GIS Infobase

Metadata and Work Flow Management

For Geographic Information Systems

User's Guide

Version 4.3

Regional Ecosystems Office
http://www.reo.gov/reo/projects/tools/infobase/infobase.htm
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1. Introduction

GIS Infobase is a database application that is designed to manage workload and documentation about spatial and tabular data sets. It was designed to address two primary needs; managing work requests for an active GIS group and to manage metadata (data about data).

The work request portion of the application is designed to manage work requests for GIS related products and services and provide a place to document processes, which will allow duplication of results in the future. Typically work requests are taken by all members of the group and then assigned to an analyst by the GIS coordinator.

The purpose of the metadata portion of the application is to provide information about spatial and tabular data sets within the corporate library. This includes definition of coding used and description of details of development. Metadata is required for all data sets that are placed on the Internet. In fact, Executive Order 12906 requires all federal agencies document data sets they create [5]. The application can generate metadata in two different formats, both of which are suitable for posting on a web server (Internet or Intranet). The quick reference format should be used for internal use (Intranet) and for posting on an organization's Internet site. The Federal Geographic Data Committee (FGDC) format should be used to post metadata on a National Spatial Database Integration (NSDI) clearinghouse node. When posted on a clearinghouse node, the metadata becomes searchable across the entire NSDI network. The intent is to reduce redundant expenditures by federal agencies by advertising that data for a particular data set and area extent has already been compiled.

The architecture of the application is client/server. The actual data tables (back end) are stored within the Oracle [1] database on an IBM server. This facilitates data sharing and data integrity. The client side of the application runs under Microsoft Access [2] on a personal computer connected to the network. The client side only contains the forms, queries, reports, and code that are necessary for the application to run. The data is accessed across the network through Open Database Connectivity (ODBC) [3] and Sql*Net (See Section 2).

2. Setup

2.1. Overview and Requirements

The architecture of the application is client server. The layers and interactions between hardware and software components are shown in Figure 2-1.

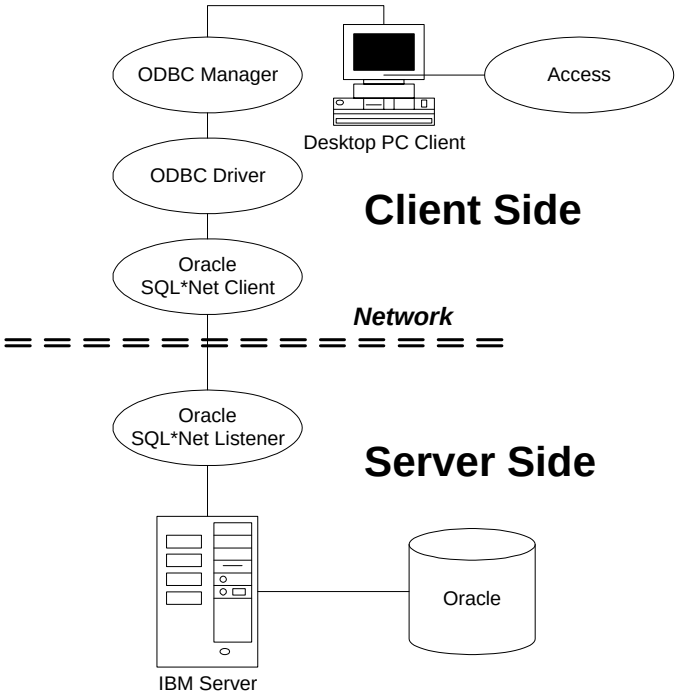

Figure 2-1 Application Architecture

The following software components are required to run the application:

1. Database schema – The tables are designed to reside in Oracle on the corporate computer system (IBM) in Oracle 7.1 or higher. The setup routine will copy the SQL data definition scripts to the application directory for schema generation. The Forest Service Database Administrator (FSDBA) **must** run the scripts in SQL+.
2. Microsoft Access – Access version 9.0 or higher must be installed on a personnel computer that is connected to the network. The application has been designed to run on Windows 95/98/NT under Access version 9.0 or higher (Office 2000 Professional).
3. GIS Infobase Application File (gisib.mdb) - This database file contains the client side of the application (forms, queries, reports, macros, and code). It also contains links to the tables stored in Oracle.
4. Oracle Sql*Net - This software allows connections to the Oracle server by many different PC application programs. Sql*Net version 2.3 or higher is required for connection to the Oracle 7 database. This is somewhat dependent on the manufacturer and version of ODBC driver that is used.

5. Oracle ODBC Driver - The driver makes the connection between Access and Sql*Net. Its job is to translate the SQL statements produced by Access to those that are native to Oracle 7. There are numerous third party suppliers that make high performance ODBC drivers. A suitable Oracle ODBC driver is included with the distribution of Office 2000 Professional. Other drivers can be obtained for free from Microsoft and Oracle via their web sites. However, many of the free drivers don't support the most recent standard of ODBC (version 3.+) and some problems may be encountered. The drivers from Merant (used to be Intersolv) have proven to be reliable, stable, and fast and are highly recommended.
6. INFO~ODBC Driver [10] – This driver allows you to read INFO files directly from the application. It's totally optional but allows you to read info item names directly without having to type them in by hand. This can be important if you have feature attribute tables with many items. Doric, the only manufacturer that makes this driver also makes INFO.

2.2. Server Side Setup

Create the database schema in Oracle. To unpack the installation files, you will need to run the Client Setup (see Step 9 of the Client Side Setup on page 10) on a single personal computer. The SQL scripts are installed under the \dbgen directory under the installation directory. For example, if you installed the application in c:\gisib, the Oracle installation scripts would be located in c:\gisib\dbgen. There is a readme.txt file that is installed in the application directory that should be reviewed for last minute changes.

1. The user FSDBA must run the installation scripts. The FSDBA User MUST have the permissions to connect, create tables, sequences, and public synonyms.
2. The application defaults to install tables in the USERS tablespace and indexes in the INDEXES tablespace. If you want to change to different tablespaces, modify the cr_table.sql script and change the variables at the top of the script before running it. It's highly recommended that you store the tables in one tablespace (on one disk) and the index's in another tablespace (on another disk) to increase performance.
3. If you have installed a previous version of GIS Infobase, you will need to alter your existing schema. The FSDBA must run the mod_gis_v43.sql script. This script will add an additional table, GIS_REQUESTITEM and add an additional column to the GIS_TABLEITEM table. You will not need to run the cr_gis.sql script.
4. If you have not previously installed GIS Infobase, FSDBA will need to run the cr_gis.sql script to create the schema. This script will run the related scripts to create tables, triggers, synonyms, and grants and populate look up tables. All tables created start with the prefix GIS_.
5. A role called GISINFOBASE is created and all grants are made to that role. This role has full permissions (Select, Insert, Update, and Delete) to all tables in the application. All tables have been granted Select access to PUBLIC so all users should be able to view the data. The FSDBA **must** create users that are not dependent on OPS$ accounts. This is because ODBC does not pass the operating system login information to Oracle. It's recommended that the same User Names be

created as contained in the OPS$ accounts only without the OPS$. Finally, assign users to the GISINFOBASE role with the following grant statement :

grant gisinfobase to <username>;

2.3. Client Side Setup

1. Install Microsoft Office Professional on the PC.
2. Install Sql*Net version 2.3 or higher. This may already be on your PC. Check to see if there is an ORAWIN95 directory on your PC and/or a Oracle for Windows 95 program group under the start menu.
3. Run the SQL Net Easy Configuration utility and add a connection to Oracle running on the IBM on your unit. Create a Database Alias name such as IBMOracle. This name is arbitrary but will need to be referenced as the "server" in the ODBC driver. Set the Host to the host name or IP address of the IBM server that Oracle is running on. Contact your local system manager or Oracle database administrator if you are not sure. Make sure you use the TCP/IP protocol, and set the database instance to **a**. Your connection information should look similar to that shown in Figure 2-2.

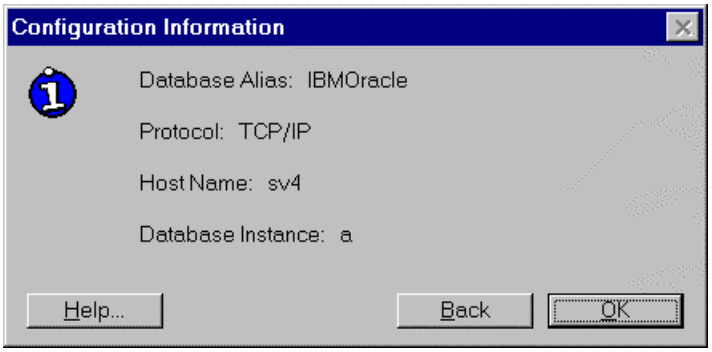

*Figure 2-2 SQL*Net Easy Configuration*

6. Install the Oracle ODBC driver and configure a data source name which points to the Database Alias configured in SQL*Net Easy. Start the ODBC 32 manager in the Windows Control Panel to start the configuration. You will need to create a Data Source Name (DSN) as shown in Figure 2-5. It's recommended that you create the DSN under the **System** tab so all users that log onto the computer can use the driver. Click the **Add button** and select the appropriate Oracle driver that you installed. On corporate PC's, the Oracle and Microsoft ODBC for Oracle drivers should be listed as shown in Figure 2-3.

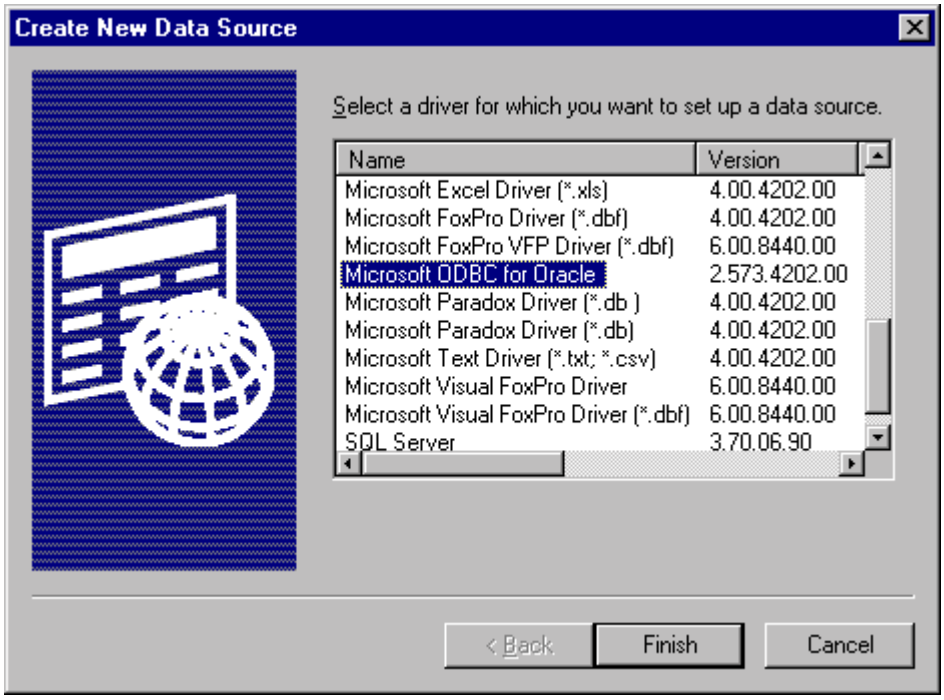

Figure 2-3 Selecting the Microsoft ODBC Driver for Oracle

Once you select the driver and click Finish, the ODBC for Oracle driver box will pop up as shown in Figure 2-4. The Data Source Name is an arbitrary name so you can call it anything you want but its suggested to name it idb. This is the default DSN that is configured on Forest Service Corporate PC's.

If you are using the Oracle ODBC driver then you can sign onto the database as your OPS$ account name. The secret to this is you must establish the same login Windows username as you have on the IBM servers. Once you login to Windows with this default name, you can log onto the database with simply a / as the User and no password.

If you use the Microsoft driver, you **must** put in a user name to force the driver to log you in as a registered user. If you don't, it will log you in as public and you won't be able to edit data. Finally, input the server name. This is the name of the Database Alias you set up in Sql*Net Easy **not** the name of the physical server.

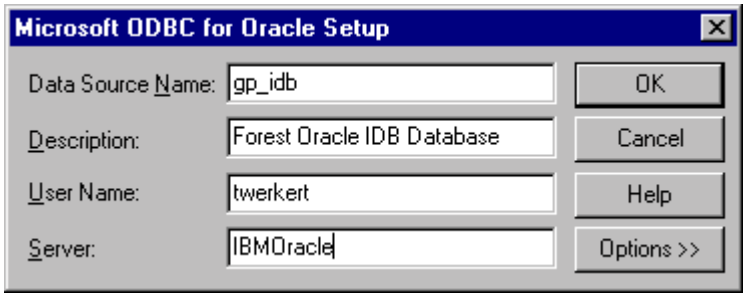

Figure 2-4 Microsoft ODBC Oracle Driver Setup

Once your final configuration information is set up, click Ok and you will be returned to the ODBC Data Source Administrator dialog box. Your connection should look similar to that shown in Figure 2-5

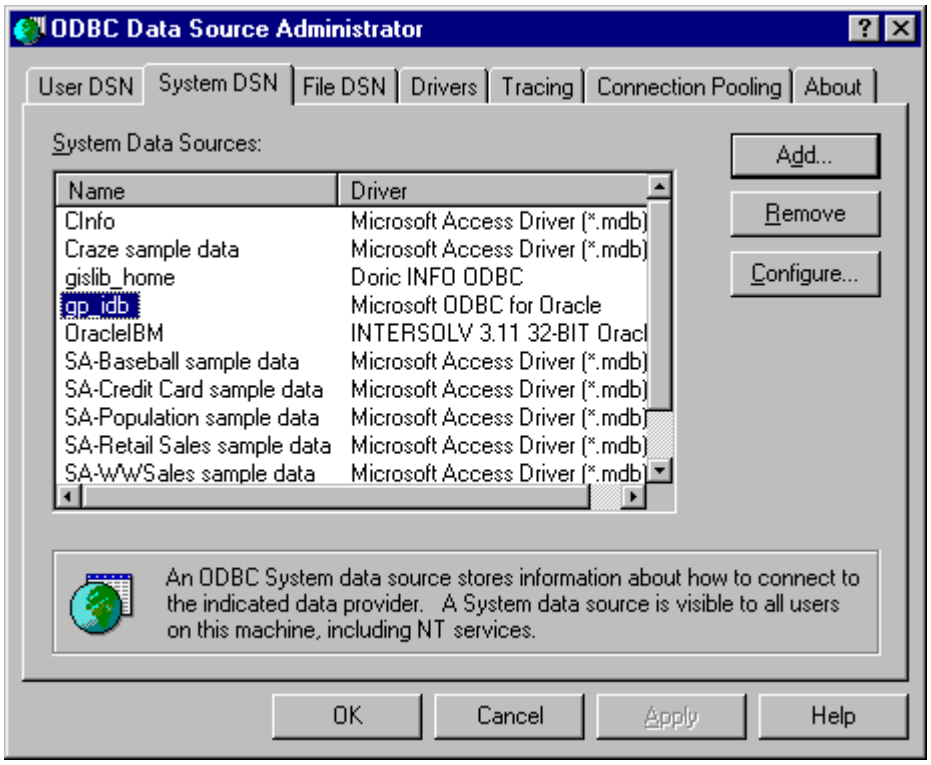

Figure 2-5 ODBC Data Source Administrator

7. Install the INFO~ODBC driver if you have it [10]. This driver is optional and will allow linking INFO tables directly. It's a highly specialized product and relatively expensive. This driver is different in that you have to create a DSN for each Arc/Info workspace that you want to access. For example, in Figure 2-6 the workspace accessed is under j:\fsfiles\ref\library\gis\infra but notice how the path has to reference into the info directory. The file that the driver is looking for is arc.dir.

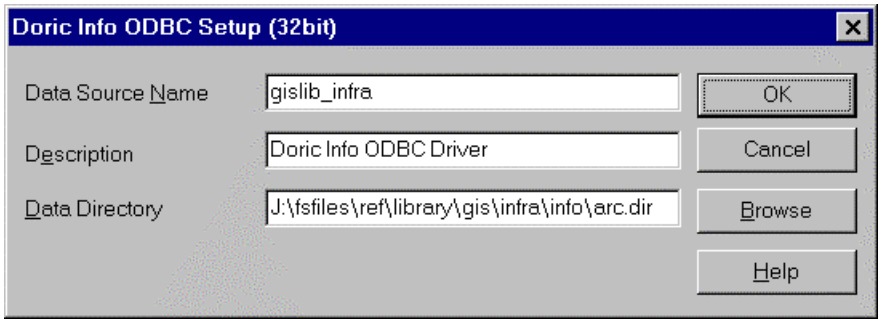

Figure 2-6 INFO ODBC Driver Setup

8. Ensure that you have a valid user name and password for Oracle. Contact the forest database administrator for a user name and password.

9. Run the GIS Infobase setup program named gisib.exe. This program will extract the setup files and then run the setup program. Do **NOT** install the application in any directory path that includes a space! This is because a secondary program (mp.exe – metadata parser) can't handle spaces in the path. The installer program may default to c:\Program Files\gisib, change that to c:\gis
10. Install Microsoft Access Jet Service Pack 4 (See Problems with Access 2000 on page 11). You can get a copy of Service Pack 4 from the Microsoft Downloads web site (http://www.microsoft.com/downloads/search.asp).
11. Start the GIS Infobase application by selecting Start, Programs, and GIS Infobase. If you get a message about the program defaults not set, select No and proceed to the next step. The table linkages must be refreshed before program defaults can be set.
12. Update the attachments to the Oracle database. Select the Update Data Link button from the Main Menu, which will bring up the dialog as shown in Figure 2-7. Type in your user name and password and make sure the owner is set to FSDBA.

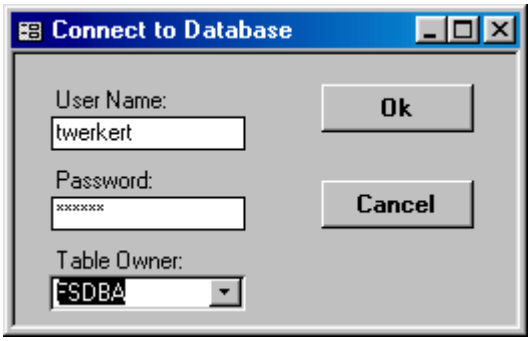

Figure 2-7 Updating the Linkages to the Oracle Tables

When the ODBC Manager pops up, select the ODBC driver that points to the Oracle database on the IBM as shown in Figure 2-5. If all connections are successful, you will see a progress meter advancing at the **bottom** of the Access container window.

13. Create your Agency. Click the Agency button and input your forest or agency name.
14. Create an Employee. Create an employee by selecting the Personnel button and input the information in the form.
15. Set the Program Defaults. Select the Program Defaults on the Main Menu and the input form shown in Figure 2-8 will pop up.

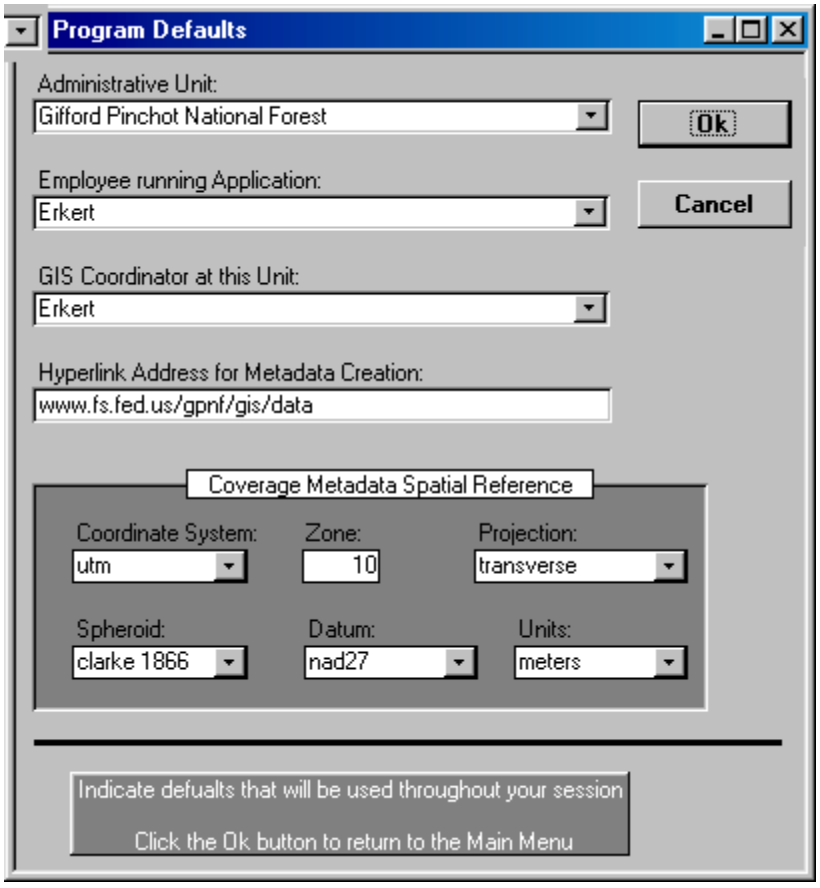

Figure 2-8 Program Defaults

Using the drop down lists, select the name of your administrative unit, an employee for the default employee that is running the application and the GIS Coordinator or Manager of the unit. The Hyperlink Address is the default web address for where spatial and tabular data is stored for your organizations web site. This is the location you will load export files of Arc/Info coverage's and tabular database extracts. The Coverage Metadata Spatial Reference inputs allow you to set global defaults for the metadata portion of the application. Once these defaults have been set, you won't have to set them again unless you want to change them.

2.4. Problems with Access 2000

GIS Infobase was written, tested, and evolved under Microsoft Access 95 and 97. Unfortunately, with Access 2000 came many unresolved bugs and problems. The author has spent months working directly with Microsoft to resolve the most serious of these problems but many problems are still left unresolved.

The most serious of problems has been corrected. This had to do with Access 2000 not picking up the unique identifiers that make the database work. A series of patches need to be applied to the PC that you will run it on. The patches include:

1. Upgrade the PC to MDAC 2.1.2.4202.3 (http://www.microsoft.com/data/download.htm). The GIS Infobase setup program should install the MDAC upgrade if the upgrade is needed on the client computer.
2. Upgrade the Jet Database engine to the Jet Service Pack 4.0. Download Jet Service Pack 4 (http://www.microsoft.com/downloads/search.asp) from the Microsoft downloads web site and execute the service pack to install it.
3. If you get a message that indicates that the data has changed, Access will undo you edits. This behavior seems to occur when you edit the same record twice in a row when the table has a set of audit columns (modified_by, modified_date) that are populated by database triggers. Access will allow you to save your changes if you edit the record a third time. This behavior seems to come from how Access uses locks that are created by the ODBC driver and Oracle.

The patches must be installed in the order shown in this list. Failure to do so could cause even more problems!

There are still the following known problems that remain unresolved:

1. When you add new records to a form that has one or more subforms contained within it and there is a filter applied to the main form, the subforms will not have any controls showing. At the time of this writing the only workaround is to close the form and reopen it once the main form record is inserted. The subform controls will then show up.
2. There also appears to be a problem with long memo type fields. There may be some strange characters at the end of the regular text. You can safely ignore these.

3. Program Operation

To start the application, select GIS Infobase from the Start menu (press the start button on the Windows task bar) and click on GIS Infobase.

3.1. Main Menu

The main menu controls the navigation within the program. It's a series of buttons that can be clicked with a mouse or activated with the keyboard by pushing the enter key. You can use the tab key while in the menu to move between the buttons.

The program is organized by area of interest and by mode, either data input, report or other function. The Request button is to manage or input work requests, Data Dictionary and Cover buttons for maintaining coverage metadata, and the Person, Agency, Quadrangle buttons for maintaining standard lookup sources. Metadata creation for Web based applications is selected with either the Intranet Web Pages or Internet Metadata and Data Export buttons.

