

# **Water Quality Exchange Network Exchange**

## **Flow Configuration Document**

**Draft**

**Version 0.15**

**October 21, 2005**



## ACKNOWLEDGEMENTS

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## Version Control

Date	Author	Changes	Version
06/20/2005	CSC	Draft	0.5
07/06/2005	Mei-Chiun Lee	Revised Draft	0.6
07/07/2005	David Dundua	Revised Draft	0.7
07/13/2005	Mei-Chiun Lee	Revised Draft	0.9
07/15/2005	Mei-Chiun lee	Revised Draft	0.10
07/28/2005	Mei-Chiun Lee	Revised Draft	0.11
08/02/2005	CSC	Adjusted Payload Operation:Delete based on Gold's modification to version 0.10	0.12
08/22/2005	CSC	Revised Draft	0.13
08/24/2005	CSC / Windsor Solutions	Revised Draft to include Windsor Solutions Comments	0.14
10/21/2005	CSC	Revised Draft to include review comments from IPT	0.15

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# Introduction

## Background

The U.S. Environmental Protection Agency's (EPA's) Office of Information Collection (OIC), Office of Wetlands, Oceans and Watersheds (OWOW), and Office of Water (OW) have committed to implementing Central Data Exchange (CDX) services and establishing the EPA infrastructure to support an ambient water quality monitoring data exchange. The Water Quality Monitoring data exchange project is the product of a collaborative effort between OIC, OW, and the Environmental Council of States (ECOS). The project was identified during the development of the Environmental Sampling Analysis and Results (ESAR) data standard for water monitoring.

The project goal is to provide EPA state partners with a means of exchanging water quality monitoring data via CDX, using the OWWQX data standard (based on the ESAR data standard). OW, in partnership with the states, will establish water quality monitoring data exchange elements, business rules for exchanging these elements, and valid domain lists for elements not covered by an existing or proposed standard.

The Office of Water, Water Quality Exchange (OWWQX) Pilot will establish a data flow through which three initial pilot states (Oregon, Michigan, and Texas), as well as the Wind River Environmental Quality Commission (WREQC), can submit Water Quality Monitoring (WQM) data to EPA via the CDX Exchange Network node.<sup>1</sup>

The OWWQX pilot will include the workflow for both CDX Node and CDX Web submissions. Only four nodes will be involved in this initial pilot, namely: Michigan, Oregon, Texas, and WREQC. The pilot will be implemented in the CDX Pre-Production environment.

Exhibit 1 depicts the high level overview of the OWWQX Pilot system. The OWWQX Pilot system consists of the following elements:

- Nodes - Michigan, Oregon, Texas, and WREQC
- CDX
- OWWQX Back-end Application
- OWWQX Database

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<sup>1</sup> Note: WREQC is a joint commission of the Arapaho and Shoshone tribes.

