NASA Electronic Library System (NELS)

Database Schema

Version 1.2

Revision 1
July 1992

NASA
Lyndon B. Johnson Space Center
Information Systems Directorate
Software Technology Division
RICIS Preface

This research was conducted under auspices of the Research Institute for Computing and Information Systems by Clovis J. Melebeck of I-NET, Inc. Dr. E. T. Dickerson served as RICIS research coordinator.

Funding was provided by the Information Technology Division, Information Systems Directorate, NASA/JSC through Cooperative Agreement NCC 9-16 between the NASA Johnson Space Center and the University of Houston-Clear Lake. The NASA research coordinator for this activity was Ernest M. Fridge III, Deputy Chief of the Software Technology Branch, Information Technology Division, Information Systems Directorate, NASA/JSC.

The views and conclusions contained in this report are those of the author and should not be interpreted as representative of the official policies, either express or implied, of UHCL, RICIS, NASA or the United States Government.
NASA Electronic Library System (NELS)

Database Schema

Prepared By: Clovis J. Melebeck
I-NET, Inc

Approved: Chris Culbert, Chief
Software Technology Branch

Version 1.2
Revision 1
July 1992

Information Technology Division

NASA
National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
Houston, Texas
# Table of Contents

1.0 NELS Version 1.2 Database Schema .............................................................. 1  
   1.1 Schema Introduction ............................................................................. 1  
1.2 NELS Object Classes ............................................................................. 1  
   1.2.1 ObjectClasses Table ...................................................................... 2  
   1.2.2 ClassFields Table ......................................................................... 3  
   1.2.3 Enum_Types Table ........................................................................ 5  
   1.2.4 Enum.Values Table ....................................................................... 5  
1.3 NELS Collections .................................................................................. 6  
   1.3.1 Librarians Table ......................................................................... 6  
   1.3.2 Master Table ........................................................................ 7  
1.4 NELS Objects ........................................................................................ 9  
   1.4.1 Objects Table ........................................................................ 9  
   1.4.2 Abstracts Table ........................................................................ 11  
   1.4.3 Authors Table ........................................................................ 12  
   1.4.4 Keywords Table ......................................................................... 12  
   1.4.5 Links Table ............................................................................... 12  
   1.4.6 LongEnum Table ....................................................................... 13  
   1.4.7 Preabstracts Table .................................................................... 14  
1.5 NELS Supplemental Tables ................................................................ 14  
   1.5.1 AdminDefs Table ...................................................................... 14  
   1.5.2 Applications Table ................................................................... 15  
   1.5.3 App_Formats Table .................................................................. 16  
   1.5.4 History Table ........................................................................ 16
1.5.5 Notify Table ........................................................................ 17
1.5.6 Output_Queue Table .......................................................... 18
1.6 NELS Index Tables ................................................................... 18
1.7 Schema Hierarchy ..................................................................... 20
1.8 NELS Table Relationships ..................................................... 21
   1.8.1 Access Privileges ........................................................... 21
   1.8.2 Collections ..................................................................... 21
   1.8.3 Object Classes .................................................................. 22
Appendix A SQL for NELS 1.2 Tables ........................................... 23
Appendix B SQL for NELS 1.2 Table Indices .................................. 27
1.0 NELS Version 1.2 Database Schema

1.1 Schema Introduction

The following section discusses the database tables used by NELS version 1.2. To provide the current functional capability offered by NELS, nineteen (19) tables have been created with ORACLE. Each table lists the ORACLE table name and provides a brief description of the tables intended use or function. The following sections cover four basic categories of tables; NELS object classes, NELS collections, NELS objects, and NELS supplemental tables. Also included in each section is a definition and/or relationship of each field to other fields or tables. The primary key(s) for each table is indicated with a single asterisk (*), while foreign keys are indicated with double asterisks (**). The primary key(s) indicate the key(s) which uniquely identifies a record for that table. The foreign key(s) is used to identify additional information in other table(s) for that record.

The two appendices are the command which are used to construct the ORACLE tables for NELS. Appendix A contains the commands which create the tables which are defined in the following sections. Appendix B contains the commands which build the indices for these tables.

1.2 NELS Object Classes

The tables listed in Table 1.2-1 NELS Object Classes, provide the necessary information to define object classes. These object classes are used by librarians to define the objects that are entered into the library. The following sections are an explanation of each table and their associated fields which are used to define these object classes.
<table>
<thead>
<tr>
<th>Table Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ObjectClasses</td>
<td>Provides a list of all the known object classes that are defined in the library.</td>
</tr>
<tr>
<td>ClassFields</td>
<td>A subordinate table to ObjectClasses. It contains information about the attributes which describe the object.</td>
</tr>
<tr>
<td>Enum_Types</td>
<td>A subordinate table to ClassFields. It provides a list of all the known enumeration types.</td>
</tr>
<tr>
<td>Enum_Values</td>
<td>A subordinate table to Enum_Types. It contains the enumerated values for each enumeration type.</td>
</tr>
</tbody>
</table>

Table 1.2-1 NELS Object Classes

The 'ObjectClasses' table is the highest level table in defining the object classes for objects. By using this table, one can construct a data structure which provides the details about each attribute used to define the metadata about an object.

