Appendix C: Study database

SPOKANE COUNTY
WATER RESOURCES

- Database structure and data entry specifications
- Quality control review
- Database as of May 2009 – electronic version on enclosed CD

GeoEngineers

523 E. Second Avenue, Spokane, WA 99202, Telephone: (509) 363-3125, Fax: (509) 363-3126 www.geoengineers.com

MEMORANDUM

TO:	Ben Brattebo, Spokane County Utilities
FROM:	Tonya Kauhi, Jonathan Rudders and Sarah Hubbard-Gray
DATE:	November 18, 2008
FILE:	0188-135-00
SUBJECT:	Database Structure and Data Entry Specifications, Spokane County Bi-State Nonpoint Source Phosphorus Study, Phase 1

INTRODUCTION

This memorandum specifies the structure of the database that will be created as part of Task 2.2 of the Bi-State Nonpoint Source Phosphorus Study. It also provides an overall summary of the data entry specifications and their relationships to each other and is intended to provide guidance to the data entry technician(s) as they enter data into data entry templates in preparation for upload into the database. The database will manage, track, store, and report phosphorus data. The database application will generate EIM compatible files for upload into Ecology's EIM system at a later date.

The data entry templates are designed to capture data in database (SQL) compatible format. This simplifies uploading data into the database. The data entry templates and data dictionary are designed to provide details of the data structure and format needed to upload the data into the database system. The templates also provide guidance when portions of data are unknown or unavailable. The data elements within the templates were determined based on our experience with environmental data and the environmental database structure.

In general, analytical results are tied to a field sample, each of which must be unique within the study. A sample is associated with a sample location that provides a spatial reference. Thus, the fundamental data in a database are locations, samples, and results. The data entry templates were developed to capture these types of information.

NAMING CONVENTIONS

In an environmental database system, sample and location names have to be unique. This can be challenging when data is being collected from multiple sources. We recommend the following naming convention:

- The naming convention for the location (*sys_loc_code*) consists of a three digit numeric identifier, i.e 001 to 999. The field *loc_name* is used to capture the locations common or historic name, i.e MW01.

- The naming convention for water **samples** consists of three components: the *sys_loc_code*, date (year, month and day) and the bibliography identifier. For a groundwater sample collected from monitoring well MW01 on November 1, 2008 in report #001 the sample name (***sys_sample_code***) would be **00120081101001**.

DISCLAIMER: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

The sample name would be entered into the historical analytical template (*sys_sample_code*) and the location identifier would be entered into both the historical analytical template and the location template (*sys_loc_code*).

GENERAL DATA ENTRY GUIDELINES

A total of three data entry templates are proposed, the structure and general content of which are identified below. These include a 1) location template, 2) historical analytical chemistry template, and 3) well template. For each result, the data entry technician will enter data into both the location and historic analytical chemistry templates. Information will be entered into the well database for results collected from wells only. These documents are described in detail below. There are certain fields that are required and are indicated in **bold** in the tables below.

Specific details regarding valid values and field definitions are outlined in the attached excel spreadsheets. A excel document summarizing each of the data entry templates are also attached to this document (Location_Template.xls, Historical_Analytical.xls and Wells_Template.xls). We recommend providing a training session for the data entry technicians to get the data entry portion started as soon as possible. We also recommend following up with the data entry technicians on a minimum of a weekly basis to answer questions and check on progress.

LOCATION TEMPLATE

The purpose of the location template is to capture information relating to a specific sample location; i.e. sample coordinates, method of coordinate collection and the type of location. Once the spatial location information is captured it can be used to visually display the sample locations within a mapping system like ArcGIS or Google Earth.

Field Name Bold = Required	Definition
SYS_LOC_CODE	UNIQUE to each facility, a user-assigned ID to identify the field Location in the database.
LOC_NAME	A map label or report friendly version of the location name, can also be a historic location name
LOC_TYPE	Identifies the type of location; i.e. a boring, geoprobe, test pit, well, etc.
X_COORD	The X-axis coordinate of a location, often called longitude, in WGS 1984.
Y_COORD	The Y-axis coordinate of a location, often latitude, in WGS 1984.
HORZ_COLLECT_METHOD_CODE	Technique used to collect the horizontal coordinates of a field Location.
COORDINATE_TYPE_CODE	The coordinate system or projection related to the XY coordinates
HORZ_DATUM_CODE	Model used to match the horizontal position of features on the ground to coordinates and Locations on a map.
SURF_ELEV	The ground surface elevation of the location.
ELEV_UNIT	The unit that the elevation was recorded.

Field Name Bold = Required	Definition
ELEV_COLLECT_METHOD_CODE	The technique used to define the Vertical Measure (Elevation) of a field Location.
ELEV_DATUM_CODE	Model used to match the Vertical Measure (Elevation) of field Locations on the ground to field Locations on a map.
SURVEY_DATE	The date the survey was completed.
SURVEYOR_NAME	The name of the company that completed the survey.