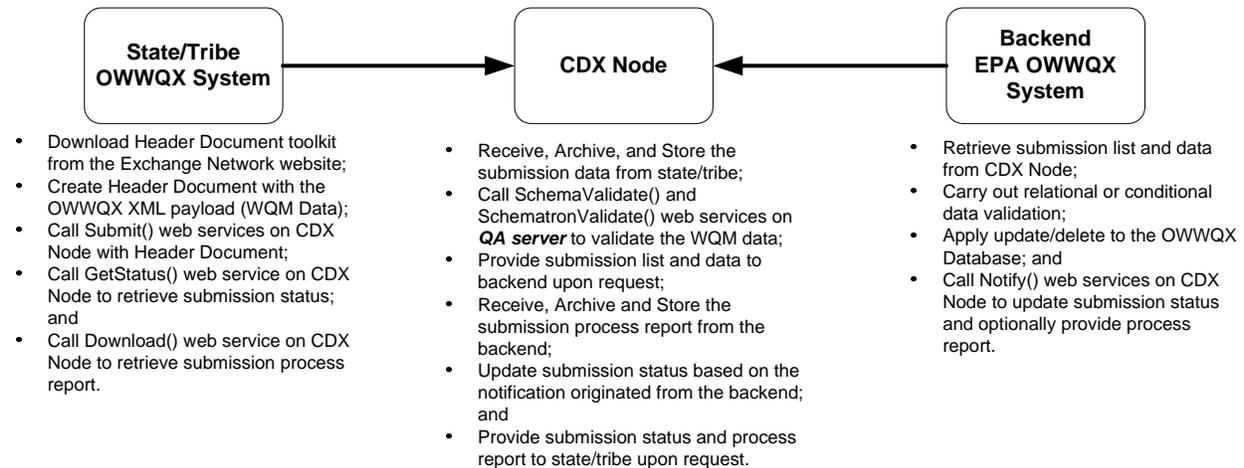


Exhibit 1 – OWWQX Pilot System Overview

Work efforts for implementing the state and tribal nodes, OWWQX Back-end Application, and OWWQX database are conducted independently under a different contract by respective parties.

The OWWQX pilot will include submitting the following types of data:

- the physical conditions in the environment at the time of a site visit;
- the chemical and bacteriological make-up of the water sampled;
- and optionally, chemical analyses of the tissues of any fish collected.

The pilot data flow will utilize two mechanisms for exchanging water quality monitoring information; a Web-based solution for manual submissions and a Web services-based solution for automated submission utilizing Exchange Network standards. Upon EPA approval of the pilot data flow, the data flow will be deployed to CDX Production.

## Document Purpose

This Flow Configuration Document (FCD) is intended to define the supported data services, the approaches and processes that are used to exchange information over the Exchange Network via Web services technology. In addition, the FCD serves as a guide for trading partners to the details and challenges associated with a specific flow.

The purpose of this FCD is to describe the operation of the Water Quality Monitoring (OWWQX) Network Exchange using XML-based data submissions through Node-to-Node or Client-to-Node transfers. This document does not consider use of the alternative ESAR formats or transfer mechanisms. The focus of the document is the core OWWQX data CDX Node flow between the state, local, and tribal agencies and EPA that meet the OWWQX requirements. The scope of this FCD has been limited to the following primary functions:

- Submission of the data; and
- Reporting of the submission status.

This document does not include any query or data retrieval methods, commonly referred to as data services. It is the objective of the OW to develop this pilot into a viable means to supply data to the central EPA data warehouse. OW is separately committed to providing outbound services from that warehouse, which will combine OWWQX data with data from other sources (e.g. Local STORET).

## **How to use this FCD**

This FCD provides guidance to implementing an XML/data service based model for the data submission. For the pilot project, there will be two types of submissions, update/insert and delete. This FCD expands upon the usage of the OWWQX Schema and introduces the implementation of the Document Header.

This document includes the following three main sections:

### Implementing the Header Document

This section describes how the OWWQX Network Exchange makes use of the Exchange Network Header Document to describe the payload content of a Network message. This submission structure will be used for both Node-to-Node/Client-to-Node submission as well as the web submission, to be implemented in a later phase.

### Configuring the Network Exchange

This section describes how the OWWQX Network Exchange should be configured for each of the two submission types. It also provides the details on the payload operations.

### Submission Processing and Feedback

This section describes the processing steps and the feedback mechanism on the submission status.

# Implementing the Header Document

## Overview

The Exchange Network Header provides additional information about the contents of a message payload. It was developed to further automate the data exchange process so that data can be more readily identified during transport and managed at its processing destination. The Header Document can describe what a data payload contains, who submitted it, when it was submitted, as well as instructions on processing the payload contents, such as whether the contents are inserts and updates or deletions. The Header is independent of payload contents.

