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Administration and System Operation of the Columbia Basin PIT Tag Information System

2007 -2008 Annual Report

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ABSTRACT

The Columbia River PIT Tag Information System (PTAGIS) is a data collection, distribution and coordination project. The project saw over 1,495,000 juvenile salmonids marked with passive integrated transponder (PIT) tags, for the 2007 out-migration through the Columbia and Snake River systems, compared to over 1,991,000 in 2006 (Tables 1 & 2). In 2007, over 626,000 tagged fish were detected (Table 3). These fish generated over 8,085,000 interrogation records (Table 4). One fish can generate many interrogation records, depending upon how many interrogation sites or monitors 'saw' the fish.

In 2007, the PTAGIS project, in cooperation with the US Army Corps of Engineers, installed PIT tag detectors on the full-flow bypass flume systems at John Day Dam and Lower Monumental Dam. In addition, in cooperation with Yakama Tribe and Bureau of Reclamation, PTAGIS installed PIT tag detectors in the adult fish ladder at Roza Dam on the Yakima River. PTAGIS O&M staff and software developers refined operations of a fifteen foot by fifteen foot PIT tag detector installed at the corner collector bypass at Bonneville dam that was initially installed in 2006.

The PTAGIS project supported 14 separate Separation by Code projects for various agencies in 2007. Development of Windows-based M4 interrogation and Separation-by-Code client software and web-based Tag Distribution System (TDS) continued in 2007.

Table 1

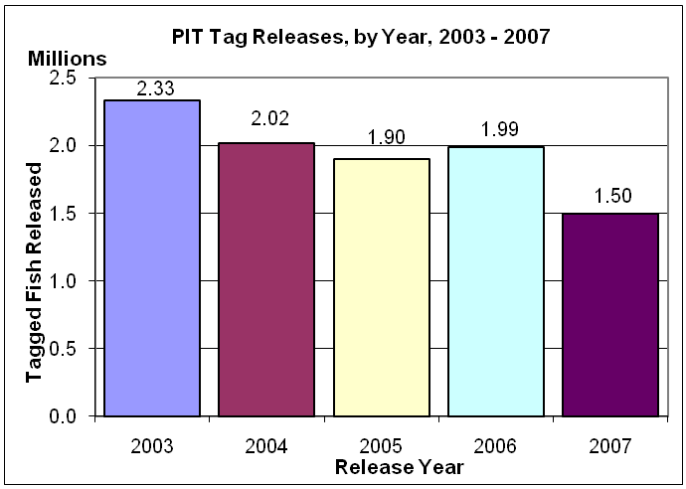
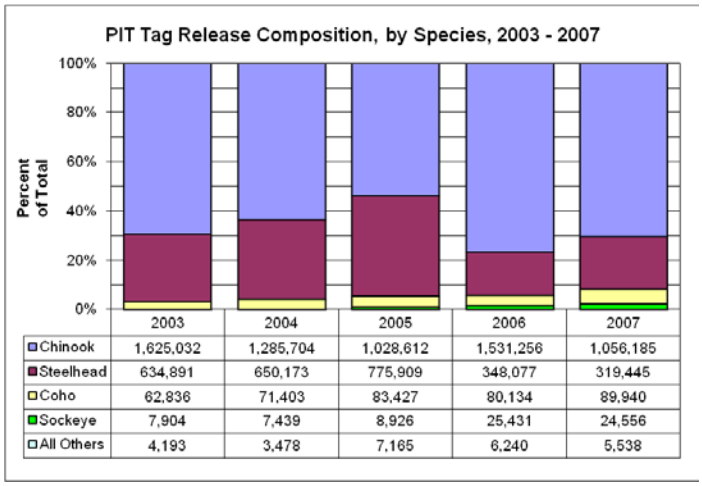


Table 2



	2003	2004	2005	2006	2007
Chinook	1,625,032	1,285,704	1,028,612	1,531,256	1,056,185
Steelhead	634,891	650,173	775,909	348,077	319,445
Coho	62,836	71,403	83,427	80,134	89,940
Sockeye	7,904	7,439	8,926	25,431	24,556
All Others	4,193	3,478	7,165	6,240	5,538