HISTORICAL ANALYTICAL CHEMISTRY TEMPLATE

The purpose of the historical analytical chemistry data entry template is to capture analytical data not available in a laboratory supplied electronic deliverable. Typically, this would apply to historical data but can be used to capture data from other hardcopy reports or other consultants submitting analytical data. Quite often the field sample information is presented along with results in reports, thus this template combines a simplified analytical results structure with field sample information.

Field Name Bold = Required	Definition
BIBLIOGRAPHY_ID	A unique user-assigned ID that links the sample to the source report or lab package.
SYS_SAMPLE_CODE	UNIQUE within a Facility, user-assigned ID to identify a sample in the database.
SAMPLE_TYPE_CODE	A code that describes the type of sample.
SAMPLE_DATE	The date the sample was collected.
START_DEPTH	The beginning depth of a sample in units below ground surface.
END_DEPTH	The end depth of a sample in units below ground surface.
DEPTH_UNIT	The unit of measurement for the depth value.
PARENT_SAMPLE_CODE	The name of the parent sample when a duplicate sample was analyzed.

Field Name Bold = Required	Definition
CHEMICAL_NAME	Name of the parameter reported for the result. Parameters are most often thought of as chemicals, but also include things like temperature, color, fish weight, flow, etc.
CAS_RN	A unique identifying number assigned by the Chemical Abstracts Service (CAS) Division of the American Chemical Society to each distinct chemical substance recorded in the CAS (Chemical Registry System). The CAS Number is accepted nationally and internationally as an identifier for specific, definable chemical substances.
RESULT	Reported result for a particular parameter.

Field Name Bold = Required	Definition
DETECT_FLAG	Refers to if the result was detected above the reporting detection limit.
LAB_QUALIFIERS	Refers to whether a sample was detected or not or provide a qualification flag about data quality
RESULT_UNIT	Result Unit is associated with a parameter's Result value.
FRACTION	The type of concentration for metals and organics.
BASIS	The type of basis reporting; i.e. wet or dry.
ANALYTIC_METHOD	The analytical method the laboratory used to analyze the sample.
ANALYSIS_DATE	The date the sample was analyzed by lab
METHOD_DETECTION_LIMIT	The Method Detection Limit (MDL) is the minimum concentration of a substance being analyzed where the test has a 99 percent probability of being identified.

Field Name Bold = Required	Definition
REPORTING_DETECTION_LIMIT	The Reporting Detection (RDL) is the concentration that can be reliably measured within specified limits during routine laboratory operating conditions using Ecology - or EPA - approved methods. It is often synonymous with the Practical Quantitation Limit (PQL).
LAB_NAME	The name of the laboratory providing the chemical analysis
SAMPLING_COMPANY_CODE	The name of the company whose sampler collected the sample.
SOURCE	The source of the surface water, groundwater or sediment sample.

WELL TEMPLATE

Well construction data is typically presented in well construction logs. Well information is important to clarify which aquifer or aquifers is associated with the sample and understand the quality of water level data and sample data.. Well information will capture data regarding construction of monitoring and/or production wells.

Field Name Bold = Required	Definition
User Location ID	UNIQUE user-assigned ID to identify the field location in database.
Location_Name	UNIQUE descriptive name for a field location.
Location Status	Current status with respect to monitoring activity.

Field Name Bold = Required	Definition
Location Well Flag	A Yes (Y) or No (N) flag that indicates whether a field Location is a Well. Additional data must be entered for a Well Location.
Well ID	Sub ID for well clusters or multiple completions at a single well. If each well or completion has its own User Location ID, this field is not required.
Well Tag Number	A unique six-digit alpha-numeric identifier consisting of three letters and three numbers (e.g. ABC123). This number is stamped on an aluminum tag and is typically affixed to the well by the driller at the time of construction, or by sampling staff from Ecology or another party.
Well Owner Name	The name of the well owner. This information is not made public without filing a formal request.
Well Status	Describes whether a well is still in existence or has been abandoned.
Well Use Code	Describes the primary use of the well.
Well Water Use Code	Describes the primary use of water from a well.
Well Natural Flow Flag	A Yes (Y) or No (N) flag that indicates whether an uncapped well would naturally flow due to artesian pressure.
Well Gradient	Identifies whether a well is hydraulically up-gradient, down-gradient, cross-gradient, has an unknown relationship to, or is within a potential contamination source. Applicable to wells that are used to monitor a known source of potential ground-water contamination, such as landfills and RCRA facilities.
Wellhead Protection Area	The name of the wellhead protection area within which a well is located, if any.
Well Construction Start Date	The date that well construction (borehole excavation) began.
Well Construction End Date	The date that well construction was completed.
Well Construction Method Code	The method used to create the borehole and construct the well.

