NAHLN Messaging With USALIMS

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Introduction

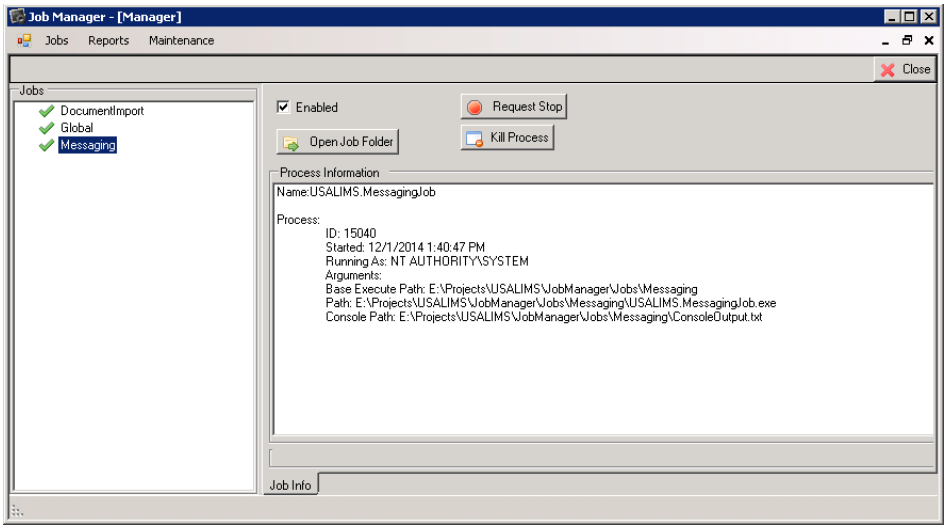
This document covers the basics of setting up and maintaining USALims to do NAHLN Result messaging. It draws from a number of sources including USALims using laboratories and CAI documentation. When we quote a button label, table name, etc., we will use a special font, Arial Narrow. Code samples are in the fixed spaced font `Courier New`.

System Setup

Installation

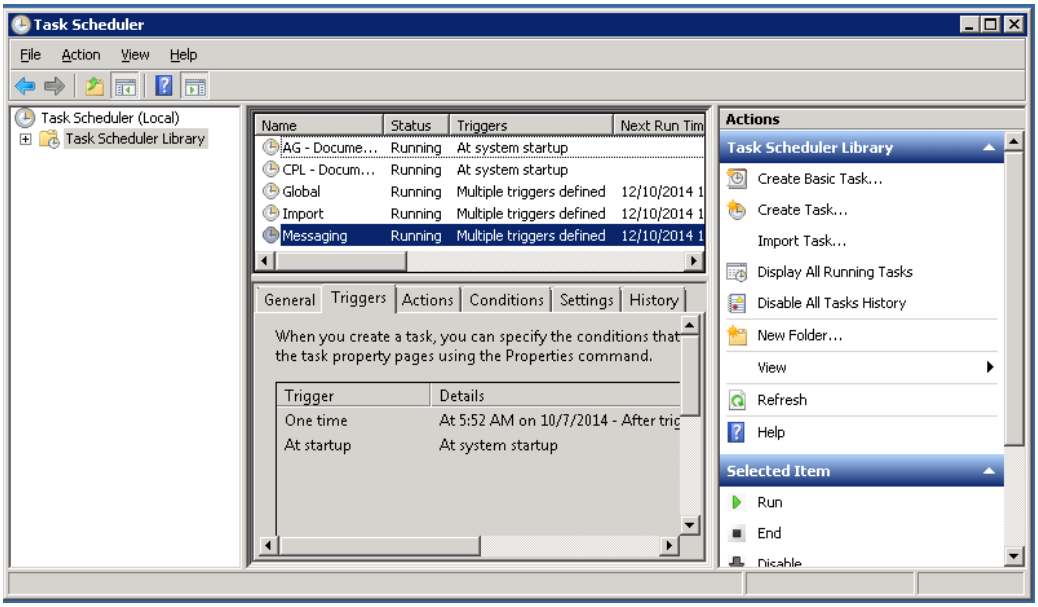
Most of what you need to run NAHLN Messaging from USALIMS is already in the system. You will however need the "USALIMS NAHLN Messaging Job" installed by CAI into the job manager.

Be sure this job is enabled and running.



But this is not enough because the job may not actually be run.

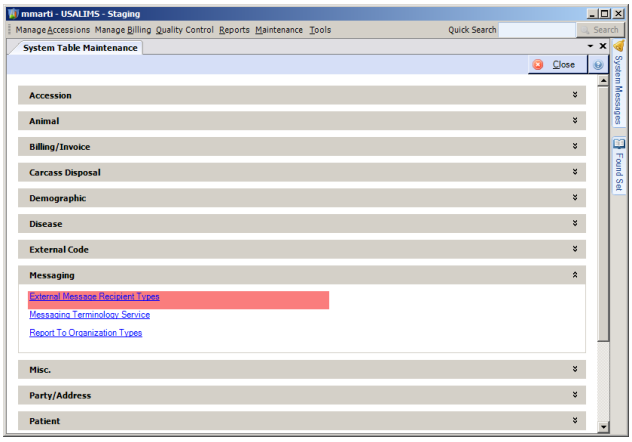
Management of jobs is a complex stack of processes that involves the Job Manager run by the Task Scheduler using a bunch of undocumented configuration files. The job needs to also show running in the Task Scheduler.



Configuration

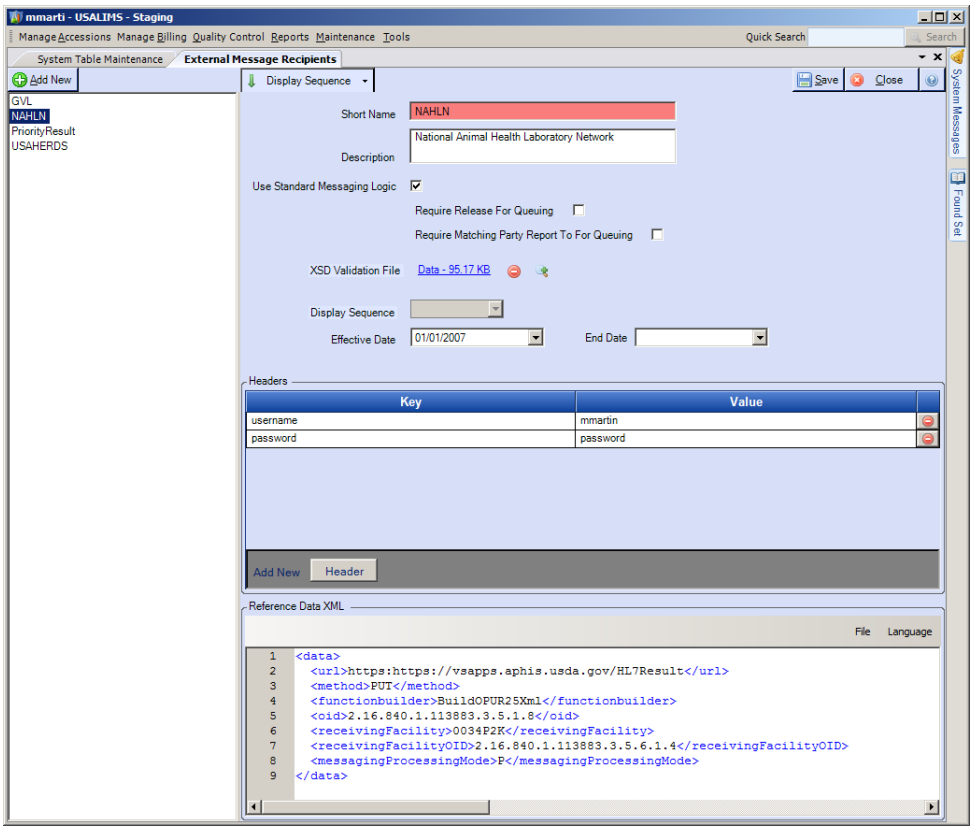
Most configuration can now (version 3.1 and up) be done from the Maintenance menu.

The first step is to set up recipients:



External Message Recipient Types

For messaging directly to the NAHLN Server this screen should look something like this:



Note the url, oid, and receivingFacility information those are all used to identify the NAHLN repository.

The LIMS needs to have a copy of the most current NAHLN Result Message Base schema with which to validate its outgoing messages. You can get the current schema in LIMS or change it from this screen.

The userid and password set here are those for the System account used to authenticate the system to the NAHLN server.

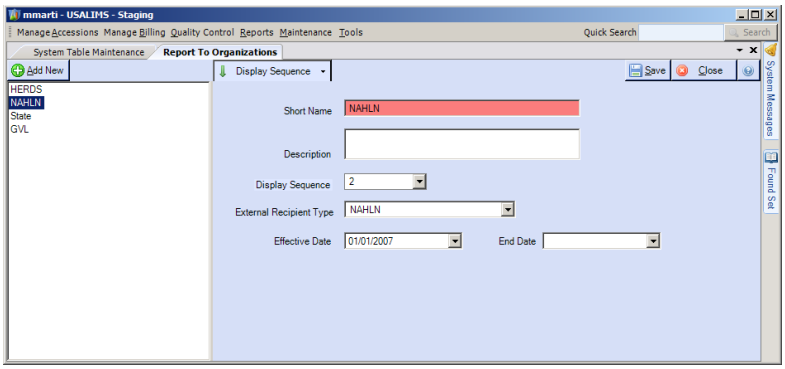
If your policy is going to require clicking the release results button before messaging, that is set here by checking the appropriate box.

The "Require Matching Report To For Queuing" box should remain unchecked unless you want to HAVE to add NAHLN as a party to every accession to be messaged. This feature was added to allow lab to lab messaging of only some results.

If you route through SALMS, very little changes except the url, username, and password.

Report To Organization Types

This box is essential. It is here, as far as I can tell, just because nothing should be done using only one table when it can be made to use two.