1.2.1 ObjectClasses Table

The first table listed in Table 1.2-1, contains a list of every object class that will or has been created by a librarian. Normally, the Head Librarian will create all the object classes that will be used for the NELS library. The object class table consist of three fields. These fields are shown in Table 1.2-2 ObjectClasses Fields.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClassID</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>ClassName</td>
<td>Character</td>
<td>80</td>
</tr>
<tr>
<td>NumFields</td>
<td>Number</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 1.2-2 ObjectClasses Fields

The 'ClassID' field is the key field used to access the attribute fields in the classfields table. This value is entered into the Class_ID field of objects to indicate what class object NELS is processing. Inheritance from base class objects is determined by this value. For example, the object class having a ClassID of '1002004' would inherit field attributes from the '1' Generic object class, the '1002' object class, and the '1002004' object class.

The 'ClassName' field is a character string which represents the name of this object class.

The 'NumFields' field contains the number of field attributes associated with this object class. This is a total of all fields, including those field attributes that are inherited from the base object class.
1.2.2 ClassFields Table

Table 1.2-3 shows the fields that make up an object class. These fields describe the information necessary for NELS to accept inputs or display output for the field attribute associated with this object class.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClasslD</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Name</td>
<td>Character</td>
<td>50</td>
</tr>
<tr>
<td>Prompt</td>
<td>Character</td>
<td>50</td>
</tr>
<tr>
<td>Kind</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>Visibility</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>Editable</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>Length</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>NumColumns</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>NumLines</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>FieldUnique</td>
<td>Character</td>
<td>1</td>
</tr>
<tr>
<td>SeqNum</td>
<td>Number</td>
<td>38</td>
</tr>
<tr>
<td>Enum ID</td>
<td>Number</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.2-3 ClassFields Fields

The 'ClasslD' field, along with the name, is the primary key used to access the attribute fields. All records containing the same classid are associated with the same object class. Multiple ClassID values, as described above are concatenated to produce the complete object class structure. For example, the object class having a ClassID of '1002004' would concatenate the field attributes from the classid '1', '1002', and '1002004'.

The 'Name' field contains field name in the objects table that is used to store values for this attribute. For example, the 'title' field in the objects table would contain the title of the object.

The 'Prompt' field is the prompt that will be displayed for this attribute. This prompt will be displayed any time the metadata about an object is displayed or entered.

The 'Kind' field is an integer value which equates to the data type of this attribute. The following values are used for this field to indicate the data format type selected.
The 'Visibility' field is an integer value which represents whether or not this attribute's value is visible to the user. The following values indicate visibility.

<table>
<thead>
<tr>
<th>Value</th>
<th>Visible</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The 'Editable' field is an integer value which determines whether or not this attribute can be edited or modified. However, when the value or values associated with this field are for display purposes only, this field is set to 'No' by the program.

<table>
<thead>
<tr>
<th>Value</th>
<th>Editable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The 'Length' field is an integer value which represents the maximum number of character for this attribute. Certain data types have preset values and this field can not be set by the librarian. The length for each of the data types is defined below. Only the character and long fields allow the librarian to enter a length.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Character</td>
<td>1 - 80</td>
</tr>
<tr>
<td>Enumeration</td>
<td>40</td>
</tr>
<tr>
<td>List</td>
<td>50</td>
</tr>
<tr>
<td>One to One</td>
<td>150</td>
</tr>
<tr>
<td>One to Many</td>
<td>150</td>
</tr>
<tr>
<td>Integer</td>
<td>10</td>
</tr>
<tr>
<td>Float</td>
<td>10</td>
</tr>
<tr>
<td>Date</td>
<td>10</td>
</tr>
<tr>
<td>Long</td>
<td>1 - 240</td>
</tr>
</tbody>
</table>

The 'NumColumns' field is an integer value which represents the number of columns that are to be visually displayed. This value should be less than or equal to the 'length' field value.
The 'NumLines' field is an integer value which represents the number of lines that are to be displayed for either character, long or list type fields.

The 'FieldUnique' field is a character field which determines the input requirements for this attribute. The value indicates whether this attribute is Required (R), Not required (N), or Unique and required (U). If the field is required, then the user must enter a value for this attribute. If a 'U' is found in this field, the user must enter a value and that value must not exist in the library for this attribute.

The 'SeqNum' field is an integer value which represent the order in which the field attributes are to be displayed.

The 'Enum_ID' field is an integer value which identifies the enumeration type associated with this attribute. This field is only valid when the 'kind' field is set to a value of 1 for enumeration data types. This value is the key field into the 'enum_types' and 'Enum_Values' tables which provide information about the enumeration type attributes.

1.2.3 Enum_Types Table

The 'Enum_Types' table contains a list of all the enumeration types currently defined. Any of these enumeration types can be used to define attributes associated with any object class. Table 1.2-4 Enum_types Fields lists the fields for this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enum_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Enum_Type</td>
<td>Character</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 1.2-4 Enum_Types Fields

The 'Enum_ID' field is a unique integer value which identifies the enumeration type. This field is the key used to obtain the enumeration values for this enumeration type.

The 'Enum_Type' field is a character field used to identify this enumeration type. For example, 'colors' would be the name entered for the enumeration type containing the colors (red, orange, yellow, green, blue, indigo, violet).

1.2.4 Enum_Values Table

The 'Enum_Values' table contains the actual enumerated values for each of the enumeration types defined in table 'Enum_Types'. An entry is entered into this table for every value associated with the enumeration type. For example, the value 'red' would be one value entered for the enumeration type 'colors'.
Table 1.2-5 Enum_Values Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enum_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Seq_Num</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Value</td>
<td>Character</td>
<td>40</td>
</tr>
</tbody>
</table>

The 'Enum_ID' field is an integer value which identifies the enumeration type. Multiple occurrences of this value form the basis of the enumerated values for the enumeration type.

The 'Seq_Num' field indicates the sequence in which the enumerated value was entered.