Field Name Bold = Required	Definition
Well Completion Depth	The final completion depth below land surface for a well as determined during initial construction. The completion depth is ideally determined by sounding the well; however, in most cases, the depth is determined by the driller. In feet or meters.
Well Completion Depth Unit of Measure (UOM)*	Units in which Well Completion Depth is expressed. In feet (F) or meters (M).
Well Hole Depth	Depth below land surface to the bottom of the borehole on completion of drilling – this may be deeper than the final Well Completion Depth.
Well Hole Depth Unit of Measure (UOM)	Units in which Well Hole Depth is expressed. In feet (F) or meters (M).
Well Maximum Casing Diameter	The diameter of the outermost permanent casing used to complete the well (In centimeters or inches). For above-ground monitoring well completions, report the diameter of the well itself and not that of the short, outer casing that is often used to secure and protect the well itself.
Well Maximum Casing Diameter Unit of Measure (UOM)	Units in which Well Maximum Casing Diameter is expressed. In centimeters (CM) or inches (IN).
Well Completion Code	The method of well completion or the nature of the openings that allow water to enter the well.
Well Development Method Code	Identifies the method used to develop the well and increase or maximize its efficiency after construction.
Well Disinfected Flag	A Yes (Y) or No (N) flag that indicates whether the well was disinfected at the time of completion.
Well Aquifer Test Flag	A Yes (Y) or No (N) flag that indicates whether a well was used to conduct a formal (documented) aquifer test. This flag should not be used to identify short term bailer or air lift tests performed by the driller during well construction or development.
Well Construction Comment	Brief comments or other important information about the construction of a well.
Well Measuring Point Name	The name used to describe a unique reference point on a well from which water-level measurements are routinely made. While most wells have only one established measuring point, some longer-term observation wells have multiple measuring points due to well modifications that occurred over time.

Field Name Bold = Required	Definition
Well Measuring Point Height	The distance (height) from the well measuring point to the land surface at the well. Measuring point heights that lie below land surface are reported as negative numbers. In feet (FT) or meters (M).
Well Measuring Point Height Unit of Measure (UOM)	Units in which the Well Measuring Point Height is expressed. In feet (FT) or meters (M).
Well Measuring Point Description	A description of the physical point on the well from which water levels are measured. The measuring point descriptions for wells with multiple measuring points must be unique (see example).
Well Measuring Point Effective Date	The date when a particular measuring point was first used. Often the same as the Well Construction End Date.
Well Measuring Point End Date	The date when a particular measuring point was abandoned. MM/DD/YYYY

Please contact us if we can provide any additional information that will assist in your review of this memorandum.

Attachments:

Location Data Dictionary
Location Template
Historical Analytical Data Dictionary
Historical Analytical Template
Well Data Dictionary
Wells Template

Location Data Dictionary

Field Name **Bold** = Required	Definition	Format	Valid Values	Valid Value Descriptions and Examples/Comments
SYS_LOC_CODE	UNIQUE to each facility, a user-assigned ID to identify the field Location in the database.	REQUIRED. Up to 20 alpha numeric.		Ex. Location/Sample name, date (year, month day) and bibliography id. Ex. MW01081116001 See attached memorandum for recommended naming conventions.
LOC_NAME	A map label or report friendly version of the location name, can also be a historic location name	OPTIONAL. Up to 40 alpha numeric.		Ex: MW-01
LOC_TYPE	Identifies the type of location; i.e. a boring, geoprobe, test pit, well, etc.	REQUIRED: Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	Ex: MW = Monitoring Well, Enter "Not Identified" if not known.
X_COORD	The X-axis coordinate of a location, often called easting or longitude, in the WA SPCS.	Optional. Up to 20 alpha numeric.		Note: All coordinates should be entered in World Geographic System 1984 (decimal degrees)
Y_COORD	The Y-axis coordinate of a location, often called northing or latitude, in the WA SPCS.	Optional. Up to 20 alpha numeric.		Note: All coordinates should be entered in World Geographic System 1984 (decimal degrees)
HORZ_COLLECT_METHOD_CODE	Technique used to collect the horizontal coordinates of a field Location.	REQUIRED. Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	
COORDINATE_TYPE_CODE	The coordinate system or projection related to the XY coordinates	REQUIRED. Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	
HORZ_DATUM_CODE	Model used to match the horizontal position of features on the ground to coordinates and Locations on a map.	REQUIRED. Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	
SURF_ELEV	The ground surface elevation of the location.	OPTIONAL		Note: All elevations should be in Vertical Control Datum, NGVD 1929
ELEV_UNIT	The unit that the elevation was recorded.	OPTIONAL	Typically will be in feet entered as "FT"	
ELEV_COLLECT_METHOD_CODE	The technique used to define the Vertical Measure (Elevation) of a field Location.	REQUIRED. Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	
ELEV_DATUM_CODE	Model used to match the Vertical Measure (Elevation) of field Locations on the ground to field Locations on a map.	REQUIRED. Up to 20 alpha numeric.	See "Valid Values" sheet in this file for a list of location types	
SURVEY_DATE	The date the survey was completed.	OPTIONAL: If the location was recorded via a survey. Up to 20 alpha numeric.		
SURVEYOR_NAME	The name of the company that completed the survey.	OPTIONAL. Up to 255 alpha numeric.		

