

## Architecture Recommendations for the PPPO Data Warehouse and GIS Viewer

Prepared by  
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## Executive Summary

Development of the Portsmouth Gaseous Diffusion Plant (PORTS) Data Warehouse and GIS Viewer (DWGIS) began in CY 2000. The system was developed and implemented to allow PORTS site personnel and contractors GIS map-based access to PORTS environmental data initially stored in the Oak Ridge Environmental Information System (OREIS) database.

The University of Kentucky – Kentucky Research Consortium for Energy and Environment (KRCEE) began development of a DWGIS for the Paducah Gaseous Diffusion Plant (PGDP) in April 2005 at the request of DOE-PPPO. Through contracts with SAIC-Dublin and the Kentucky Geological Survey (KGS), KRCEE completed Phase I PGDP-DWGIS development activities in December 2005.

Phase I PGDP-DWGIS activities encompassed development, deployment and beta-testing of a PGDP-DWGIS. The capabilities of the Phase I PGDP-DWGIS were based upon, and synonymous with, the capabilities of the existing PORTS-DWGIS. As such, features and functionality developed for the PGDP-DWGIS are readily applicable and interchangeable with the PORTS-DWGIS and vice versa. Table ES-1 provides a comparison of the records that are presently available on the PORTS-DWGIS and PGDP-DWGIS. Table ES-2 provides a comparison of the features and functionality of the PORTS-DWGIS and PGDP-DWGIS.

In order to ensure implementation, ease of use, and end-user access to the DWGIS, DOE-PPPO requested KRCEE identify and evaluate alternatives to house, manage, maintain, and provide end-user access to the PORTS-DWGIS and PGDP-DWGIS. KRCEE's evaluation resulted in the development of a set of recommendations to DOE-PPPO for housing, managing, maintaining, and providing end-user access to the PORTS-DWGIS and PGDP-DWGIS. These recommendations are provided in Section 8 of this report. The recommendations are summarized in the bullets below.

### System Architecture Recommendations and Implementation Costs

The following sections summarize the recommendations for system architecture for the PORTS DWGIS, PGDP DWGIS, and LEXNET/PPPO management/connectivity to the DWGIS.

#### Recommendation 1. . PORTS/PGDP DWGIS General Architecture Recommendation

Figure ES-1 illustrates the recommended architecture for the PORTS-DWGIS, PGDP-DWGIS in a configuration that efficiently establishes connectivity pathways for site contractors, PPPO, UK-KRCEE, regulatory agencies, and stakeholders. .

#### Recommendation 2. PGDP-DWGIS, PORTS-DWGIS and OREIS Interface

It is recommended that the PORTS-DWGIS and PGDP-DWGIS OREIS update processes be automated and conducted on a regular basis such as monthly or quarterly. To allow access to the secure OREIS databases for both PORTS and PGDP, it is recommended that a secure read-only virtual private network (VPN) protocol be developed. Updates should also occur if new

verified and validated data are placed in the OREIS database. This would allow for real-time input/access of information.

### **Recommendation 3. PPPO and LEXNET DWGIS Administration & Interface**

It is not recommended that DOE-PPPO utilize its facilities to house, administer, operate and maintain the PORTS DWGIS and the PGDP DWGIS. The following bullets summarize the reasons for the recommendation.

- Administration, operation, and maintenance of the PORTS-DWGIS and PGDP-DWGIS would require the procurement of server hardware.
- Would require the procurement of server software
- Would require procurement of GIS workstation hardware and software
- Would require procurement of additional T1 service lines to provide capacity to operate both the PORTS-DWGIS and PGDP-DWGIS;
- Would require the hire of one or more IT professionals to provide daily administration, operation, and maintenance of the systems; and
- Would require the implementation of clearance and access for end-users that do not presently have clearance for the LEXNET network.
- Speed of remote transmissions could be significantly reduced because of distance, bandwidth and firewall security issues.

Because of the issues, identified above which are specific to the DOE-PPPO it is recommended that DOE-PPPO utilize internet connectivity to a 3<sup>rd</sup>-party host for PPPO internal interface needs to the PORTS-DWGIS and PGDP-DWGIS (Figure ES-1).

### **Recommendation 4. 3<sup>rd</sup> Party Hosting for PPPO, Regulators, Stakeholders, Site Offices**

It is recommended that a 3<sup>rd</sup> party host be utilized to provide access to the PGDP-DWGIS for PPPO, regulators, UK-KRCEE, and stakeholders. It is also recommended that a 3<sup>rd</sup> party host be utilized to provide the PORTS Site Office and PGDP Site Office connectivity to the PORTS-DWGIS and PGDP-DWGIS.

The 3<sup>rd</sup> party host will be administered, maintained and operated by UK-KGS or SAIC- Dublin in Dublin, Ohio.

Development of different versions of the PGDP-DWGIS would be designed and implemented for different end-users. Development costs for the additional DWGIS versions are identified in Table ES-3. A full-scale DWGIS would be accessible from the 3<sup>rd</sup> party host to PPPO & Site Offices and a modified version of the DWGIS would be accessible for regulators and stakeholders. Total costs to implement 3<sup>rd</sup> party hosting are identified in Table ES-3.

## **Recommendation 5. PORTS-DWGIS**

The following is recommended for the setup, operation, and maintenance of the PORTS DWGIS.

- Theta Pro2Serve Management Company (TPMC) should establish the necessary firewall exceptions to allow PORTS contractors, the PORTS Site Office, and others with “need to know” requirements access to the PORTS-DWGIS.
- TPMC should acquire training on the operation and maintenance of the PORTS DWGIS
- TPMC should acquire training to PORTS end-users on the use of the PORTS-DWGIS.

The bullets below summarize the justifications for the architecture and training recommendations.

- TPMC has procured and installed the hardware and software required to operate and maintain the PORTS-DWGIS on the TPMC network.
- TPMC must maintain the PORTS-DWGIS under the terms of its contract with the DOE. Costs for configuring the existing PORTS-DWGIS with the new features and functionality developed for the PGDP\_DWGIS are identified in Table ES-3.
- TPMC has not received administrator or end-user training for the PORTS-DWGIS. The Cost associated with training PORTS-DWGIS administrators and end-users is identified in Table ES-3. .

The costs for TPMC’s utilization of internal resources to implement access to the PORTS-DWGIS are not addressed in these recommendations. The costs for KRCEE to contract and manage PORTS training are reflected in Table ES-3.

## **Recommendation 6. PGDP-DWGIS**

The following bullets identify the recommendations for implementation, administration, operation, and maintenance of the PGDP-DWGIS.

- PRS should procure the hardware and software for the PRS network (Table ES-3).
- PRS should obtain training on the operation and maintenance of the PGDP-DWGIS.
- PRS will maintain the system and provide access to Paducah contractors that have the need to access data (Figure ES-1).
- PRS will establish any firewall exceptions for the Paducah contractor end-users.

## **Recommendation 7. PGDP-DWGIS Phase II Development & Costs**

Table ES-4 identifies the tasks that comprise the scope of the KRCEE PGDP-DWGIS Phase II Development Proposal (Attachment 5). Tasks 4 and 5 have been undertaken, Task 5 is completed and Task 4 is underway, both funded by KRCEE-DOE earmark funding. Tasks 1, 2, 3, 6, and 7 are recommended for development and deployment to the PGDP-DWGIS. The

timeframes and subcontract task costs are identified in Table ES-5. Cost for completion of proposed PGDP-DWGIS development Tasks 1, 2, 3, 6, and 7 and are identified in Table ES-3.

The costs for Phase II development are one-time costs. Future costs for development of additional features and capabilities would be dependent upon identification of additional features for the DWGIS and a decision by DOE PPPO to undertake development of those features. In order to minimize developmental costs and ensure consistency in PORTS and PGDP DWGSI data handling, features developed for the PGDP-DWGIS will be readily transferable to and implementable on the PORTS-DWGIS.

