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.

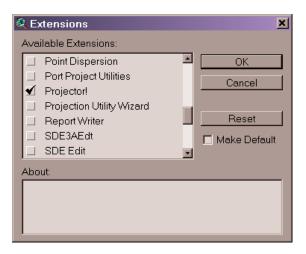
The software required to perform the necessary operations includes ESRI® ArcView 3.2a[™] and ArcToolbox 8.1[™]. The operator will also need the "Projector!" and "ShapeNADCON" tools (extensions) for ArcView. ArcView versions 3.1 and 3.2 should have included the "Projector!" utility as a sample extension. 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>.

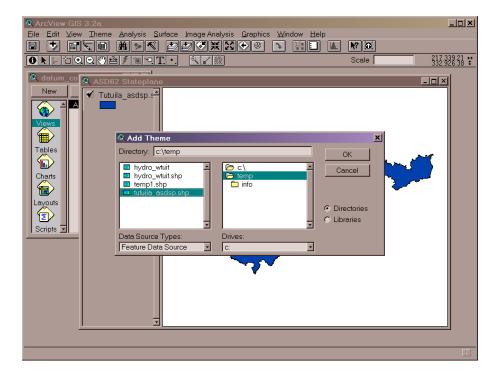
Procedure for Projecting and Transforming American Samoa GIS Data from Stateplane ASD62 to UTM WGS84.

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".



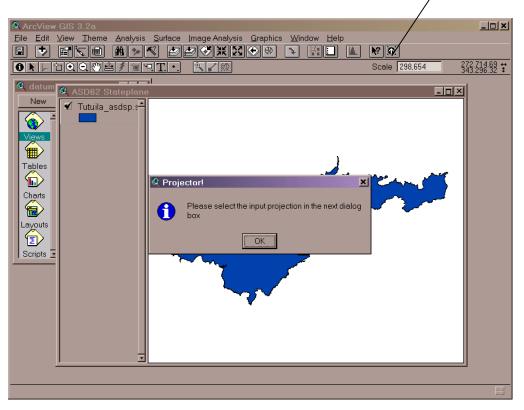
2. Go to "View" drop-down menu, click "Add Theme", browse to directory containing shapefile in the Stateplane Coordinate System in the American Samoa Datum of 1962, select file, and click "OK".



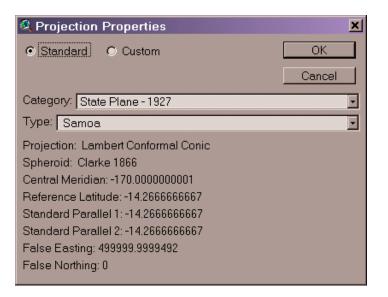
3) Go to the "View" drop-down menu, select "Properties", set "Map Units" to feet, and click "OK".

🍳 View Properties		×
Name: ASD62 Stateplane		OK
Creation Date: Jesday, February	12, 2002 03:02:26 PM	Cancel
Creator:		
Map Units: <mark>feet</mark> Distance Units: Junknown	v v	
Projection	Area Of Interest	
Background Color:	Select Color	
Comments:		
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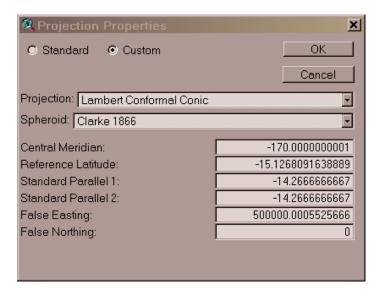
4. Make sure the theme is active, click on the "Projector!" button , and click "OK".



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



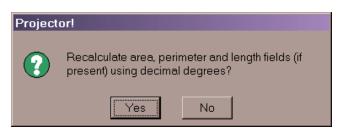
6. Change "Reference Latitude" to -15.1268091638889 and click "OK".



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



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



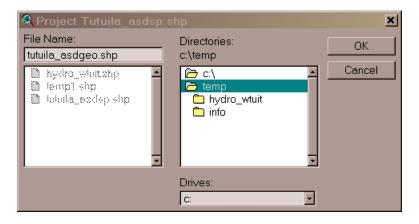
9. Add projected shapefile(s) as theme(s) to a view? Select "Yes".