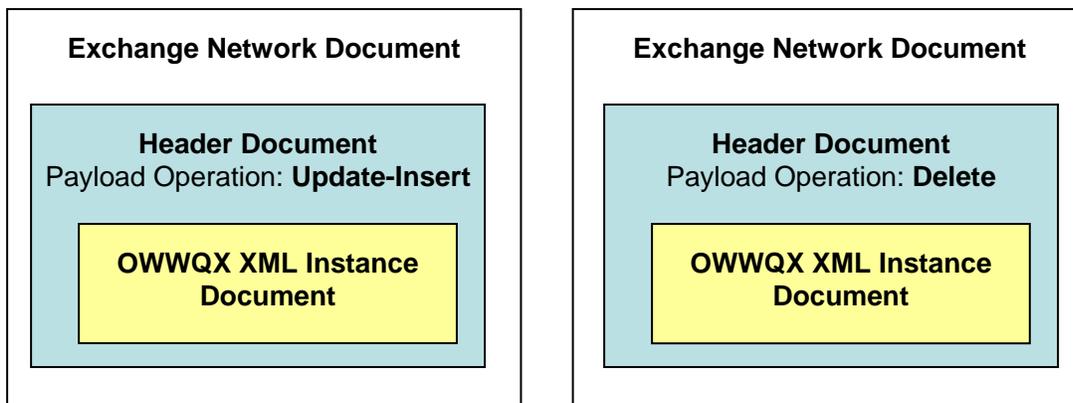
Essentially, the Header Document is an XML wrapper which is placed around one or more XML payloads before transmission to CDX. A Header Document toolkit is available in the Tool Box section of the Exchange Network Web site (<http://www.exchangenetwork.net>), containing additional background about the Header Document, as well as Java and .Net implementation tools.

## Header/Payload Relationship

Any network exchanges for OWWQX must use the Header Document structure. This approach must be used in order to meet EPA CDX and OWWQX processing requirements and prior Exchange Network agreements.

The Exchange Network Document will include the Header Document and the Payload in a single XML document for the submission. For the purposes of this exchange, the Exchange Network Header must contain only a single payload. The Payload must conform to one of the OWWQX standard schemas for data submissions. When preparing the XML document, the agency should follow OWWQX standards to ensure that all data completeness and relationship rules are met.

The following diagrams describe the basic Exchange Network Document Structure and the relationship of the header to payload.



The following table describes the Header Document elements and how they are utilized for the purpose of the OWWQX submissions.

Header Element	Description	Example Value	Req'd	Notes
Author	First and Last Name of Individual generating the XML document	Joe Smith	Yes	Reference only
Organization	Name of company or environmental agency or individual generating the XML document	State X Department of Environmental Quality	Yes	Reference only
Title	Type of Submission	Set to "OWWQX"	Yes	Reference to the flow.
CreationTime	Date/Time when the document was generated	2003-01-01T12:12:12 (where date is a valid XML date format string)	Yes	Used to validate submission requirements.
Comment	Free text description of the message contents.		No	Reference
Data Service	Name of the backend application	N/A	No	Unused
ContactInfo	Name, mailing address, city, state, zip, telephone number, and email address of person who may be contacted with questions concerning the submission.	Joe Smith 123 Main St. Portland, OR 97226 503 123 4567 Joe@deq.statex.gov	Yes	Reference
Notification	URI where return document is sent in instances of invoking solicit services. Multiple values allowed.	N/A	No	unused
Sensitivity	Level of Document Sensitivity	N/A	No	unused
Property	Name Value pairings used to describe specific properties of the document.			unused
Payload Operation Attribute	This is specified by payload and describes the operation to be	[Update-Insert] or [Delete]	Yes	This describes both the data source type and the operation to be performed. The

Header Element	Description	Example Value	Req'd	Notes
	performed on the payload. Multiple values are not allowed			operation component replicates the function of the Transmittal Group Transaction Type element.
Schema Reference	OWWQX approved schema for submission	OWWQX_OWVWQX_v1.0.xsd or OWWQX_OWVWQX_Delete_v1.0.xsd	Yes	

## Submission Structure

In addition to the Exchange Network Document (containing the Header and Payload described above), a submission can also include binary objects (such as images or documents). These binary objects will be referenced (by unique name) in the OWWQX schema, but will be provided as individual, external documents. In order to group all related documents for a submission, each OWWQX submission must be provided to CDX in a single compressed file in ZIP format. This will also improve transmission efficiency due to the smaller size of compressed files. Even if a submission does not contain any external binary objects, it must still be provided in ZIP format. Additionally, the Exchange Network Document within the submission must be the only file to have an ".xml" extension. This will allow CDX to differentiate between it and any other binary object files included in the submission.

## Processing

The Payload Operation Attribute provided in the Header Document is used to denote the type of processing for a submission. There are two acceptable values: "Update-Insert" or "Delete". Use of these operators will trigger the modular processing approach outlined in the *Configuration of the Network Exchange* section of this document. For example, a payload operation of "Update-Insert" will inform the back-end application that the payload contains new or existing data. Existing records, identified by a matching unique identifier, will be replaced with the updated data in the payload for that matching identifier.