Location Template

SYS_LOC_CODE	LOC_NAME	LOC_TYPE	X_COORD	Y_COORD	HORZ_COLLECT_METHOD_CODE	COORDINATE_TYPE
060000MW001	*MW-01*	*MW*	*1301811.324*	*225714.917*		*5 LATLONG*

HORZ_DATUM_CODE	SURF_ELEV	ELEV_UNIT	**ELEV_COLLECT_METHOD_CODE**	**ELEV_DATUM_CODE**	SURVEY_DATE	SURVEYOR_NAME
4	*450*	*feet*	*03*	*02*	*6/25/2008*	*GeoEngineers, Inc.*

Historical Analytical Data Dictionary

Field Name **Bold** = Required	Definition	Format	Valid Values	Valid Value Descriptions and Examples/Comments
BIBLIOGRAPHY_ID	A unique user-assigned ID that links the sample to the source report or lab package.	REQUIRED. Integer		As determined by the City of Redmond.
SYS_SAMPLE_CODE	UNIQUE within a Facility, user-assigned ID to identify a sample in EQuIS.	REQUIRED. Up to 20 alpha numeric.		Ex: A sample collected at MW01 on June 19, 2008 may be named MW01-080619-W. MW01 is the well identifier, 080619 is the year, month and day and W is the matrix abbreviation for water.
SAMPLE_NAME	Used as an alternate to the SYS_SAMPLE_CODE. Can be a short abbreviation or value of a historical sample ID	OPTIONAL: Up to 50 alpha numeric		
SAMPLE_TYPE_CODE	A code that describes the type of sample.	REQUIRED. Up to 20 alpha numeric.	Trip Blank = "TB", Normal sample = "N" and Field duplicate = "FD".	
SAMPLE_DATE	The date the sample was collected.	OPTIONAL:smalldatetime		
SAMPLE_MATRIX	Describes the environmental matrix which was measured or from which a sample was taken.	REQUIRED. Up to 10 alpha numeric.	See "Matrix" in this Excel file for a list of matrix names.	
SYS_LOC_CODE	UNIQUE user-assigned ID to identify the field Location in EQuIS. Sample collection location.	REQUIRED. Up to 20 alpha numeric.		Combination of watershed, location type, and location number e.g. 540000MW128
START_DEPTH	The beggining depth of a sample in units below ground surface.	OPTIONAL: Real		Note: If only one depth value is known enter into both depth fields
END_DEPTH	The end depth of a sample in units below ground surface.	OPTIONAL: Real		Note: If only one depth value is known enter into both depth fields
DEPTH_UNIT	The unit of measurement for the depth value.	REQUIRED IF START AND/OR END DEPTH ARE POPULATED. Up to 10 alpha numeric.		
PARENT_SAMPLE_CODE	The name of the parent sample when a duplicate sample was analyzed.	OPTIONAL. Up to 40 alpha numeric.		

Historical Analytical Data Dictionary

Field Name **Bold** = Required	Definition	Format	Valid Values	Valid Value Descriptions and Examples/Comments
CHEMICAL_NAME	Name of the parameter reported for the result. Parameters are most often thought of as chemicals, but also include things like temperature, color, fish weight, flow, etc.	REQUIRED: Up to 254 alpha/numeric.	See "Chemcial Name & CAS Lookup" in this Excel file for a list of chemical names.	Example; "Cadmium"
CAS_RN	A unique identifying number assigned by the Chemical Abstracts Service (CAS) Division of the American Chemical Society to each distinct chemical substance recorded in the CAS Chemical Registry System. The CAS Number is accepted nationally and internationally as an identifier for specific, definable chemical substances.	REQUIRED: Up to 15 alpha/numeric. Format for known CAS#: XXXXXX-XX-X	See "Chemcial Name & CAS Lookup" in this Excel file for a list of CAS numbers.	Example; "30002-00-9" Must include dashes.
RESULT	Reported result for a particular parameter.	REQUIRED: Has to be a numeric value and should not be left Null.		Ex. "4.60" For non-detects, record the reporting limit and use the appropriate qualifier in the Lab Qualifier field. If the reporting limit is unavailable input "-999".
DETECT_FLAG	Refers to if the result was detected above the reporting detection limit.	REQUIRED:Up to 2 alpha numeric.	Y = Yes, N = No	
LAB_QUALIFIERS	Lab data qualifier for Result value. Used for quality assurance/quality control purposes.	REQUIRED if a value was not detected:Up to 20 alpha numeric.	See "Lab Qualifier Lookup" worksheet in this Excel file for a list of Result Data Qualifiers.	Ex. (lab) J = Analyte positively identified. Associated numerical result is an estimate.
RESULT_UNIT	Result Unit is associated with a parameter's Result value.	REQUIRED:Up to 15 alpha numeric.	See "Result Unit Valid Value Lookup" worksheet in this Excel file for a list of Result units.	ug/L = micrograms per liter
FRACTION	The type of concentration for metals and oragnics.	REQUIRED:Up to 10 alpha numeric.	"T = Total", "D = Dissolved" or "N = organic	If required, then it must be either "T" for total [metal] concentration, "D" for dissolved or filtered [metal] concentration, or "N" for organic (or other) constituents for which neither "total" nor "dissolved" is applicable.