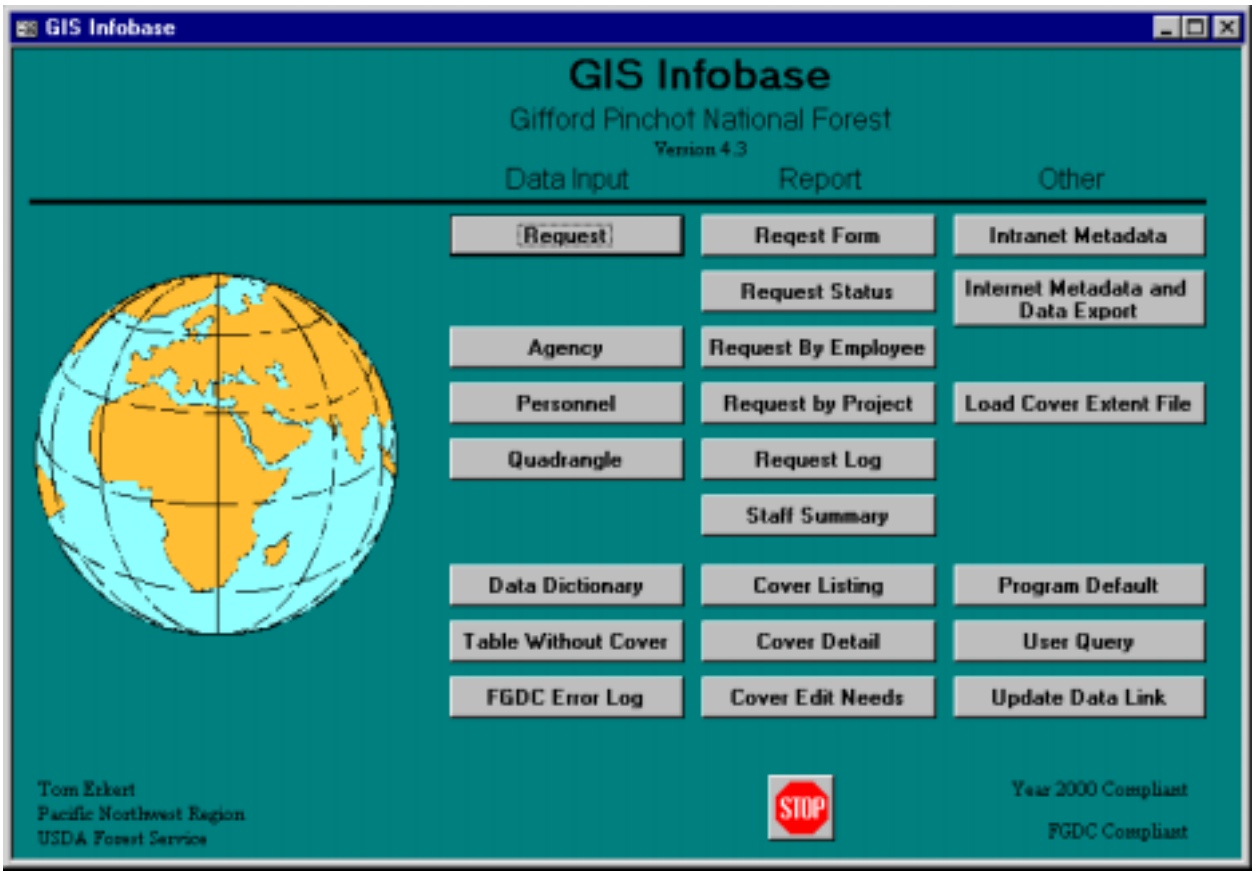

Figure 3-1 Main Menu

3.2. Logging on to the Data Source

The first time you open up a form or run a report that requires data from the Oracle server, a dialog box will pop up requesting your user name and password as shown in Figure 3-2. Enter the requested data and click OK.

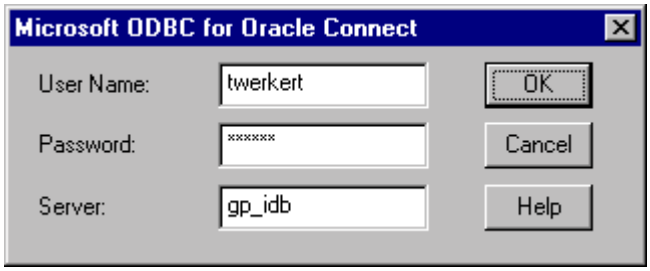

Figure 3-2 Logon to Oracle

The Server Name is dependent on the specific ODBC driver that you have installed and how you set up the data source name to access the Oracle database (See Section 2 for more information). The server is the SQL*Net Database Alias string that you have set up previously.

3.3. Data Input Forms

All data input forms work in a similar fashion to add or edit data. These are controlled by Access and no attempt has been made to change them. The following discussion is a brief overview of how to add and edit data in Access forms. For a complete discussion of editing, consult the Access User's Guide [2].

3.3.1. Adding Records

To add records, go to the last record in the form by clicking on the right most VCR control at the bottom of the form as shown in Figure 3-3. Then go to the next record by clicking on the next VCR control (just to the left of the last VCR control). Add the data for the new record and notice how the record indicator at the top left of the form changes to a pencil. This means you can undo your changes by pressing the <esc> key (See Section 3.3.5). You can also select Data Entry from the Records menu bar to just enter new data.

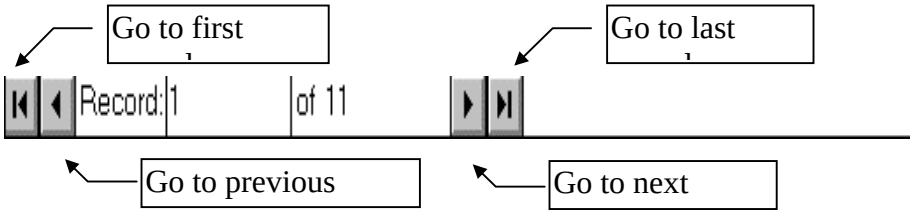

Figure 3-3 Record Navigation VCR Control

3.3.2. Editing Records

Editing records involves two steps; finding the record that you are interested in and then editing the data. You can find a record in several ways. If a form does not have a custom Find button, use the default Find button that comes with Access (Figure 3-4). This is noted by a set of binoculars on the toolbar or by choosing Find on the Edit menu bar. To use this find method, **place the cursor in the field you want to search**, then press the Find icon on the toolbar. Fill in the search criteria and indicate if you want to match the entire field or just part of a field. Then click on the Find First button to find the record.

Figure 3-4 Find Dialog

The example shown in Figure 3-4 will find a coverage named "gpws" if the cursor is placed in the Name field and assuming that the coverage exists.

Once the record is located, simply click in the field that needs to be changed and change the data. Again notice how the pencil marker appears in the upper left corner of the screen meaning that you are editing data and it can be undone by pressing <esc>. If you get a message that indicates that the data has changed, Access will undo you edits. This behavior seems to occur when you edit the same record twice in a row when the table has a set of audit columns (modified_by, modified_date) that are populated by database triggers. Access will allow you to save your changes if you edit the record a third time. This behavior seems to come from how Access uses locks that are created by the ODBC driver and Oracle.

3.3.3. Copying

You can copy individual parts of fields, entire fields, and entire records. Each type involves selecting the data you want to copy then copying the data to the clipboard and pasting it somewhere else. To copy a field or a part of a field, select the data that you want then choose the Copy command on the Edit menu at the top of the screen. To copy entire records, click on the record selector, which is the vertical bar that runs along the left side of the form, and copy the record. For data sheet views (where it looks like a spreadsheet), select a record by selecting the row selector just to the left of the first field in the row you want to copy.

3.3.4. Deleting

Deleting records is very similar to copying records in that you need to find the record you want to delete then either press the <Delete> key or select Delete Record from the Edit menu. It is important to note that on some forms, a cascading delete in other tables will occur if you select a parent record for deletion. This is an important feature of the application and is designed to maintain referential integrity between tables. A complete list of linkages and cascading properties is contained in Section 8.2.

3.3.5. Undo

When you add or edit data, an icon in the top left corner of the form informs you of what editing mode you are in. If the icon looks like a triangle, the record is simply set as the current record and no editing has taken place. If the icon looks like a pencil, then editing has taken place and the undo features of Access can be used. If you make a mistake in a field that you are editing, pressing the <Esc> once will undo that change. If you press the <Esc> key a second time the changes to the entire record will be undone.

3.3.6. Pick Lists

An integral part of any database application is to ensure that data that needs to be queried frequently maintains a common format and a standard set of values. This is accomplished by the use of combo boxes that show a set of values to choose from. Any time you see a vertical arrow at the right edge of a field in a form, dialog box, or data sheet, it means that a standard set of values is available. If you start typing at one of these combo boxes, the software will try to guess the correct entry. Most of these combo boxes will ensure that the data selected or typed meet a defined list of values and will not allow you to go on until the data is changed to meet the value of one of the entries in the list.

3.3.7. Mouse Shortcuts

The right mouse button can be clicked when editing data to bring up a short menu of options that are commonly used when entering data. This is a quick way to bring up the Find dialog or insert a picture into a field that allows that.

3.3.8. Keyboard Shortcuts

Once you become familiar with adding and editing data, many shortcut keys can be used to make editing faster. The primary keys used to make editing easier are shown in Table 3-1. Please note the Ctrl+Enter key sequence in the table below. This is required if you want to place new lines within memo or large text block fields.

Table 3-1 Shortcut Keys

Key	Meaning
F2	Switch between editing and navigation modes. This is a quick way to get to the end of long field.
Ctrl+Break	Cancel a query
Shift+F2	Opens a zoom box. This is a good way to edit data in long text fields where a lot of text is entered similar to a word processor. Clicking the right mouse button and selecting zoom when the cursor is in the field can also open this.
Esc	Undo changes in current field or record
Ctrl + ‘	Insert the same value as in the previous record
Ctrl + ;	Insert the current date
Ctrl + Enter	Add a new line to a Memo field. This is very important for entering text into these types of fields.
Shift + Enter	Saves the current record

3.3.9. Closing Forms

You can close a data input form in one of two ways. On each form a close button is placed near the upper right corner of the screen with a picture of a door and arrow on it. You can also close a form by selecting the hyphen in the very upper left corner of the window then select close on the menu that will appear.

3.4. Report Dialogs

Most reports have a dialog box that will appear after the option is selected from a menu. Each of these dialog boxes is a place to **limit** the set of records that the report is based on. Each report dialog is slightly different but work in the same way. An example report dialog is shown in Figure 3-5. In this case the GIS requests will be limited to the date range shown and will only show those that are incomplete. There are also options available on many of the report dialog boxes and are described in the appropriate section in this guide.

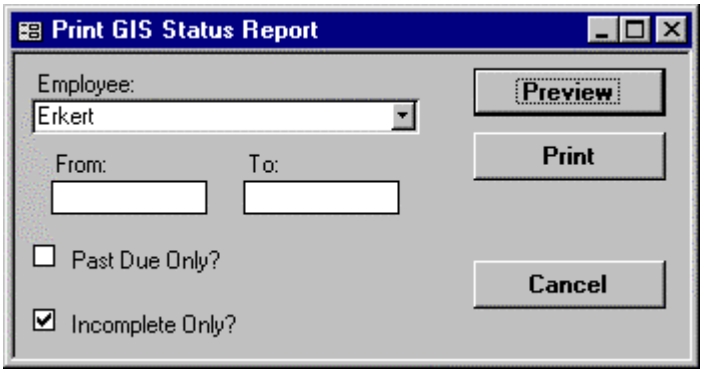

Figure 3-5 Example Report Dialog

The options that are available on each report dialog are:

1. Preview - To run the report and send the output to the screen. You can still print the report after it has been formatted for the screen.
2. Print - Run the report and send the output directly to the printer.
3. Cancel - Cancels the report

4. Request

The Request portion of the application is to provide a central storage place for work requests for GIS products. Products are assigned to an analyst by the GIS Coordinator and work progress tracked throughout the project.

To input or edit a request, click on the Request button on the main menu. When this option is selected, the GIS Requests form will pop up as shown in Figure 4-1.

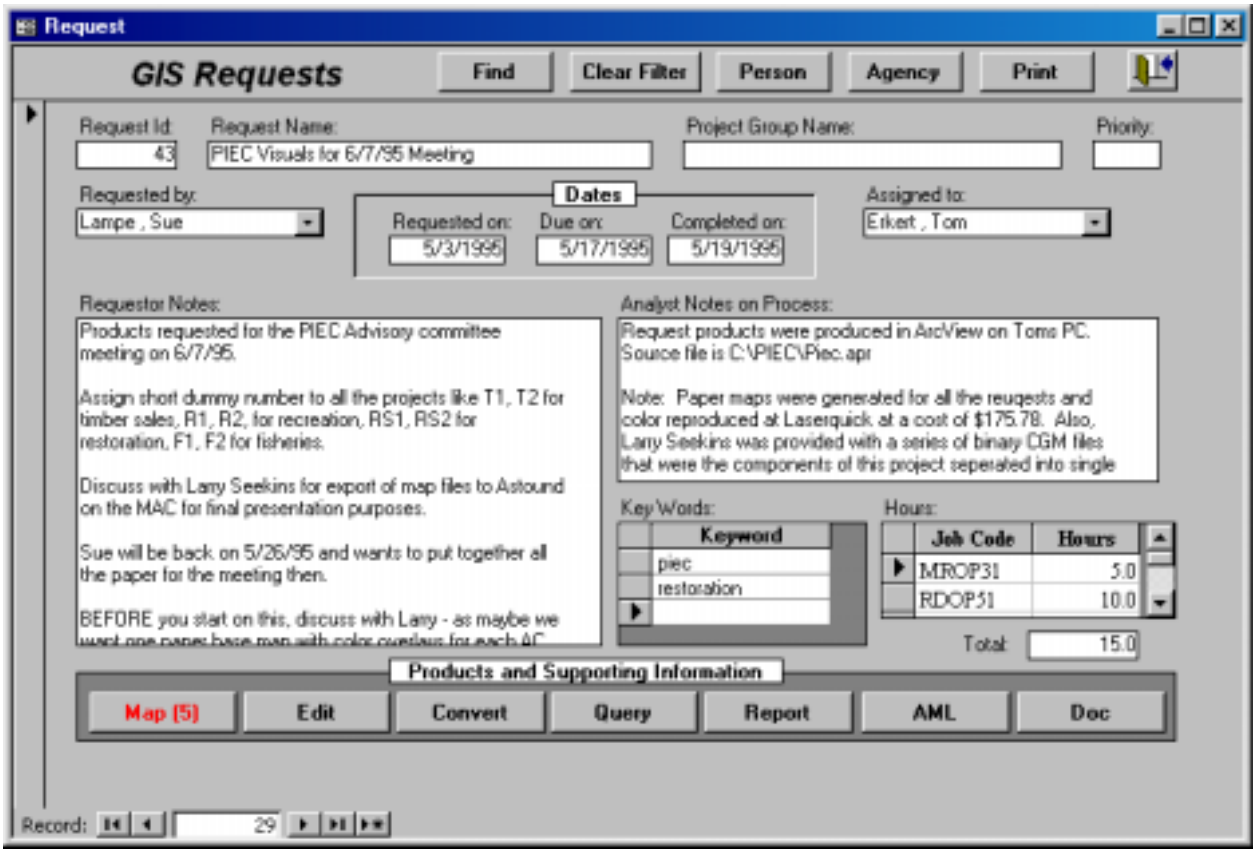

Figure 4-1 GIS Request Data Input Form

The form shown in Figure 4-1 has input fields for general information and buttons along the bottom of the form that provide access to other forms that contain the details of the request. The buttons along the top of the form are designed to help you find or filter existing requests and provide a shortcut to Personnel or Agency forms if they are needed. If there are products associated with a request, the button text along the bottom will be highlighted in red and the number of products shown in parenthesis.

The person completing the request should complete all input boxes on this form except for the Assigned To, Complete Date, Key Words, Job Code Hours, and Analyst Notes as these will be completed by the Analyst completing the work. The Requester Notes field can be used to put general notes in about the request but should not be used to describe

the individual components of the request as that is what the buttons on the bottom of the form are for.

Take note of the AML button at the bottom of the screen. If you have created AML's for the project, they can be copied into database and stored with the request. This is very useful if someone wants to recreate the request but directory cleaning has managed to wipe out the AML's that were previously created. Likewise, if associated electronic documents are associated with the request they can be stored under the Doc button.

The Request Id is the unique identifier of the request and is generated by the database itself and is therefore unavailable for editing. The Request Id is used in many places in the application and is the common glue (key) that holds the request information together.

The Hours box allows you to track the total number of hours that were spent on a given request by Job Code. Since each request is tracked back to a person that requested it and that person has to belong to a staff group, total hours of work can be summarized by staff area.

4.1. Find

Click on the Find button at the top of the Request form to find a particular request or to find a group of requests that meet a set of criteria (a filter in database terminology). When this option is selected, the Request Find input form will pop up as shown in Figure 4-2.

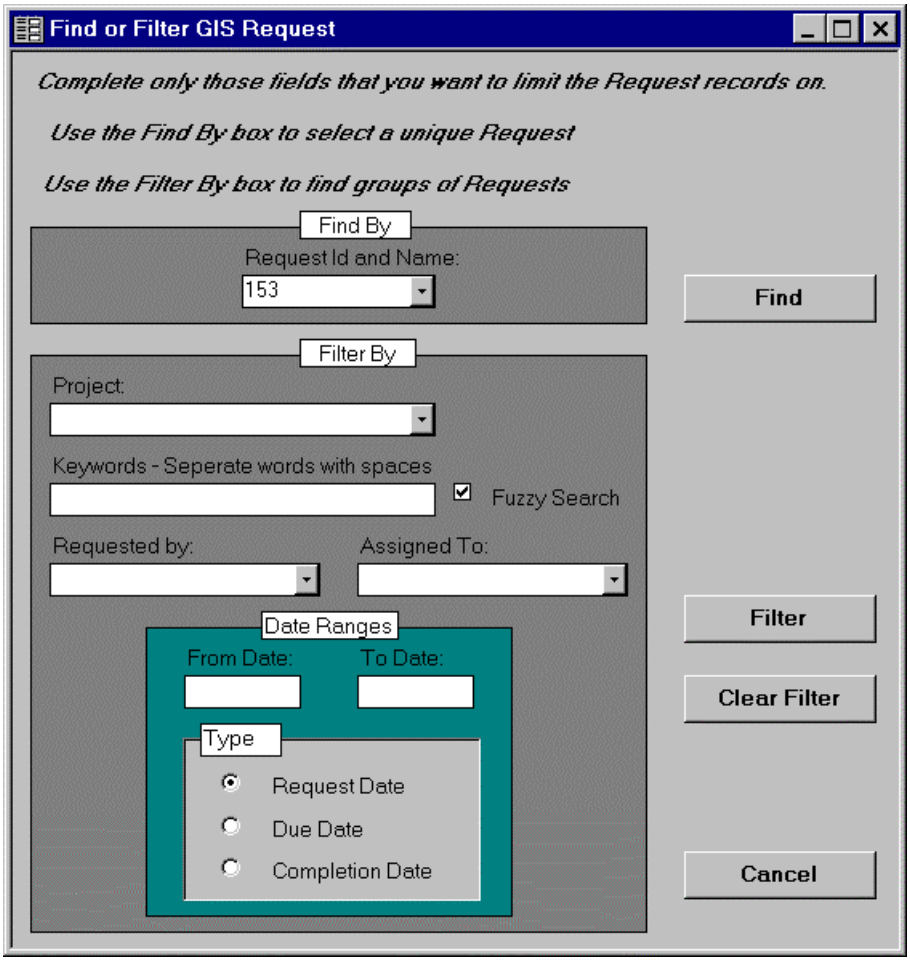

Figure 4-2 Find or Filter GIS Request Dialog Box

You can find a particular request by selecting the Request Id from the combo box within the Find By section of the form. After selecting the request id or after typing it in, click on the Find button and the GIS Requests form will show the selected request.

If you are unsure of the request and want to select a group of requests for review, use the Filter By section of the form. You can input a project group, key words (separate them with spaces), who requested it, who it was assigned to, and date ranges corresponding to when it was input, when it is due, or when it was completed. All inputs in this section are additive, that is the resultant filter will use all criteria input in the Filter By section. For request key words, leave the Fuzzy Search option box checked if you want to search for words like the words input or click it off if you want an exact match.

Once you have selected all the criteria, click on the Filter button. After a message pops up that informs you that the filter has been applied, the GIS Requests form will be active again with only those requests that meet your conditions. You can now step through the requests to find the one that you are searching for. When a filter is active, you will see the message ***Filter On!*** in the lower left corner of the Request form. If you want to remove the filter so that all records are displayed, click on the Clear Filter button on the GIS Requests form or in the Find or Filter dialog box.

4.2. Map

To request a map product in either hard copy or digital form, press the Map button **after** the main request information has been entered. When the Map button is activated the Map input form will pop up as shown in Figure 4-3.

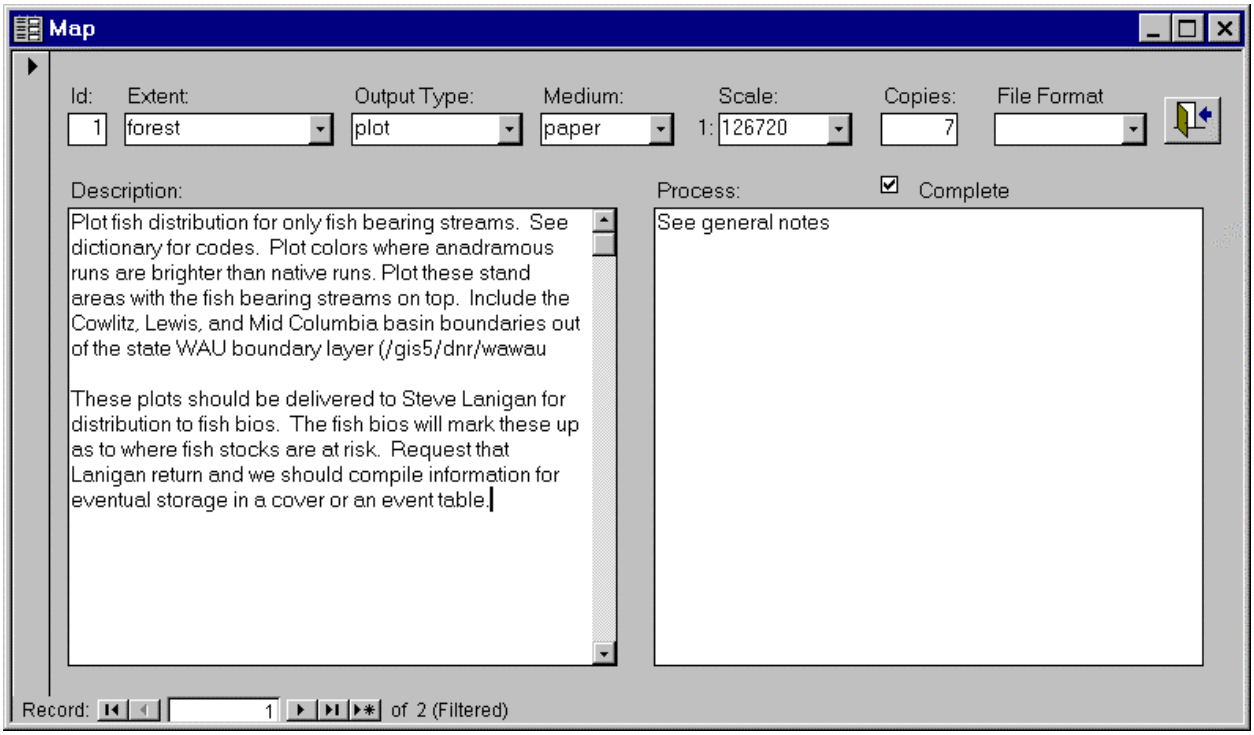

Figure 4-3 Request Map Input Form

Input the information requested in all boxes except the Id, Complete, and Process boxes as these are for the analyst to document how the map was produced. The Id will be assigned automatically by the computer and is therefore unavailable for editing. If you want the map digitally instead of hard copy, select the output file format. You can input as many map products as you need (See Section 3.3.1 for Adding Records).