## Configuring the Network Exchanges

One primary flow has been identified for this Network Exchange, and is detailed in the following configuration table. Following these configuration details is a detailed description of the payload operations supported by this Network Exchange.

FCD Specification Area	Value	Notes
Flow Name	OWWQX	
Network Method/parameters	<p><b>Submit</b> with the following parameters:</p> <p>§ securityToken: A security token issued by the service provider or a trusted service provider.</p> <p>§ transactionId: unused for State/Tribe submission.</p> <p>§ dataflow: The name of target dataflow : "OWWQX"</p> <p>§ documents: An array of nodeDocument. Each nodeDocument structure describes a single attachment or payload. For this flow, only a single instance of nodeDocument will be submitted.</p> <p><b>GetStatus</b> with the following parameters:</p> <p>§ securityToken: A security token issued by the NAAS</p> <p>§ transactionId: A transaction ID obtained from the submission call.</p>	
Payload Schema	OWWQX_OWVWQX_v1.0.xsd or OWWQX_OWVWQX_Delete_v1.0.xsd	
Payload Operation	Update-Insert or Delete	
Payload Formatting/ Structure		nodeDocument must contain file in ZIP format as described in the <i>Submission Structure</i> section of this document
GetStatus Responses	Created, Pending, Completed, or Failed	
Timing	As established in Trading Partner Agreements/ Expected to be a minimum of once per month.	
NAAS Authorized User Accts	NAAS must have a policy to authorize Submit and getStatus for the OVVWQX exchange	

## Payload Operations

Two types of operations can be performed. These are the Update-Insert Operation and the Delete Operation. Exhibit 2 provides the high level overview on the relationships between the elements. The detailed element relationship will be provided once the database design is completed.

The following sections provide the details for each operation.