Historical Analytical Data Dictionary

Field Name **Bold** = Required	Definition	Format	Valid Values	Valid Value Descriptions and Examples/Comments
BASIS	The type of basis reporting; i.e. wet or dry.	REQUIRED:Up to 10 alpha numeric.	"Dry", "Wet" or "NA"	If required, then it must be either "Wet" for wet-weight basis reporting, "Dry" for dry-weight basis reporting, or "NA" for tests for which this distinction is not applicable.
ANALYTIC_METHOD	The analytical method the laboratory used to analyze the sample.	REQUIRED:Up to 20 alpha numeric.	See "Analytic Method Lookup" worksheet in this Excel file for a list of Analytic Methods.	If method is unknown, enter "METHOD" if column.
ANALYSIS_DATE	The date the sample was analyzed by lab.	REQUIRED:smalldatetime		If analysis date is unknown, enter the sample date.
METHOD_DETECTION_LIMIT	The Method Detection Limit (MDL) is the minimum concentration of a substance being analyzed test that has a 99 percent probability of being identified.	OPTIONAL: Up to 20 alpha numeric.		
REPORTING_DETECTION_LIMIT	The Reporting Detection (RDL) is the concentration that can be reliably measured within specified limits during routine laboratory operating conditions using Ecology- or EPA-approved methods. It is often synonymous with the Practical Quantitation Limit (PQL).	OPTIONAL: Up to 20 alpha numeric.		
LAB_NAME	Name of lab that processed the analytical samples.	OPTIONAL: Up to 20 alpha numeric.	See "Lab Name Lookup" worksheet in this Excel file for a list of Labs.	
SAMPLING_PERSON	The name of the person collecting the sample.	OPTIONAL: Up to 50 alpha numeric.		
SAMPLER_COMPANY_CODE	The name of the company the sampler collected the sample.	OPTIONAL: Up to 20 alpha numeric.		
SOURCE	The source of the surface water, groundwater or sediment sample.	OPTIONAL: Up to 20 alpha numeric.	Spokane River, Lake CDA, SVRP aquifer	

Historical Analytical Template

BIBLIOGRAPHY_ID	SYS_SAMPLE_CODE	SAMPLE_NAME	SAMPLE_TYPE_CODE	SAMPLE_DATE	SAMPLE_MATRIX	SYS_LOC_CODE	START_DEPTH
1	MW01-080620		N	6/20/2008	GW	060000MW001	12

END_DEPTH	DEPTH_UNIT	PARENT_SAMPLE_CODE	CHEMICAL_NAME	CAS_RN	RESULT	DETECT_FLAG	LAB_QUALIFIERS	RESULT_UNIT	FRACTION
12	*FEET*		*Arsenic*	*7440-38-2*	*25*	*Y*		*mg/L*	*T*

BASIS	ANALYTIC_METHOD	ANALYSIS_DATE	METHOD_DETECTION_LIMIT	REPORTING_DETECTION_LIMIT	LAB_NAME
DRY	*SW6010*	*6/21/2008*	*0.5*	*0.75*	*Fremont Analytical, Inc., Seattle*

SAMPLING_PERSON	SAMPLER_COMPANY_CODE	SOURCE
John Doe	*GeoEngineers, Inc.*	*SVRP Aquifer*

Well Data Dictionary

Col-um	Title **Bold** = required **Bold** = required for wells * = conditional requirement	Description	Format	Valid Values Use these values in the spreadsheets. If there are no values, see next column for examples.	Valid Value Descriptions and Examples/Comments
A	**User Location ID**	UNIQUE user-assigned ID to identify the field location in EIM.	**REQUIRED.** Up to 15 alpha/numeric		The IDs that you create in this column are the same ones you will use in Column B of the Results spreadsheet. Use a consistent naming convention for all locations for a given EIM study. If you have an Ecology Facility-Site ID or other ID such as a VCP number, it can be used as a prefix. **For wells**, the Ecology Well Tag Number can be used for the User Location ID (like ABC123). Ex. For monitoring well MW4 at Voluntary Cleanup site NW0001, use VCNW0001_MW4. Do NOT make it MW-4 – it is not unique.
B	**Location Name**	UNIQUE descriptive name for a field location.	**REQUIRED.** Up to 40 alpha/numeric		The Location Name must be unique for each User Location ID Ex. "VCNW0001 MW4," or "Nooksack River at Brennan," etc. Don't use something like "Nooksack River" without any additional information. For wells, the Ecology Well Tag Number can also be used for the Location Name (like AAB123).
D	**Location Status**	Current status with respect to monitoring activity.	**REQUIRED.** Up to 15 alpha	Active, Inactive, Seasonal	
F	**Location Well Flag**	A Yes (Y) or No (N) flag that indicates whether a field Location is a Well. Additional data must be entered for a Well Location.	**REQUIRED FOR WELLS.** 1 alpha.	Y, N	**Y** yes, **N** no **For Wells, enter "Y"**