4.3. Edit

Click on the Edit button on the bottom of the GIS Requests form if you want to request a new coverage be built or to edit an existing coverage. When you select this option the Edit input form will pop up as shown in Figure 4-4.

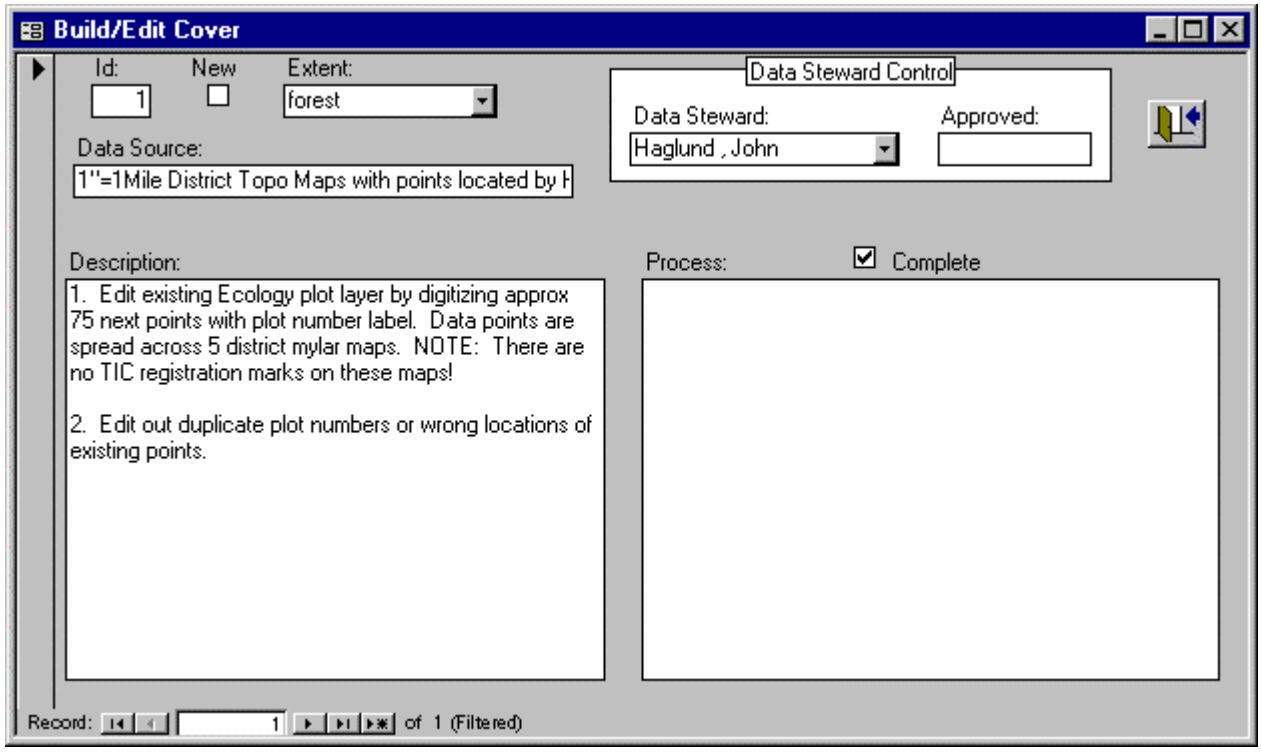

Figure 4-4 Build/Edit Cover Data Input Form

Complete all input boxes except for the Id, Complete, Process, and Approved Date boxes as the analyst will complete these. The Id will be assigned automatically by the computer and is therefore unavailable for editing. Assign who is the data steward of the coverage. This is the person that is responsible for the content of the data and will be required to proof the draft plots of the input to assure quality. Once the edits have been checked the analyst will complete the approved date. In the description box describe what you want built and how the manuscripts were prepared.

4.4. Convert

Click on the Convert button on the bottom of the GIS Requests form if you want to request data conversion of an existing coverage(s). This may be necessary if you are sending data to an external source, or importing it into some other program. When you select this option, the Edit input form will pop up as shown in Figure 4-5.

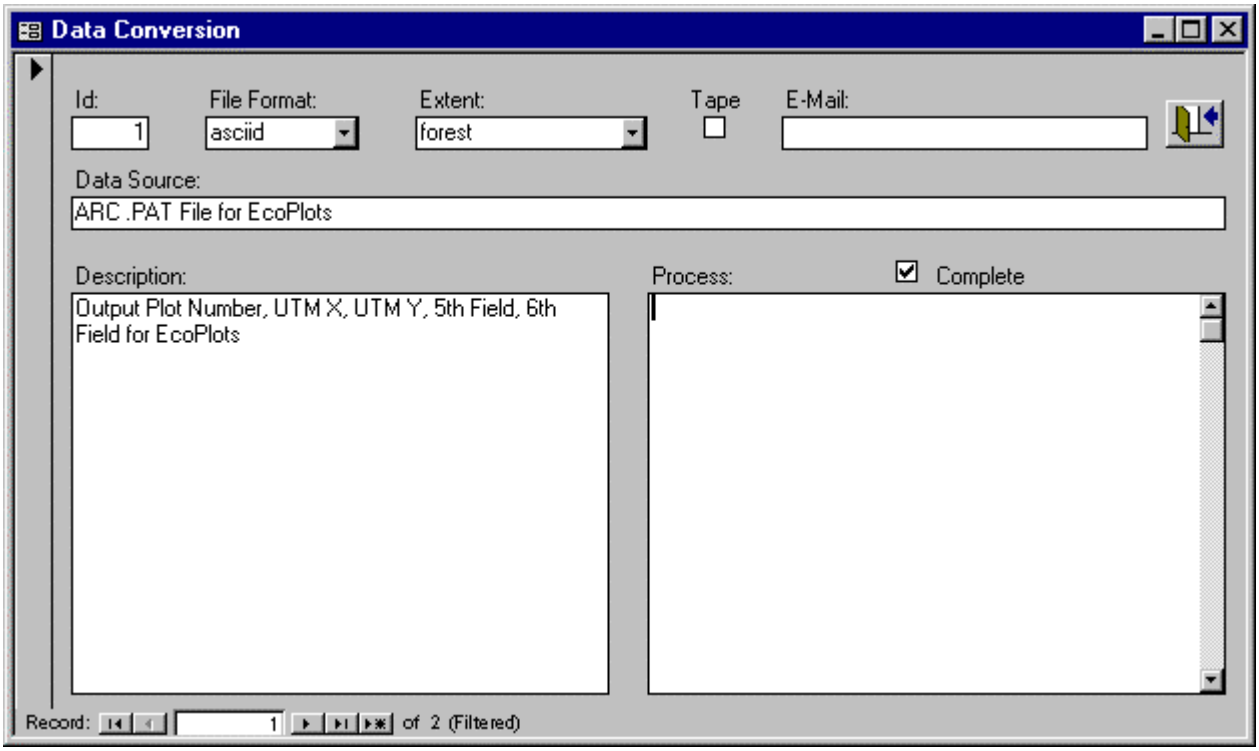

Figure 4-5 Data Conversion Data Input Form

Complete all input boxes except for the Id, Complete, and Process boxes as the analyst will complete these. The Id will be assigned automatically by the computer and is therefore unavailable for editing. Select the file format that you want the coverage converted into and the extent of the conversion. Click the Tape box if the data should be output on 8-mm tape in UNIX tar format. Complete an e-mail address if the data should be sent to someone directly over the Internet. Input the name of the coverage or file to be converted in the data source box and complete any other notes in the description box.

4.5. Query

Click on the Query button on the bottom of the GIS Requests form if you want to request a query be completed based on a coverage or an output of a spatial analysis. This option isn't used much as most users want a finished report instead. However, if all you want is a simple data table output this is the place to indicate it. When you select this option the Query input form will pop up as shown in Figure 4-6.

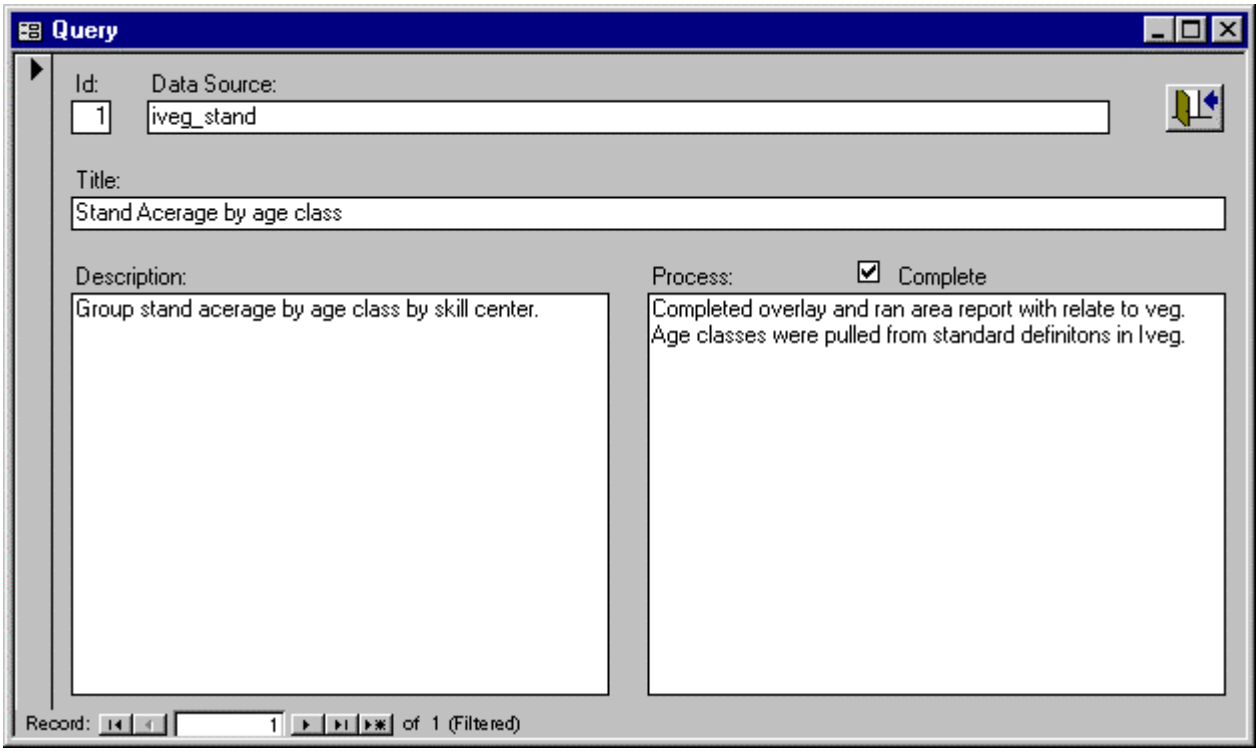

Figure 4-6 Request Query Data Input Form

Complete all the input boxes except the Id, Complete, and Process boxes. The Id will be assigned automatically by the computer and is therefore unavailable for editing. Indicate the data source, title if wanted and a description of the final output results desired.

4.6. Report

Click on the Report button on the bottom of the GIS Requests form if you want to request a report be completed based on a coverage or an output of a spatial analysis. This option should be used to indicate reports required such as an area or length report after a spatial analysis is completed such as the acreage by watershed of early seral stands. When you select this option the Report input form will pop up as shown in Figure 4-7.

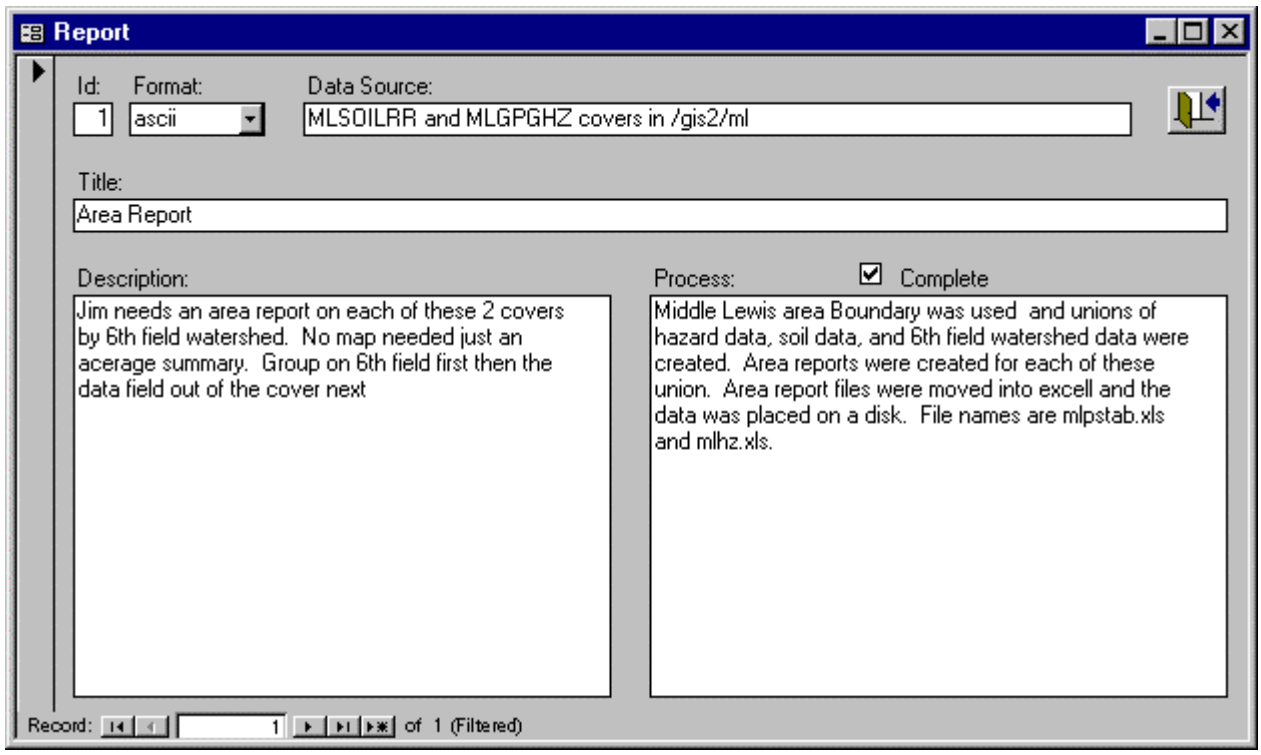

Figure 4-7 Request Report Data Input Form

Complete all the input boxes except the Id, Complete, and Process boxes. The Id will be assigned automatically by the computer and is therefore unavailable for editing. If you do not know the data source just describe the report wanted in the description box.

4.7. AML

Arc Macro Language (AML) code can be stored along with the request by clicking on the AML button. Any number of AML's can be stored along with the request. The AML's can then be removed from the file system if necessary. This will allow for easy storage and retrieval of code that may be needed later to regenerate output products. When you select this option the AML input form will pop up as shown in Figure 4-8.

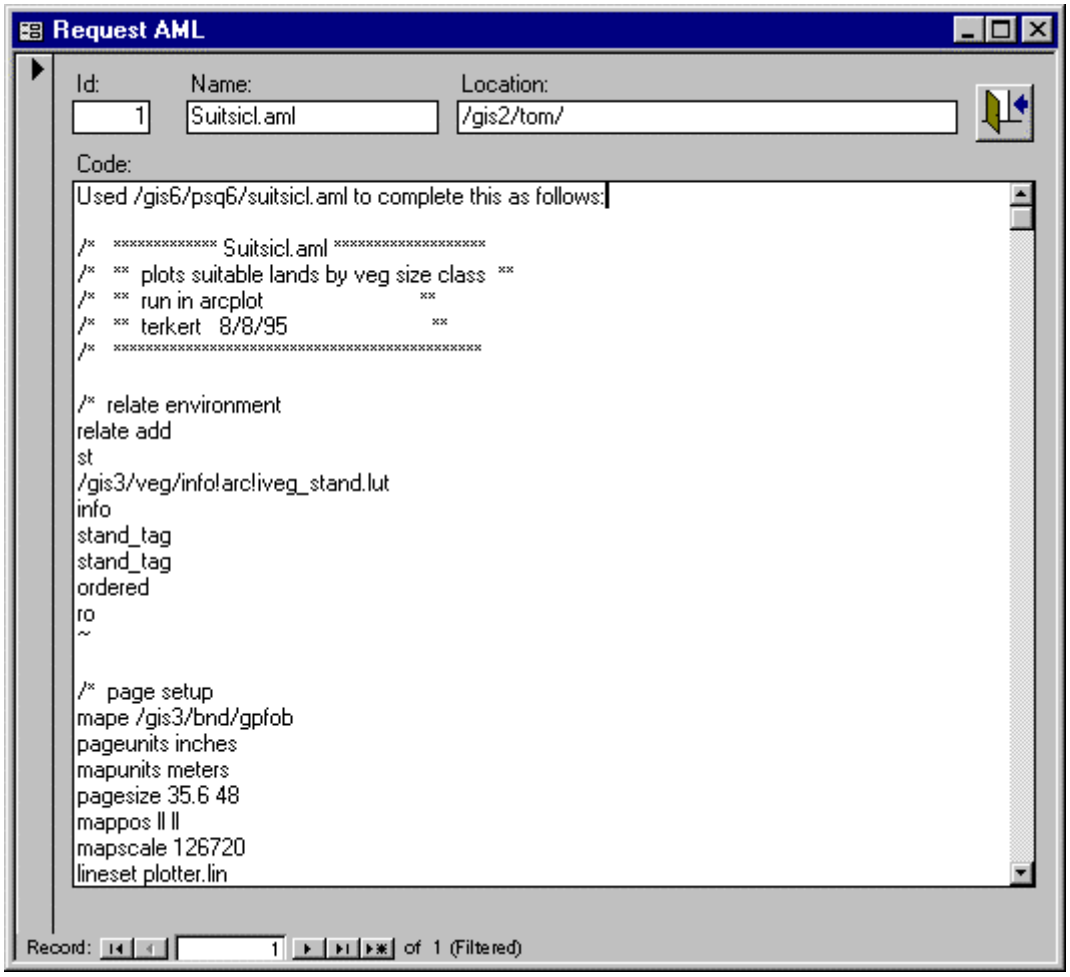

Figure 4-8 Request AML Data Input Form

Open up your aml and read the text into the Windows clipboard, which can be done by many text editors. However, if you store your aml's on a Unix computer, you will need to use a text editor that supports the difference between PC and Unix for text files. One that is highly recommended is the Programmers Text Editor (http://www.lancs.ac.uk/people/cpapp/pfe). Select the code and copy it to the clipboard. Switch to the GIS Infobase application, highlight the code field and paste it in. Complete the remaining data except for the Id as it is generated by the database and is therefore unavailable for editing.

4.8. Associated Documents

The Doc button allows you to input associated documents such as letters and memos that are associated with a request. If a letter is written it should be captured in the Windows clipboard and pasted into this section. When this option is selected, the input form shown in Figure 4-9 will pop up.

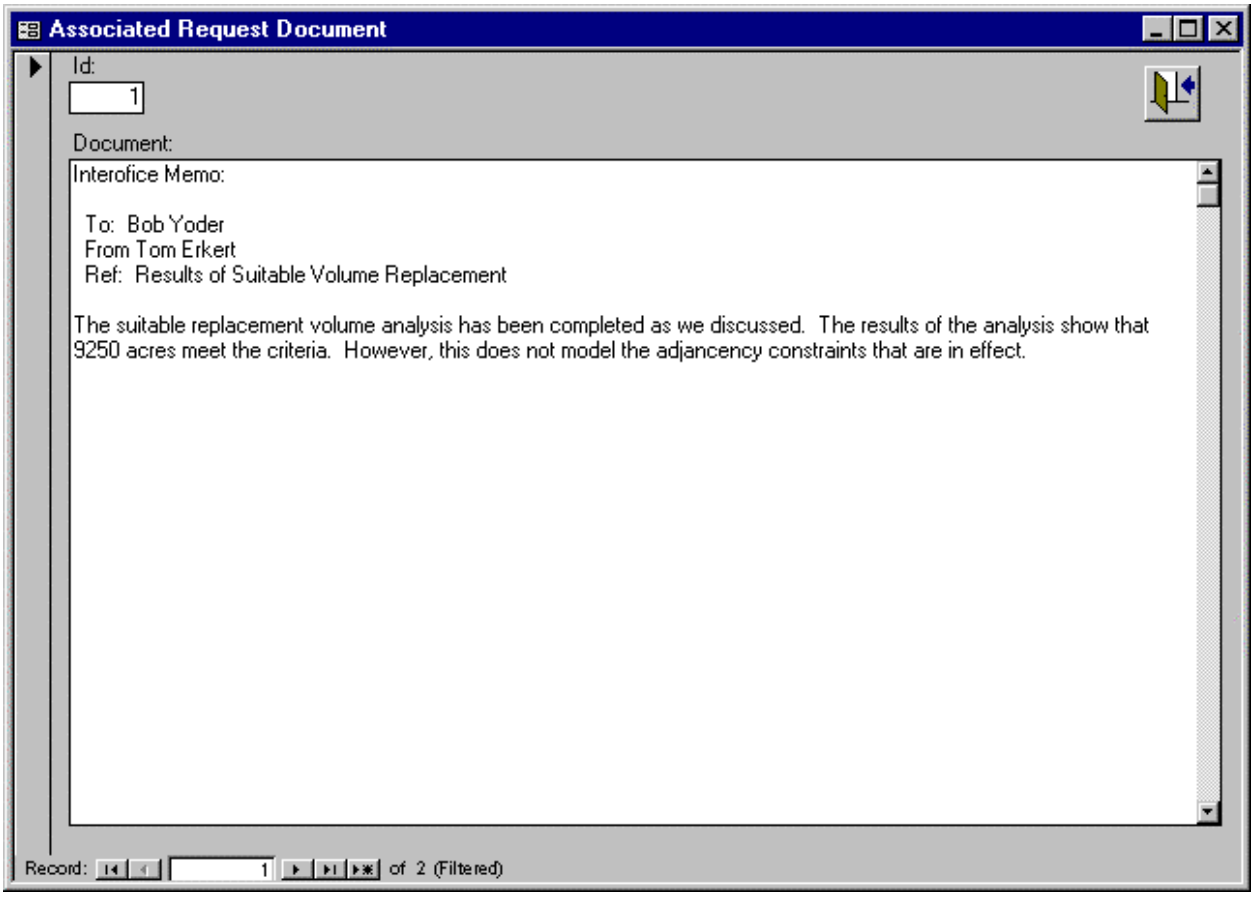

Figure 4-9 Associated Request Document

4.9. Reports

The following sections briefly describe the reports that are available for GIS requests in the application. Each report has a dialog box to specify options when printing or previewing the report.

4.9.1. Request Form

Select this option from the main menu if you want to print or preview a request or group of requests. When you select this option the dialog box shown in Figure 4-10 will pop up.