The 'Value' field is a character value which represents one of the occurrences of this enumeration type.

### 1.3 NELS Collections

The section will discuss the tables which are used by NELS to describe the various collections created by a librarian. Table 1.3-1 NELS Collections provides a brief summary of each table used to define a collection in the library.

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Librarians</td>
<td>Provides information about the persons authorized to make any changes to the library.</td>
</tr>
<tr>
<td>Master</td>
<td>Provides information about the collection.</td>
</tr>
</tbody>
</table>

Table 1.3-1 NELS Collections

#### 1.3.1 Librarians Table

The 'Librarians' table is included in this section because librarians are the only persons authorized to add, update, move, or delete collections in the library. This table plays an important role in determining who can add, update, modify, copy, move, and delete library components. These components are the object classes, collections, objects, and addition of other librarians. The object classes are required entries in an NELS library. Without object classes, no metadata about an object could be entered. Collections are also required. These collections are placeholders for objects. It is also a means of organizing objects into a common collection. Collection hierarchies can be built to model a domain. Once the object classes and collections have been created, the metadata about the objects can be entered into the library. From this metadata, users can search for objects of interest similar to browsing the local library.
The 'User ID' field is a user identification string indicating that this user has certain administrative capabilities.

The 'Collection ID' field is the collection identifier which indicates the top-most collection in which these privileges are active. A user who has privileges at the specified collection, also has these same privileges at all sub-collections in this hierarchy. However, if this user has been given other privileges at a sub-collection, then the lower level privileges are enforced when the user traverses the hierarchy beyond this point. This means that a librarian can give a user all privileges at a high level, but take these privileges away at a sub-collection in the hierarchy.

The 'Admin Mask' field contains the administrative mask indicating the privileges the user has at or below the collection specified in subject_id.

The 'Custom Mask' field contains the administrative mask indicating the privileges the user has at or below this collection specified in subject_id. Initially, this mask is the same as the admin mask. If the person defined by 'user_id' has been granted "update librarian" privileges, the user can enter the Update Librarian menu and change or customize his privileges. The user can only add or delete privileges given at creation. Privileges not granted can not be altered.

1.3.2 Master Table

The 'Master' table contains the information about an NELS collection. A collection is similar to a container or a folder. This folder can hold different classes of objects and other collections (normally called sub-collections). Following is Table 1.3-3 Master Fields, which contains the fields used to describe a collection.

<table>
<thead>
<tr>
<th>Field</th>
<th>Type</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>User_ID</td>
<td>Character</td>
<td>35</td>
</tr>
<tr>
<td>Collection_ID</td>
<td>Character</td>
<td>35</td>
</tr>
<tr>
<td>Admin_Mask</td>
<td>Number</td>
<td>22</td>
</tr>
<tr>
<td>Custom_Mask</td>
<td>Number</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 1.3-2 Librarians Fields
The 'Collection_ID' field is the collection identifier of a collection. The highest level collection identifier is 'S'. All other collections are subordinate to this collection. Each subordinate collection is indicated by one character. For example, 'S2' would indicate the second subordinate collection under collection 'S'. Subordinate collections are labeled from 1 - 9, then from A through Z. A maximum of 35 subordinate collections can exist for each collection.

The 'Collection_Name' field is the collection name given to the collection. This is the name that will appear on any collection lists.

The 'Description' field is a brief description of the collection.

The 'Related_Count' field is the number of related collections which contain similar or related information to this collection. The Collection_ID value(s) entered for this collection are entered into the Links table and the number of collection links is entered into this field.

The 'Node_Type' field is an enumerated type field. Legal values are "production", "developmental", "secure", "archive production", "archive developmental", and "archive secure". Normal users will only see objects that are of type production. Librarians will be able to see all objects.

The 'Password' field is reserved for future use with secure type collections.

The 'Total_Objects' field contains the total number of "production" objects at this level and all levels (sub-collections) below this level.

The 'Num_Production' field contains a count of all the objects in this collection which are of node_type "production".

The 'Num_Developmental' field contains a count of all the objects in this collection which are of node_type "developmental".
The 'Num_Secure' field contains a count of all the objects in this collection which are of node_type “secure”.

The 'Num_Archive_Production' field contains a count of all the objects in this collection which are of node_type “archive production”.

The 'Num_Archive_Developmental' field contains a count of all the objects in this collection which are of node_type “archive developmental”.

The 'Num_Archive_Secure' field contains a count of all the objects in this collection which are of node_type “archive secure”.

### 1.4 NELS Objects

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objects</td>
<td>This table contains most of the metadata about each object and each tool in the library.</td>
</tr>
<tr>
<td>Abstracts</td>
<td>A subordinate table to Objects. It contains the value(s) which make up the abstract/description of the object.</td>
</tr>
<tr>
<td>Authors</td>
<td>A subordinate table to Objects. It contains the value(s) for the list of authors of an object.</td>
</tr>
<tr>
<td>Keywords</td>
<td>A subordinate table to Objects. It contains the subject terms/keywords associated with the object at each collection the object exists.</td>
</tr>
<tr>
<td>Links</td>
<td>A subordinate table to Objects. It contains the value(s) for a user-defined ‘one-to-one’ and ‘one-to-many’ link data type.</td>
</tr>
<tr>
<td>Long_Enum</td>
<td>A subordinate table to Objects. It contains the value for user-defined ‘long’ data type.</td>
</tr>
<tr>
<td>Preabstracts</td>
<td>A subordinate table to Objects. It contains the pre-processed abstract of the object.</td>
</tr>
</tbody>
</table>

**Table 1.4-1 NELS Objects**

### 1.4.1 Objects Table

A total of seven ORACLE tables are used to fully describe the metadata for an object entered into the NELS library. The primary table which contains a majority of the metadata is the 'objects' table. Table 1.4-2 Objects Fields defines the items which comprise this table. This table contains the most of the metadata about an object or a tool. Each object is represented by a single row (record) in the objects table.
The 'Collection_ID' field is the collection in which this object is defined. This field and the object_id field uniquely identifies the object.