**Table ES-1. Environmental Data Warehouse Statistics:**

	Paducah	Portsmouth
Environmental lab results	2,296,537	1,040,657
Groundwater Elevation	21,960	27,955
Environmental Sample Locations	10,262	6,950
Groundwater Wells	866	1,231
Field Measurements	95,600	0
Boring/Well Logs (PDF)	652	2,055
Geologic Stratigraphy/Lithology Picks	0	1,939
GeoScience	0	1,483
GeoScience Logs	0	264
Standardized GIS Features	140	80
Aerial Images	3	1
2 meter Digital Elevation Model	1	1

**Table ES-2. PORTS & PGDP DWGIS Feature & Functionality Comparison**

Y = attribute/tool/capability is part of system

<b>FEATURE</b>	<b>PORTS DWGIS</b>	<b>PGDP DWGIS</b>
Web Accessibility	Y	Y
Security Features (multi-level)	Y	Y
Data Warehouse Web Page	Y	Y
Analytical Data & Plotting Page Link	Y	Y
Site GIS Viewer Page Link	Y	Y
Well and Borehole Information Page Link	Y	Y
Geoscience Page Link	Y	Y*
GIS Viewer Web Page	Y	Y
Feature Search by Name	Y	Y
Feature Search by Description	Y	Y
Query Samples by Media	Y	Y
View Legend	Y	Y
Set Media Result Layers	Y	Y
Set Non-Media Layers	Y	Y
Add and Delete Visible Layers	Y	Y
Set Visible Layers	Y	Y
Set Active Layer	Y	Y
Prioritize Layers	Y	Y
GIS Map-Viewer Functions	Y	Y
Auto Zoom to Original Extent	Y	Y
Auto Zoom In/Out	Y	Y
Zoom to Full Extent	Y	Y
Zoom to Active Layer	Y	Y
Zoom to Last Extent	Y	Y
Pan View	Y	Y
Select View by Rectangle	Y	Y
Hyperlink	Y	Y
Query	Y	Y
Measure	Y	Y
Data Query by Buffer	Y	Y
Data Query select by Rectangle	N	Y
Data Query select by Polygon	N	Y
Data Query select by Radius	N	Y
Clear	Y	Y
Print	Y	Y
Server Requirements		
Physical	Y	Y
Software	Y	Y
Desktop Workstation Requirements		
Physical	Y	Y
Software	Y	Y

Data Accessibility

Analytical Data & Plotting Page Link	Y	Y
Query analytical data by location	Y	Y
Query analytical data by media	Y	Y
Query analytical data by analyte/location/depth	Y	Y
Screening results by detects & non-detects	Y	Y
Query analytical data by location/analyte/fraction	Y	Y
Query field measurements	N	N
Query data by sampling event	Y	Y
Query analytical data by specified sample date range	Y	Y
Query submitted to table (screen view)	Y	Y
Query submitted to downloaded Excel Spreadsheet	Y	Y
* Not populated as part of Phase I development Activities		

**Table ES-3. Proposed-DWGIS Implementation, Development & Hosting Costs**

Cost Element	Cost
<b>PORTS-DWGIS</b>	
Server Hardware Cost	\$0.00
Server Software Cost	\$0.00
Training Cost	\$20,000.00
New Feature Configuration (from PGDP-DWGIS)	\$5,000.00
<b>Total PORTS Training/Configuration Subcontract</b>	<b>\$25,000.00</b>
KRCEE Administrative Cost	\$5,000.00
UK Indirect Cost	\$11,875.00
<b>Total PORTS Training/Configuration Contract Costs thru KRCEE</b>	<b>\$41,875.00</b>
<b>PGDP-DWGIS Implementation &amp; Training</b>	
Server Hardware Cost (See Attachment 1 - Table 1)	\$13,000.00
Server Software Cost (See Attachment 2 - Table 2)	\$39,200.00
<b>Total Hardware &amp; Software Cost for PGDP IT Contractor</b>	<b>\$52,200.00</b>
Implementation Configuration & Training Cost	\$20,000.00
<b>Total Implementation &amp; Training Subcontract</b>	<b>\$20,000.00</b>
Administrative Costs	\$4,000.00
UK Indirect Costs	\$11,400.00
<b>Total PGDP-DWGIS Implementation Contract Costs thru KRCEE</b>	<b>\$35,400.00</b>
<b>Total PGDP-DWGIS Implementation Costs</b>	<b>\$107,600.00</b>
<b>PGDP 3<sup>rd</sup> Party Hosting</b>	
Annual Hosting Fee (\$1,250/mo.)	\$15,000
Configuration Cost	\$5,000
Regulator/Public Web Site (Requirements & Design)	\$20,000
<b>Total Subcontract Cost</b>	<b>\$40,000</b>
Administration	\$10,000
Technical Support	\$10,000
UK Indirect Charges	\$21,375
<b>Total 3<sup>rd</sup> Party Host Contract Costs thru KRCEE</b>	<b>\$81,375</b>
<b>PGDP-DWGIS Phase II Development</b>	
<b>Total SubContract Costs</b>	<b>\$86,500.00</b>
Administration	\$21,300.00
Technical Support	\$20,000.00
UK Indirect Cost	\$31,492.50
<b>Total Contract Cost for Phase II Development thru KRCEE</b>	<b>\$159,292.50</b>

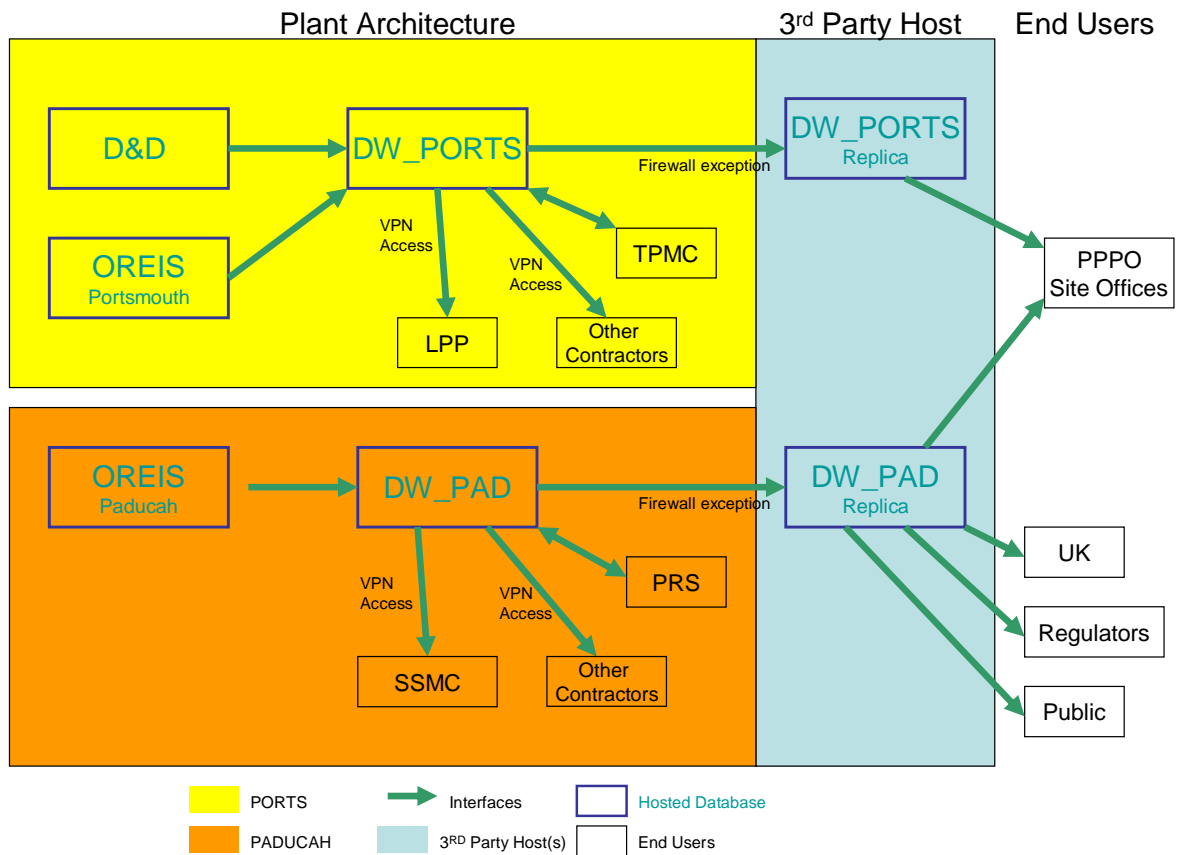
**Table ES-4. Proposed Features for KRCEE Phase II PGDP-DWGIS Development**

<b>Proposed Activity</b>	<b>Description</b>	<b>Completed Or Underway</b>	<b>Pending Funding</b>
<b>1.</b>	Document Indexing and Linkage Module		X
<b>2.</b>	Risk Assessment Module		X
<b>3.</b>	Training		X
<b>4.</b>	On-Going Data Support and Integration	X	
<b>5.</b>	Development of Spatial Query Tools	X	
<b>6.</b>	Development of DWGIS GIS Analyst Feature Extraction Tools		X

**Table ES-5. PGDP-DWGIS Phase II Development Subcontract Task Costs**

<b>Proposed Activity</b>	<b>Description</b>	<b>Time to Complete</b>	<b>Pending Funding</b>
<b>1.</b>	Document Indexing and Linkage Module	12 mos.	<b>\$30,000.00</b>
<b>2.</b>	Risk Assessment Module*	12-15 mos.	<b>\$33,000.00</b>
<b>3.</b>	Training	3 mos.	<b>\$10,000.00</b>
<b>6.</b>	Development of DWGIS GIS Analyst Feature Extraction Tools	3 mos.	<b>\$9,500.00</b>
<b>7.</b>	White Paper for 3-D Visualization Software	3 mos.	<b>\$4,000.00</b>
*The proposed Risk Assessment Module proposes use of KRCEE macros. Should new macro development be necessary or SAS type statistical program development be scoped for this task, additional costs would be incurred.			

**Figure ES-1. Recommended Architecture for PGDP and PORTS DWGIS.**



## **1. 1. Purpose**

The purpose of this document is to: 1) Identify and describe existing networks, network configurations, and network relationships at the United States Department of Energy's (DOE) Portsmouth Gaseous Diffusion Plant (PORTS), Paducah Gaseous Diffusion Plant (PGDP), and the Lexington based Portsmouth-Paducah Project Office (PPPO); 2) Develop recommendations for housing, management, and maintenance of the PGDP Data Warehouse (DW) and Geographic Information System (GIS) Viewer (DWGIS); 3) Provide recommendations for feasibly connecting and managing prescribed PGDP end-users to the DWGIS; and 4) Provide recommendations for short and long-term development of the PGDP DWGIS; and 5) Develop cost estimates for the recommendations.