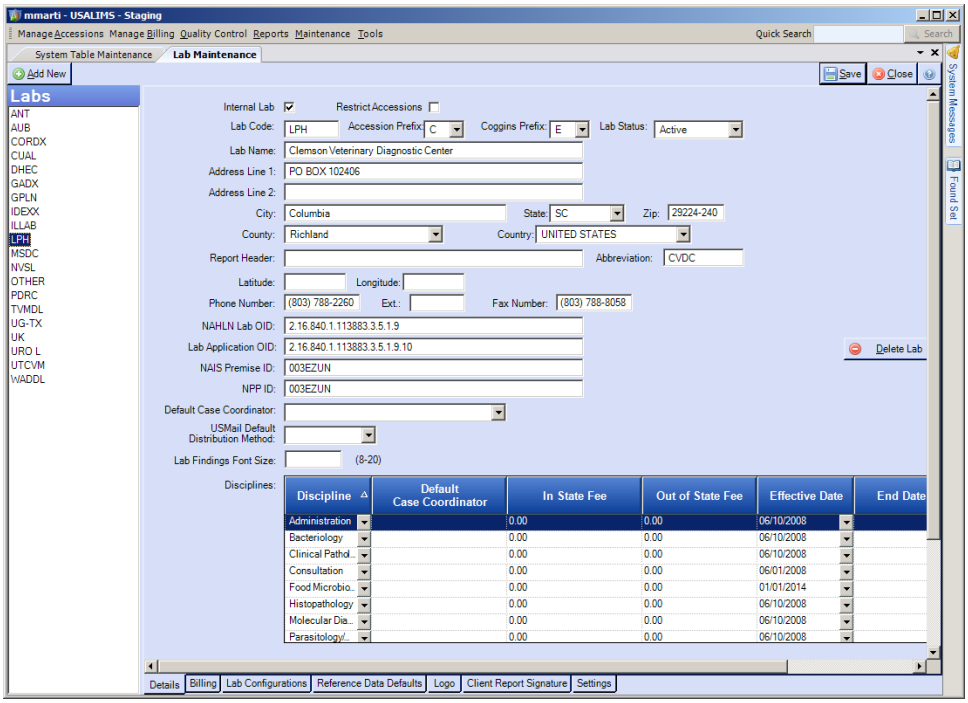


Lab Maintenance

This is where you set up your PIN and OIDs

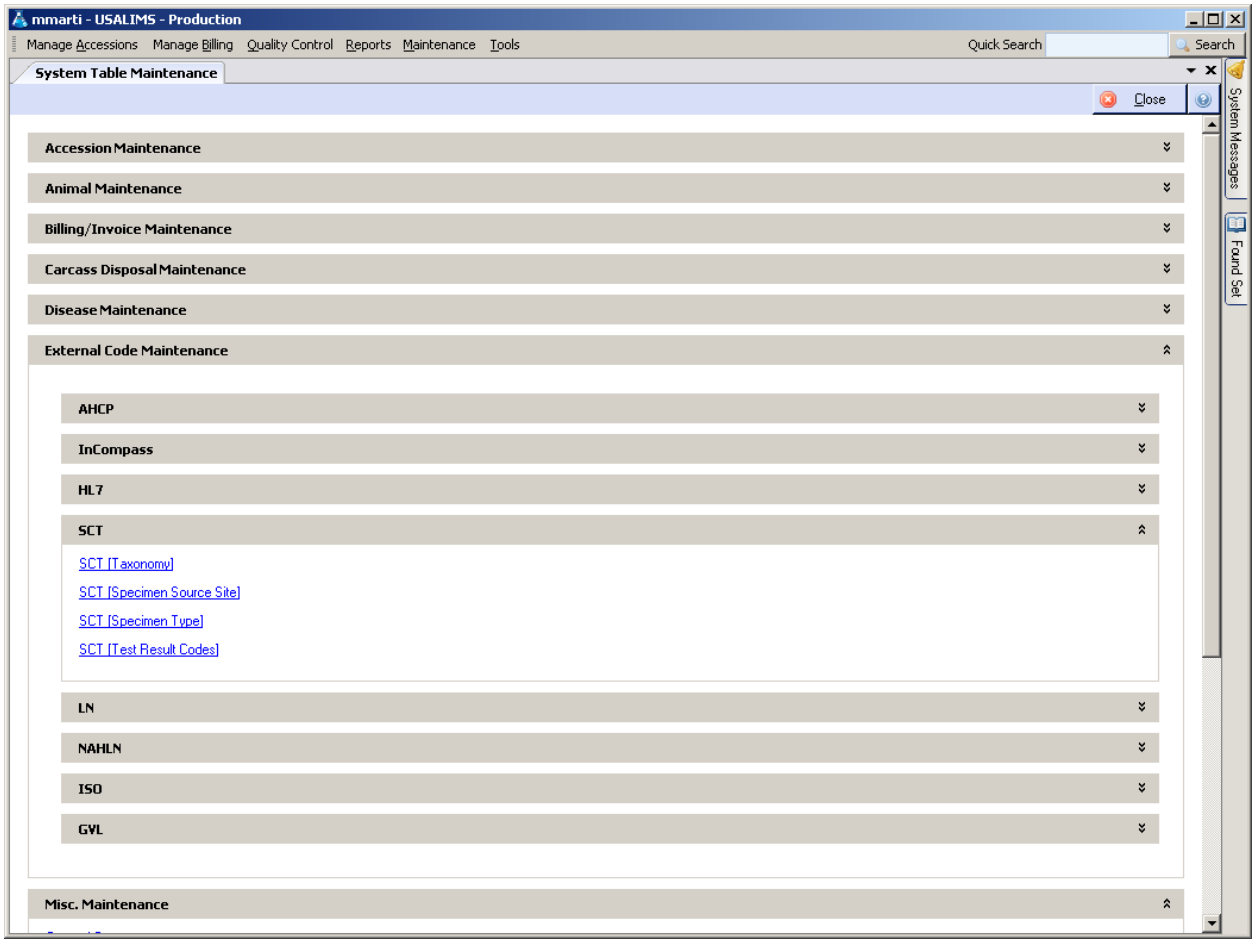
Under Miscellaneous Maintenance in Labs, select your lab and add the Lab's OID (you have one, right? If not see http://vdpamweb2.vdl.iastate.edu/aavld_oid/.) You will need to create a Laboratory Application OID as a node off of your root OID. This is just a matter of adding ".NNN" to the end of your root OID, where "NNN" is any integer. You then need to reserve use of that node to always only mean the LIMS Application.

In the same panel add your lab's Animal Disease Traceability (ADT) program Premises Identifier (PIN), Location Identifier (LID), or Non-producer Participant Identifier in the appropriate field. (Does USALims correctly handle non-7-digit LIDs? Does the NAHLN?)



External Codes

Appendix A contains a complete list of external code tables that need to be populated, and Appendix B contains a complete list of system tables that need mappings set. These are no longer arranged in distinct external code tables but in a set of three tables: CodingSystemTypes, CodingSystemTables, and ExternalCodes. In the following sections we will address the techniques used to find, populate, and map a variety of these. We won't repeat for others that work the same way. They are all accessed via the External Code Maintenance area.



SNOMED

Finding External Codes

The main resource for finding external codes is the Virginia Tech Terminology website. This tool was developed for the NAHLN and has been cited by informatics projects worldwide as the example of how to support terminology. There you can find carefully curated lists of codes. This is much safer than going to the full source terminology. http://vtsl.vetmed.vt.edu/nahln/main.cfm

Before using the search feature of the terminology website you need to understand the true meaning of the local code or term you are mapping. In the case of specimen types this is usually fairly clear. For test types you will need a clear understanding of the analyte, method, and result type (or just let the NAHLN SOPs tell you). For animal taxonomy you may have to dig a little. Start with the name the lab gives you,

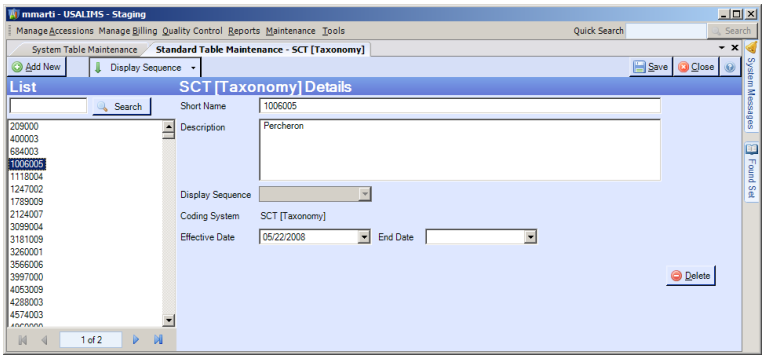
research it, and ask questions if you need to. Good research sites include Wikipedia (*always* confirm what you learn on Wikipedia via a more strongly validated site, but it gives a good way to figure out what to look for on those other sites), ITIS, and breed association web sites. Once you are confident of the Linnaean taxonomy of your animal type, try searching on the terminology site for the latin or common name. Be sure to explore the hierarchy to be sure that the code you have found has the correct "parent" and that it doesn't have a more appropriate "child." At this point you can record the concept identifier and preferred or fully-qualified name.

Taxonomy

This is by far the trickiest to deal with in USALIMS. The SNOMED concept identifier is the ShortName in this table and the SNOMED Preferred or Fully-qualified Term is the Description. And the concept identifiers are sorted in *numeric* order, which makes sense since they are represented as integers, but doesn't make sense because they are not numerically meaningful. This all makes looking up in the maintenance area a mess. You will want to keep a lookup table of these codes handy. This is fairly easy to generate from the USALIMS database if you have SQL access:

```
SELECT ec.ShortName, ec.Description
FROM ExternalCodes ec
JOIN CodingSystemTables ct ON ct.CodingSystemTableKey =
                              ec.CodingSystemTableKey
WHERE ct.InternalName = 'SCT-Taxonomy' AND ec.EndDate IS NULL
ORDER BY ec.Description
```

The SCT-Taxonomy system table needs to contain SNOMED codes for any species or breeds you will need to message to NAHLN. This will most likely be your biggest mapping job.



Mapping is then handled from the Animal Taxonomy system table maintenance area. For each animal taxonomy "node" that may be selected for a NAHLN test, open its entry and click the Add External Code button. Selecting the proper code has gotten *much* easier in recent releases of USALIMS. When you click Select External Code, expand SCT and select SCT [Taxonomy] you will be presented with a giant list box with the codes sorted in alpha order by code. So you can look up by the first few digits of the code. Set the Effective Start Date. The End Date is empty for now. It will come into play as we handle updates.

When adding codes after the initial setup, it may make sense to first look in the Animal Taxonomy maintenance area and, if not found, go to the External Code Maintenance page to add it. But note that due

to caching you will need to close the Animal Taxonomy Maintenance page and reopen it after you add the code. Grrrh. Maybe this will change someday, but I doubt it.

Specimen Types

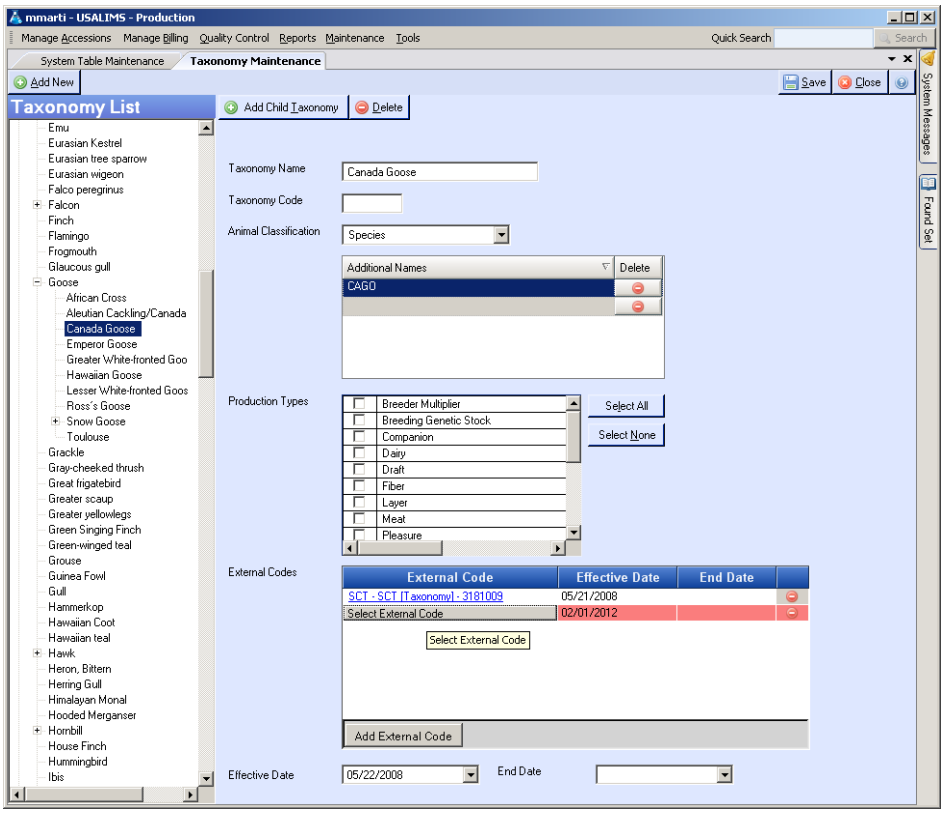
The other complicated subset of SNOMED codes is the one for Specimen Types. For only NAHLN testing, this is not complicated. The NAHLN Terminology Services has established a pattern of pre-coordinating any common specimen/source combinations into Specimen Type codes. So, simply use the specimen types and SNOMED codes specified by the testing program. But if you are trying to set up for more general testing, you will need to map the combination of Specimen Types and Specimen Source Types to the SNOMED codes for Specimen Type and Specimen Source. This may be—probably is—more complicated than it sounds. Some of your specimen types may map to a combination of SNOMED specimen type and SNOMED specimen source. Others may map a combination of your type and source to a single SNOMED specimen type. USALIMS can handle the former situation by mapping both an SCT [Specimen Type] and an SCT [Specimen Source Site] external code to the single specimen type in System Table Maintenance. The later may require an additional specimen type code to handle the combination.