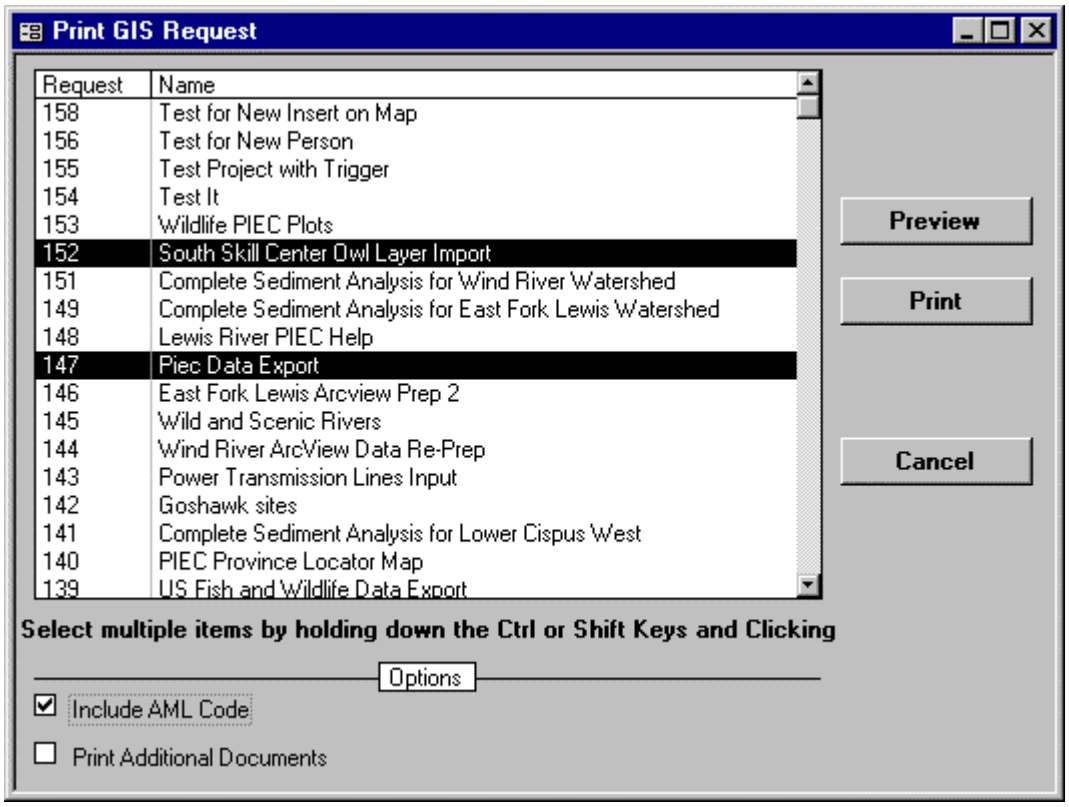

Figure 4-10 Print GIS Request Dialog Box

You can select multiple requests by clicking on each request while you hold down the <Ctrl> key. If you want to un-select a request you can simply click on it again and it will turn the selection off. Once the requests are selected, select the appropriate options at the bottom of the dialog box and click Preview or Print.

4.9.2. Request Status

The Request Status report shows what the status is for the requests that are in the system. When you select this option from the main menu, the dialog box shown in Figure 4-11 will pop up.

The options available are to review all requests, only incomplete requests, or requests that are past their due date. Input a date range in the From and To box if you want to limit the status list to a certain time period.

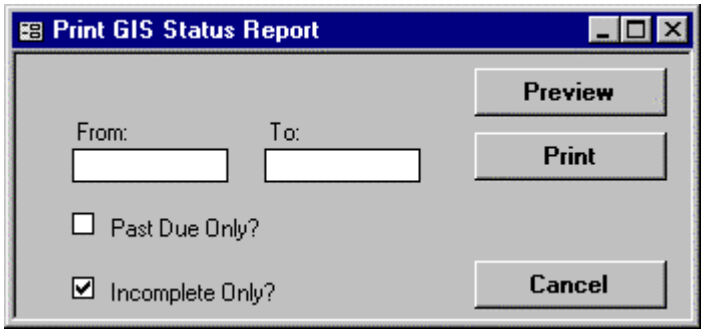

Figure 4-11 GIS Status Report Dialog Box

This report will show an approximate percentage complete based on the number of individual products within the request and the current status of them as input by the analyst.

4.9.3. Request by Employee

This report is similar to the Request Status report, but it's grouped by the analyst that the requests are assigned to. It also contains a summary of each product within the request. This is a good report for each analyst to check to see what requests they have assigned to them. The dialog box options are shown in Figure 4-12.

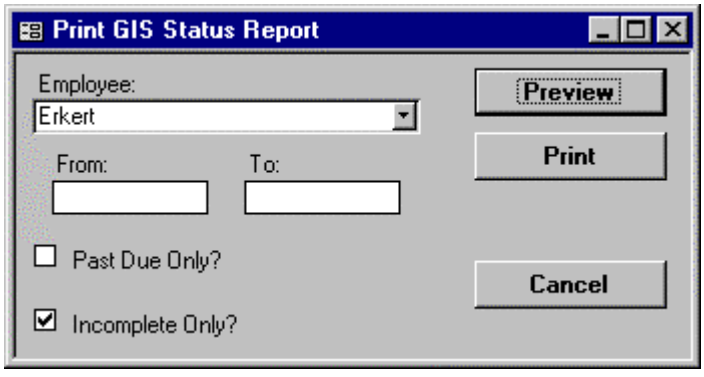

Figure 4-12 GIS Status Report for Employee Dialog Box

4.9.4. Request by Project

The Request by Project report will list all requests that pertain to a larger comprehensive project. All requests that are associated with a large project, such as a watershed analysis, should have the project name input as part of the request. This will allow the tracking of multiple requests by multiple analysts for a larger project. When this option is selected, the dialog box shown in Figure 4-13 will pop up.

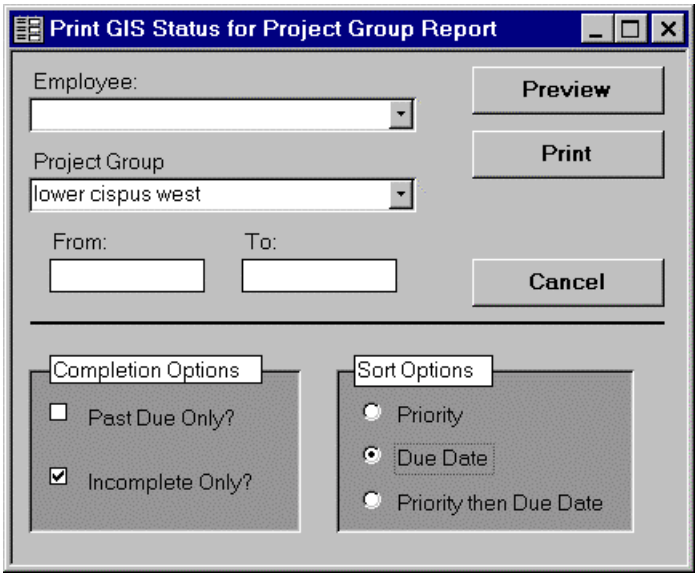

Figure 4-13 GIS Status Request for Project Group Dialog Box

Select the Project Group from the combo box and indicate an Employee if you only want to see the requests assigned to that Employee. If you want all requests for the project group, leave the Employee box blank. Select the sorting options in the Sort Options box and the options for completion in the Completion Options box.

4.9.5. Request Log

The Request Log report will produce a simple listing of requests that are ordered by the Request Id for a date range specified. This is useful for placing a log in the front of the GIS Request binder for the year. When you select this option the dialog box shown in Figure 4-14 will pop up.

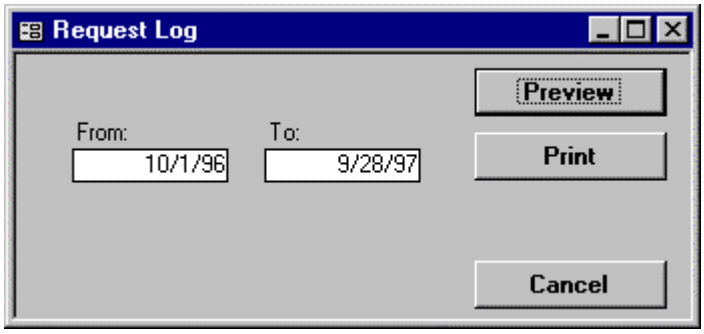

Figure 4-14 Request Log Dialog Box

4.9.6. Staff Request Summary

This report is useful to prepare a summary of the number of requests that were processed over a fiscal year or any other time from by the staff area that requested the products. This report will produce a one-page report that contains the number of requests by staff area and a pie chart that illustrates the data graphically. When you select this option the dialog box shown in will Figure 4-15 pop up.

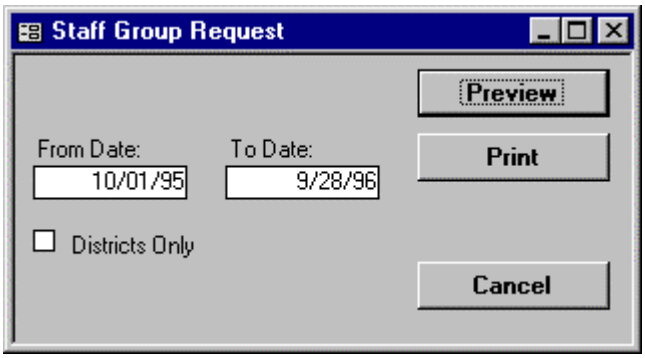

Figure 4-15 Staff Request Dialog Box

Indicate the date range that you are interested in and also if you want to see only requests made by the districts. Noting the organization that each employee belongs to does this.

5. Data Dictionary

The Data Dictionary is the part of the application that manages “metadata” (data about data) on spatial and tabular data sets. The data dictionary is critical for internal and external customers to be able to work with and understand the data. It doesn't do any good to have amassed large volumes of information if specialists, managers, and external customers can’t find the data or don't know the coding used.

Executive Order 12906 that was signed by President Clinton in 1994 requires that federal agencies compile metadata on their spatial data set holdings **and** provide them to the public via the Internet. The Federal Geographic Data Committee was formed and devised a system for data distribution called the National Spatial Database Infrastructure [5]. The backbone of this system is a set of computers communicating across the Internet with metadata that is compiled in a common searchable standard. FGDC created the Content Standard for Digital Geospatial Metadata, which set forth the content standards but did not provide a common way to encode them. FGDC approved an encoding standard in 1997 that allowed automated production of files for posting on a NSDI clearinghouse node. Peter Schweitzer of the USGS created a compiler that would enforce these encoding standards and produce the html and sgml files necessary from text file input [9]. While the FGDC standard is very complete, it’s not conducive as a quick reference for internal customers that use GIS related data on a daily basis. Clearly a way was needed to produce several formats of metadata from the same source data. The GIS Infobase application was designed to answer this need. It can produce both FGDC and Quick Reference formats for metadata as well as prepare the data sets for exporting.

5.1. Geographic Coverages

To review or input information on coverage's, select the Data Dictionary button from the main menu. When you select this option, the Geographic Coverages input form will pop up as shown in Figure 5-1.

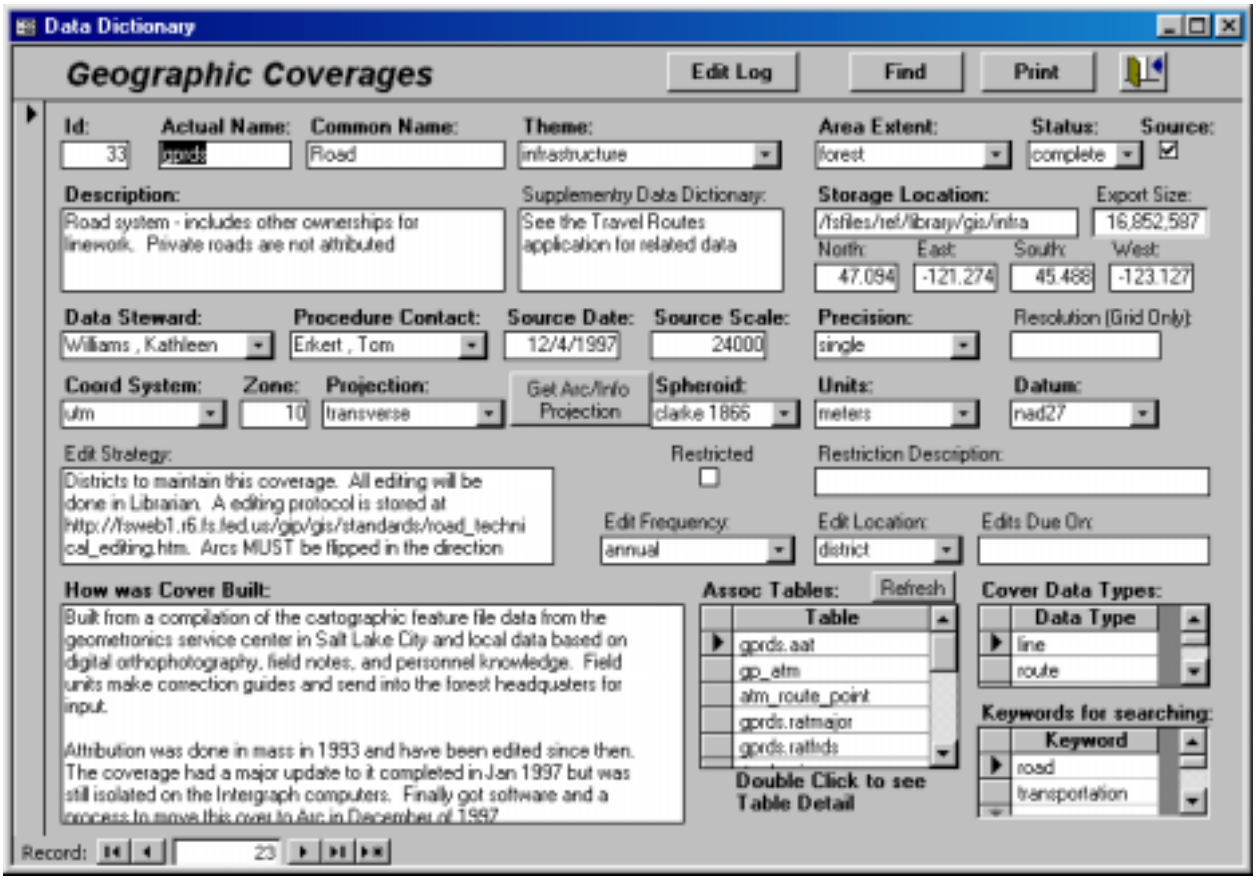

Figure 5-1 Geographic Coverage's Data Input Form

This form contains coverage details and management information such as the editing strategy and where and how often editing should take place. Each of the applicable fields should be completed. The fields that are shown with bold captions, are required to make the program work. A description of each field is shown in Table 5-1.

Table 5-1 Coverage Metadata Field Instructions (bold indicates required)

Data Field	Description
Id	This is generated by the Oracle database and does not need to be input
Actual Name	Name of the coverage as it exists in the Arc/Info workspace
Common Name	A generic name of the coverage such as Road, Stream, Watershed. It's recommended to use the Core Data dictionary name here if it's a "core" coverage.
Theme	The theme that the coverage belongs to. A theme is a logical grouping of coverage's by subject matter. Examples would be "infrastructure" for roads, trail, bridges, and buildings or vegetation for stands, inventory plots, potential vegetation models, etc. These names allow coverage's to be grouped together in reports and on web pages.
Area Extent	Local name for the extent of the coverage, such as forest, district, region, etc

Data Field	Description
Status	Completion status - complete, in process, planned
Source	Indicates if the coverage is a source coverage or derived from another coverage. Check the box it it's a source coverage. This partially controls the coverages available for public export. Only source coverages will be exported in the Internet Metadata Data Export routine.
Description	Short description of the coverage – consider this to be an abstract.
Supplemental Data Dictionary	Where other information can be found on the coverage or related database tables. Many times this will be a User Guide for a database application.
Storage location	File system path on the IBM where the coverage is stored. Do **NOT** include the coverage name itself
Export Size	The size of the export file in bytes. This should be populated after the Internet Metadata and Export routine is run and all files are in final compressed format (Section 6.3).
North, East, South, West	Latitude or Longitude of the bounding extent of the coverage. This doesn't have to be input directly. An AML is created under the Internet/Public web page generation that will project the coverages to geographic then write out the bounding coordinates to a text file. This file can be imported into the application and a mass update query run to populate these fields (See Section 6.2).
Data Steward	Employee that is responsible for the content of the data set. They should be the local subject matter expert.
Procedure Contact	Employee that is knowledgeable on how the GIS coverage was constructed. This is usually a different person than the Data Steward and is typically a member of the GIS Staff.
Source Date	Initial date that the coverage was brought into the library and available for use. This is not the date the coverage was last updated. There is an edit log available for use by selecting the Edit Log button at the top of the form.
Source Scale	Map scale denominator of the base materials used to create the coverage. This is usually set to 24000 for resource layers in the Forest Service.
Precision	Coverage precision either single or double
Resolution (Grid only)	Cell size in coverage units for the grid. Leave blank for vector coverage's
Coordinate System	The coordinate system used if applicable. The choices are utm, stateplane, ups, geographic, or none. If utm or stateplane are used, you must indicate a zone. Once the zone is input for these two coordinate systems, the projection will be automatically filled in. All utm and state plane zones for the United States have been embedded in the application.
Zone	The zone for utm, stateplane, or ups coordinate systems if applicable
Projection	The projection used if no coordinate system is used. You should always complete the projection information for library coverages in Arc/Info for portability so that others can re-project the data into the projection that they use. Once defined, you can use the **Get Arc/Info Projection** button to read in the projection data maintained by Arc/Info. See the discussion in this section for more information.
Spheroid	Spheroid name that the projection is based on. Choices include Clarke 1866, wgs 1984, grs 1980
Units	Units of measurement for the coverage. Choices are meters, feet-us (us survey feet), feet-int (international feet), dd (decimal degrees), dms (degree, minute, seconds)
Datum	Datum used for the projection. Choices are nad27 or nad83
Restricted	Flag to indicate if the coverage is restricted from public distribution. This can occur for data sets that are protected by law such as caves or antiquities (not T&E really but we indicate it anyway). The other situation is if the data was obtained from another agency and a license agreement was signed that prevents the further distribution.
Restriction Description	Describe the circumstances of the restriction
Edit Strategy	The overall strategy of how the coverage is to be maintained over time. Indicate primary source area that editing is to take place and other notes on editing strategy.
Edit Frequency	Frequency of edits
Edit Location	Primary unit that is responsible for editing. Choices are district, forest, region, n/a
Edits Due On	General date that the edits are due based on the frequency
How was Cover Built	Description of the process used to build the coverage. This is typically the first initial surge of work that was used to create or import the coverage into the library. You should place most of your processing notes in here. This information is very important and is the first step in the lineage of the coverage. After initial creation, use the Edit Log to maintain updates to the coverage over time.
Associated Tables	List of database tables associated with the coverage. Each feature attribute table should be documented along with each related database table. To add a new table, just start typing in a blank row in this list. If the table documentation does not exist, a message box will pop up that asks if you want to add the table. To edit existing tables, double click the table name in the list.
Cover Data Types	Indicate the feature types in the coverage. The list includes all basic feature types that are supported in

Data Field	Description
	Arc/info. You don't have to include tics, as these are common to all.
Keywords for Searching	This is a requirement of FGDC. Enter keywords that would identify the coverage in a database search on the NSDI clearinghouse.

5.1.1. Edit Log

The Edit Log button at the top of the Geographic Coverages form will bring up the coverage Edit Log as shown in Figure 5-2. This should be used to manage information about editing processes that are done. This is important information to track the lineage of a coverage and to resolve questions on how it has changed and how current it is. Although Arc/Info allows some limited lineage with the use of the log <cover> function it does not provide an adequate edit environment. It's not recommended that every detail is input, but indicate the general types of editing processes that were done. If desired, you can add the quads that were edited in the Quads Edited list (very optional).

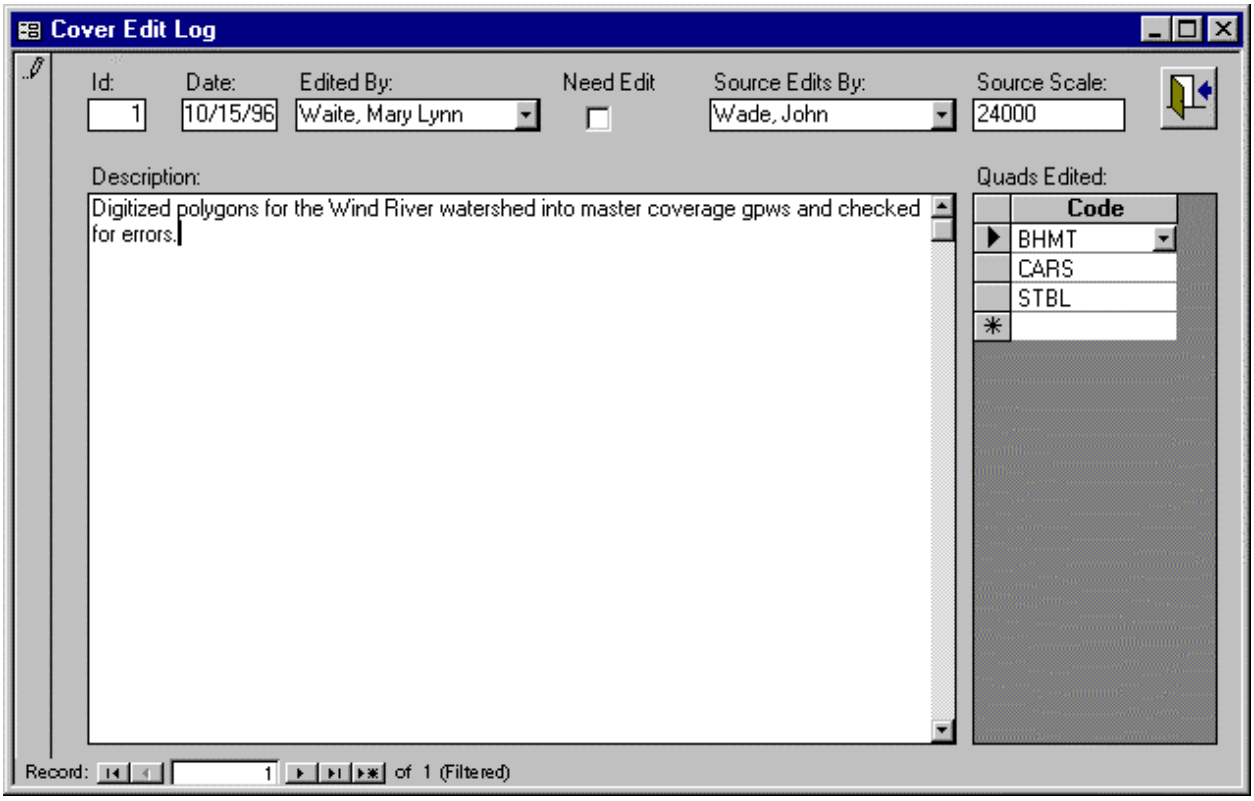

Figure 5-2 Cover Edit Log Data Input Form

Indicate the date that the coverage was edited, who completed the edit, who the source of the edit was, the scale of the source edits, and a description of what was done. If the coverage was edited in quad form input the quad codes that were edited during the session in the quads edited box. This data should resolve questions of how current a coverage is and what was done to it by whom and to what extent.

This input form can also be used to indicate if a coverage **needs** to be edited. To indicate this, check the Need Edit check box. This is a flag that will be shown on a report that is available from the main menu. Once those edits are done, this box should be cleared.

5.1.2. Find Coverage

To find a coverage, select the Find button at the top of the form. When you select this button a dialog box will pop up as shown in Figure 5-3.