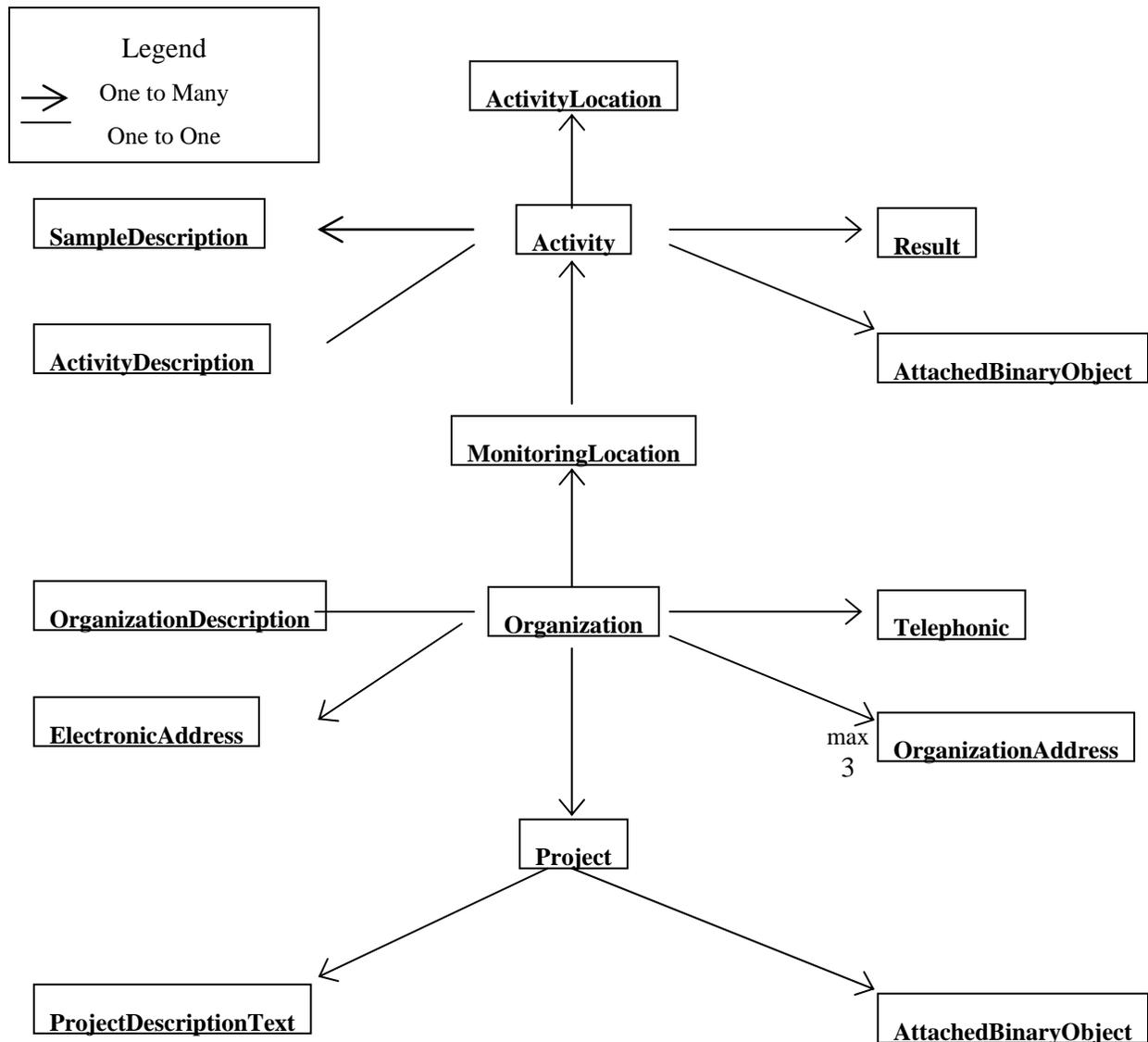


Exhibit 2 – High Level Relationship Overview

### ***Payload Operation: Update-Insert***

For the *Update-Insert* operation, the OWWQX Back-end Application will compare the unique ID for each Project, Monitoring Location, and Activity in the Payload with existing data in the OWWQX database. If the data already exists, it will be replaced by the copy from the Payload. If it does not exist, it will be inserted into the database as new data.

As the Activity element is the lowest element in the OWWQX Schema hierarchy to contain a unique ID, it will be the lowest level of Update that can occur. In other words, elements in the schema that fall below an Activity (i.e. Field Sub-sample, Results, etc.) cannot be updated individually. The Activity unique ID, global identifier, is unique within the organization. If an Activity in the Payload matches an existing Activity in the OWWQX Database, the Activity and all of its related Field Sub-samples, Results, etc. will be deleted from the database before inserting the new Activity, Field Sub-samples, and Results from the Payload. All other elements in the schema containing a unique ID that are above the Activity (e.g. Project, Monitoring Location, etc.) can be updated without requiring a full replace of all child records.

Although Organization is a required element in the Update Schema, ancillary organization data (e.g. OrganizationAddress, ElectronicAddress, and Telephonic), are not required. The rules for updating this information is as follows:

1. If an element is included in the payload it will replace all elements of the same type in the database. For example: if one or more OrganizationAddress elements are included in the payload, all Organization Addresses in the OWWQX Database will be deleted before creating the new Organization Address(es).
  - a. Additionally, if the OrganizationAddress tags are in the payload but contain no data, then only the Delete step will be performed (leaving no Address for the Organization in the database). For example, if an Organization has 3 addresses prior to the submission and the submission contains only one address, the OWWQX database will only contain the single address after the submission has been processed.,
2. If an element is excluded, then all ancillary organization data in the database (of that type) will remain unchanged.

The Source Map Scale Number is required in OWWQX schema only if the data element HorizontalCollectionMethodCode is "INTERPOLATION MAP". In case this information is not known, the submitter can use 1:100K scale to denote unknown for this element.

### ***Payload Operation: Delete***

For the Delete operation, the OWWQX Back-end Application will compare the unique ID for each Project, Monitoring Location, and Activity in the Payload with existing data in the OWWQX database. If the unique ID provided does not match an existing record, it will be ignored. Otherwise, the existing record will be deleted from the OWWQX database.

Each *Delete* request that is in the payload will be made up of an Organization ID and either a Monitoring Location ID, Project ID, or Activity ID. The following is an outline of the basic types of Delete Requests that are supported.