The 'Object_ID' field is an internally generated value which is used by NELS to uniquely identify the object.

The 'Class_ID' field indicates the object class of the object.

The 'Host_Name' field identifies the host computer on which the object resides. This field will be implemented in a later version.

The 'Format' field determines the object's format. For example, having ASCII as a format value would mean that the object defined by this metadata is ASCII format and can be viewed by an ASCII viewer.

The 'Object_Name' field can be used by the user to supply additional object information.

The 'PathName' field contains the complete path name or location of the object. This field must start with a '/' if the object is on-line, else the object is considered to be off-line. This location is used to view, copy, or print the contents of the object.

The 'Version' field contains the version of the object that is being placed into the library.

The 'Lib_Entry_Date' field contains the date in which the object was entered into the library. This field can not be altered by the user. It is determined by the system date.
The 'Last_Modified' field contains the date in which the object was last modified. This field cannot be altered by the user.

The 'Flags' field indicates which metadata fields in other tables have values. The flags field will be implemented in a later version.

The 'Node_Type' field is an enumerated type field which indicates the node type of the object. Legal values are "production", "developmental", "secure", "archive production", "archive developmental", and "archive secure".

The 'Title' field contains a title or brief information about the object.

The 'field9' through 'field50' fields are generic character fields which are used to contain other user-defined metadata fields (attributes) about an object. The data type of each field is determined by its classid. If user-defined fields for an object class were defined, the information contained in the ObjectClasses, ClassFields, Enum_Types, and Enum_Values tables would describe the contents contained in one of these fields.

1.4.2 Abstracts Table

This table contains the abstract segments which describe the object or contents of an object. Multiple records with the same object_id can be entered to provide abstracts as large as 2400 characters. Table 1.4-3 Abstracts Fields defines the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection_ID*</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Abstract</td>
<td>Long</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.4-3 Abstracts Fields

The 'Collection_ID' field identifies the collection in which the object exists.

The 'Object_ID' field identifies the object. This is the key that associates the abstracts with an object.

The 'Abstract' field contains the actual abstract information that was entered by the user for the object. The abstract is broken into 240 character segments and entered into this table. The sequence number (Seq_Num) is incremented by 1 every time a new 240 character segment is required to contain the abstract. A maximum of 10 segments may be entered into this table at this time.
1.4.3 Authors Table

This table contains the list of authors associated with an object. Multiple records with the same Object_ID can be entered to provide an unlimited number of authors. Table 1.4-4 Authors Fields defines the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection_ID</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Author</td>
<td>Character</td>
<td>240</td>
</tr>
</tbody>
</table>

Table 1.4-4 Authors Fields

The 'Collection_ID' field identifies the collection in which the object exists.

The 'Object_ID' field identifies the object. This is the key that associates the authors with an object.

The 'Author' field identifies the author of the object. A list of authors may be entered for any object. No limits exist, other than storage and memory.

1.4.4 Keywords Table

This table contains the list of keywords associated with an object in a specific collection. Multiple records with the same Object_ID and different Collection_IDs can be entered to provide a separate set of keywords for the same Object_ID in different collections. Table 1.4-5 Keywords Fields defines the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection_ID</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Keyword*</td>
<td>Character</td>
<td>35</td>
</tr>
</tbody>
</table>

Table 1.4-5 Keywords Fields

The 'Collection_ID' field identifies the collection in which this object exists.

The 'Object_ID' field identifies the object. This is the key that associates the keyword with an object and a collection.

The 'Keyword' field contains the keyword entered for this object in this collection.

1.4.5 Links Table

This table contains the list of links (one-to-one and one-to-many) to other objects associated with object. It also contains the related collection for collections. Multiple records with the same Object_ID can be entered to provide an unlimited number of links. Table 1.4-6 Links Fields defines the items which form this table.
The **Collection_ID** field identifies the collection associated with this link.

The **Object_ID** field identifies the object. For object links, this is the Object_ID of the object that contains a link to another object. For related collection links, this value is zero (0).

The **Name** field contains the database field name defined as a one-to-one or one-to-many link field attribute.

The **Link_Collection** field contains a Collection_ID value of the collection being linked.

The **Link_Object** field contains an Object_ID value of the object being linked.

### 1.4.6 Long Enum Table

This table contains values of attributes which have been defined as a long data type. A field name is also required to uniquely identify this attribute. Table 1.4-7 Long_enum Fields defines the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection_ID*</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Name*</td>
<td>Character</td>
<td>50</td>
</tr>
<tr>
<td>Abstract</td>
<td>Character</td>
<td>240</td>
</tr>
</tbody>
</table>

**Table 1.4-7 Long_enum Fields**

The **Collection_ID** field identifies the collection in which the object exists.

The **Object_ID** field identifies the object. This key plus the 'name' value provide the key necessary to retrieve the long values for this object and field attribute.

The **Name** field contains the database field name defined as a long field attribute. This key plus the **Object_ID** value provide the key necessary to retrieve the long values for this object and field attribute.