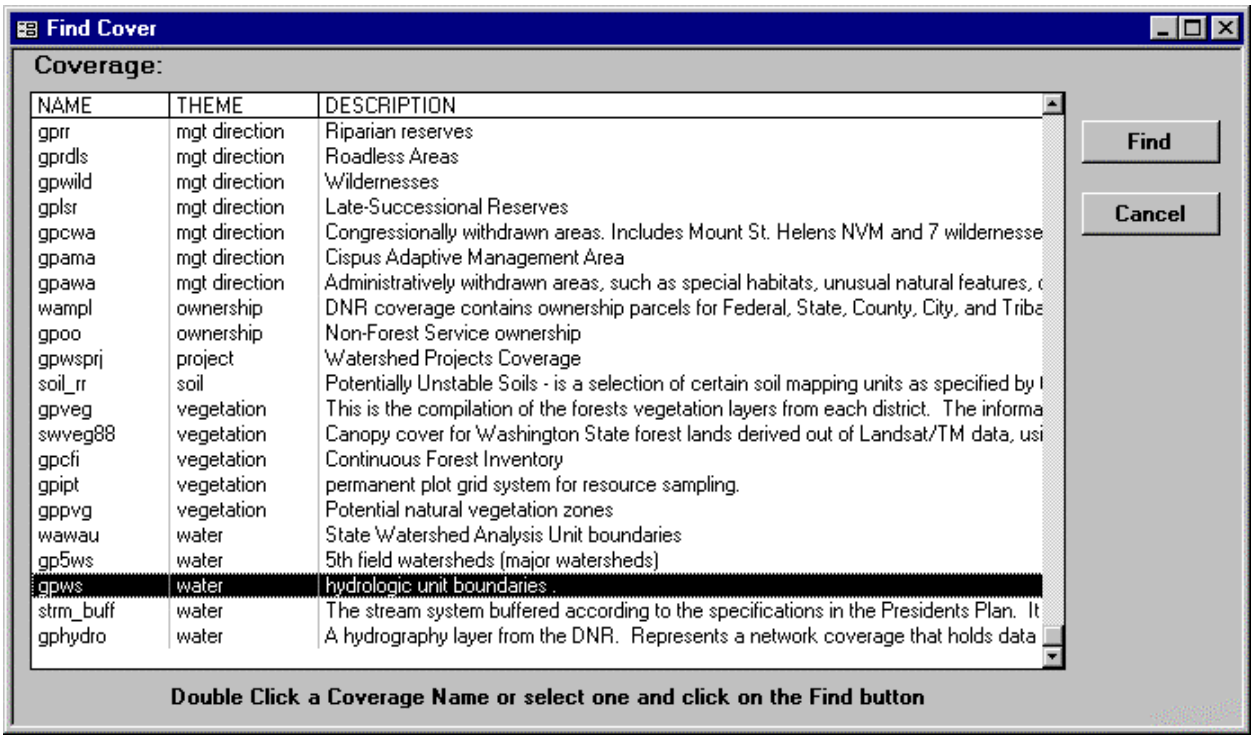

Figure 5-3 Find Cover Dialog Box

The coverages are grouped by theme to make finding them easier. Highlight the coverage that you want to review and either double click it or click the Find button. The dialog box will then close and the Geographic Coverage's data input form will then be on the selected metadata record. Another way to find a coverage is to use the built in find button (binoculars) based on the Name or Cover Id.

5.1.3. Print

This button can be used to print out a coverage metadata report in hard copy format. This isn't used much as the Intranet or Internet web page creation allows you to look at the metadata through a web browser for every day use.

5.1.4. Get Arc/Info Projection

This button can be used to read the projection information maintained by Arc/Info into the application. This will only work if the projection information is defined in Arc/Info with the Project, ProjectDefine, or ProjectCopy commands. When you select this button, a standard Windows File dialog box will pop up as shown in Figure 5-4.

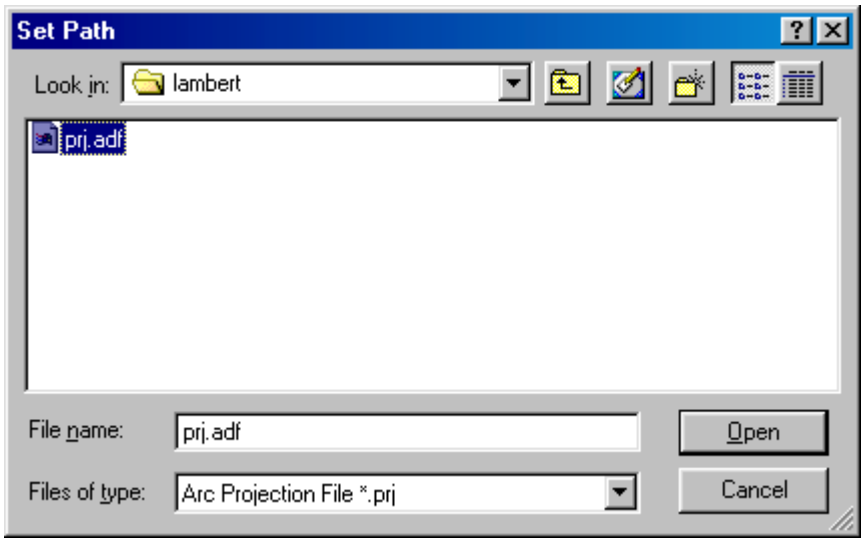

Figure 5-4 Get Arc/Info Projection File dialog

Navigate to and inside the coverage directory on the file system and find the prj.adf file. This is the file that Arc/Info stores projection information in. For example, if you wanted to get the projection file for the road cover stored in /fsfiles/ref/library/gis/infra you would have to open the /fsfiles/ref/library/gis/infra/road/prj.adf file. Select Open to load the projection file or Cancel to cancel the load.

When the file is opened, several things happen. First, the coordinate system, zone, projection, datum, units are filled in. Second, the projection file parameter data is read in and stored in a table for later use in processing FGDC metadata. These projection parameters are especially important if you use a projection (such as Albers) with no coordinate system. If projection data is already defined for a coverage and this option is selected again, the old data will be deleted and replaced with the new projection file data.

A concerted effort was made to research and embed associated geodesy information with a minimum of effort. All state plane zones for the United States are encoded as to the projection and standard parameters for NAD 27 and NAD 83 [11, 12]. UTM zones were configured also [14]. National map accuracy standards were encoded so that they reflect scale dependencies [13].

5.2. Table

Most of the power of GIS comes from the tabular data behind the spatial data. This data is extremely important to accomplishing anything with the GIS. Most tabular data that needs to be shared and linked to spatial data should be stored in Oracle but the reality is that it's stored in several different places. Oracle and INFO are the most common storage repositories and each are supported for obtaining item or column definitions from. The Table Definition Input form, Figure 5-5, allows you to dynamically read Oracle and INFO tables and obtain whatever dictionary information is available. You must have the Doric INFO~ODBC driver installed on your computer to read INFO files [10].

Each table structure related to a spatial coverage should be input from the Geographic Coverage data input form by typing in the table name in the Associated Tables list at the bottom of the Geographic Coverage's form. A dialog box will pop up asking if you want to add the new table. If you select Yes, the Table data input form will pop up as shown in Figure 5-5.

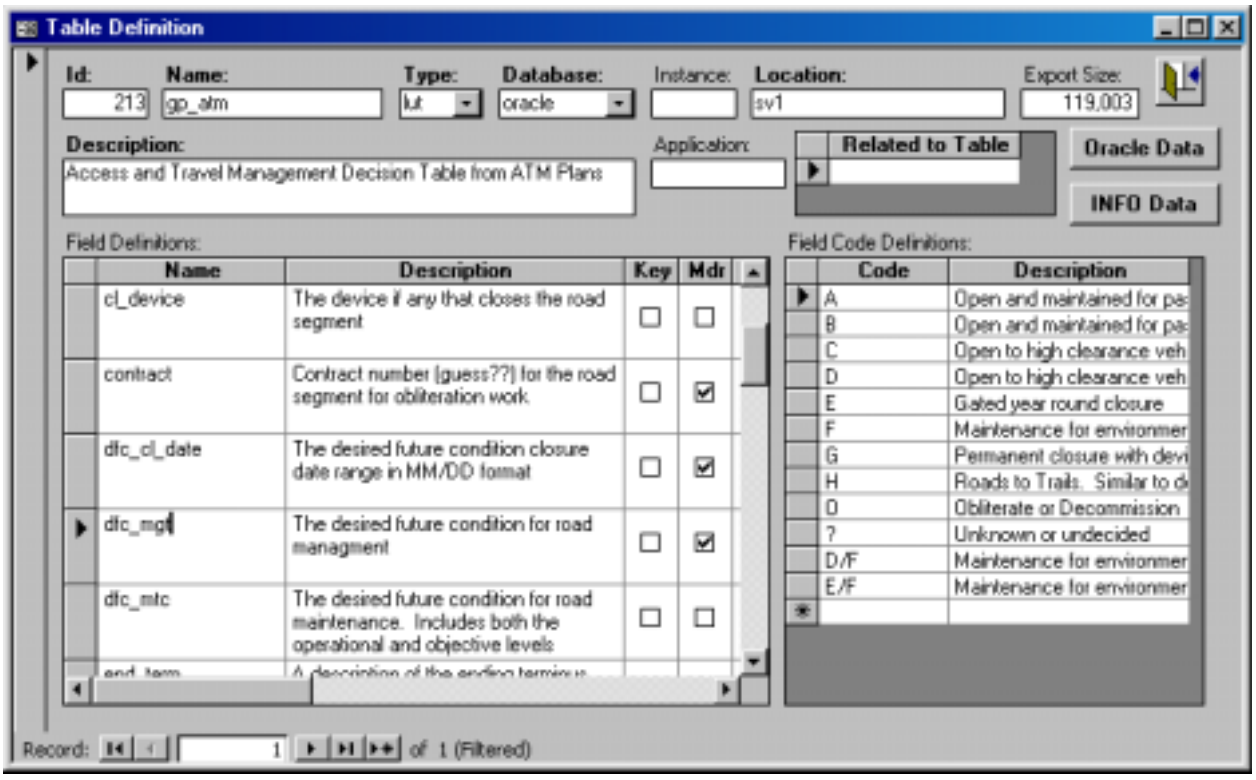

Figure 5-5 Table Definition Data Input Form

The data in the upper part of the form is information on the table itself, where it's stored, the application it belongs to (if applicable) and what other tables are related. You must indicate that non-feature attribute tables are of type **lut** or **view** (look up table). This is used to note which tables are feature attribute tables and which ones aren't as only non-feature attribute tables need to be exported separately. Input a description of the table in the Table Description box. The Field Definitions box contains data that describes each field within the table, if it's a key column, and a description of the field. As the cursor is

placed in each row in the Field Descriptions box, the codes that are defined for that field are shown in the Field Code Definitions box. Input any codes and definitions in this box while your record selector **is in the appropriate row** in the Field Descriptions box. The code definitions are very important for internal and external customers to understand it.

5.2.1. Oracle Data

If the table to be documented is an existing table or view in Oracle, Click the Oracle Data button when you **first** add the table. When you click this button, the application will read Oracle's data dictionary and return a list of objects in Oracle to select from (Figure 5-6).

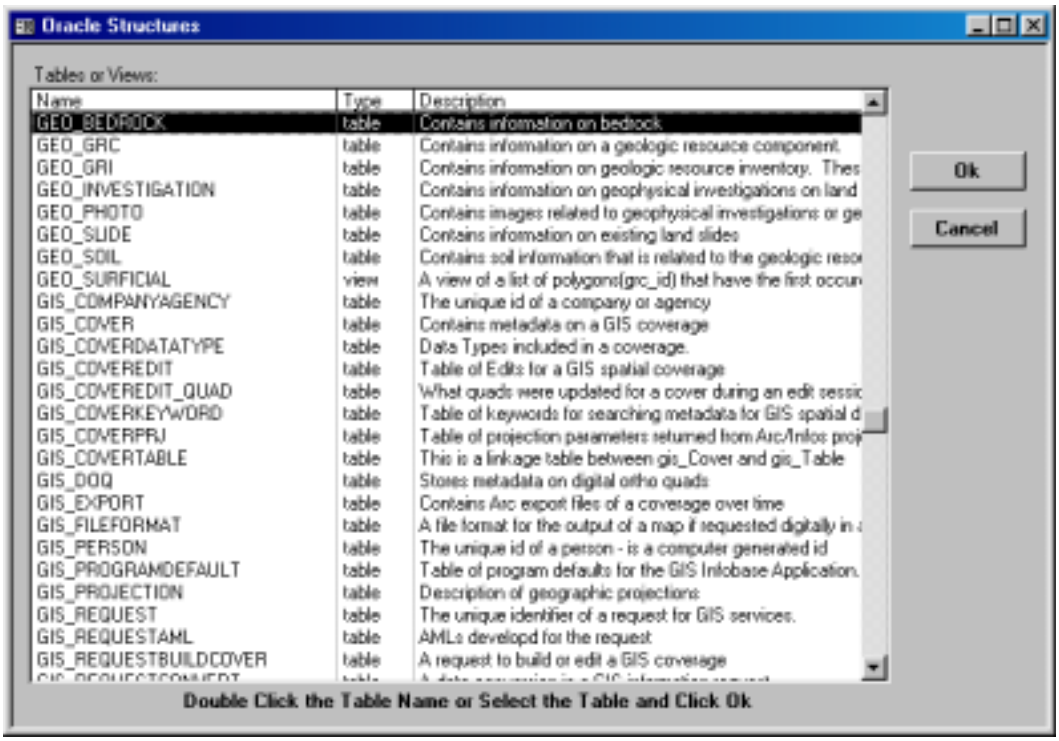

Figure 5-6 Oracle Structure List

The list contains both tables and views. The description is available only if the developer that created the object created a comment for it. Select an object from the list and click Ok and the application will read all pertinent information that is contained within Oracles data dictionary. It will read Table/View comments, column names and comments, column data types, and indicate which columns are designated as part of the primary key. Because Oracle has no place to intrinsically store codes within columns, the codes will need to be input by hand. Sometimes they can be populated by creating append queries from an applications own code table if you know where they're stored.

5.2.2. INFO Data

Use this button if you have the Doric INFO~ODBC driver installed and you want to read the item names from an INFO table. When you select this button, the Select Data Source dialog box from the ODBC manager will pop up as shown in Figure 5-7.

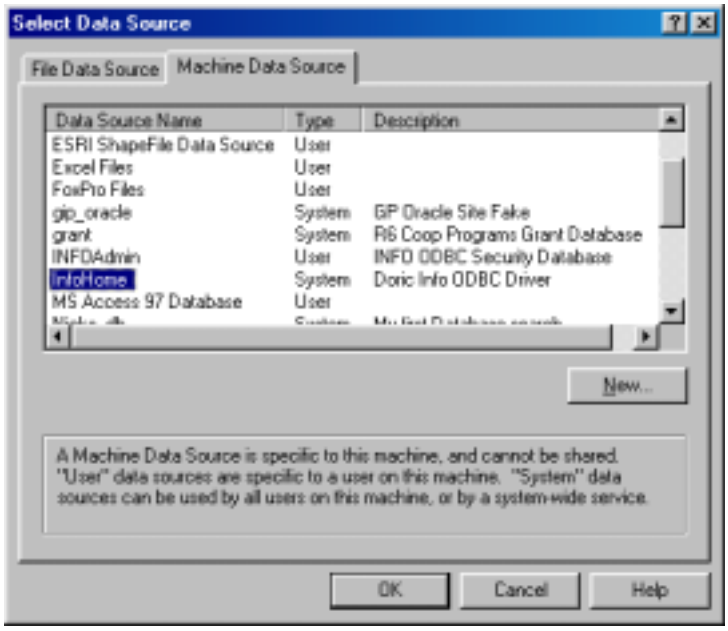

Figure 5-7 Select Data Source for INFO Table

The INFO~ODBC driver works a little different than the Oracle driver. You will need to set up a separate Data Source Name (DSN) for each Arc/Info workspace (actually the info directory inside the workspace). If you don't have the DSN already set up, click the New button in this dialog which will allow you to create one. After you select a DSN and click Ok, the INFO table list will pop up as shown in Figure 5-8.

Figure 5-8 INFO Database File Documenter

Select the table that you want to document and press Ok and the item names will be populated in the Field Definitions box. Each of the INFO files have the "." replaced with an "_" as the period is an illegal character in Access tables. Unfortunately, since INFO has non-standard data definitions and it doesn't have an internal data dictionary, only item names and a guess at the item types can be obtained. Numeric items will have to be adjusted by hand as there is no information returned through the ODBC driver as to the length and decimal places if applicable. Code definitions will also have to be populated at this point.

If an existing table exists with the same name, the application will update the field list but will preserve the descriptions and coding. New items that were added will be discovered and added to the field list.

5.3. Reports

The following sections briefly describe the reports that are available for GIS requests in the application. Each request has a dialog box for options when printing or previewing the report. Web page metadata generation is covered in Section 6.

5.3.1. Cover Listing

To obtain a simple listing of coverage's in the Data Dictionary, select the Cover Listing button from the Main Menu. When you select this option, a dialog box will pop up that allows you to group the listing by Theme or Data Steward. This listing is a good quick reference to what is contained in the library. Use the Group by Data Steward option for review of dictionary information by the Data Stewards. This listing should be published periodically to all personnel that are interested in spatial data. This listing is also available to be published in HTML format for web page distribution (See section 6).

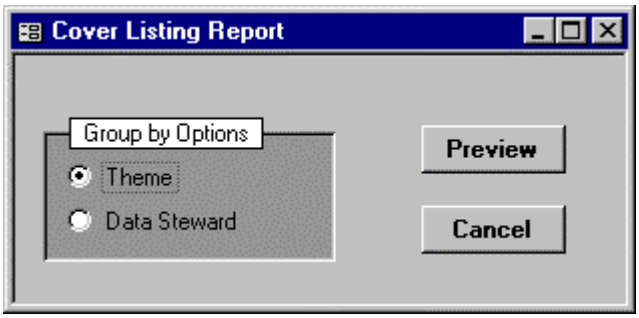

Figure 5-9 Coverage Listing Dialog Box

5.3.2. Cover Detail

To produce a detailed report of a coverage(s), select the Cover Detail button from the Main Menu. This will produce a report with all metadata and associated database tables and field/code definitions. When you select this option a dialog box will pop up as shown in Figure 5-10.

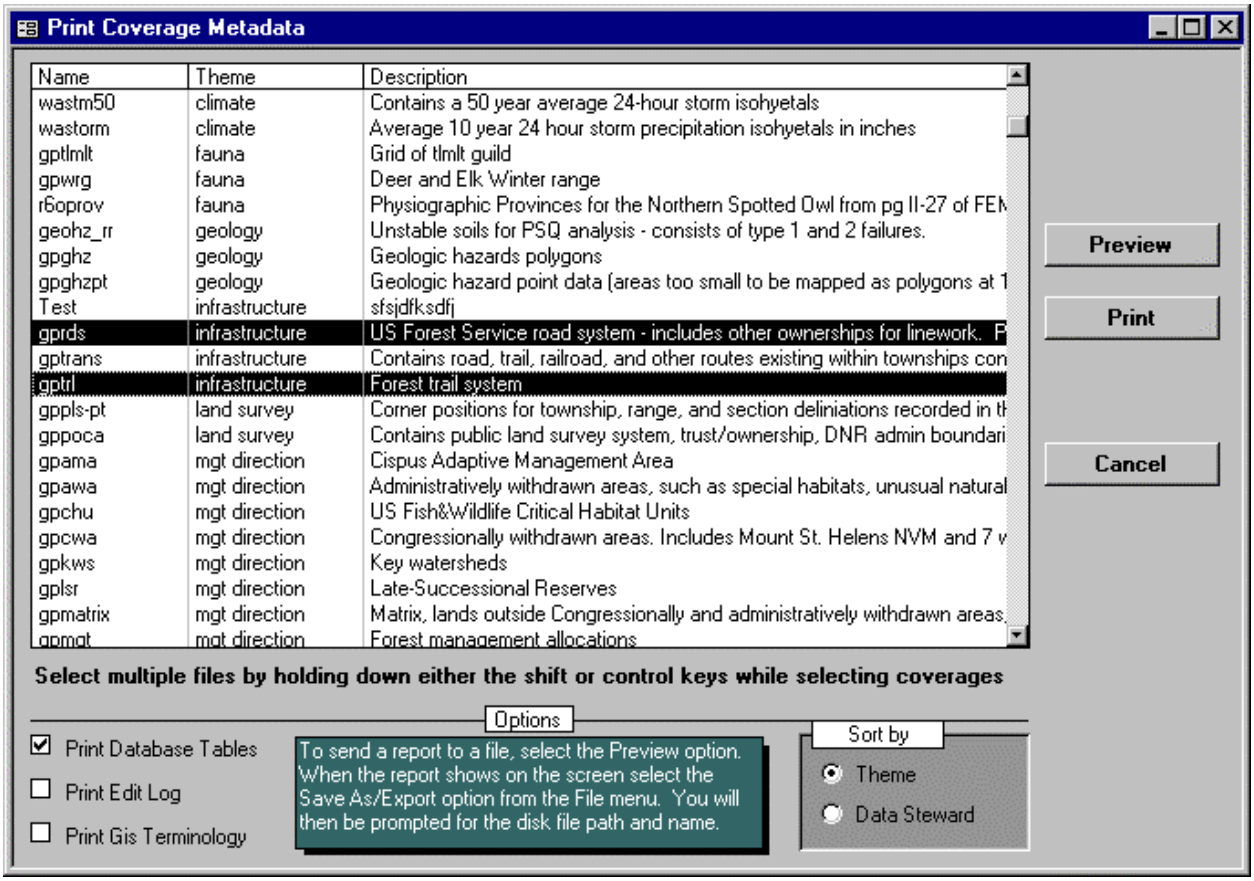

Figure 5-10 Cover Metadata Dialog Box

The list in the dialog box is sorted by theme then by coverage name to make it easier to find the coverage that you are looking for.

You can select multiple coverages by clicking on each coverage while holding the <Ctrl> key down. If you want to deselect a coverage, click on it again. Check the options that you want included in the report(s) by selecting the check boxes on the lower left of the screen. You can also indicate how you want the reports sorted, either by Theme or Data Steward.

The coverage report can also be produced for a single coverage by clicking the Print button at the top of the Geographic Coverage's data input form. This will produce this same report but for the currently selected coverage in the form.

5.3.3. Cover Edit Needs

This option runs a report directly and no dialog box will pop up. This report will print a simple listing of the coverage's that need editing as indicated by the check box being checked in the Need Edit check box in the Edit Coverage Input form. When a coverage has had edits completed, this check box should be cleared so the coverage will not print again here.

6. Metadata Generation for the Web

The GIS Infobase application can produce metadata suitable for posting to a web server. This is the preferred method of publishing metadata for both internal (Intranet) and external (Internet) customers. The application can produce two different formats of metadata:

1. Quick Reference format - This format is an easy to read ready reference format that can be used for every day use. This format should be used as the internal data dictionary posted on the units' fsweb site.
2. FGDC format – this format is required if you want to post your metadata to a NSDI clearinghouse server. While the format is complete, it's difficult to read and should only be used for transfer to a NSDI server.

6.1. Intranet Metadata

Select this option to produce a series of formatted web pages that contain the coverage listing and links to the data dictionary reports. This option should be used to generate metadata documentation that can be placed on an internal web server such as the fsweb. The only disadvantage to this method is that the pages are static and don't contain live links to the database. Therefore, if you select this method the routine will need to be run at some periodic interval.

If you have access to a Web Server that supports Active Server Pages (ASP), you can use the ASP files distributed with the application to produce web pages with a live linkage to the database. This is the preferred method as it requires less maintenance. However, support for ASP is not widely available yet within the Forest Service. You will need to perform some minor edits on the ASP files to replace any reference to the Gifford Pinchot forest with your own unit name. The ASP files distributed are:

Name	Function
default.asp	Start page that controls the frames
ddindex.asp	Table of Contents frame
ddmain.asp	Cover Listing page displayed in main frame. This file will need to be edited to replace "Gifford Pinchot" with your own unit name.
dd.asp	Produces the individual metadata page in the main frame. This file needs to be edited to replace "Gifford Pinchot" with your own unit name.
ddtable.asp	Produces the table page in the main frame

When you select the Intranet Metadata, the dialog box shown in Figure 6-1 will pop up.