1. Delete an Activity (and its related Field Sub-samples, Results, etc).

In this case, the Organization ID, Monitoring Location ID, and Activity ID are required to identify the Activity to delete. As a consequence of the Activity deletion, all related child records (Field Sub-sample, Results, etc.) will also be deleted.

If the only remaining Activity beneath either a Monitoring Location or Project is deleted, the related Monitoring Location or Project will be deleted as well.

This operation can be used as a method to replace the existing data (whether it is to revise the results or reassigning activities to a new Monitoring Location or Project). The submitter can first submit a payload with the Delete operation. Once the submission is successfully processed, the submitter can then submit a payload with the Update-Insert operation.

2. Delete a Monitoring Location (and its related Activities, Field Sub-samples, Results, etc.)

In this case, the Organization ID and Monitoring Location ID are required to identify the Monitoring Location to delete. As a consequence of the Monitoring Location deletion, all related child records (Activities, Field Sub-samples, Results, etc.) will also be deleted.

3. Delete a Project (and its related Activities, Field Sub-samples, Results, etc.)

In this case, the Organization ID and Project ID are required to identify the Project to delete. As a consequence of the Project deletion, all Activities that are associated with the Project will have this association removed.

The OWWQX System allows for a scenario where one Activity can relate to more than one Project. This feature has an effect on how a Project Delete Request is processed. For example, if an Activity in OWWQX relates to two Projects and only one of those Projects is being deleted, the Activity will not be deleted. In this case only the reference to the Project will be deleted. The end result is that the Activity will now relate to only one Project.

In conclusion, when a Project ID is included in an OWWQX Delete payload operation, all Activities (and Results) relating to only that Project will be deleted as well. Activities (and Results) relating to additional Projects will not be deleted.

## Submission Processing and Feedback

The following discussion is conceptual in approach and has not been finalized. Several items require elaboration and confirmation from responsible parties. Furthermore, this process will be elaborated upon and confirmed through the subsequent OWWQX Exchange Network Pilot Project. All comments are welcome.

Before an OWWQX submission can be made to CDX, a Node user must register with NAAS and obtain a User ID. Furthermore, a NAAS policy must be established that allows the account to invoke the Submit method on the CDX node for the OWWQX exchange.

Submission of the OWWQX Exchange Network Documents to the back-end application via the CDX Node will follow the following processing steps.

1. State / local / tribal Node executes a Submit operation to CDX/EPA.
2. The entire submission zip file is archived at CDX.
3. A Transaction ID is issued to the Node submitter indicating that the file transfer was successful. (Note: the *GetStatus* response will be "Received".)
4. The submission file is validated against the Header Schema and the appropriate OWWQX Schema, where appropriate, for form and content.
  - a. Schematron is used to validate the payload. (Schematron is a technology used by CDX which permits the definition of complex business rule validation. Any relational or conditional checks would only be repeated at the backend application and including them at CDX would add significant maintenance to the flow process.)
  - b. If any XML file fails validation the submission is terminated and the submitter receives the XML validation Error Fault.
  - c. If all XML files pass validation, processing continues.
5. The Submission Zip File will be transferred to the OWWQX back-end application. (Note: after this step has completed, the *GetStatus* response will be "Pending".)
6. The OWWQX back-end application processes the payload based on the payload operation.
7. The Processing Summary/Error Report will be returned to CDX/EPA.
8. The Processing Summary/Error Report will be archived at CDX. (Note: the *GetStatus* response will now be either "Completed" or "Failed" based on the backend processing report.)
9. The submitter Node can obtain the status of the transaction via the *GetStatus* method provided by CDX Node web services.
  - a. The Processing Summary/Error Report will be an XML-based summary of the processing that occurred on the back-end application (including processing time, insert/update/delete counts and any error or warning messages).
10. The submitter Node can retrieve the Processing Summary/Error Report via the *Download* method provided by CDX Node web services.

Prior to initiating a submit transaction with the CDX node for the OWWQX Exchange, partners are encouraged to locally pre-validate XML payload documents against the OWWQX Schema. The version 1 of the schema will be used for the pilot system and always be available at the Exchange Network website.