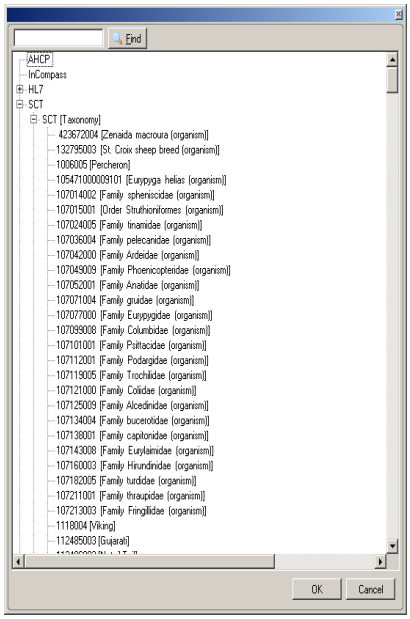
The process for obtaining and adding external codes, and then adding mappings to these codes in the appropriate system tables is the same as for animal taxonomy.

Mapping

Once the external codes are in the External Codes area, you can assign them to specific local terminology entries. For example each entry in your Animal Taxonomy system table that might be used in a message needs a current mapping to SNOMED [Taxonomy]

The Add External Code dialog has gotten MUCH more user friendly in recent releases.





Other system tables have similar mapping controls.

When mapping Specimen Type and Specimen Source, you may not have one-to-one matches. It is OK for your specimen type to map to both a type and a source in SNOMED. There doesn't seem to be a way to map a type and source in LIMS to just a type in SNOMED. This might be an issue with weird SNOMED types like "Oropharyngeal, Cloacal Swab Pool."

Updates

SNOMED codes get changed from time to time. The terminology web service makes lists of retired codes available as XML or comma separated (csv) files. CAI is slowly working on handling this web service but for now the update process is manual or semi-automated through SQL Scripts.

If you download the csv file of the retired codes for animal taxonomy and import into SQL Server in a schema that this sample calls xxx (I use my login schema) to a table called RetiredSCTSpecies, the following SQL will list the codes that need to be dealt with. Note: These seem to be correct as of release 2.8, but the table structure could change.

```
-- This query shows the rows we have to deal with in the mapping table
SELECT m.*, r.*
FROM xxx.RetiredSCTSpecies r
JOIN dbo.ExternalCodes c ON c.ShortName = r.RETIREDCODE
JOIN dbo.CodingSystemTables t ON t.CodingSystemTableKey =
c.CodingSystemTableKey
JOIN dbo.AnimalTaxonomyECMapping m ON m.ExternalCodeKey = c.ExternalCodeKey
WHERE t.InternalName = 'SCT-Taxonomy' AND m.EndDate IS NULL;
```

If you are really brave, and have a current backup, the following will end-date things for you.

```
declare @today as datetime
declare @tomorrow as datetime
select @today = dbo.DateTimePrecision(getDate(),'day');
select @tomorrow = dbo.DateTimePrecision(dateadd( day, 1, @today ),'day');

-- End date the ones we haven't already done manually
UPDATE dbo.ExternalCodes
SET EndDate = @today
FROM xxx.RetiredSCTSpecies r
JOIN dbo.ExternalCodes c ON c.ShortName = r.RETIREDCODE
JOIN dbo.CodingSystemTables t ON t.CodingSystemTableKey =
c.CodingSystemTableKey
WHERE t.InternalName = 'SCT-Taxonomy' AND c.EndDate IS NULL;

-- End date the retired taxonomy mappings
UPDATE dbo.AnimalTaxonomyECMapping
SET EndDate = @today
FROM xxx.RetiredSCTSpecies r
JOIN dbo.ExternalCodes c ON c.ShortName = r.RETIREDCODE
JOIN dbo.CodingSystemTables t ON t.CodingSystemTableKey =
c.CodingSystemTableKey
JOIN dbo.AnimalTaxonomyECMapping m ON m.ExternalCodeKey = c.ExternalCodeKey
WHERE t.InternalName = 'SCT-Taxonomy' AND m.EndDate IS NULL;
```

If you are *really* bold, this will add in the new external codes.

```
-- Insert replacements for the two attributes that are "deterministic"
replacements
INSERT INTO dbo.ExternalCodes( CodingSystemTableKey, ShortName, Description,
EffectiveDate, CreatedByUserName )
SELECT t.CodingSystemTableKey, r.REPLACEMENTCODE, r.REPLACEMENTTEXT,
@tomorrow, 'your user id'
FROM xxx.RetiredSCTSpecies r
JOIN dbo.ExternalCodes c ON c.ShortName = r.RETIREDCODE
JOIN dbo.CodingSystemTables t ON t.CodingSystemTableKey =
c.CodingSystemTableKey
WHERE t.InternalName = 'SCT-Taxonomy'
  AND r.RELATIONSHIPTYPE IN ('REPLACED BY (attribute)',
                             'SAME AS (attribute)', 'MAY BE A (attribute)')
  AND NOT EXISTS ( select * from dbo.ExternalCodes
                   where ShortName = r.REPLACEMENTCODE );
GO
```

Adding the actual new mappings is trickier because you might have already dealt with some of them manually or have created other existing mappings, etc.

LOINC Codes

Coding the specific test results is conceptually more complicated but more straightforward in practice. The key to having this make sense is to remember that the O in "LOINC" stands for "observation." Many "tests" result in multiple "observations." Each true observation is mapped to a LOINC code. So, most of your Result Setups will have LOINC codes. But others don't represent raw observations. These are actually interpretations of the results in other Result Setups. For example "Positive" in a result along with a Ct value result of "24.5" would be an interpretation rather than an observation value.

If that much is clear then LOINC coding NAHLN tests is really easy. Just use the Search function on the terminology website and look for the specific test. Or use LOINC codes provided by the testing program documentation such as the "Idiot's Guide" for the specific program.

First add the external code to the LOINC External Codes set in System Table Maintenance. Then go to the Lab Test Offering level of the Test Maintenance area and select the Expected Answer for the Result Setup that holds the actual observation value. This will be the Ct value for a PCR. It may be a coded organism name for a culture, etc. This is the "field" that gets the LOINC code. At the bottom of this panel is the LOINC mapping pane. Add the appropriate LOINC code. If the test also has an interpretation, you point to the Expected Answer field holding that in the Interpretation column of this "table" control.

HL7 Table Values

Most of the codes in HL7 tables are small, structural codes used by the messaging system more than the systems on the two ends. Almost all the values you will need are listed in Appendix C. These are entered in System Table Maintenance the same way the more complex code systems are. You will need to assign codes in Accession Maintenance for Purpose of Tests and possibly Quality Check Types. In Animal Maintenance there are several mappings to do including Taxonomy and Production Type, but also Identifier and Gender Types. In Party/Address Maintenance Party Accession Purpose Types is where you map to HL7 codes for owner, submitter, etc. from HL7 table 0063.

LIMS Phone Number Types are unusual in that each one needs to map to a pair of HL7 codes, one for Purpose and another for Equipment (tables HL70201 and 0202 respectively). This makes sense for home phone, home fax, etc., but gets goofy for things like beeper.

Any "single" Result Expected Answers "answers" used in interpretation (OBX.8) need to have their Test Offering Result Types mapped to HL7 table 0078. These are usually all versions of "negative", "not detected", etc., mapped to "NEG; all versions of "positive", "detected", etc., mapped to "POS"; and all "intermediate", "indeterminate", "suspect", etc., mapped to "IND".

NAHLN Assigned Codes

NAHLN "local" codes include Submission Reason and State. Why State is in this section is not clear, but you have to go into Party/Address Maintenance and map each state to the corresponding--and almost certainly always same--state code in LIMS. Almost all the values needed are listed in Appendix D.

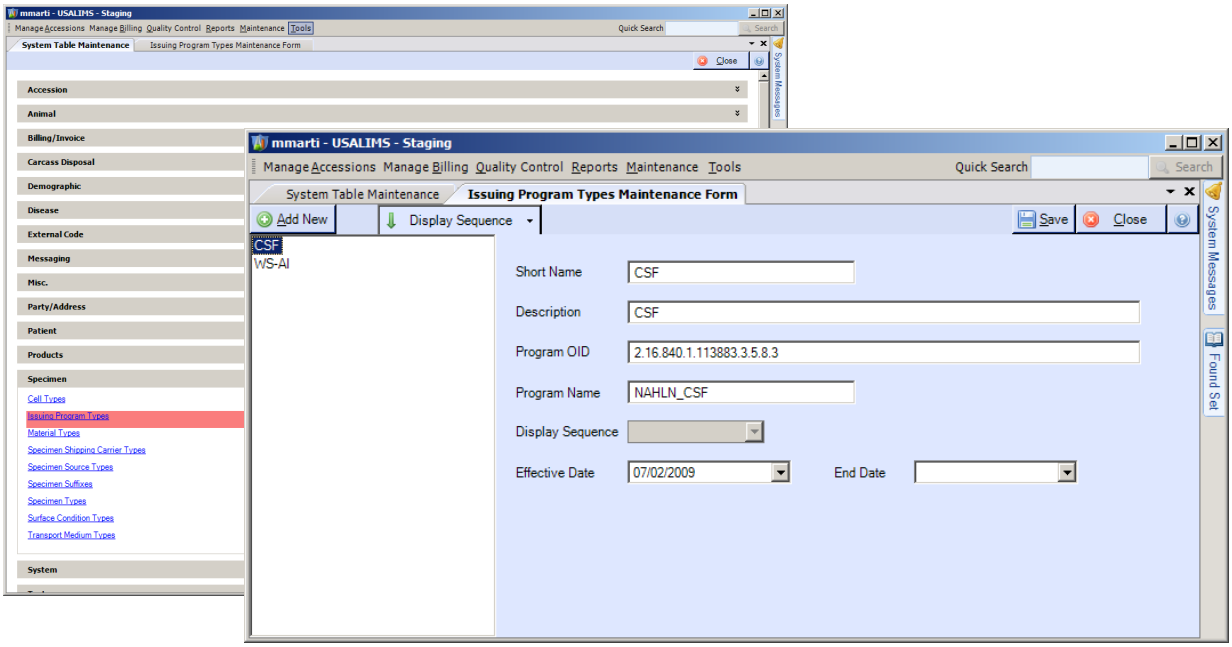
OIDs

Some OIDs are entered directly into data fields such as when you put your lab OID in Lab Maintenance. Others are entered as External Codes and mapped as is the case with Method OIDs. The OIDs that identify testing programs are associated with the assigning authority for the specimen IDs on all the testing thus far. As such, they are entered in the Specimen Maintenance area in the Issuing Program Types form. This is an example of OIDs being entered directly on the form.