The **Abstract** field contains the value of the long field.
1.4.7 Preabstracts Table

This table contains the pre-processed abstract derived from the title, keywords, and abstract fields of the object. Table 1.4-8 Preabstracts Fields defines the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection_ID</td>
<td>Character</td>
<td>22</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td></td>
</tr>
<tr>
<td>Keywords*</td>
<td>Character</td>
<td>80</td>
</tr>
</tbody>
</table>

Table 1.4-8 Preabstracts Fields

The 'Collection_ID' field identifies the collection in which this object exists.

The 'Object_ID' field identifies the object. This key is necessary to retrieve the pre-processed abstract for the object.

The 'Keywords' field contains the pre-processed keyword that will be used by the natural language search feature of NELS. This is a processed version of the title, keywords, and abstract fields of the object.

1.5 NELS Supplemental Tables

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admin_Defs</td>
<td>Contains pre-defined librarian classes and the privileges associated with this class.</td>
</tr>
<tr>
<td>Applications</td>
<td>Contains information regarding applications that can be run from the &quot;Applications&quot; menu, used as object viewers, and for output requests.</td>
</tr>
<tr>
<td>App_Formats</td>
<td>Contains legal format information pertaining to the applications defined in the Applications table.</td>
</tr>
<tr>
<td>History</td>
<td>Contains audit information about NELS usage.</td>
</tr>
<tr>
<td>Notify</td>
<td>Contains information about messages sent to users of NELS.</td>
</tr>
<tr>
<td>Output_Queue</td>
<td>Contains queued output requests which are processed just prior to the user exiting NELS.</td>
</tr>
</tbody>
</table>

Table 1.5-1 Supplemental Tables

1.5.1 Admin_Defs Table

This table is a supplemental table used by NELS. This table contains a list of pre-defined librarian classes. This list allows the head librarian to pre-define privileges for different types of librarians and assign these special privileges to a pre-defined librarian class. Table 1.5-2 Admin_defs describes the items which form the Admin_defs table.
The ‘Name’ field contains the name assigned to the privileges for a specified librarian class. For example, "Head Librarian" would be a name of a librarian who has all administrative privileges assigned. This means that a librarian with these privileges could perform any of the administrative functions currently available in NELS.

The ‘Mask’ field contains the preset privileges allowed for this type of librarian. A librarian with these privileges can only perform those functions that are determined by the value in the mask.

### 1.5.2 Applications Table

This table provides the necessary information required by NELS to build a command that will execute the application. The application can be activated from the “Applications” menu if defined as an application. If the application is defined as an object viewer, the application will be activated when an object of the format specified for the application is selected for viewing in the "Object Browser" window. If the application is an "output request" type application, the application is executed in the same manner as the object viewer. Table 1.5-3 Applications Fields describes the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name*</td>
<td>Character</td>
<td>40</td>
</tr>
<tr>
<td>Description</td>
<td>Character</td>
<td>80</td>
</tr>
<tr>
<td>AppType</td>
<td>Character</td>
<td>20</td>
</tr>
<tr>
<td>Process</td>
<td>Character</td>
<td>20</td>
</tr>
<tr>
<td>Path</td>
<td>Character</td>
<td>80</td>
</tr>
<tr>
<td>User Mode</td>
<td>Character</td>
<td>5</td>
</tr>
<tr>
<td>Parameters</td>
<td>Character</td>
<td>240</td>
</tr>
</tbody>
</table>

Table 1.5-3 Applications Fields

The ‘Name’ field contains the application name that will be used to uniquely identify the application to execute.

The ‘Description’ field contains a short description of the application.

The ‘AppType’ field identifies the type of application or intended use of the application. Legal selections are "application", "viewer", "archive", and "output request".

The ‘Process’ field identifies the processing for the application. The application is either processed "immediately" or is "queued" for later processing.
The 'Path' field identifies the complete path name of the executable program.

The 'User_Mode' field identifies the mode of operation of the application. The User_Mode selections are "X" if the application only runs under X windows, "ASCII" if the application only runs in character mode, or "Both" if the application can execute in either mode.

The 'Parameters' field identifies any parameter(s) that is to be sent the application defined.

1.5.3 App_Formats Table

This table provides the formats that the applications defined in the Applications table can handle. The format entered for the application should be the word "all" or one of the format values listed in the add/update objects window. Table 1.5-4 Appl_Formats Fields describes the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name*</td>
<td>Character</td>
<td>40</td>
</tr>
<tr>
<td>AppType</td>
<td>Character</td>
<td>20</td>
</tr>
<tr>
<td>User_Mode</td>
<td>Character</td>
<td>5</td>
</tr>
<tr>
<td>Format</td>
<td>Character</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 1.5-4 App_Formats Fields

The 'Name' field contains the application name associated with the format entered.

The 'AppType' field identifies the type of application or intended use of the application. Legal selections are "application", "viewer", "archive", and "output request".

The 'User_Mode' field identifies the mode of operation of the application. The User_Mode selections are "X" if the application only runs under X windows, "ASCII" if the application only runs in character mode, or "Both" if the application can execute in either mode.

The 'Format' field contains the format that the application can process. A value of "all" indicates that all object formats or files can be processed.

1.5.4 History Table

This table provides an audit trail of many of the actions perform against an object. Actions such as add, update, delete, viewing, copying, etc are recorded in this history file. Table 1.5-5 History Fields describes the items which form this table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>User_ID</td>
<td>Character</td>
<td>35</td>
</tr>
<tr>
<td>Action</td>
<td>Number</td>
<td>3</td>
</tr>
<tr>
<td>Acct_Date</td>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>
The 'User_ID' field identifies the user who performed the action.

The 'Action' field describes the action which took place. Such as Copied or Browsed.

The 'Acct_Date' field contains the date and time the action took place.