## **2. Organization**

This document: 1) Provides a brief background to the development of Portsmouth Gaseous Diffusion Plant (PORTS) Data Warehouse and GIS Viewer (DWGIS) and the DWGIS at the Paducah Gaseous Diffusion Plant (PGDP); 2) Describes the existing networks and network configurations for the Department of Energy Portsmouth-Paducah Project Office (PPPO), PORTS, and PGDP and how they interface; 3) Identifies a recommended DWGIS network configuration for PORTS-DWGIS and PGDP-DWGIS considering PPPO; 4) Describes hardware and software necessary to operate the PORTS-DWGIS and the PGDP DWGIS in the recommended configuration utilizing hardware and/or software that is already procured and in place where possible; 5) Provides cost estimates for the recommended configuration; 6) Identifies DWGIS features that are under development by KRCEE and SAIC as part of Phase II PGDP-DWGIS activities through DOE-KRCEE earmark funding; 7) Defines Phase II PGDP-DWGIS features identified for implementation through end-user beta testing that are not funded by the DOE-KRCEE earmark; 8) Provides cost estimates and time frames for development and implementation of Phase II PGDP-DWGIS features not funded under the DOE-KRCEE earmark; and 9) Provides recommendations and an annual cost estimate for operation and management of a PGDP-DWGIS interface for regulators, the academic community, and stakeholders. Attachments to this text include: 1) detailed hardware and software description tables that define the software uses and identifies costs used in developing the cost estimates; and 2) PGDP Phase II DWGIS Development proposal with detailed description of "to be developed" features and their utility.

## **3. Background**

Development of the PORTS-DWGIS system began in CY 2000. The system was developed and implemented to allow PORTS site personnel and contractors GIS map-based access to PORTS environmental data initially stored in the Oak Ridge Environmental Information System (OREIS) database. Historically, OREIS has been maintained by Bechtel-Jacobs, Inc. in Oak Ridge, Tennessee. Since its deployment in CY 2000, the PORTS-DWGIS has been routinely improved. Improvements, maintenance, and hosting of the PORTS-DWGIS was the responsibility of SAIC in Dublin, Ohio until the 2005 PORTS contract transition. In January 2006, the PORTS-DWGIS was physically transferred from SAIC to the PORTS facility.

A new contracting team, LATA/Parallax Portsmouth LLC (LPP) and Theta Pro2Serve Management Company (TPMC), was put in place at PORTS in CY 2005. In April 2006 the OREIS database for PORTS was physically transferred from Oak Ridge to the PORTS facility. As a result of the transfer, the OREIS web access for PORTS end-users was discontinued. Access to the PORTS-DWGIS is required by LPP personnel, TPMC personnel, and by PPPO end-users to replace discontinued OREIS access.

The University of Kentucky – Kentucky Research Consortium for Energy and Environment (KRCEE) began development of the PGDP-DWGIS in April 2005 at the request of DOE-PPPO. Through contracts with SAIC-Dublin and the Kentucky Geological Survey (KGS), KRCEE completed Phase I PGDP-DWGIS activities that encompassed development and implementation of a PGDP-DWGIS with capabilities based upon and synonymous with the capabilities of the existing PORTS-DWGIS. Table 1 provides a comparison of the records that are available on the PORTS-DWGIS and PGDP-DWGIS. Table 2 provides a comparison of the features and functionality of the PORTS-DWGIS and PGDP-DWGIS.

**Table 1. Environmental Data Warehouse Statistics:**

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Standardized GIS Features	140	80
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**Table 2. PORTS & PGDP DWGIS Feature & Functionality Comparison**

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Security Features (multi-level)	Y	Y
Data Warehouse Web Page	Y	Y
Analytical Data & Plotting Page Link	Y	Y
Site GIS Viewer Page Link	Y	Y
Well and Borehole Information Page Link	Y	Y
Geoscience Page Link	Y	Y*
GIS Viewer Web Page	Y	Y
Feature Search by Name	Y	Y
Feature Search by Description	Y	Y

Query Samples by Media	Y	Y
View Legend	Y	Y
Set Media Result Layers	Y	Y
Set Non-Media Layers	Y	Y
Add and Delete Visible Layers	Y	Y
Set Visible Layers	Y	Y
Set Active Layer	Y	Y
Prioritize Layers	Y	Y
GIS Map-Viewer Functions	Y	Y
Auto Zoom to Original Extent	Y	Y
Auto Zoom In/Out	Y	Y
Zoom to Full Extent	Y	Y
Zoom to Active Layer	Y	Y
Zoom to Last Extent	Y	Y
Pan View	Y	Y
Select View by Rectangle	Y	Y
Hyperlink	Y	Y
Query	Y	Y
Measure	Y	Y
Data Query by Buffer	Y	Y
Data Query select by Rectangle	N	Y
Data Query select by Polygon	N	Y
Data Query select by Radius	N	Y
Clear	Y	Y
Print	Y	Y
Server Requirements		
Physical	Y	Y
Software	Y	Y
Desktop Workstation Requirements		
Physical	Y	Y
Software	Y	Y
Data Accessibility		
Analytical Data & Plotting Page Link	Y	Y
Query analytical data by location	Y	Y
Query analytical data by media	Y	Y
Query analytical data by analyte/location/depth	Y	Y
Screening results by detects & non-detects	Y	Y
Query analytical data by location/analyte/fraction	Y	Y
Query field measurements	N	N
Query data by sampling event	Y	Y
Query analytical data by specified sample date range	Y	Y
Query submitted to table (screen view)	Y	Y
Query submitted to downloaded Excel Spreadsheet	Y	Y

\* Not populated as part of Phase I development Activities

KRCEE's Phase I PGDP-DWGIS activities included: 1) Obtaining the PGDP OREIS database; 2) Obtaining and developing PGDP GIS information; 3) Correlation of GIS data to site environmental data; 4) Implementation of a beta PGDP-DWGIS for evaluation by end-users; 5) Beta-testing by KRCEE and PGDP end-users; 6) Revision of the beta PGDP-DWGIS based

upon end-user comments; and 7) Identification of Phase II (future) data-GIS needs based on input from PPPO and PGDP end-users. The PGDP-DWGIS was prepared for release in mid-January 2006 following the completion of Phase I development and deployment activities. KRCEE personnel, PGDP contractors, and PPPO staff have had the capability to utilize the PGDP-DWGIS in the execution of daily work since that time.

KRCEE has identified and undertaken Phase II PGDP-DWGIS development tasks that will enhance the utility of the Phase I PGDP-DWGIS. Those tasks include; 1) development and implementation of several areal GIS spatial query tools; 2) inclusion of field measurement data in the data warehouse; 3) linkage of field measurement data to GIS components; 4) an OREIS database update; 5) GIS layer additions such as local property ownership from the McCracken County PVA; 6) expansion of the default data set downloads from the data warehouse and the GIS interface; 7) development of data-field choices for downloaded data; and 8) Development of a GIS analyst tool that will permit download of data and shape files for use in software packages such as ARCGIS 9.x. Additional Phase II PGDP-DWGIS development recommendations are identified later in the text.

A new contracting team for the PGDP, Paducah Remediation Services (PRS) and Swift and Staley Management Corporation (SSMC), was identified in late December 2005. The transition of site activities from the existing Bechtel-Jacobs contract team to PRS and SSMC is expected to be complete in late April 2006. Following contract transition, PRS will assume management of the PGDP OREIS database and the OREIS database will be physically transferred from Oak Ridge to the PGDP. As a result of the transfer, the OREIS web access for the PGDP will be discontinued. Access to the PGDP-DWGIS will be required by PRS personnel, SSMC personnel, and PPPO end-users to replace discontinued OREIS access.

In addition to access by PRS, SSMC, and PPPO personnel, access to the PGDP-DWGIS will be required by the KRCEE, Commonwealth of Kentucky regulators and stakeholders such as the PGDP CAB.