Testing Programs and Referral Numbers

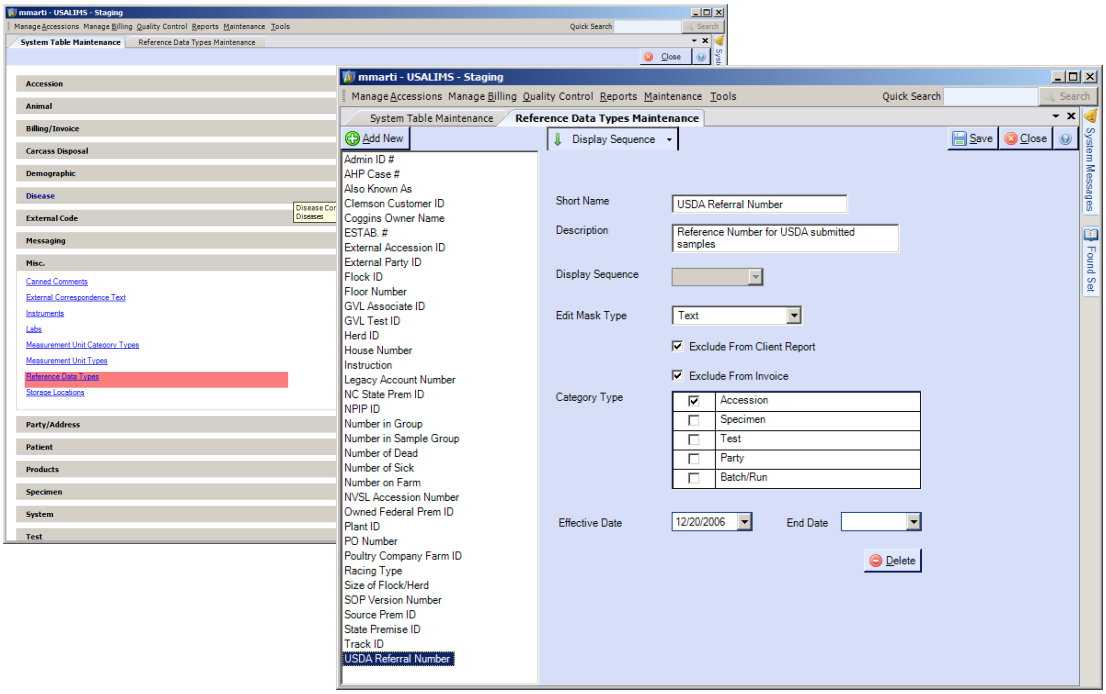
An important and often overlooked issue is program OIDs and referral numbers. These are important for any testing program, FAD investigation, etc. They are *essential* for CSF testing.

The first step is to set up Issuing Program Types in the Specimen maintenance area.



Specimens messaged must have an issuing program assigned on the specimen tab if *either* a referral number or barcoded specimen ID has been provided by the testing program!

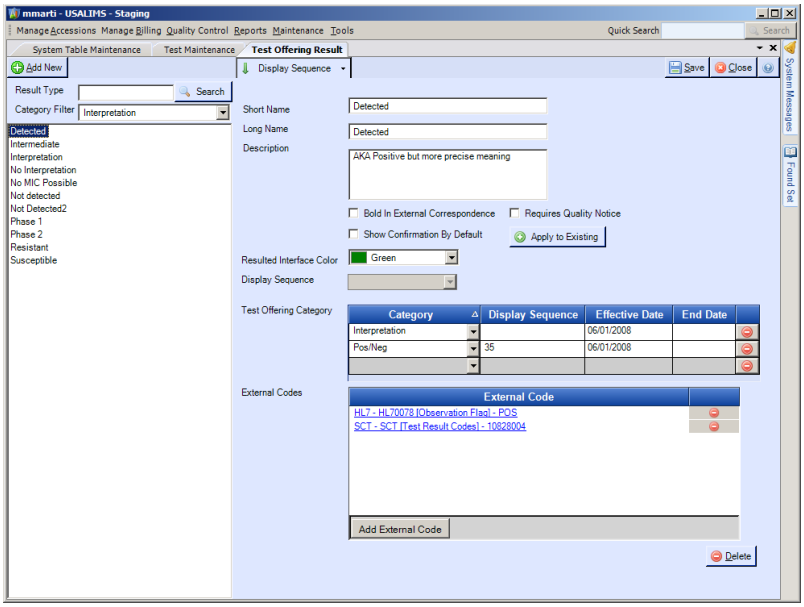
The next step is to be sure you have a Reference Data Type for "USDA Referral Number" at the Accession level. (This is not quite right. It is messaged at the specimen/order level but most often applies to the whole accession.)



Tests with referral numbers such as (and especially) CSF *must* have this reference data value added on the general tab.

Test Offering Result Types

Any coded result types or interpretations will need mappings assigned in Test Maintenance.



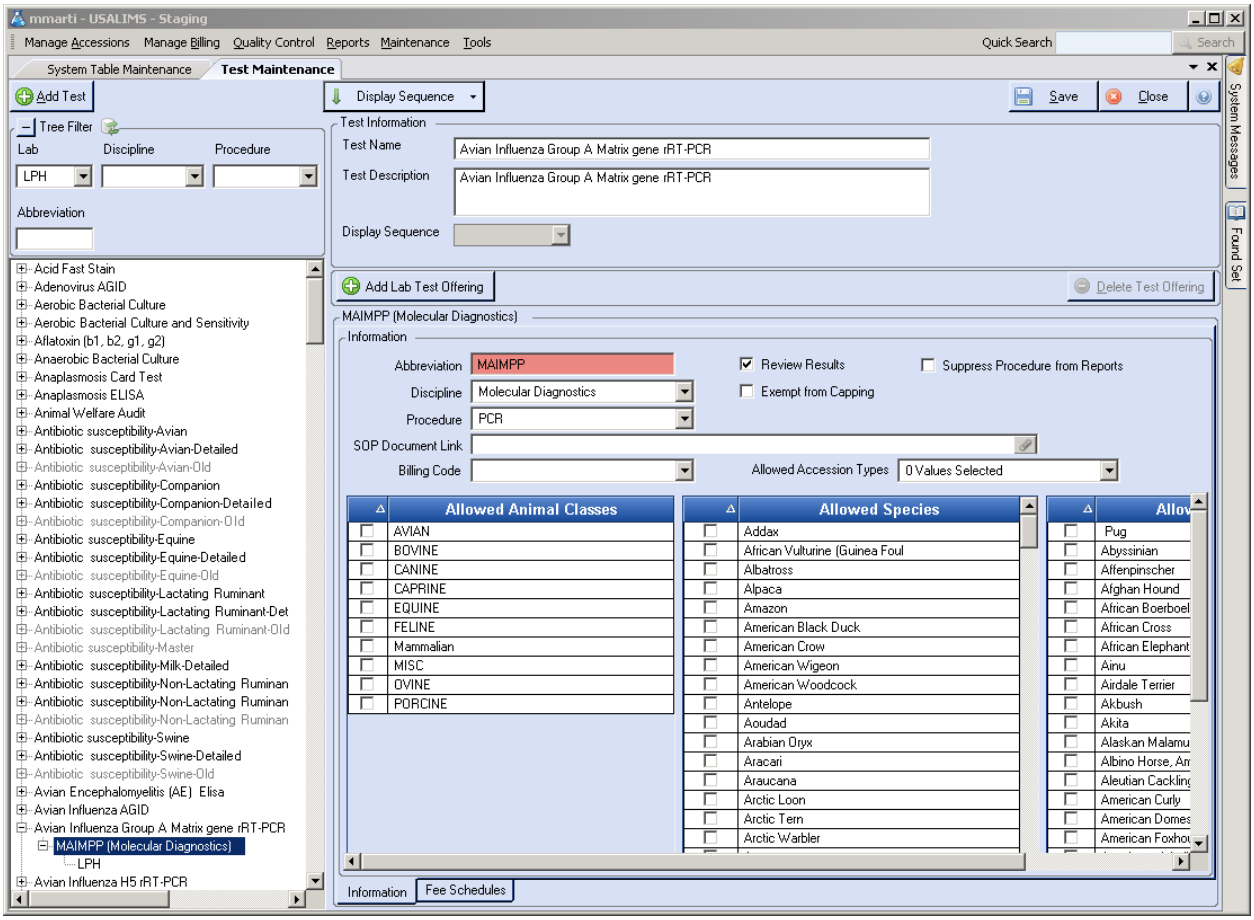
Party Purposes

Accession Parties become parts of NAHLN messages in a number of ways. The Submitter purpose becomes a submitter (SUB) Role segment. This use requires an external code mapping in the HL7 table mapping area. The Owner party becomes the Next of Kin (NK1) segment with a relationship of Owner. In each case, there should be only one of each of these segments. In USALIMS prior to version 3.3, you just had to be careful not to add more than one of each to any accession that was going to be messaged. Starting in 3.3 there is a check box in the System Table Maintenance for Party Purposes that lets you restrict the purpose to one party per accession. Be sure to check that box to prevent duplicate segment errors.

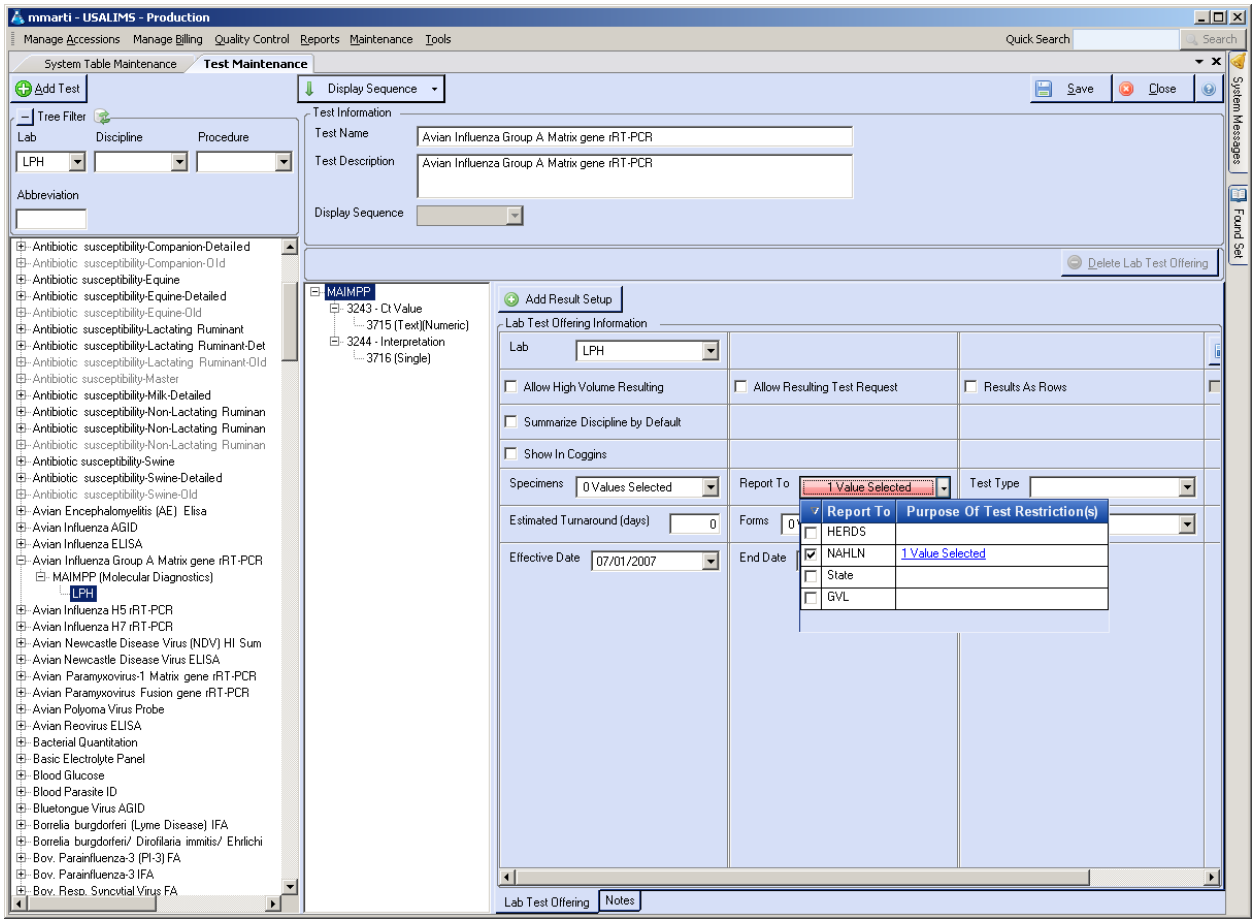
Test Setups

Once all the necessary external codes are added and mapped to the appropriate internal system table values, it is time to enter Test Maintenance for any tests to be messaged.