The 'Collection_ID' field identifies the collection upon which the action occurred.

The 'Object_ID' field identifies the object upon which the action occurred.

### 1.5.5 Notify Table

The notify table is a table used for passing messages from one user to another. This table is also used to notify users of changes to objects. Notification of changes to objects only occurs if the object was copied by the user. Table 1.5-6 Notify Fields describes the items which form the notify table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>User_ID</td>
<td>Character</td>
<td>35</td>
</tr>
<tr>
<td>Object_ID</td>
<td>Number</td>
<td>1</td>
</tr>
<tr>
<td>Notifier</td>
<td>Character</td>
<td>40</td>
</tr>
<tr>
<td>New_Vers_ID</td>
<td>Character</td>
<td>240</td>
</tr>
<tr>
<td>Message</td>
<td>Date</td>
<td>35</td>
</tr>
<tr>
<td>RetainDate</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>From_User</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Date</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.5-6 Notify Fields

The 'User_ID' field identifies the user to whom the message is to be sent.

The 'Object_ID' field identifies the object, if any, associated with the message. This is used whenever a user wants to be notified of changes to an object.

The 'Notifier' field identifies the type of notify message that to be sent.

The 'New_Vers_ID' field contains the new version id of the object specified in the object_id field above, if any.

The 'Message' field contains the message to be sent to the user. This message only applies to messages sent by another user. Messages related to changes associated with an object are formulated by the NELS program based on the value of notifier.
The 'RetainDate' field contains the last date that the message will be displayed to all users. This field only applies to messages sent to all users.

The 'From_User' field contains the user id of the person sending the message. This field only applies to messages sent from one user to another or from one user to all users.

The 'Time' field contains the date and time the message is sent.

1.5.6 Output Queue Table

The Output Queue table is a table used to store the output request which was specified in a browsing session. The output request is placed into this table until the user exits NELS. Upon exiting, the user is given the option of cancelling the requests or processing the requests at this time. The requests are then removed from the table. Table 1.5-7 Output Queue Fields describes the items which form the output queue table.

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Format</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>User_ID*</td>
<td>Character</td>
<td>35</td>
</tr>
<tr>
<td>Directory</td>
<td>Character</td>
<td>80</td>
</tr>
<tr>
<td>Command</td>
<td>Character</td>
<td>240</td>
</tr>
</tbody>
</table>

Table 1.5-7 Output Queue Fields

The 'User_ID' field identifies the user requesting the delayed output request.

The 'Directory' field contains the directory where the files for output can be found.

The 'Command' field contains the actual command that is to be issued to complete the output request.

1.6 NELS Index Tables

To provide more efficient retrieval of data, NELS uses index tables. Table 1.6-1 Index Tables lists all the tables for which index tables have been created. This table shows the table name, index table name, and the field names which are used to define a key for that table.
<table>
<thead>
<tr>
<th>Table Name</th>
<th>Index Table Name</th>
<th>Key Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstracts</td>
<td>iabstracts</td>
<td>Collection_ID, Object_ID, Name</td>
</tr>
<tr>
<td>Admin_Defs</td>
<td>iadmin_defs</td>
<td>Name</td>
</tr>
<tr>
<td>Applications</td>
<td>iapplications</td>
<td>AppType, Name</td>
</tr>
<tr>
<td>App_Formats</td>
<td>iapp_formats</td>
<td>Name, Format</td>
</tr>
<tr>
<td>Authors</td>
<td>iauthors</td>
<td>Collection_ID, Object_ID</td>
</tr>
<tr>
<td>ClassFields</td>
<td>iclassfields</td>
<td>ClassID, SeqNum</td>
</tr>
<tr>
<td>Enum_Types</td>
<td>ienum_types</td>
<td>Enum_ID</td>
</tr>
<tr>
<td>Enum_Values</td>
<td>ienum_values</td>
<td>Enum_ID, Seq_Num</td>
</tr>
<tr>
<td>History</td>
<td>ihistory</td>
<td>Acct_Date, Action</td>
</tr>
<tr>
<td>Keywords</td>
<td>ikeywords</td>
<td>Collection_ID, Object_ID, Keyword</td>
</tr>
<tr>
<td>Librarians</td>
<td>ilibrarians</td>
<td>User_ID, Collection_ID</td>
</tr>
<tr>
<td>Links</td>
<td>ilinks</td>
<td>Collection_ID, Object_ID, Name</td>
</tr>
<tr>
<td>Long_Enum</td>
<td>ilong_enum</td>
<td>Collection_ID, Object_ID, Name</td>
</tr>
<tr>
<td>Master</td>
<td>imaster</td>
<td>Collection_ID</td>
</tr>
<tr>
<td>Notify</td>
<td>inotify</td>
<td>Node_Type, Collection_ID</td>
</tr>
<tr>
<td>ObjectClasses</td>
<td>iobjectclasses</td>
<td>User_ID</td>
</tr>
<tr>
<td>Objects</td>
<td>iobjects</td>
<td>Collection_ID, Object_ID, Class_ID</td>
</tr>
<tr>
<td>Objects</td>
<td>iobjects2</td>
<td>Class_ID, Collection_ID, Object_ID</td>
</tr>
<tr>
<td>Objects</td>
<td>iobjects3</td>
<td>Node_Type, Class_ID, Collection_ID, Object_ID</td>
</tr>
<tr>
<td>Preabstracts</td>
<td>ipreabstracts</td>
<td>Collection_ID, Object_ID</td>
</tr>
</tbody>
</table>

Table 1.6-1 Index Tables
1.7 Schema Hierarchy

The NELS 1.2 schema hierarchy is illustrated by Figure 1-1 NELS Table Hierarchy.