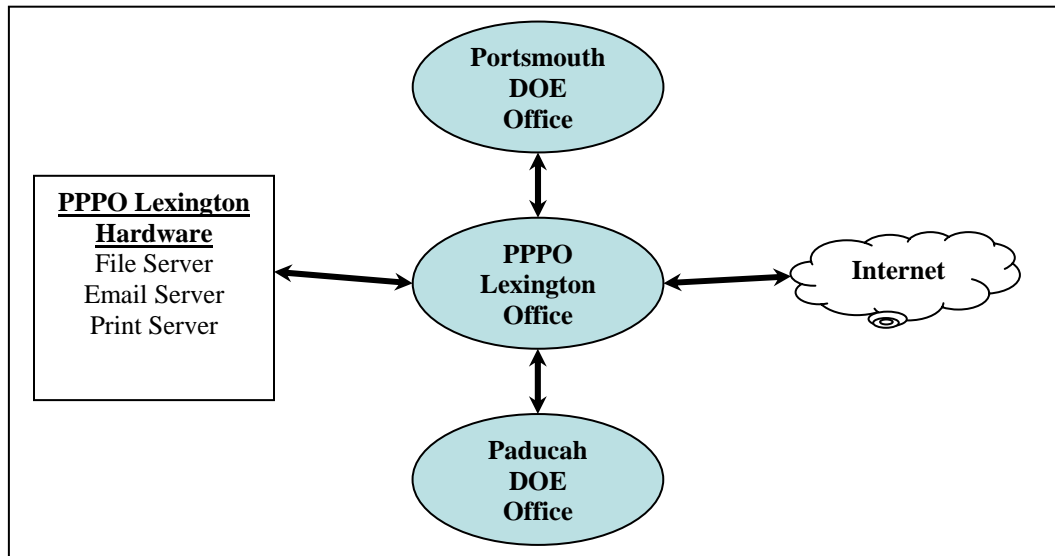
## **4. Existing Networks**

### **4.1 LEXINGTON PPPO & LEXNET**

#### **4.1.1. Current Status**

LEXNET is a USDOE network that presently utilizes a server in the Lexington PPPO as a hub. Paducah and Portsmouth DOE site staff are connected to LEXNET based upon need and security clearance (Figure 1). The Lexington PPPO hub has the internet gateway for the LEXNET network. Presently only basic file, print and email services are used within the PPPO LEXNET network. There are no database servers or web servers associated with the Lexington PPPO LEXNET hub. There is no GIS software located on the Lexington PPPO hub that is operated across the LEXNET network.

LEXNET has firewall security policies that govern the information allowed in and out of the network. Because of the secure nature of the LEXNET network, PPPO IT professionals have indicated that it is not feasible to utilize LEXNET to distribute the PORTS DWGIS and/or the PGDP DWGIS.



**Figure 1. Current LEXNET Configuration**

#### **4.1.2 Recommendation for PPPO Infrastructure**

Administration, operation, and maintenance of the PORTS DWGIS and PGDP DWGIS utilizing LEXNET and the PPPO as the location for the primary hub for both systems would require the procurement of server hardware and server software as well as GIS workstation hardware and software for the PPPO office. Additional requirements necessary for the utilization of the PPPO as the primary hub for both systems would be 1) procurement of additional T1 service lines to operate both the PORTS DWGIS and PGDP DWGIS; 2) the hire of one or more IT professionals to provide daily administration, operation, and maintenance of the systems; and 3) security allowances be made and access granted to the LEXNET network to many end-users that do not presently have access and connectivity to the LEXNET network.

A significant drawback to utilizing PPPO or any other hub is that remote access (across the internet) to a DWGIS end-user is significantly affected by the speed of data transmission and the available bandwidth for communication from the hub through the web to the end user. Firewall security protocols are an additional drawback to utilizing a single centralized hub for the PGDP-DWGIS and/or the PORTS-DWGIS. The speed of remote transmissions to an end-user can be greatly diminished by firewall security protocols. Beta-testing observations indicated that distance and firewall security issues diminished the speed of T1 data connections to rates that were less than or equal to transmission speed of data across DSL and broadband connections.

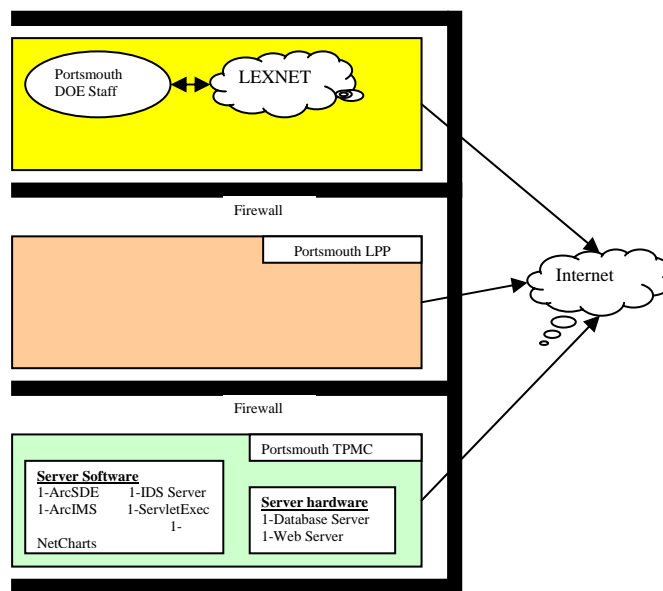
KRCEE does not recommend that DOE-PPPO utilize its facilities to house, administer, operate and maintain the PORTS DWGIS and the PGDP DWGIS. Additionally, KRCEE does not recommend that DOE PPPO procure server hardware or software necessary for the operation of the PORTS and PGDP systems.

KRCEE does recommend that DOE PPPO utilize internet connectivity to a 3<sup>rd</sup>-party host for PPPO internal PORTS and PGDP DWGIS interface needs.

## 4.2. PORTSMOUTH

### 4.2.1. Current Status

PORTS has three networks: 1) LEXNET, 2) an independent LPP local network; and 3), an independent TPMC local network. These three networks are separated by firewalls and do not interface. Each network has dedicated equipment (servers, printers, etc.) to perform local network functions. All three networks have gateways to the internet.



**Figure 2. Portsmouth Current Configuration**

The TPMC network currently utilizes two servers to operate the PORTS-DWGIS. However, the PORTS-DWGIS is available for internal TPMC use only and is not accessible to the LPP local network or LEXNET. Only the TPMC network users have access to the Portsmouth Data Warehouse, web site, and GIS software.

TPMC currently has GIS software ArcSDE and ArcIMS on a server. ArcInfo is installed on one GIS workstation. TPMC also has server software SQL Server, IDS Server, ServletExec, NetCharts and J2EE in order to administer the PORTS-DWGIS.

## 4.2.2. PORTS-DWGIS Recommendation

TPMC has procured and installed the hardware and software required to operate and maintain the PORTS-DWGIS on the TPMC network. TPMC will maintain the PORTS-DWGIS under the terms of its contract with the DOE.

TPMC should establish the necessary firewall exceptions to allow LPP, PORTS contractors, DOE PPPO, and others with a “need to know” access to the PORTS-DWGIS.

TPMC personnel will require training on the operation and maintenance of the PORTS-DWGIS. TPMC, LPP, PORTS contractors, and DOE PPPO personnel will also require training on the use of the PORTS-DWGIS. Costs associated with implementation of the PORTS-DWGIS are outlined in Table 3.

**Table 3. Cost Estimate for Implementation of PORTS-DWGIS recommendation.**

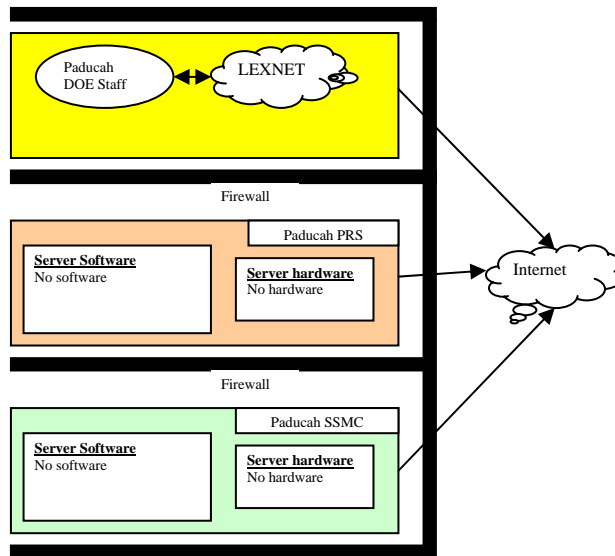
Cost Element	Cost
<b>PORTS-DWGIS</b>	
Server Hardware Cost	\$0.00
Server Software Cost	\$0.00
Training Cost	\$20,000.00
New Feature Configuration (from PGDP-DWGIS)	\$5,000.00
<b>Total PORTS Training/Configuration Subcontract</b>	<b>\$25,000.00</b>
KRCEE Administrative Cost	\$5,000.00
UK Indirect Cost	\$11,875.00
<b>Total PORTS Training/Configuration Contract Costs thru KRCEE</b>	<b>\$41,875.00</b>

## 4.3 PADUCAH

### 4.3.1 Current Status

PGDP has three networks: 1) LEXNET; 2) an independent PRS local network; and 3) an independent SSMC local network (Figure 3). These three networks are separated by firewalls and local security. All three networks have gateways to the internet.

Each network has dedicated equipment (servers, printers, etc.) to perform local network functions. There are no network servers in place for the PGDP-DWGIS. There currently is no GIS software ArcSDE, ArcIMS and ArcInfo in place at the PGDP. Additionally there is no server software SQL Server, IDS Server, ServletExec, NetCharts and J2EE procured or installed at the PGDP for the operation of the PGDP-DWGIS.



**Figure 3. Paducah Current Configuration**

#### 4.3.2 PGDP-DWGIS Recommendation

Procure the hardware and software for the PRS network (Table 4). Train PRS on the operation and maintenance of the Paducah Data Warehouse and GIS Viewer. PRS will maintain the system and provide access to Paducah contractors that have the need to access data. PRS will establish any firewall exceptions for the Paducah contractor end-users.