Table 3

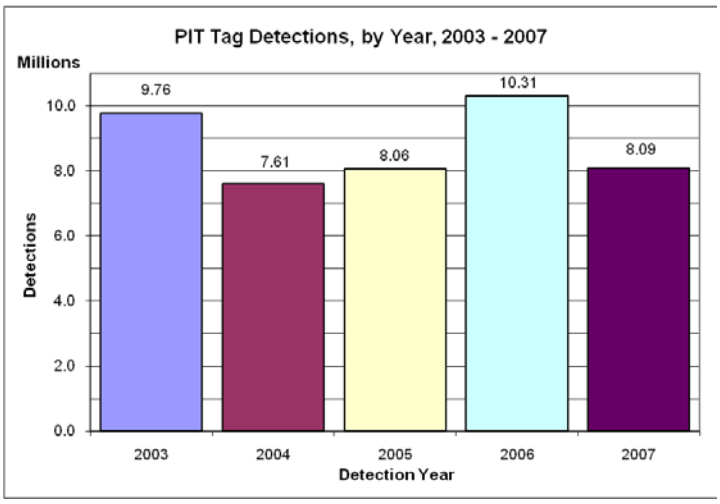
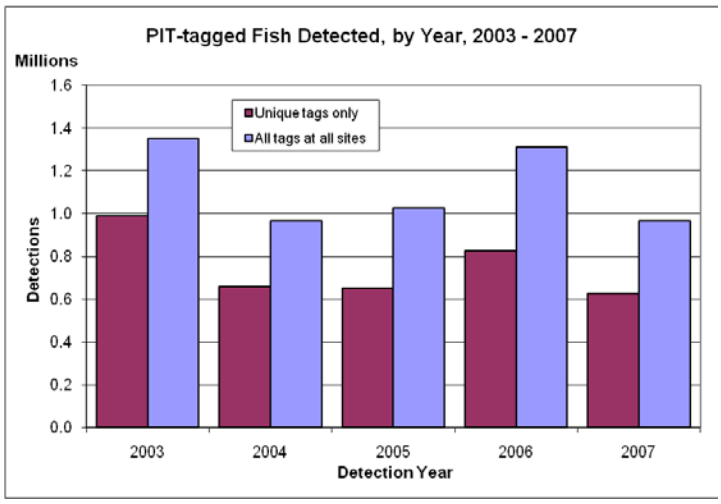


Table 4



PREFACE

In 1984, Bonneville Power Administration (BPA) entered into an agreement with the National Marine Fisheries Service (NMFS) to research and develop a passive integrated transponder (PIT) tag for use in the Columbia River Basin (CRB) Fish and Wildlife (F&W) Program. The PIT tag system enables large amounts of data to be produced using relatively few tags, compared to traditional tagging and marking systems.

In 1988 and 1989, NMFS contracted with PSMFC to develop and operate a prototype database system to help NMFS meet, in a timely manner, its contractual and verbal agreements involving PIT tag data. The database was designed to meet immediate needs as well as provide a framework for a formalized database system for the Columbia River Basin PIT tag program.
In April 1989, NMFS announced its intention to phase out of the operation, maintenance and management of the PIT tag systems in the Columbia River Basin. Subsequently, BPA contracted with

PSMFC because it was the only agency experienced in data management with no vested interest in the interpretation of data generated from PIT tags, while being independent of water or fish and wildlife management responsibilities.

In 1992, NMFS initiated the transfer of field operations and maintenance (O&M) to PTAGIS. This transition was completed in 1995 when the Columbia Basin PIT Tag Information System transitioned from a research and development (R&D) effort into an operations and maintenance effort. Note, however, those R&D efforts by NOAA Fisheries continue in collaboration with the PTAGIS project staff and other contractors.