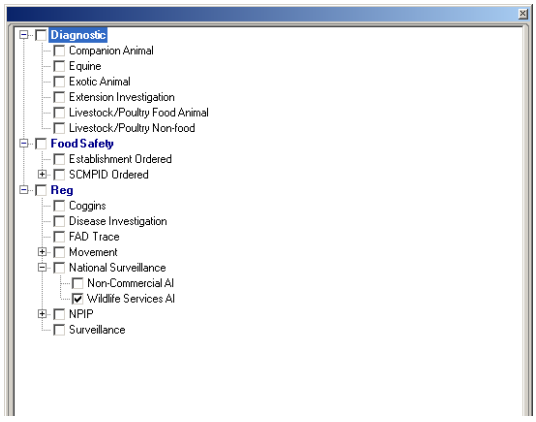
The trigger that tells LIMS that a result is ready to message is when the results are released. Obviously, but easily missed, the test needs to be set up to require clicking the Release Results button. This is done by checking the Review Results check box on the Test Offering page of the test.



The next step is to go to the Lab Test Offering level of the test to be messaged and add the NAHLN to the Report To list.



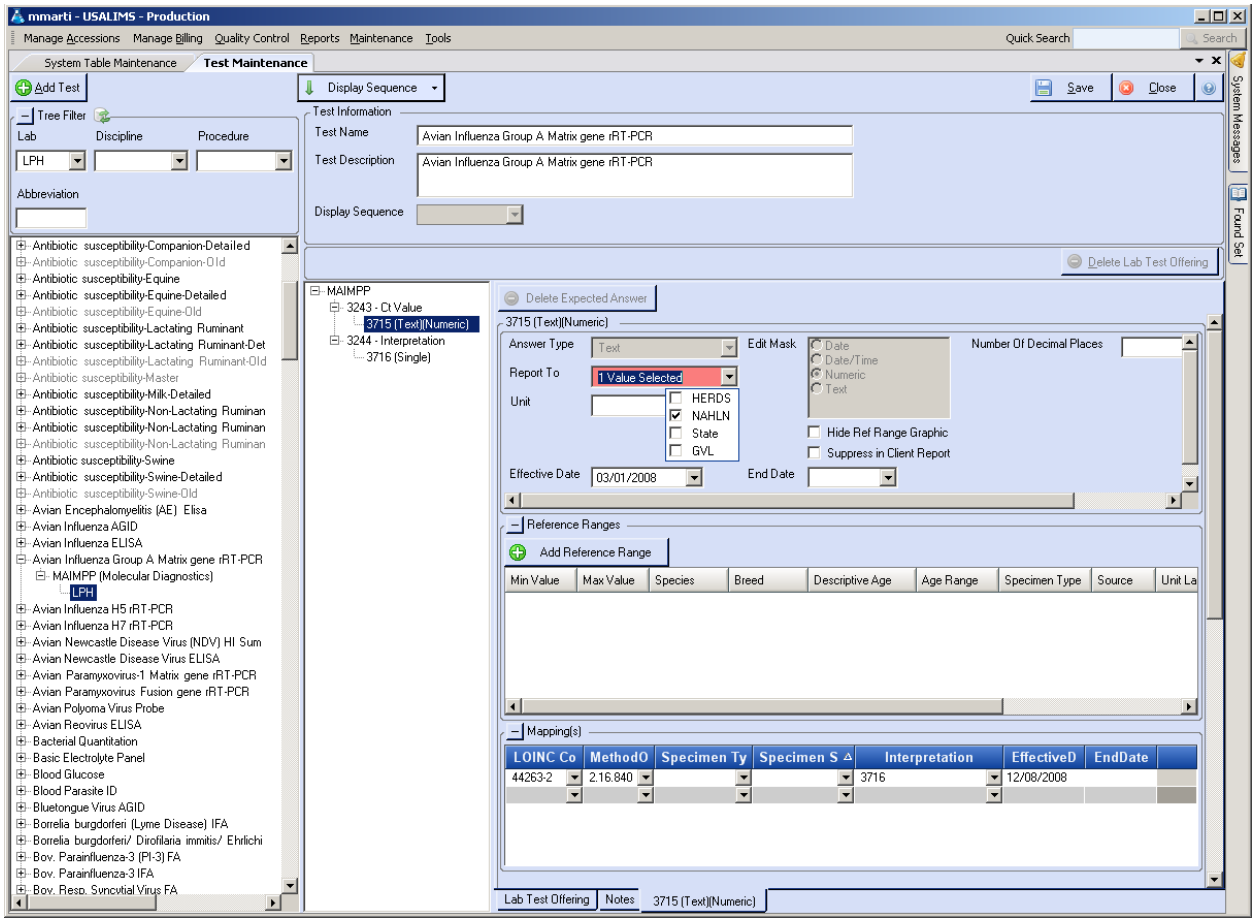
Note the Purpose of Test Restrictions column. If a test—such as the Wildlife Services AI Testing Program—is only to be messaged if a specific purpose of test is selected, you can set it by clicking the link in this column.



Then it is also added to the Result Expected Answer level of the Result Setup that forms the actual observation. This is the Ct value in a real time PCR, for example. This pane is where you indicate the

LOINC code for the test result. It appears in a table at the end of the pane below the reference ranges. Note that this table also contains a field to enter the key of the Result Expected Answer that contains the interpretation code. If necessary, there can be different LOINC codes for different specimen types or sources for the same test.

A current limitation is that the method OID is also set in this table. For labs that use more than one method to perform the same NAHLN test will need to work around this limitation by defining different tests, pseudo specimen types or sources, etc. to force a way to select between methods.

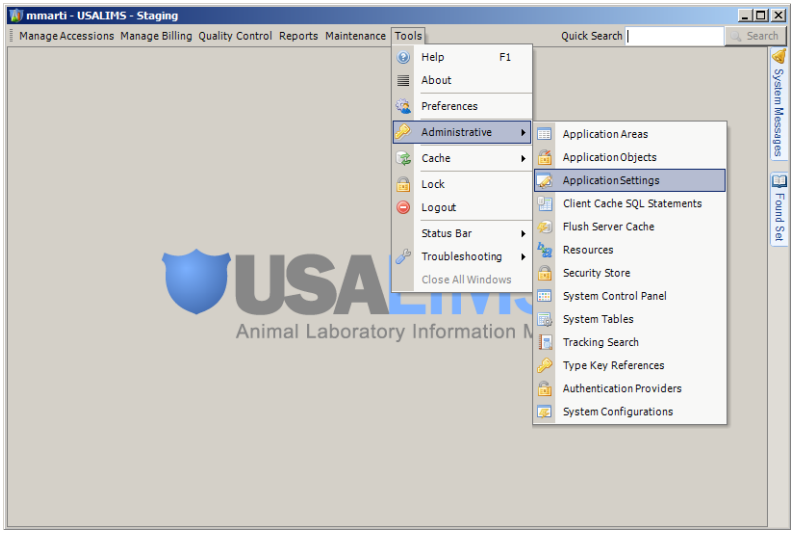


NOTE: In the mappings section we have provided a LOINC code, a method OID (may be omitted for tests with no NAHLN method OID assigned) but NO Specimen Type or Specimen Source. These fields are here in case the LOINC code or OID only applies for some specimens. In that case, all valid specimens must have mappings or some will not be messaged.

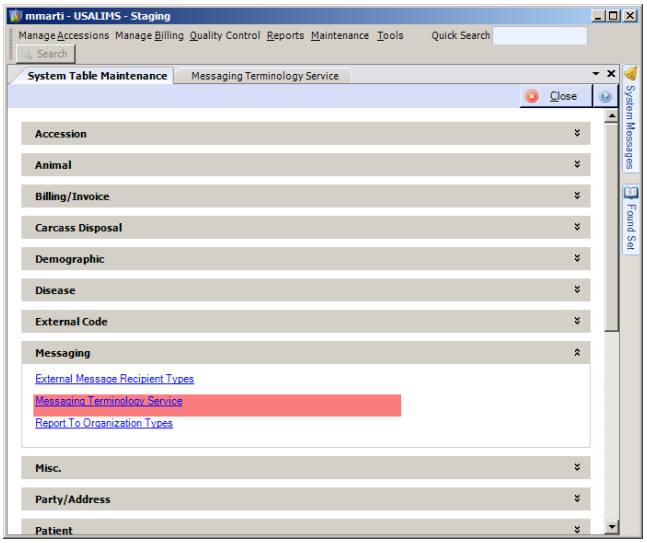
Finally, notice the Interpretation column. This is the key to the Expected Answer that will contain the interpretation (OBX.8) for this result. For the PCR in this example, the answer (OBX.5) is the Ct value while the interpretation (OBX.8) is POS/IND/NEG which is entered in the second box in our setup.

Terminology Services

The connection information for the Terminology Services server is divided between two different locations. Several items are in the database in a table called ApplicationSettings. This information can be accessed via the Tools/Administrative/Application Settings menu item.



This allows access to the Terminology Services directly from USALIMS



Accession Workflow[1]

While this section was written based on the workflow for Classical Swine Fever real time PCR testing, the steps will apply equally to virtually any PCR testing for the NAHLN and, with minor changes, to other types of tests as well.

[1] Special thanks to Tom Miller, North Carolina Department of Agriculture for almost all of this section's text and graphics.

When results are entered and released for tests that are part of active NAHLN HL7 Messaging programs USALims automatically creates and sends an electronic message to the NAHLN. In order for these electronic messages to be acceptable they must be deemed 'well formed'. That is, contain the minimum required and correct data elements. The data elements that must be included, along with all other standard ones, when creating the accession and resulting it are:

General Tab

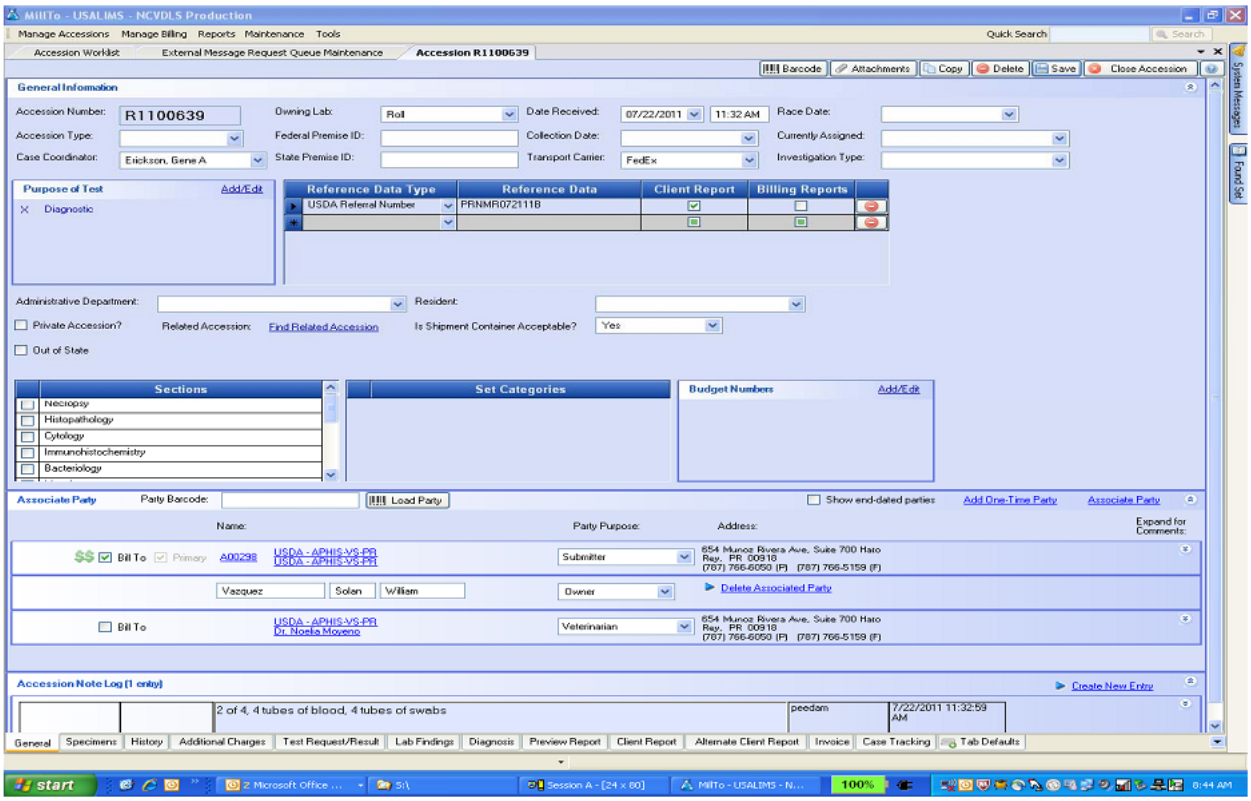
a) There must be a specific, unique value for the Reference Data Type USDA Referral Number made up of the following elements:

ST = State abbreviation
ABC = Submitter's initials
mm = Month
dd = Day
yy = Year
A = (Optionally required) A sequential alpha character in the range of A – Z is required for each subsequent case, after the 1st, submitted by the same submitter on the same day

Example: NCTWM101409A (This would be the 2nd submission) - This is often contained in the CSF Referral Number box on the USDA CSF Surveillance forms.

b) At least two associated parties; with one having a Party Purpose type of Submitter and the other having a Party Purpose type of Owner. There must not be multiple Submitter or Owner parties on an accession. If any party is entered as a one-time party, make sure that both the first name and last name fields contain at least one non-blank character. NOTE: It appears that we get errors if an accession has more than ONE Party with a Purpose of Owner.

c) The Purpose of Tests must be set to a value mapped to the NAHLN code N for National Surveillance. If you have setup the test to be messaged only for specified purpose of test, it must have this purpose of test assigned.

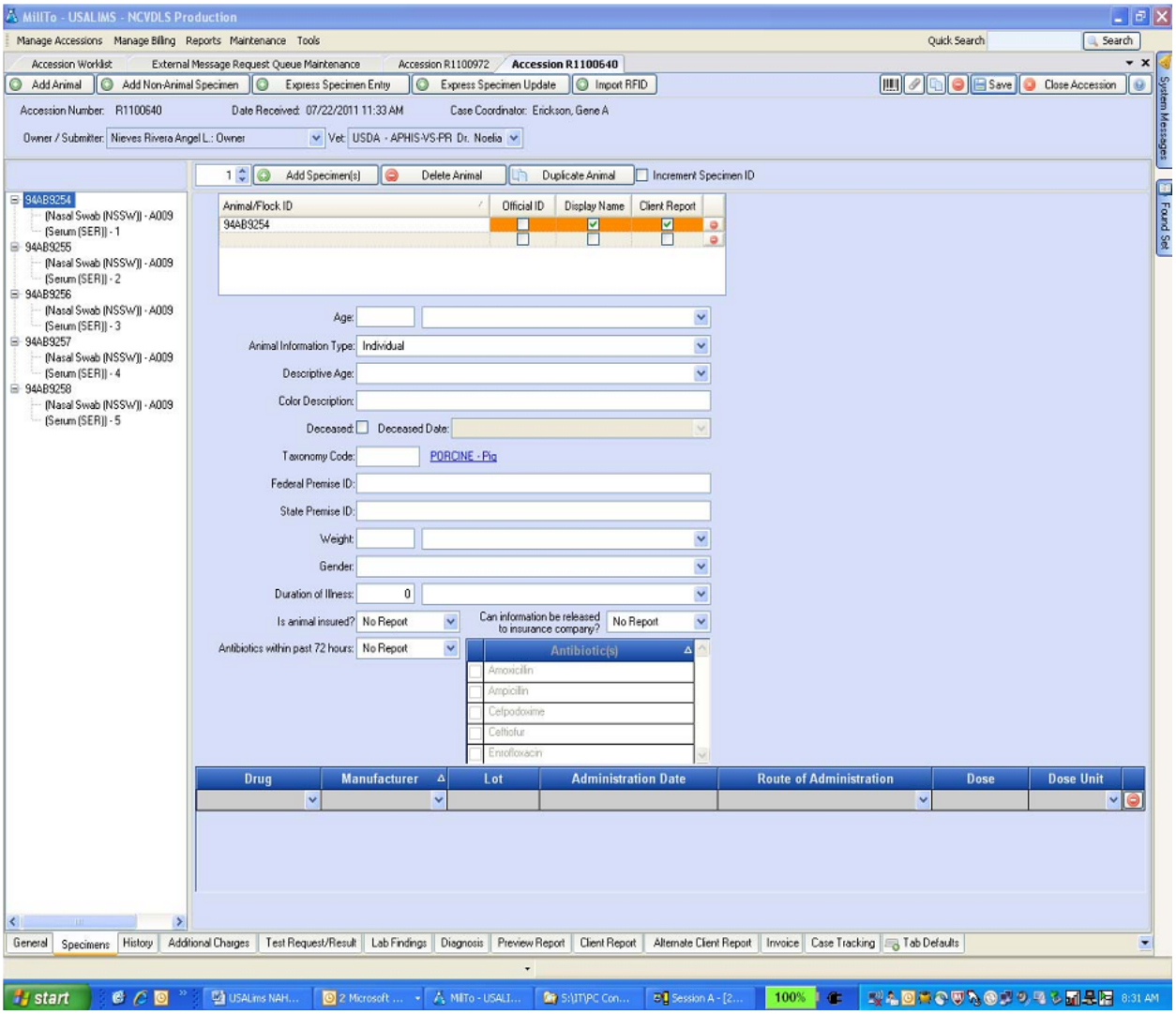


Specimen Tab

a) The NAHLN requires that each qualifying specimen have a one-to-one relationship with one animal that has an Animal Information Type of Individual rather than a Group.

b) A unique-to-the-accession Animal/Flock ID must be specified for each animal. For some test programs this identifier may be the same as the bar coded specimen label.

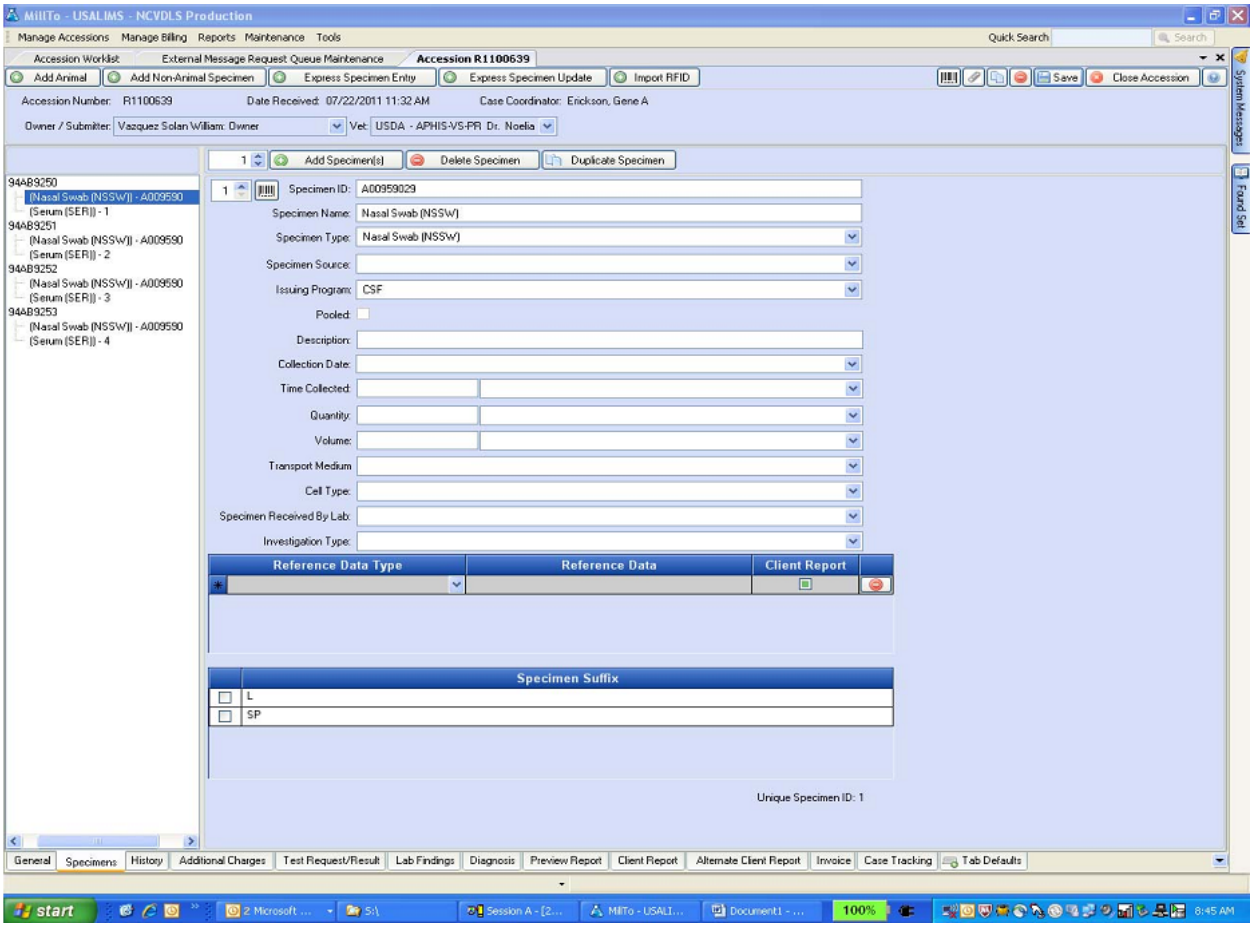
c) The correct Taxonomy must be designated. The taxonomy selected must correspond to an external mapping setup during system configuration. Laboratory specific SOPs should clearly specify the appropriate taxonomy or range of taxonomy allowed. This test may have also been restricted to appropriate taxonomy types during test maintenance.



d) The specimens that will have the NAHLN program test performed and resulted on them must each have a unique-to-the-accession Specimen ID associated with them; which must match what is manually entered with the order on the NAHLN website. This can be the scanned-in specimen barcode. The entry order must also match what was entered on the NAHLN website.

e) Each specimen must have the correct Specimen Type designated; as only a select sub-group of Specimen Type(s) are mapped with NAHLN code values. Note that each lab will have its own local name for the specimen type(s) and source(s). Be sure to document in lab SOPs precisely what specimens are to be listed to ensure that the mapping is correct.

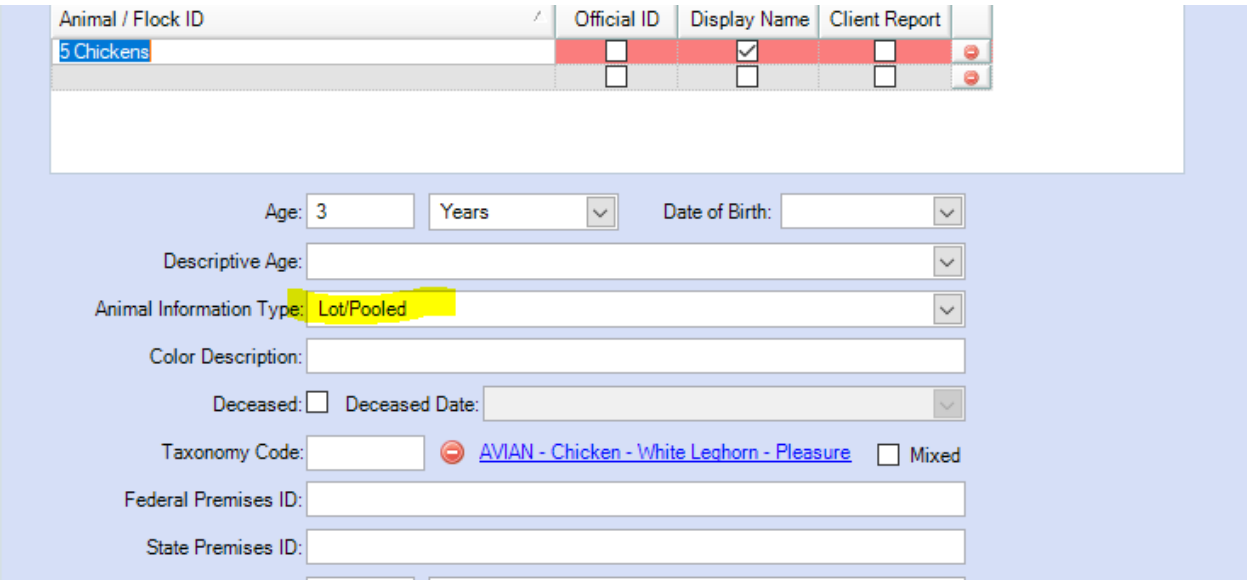
f) Each specimen must also have the appropriate Issuing Program designated for it from the drop-down field to the right (see screen shot below). In this case it is CSF.