**Table 4. Cost Estimate for Implementation of PGDP-DWGIS recommendation.**

<b>PGDP-DWGIS Implementation &amp; Training</b>	
Server Hardware Cost (See Attachment 1 - Table 1)	\$13,000.00
Server Software Cost (See Attachment 2 - Table 2)	\$39,200.00
<b>Total Hardware &amp; Software Cost for PGDP IT Contractor</b>	<b>\$52,200.00</b>
Implementation Configuration & Training Cost	\$20,000.00
<b>Total Implementation &amp; Training Subcontract</b>	<b>\$20,000.00</b>
Administrative Costs	\$4,000.00
UK Indirect Costs	\$11,400.00
<b>Total PGDP-DWGIS Implementation Contract Costs thru KRCEE</b>	<b>\$35,400.00</b>
<b>Total PGDP-DWGIS Implementation Costs</b>	<b>\$107,600.00</b>
<b>PGDP-DWGIS Implementation &amp; Training</b>	
Server Hardware Cost (See Attachment 1 - Table 1)	\$13,000.00
Server Software Cost (See Attachment 2 - Table 2)	\$39,200.00
<b>Total Hardware &amp; Software Cost for PGDP IT Contractor</b>	<b>\$52,200.00</b>
Implementation Configuration & Training Cost	\$20,000.00
<b>Total Implementation &amp; Training Subcontract</b>	<b>\$20,000.00</b>
Administrative Costs	\$4,000.00
UK Indirect Costs	\$11,400.00

<b>Total PGDP-DWGIS Implementation Contract Costs thru KRCEE</b>	<b>\$35,400.00</b>
<b>Total PGDP-DWGIS Implementation Costs</b>	<b>\$107,600.00</b>

## **5. Interfaces**

### **5.1. Interface with OREIS**

#### **5.1.1. Current Status**

The PORTS and PGDP OREIS databases were maintained by Bechtel-Jacobs, Inc. in Oak Ridge until April 17<sup>th</sup>, 2006 when the Portsmouth OREIS database was moved to PORTS and the Paducah OREIS database was being moved to PGDP. The OREIS database servers for both PORTS and PGDP will be maintained independently behind secure firewalls.

The interfaces between both the PORTS-DWGIS and PGDP-DWGIS and OREIS have been conducted indirectly. The indirect process includes three steps:

- 1) A formal request is submitted for electronic release of the data;
- 2) Data is copied to a compact disk and delivered via mail;
- 3) Contents of the compact disk are uploaded to the data warehouse.

#### **5.1.2. Alternatives**

- 1) Continue the current manual process or
- 2) Automate the OREIS update process. Steps 1 and 2 (above) that presently require manual processing should be replaced with a routinely scheduled secure access procedure between OREIS and both DWGIS systems. The mechanism to automate this activity would require OREIS to be accessed via a secure virtual private network (VPN) protocol. The VPN access would allow for read-only access and provide direct connection from each DWGIS system to OREIS for routine periodic updates.

#### **5.1.3. Recommendation**

Alternative 2. Acquire a secure VPN connection to the OREIS server and acquire login credentials for the Paducah and Portsmouth databases and provide a seamless connection from OREIS. Figure 4 describes the recommended configuration.

## **5.2 Interface with PPPO/Site Office**

### **5.2.1. Current Status**

There is no access for PPPO and the PORTS Site Office to the PORTS-DWGIS that is hosted in Portsmouth by TPMC. Also, there is no access for PPPO and the PGDP to the PGDP-DWGIS that will be hosted in Paducah by PRS. PPPO does not have the hardware or software necessary to host the PORTS-DWGIS or the PGDP-DWGIS.

LEXNET administrators do not desire to support any other systems on the local network. Some PPPO staff members have temporary usernames to the PGDP-DWGIS on a test server via the internet. This test server will be phased out in a future phase of development.

### **5.2.2. Alternatives**

- 1) The PORTS Site Office interface could be provided via a secure virtual private network (VPN) protocol through the Portsmouth firewall. A similar configuration could be provided for the PGDP Site Office after PRS procures required hardware and software and deploys the PGDP-DWGIS.
- 2) Place snapshot versions of the PGDP- and PORTS-DWGIS systems onto a 3<sup>rd</sup> Party server. The server would be accessible to PPPO without any VPN protocol.

### **5.2.3. Recommendation**

Alternative 2. Have a 3<sup>rd</sup> Party hosting server that maintains **snapshot DWGIS** information for both PORTS and PGDP. Figure 4 describes the recommended configuration.

## **5.3 Interface with UK & KY Regulators/Public**

### **5.3.1. Current Status**

UK-KRCEE staff members currently have temporary usernames to the PGDP-DWGIS on a test server via the internet. This test server will be phased out in the near future. Commonwealth of Kentucky regulators and stakeholders have no access to the PGDP-DWGIS. A simplified, security sanitized version of the PGDP-DWGIS is desired for the KY regulators, stakeholders, and the public.

### **5.3.3. Recommendation**

Place a snapshot version of the PGDP-DWGIS systems onto a 3<sup>rd</sup> Party host server. The 3<sup>rd</sup> party host server would be accessible to UK-KRCEE, regulators, stakeholders, and public without any VPN protocol..

Since a similar system for access is already required for PPPO connectivity to the PGDP-DWGIS, the same access method should be implemented for UK, regulators, stakeholders, and the public. It is recommended that the requirements for a simplified PGDP-DWGIS interface be identified by DOE-PPPO and a simplified PGDP-DWGIS be developed and deployed for regulators, stakeholders, and public end-users. Figure 4 describes the recommended configuration.

## **5.4. 3<sup>rd</sup> Party Host Configuration**

### **5.4.1. Current Status**

SAIC currently hosts the PGDP DWGIS on a development server. This server is accessed securely via the internet by KRCEE, select PPPO personnel, and Paducah beta testers. The Paducah beta-testers are made up of UK, PGDP contractors and PPPO end-users.

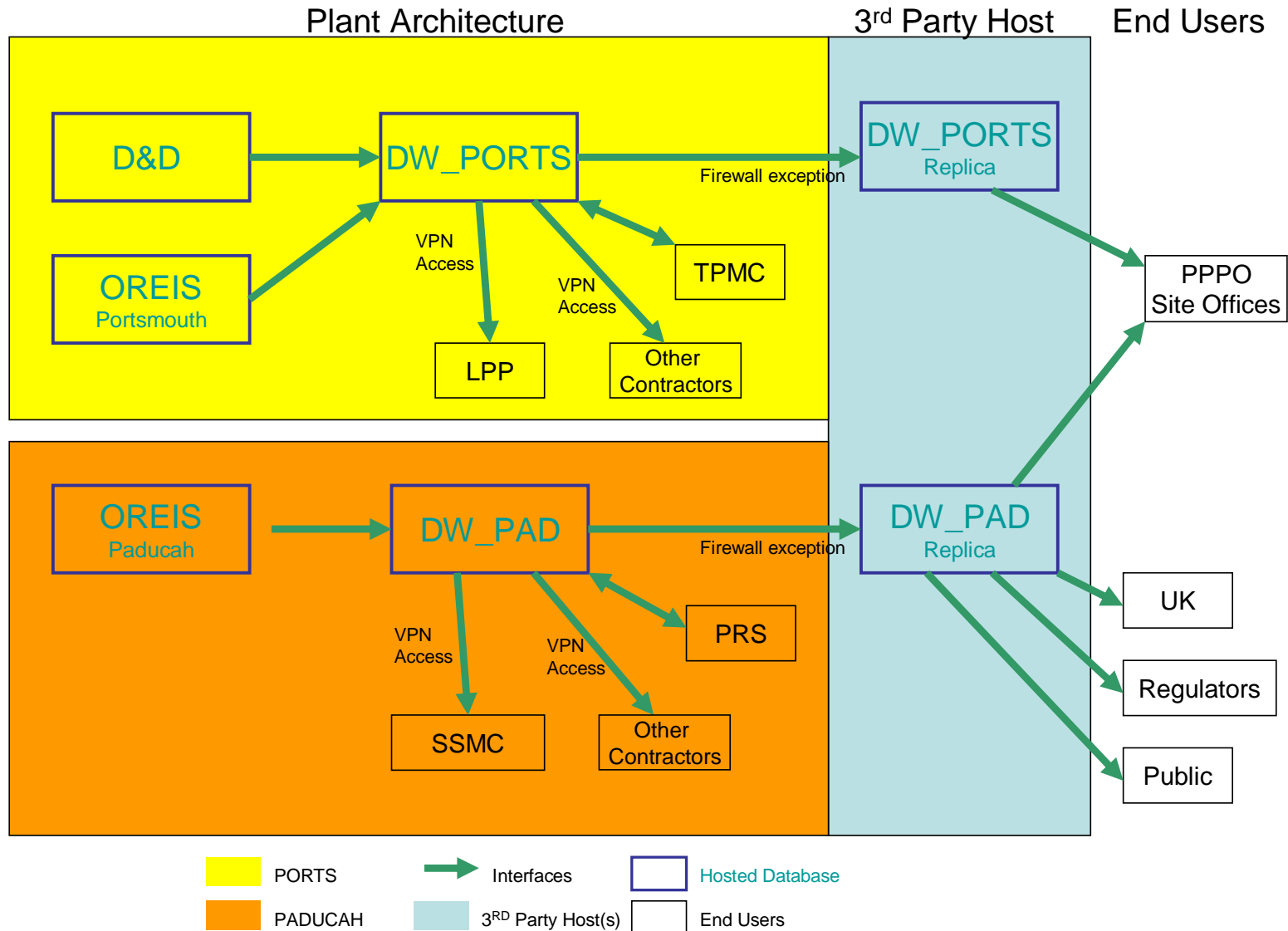
### 5.4.3. Recommendation

Place a snapshot version of the PORTS and PGDP DWGIS systems onto a secure 3<sup>rd</sup> party host server. The 3<sup>rd</sup> party host could be located securely at SAIC-Dublin or at UK-KGS. The server would be securely accessible to PPPO, the PGDP Site Office, and UK-KRCEE. Secure access would provide the same PORTS DWGIS and PGDP-DWGIS that are available to site contractors and the site offices. Access would be made available to Commonwealth of KY regulators and stakeholders without any VPN protocol. The 3<sup>rd</sup> Party host would maintain secure usernames and passwords and distribute notices of updates to end-users.