The rest of the fields are for wells only					
AX	Well ID	Sub ID for well clusters or multiple completions at a single well. If each well or completion has its own User Location ID, this field is not required.	Up to 3 numeric		Ex. "1," "2," etc. Required for wells **ONLY** when well clusters or multiple completions are at the exact same location and do not have separate User Location IDs.
AY	Well Tag Number*	A unique six-digit alpha-numeric identifier consisting of three letters and three numbers (e.g. ABC123). This number is stamped on an aluminum tag and is typically affixed to the well by the driller at the time of construction, or by sampling staff from Ecology or another party. The Well Tag Number is also included on the well log submitted by the driller or sampling staff. Because it is unique and recognized throughout Washington, the Well Tag Number is often used in EIM as the User Location ID and the Location Name.	**REQUIRED FOR WELLS if** available. Up to 6 alpha/numeric		This **must** be the unique number off the well tag attached to a well. If a well is not tagged, tags are available from Ecology (call Marian Brunner, 360-407-6650). Format of Well Tag Number: Three letters and three numbers (ABC123). **If you don't have a valid well tag ID and it is not practical to get one, leave this field blank.**
AZ	Well Owner Name	The name of the well owner. This information is not made public without filing a formal request.	Up to 70 alpha/numeric		This information will not be made public.
BA	**Well Status**	Describes whether a well is still in existence or has been abandoned.	**REQUIRED FOR WELLS.** Up to 9 alpha/numeric.	Abandoned, Active	

BB	**Well Use Code**	Describes the primary use of the well.	**REQUIRED FOR WELLS.** Up to 30 alpha.	Anode, Dewater, Drainage, Geothermal, Heat Reservoir, Injection, Monitor, Observation, Oil and Gas Well, Recharge, Remediation, Repressurization, Seismic, Test Hole, Waste Disposal, Withdrawal of Water, Other	Cleanup sites usually use "Monitor" or "Remediation."
BC	Well Water Use Code	Describes the primary use of water from a well.	Up to 19 alpha.	Air Conditioning, Aquacult ure, Bottling, Commercial, Desalination, Domestic, Fire Fighting, Industrial, Industrial(Cooling), Institutional, Irrigation, Livestock Watering, Medicinal, Mining, Power, Public Water Supply, Recreation, Unused, Other	Monitoring wells usually use "Unused."
BD	Well Natural Flow Flag	A Yes (Y) or No (N) flag that indicates whether an uncapped well would naturally flow due to artesian pressure.	1 alpha	Y, N	**Y** yes, **N** no, if unknown, leave blank

BE	Well Gradient*	Identifies whether a well is hydraulically up-gradient, down-gradient, cross-gradient, has an unknown relationship to, or is within a potential contamination source. Applicable to wells that are used to monitor a known source of potential ground-water contamination, such as landfills and RCRA facilities.	**REQUIRED FOR WELLS if** part of a landfill, RCRA facility, or cleanup site. 1 alpha.	C, D, N, U, X	In reference to the primary source: **C** cross-gradient, **D** downgradient, **N** unknown, **U** upgradient, **X** within the source
BF	Wellhead Protection Area	The name of the wellhead protection area within which a well is located, if any.	Up to 40 alpha/numeric.		Check with State Health Department, Drinking Water Division; (Ex. McAllister Springs Wellhead Protection Area)
BG	Well Construction Start Date	The date that well construction (borehole excavation) began.	MM/DD/YYYY		Ex. "12-31-1999"
BH	Well Construction End Date*	The date that well construction was completed.	**REQUIRED FOR WELLS if** available. MM/DD/YYYY		Ex. "01-01-2000"
BI	Well Construction Method Code*	The method used to create the borehole and construct the well.	**REQUIRED FOR WELLS if** available. 2 alpha.	AP, AR, BA, CT, DR, DU, DW, HR, JE, RR, SO, TR	**AP** air percussion, **AR** air rotary, **BA** bored/augered, **CT** cable tool, **DR** driven, **DU** dug, **DW** drive & wash, **HR** hydraulic rotary, **JE** jetted, **RR** reverse rotary, **SO** sonic, **TR** trenching
BJ	Well Completion Depth*	The final completion depth below land surface for a well as determined during initial construction. The completion depth is ideally determined by sounding the well; however, in most cases, the depth is determined by the driller. In feet or meters.	**REQUIRED FOR WELLS if** available. Up to 5 numeric, up to 3 decimals.		In feet or meters; Ex. "48.84"
BK	Well Completion Depth Unit of Measure (UOM)*	Units in which Well Completion Depth is expressed. In feet (F) or meters (M).	**REQUIRED FOR WELLS if** available. Up to 2 alpha.	FT, M	**FT** feet, **M** meters