![Diagram of NELS 1.2 Schema Hierarchy]

Figure 1.7-1 NELS 1.2 Schema Hierarchy
1.8 NELS Table Relationships

This section discusses the relationships of the tables to other tables in regards to their use by NELS. Each table in the hierarchy of Figure 1.7-1 above is discussed in greater detail in the following paragraphs. The use of each specific field for each table will not be discussed at this time.

1.8.1 Access Privileges

The librarians table contains the necessary information required by NELS to validate whether the current user has privileges to perform various NELS administrative functions. Every NELS library must have a minimum of one "Head Librarian". This person has full authorization to add, update, modify, and delete object classes, collections, tools, and objects in the library. The "Head Librarian" is assigned all privileges from collection "S" and all subordinate level collections. The 'user_id' and 'subject_id' fields are used to determine the current user privileges. Without this table, no other table in the library can be modified.

1.8.2 Collections

A collection consists of a defined area in the library (masters table), the tools associated with the collection (tools table), and the objects associated with the collection (objects table and subordinate tables). The masters tables contains the information about all collections in the library.

When a librarian performs an administrative function on a collection, the tables below this table may be affected. Depending on the function being performed, different tables may be modified. If a new collection is being added or modified in the library, only the masters table is changed by the function. However, if a move or delete function is performed, the 'subject_id' value would be used to move/remove all entries from the tools, members, and associated objects tables having that collection value. All subordinate collections would also be moved/removed. Additionally, any librarians that were defined for any of these collections would be modified/deleted from the librarians table.
Once collections have been created, tools and objects may be entered into the library. When tools are added to a collection, the information about the tool is entered into the 'tools' table and the 'objects' table. When objects are entered into a library collection, the 'members' table and the 'objects' tables are changed. Note that objects that are entered into the library also depend on information contained in the 'objectclasses' table and subordinate tables. The objectclasses table hierarchy determines what information is to be entered for the object based upon the object class that has been selected for that object. This is the 'type_id' field in the objects table.

The 'objects' table is the primary table used in defining the metadata about an object entered into the library. The 'objects' table is composed of the "objects" table and 6 subordinate tables. The six other tables which complete the definition of a object's metadata are the 'authors', 'abstracts', 'preabstracts', 'keywords', 'long_enum', and 'links' table. All of these tables use the 'object_id' field to uniquely identify the values associated with a particular object. However, the keywords table, uses the subject_id and object_id fields to uniquely identify the keywords for a particular object. This use of subject_id (collection id), provides the addition of collection specific keywords, since an object can be used in more than one collection.

1.8.3 Object Classes

Object classes must be defined by librarians before an object of this class can be entered into the library. To define an object class, the hierarchy relationship depicted by Figure 1.7-1 is used. The objectclasses table contains basic information about the object class being defined. Each object class is given a unique identifier, 'class_id' field, which can be used to obtain information about all the field attributes associated with an object class. This value is entered into the 'type_id' field of the objects table when a new object is added to the library.

The classfields table contains all the field attributes which make up this object class. When field attributes are inherited from another base class, the field attributes of this class plus the field attributes of the base class are used to complete the object class definition. For example, "TG1" would require all the field attributes of object class "T" (the generic class) plus all the field attributes of "TG1". Note, all object classes other than the generic class "T", contain two characters.

If an attribute field in the classfields table is an enumeration type field, then information about the enumeration type can be found by using the 'enum_id' foreign key field. The 'enum_types' and 'Enum Values' tables provide information about the definition of the enumeration type and the enumeration values.
Appendix A  SQL for NELS 1.2 Tables

/* Create tables for NELS */

CREATE TABLE Abstracts (  
  Collection_ID CHARACTER(22)  
  Object_ID NUMBER,  
  Abstract LONG  
);

CREATE TABLE Output_Load (  
  UserID CHAR(35) NOT NULL,  
  Directory CHAR(80) NOT NULL,  
  Command CHAR(240) NOT NULL  
);

CREATE TABLE Authors (  
  Collection_ID CHARACTER(22) NOT NULL,  
  Object_ID NUMBER NOT NULL,  
  Author CHAR(240) NOT NULL  
);

CREATE TABLE Enum_Values (  
  Enum_ID NUMBER NOT NULL,  
  Seq_Num NUMBER NOT NULL,  
  Value CHAR(40)  
);

CREATE TABLE Enum_Types (  
  Enum_ID NUMBER NOT NULL,  
  Enum_Type CHAR(40) NOT NULL,  
  Name CHAR(50) NOT NULL  
);

CREATE TABLE History (  
  User_ID CHAR(35) NOT NULL,  
  Action NUMBER(3) NOT NULL,  
  Acct_Date DATE,  
  Collection_ID CHAR(22),  
  Object_ID NUMBER  
);

CREATE TABLE Keywords (  
  Collection_ID CHAR(22),  
  Object_ID NUMBER,  
  Keyword CHAR(35)  
);

CREATE TABLE Links (  
  Collection_ID CHAR(22) NOT NULL,  
  Object_ID NUMBER NOT NULL,  
  Name CHAR(50),  
  Link_Collection CHAR(22),  
  Link_Object CHAR(15)  
);

CREATE TABLE Long_Enum (  
  Collection_ID CHARACTER(22)  
) ;
CREATE TABLE Master
(
Collection_ID CHAR(22) NOT NULL,
Collection_Name CHAR(35) NOT NULL,
Description CHAR(240),
Related_Count NUMBER NOT NULL,
NodeType CHAR(40),
Password CHAR(8),
Total_Objects NUMBER,
Num_Production NUMBER,
Num_Developmental NUMBER,
Num_Secure NUMBER,
Num_Archive_Production NUMBER,
Num_Archive_Developmental NUMBER,
Num_Archive_Secure NUMBER
)
);