Since a system for access is already required for PPPO, simply use the same access method for UK-KRCEE, regulators and stakeholders. Collect requirements for and develop a simplified PGDP DWGIS interface for the KY regulators and public end-users. Costs for implementing the KRCEE 3<sup>rd</sup> party hosting recommendation are in Table 5. Figure 4 describes the recommended configuration.

**Table 5. Estimated Costs for 3<sup>rd</sup> Party Hosting of Regulator and Stakeholder DWGIS**

<b>PGDP 3<sup>rd</sup> Party Hosting</b>	
Annual Hosting Fee (\$1,250/mo.)	\$15,000
Configuration Cost	\$5,000
Regulator/Public Web Site (Requirements & Design)	\$20,000
<b>Total Subcontract Cost</b>	<b>\$40,000</b>
Administration	\$10,000
Technical Support	\$10,000
UK Indirect Charges	\$21,375
<b>Total 3<sup>rd</sup> Party Host Contract Costs thru KRCEE</b>	<b>\$81,375</b>



**Figure 4. Recommended Architecture Configuration for PORTS and PGDP networks & DWGIS.**

## 6.0. System Development and PGDP/PORTS DWGIS Interchange

System tools developed for the original PORTS-DWGIS were used to develop the Phase I PGDP-DWGIS. Following the completion of the Phase I PGDP-DWGIS development, KRCEE began development and implementation of specific additional features and tools to benefit PGDP-DWGIS end-users. Those features are described in detail in Attachment 5 and include updating the PGDP-DWGIS with field measurement data, new GIS layers, and several GIS viewer data query tools. These features along with additional features discussed in Section 7.0 are ready for immediate application to the PORTS-DWGIS. PPPO is provided a very cost effective opportunity to operate state-of-the-art data warehouse/GIS systems through direct utilization and application of features developed for the PGDP-DWGIS on the PORTS DWGIS and vice-versa.

## 7.0. DWGIS Phase II Development

### 7.1 Recommended DWGIS Phase II Development Tasks

A PGDP-DWGIS Phase II Development Proposal (Attachment 5) was compiled by KRCEE between November 2005 and early January 2006. The proposal recommended development and deployment of enhancements to the Phase I PGDP-DWGIS based upon UK and PGDP end-user beta-tester feedback. The following features, tools, and tasks were identified for development, deployment, and/or distribution in the KRCEE Phase II development proposal (Table 6):

**Table 6. Proposed Features for KRCEE Phase II PGDP-DWGIS Development**

Proposed Activity	Description	Completed Or Underway	Pending Funding
1.	Document Indexing and Linkage Module		X
2.	Risk Assessment Module		X
3.	Training		X
4.	On-Going Data Support and Integration	X	
5.	Development of Spatial Query Tools	X	
6.	Development of DWGIS GIS Analyst Feature Extraction Tools		X
7.	White Paper for 3-D Visualization Software		X

KRCEE began development and deployment of proposed Phase II activities 4 and 5 (Table 4) in January 2006. The development of items 4 and 5 was undertaken with DOE-UK/KRCEE earmark funding. Items 1, 2, 3, 6 and 7 will require funding from DOE-PPPO or site contractors for completion. Detailed information on the proposed Tasks for PGDP-DWGIS development can be found in Attachment 5.

### 7.2 Completed/Underway DWGIS Phase II Development Tasks

The status of proposed PGDP-DWGIS Phase II activities 4 and 5 varies: Activity 4, “Ongoing Data Support and Integration”, is ongoing and expected to be completed by September 2006;

Activity 5, “Spatial Query Tools”, was completed and the tools deployed to the PGDP-DWGIS in March 2006. . Tasks 4 and 5 are described and their status is identified below.

- **Task 4**, On-Going Data Support and Integration, consists of long-term activities to continue updating the data warehouse with additional data; include newer OREIS data, newer or updated GIS features, geoscience data generated from historical and on-going projects, and the activation of web interfaces for geoscience data. Task 4 is underway and will be ongoing. GIS features such as as property ownership and tax assessment have been added to the GIS Viewer Web Page since January 2006. Also since January 2006, the Data Warehouse has been updated to include PGDP field measurement data as well as expanded default data category downloads and user-specified data category downloads.
- **Task 5**, Development of Spatial Query Tools, is the development and deployment of several geospatial query tools for the GIS Viewer Web Page. Four (4) tools that will allow end-users to spatially query data have been developed and deployed on the PGDP-DWGIS GIS Viewer Web Page: 1) Select data by Rectangle; 2) Select data by Polygon; 3) Select data by Radius; and 4) Select data by Buffer. These tools are already deployed on the PGDP DWGIS.

### 7.3 DWGIS Phase II Development Tasks To Be Completed

- **Task 1**, Document Indexing and Linkage Module, is the development and deployment of a standardized methodology to collect, index, link and then distribute technical PGDP documents to end-users via the web-based data warehouse. An integrated approach utilizing commercial web document indexing is described in this section and documents related to sampling locations, SWMUs, OUs, etc. could be linked to the GIS Web Viewer through the use of a query tool.
- **Task 2**, Risk Assessment Module, is the scoping, development, and deployment of a Risk Assessment Module that applies standardized statistical analysis of environmental data for comparison to human health risk-based standards and compliance standards. Traditionally this type of comparison is periodically conducted by scientists every time new data is added. Each scientist downloads the data, standardizes the data, compares the data and runs statistics on the data in a redundant process. This module will perform risk-based data comparison process as needed so that end-users can access the risk-based comparisons from the web-based GIS.
- **Task 3**, Training, describes two types of training to be conducted for the Paducah Data Warehouse and GIS. The first training session will be targeted for general system use for up to 12 users. The other training session is for server configuration and installation limited to a smaller group of IT professionals.
- **Task 6**, Development of DWGIS GIS Analyst Feature Extraction Tools, consists of the development and deployment of a feature extraction tool for the DWGIS that would allow GIS analysts and end-users to download active GIS layers and data directly from the GIS Viewer Web Page. Once downloaded, the GIS layers and data could be used for geospatial analysis in ARCGIS/ARCINFO and for production of presentation

quality graphics and production of reports. This tool allows for ready access to routinely updated GIS layers and data.

- **Task 7**, White Paper for 3-D Visualization Software, consists of the development of a white paper to identify three-dimensional data visualization tools for the PGDP. The white paper, when completed, will define the specific software, software capabilities, and software applicability for 3-D visualization of various types of PGDP data. The white paper is proposed to be developed to serve as the basis for identifying the appropriate 3-D visualization software for use at the PGDP. Once appropriate 3-D visualization software is identified, future development proposal will address the development of a GIS Viewer Web Page tool to export data in the format(s) necessary for direct utilization in 3-D software.

#### 7.4 Phase II PGDP DWGIS Cost Estimates

The subcontract task costs for development of Tasks 1, 2, 3, 6, and 7 and the time frames for completion of those tasks is identified in Table 7a below. Table 7b reflects the total costs for completion of the Phase II DWGIS development tasks including management and indirect institutional costs.

**Table 7a. PGDP-DWGIS Phase II Development Subcontractor Task Costs**

<b>Proposed Activity</b>	<b>Description</b>	<b>Time to Complete</b>	<b>Pending Funding</b>
<b>1.</b>	Document Indexing and Linkage Module	12 mos.	<b>\$30,000.00</b>
<b>2.</b>	Risk Assessment Module*	12-15 mos.	<b>\$33,000.00</b>
<b>3.</b>	Training	3 mos.	<b>\$10,000.00</b>
<b>6.</b>	Development of DWGIS GIS Analyst Feature Extraction Tools	3 mos.	<b>\$9,500.00</b>
<b>7.</b>	White Paper for 3-D Visualization Software	3 mos.	<b>\$4,000.00</b>
*The proposed Risk Assessment Module proposes use of KRCEE macros. Should new macro development be necessary or SAS type statistical program development be scoped for this task, additional costs would be incurred.			