BL	Well Hole Depth	Depth below land surface to the bottom of the borehole on completion of drilling – this may be deeper than the final Well Completion Depth.	Up to 5 numeric, up to 3 decimals.		In feet or meters; Ex. "22.500"
BM	Well Hole Depth Unit of Measure (UOM)	Units in which Well Hole Depth is expressed. In feet (F) or meters (M).	Up to 2 alpha.	FT, M	**FT** feet, **M** meters
BN	Well Maximum Casing Diameter	The diameter of the outermost permanent casing used to complete the well (In centimeters or inches). For above-ground monitoring well completions, report the diameter of the well itself and not that of the short, outer casing that is often used to secure and protect the well itself.	Up to 3 numeric, up to 2 decimals.		Ex. "8.00"
BO	Well Maximum Casing Diameter Unit of Measure (UOM)	Units in which Well Maximum Casing Diameter is expressed. In centimeters (CM) or inches (IN).	2 alpha.	CM, IN	**CM** centimeters, **IN** inches
BP	Well Completion Code*	The method of well completion or the nature of the openings that allow water to enter the well.	**REQUIRED FOR WELLS if** available. Up to 15 alpha.	Gravl Pack Perf, Gravl Pack Scrn, Horz Gallery, Open End, Open Hole, Perf/Slotted, Porous Concrete, Sand Point, Screen, Walled, Other, Unknown	**Gravl Pack Perf** gravel packed with perforated casing; **Gravl Pack Scrn** gravel packed with screened casing; **Horz Gallery** horizontal conduit, such as infiltration gallery; **Open End** intake occurs via bottom of casing; **Open Hole** most common in bedrock, uncased hole extends below the bottom of the casing; **Perf/Slotted** intake occurs via perforations or slots in casing; **Porous Concrete** most common in shallow, dug wells; **Sand Point** narrow, shallow, driven well, usually in sands, also know as a drive or well point; **Screen** intake occurs via screen in casing; **Walled** or shored - most common in shallow, dug wells ; **Other** use if none of the other categories fit; **Unknown** use if unknown.
BQ	Well Development Method Code	Identifies the method used to develop the well and increase or maximize its efficiency after construction.	2 alpha	AL, BA, CT, JE, SB	**AL** Airlift, **BA** Bail, **CT** Chemical Treatment, **JE** Jet, **SB** Surge Block

BR	Well Disinfected Flag	A Yes (Y) or No (N) flag that indicates whether the well was disinfected at the time of completion.	1 alpha	Y, N	**Y** yes, **N** no, if unknown, leave blank
BS	Well Aquifer Test Flag	A Yes (Y) or No (N) flag that indicates whether a well was used to conduct a formal (documented) aquifer test. This flag should not be used to identify short term bailer or air lift tests performed by the driller during well construction or development.	1 alpha	Y, N	**Y** yes, **N** no; if unknown, leave blank
BT	Well Construction Comment	Brief comments or other important information about the construction of a well.	Up to 254 alpha/numeric.		
BU	**Well Measuring Point Name**	The name used to describe a unique reference point on a well from which water-level measurements are routinely made. While most wells have only one established measuring point, some longer-term observation wells have multiple measuring points due to well modifications that occurred over time.	**REQUIRED FOR WELLS.** Up to 8 alpha/numeric.		Ex. **MP1**, MP2, MP3, etc. There is only room for one Measuring Point in the Location spreadsheet. If there is more than one Measuring Point for a Well Location, please contact your Data Coordinator.
BV	**Well Measuring Point Height**	The distance (height) from the well measuring point to the land surface at the well. Measuring point heights that lie below land surface are reported as negative numbers. In feet (FT) or meters (M).	**REQUIRED FOR WELLS.** Up to 5 numeric, 3 decimals.		In feet or meters; Ex. "5.5," "-2.25," etc. **This is NOT the elevation of the well.** It is an actual measurement of casing height above or below land surface ("stickup").
BW	**Well Measuring Point Height Unit of Measure (UOM)**	Units in which the Well Measuring Point Height is expressed. In feet (FT) or meters (M).	**REQUIRED FOR WELLS.** Up to 2 alpha.	FT, M	**FT** feet, **M** meters
BX	**Well Measuring Point Description**	A description of the physical point on the well from which water levels are measured. The measuring point descriptions for wells with multiple measuring points must be unique (see example).	**REQUIRED FOR WELLS.** Up to 40 alpha/numeric.		Ex. "MP1 = top of casing, notch on north side" "MP2 = lower lip of hole, south side of casing"

BY	**Well Measuring Point Effective Date**	The date when a particular measuring point was first used. Often the same as the Well Construction End Date.	**REQUIRED FOR WELLS.** MM/DD/YYYY.		If date is not known, use 01/01/1900 as default value.
BZ	Well Measuring Point End Date	The date when a particular measuring point was abandoned.	MM/DD/YYYY		

Wells Template

User_Location_ID	Location_Name	Location_Status	Location_Well_Flag	Well_ID	Well_Tag_Number	Well_Owne	Well_Status

Wells Template

Well_Use_Code	Well_Wate	Well_Natur	Well_Grad	Wellhead_	Well_Cons	Well_Construction_End_Date	Well_Construction_Method_Code

Wells Template

Well_Completion_Depth	Well_Completion_Depth_UOM	Well_Hole_Depth	Well_Hole	Well_Maxi	Well_Maxi	Well_Com	Well_Deve	Well_Disin

Wells Template

Well_Aquif	Well_Construction_Comment	Well_Measuring_Point_Name	Well_Measuring_Point_Height	Well_Measuring_Point_UOM

Wells Template

Well_Measuring_Point_Description	Well_Measuring_Point_Effective_Date	Well_Measuring_Point_End_Date

GeoEngineers

523 E. Second Avenue, Spokane, WA 99202, Telephone: (509) 363-3125, Fax: (509) 363-3126 www.geoengineers.com

MEMORANDUM

TO:	Ben Brattebo
FROM:	Jon Rudders
DATE:	March 23, 2009
FILE:	0188-135-00
SUBJECT:	Spokane County Bi-State Nonpoint Source Phosphorus Study, Quality Control Review of Project Database

Ben,

The below discussion summarizes the actions taken during the quality control (QC) review of the project database created as a component of Phase 1 of the Spokane County Bi-State Nonpoint Source Phosphorus Study, which was consistent with the approach provided in our February 19, 2009 meeting. Please contact me with any questions or concerns.