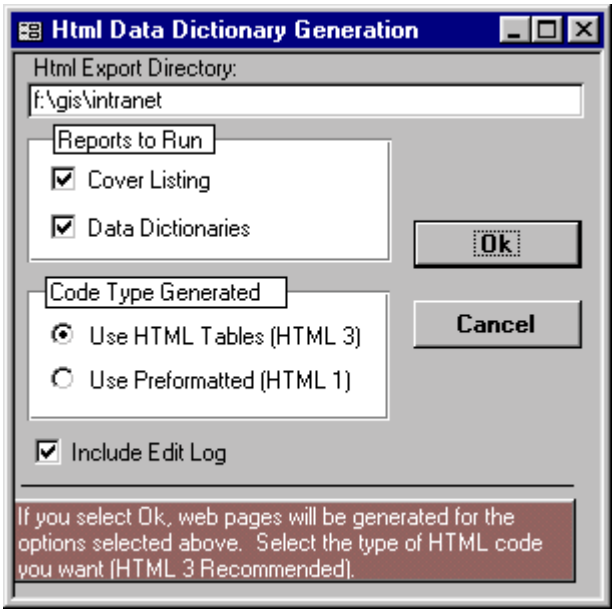

Figure 6-1 Intranet Web Page Dialog Box

Several options are included in this dialog box to allow some flexibility to the HTML code generation. The Reports to Run box includes the reports to include in the code generation. Both reports should be checked to have a set of pages that work together. The Code Type Generated box allows you to select the version of HTML to use. The primary difference between the two is that HTML version 3 uses tables and HTML 1 does not. It's **highly** recommended that you select the HTML 3 format. All pages generated will be written out to the directory indicated in the HTML Export Directory box. This directory defaults to a directory called Intranet under the installation directory (`install_directory\intranet`). The directory must exist or an error will be reported. After the pages have been created, move the files to the web server and provide a link to the `index.html` page (starting point). See section 6.2.2 for the layout of the page and adjustment of graphic images.

6.2. *Internet Metadata and Data Export*

This option will produce metadata in two different formats that are suitable for posting to a www web server. This option is designed to produce all needed files to include on distribution media or posted directly on a web server. It automates the production of the metadata, creates AML's for export of coverages, and creates exports of related database tables from Oracle and Info in ASCII delimited format. When this option is selected, the dialog box shown in Figure 6-2 will pop up. Complete the directory information and note that any directory shown should not have any trailing forward or backward slash after the name.

Figure 6-2 Internet and Data Export Dialog Box

Input the directory where you want the HTML and exported databases placed in the Html and Oracle Database Export Directory box. This directory defaults to a directory called Internet under the installation directory (`install_directory\internet`). The directory must exist or an error will be reported. Also indicate the path on the IBM where the actual coverage export files will be placed if the Create Export AML option is selected. This directory needs to be indicated in Unix format, as it will eventually be run from an Arc/Info AML.

The covers to be documented need to be selected first by clicking the Select Covers button. This allows you to select all coverages or individual coverages. After you click the Select Covers button, the form shown in Figure 6-3 will pop up.

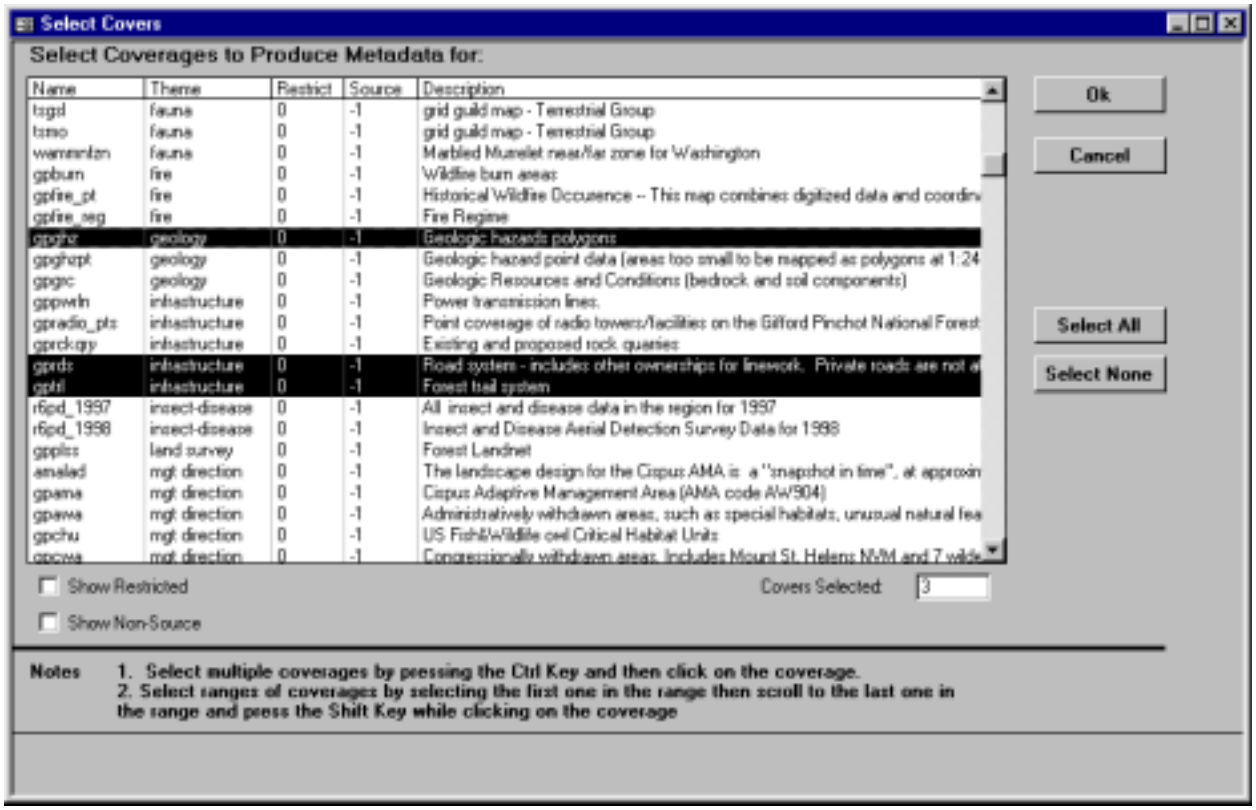

Figure 6-3 Select Covers Dialog Box

The list of coverages presented defaults to only those that are not restricted and that are source coverages (see section 5.1). This is the recommended set of coverages that should be available for public export. If you want to export either restricted or non-source coverages, you must check the appropriate boxes in the lower left corner of the form. You can select multiple coverages by holding down the Ctrl key on the keyboard while you click on the coverage name in the list. The list is sorted by Theme then by Coverage name. It also includes the flags for Restricted and Source (-1 is true, 0 is false). You can select a range of coverages by selecting the first one in the range, then scroll to the last one in the range and hold the Shift key down while you click on the last coverage in the range. You can quickly select or deselect all covers in the list by clicking the Select All or Select None buttons on the right side of the form. Any time a cover is selected or deselected the number of coverages selected will be shown in the Covers Selected box in this form and on the main Internet Public export form. When you have selected all the coverages you want to document and/or export, click the Ok button and you will be returned to the GIS Public Coverage Export dialog box.

A great deal of flexibility is allowed through the use of the various options in the GIS Public Coverage Export dialog box. The options available are:

1. Create Export AML - This will produce several aml's that need to be run to physically export the spatial data sets. The export aml (covexp.aml) will only run if the path, name of the coverage and spatial data types are correct in the database. An additional aml called chkcname.aml will check each coverage name against the actual file system and report any errors. You must then return to the database and correct the problems. The chkcname.aml is called from the covexp.aml so there is no need to run it separately.
2. Create the Extent AML – This aml (genextent.aml) will iterate through the list of coverages and project each one to geographic coordinates and write the latitude and longitude coordinates out into a file called covextent.txt. This file will include the CoverId and the maximum bounding coordinates in decimal degrees. This file should be imported back into the application and used as a source for an update of the bounding coordinates. This process is automated – see Section 6.2.2 for more information.
3. Create Data Dictionary in Quick Reference Format - this option will create a series of HTML pages in a ready reference format. A master page named index.html is the same report as the coverage listing. Each cover page is named with the c#.htm where # is the CoverId in the database. Each table page is also a separate html page and is named t#.htm where # is the Table Id.
4. Produce FGDC Metadata in addition to the Quick Reference Format – This option will produce a series of text files in the appropriate format. These text files are then run through the Metadata Parser program [9] to produce. html and .sgml files that are required for posting to a NSDI clearinghouse node. This format is very unforgiving and will report errors where the standard is slightly violated. These errors are captured in a log that is shown in a form at the end of the metadata creation process (Section 6.2.1). If no form pops up, the data has been translated without error. This option will write all files created under the application directory/internet/fgdc directory.
5. Include Data Steward Names instead of Job Titles – This option allows you to include actual steward names instead of job titles. It's recommended using actual names to facilitate direct public contact. However, if your stewards are overly paranoid, this option can be used to remove their names.
6. Include Hyperlink at Address - this option will place a link on each data dictionary page and a master index page that allows customers to transfer the data set via the Internet. You need to select a protocol to use in the Protocol option box. We have had the most luck with http links as ftp is disabled from the web server of the Washington Office.

7. Compress Export and Database Files – Check this option to compress all files with the Unix compress command. Actually, all Arc export and INFO table exports will be compressed via the aml's that are generated. To compress the Oracle database files, they need to be moved to the IBM and compressed with the compress command.
8. Export Oracle tables linked to Source Covers - This will export Oracle tables in ASCII delimited format with column names in the first row strings double quoted, and data fields separated by commas. All data is stripped of quote characters as they cause problems with data import. No binary long columns are exported.
9. Export INFO tables linked to Source Covers - This will export lookup INFO tables (*.lut) in ASCII delimited format with the column names in the first row.

The export routine will also write to disk a readme file that should be included with the data. The readme.txt file lists all files included and a description. This file is useful for distributing on physical media.

6.2.1. FGDC Error Log

When you select the FGDC option, the application writes out a series of text files that are processed through the Metadata Parser program [9]. The Metadata Parser checks the text files for content errors and then produces a set of files that are needed for posting to a NSDI web server. The files produced are .html, .sgml, and .err (errors). All file types except the .err files need to posted to the NSDI server. The files will be stored in a directory called FGDC under the directory you have indicated in the HTML and Oracle database export directory in the GIS Public Coverage Export dialog box.

The error logs from the .err files are captured in several local database tables and shown in a form after the process finishes (Figure 6-4). You can easily correct the errors in the data by clicking on the Data Dictionary button which will bring up the coverage that you are reviewing the error log for. Click the Print Error Log button if you prefer a printed report. You must correct all errors before posting the final files to an NSDI web server.

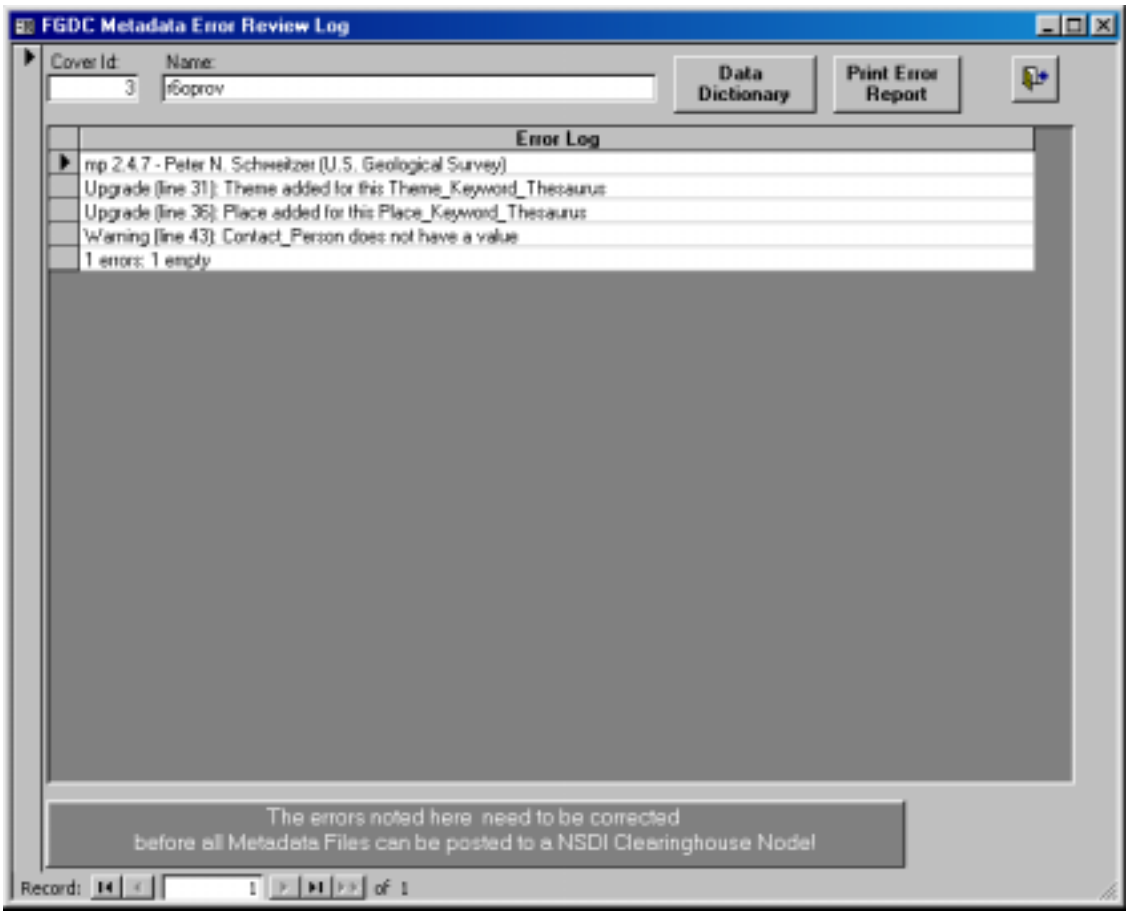

Figure 6-4 FGDC Metadata Error Review Log

6.2.2. Load Cover Extent File

This option will load the bounding coordinate file (covextent.txt) produced from the Internet Metadata and Data Export option. This file includes the bounding coordinates for each coverage, which have been projected into geographic coordinates (i.e. longitude and latitude). Before you select this option you must:

1. Run the Internet Metadata and Data Export routine
2. Execute the genexent.aml macro in Arc/Info
3. Move the covextent.txt file back to the PC via ftp in **ASCII** mode as this will force a Carriage Return, Line Feed combination at the end of each line.

After the steps above are completed, select the Load Cover Extent File from the Main Menu and the dialog shown in Figure 6-5 will pop up.

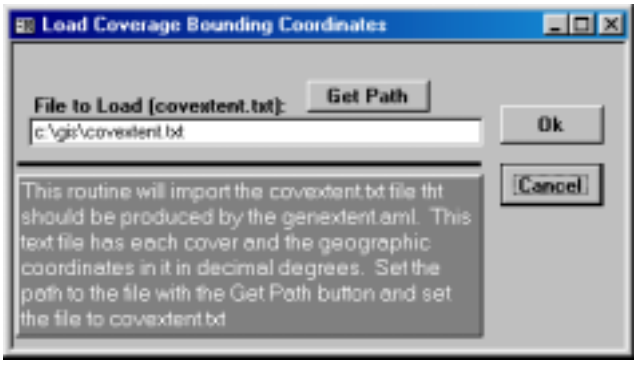

Figure 6-5 Load Coverage Bounding Coordinate Dialog

Use the **Get Path** button to browse the file system and select the **covextent.txt** file in the appropriate directory. When you select Ok, the application will load the coverage extent data from the text file into a temporary table, then run an update query on the coverage table to update the bounding coordinates.

6.2.3. Load File Size File

This option will load the file that contains export files sizes (filelist.txt). This is only useful after you have produced all cover and table export files and compressed them. The purpose is to load the actual file sizes back into the database so that accurate file sizes can be listed on the final web pages. You must issue the following command at the Unix prompt to build the correctly formatted file:

```
ls –al *.Z > filelist.txt
```

Move the filelist.txt file back to the PC via ftp in **ASCII** mode, as this will force a Carriage Return, Line Feed combination at the end of each line, which is required for the loading routines to work properly. After you have moved the file, select the Load Cover/Table File Export Sizes button from the main menu and the form shown in will pop up.

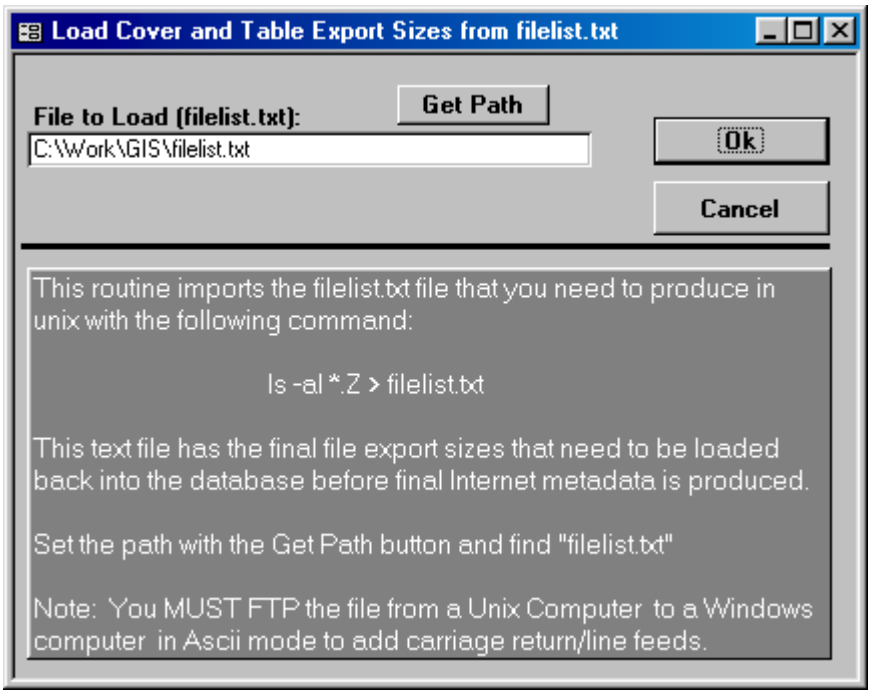

Figure 6-6 Load Cover and Table Export Sizes

Web Page Layout and Graphics Files

The quick format web page has several graphic images on it that you can replace with your own images as shown below.

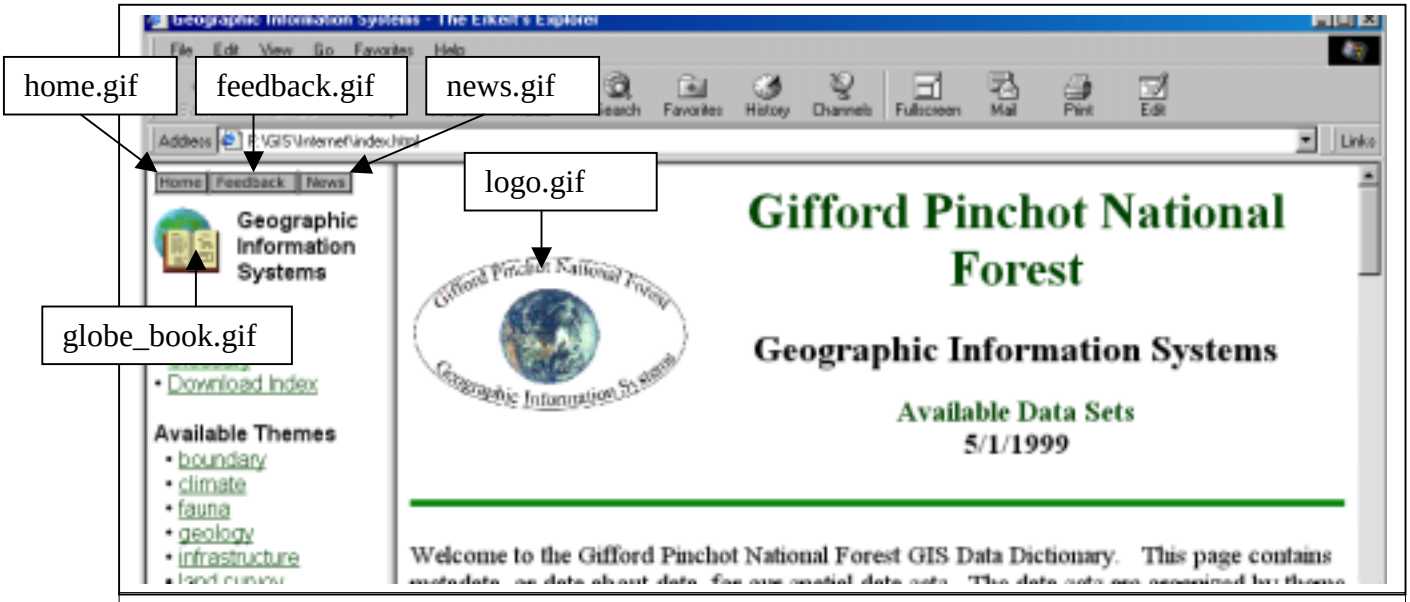

Figure 6-7 Web Page Graphic Location and Naming

6.3. Task Sequence to Post on a Web Server

There are several other tasks that need to be completed before the final metadata can be posted. A typical sequence of events to provide an adequate posting is:

1. Run the Internet Metadata and Data Export routine but **only** select the check boxes for the AML production and table exports from Oracle and INFO. Correct any errors in cover names as indicated by the chkcover.aml and rerun if necessary. Move the amls over to the IBM and create the export files and coverage extent file. Also be sure to move the arc2geodd.prj file over to the directory where you will execute the amls. This aml holds the projection parameters in it to do the projection. It is set to project from UTM zone 10 to Geographic decimal degrees. If your library is different, you should modify the file.

2. Move the Oracle table export files over to the IBM with BINARY mode via FTP. This will preserve the carriage return/line-feed combination so the data can be loaded in a PC database. Compress all the files with the Unix **compress** command.

3. Create a text file of the compressed object names with the list command and pipe it into a text file. This is the source data for the Export_Size column in the gis_cover and the gis_table table. You can load this by manipulating the name of the object and linking this back to the coverage ids and doing a mass update. This process is not automated.

4. Load the coverage extent file back into the database (see section 6.2.2).

5. Run the Internet Metadata and Data Export routine again and produce the final metadata documents in the format you prefer.
6. Post all files to the web server(s).

7. Lookups

There are a series of forms that are used to add or edit standard information on people, agency or companies, and quadrangle data. These are used throughout the application as standard lookups.

7.1. Agency

Use the Agency button to add or edit agency or companies that people that are making a request are employed by. You must add an Agency or Company before you add any personnel that are associated with it. When you select this option from the main menu, the Agency data input form will pop up as shown in Figure 7-1.