**Table 7b. PGDP-DWGIS Phase II Development Contract Costs**

<b>PGDP-DWGIS Phase II Development</b>	
<b>Total SubContract Costs</b>	<b>\$86,500.00</b>
Administration	\$21,300.00
Technical Support	\$20,000.00
UK Indirect Cost	\$31,492.50
<b>Total Contract Cost for Phase II Development thru KRCEE</b>	<b>\$159,292.50</b>

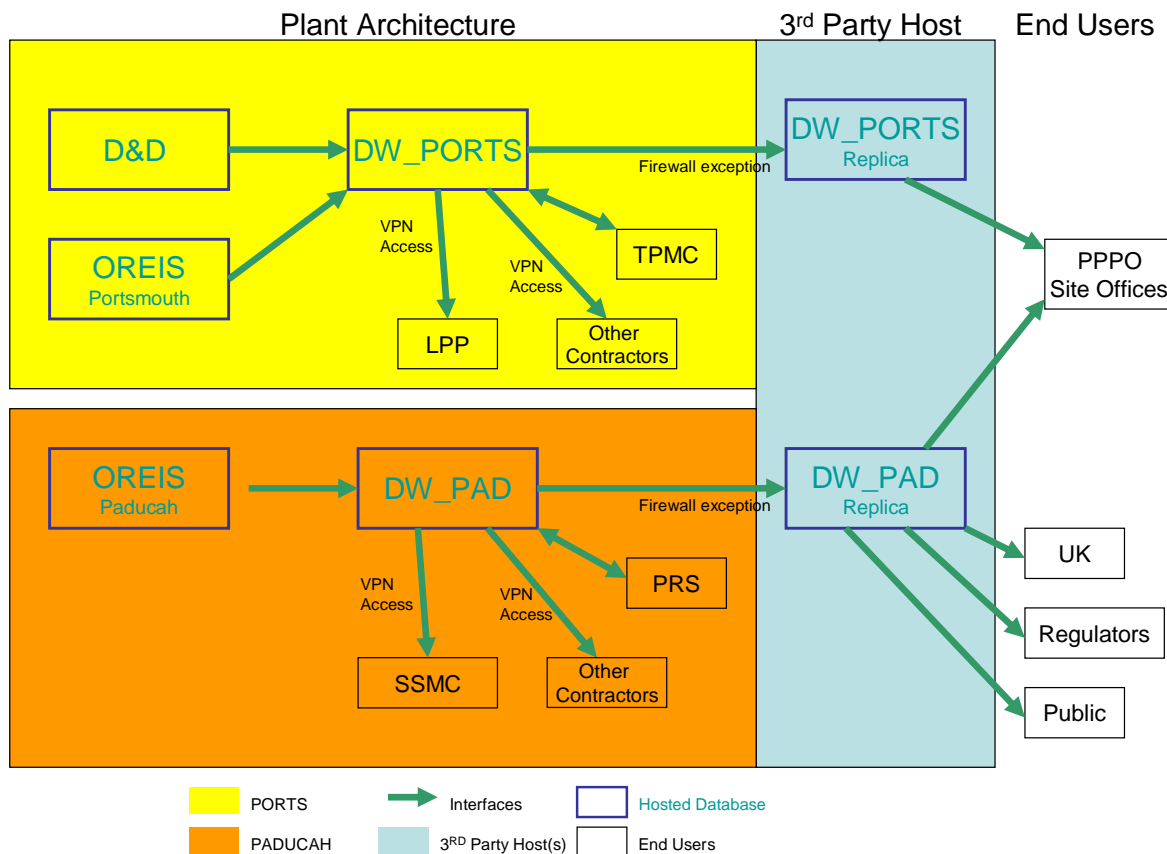
## 8.0. Recommendations and Cost Summaries

### 8.1. System Architecture Recommendations and Implementation Costs

The following sections summarize the recommendations for system architecture for the PORTS DWGIS, PGDP DWGIS, and LEXNET/PPPO management/connectivity to the DWGIS.

#### 8.1.1 PORTS/PGDP DWGIS General Architecture Recommendation

Figure 5 illustrates the recommended architecture for the PORTS-DWGIS, PGDP-DWGIS to be administered and provide access to end-users such as PPPO, UK-KRCEE, regulatory agencies, and stakeholders.



**Figure 5. Recommended Architecture for PGDP and PORTS DWGIS.**

#### 8.1.2 PGDP-DWGIS, PORTS-DWGIS and OREIS Interface

KRCEE recommends that the PORTS-DWGIS and PGDP-DWGIS OREIS update processes be automated and conducted on a regular basis such as monthly or quarterly. To allow access to the secure OREIS databases for both PORTS and PGDP, it is recommended that a secure read-only virtual private network (VPN) protocol be developed.

### **8.1.3 PPPO and LEXNET DWGIS Administration & Interface**

KRCEE does not recommend that DOE PPPO utilize its facilities to house, administer, operate and maintain the PORTS DWGIS and the PGDP DWGIS. The following bullets summarize the reason for the recommendation.

- Administration, operation, and maintenance of the PORTS DWGIS and PGDP DWGIS would require the procurement of server hardware.
- Would require the procurement of server software
- Would require procurement of GIS workstation hardware and software
- Would require procurement of additional T1 service lines to provide capacity to operate both the PORTS-DWGIS and PGDP-DWGIS;
- Would require the hire of one or more IT professionals to provide daily administration, operation, and maintenance of the systems; and
- Would require the implementation of clearance and access for end-users that do not presently have clearance for the LEXNET network.
- Speed of remote transmissions could be significantly reduced because of distance, bandwidth and firewall security issues.

KRCEE does recommend that DOE-PPPO utilize internet connectivity to a 3<sup>rd</sup>-party host for PPPO internal PORTS and PGDP DWGIS interface needs (Figure 5).

### **8.1.4 3<sup>rd</sup> Party Hosting for PPPO, Regulators, Stakeholders, Site Offices**

It is recommended that a 3<sup>rd</sup> party host be utilized to provide access to the PGDP-DWGIS for PPPO, Regulators, UK-KRCEE, and Stakeholders. It is also recommended that a 3<sup>rd</sup> party host is utilized to provide PORTS-DWGIS access to the PORTS Site Office. The 3<sup>rd</sup> party host would be administered, maintained and operated by UK-KGS or SAIC in Dublin, Ohio. Different versions of the PGDP-DWGIS would be designed and implemented for Regulators and stakeholders. Total KRCEE contract costs to implement 3<sup>rd</sup> party hosting are identified in Table 5 and Table 8.

### **8.1.5 PORTS-DWGIS**

The following is recommended for the setup, operation, and maintenance of the PORTS DWGIS.

- TPMC should establish the necessary firewall exceptions to allow PORTS contractors, the PORTS Site Office, and others with “need to know” requirements access to the PORTS-DWGIS.
- TPMC should acquire training on the operation and maintenance of the PORTS DWGIS
- TPMC should acquire training to PORTS end-users on the use of the PORTS-DWGIS.

The bullets below summarize the reasons for the architecture and training recommendations.

- TPMC has procured and installed the hardware and software required to operate and maintain the PORTS-DWGIS on the TPMC network.
- TPMC will maintain the PORTS-DWGIS under the terms of its contract with the DOE. Costs associated with training and implementation of the PORTS-DWGIS are outlined in Table 3 and Table 8.
- TPMC has not received administrator or end-user training for the PORTS-DWGIS.

The costs for TPMC to implement access to the PORTS-DWGIS are not addressed by this proposal. The costs for recommended training to be provided to TPMC IT administrators and end-users is summarized in Table 3 and Table 8. Training could be provided through a DWGIS contract with KRCEE. The costs for KRCEE to contract and manage PORTS training are reflected in Table 3 and Table 8.

### **8.1.6 PGDP-DWGIS**

The following bullets identify the recommendations for implementation, administration, operation, and maintenance of the PGDP-DWGIS.

- Procure the hardware and software for the PRS network (Table 8).
- Train PRS on the operation and maintenance of the PGDP-DWGIS.
- PRS will maintain the system and provide access to Paducah contractors that have the need to access data (Figure 5).
- PRS will establish any firewall exceptions for the Paducah contractor end-users.

## **8.2 PGDP-DWGIS Phase II Development & Costs**

Table 6 identifies the tasks that comprise the scope of the KRCEE PGDP-DWGIS Phase II Development Proposal (Attachment 5). Tasks 4 and 5 have been undertaken by KRCEE utilizing DOE earmark funding. Tasks 1, 2, 3, 6, and 7 are recommended for development and deployment to the PGDP-DWGIS. The timeframes and task subcontract costs are identified in Table 7a and cost for completion of proposed PGDP-DWGIS development Tasks 1, 2, 3, 6, and 7 and are identified in Table 7b and Table 8.

The costs for Phase II development are one-time costs. Future costs for development of additional features and capabilities would be dependent upon identification of additional features for the DWGIS and a decision to undertake development of those features.