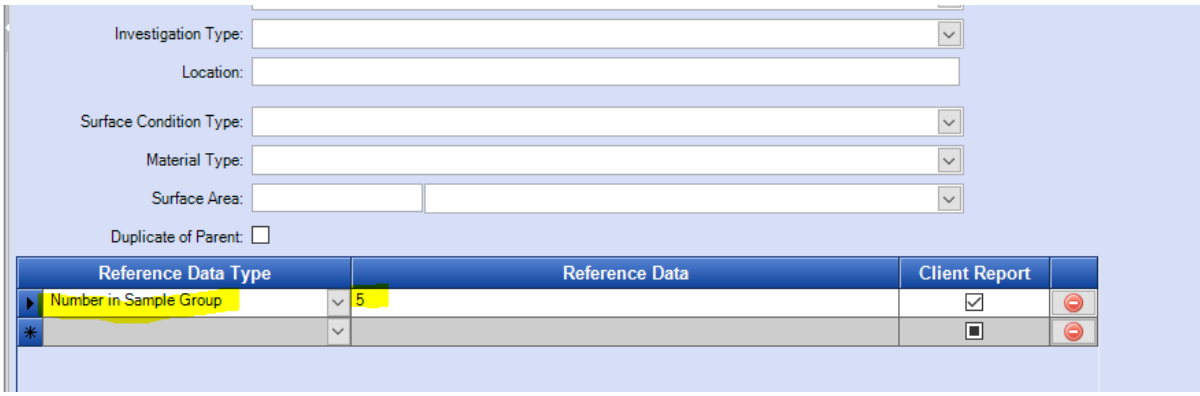
Pooled Samples in One Tube

Here we will show how the simplest form of pooling can be entered and messaged via SPM.11 and 13. Specimen Role and Grouped Specimen Count. This applies to those common cases when 5, 10 or 11 swabs are placed in one media tube and tested as a pool without individual animal or specimen IDs for each swab.

The Animal record includes a field named “Animal Information Type” used to indicate specimen role of patient or pool. If individual animals, the value is “Individual.” If part of a group reported by average value, the value is “Group.” And if a pool such as the case here, the value is “Lot/Pooled.”



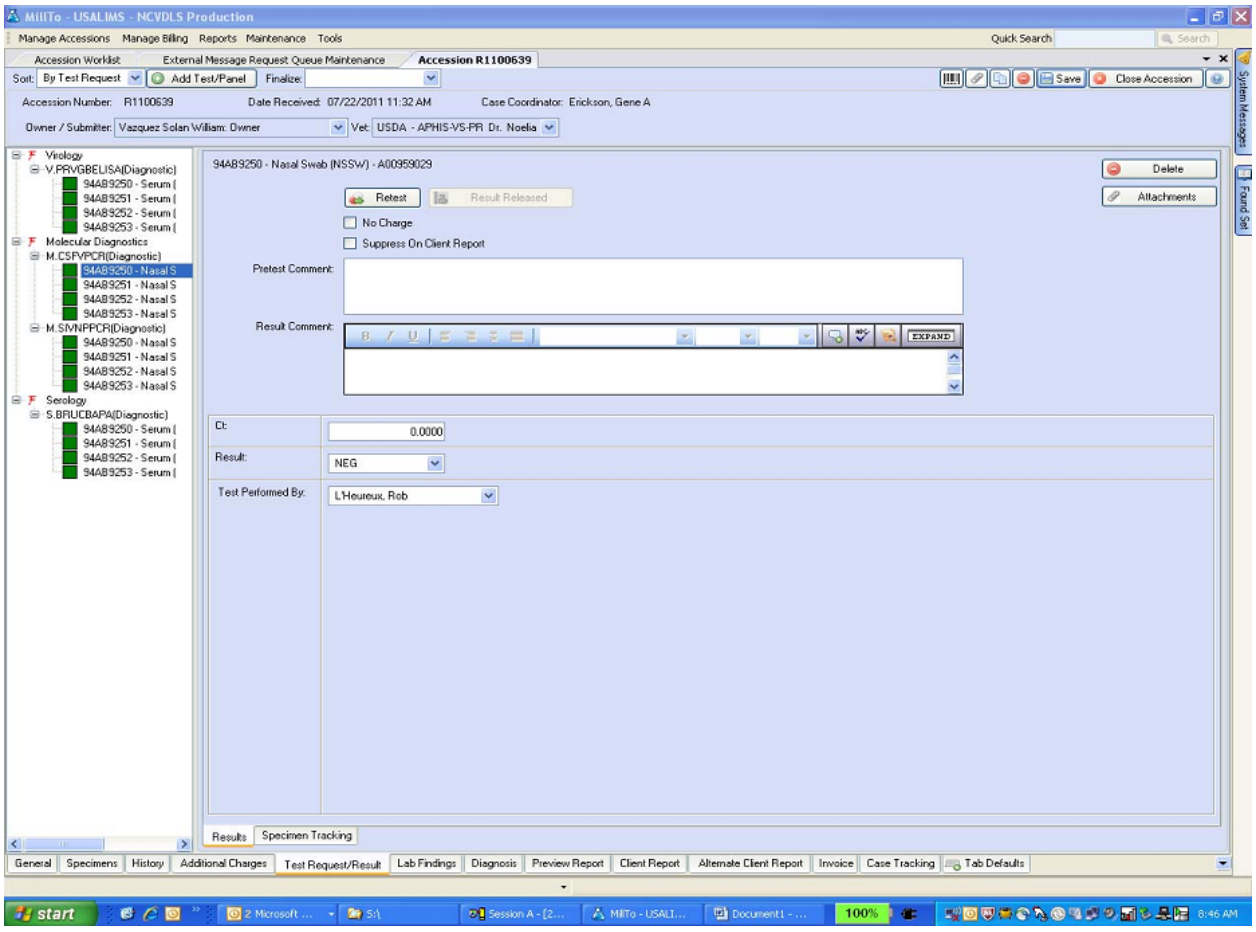
The Specimen record has a Reference Data Type "Number in Specimen Group" that tells how many individual specimens (swabs) went into this pooled sample.



Test Request/Result tab

All result fields, with the exception of Result Comment, must contain a value and be released. In the case of the CSF program a test is deemed resulted by USALims and the specimen boxes in the left pane turn green or red by choosing NEG or POS , while leaving the Ct value field empty. However, NAHLN requires that at least a 0.0000 value be entered in the Ct value field.

Clicking the Release Results button on a complete result and then saving the accession are the trigger that puts this test in the messaging queue ready to send to NAHLN.



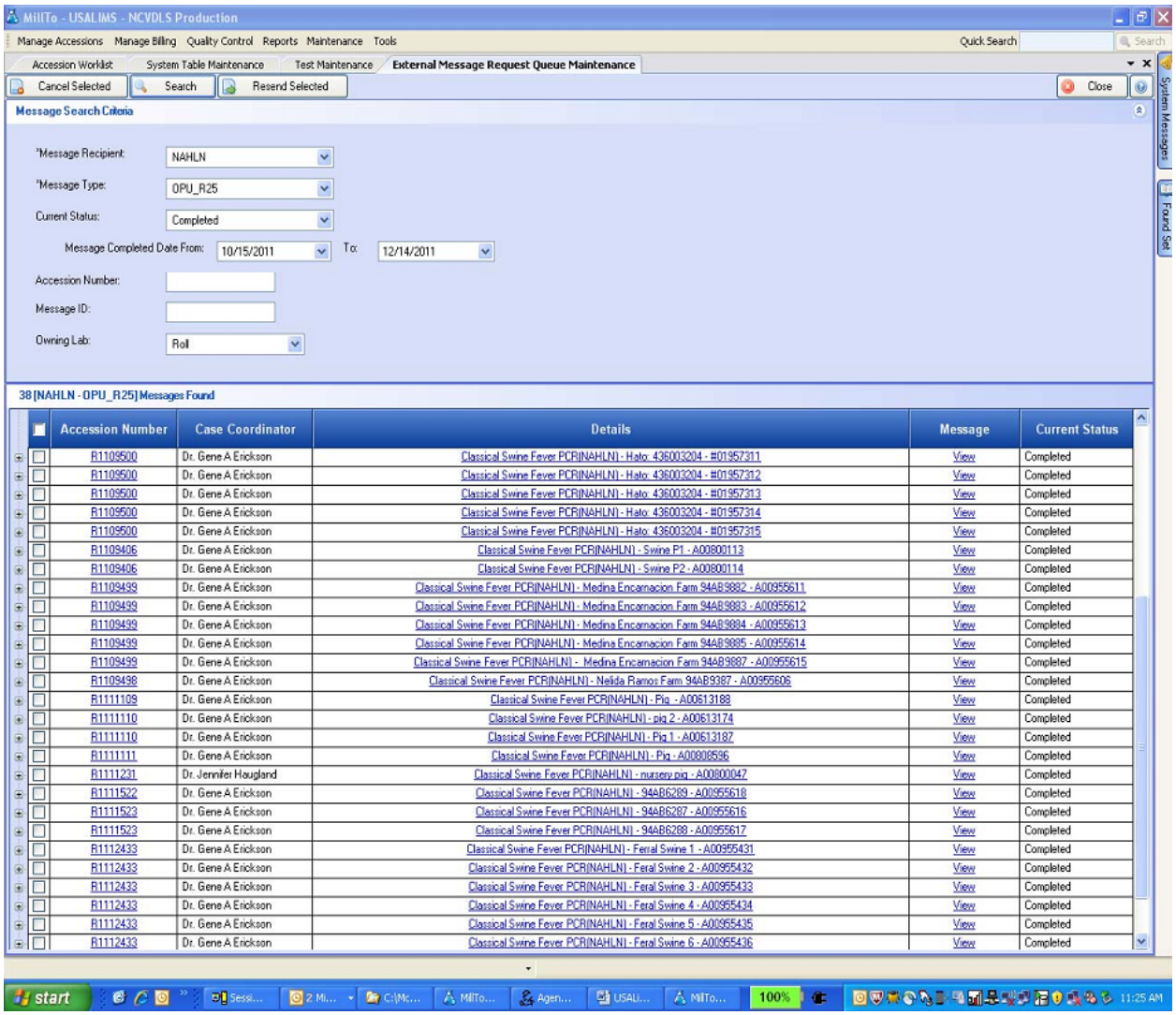
Monitoring NAHLN HL7 Messaging Activity[2]

USALims messaging activity can be monitored by permission. To do so, select Maintenance on the menu bar and then Message Request Queue Maintenance. This brings up the below screen where you select the type of message listing you want to see from the *Current Status* drop-down. The choices are Queued, Failed, Completed, Canceled, Ready To Send, or In-Process.