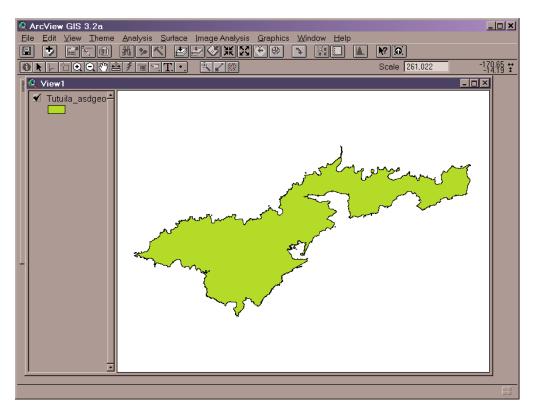
10. Add Theme to: select "<New View>" and click "OK".



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".

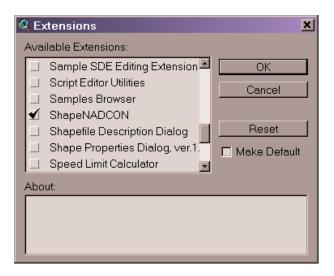


12. The new ASD62 Geographic shapefile will now appear in a separate view window.



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>
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		Scale 261,022	-170.55 ↔ -14.19 ↓
ASD62 Geographic	1	83 to (NAD27/Island De C Browse Browse Browse	
			===

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

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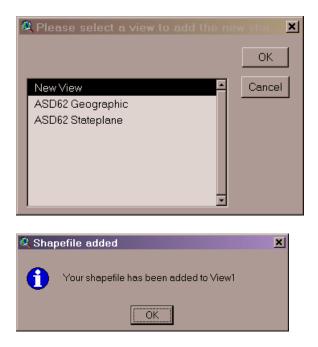
4. Click on the lower "Browse" button in the "ShapeNADCON" window, browse to the directory where the new NAD83 file will be stored, type an appropriate name for the shapefile into the "File name" box and click on "Save".

ArcView GIS 3.2a			
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			-120.25 **
		Scale 261.022	-1得辞 ::
ASD62 Geographic & ShapeN	ADCON	×	
✓ Tutuila_asdgeo∸ Convert	NAD27/Island Datum) to NA G Datum NAD83 to (NAD27/Isla	nd Dr.	
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My Computer			
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	Férname tutulla_nadgeo.shp -	Save	
	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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Convert:		
Datum (NAD27/Isla	ind Datum) to NA 💿 Datum NAD83 to (NAD27/Isla	nd Da 🔍 🔘
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	Note: Shapefiles must be in Latitude/Longitude before using	
Output Shapefi	C:\temp\tutuila_nadgeo.shp	Browse
	Note: Output shapefiles will be in Latitude/Longitude	
Help	ок	Quit
Ruccess!	×	
•		
Conversion C	omplete!	
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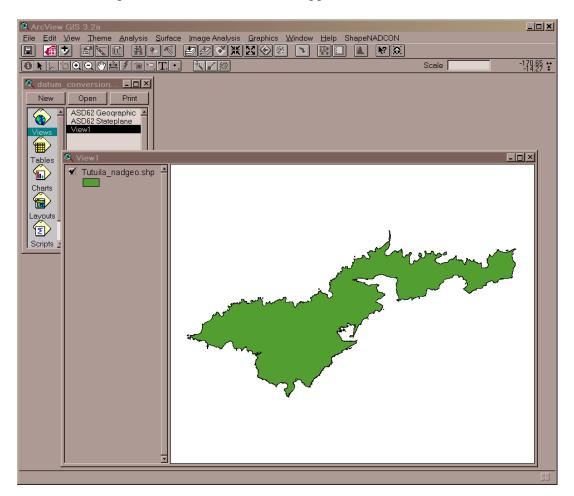
6. Select "New View" and click "OK". Click "OK" on "Shapefile added" message window.



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

ShapeNADCON	<u>></u>	٢
Convert:		
Datum (NAD27/Islar	nd Datum) to NA 💿 Datum NAD83 to (NAD27/Island Datum)	
Input Shapefi	C:\temp\tutuila_asdgeo.shp Browse	
	Note: Shapefiles must be in Latitude/Longitude before using	
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) Int to assign a coordinate system pefiles and geodatabase feature classes and	× 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:				
	2				
	Select Coordinate System				
	<back next=""> Cancel</back>				

4. Click the "Select" button.

Spatial Reference	Properties	×
Coordinate System		_
Name: Unknor	wn	
Details:		
	×	
	y	
Select	Select a predefined coordinate system.	
Import	Import a coordinate system and X/Y, Z and M domains from an existing geodataset (e.g., 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	

5. Select the "Geographic Coordinate System" folder.

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

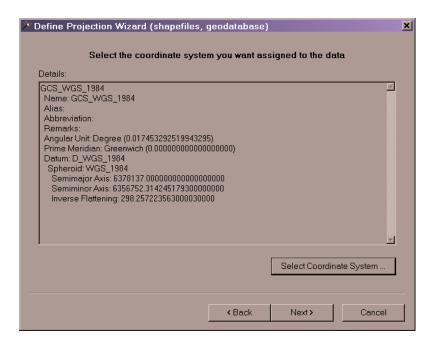
6. Click on "World" and then select "WGS 1984.prj". Click "Add".

