------|
| Look in:      | ⊐ ∪tm              |      |        |
| 🔲 Wgs 1984    |                    | <br> |        |
| Uther GCS     |                    |      |        |
| Nad 1983      |                    |      |        |
|               |                    |      |        |
|               |                    |      |        |
|               |                    |      |        |
|               |                    |      |        |
|               |                    |      |        |
| Name:         | Wgs 1984           |      | Add    |
| Show of type: | Spatial references |      | Cancel |
| onon or gpc.  |                    |      |        |

17. Select "WGS 1984 UTM Zone 2s.prj" and click "Add".

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|--|---|--|--|---|--|
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| WGS 1984 UT<br>WGS 1984 UT | TM Zone 39S.prj<br>TM Zone 39N.prj<br>TM Zone 38S.prj<br>TM Zone 38N.prj<br>TM Zone 37S.prj<br>TM Zone 37N.prj<br>TM Zone 36S.prj<br>TM Zone 36N.prj<br>TM Zone 35S.prj | ©WGS 1984 UTM 2c<br>©WGS 1984 UTM 2c | one 34N.prj<br>one 33S.prj<br>one 33S.prj<br>one 33N.prj<br>one 32S.prj<br>one 32N.prj<br>one 31S.prj<br>one 31N.prj<br>one 30S.prj<br>one 30N.prj | <ul> <li>WGS 198</li> </ul> | 14 UTM Zone 2N.p<br>14 UTM Zone 29S.<br>14 UTM Zone 29S.<br>14 UTM Zone 28S.<br>14 UTM Zone 28S.<br>14 UTM Zone 27S.<br>14 UTM Zone 27S.<br>14 UTM Zone 26S.<br>14 UTM Zone 25S.<br>14 UTM Zone 25S.<br>14 UTM Zone 25S. |
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| Name:  | WGS 1984 UTM Z  | one 2S.prj   |  |   | Add  |
| Show of type:  | Spatial references  | 3  |  | •   | Cancel   |
|  |   |  |  |   |  |

18. In the "Spatial Reference Properties" window click "Apply" and then "OK".

| Spatial Reference  | Properties 📲 🔳 🕎 🞴  |  |  |  |
|--|---|--|--|--|
| Coordinate System  |   |  |  |  |
| Name: WGS_   | 1984_UTM_Zone_2S  |  |  |  |
| Details:   |   |  |  |  |
| Alias:  Abbreviation: Remarks: Projection: Transverse_Mercator Parameters: False_Northing: 1000000.000000 Central_Meridian: -171.000000 Scale_Factor. 0.999600 Latitude_Of_Origin: 0.000000 Linear Unit: Meter (1.000000) Geographic Coordinate System: Name: GCS_WGS_1984 |   |  |  |  |
| Import   | Import a coordinate system and X/Y, Z and M<br>domains from an existing geodataset (e.g.,<br>feature dataset, feature class, raster). |  |  |  |
| New -  | Create a new coordinate system.   |  |  |  |
| Modify   | Edit the properties of the currently selected<br>coordinate system.   |  |  |  |
| Clear  | Sets the coordinate system to Unknown.  |  |  |  |
| Save As  | Save the coordinate system to a file.   |  |  |  |
|  | OK Cancel Apply   |  |  |  |

# 19. Click "Next".

| 🎢 Project Wizard (shapefiles, geodatabas  | e)              |                   |            | × |
|---|-----------------|-------------------|------------|---|
| Select the coordinate system  | n you want to a | assign to the dat | a          |   |
| Details:  |                 |                   |            |   |
| WGS_1984_UTM_Zone_2S<br>Alias:<br>Abbreviation:<br>Remarks:<br>Projection: Transverse_Mercator<br>Parameters:<br>False_Easting: 500000.000000<br>False_Northing: 1000000.000000<br>Central_Meridian: -171.000000<br>Scale_Factor: 0.999600<br>Latitude_0f_Origin: 0.000000<br>Linear Unit: Meter (1.000000)<br>Geographic Coordinate System:<br>Name: GCS_WGS_1984<br>Alias:<br>Abbreviation: |                 |                   | 4          |   |
|   |                 | Select Coordina   | ate System |   |
|   |                 |                   |            | _ |
| ļ   | < Back          | Next >            | Cancel     |   |

### 20. Click "Next".

| > Project Wizard (shapefiles, geodatabase) |   |                 |                      |        |  |  |  |  |
|--|---|-----------------|----------------------|--------|--|--|--|--|
|  | Coordinate extents for the output dataset |                 |                      |        |  |  |  |  |
| The follow                                 | ing values are an estimate of the outp    | ut extent based | d on input datasets. |        |  |  |  |  |
| lf you knov                                | v the exact extent and precision, you c   | an change the:  | se values.           |        |  |  |  |  |
| Min X:                                     | 516495.718287731                          | Max X:          | 547499.516398638     |        |  |  |  |  |
| Min Y:                                     | 8410837.9563402                           | Max Y:          | 8426877.89702306     |        |  |  |  |  |
| Precision:                                 | 69265.1796182521                          |                 |                      |        |  |  |  |  |
|  |   |                 |                      |        |  |  |  |  |
|  |   |                 |                      |        |  |  |  |  |
|  |   |                 |                      |        |  |  |  |  |
|  |   |                 |                      |        |  |  |  |  |
|  | [   | < Back          | Next >               | Cancel |  |  |  |  |

### 21. Click "Finish" below.

| Project Wizard (shapefiles, geodatabas)  | Project Wizard (shapefiles, geodatabase) |        |          |  |  |
|--|--|--------|----------|--|--|
| Summary  | of your input                            |        |          |  |  |
| Input Datasets:<br>C:\GIS\tutuila\base_maps\tutuila_nadgeo.shp   |  |        | <u>•</u> |  |  |
| New location:<br>C:\GlS\tutuila\base_maps\UTM_WGS84\tutuila  | a_utmwgs.shp                             |        |          |  |  |
| Projected Coordinate System<br>Alias:<br>Abbreviation:<br>Remarks:<br>Projection: Transverse_Mercator<br>Parameters:<br>False_Easting: 500000.000000<br>False_Northing: 1000000.000000 |  |        |          |  |  |
| Central_Meridian: -171.000000<br>Scale_Factor: 0.999600<br>Latitude_Of_Origin: 0.000000  |  |        | T        |  |  |
|  |  |        |          |  |  |
| ļ  | < Back                                   | Finish | Cancel   |  |  |

22. The shapefile projected into UTM Zone 2 South should be now be stored in the previously specified directory.