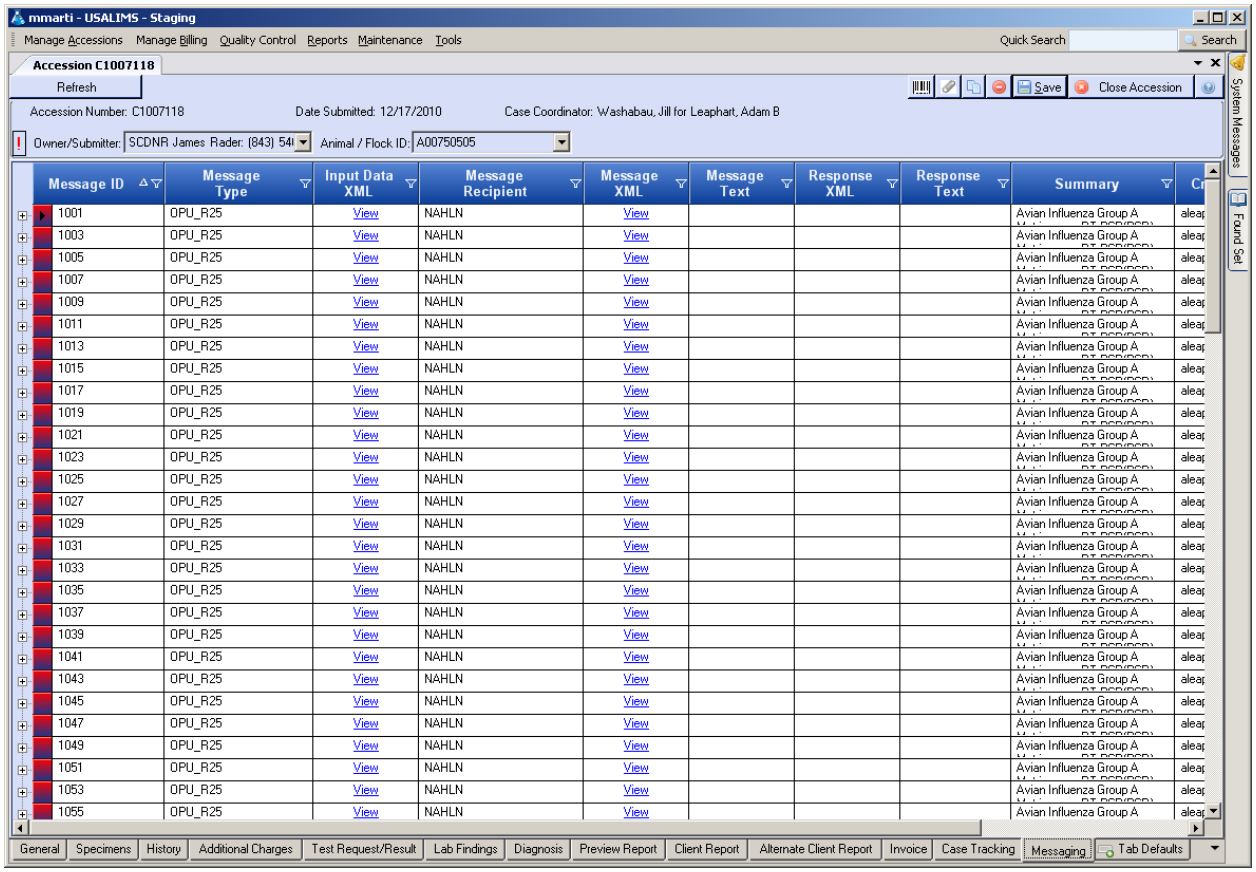
Messages in the Failed listing have associated hyperlinks to text that describe why the message failed so that corrections can be made to the accession(s) and they can then be re-submitted directly from the Failed listing.

[2] Special thanks to Tom Miller, North Carolina Department of Agriculture for almost all of this section's text and graphics.

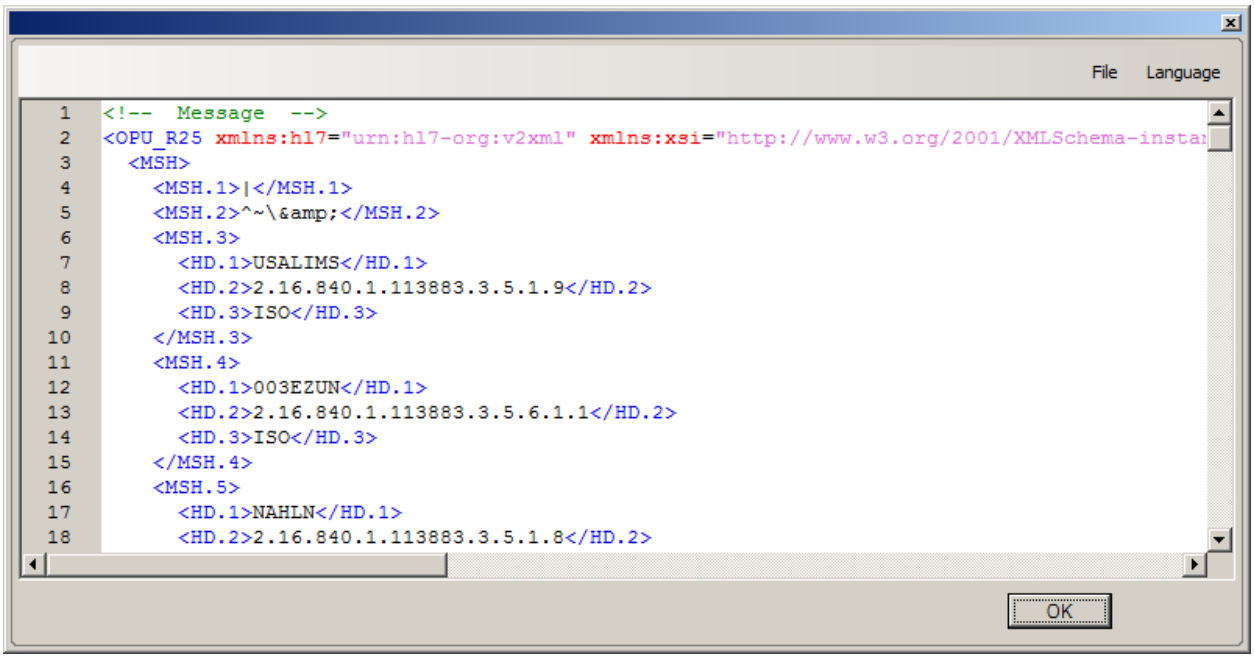
You can view the USALims-generated XML output file that was sent to the NHALN by clicking on the View link in the Message column.



You can also access any messages sent from an accession by opening the Messaging tab. Each message sent from this accession is listed. You can view the Message XML by clicking the link.



The View link under Message or Message XML will show you what you actually sent. Email this to Michael Martin if you need help figuring out what is wrong with a message. Without it, only a few error messages will make much sense.



Appendix A (USALIMS external codes tables that need values)

(Note: This list is from older versions where each external code type was in a distinct table. Included here to show the types of code lists that are needed in the one ExternalCodes table.)

Animal Gender Types
Animal Identifier Types
Animal Production Types
Animal Taxonomy
LOINC Codes for tests
Measurement Unit Types
Method OID
Party Accession Purpose Types
Phone Number Types
NOTE: Phone number types need to be mapped to **BOTH** HL70201 AND HL70202.
Purpose Of Tests
Quality Check Types
Result Answer Types
This is a fixed mapping of Text (Text)="ST", Text (Numeric)="NM" and Single="CNE"
Specimen Source Types
Specimen Types
States
This is a fixed mapping based on the States table but needs to be set
Test Offering Result Types for interpretation
Transport Medium Types

Appendix B (USALIMS maintenance tables need their mappings set)

Animal Gender Types
Animal Identifier Types
Animal Production Types
Animal Taxonomy
Measurement Unit Types (for tests with units)
Method OID
Party Accession Purpose Types
Phone Number Types
Purpose Of Tests
Quality Check Types
Result Answer Types
    This is a fixed mapping of Text(Text)="ST", Test(Numeric)="NM" and Single="CNE"
Specimen Source Types
Specimen Types
States
    This is a fixed mapping based on the States table
Test Offering Result Types
    Be sure that all permutations of positive, negative, POS, NEG, Intermediate, etc. are mapped to HL70078 values for use in the interpretation field.
Transport Medium Types

Appendix C Sample HL7 Table Values

Table Name	Table Description	Short Name	Description
HL70001	Gender	C	Neutered Male
HL70001	Gender	F	female
HL70001	Gender	M	Male
HL70001	Gender	S	Neutered Female
HL70001	Gender	U	Gender Unknown
HL70001	Gender	X	Multiple Genders
HL70063	Relationship to Patient	OWN	Owner or reponsible party
HL70078	Observation Flag	IND	Indeteriminate
HL70078	Observation Flag	NEG	Negative
HL70078	Observation Flag	POS	Positive
HL70085	Result Status	F	Final Results
HL70085	Result Status	I	In Process
HL70085	Result Status	P	Preliminary Results
HL70085	Result Status	X	Canceled, results cannot be obtained
HL70125	Result Data Types	CNE	Single
HL70125	Result Data Types	NM	Numeric

HL70125	Result Data Types	ST	Test
HL70190	Address Types	B	Business
HL70190	Address Types	BI	Billing
HL70190	Address Types	H	Home
HL70190	Address Types	M	Mailing
HL70201	Telecommunications Use Code	BPN	Beeper
HL70201	Telecommunications Use Code	NET	Email Address
HL70201	Telecommunications Use Code	ORN	Other Residence Number
HL70201	Telecommunications Use Code	PRN	Primary Residence Number
HL70201	Telecommunications Use Code	WPN	Work Phone
HL70202	Telecommunications Equipment	BP	Beeper
HL70202	Telecommunications Equipment	CP	Cell Phone
HL70202	Telecommunications Equipment	FX	Fax
HL70202	Telecommunications Equipment	Internet	Internet
HL70202	Telecommunications Equipment	PH	Phone
HL70371	Specimen Additives	BF10	Buffered 10% formalin
HL70371	Specimen Additives	C32	3.2% Citrate
HL70371	Specimen Additives	EDTK	Potassium/K EDTA
HL70371	Specimen Additives	F10	10% Formalin
HL70371	Specimen Additives	HEPN	Sodium/Na Heparin
HL70429	Production Class	BR	Breeding/genetic stock
HL70429	Production Class	CP	Companion
HL70429	Production Class	DA	Dairy
HL70429	Production Class	DR	Draft
HL70429	Production Class	DU	Dual Purpose
HL70429	Production Class	EX	Exhibition
HL70429	Production Class	FB	Fiber
HL70429	Production Class	LY	Layer, including multiplier flocks
HL70429	Production Class	MP	Multiple purpose
HL70429	Production Class	MT	Meat
HL70429	Production Class	NP	Non-physical product production
HL70429	Production Class	OR	Ornamental
HL70429	Production Class	OT	Other
HL70429	Production Class	PL	Pleasure
HL70429	Production Class	PP	Physical product production
HL70429	Production Class	RA	Racing
HL70429	Production Class	SH	Show
HL70429	Production Class	SV	Service
HL70429	Production Class	WI	Wildlife
HL70429	Production Class	Z	Zoo
HL70443	Person Role	AT	Attending

HL70443	Person Role	COL	Collector
HL70443	Person Role	SUB	Submitter
HL70493	Specimen Condition	FROZ	Frozen

Appendix D NAHLN "Local" Codes

Table Name	Table Description	Short Name	Description
L	Submission Reason	E	Export
L	Submission Reason	F	FAD Diagnostics
L	Submission Reason	G	General Diagnostics
L	Submission Reason	H	Health Monitoring
L	Submission Reason	I	Import
L	Submission Reason	M	Interstate Movement
L	Submission Reason	N	National Surveillance
L	Submission Reason	Q	Laboratory Quality Assurance
L	Submission Reason	S	Surveillance
L	State	AK	Alaska
L	. . .	. . .	. . .
L	State	WY	Wyoming
L	State	XX	Foreign Country