Browse for Cod	rdinate System		×
Look in: 🛄	Vorld	• • • •	
© WGS 1984.pi © WGS 1972.pi © WGS 1972 T © WGS 1966.pi © NSWC 9Z-2.p	j BE.prj 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 Spheroid: WGS_1 Semimajor Axis: Semiminor Axis:	eenwich (0.0000000) 184	00000000000) 1000000000 300000000	Ĩ
Select	Select a predefin	ed coordinate sys	tem.
Import	Import a coordinate system and X/Y, Z and M domains from an existing geodataset (e.g., 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

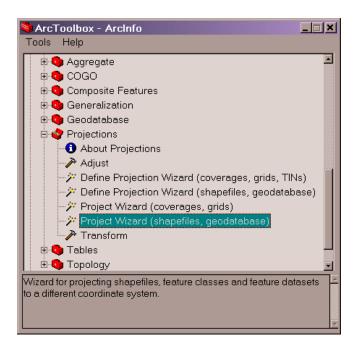
8. Click "Next" and then "Finish".



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 You can project shapefiles and geodatabas	ta you want to pro		is wizard		
						
	Data	Coordinate System	n			
	C:\GIS\tutuila\base_maps\tutuila_nadge	GCS_WGS_1984				
	Data in this list will be projected to the same (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 feature dataset or folder to store the output. Yo				
Output location:				
C:\GIS\tutuila\base_maps\UTM_WGS84\tutui	la_utmwgs.shp			
	< 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:					
	<u>ع</u>				
I	_				
	Select Coordinate System				
	<back next=""> Cancel</back>				

13. Click the "Select" button.

Spatial Reference	Properties 🛛 🖬 🔝 🔀
Coordinate System	
Name: Unkno Details:	wn
,	_
Select	Select a predefined coordinate system.
Import	Import a coordinate system and X/Y, Z and M domains from an existing geodataset (e.g., 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
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World Utm State Pla Polar National Gauss Kr Continen	Grids 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		 	
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".

Browse for Coo	rdinate System				×
Look in: 🗎 🖓	Vgs 1984	•	<u>e</u> 👀		
WGS 1984 UT WGS 1984 UT	TM Zone 39S.prj TM Zone 39N.prj TM Zone 38S.prj TM Zone 38N.prj TM Zone 37S.prj TM Zone 37N.prj TM Zone 36S.prj TM Zone 36N.prj TM Zone 35S.prj	©WGS 1984 UTM 2c ©WGS 1984 UTM 2c	one 34N.prj one 33S.prj one 33S.prj one 33N.prj one 32S.prj one 32N.prj one 31S.prj one 31N.prj one 30S.prj one 30N.prj	 WGS 198 	14 UTM Zone 2N.p 14 UTM Zone 29S. 14 UTM Zone 29S. 14 UTM Zone 28S. 14 UTM Zone 28S. 14 UTM Zone 27S. 14 UTM Zone 27S. 14 UTM Zone 26S. 14 UTM Zone 25S. 14 UTM Zone 25S. 14 UTM Zone 25S.
					F
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 domains from an existing geodataset (e.g., 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			

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 Alias: Abbreviation: Remarks: Projection: Transverse_Mercator Parameters: False_Easting: 500000.000000 False_Northing: 1000000.000000 Central_Meridian: -171.000000 Scale_Factor: 0.999600 Latitude_0f_Origin: 0.000000 Linear Unit: Meter (1.000000) Geographic Coordinate System: Name: GCS_WGS_1984 Alias: 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: C:\GIS\tutuila\base_maps\tutuila_nadgeo.shp			<u>•</u>		
New location: C:\GlS\tutuila\base_maps\UTM_WGS84\tutuila	a_utmwgs.shp				
Projected Coordinate System Alias: Abbreviation: Remarks: Projection: Transverse_Mercator Parameters: False_Easting: 500000.000000 False_Northing: 1000000.000000					
Central_Meridian: -171.000000 Scale_Factor: 0.999600 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.