CREATE TABLE Notify
(
User_ID CHAR(35),
Object_ID NUMBER,
Notifier CHAR(1),
New_Vers_ID CHAR(40),
Message CHAR(240),
RetainDate DATE,
From_User CHAR(35),
Time DATE
);

CREATE TABLE Objects
(
Collection_ID CHAR(22) NOT NULL,
Object_ID NUMBER NOT NULL,
Class_ID CHAR(22) NOT NULL,
Host_Name CHAR(80),
Format CHAR(40),
Object_Name CHAR(80),
PathName CHAR(240),
Version CHAR(40),
Lib_Entry_Date DATE,
Last_Modified DATE,
Flags NUMBER,
Node_Type CHAR(40),
Title CHAR(80),
FIELD9 CHAR(80),
FIELD10 CHAR(80),
FIELD11 CHAR(80),
FIELD12 CHAR(80),
FIELD13 CHAR(80),
FIELD14 CHAR(80),
FIELD15 CHAR(80),
FIELD16 CHAR(80),
FIELD17 CHAR(80),
FIELD18 CHAR(80),
FIELD19 CHAR(80),
);

24
CREATE TABLE Preabstracts
    (Collection_ID CHAR(22) NOT NULL,
     Object_ID NUMBER NOT NULL,
     Keywords CHAR(80));

CREATE TABLE Librarians
    (User_ID CHAR(35),
     Collection_ID CHAR(22),
     Admin_Mask NUMBER(38),
     Custom_Mask NUMBER(38));

CREATE TABLE ClassFields
    (ClassID CHAR(22) NOT NULL,
     Name CHAR(50) NOT NULL,
     Prompt CHAR(50) NOT NULL,
     Kind NUMBER(38) NOT NULL,
     Visibility NUMBER(38) NOT NULL,
     Editable NUMBER(38) NOT NULL,
     Length NUMBER(38),
     NumColumns NUMBER(38),
     NumLines NUMBER(38),
     FieldUnique CHAR(1)).
CREATE TABLE ObjectClasses(
    ClassID CHAR(22) NOT NULL,
    ClassName CHAR(80) NOT NULL,
    NumFields NUMBER(38)
);

CREATE TABLE Applications(
    Name CHAR(40),
    Description CHAR(80),
    AppType CHAR(20),
    Process CHAR(20),
    Path CHAR(80),
    User_Mode CHAR(5),
    Parameters CHAR(240)
);

CREATE TABLE App_Formats(
    Name CHAR(40),
    AppType CHAR(20),
    User_Mode CHAR(5),
    Format CHAR(40)
);

CREATE TABLE Admin_Defs(
    Name CHAR(35),
    Mask NUMBER(38)
);

CREATE TABLE Output_Queue(
    Userid CHAR(35) NOT NULL,
    Directory CHAR(80),
    Command CHAR(240) NOT NULL)
;

/* Create a sequence number that will be used for object IDs */
CREATE SEQUENCE NewObjectID INCREMENT BY 1 START WITH 101
NOMAXVALUE MINVALUE 100 NOCYCLE CACHE 50 ORDER;

COMMIT WORK;
QUIT:
Appendix B  SQL for NELS 1.2 Table Indices

/* Create index files for NELS tables */
CREATE UNIQUE INDEX iabstracts ON Abstracts(Collection_ID, Object_ID);
CREATE UNIQUE INDEX iadmin_defs ON AdminDefs(Name);
CREATE UNIQUE INDEX iapplications ON Applications(AppType, Name);
CREATE UNIQUE INDEX iapp_formats ON App_Formats(Name, Format);
CREATE INDEX iauthors ON Authors(Collection_ID, Object_ID);
CREATE UNIQUE INDEX iclassfietds ON ClassFields(ClassID, SeqNum);
CREATE UNIQUE INDEX ienum_types ON Enum_Types(Enum_ID);
CREATE UNIQUE INDEX ienum_values ON Enum_Values(Enum_ID, Seq_Num);
CREATE UNIQUE INDEX ihistory ON History(Acct_Date, Action);
CREATE UNIQUE INDEX ikeywords ON Keywords(Collection_ID, Object_ID, Keyword);
CREATE UNIQUE INDEX ilibrarians ON Librarians(User_ID, Collection_ID);
CREATE INDEX ilinks ON links(Collection_ID, Object_ID, Name);
CREATE UNIQUE INDEX ilong_enum ON Long_Enum(Collection_ID, Object_ID, Name);
CREATE UNIQUE INDEX imaster ON Master(Collection_ID);
CREATE UNIQUE INDEX imaster2 ON Master(Node_Type, Collection_ID);
CREATE UNIQUE INDEX inotify ON Notify(User_ID, Time);
CREATE UNIQUE INDEX ioobjectclasses ON ObjectClasses(ClassID);
CREATE UNIQUE INDEX ioobjects ON Objects(Collection_ID, Object_ID, Class_ID);
CREATE UNIQUE INDEX ioobject2 ON Objects(Object_ID, Class_ID, Collection_ID);
CREATE UNIQUE INDEX ioobjects3 ON Objects(Node_Type, Class_ID, Collection_ID, Object_ID);
CREATE INDEX ipreabstracts ON Preabstracts(Object_ID, Collection_ID);
COMMIT WORK;
QUIT.