### 8.3 Costs for PGDP-DWGIS, PORTS-DWGIS, and PGDP-DWGIS Phase II Development

**Table 8. Proposed-DWGIS Implementation, Development & Hosting Costs**

Cost Element	Cost
<b>PORTS-DWGIS</b>	
Server Hardware Cost	\$0.00
Server Software Cost	\$0.00
Training Cost	\$20,000.00
New Feature Configuration (from PGDP-DWGIS)	\$5,000.00
<b>Total PORTS Training/Configuration Subcontract</b>	<b>\$25,000.00</b>
KRCEE Administrative Cost	\$5,000.00
UK Indirect Cost	\$11,875.00
<b>Total PORTS Training/Configuration Contract Costs thru RCEE</b>	<b>\$41,875.00</b>
<b>PGDP-DWGIS Implementation &amp; Training</b>	
Server Hardware Cost (See Attachment 1 - Table 1)	\$13,000.00
Server Software Cost (See Attachment 2 - Table 2)	\$39,200.00
<b>Total Hardware &amp; Software Cost for PGDP IT Contractor</b>	<b>\$52,200.00</b>
Implementation Configuration & Training Cost	\$20,000.00
<b>Total Implementation &amp; Training Subcontract</b>	<b>\$20,000.00</b>
Administrative Costs	\$4,000.00
UK Indirect Costs	\$11,400.00
<b>Total PGDP-DWGIS Implementation Contract Costs thru KRCEE</b>	<b>\$35,400.00</b>
<b>Total PGDP-DWGIS Implementation Costs</b>	<b>\$107,600.00</b>
<b>PGDP 3<sup>rd</sup> Party Hosting</b>	
Annual Hosting Fee (\$1,250/mo.)	\$15,000
Configuration Cost	\$5,000
Regulator/Public Web Site (Requirements & Design)	\$20,000
<b>Total Subcontract Cost</b>	<b>\$40,000</b>
Administration	\$10,000
Technical Support	\$10,000
UK Indirect Charges	\$21,375
<b>Total 3<sup>rd</sup> Party Host Contract Costs thru KRCEE</b>	<b>\$81,375</b>
<b>PGDP-DWGIS Phase II Development</b>	
<b>Total SubContract Costs</b>	<b>\$86,500.00</b>
Administration	\$21,300.00
Technical Support	\$20,000.00
UK Indirect Cost	\$31,492.50
<b>Total Contract Cost for Phase II Development thru KRCEE</b>	<b>\$159,292.50</b>

# ATTACHMENT 1

## Server Hardware Requirements

**Table 1. Hardware Requirements for Data Warehouse and Web Site.**

Hardware Requirements			
Hardware Model	Vendor	Use and Configuration	Cost <sup>a</sup>
PowerEdge 2850	Dell <a href="http://dell.com">http://dell.com</a>	<p><b>Database server:</b></p> <ul style="list-style-type: none"> <li>• Dual 3.0 GHz CPU LV/2 MB cache;</li> <li>• 4 GB DDR2 400 MHz (2 x 2 GB DIMMs) RAM;</li> <li>• 2 x 146 GB U320 SCSI hard drive (RAID1 configuration)</li> <li>• 4 x 146 GB U320 SCSI hard drive (RAID5 configuration);</li> <li>• Windows Server™ 2003 Standard Edition, Includes Microsoft IIS</li> <li>• CD+RW/DVD+RW.</li> </ul>	\$7,500
PowerEdge 2850	Dell <a href="http://dell.com">http://dell.com</a>	<p><b>Web Server:</b></p> <ul style="list-style-type: none"> <li>• Single 3.0 GHz CPU LV/2 MB cache;</li> <li>• 4 GB DDR2 400 MHz (2 x 2 GB DIMMs) RAM;</li> <li>• 2 x 146 GB U320 SCSI hard drive (RAID1 configuration)</li> <li>• Windows Server™ 2003 Standard Edition, Includes Microsoft IIS</li> <li>• CD+RW/DVD+RW.</li> </ul>	\$5,500

<sup>a</sup> Pricing included as an estimation of cost for DOE procurement. Pricing is an approximation based on the configuration noted using the Dell.com website. Actual cost will vary dependant upon complete configuration procured by DOE.

## **ATTACHMENT 2**

## Server Software Requirements

**Table 2. Software Requirements for Data Warehouse and Web Site**

Software Requirements				
Software Product	Vendor	Current Version	Purpose/Use	Cost <sup>a</sup>
ArcInfo™	ESRI® <a href="http://www.esri.com/products.html">http://www.esri.com/products.html</a>	9.1	Main GIS geoprocessing and analysis software. One license can be shared by multiple locations with access to the license server software. Concurrent multi-seat licensing is more cost effective than single independent licenses.	\$12,600
ArcIMS®	ESRI® <a href="http://www.esri.com/products.html">http://www.esri.com/products.html</a>	9.1	Allows web-based dynamic map and GIS services (Internet Map Server). One license required for each web server.	\$9,000
ArcSDE™	ESRI® <a href="http://www.esri.com/products.html">http://www.esri.com/products.html</a>	9.1	Server software used to access spatially-enabled data stored on relational database (SQL Server). One license can be shared by multiple locations.	\$9,000
SQL Server 2005 Standard Edition	Microsoft® <a href="http://www.microsoft.com/sql/2005/default.msp">http://www.microsoft.com/sql/2005/default.msp</a>	2000	Relational database server application software. One license required for each database server.	\$4,500
IDS Server	IDS Software <a href="http://www.idsoftware.com/">http://www.idsoftware.com/</a>	4.15	Allows connection between Java database (JDBC) and Microsoft (ODBC). One license required for each database server.	\$1,495 <sup>b</sup>
ServletExec®	New Atlanta Communications, LLC <a href="http://www.newatlanta.com/products/index.jsp">http://www.newatlanta.com/products/index.jsp</a>	5.0	Web application server that allows Java Server Pages (JSP™) to be run on Microsoft IIS. Used for dynamically requesting and receiving map information with ArcIMS®. One license required for each web server.	\$695 <sup>b,c</sup>
NetCharts® Applets	Visual Mining, Inc. <a href="http://www.visualmining.com/products/netcharts-graphing-tools.shtml">http://www.visualmining.com/products/netcharts-graphing-tools.shtml</a>	4.6	Allows dynamic charting and trending of data within webpage. One license required for each web server.	\$2,000 <sup>d</sup>
Java 2 Enterprise Edition (J2EE™) Software Development Kit (SDK)	Sun Microsystems, Inc. <a href="http://java.sun.com/j2ee/1.4/download.html#sdk">http://java.sun.com/j2ee/1.4/download.html#sdk</a>	1.4	Allows NetCharts® Java applet to function without each user having to download a Java web browser plug-in. One license required for each web server.	No Cost. Download for free from Sun Microsystems.

<sup>a</sup> Pricing included as an estimation of cost for DOE procurement. Pricing assumes one CPU server license. May require additional cost if server has multiple CPUs; all pricing GSA ([https://www.gsaadvantage.gov/advgsa/advantage/main/start\\_page.do](https://www.gsaadvantage.gov/advgsa/advantage/main/start_page.do)) except where noted.

<sup>b</sup> No GSA pricing available; price from vendor website.

<sup>c</sup> Assumes no 2-year upgrade subscription (\$995 with upgrade subscription).

<sup>d</sup> No GSA pricing available; price directly from vendor sales staff quote; price assumes no support package (\$2,400 with support).

## **ATTACHMENT 3**

# GIS Analyst Hardware and Software Requirements

Table 3. Hardware & Software Requirements for GIS Analyst Workstation.

Hardware & Software Requirements			
Vendor	Use and Configuration	Purpose/Use	Cost <sup>a</sup>
Various	<ul style="list-style-type: none"> <li>• P4 1.4GHz or faster;</li> <li>• 512 MB RAM or larger;</li> <li>• 20 GB Hard Drive or larger;</li> <li>• Windows 2000, XP</li> <li>• CD+RW/DVD+RW.</li> </ul>	Create maps with ArcGIS software. Manage GIS data in ArcSDE geodatabase	\$1-2K
ArcInfo™ Version 9.1	ESRI® <a href="http://www.esri.com/products.html">http://www.esri.com/products.html</a>	<i>Main GIS geoprocessing</i> and analysis software. Primarily required to <i>update geospatial data in the data warehouse</i> . Can also be used to <i>make production quality maps</i> from geospatial data. One license can be shared by multiple locations with access to the license server software. Concurrent multi-seat licensing is more cost effective than single independent licenses.	\$12,600
ArcView™ Version 9.1	ESRI® <a href="http://www.esri.com/products.html">http://www.esri.com/products.html</a>	<i>Basic GIS geoprocessing</i> and analysis software. Primarily used to <i>make production quality maps</i> from geospatial data. One license can be shared by multiple locations with access to the license server software. Concurrent multi-seat licensing is more cost effective than single independent licenses.	\$1,500

<sup>a</sup> Pricing included as an estimation of cost for DOE procurement. Pricing is an approximation based on the configuration noted using the Dell.com website. Actual cost will vary dependant upon complete configuration procured by DOE.

## ATTACHMENT 4

## Hardware and Software Requirements for Web Workstation

**Table 4. Hardware & Software Requirements for Web Workstation.**

<b>Hardware &amp; Software Requirements</b>			
<b>Vendor</b>	<b>Use and Configuration</b>	<b>Purpose/Use</b>	<b>Cost <sup>a</sup></b>
Various	<ul style="list-style-type: none"> <li>• Basic Pentium III or higher PC;</li> <li>• 128MB RAM or larger;</li> <li>• 20 GB Hard Drive or larger;</li> <li>• Windows 2000, XP.</li> </ul>	Browse Environmental Data Warehouse and download analytical data. Use web-based GIS Viewer to view maps.	\$500- \$1000
Microsoft	Internet Explorer	Internet browser software already loaded on PC with Windows 2000 or XP	\$0
Microsoft	Office 2003	Optional software used to manipulate data downloaded from the data warehouse.	

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## **ATTACHMENT 5**