QUERIES AND QC PROCESSES COMPLETED

The following queries and checks were completed on the project database:

- Required Valid Values
    - Queried required fields to validate that the values meet valid value lists and/or were completely populated. Fields with valid value lists were examined to ensure that entries matched the list. Incorrectly populated records were re-populated either 1) by valid values based on other parameters, 2) using the correct coding, or 3) by going back to the source data. Fields included:
        - Sample_Matrix
        - CAS_RN
        - Result_Unit
        - Detect_Flag
        - Lab_Qualifiers
        - Fraction
        - Basis
        - Analytical_Method
        - Loc_type
        - Horz_Collect_Method_code
        - Coordinate_Type_Code
        - Horz_Datum_Code
        - Elev_Collect_Method_Code
        - Elev_Datum_Code

DISCLAIMER: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

        - Chemical_Name

- Invalid and Missing Values
    - Queried table relationships to validate that there are no orphan records and that relationships between tables are valid.
    - Corrected invalid and missing values based on source documents. Changes were consistent with field type and data elements.
    - Identified invalid dates. Most of the invalid dates were 1/1/1900. These were replaced with the analysis date.
- Duplicates

A series of queries were completed to check for potential duplicates in the various tables. Specific types of duplicates were dealt with as described below:

    - Duplicates by Location
        - Identified records with the same 1) physical location (X,Y), 2) location name, 3) chemical tested, 4) unit and 5) result. The records from the original study or the study with greater data were kept in the database and the other records were removed and placed in a new table. Records at different depths were retained in the database.
        - Queried for duplicate results with the same 1) location, 2)sample date but at different depths. Query results show some with different analytical methods and some with different analysis dates. These were corrected as necessary.
    - Duplicate Well Samples
        - Examined source data and corrected errors. Duplicates entered more than once were deleted.
- Sample Depth
    - Checked start and end depths for accuracy. Entries with just a start depth or an end depth value were copied to the respective depth entry.
    - Checked depth units for accuracy. For samples without depths, we verified that the depth entry is blank.
- Surface Water Sampling Locations
    - Verified that samples had a location record and location records are connected to at least one sample record. A location record was added even if the X,Y is unknown, to document that the X,Y is unknown.
    - Verified that X,Y coordinates were appropriate for the project area.
    - Added X,Y locations for Liberty Lake using coordinates and locations provided by Spokane County. These were missing from the original source data provided.
    - Added X,Y locations for the Steven County Conservation District data based on Ecology's published water quality monitoring stations data. These were missing from the original database.

- Well Locations
    - Checked that wells are tied to a location in the HistoricalAnalytical table and tied to a location in the Locations table. Corrected or inserted links as needed.
- Fields Populated
    - Performed queries to check that required fields are populated. Entries that were not populated were corrected based on other entries and by reviewing the source data. Required fields include:
        - HistoricalAnalytical
            - Bibilography_ID
            - Sys_Sample_Code (Geo populated)
            - Sample_Type_Code
            - Sample_Matrix
            - Sys_Loc_Code
            - Depth_Unit
            - Chemical_Unit
            - Chemical_Name
            - CAS_RN
            - Result
            - Detect_Flag
            - Lab_Qualifiers
            - Result_Unit
            - Fraction
            - Basis
            - Analytical_Method
            - Analysis_Date
        - Location
            - Sys_Loc_Code
            - Loc_type
            - Horz_Collect_Method_code
            - Coordinate_Type_Code
            - Horz_Datum_Code
            - Elev_Collect_Method_Code
            - Elev_Datum_Code

- Flags
    - Examined Detect_Flag and Lab_Qualifiers for entry consistency.
    - Checked that the Results and the Detect_Flag entries were consistent.

- Result Data Values
    - Negative and zero entries (i.e. non-detects and/or reported as zeros) were verified.
    - Checked maximum results to identify unusually high results, both for the database and for each study. Added to a field in the database to track comments. High values confirmed as valid were noted in the comments.
    - Checked that all identified source data were loaded into the database. Missing data were loaded or entered into the database.
- Units
    - Verified that result units were appropriate for the type of chemical being tested.
    - Reformatted data with mixed capitalization from the source data (e.g. changed MG/L to mg/L).
    - Checked the fraction values against the chemical names for consistency.
    - Examined expected, valid ranges of results for each type of chemical and result unit; checked suspected errors against source data and changed and/or documented inconsistencieswith the source data.
- Database
    - Checked and updated the Loc_Name field relative to the source data.
    - Checked for duplicate bibliography codes and fixed ones that existed.
    - Reformatted dates transferred from other data sources as date/time format to allow grouping and querying by date only.
    - Reformatted result values to truncate extra decimal places caused by transfer of digital data.
- Other
    - Completed multiple random checks against both digital and paper data.