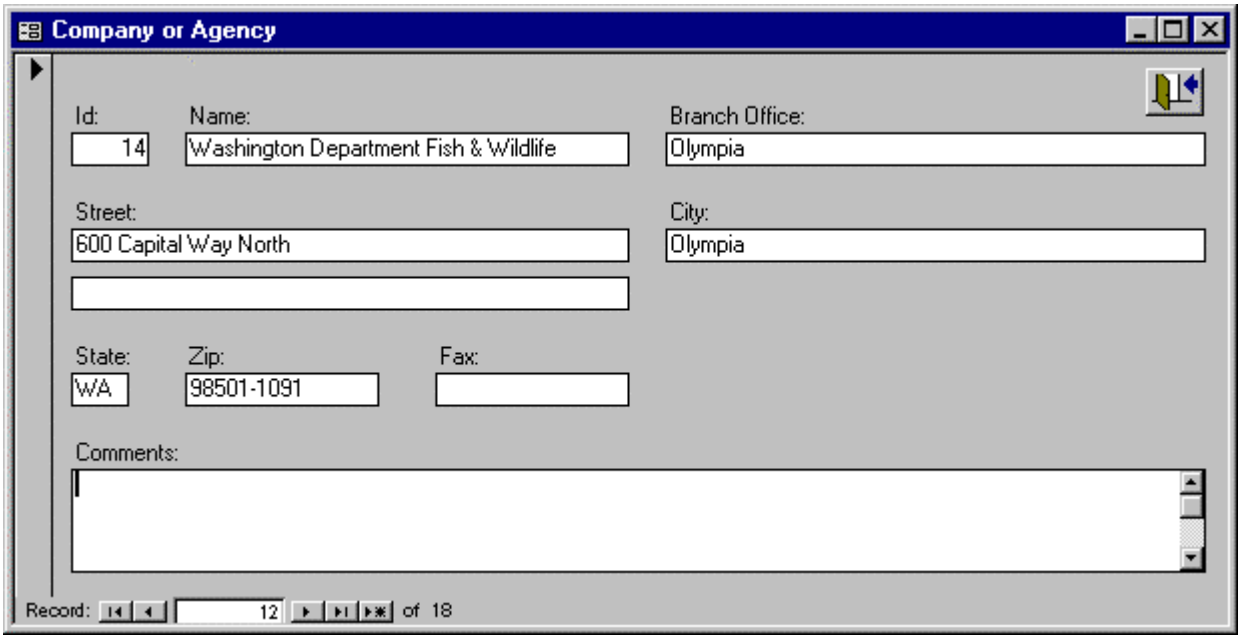

Figure 7-1 Company or Agency Data Input Form

Input all the data requested except for the Id value as it is generated by the database itself and is therefore unavailable for editing. The branch office is the name within the organization that is external to the main office. This would include USFS District office names or names of companies branch offices such as the Chehalis and Longview offices of Weyerhaeuser.

7.2. Personnel

Use the Personnel button to add or edit employees of companies or agencies after the company or agency has been input. This is just a convenient place to store phone and fax numbers so the analyst can quickly communicate with who is making a request. It is also used in metadata creation for looking up Data Steward and Contact names. When this option is selected, the Personnel data input form will come up as shown in Figure 7-2.

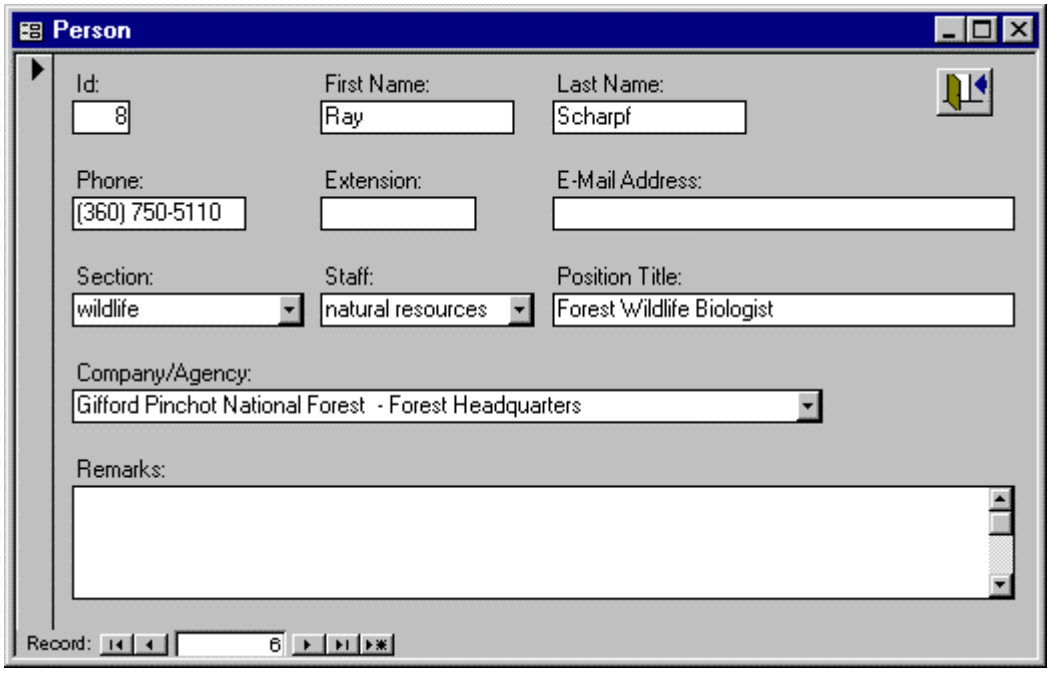

Figure 7-2 Personnel Data Input Form

Input all the data requested except for the Id value as it is generated by the database itself and is therefore unavailable for editing. The section is the locally known functional group within a broad staff area within the organization. For companies you should indicate that the staff is outside agency. The position title should be indicated for all data stewards, as the title will be included on web pages on the Internet.

7.3. Quadrangle

Use the Quadrangle button to add or edit data that pertain to the standard 1:24,000 base quadrangles that are used for manuscripting. When this option is selected the Quadrangle data input form will come up as shown in Figure 7-3.

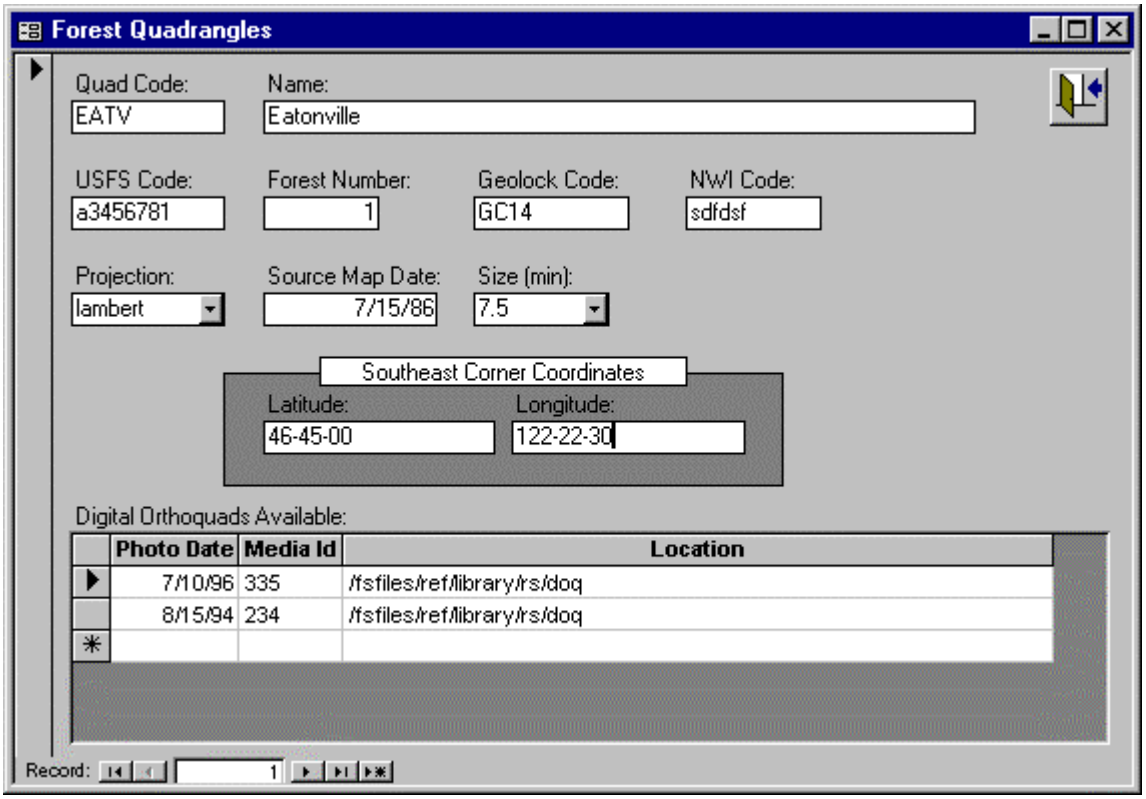

Figure 7-3 Quadrangle Data Input Form

The quad code and forest numbers are local known unique codes that quadrangles are known by. The geolock code is the coding used by the USGS to identify all quadrangles on a national basis. Input the projection, source date, and size of the quad in minutes and the coordinates in degrees-minutes-seconds of the southeast corner of the quad.

You can also indicate on this form, what sources of digital orthophotos are available for each quad. This is a good way of keeping track of multiple imagery sources over time.

8. Database Design

The database structure was designed using an information modeling package [8]. The software generated the database structure creation scripts. This database design package uses a language called Formal Object Role Modeling Language (FORML). This language allows the designer and subject matter expert to model the application in English without having to have a clear understanding of the underlying database structures.

8.1. Table Diagrams

The diagrams shown in the following figures graphically show the relationships between the different tables. These diagrams are useful when questions arise on how a query should be designed and which tables the data is actually stored in. The diagrams are organized by functional area of the application. The symbols next to the join lines indicate the type of relationship between the tables. The crows foot symbol indicates the "many" side of the relationship.

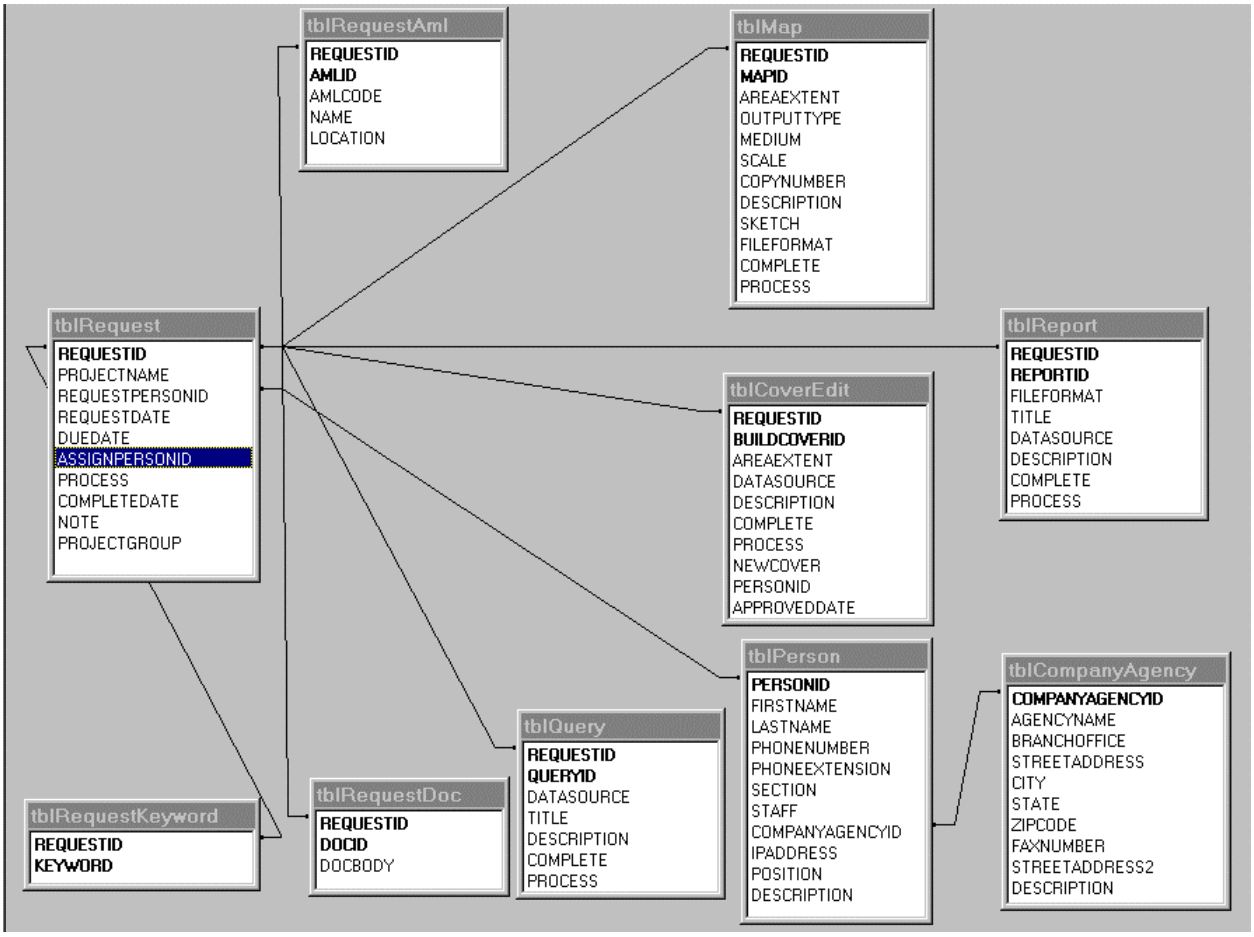

Figure 8-1 GIS Request Data Model

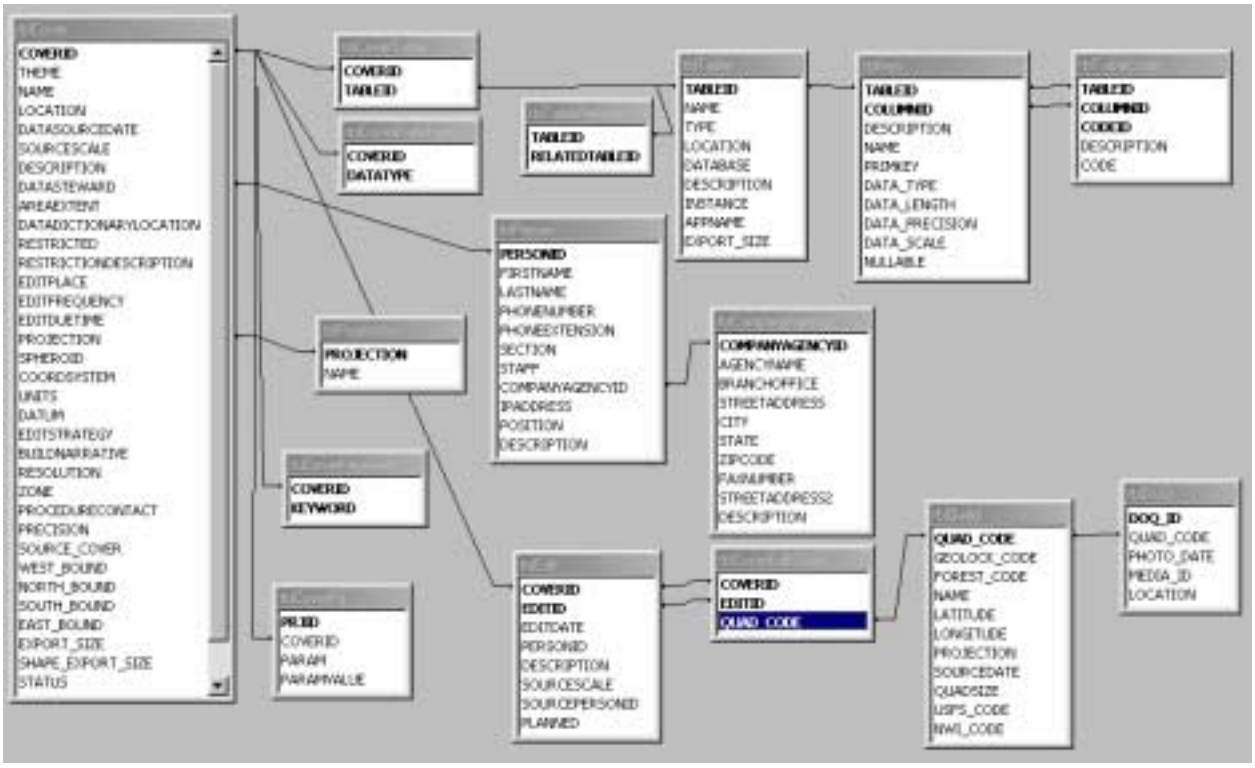

Figure 8-2 Coverage Data Model

8.2. Table Definitions

The structure for each table used in the application is documented in the following sections. Each table is described with each field and any codes used in those fields. The columns that make up the tables' primary key are shown in ***bold Italics*** in the column name. The primary and foreign key constraints are shown after the structure along with their constraint names. The formats of these lines are:

constraint name(columns), table referenced, cascade options

Any associated database triggers that are designed are also shown with each table. The only database triggers used are to generate unique identifiers from sequences.

8.2.1. GIS_CompanyAgency

Purpose: Stores data on Companies or Agencies that request GIS products or services.

Column	Data Type	Length	Prec.	Scale	Null	Description
COMPANYAGENCYID	NUMBER	22	9	0	N	The primary identifier of a company or agency. This is generated by a database trigger from a sequence.
AGENCYNAME	VARCHAR2	60			Y	The name of the company or agency
BRANCHOFFICE	VARCHAR2	60			Y	Branch office name if applicable
CITY	VARCHAR2	30			Y	City the company or agency is located in
FAXNUMBER	VARCHAR2	14			Y	Fax number of the office
STATE	VARCHAR2	2			Y	State Abbreviation
STREETADDRESS	VARCHAR2	60			Y	First street address
STREETADDRESS2	VARCHAR2	60			Y	Second street address if needed
ZIPCODE	VARCHAR2	10			Y	Zip code that the company or agency is in

Primary Key: *gis_CompanyAgency_PK* (CompanyAgencyId)

Triggers: gis_CompanyAgency_bef_ins_row references gis_CompanyAgency_Seq

8.2.2. GIS_Cover

Purpose: Stores what is known as "metadata" on each spatial coverage in the database. This information is required to meet the FGDC committee guidelines. It is vital to include this data whenever spatial data is sent to the public or to other offices internal to the organization.

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage. This is generated by a database trigger from a sequence.
AREAEXTENT	VARCHAR2	20			Y	The common name of the extent of the coverage. Valid values are **quad, district, project area, watershed, forest, province, county, state, region, country, world**
BUILDNARRATIVE	LONG	0			Y	Describe how the coverage was built. Include any known problems with the data or processing. Include the general

Column	Data Type	Length	Prec.	Scale	Null	Description
						processing steps that were done.
COORDSYSTEM	VARCHAR2	30			Y	The coordinate system of the coverage. Valid values are **utm; stateplane,ups, geographic** (lat/long)**, none**.
COMMONNAME	VARCHAR2	60			Y	A common name for the coverage
DATADICTIONARYLOCATION	VARCHAR2	255			Y	Description of where the official data dictionary is stored if the database is not the primary location.
DATASOURCEDATE	DATE	7			Y	The date of the source data. For most coverage's this is the date of the last complete edit cycle.
DATASTEWARD	NUMBER	22	9	0	Y	The PersonId that is designated as the Data Steward for the coverage. This is the person who is in charge of all content and coordinates with their representatives in the field.
DATUM	VARCHAR2	20			Y	The datum that is referenced by the projection of the coverage. Valid values are: **nad27; nad83**
DESCRIPTION	VARCHAR2	2000			Y	A common description of what the coverage contains. This should be in plain English without slang terminology.
EDITDUETIME	VARCHAR2	50			Y	The times of year that edits are due if applicable. Indicate a time that makes sense in relation to the edit frequency.
EDITFREQUENCY	VARCHAR2	20			Y	The edit frequency that is expected for maintenance of the coverage. Valid values are: **multi-year; annual; semi-annual; quarterly; monthly; constant; unknown; n/a**
EDITPLACE	VARCHAR2	10			Y	The physical location and office responsible for primary edits on the coverage. Valid values are: **district; forest; region; n/a**
EDITSTRATEGY	VARCHAR2	2000			Y	A description on the strategy used for editing the coverage.
EXPORT_SIZE	NUMBER	11	0		Y	The size of the compressed export file in bytes.
LOCATION	VARCHAR2	80			N	The full path to where the coverage is stored on disk in the corporate computer system.
NAME	VARCHAR2	60			N	The name of the coverage as it is named within Arc/Info
PRECISION	VARCHAR2	20			Y	The precision of the coordinates in the coverage. Valid values are: **single; double**
PROCEDURECONTACT	NUMBER	22	9	0	Y	The PersonId of the person that is knowledgeable on how the coverage was constructed or edited. This should usually be a GIS specialist while the data steward is a resource specialist.
PROJECTION	VARCHAR2	30			Y	The projection of the coverage. This is the actual projection that the coverage is stored in and may not be the projection of the source data. Note that state plane is not a projection. The application will input the correct projection for any state plane zone.
RESOLUTION	VARCHAR2	30			Y	Use this for grids only - input the cell size in the units of the coverage.
RESTRICTED	NUMBER	22	3	0	N	Indicates if the coverage is restricted to public distribution. Valid values are; **0 (no restrictions); -1 (restricted)**

Column	Data Type	Length	Prec.	Scale	Null	Description
RESTRICTIONDESCRIPTION	VARCHAR2	100			Y	A description of why the coverage is restricted to public distribution.
SHAPE_EXPORT_SIZE	NUMBER	11	0		Y	Size of an export file in bytes in shape file format if applicable.
SOURCESCALE	VARCHAR2	10			Y	The primary scale of the source data used to construct the coverage.
SOURCE_COVER	NUMBER	22	3	0	N	Flag for if the coverage is a source cover or not. **0 (not source) and -1 (source)**
STATUS	VARCHAR2	10			Y	Indicates the status of completion **complete, in work, planned**
SPHEROID	VARCHAR2	20			Y	The geodetic spheroid that the coverage is based on. Valid values are: **wgs 1984; grs 1980; clarke 1866**
THEME	VARCHAR2	20			Y	A grouping of coverage's that corresponds to a resource area. Examples are **boundary; cartography;climate; ecology; fauna; geology; fire; history; infrastructure; land survey; mgt direction; ownership; insect-disease; project; recreation; socioeconomic; topography; vegetation; water**.
UNITS	VARCHAR2	10			Y	The units of the coordinate system used in the coverage. Valid values are: **meters; feet-us(US Survey Feet);feet-int(International Feet), degree (lat/long)**
ZONE	VARCHAR2	10			Y	The zone of the coordinate system if applicable. The Gifford Pinchot is in UTM zone 10 or Washington State Plane south zone 5626
WEST_BOUND	Number	14	3		Y	West bounding coordinate in decimal degrees, required to be negative
EAST_BOUND	Number	14	3		Y	East bounding coordinate in decimal degrees, required to be negative
SOUTH_BOUND	Number	14	3		Y	South bounding coordinate in decimal degrees
WEST_BOUND	Number	14	3		Y	West bounding coordinate in decimal degrees
MODIFIED_BY	Varchar2	30			N	User that last updated the record. A database trigger generates it.
MODIFIED_DATE	Date				N	Date the record was last updated. Access uses this to resolve record locking. A database trigger generates it.

Primary Key: *gis_Cover_PK* (CoverId)

Foreign Keys: *to_gis_Person4* (DataSteward), Refer gis_Person
to_gis_Person5 (ProcedureContact), Refer gis_Person

Triggers: *gis_Cover_bef_ins_row* references gis_Cover_Seq

gis_Cover_mod_row – Updates audit columns on update

8.2.3. GIS_CoverDataType

Purpose: Stores what spatial feature types are contained within a coverage.

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
DATATYPE	VARCHAR2	10			N	The feature type present. Valid values are: **line; point; region; route; tic; poly; grid; tin; lattice; image; cad; section; node; annotation**

Primary Key: *gis_CoverDataType_PK* (CoverId, DataType)

Foreign Keys: *to_gis_Cover1* (CoverId), Refer gis_Cover; Delete Cascade

8.2.4. GIS_CoverKeyword

Purpose: Stores keywords that are used by a search engine on the content of the coverage. This is a requirement of the FGDC standard

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
KEYWORD	VARCHAR2	20			N	The keyword text

Primary Key: *gis_CoverKeyword_PK* (CoverId, Keyword)

Foreign Keys: *to_gis_Cover5* (CoverId), Refer gis_Cover; Delete Cascade

8.2.5. GIS_CoverPrj

Purpose: Stores Arc/Info projection file parameters. This data is obtained from the Arc/Info prj.adf file

Column	Data Type	Length	Prec.	Scale	Null	Description
PRJID	NUMBER	22	9	0	N	The unique id of the projection record. This is generated by an insert trigger.
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
PARAM	VARCHAR2	40			N	The parameter name in the projection file
PARAMVALUE	VARCHAR2	40			N	The parameter value in the projection file

Primary Key: *gis_CoverPrj_PK* (PrjId)

Foreign Keys: *to_gis_Cover6* (CoverId), Refer gis_Cover; Delete Cascade

8.2.6. GIS_CoverEdit

Purpose: Stores a lineage of what was done to edit a primary library coverage. This data should only be input for master library and primary project coverage's that are meant to be maintained over time.

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
EDITID	NUMBER	22	9	0	N	The sequential identifier of the edit within the coverage. This is generated by the computer
DESCRIPTION	VARCHAR2	2000			Y	A description of what was done in the editing session.
EDITDATE	DATE	7			Y	The date that the coverage was edited
PERSONID	NUMBER	22	9	0	Y	The person that edited the coverage.
PLANNED	NUMBER	22	3	0	N	Indicates if the edit is planned (i.e. needed) or an edit completed. Planned is **–1**, existing is **0**.
SOURCEPERSONID	NUMBER	22	9	0	Y	The person that supplied the source of the edits in either a manuscript or other form.
SOURCESCALE	VARCHAR2	10			Y	The scale of the source data that was provided by the source person.

Primary Key: *gis_CoverEdit_PK* (CoverId, EditId)

Foreign Keys: *to_gis_Person6* (PersonId), Refer gis_Person
to_gis_Person7 (SourcePersonId), Refer gis_Person
to_gis_Cover4 (CoverId), Refer gis_Cover; Delete Cascade

8.2.7. GIS_CoverEdit_Quad

Purpose: Stores what quadrangles were edited for a coverage during a editing session. Use this table to find out over what spatial extent the edits to a coverage were made at a particular point in time.

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
EDITID	NUMBER	22	9	0	N	The sequential identifier of the edit within the coverage. This is generated by the computer
QUAD_CODE	VARCHAR2	4			N	The quad code of the quad that was edited during the edit session.

Primary Key: *gis_CoverEdit_Quad_PK* (CoverId, EditId, Quad_Code)

Foreign Keys: *to_gis_CoverEdit1* (CoverId, EditId), Refer gis_CoverEdit; Delete Cascade
to_gis_Quad1 (Quad_Code), Refer gis_Quad

8.2.8. GIS_CoverTable

Purpose: Stores what tables are associated to which coveraeges.

Column	Data Type	Length	Prec.	Scale	Null	Description
COVERID	NUMBER	22	9	0	N	The primary identifier of a coverage
TABLEID	NUMBER	22	9	0	N	The primary identifier of a table

Primary Key: *gis_CoverTable_PK* (CoverId, TableId)

Foreign Keys: *to_gis_Cover2* (CoverId), Refer gis_Cover; Delete Cascade
to_gis_Table1 (TableId), Refer gis_Table; Delete Cascade

8.2.9. GIS_DOQ

Purpose: Stores what quadrangles have digital orthophoto (doq) have imagery available.

Column	Data Type	Length	Prec.	Scale	Null	Description
DOQ_ID	NUMBER	22	9	0	N	The primary identifier of a doq
LOCATION	VARCHAR2	80			Y	The location on disk where the doq is stored
MEDIA_ID	VARCHAR2	10			Y	The identifier on the distribution media
PHOTO_DATE	DATE				Y	The source date of the imagery used to produce the doq
QUAD_CODE	VARCHAR2	4			N	The quad code of the quad that was edited during the edit session.

Primary Key: *gis_DOQ_PK* (Doq_Id)

Foreign Keys: *to_gis_Quad2* (Quad_Code), Refer gis_Quad

8.2.10. GIS_FileFormat

Purpose: A lookup table of file formats used for data conversion.

Column	Data Type	Length	Prec.	Scale	Null	Description
FILEFORMAT	VARCHAR2	10			N	The file extension name
COMMONNAME	VARCHAR2	30			N	The common name associated with the file extension

Primary Key: *gis_FileFormat_PK* (FileFormat)

8.2.11. GIS_Person

Purpose: A lookup table of personnel in internal and external organizations that request GIS services or are part of the GIS team.

Column	Data Type	Length	Prec.	Scale	Null	Description
PERSONID	NUMBER	22	9	0	N	The unique identifier of a person. This is generated by a database trigger and no effort should be made to input or edit this
COMPANYAGENCYID	NUMBER	22	9	0	Y	The identifier of the company or agency that the person works for.
DESCRIPTION	VARCHAR2	2000			Y	Notes on a person or contact
FIRSTNAME	VARCHAR2	30			Y	First name of the person
LASTNAME	VARCHAR2	30			Y	Last name of the person
IPADDRESS	VARCHAR2	50			Y	The E-Mail address of the person
PHONENUMBER	VARCHAR2	14			Y	The phone number of the person
PHONEEXTENSION	VARCHAR2	10			Y	A phone extension if applicable
POSITION	VARCHAR2	50			Y	The position title of the person
STAFF	VARCHAR2	20			Y	The staff that the person works for. This is the higher level of organization than the section. Valid values are: **administration; ecosystems; engineering; natural resources; outside agency; outside forest; public affairs**. Use outside agency for personnel that work outside the USFS and use outside forest for people that work for the USFS but not on the forest.
SECTION	VARCHAR2	20			Y	The section within the organization that the person works under. This is what people identify as their function. Valid values are: **ecology/demo; engineering; foia; facilities; fire management; fisheries; forest supervisor; gis; geology; lands; land line; landscape arch; ms; null for not assigned; outside agency; outside forest; planning; public service; recreation; soil; timber; transportation; silviculture; watershed; wildlife**

Primary Key: *gis_Person_PK* (PersonId)

Foreign Keys: *to_gis_CompanyAgency1* (CompanyAgencyId), Refer gis_CompanyAgency

Triggers: *gis_Person_bef_ins_row* references gis_Person_Seq

8.2.12. GIS_Projection

Purpose: A lookup table of projections used for spatial coverage's.

Column	Data Type	Length	Prec.	Scale	Null	Description
PROJECTION	VARCHAR2	30			N	The projection as it is named in Arc/Info
NAME	VARCHAR2	60			N	The common name of the projection

Primary Key: *gis_Projection_PK* (Projection)

8.2.13. GIS_Quad

Purpose: A lookup table of all forest base 1:24000 quadrangles. This is to record standard lookup information that is constant for each quadrangle map

Column	Data Type	Length	Prec.	Scale	Null	Description
QUAD_CODE	VARCHAR2	4			N	The primary identifier of the quad. It is a four digit abbreviation of the quad name. Although this will not be unique outside the forest it is what most people use to reference quads.
FOREST_CODE	NUMBER	22	4	0	Y	The forest number for the quad. This is locally defined at the forest level
GEOLOCK_CODE	VARCHAR2	4			Y	The USGS geolock code for the quadrangle
LATITUDE	VARCHAR2	10			Y	Latitude of the south east corner of the quad
LONGITUDE	VARCHAR2	10			Y	Longitude of the south west corner of the quad
NAME	VARCHAR2	60			Y	The full name of the quadrangle
NWI_CODE	VARCHAR2	10			Y	Code for the quad in the National Wetlands Inventory
PROJECTION	VARCHAR2	30			Y	The projection of the quadrangle as shown in the title data on the quad.
QUADSIZE	VARCHAR2	5			Y	The size in minutes of the quadrangle
SOURCEDATE	DATE	7			Y	The date of the original quadrangle compilation by the USGS.
USFS_CODE	VARCHAR2	8			Y	The code used from the national filing structure committee.

Primary Key: *gis_Quad_PK* (Quad_Code)

8.2.14. GIS_Request

Purpose: To store master information on a GIS related request for services or products. This master table is the basis for tracking work flow through the GIS section.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request. A database trigger generates this and no attempt should be made to input or edit it.
ASSIGNPERSONID	NUMBER	22	9	0	Y	The id of the person that the request is assigned to. This should be assigned by the GIS Coordinator.
COMPLETEDATE	DATE	7			Y	The date that the entire request was completed
DUEDATE	DATE	7			Y	The date that the request is due by. This should be done by requester after negotiation with the GIS coordinator.
NOTE	VARCHAR2	2000			Y	Any general notes that the requester needs to make on the request. The specifics on the products of the request should NOT be entered here.
PRIORITY	NUMBER	22	3		Y	Indicates the priority of the request within the project group. This should only be input for those requests that are part of a larger project.
PROCESS	VARCHAR2	2000			Y	General processing notes that the analyst used to complete the request. Specific processes should be documented along with the specific product within the request not here.
PROJECTGROUP	VARCHAR2	60			Y	The name of a larger project that the request may belong to.
PROJECTNAME	VARCHAR2	60			Y	A general name for the request.
REQUESTDATE	DATE	7			Y	The date the request was made
REQUESTPERSONID	NUMBER	22	9	0	Y	The id of the person that made the request
MODIFIED_BY	Varchar2	30			N	User that last updated the record. A database trigger generates it.
MODIFIED_DATE	Date				N	Date the record was last updated. Access uses this to resolve record locking. A database trigger generates it.

Primary Key: *gis_Request_PK* (RequestId)

Foreign Keys: *to_gis_Person1* (RequestPersonId), Refer gis_Person
to_gis_Person2 (AssignPersonId), Refer gis_Person

Triggers: *gis_Request_bef_ins_row* references gis_Request_Seq

gis_Request_mod_row – Updates audit columns on update

8.2.15. GIS_RequestAml

Purpose: To store arc macro language (AML) code associated with a request. If aml's are stored in the database then they can be removed from disk but the request can still be reproduced.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
AMLID	NUMBER	22	4	0	N	The identifier of the AML within the request. The application will generate this number for you and no attempt should be made to edit it.
AMLCODE	LONG	0			Y	The code of the AML. Use the windows clipboard to bring in the AML code developed and paste it into this field.
LOCATION	VARCHAR2	80			Y	The path of the AML if it will be stored on disk instead of in the database.
NAME	VARCHAR2	60			Y	The name of the AML

Primary Key: *gis_RequestAml_PK* (RequestId, AmlId)

Foreign Keys: *to_gis_Request7* (RequestId), Refer gis_Request; Delete Cascade

8.2.16. GIS_RequestBuildCover

Purpose: To store requests to build or edit a coverage. This table is used to store requests to build or edit coverage and does not document actual edits on a coverage (see section 8.2.4). This data is not only to track the request but also provides a place to assign a data steward to the coverage.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
BUILDCOVERID	NUMBER	22	4	0	N	The identifier of the request to build or edit a coverage within the request. The application will generate this number for you and no attempt should be made to edit it.
APPROVEDDATE	DATE	7			Y	The date that the Data Steward approves the check plots of the work on the coverage.
AREAEXTENT	VARCHAR2	20			Y	The extent of the area over which the coverage is to be edited or built.
COMPLETE	NUMBER	22	3	0	Y	Indicates if the request component is complete. Valid values are; **0 (not complete); -1 (complete)**
DATASOURCE	VARCHAR2	100			Y	Describe the source of the data from which the edits will be done.
DESCRIPTION	VARCHAR2	2000			Y	Description of the edits to be done and any special processing requested.
NEWCOVER	NUMBER	22	3	0	Y	Indicates if this is a new coverage. Valid values are; **0 (existing coverage); -1 (new coverage)**
PERSONID	NUMBER	22	9	0	Y	The person that is assigned as the data steward for the coverage. If this is a new coverage the person should be made aware of the responsibilities.
PROCESS	VARCHAR2	2000			Y	The general process used to build or edit the coverage. If the coverage editing form will be completed, only complete a short summary here.

Primary Key: *gis_RequestBuildCover_PK* (RequestId, BuildCoverId)

Foreign Keys: *to_gis_Request6* (RequestId), Refer gis_Request; Delete Cascade
to_gis_Person3 (PersonId), Refer gis_Person

8.2.17. GIS_RequestConvert

Purpose: To store requests to convert a coverage into another format or to bring external data into the GIS library.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
CONVERTID	NUMBER	22	4	0	N	The identifier of the conversion within the request. The application will generate this number for you and no attempt should be made to edit it.
AREAEXTENT	VARCHAR2	20			Y	The extent of the area over which the coverage is to be converted.
COMPLETE	NUMBER	22	3	0	Y	Indicates if the request component is complete. Valid values are; **0 (not complete); -1 (complete)**
DATASOURCE	VARCHAR2	100			Y	Describe the source of the data from which the conversion will be done.
DESCRIPTION	VARCHAR2	2000			Y	Description of the conversion to be done and any special processing requested.
FILEFORMAT	VARCHAR2	10			Y	The file format to convert the data into or from
IPADDRESS	VARCHAR2	50			Y	The E-Mail address to send the data to if requested that way.
PROCESS	VARCHAR2	2000			Y	The general process used to convert the coverage.
TAPE	NUMBER	22	3	0	Y	Indicates if the conversion should be output to tape. Indicate in the description any details on the type of tape, density, the computer and tape drive it will be loaded on, etc. Valid values are; **0 (not on tape); -1 (on tape)**

Primary Key: *gis_RequestConvert_PK* (RequestId, ConvertId)

Foreign Keys: *to_gis_Request5* (RequestId), Refer gis_Request; Delete Cascade
to_gis_FileFormat3 (FileFormat), Refer gis_FileFormat

8.2.18. GIS_RequestDoc

Purpose: To store additional documents related to a request. This can be letters, memos, etc.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
DOCID	NUMBER	22	4	0	N	The identifier of the document within the request
DOCBODY	LONG				N	The actual document body

Primary Key: *gis_RequestDoc_PK* (RequestId, DocId)

Foreign Keys: *to_gis_Request8* (RequestId), Refer gis_Request; Delete Cascade

8.2.19. GIS Request_Hour

Purpose: Table of columns or items within a database table.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	Request Identifier that may have hours.
JOBCODE	VARCHAR2	6			N	The Job Code charged for the hours.
HOUR	NUMBER	22	6	2	N	Total Hours charged to the job code for the request.

Primary Key: GIS_REQUEST_HOUR_PK (RequestId, JobCode)
Foreign Keys: TO_GIS_REQUEST9 (RequestId), Refer gis_Request; Delete Cascade

8.2.20. GIS_RequestMap

Purpose: To store requests to produce map products in either hard copy form or digitally. This is the place to indicate all map products for the results of an analysis or just simple plots of library coverage's.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
MAPID	NUMBER	22	4	0	N	The identifier of the map within the request. The application will generate this number for you and no attempt should be made to edit it.
AREAEXTENT	VARCHAR2	20			Y	The extent of the area over which the map is to be produced.
COMPLETE	NUMBER	22	3	0	Y	Indicates if the request component is complete. Valid values are; **0 (not complete); -1 (complete)**
COPYNUMBER	NUMBER	22	4	0	Y	Indicate the number of copies desired
DESCRIPTION	VARCHAR2	2000			Y	Description of the map and the components needed on the map. Specifics such as title and legend text, colors, line types and weights, scale bars, neat lines, should be described.
FILEFORMAT	VARCHAR2	10			Y	Indicates the file format of the output map if it is requested digitally instead of hard copy.
MEDIUM	VARCHAR2	10			Y	The type of medium to be used for the hard copy map product. Valid values are: **paper; film; matte; slide**.
OUTPUTTYPE	VARCHAR2	20			Y	The type of output desired. Valid values are: **plot; graphic file; screen dump**.
PROCESS	VARCHAR2	2000			Y	Processing notes on how the map was produced. If an AML was developed it should be input into the AML section and a general summary should be input here.
SCALE	VARCHAR2	10			Y	The map scale desired.
SKETCH	LONG RAW	0			Y	A digital sketch of the map desired if needed. This can be input by using the insert object from the menu or by clicking the right mouse button. Draw a sketch in your favorite graphics program and insert it. Only use this if you can not describe what is needed as it slows database performance.

Primary Key: *gis_RequestMap_PK* (RequestId, MapId)
Foreign Keys: *to_gis_Request2* (RequestId), Refer gis_Request; Delete Cascade
to_gis_FileFormat1 (FileFormat), Refer gis_FileFormat

8.2.21. GIS_RequestQuery

Purpose: To store requests to query the feature attribute file of a coverage or to produce a query on a database or to assist a user in creation of a query.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
QUERYID	NUMBER	22	4	0	N	The identifier of the query within the request. The application will generate this number for you and no attempt should be made to edit it.
COMPLETE	NUMBER	22	3	0	Y	Indicates if the request component is complete. Valid values are; **0 (not complete); -1 (complete)**
DATASOURCE	VARCHAR2	100			Y	Describe the source of the data from which the query will be done. Name the tables involved if possible.
DESCRIPTION	VARCHAR2	2000			Y	Description of the query to be done and any special processing requested.
PROCESS	VARCHAR2	2000			Y	Processing notes on the query. If the query is a SQL script, store that script here.
TITLE	VARCHAR2	60			Y	A title to include on the query

Primary Key: *gis_RequestQuery_PK* (RequestId, QueryId)

Foreign Keys: *to_gis_Request3* (RequestId), Refer gis_Request; Delete Cascade

8.2.22. GIS_RequestReport

Purpose: To store requests to produce a report on the feature attribute file of a coverage or to produce a report from a database.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
REPORTID	NUMBER	22	4	0	N	The identifier of the query within the request. The application will generate this number for you and no attempt should be made to edit it.
COMPLETE	NUMBER	22	3	0	Y	Indicates if the request component is complete. Valid values are; **0 (not complete); -1 (complete)**
DATASOURCE	VARCHAR2	100			Y	Describe the source of the data from which the report will be done. Name the tables involved if possible.
DESCRIPTION	VARCHAR2	2000			Y	Description of the report to be done and any special processing requested.
FILEFORMAT	VARCHAR2	10			Y	The file format of the finished output report if requested digitally.
PROCESS	VARCHAR2	2000			Y	Processing notes on the report. If the report is a SQL script, store that script here.
TITLE	VARCHAR2	60			Y	A title to include on the report

Primary Key: *gis_RequestReport_PK* (RequestId, ReportId)

Foreign Keys: *to_gis_Request4* (RequestId), Refer gis_Request; Delete Cascade
to_gis_FileFormat2 (FileFormat), Refer gis_FileFormat

8.2.23. GIS_Request_Keyword

Purpose: To store keywords that are associated with a request for querying later on.

Column	Data Type	Length	Prec.	Scale	Null	Description
REQUESTID	NUMBER	22	9	0	N	The unique identifier of the request.
KEYWORD	VARCHAR2	20			N	A keyword associated with the request.

Primary Key: *gis_Request_PK* (RequestId, Keyword)

Foreign Keys: *to_gis_Request1* (RequestId), Refer gis_Request; Delete Cascade

8.2.24. GIS_Table

Purpose: To store data on what tables are in the corporate and other database systems that have some linkage to spatial data. This is the back bone of the metadata that users need as without a description of the database tables, fields, and codes much of the GIS is worthless.

Column	Data Type	Length	Prec.	Scale	Null	Description
TABLEID	NUMBER	22	9	0	N	The unique identifier of the table. A database trigger generates this and no attempt should be made to input or edit it.
APPNAME	VARCHAR2	20			Y	If the table belongs to a finished application, input the application name here. Many applications in the Oracle environment are designed with a prefix before all table names. If that is the case input that prefix here.
DATABASE	VARCHAR2	20			Y	Indicate the database that the table is contained in. Valid values are: **oracle; info; access; paradox; dbase; rbase**.
DESCRIPTION	VARCHAR2	2000			Y	Describe what the data in the table contains and the purpose for the table.
INSTANCE	VARCHAR2	10			Y	Use only if the table is stored in a database that has multiple instances. This is typical in Oracle in the USFS where the IDB (integrated database) and the DDB (development database) have been used.
LOCATION	VARCHAR2	80			Y	The file path to where the data is stored. Indicate the server that the table is stored on if the data is in Oracle.
NAME	VARCHAR2	60			Y	The name of the table exactly as it appears to the database manager.
TYPE	VARCHAR2	10			Y	The type of table that it is. Indicate the type of table if it is a info file that is associated with a coverage. All other database tables are lookup tables as far as the spatial data is concerned. Valid values are**: pat; aat; tic; vat; rat; sec; lut; tat; nat; view; relate**.
MODIFIED_BY	Varchar2	30			N	User that last updated the record. A database trigger generates it.
MODIFIED_DATE	Date				N	Date the record was last updated. Access uses this to resolve record locking. A database trigger generates it.

Primary Key: *gis_Table_PK* (TableId)

Foreign Keys: *to_gis_Cover2* (CoverId), Refer gis_Cover; Delete Cascade

Triggers: *gis_Table_bef_ins_row* references gis_Table_Seq

gis_Table_mod_row – Updates audit columns on update

8.2.25. GIS_TableItem

Purpose: To store information on the columns (fields in PC databases or items in info) within a database table.

Column	Data Type	Length	Prec.	Scale	Null	Description
TABLEID	NUMBER	22	9	0	N	The unique identifier of the table.
COLUMNID	NUMBER	22	4	0	N	The identifier of the column within the table. The application will generate this number for you and no attempt should be made to edit it.
DATA_TYPE	VARCHAR2	9			Y	The data type of the column or item
DATA_LENGTH	NUMBER	22	4		Y	The width of the column or item
DATA_PRECISION	NUMBER	22	4		Y	Overall number of digits within a number data type.
DATA_SCALE	NUMBER	22	4		Y	The number of decimal places after the decimal point if it is a numeric data type.
DESCRIPTION	VARCHAR2	2000			Y	A description of what the column is and any instructions for editing it. Codes are not defined here.
NAME	VARCHAR2	20			N	The name of the column exactly as it appears in the database.
NULLABLE	VARCHAR2	1			Y	Indicates if the column or item can be null.
PRIMKEY	NUMBER	22	3	0	Y	Indicates if the column is part of the primary key of the table (columns that uniquely identify the row within the table). Valid values are **0 (not part of primary key); -1 (part of primary key)**
MANDITORY	NUMBER	3		0	y	A flag to indicate if the column is a mandatory data requirement.

Primary Key: *gis_TableItem_PK* (TableId, ColumnId)

Foreign Keys: *to_gis_Table3* (TableId), Refer gis_Table; Delete Cascade

8.2.26. GIS_TableItemCode

Purpose: To store information on the codes within the columns in a database table.

Column	Data Type	Length	Prec.	Scale	Null	Description
TABLEID	NUMBER	22	9	0	N	The unique identifier of the table.
COLUMNID	NUMBER	22	4	0	N	The identifier of the column within the table. The application will generate this number for you and no attempt should be made to edit it.
CODEID	NUMBER	22	4	0	N	The identifier of the code within the column in the table. The application will generate this number for you and no attempt should be made to edit it.
CODE	VARCHAR2	20			N	Codes that are used
DESCRIPTION	VARCHAR2	2000			Y	Description of the meaning of the code.

Primary Key: *gis_TableItemCode_PK* (TableId, ColumnId, CodeId)

Foreign Keys: *to_gis_TableItem1* (TableId, ColumnId), Refer gis_TableItem; Delete Cascade

8.2.27. GIS_Table_Relation

Purpose: To store data on what tables are related to each other. This is a means of tracking the relationships between tables.

Column	Data Type	Length	Prec.	Scale	Null	Description
TABLEID	NUMBER	22	9	0	N	The table that is being referenced
RELATEDTABLEID	NUMBER	22	9	0	N	The table that it is related to

Primary Key: *gis_Table_Relation_PK* (TableId, RelatedTableId)

Foreign Keys: *to_gis_Table1* (TableId), Refer gis_Table; Delete Cascade
to_gis_Table2 (RelatedTableId), Refer gis_Table; Delete Cascade

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