The PTAGIS project covered by this report has been part of the Northwest Power and Conservation Council's Fish and Wildlife Program funded by Bonneville Power Administration since 1990. The NMFS 2000 BiOp for the Federal Columbia River Power System (FCRPS) includes approximately 15 RPA Actions calling for studies that explicitly include PIT-tags or would likely employ them. The Tagging Studies Technical Committee (TSTC) would help ensure that the numbers of ESA-listed fish proposed for tagging (in the study designs) are necessary and adequate to address BiOp implementation and other needs. Additionally, the NMFS BiOp includes numerous RPA Actions calling for studies that may employ other tagging methods that may benefit from improved integration with PIT-tagging studies.

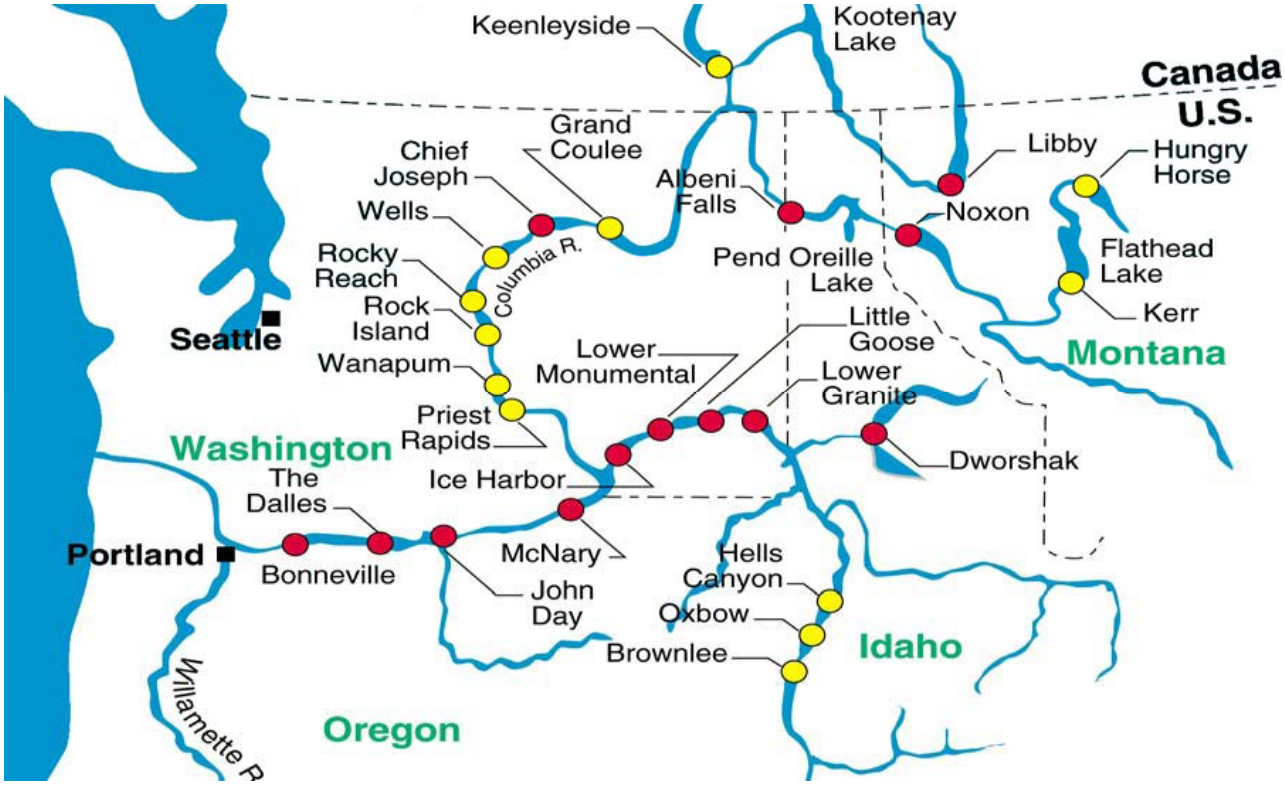
The PTAGIS project is guided by the Columbia Basin PIT Tag Steering Committee (PTSC) which was chartered through an agreement between Pacific States Marine Fisheries Commission and the Columbia Basin Fish and Wildlife Authority in 1993. PTSC representatives are National Marine Fisheries Service, U.S. Fish and Wildlife Service, Tribal Representation through CBFWA Anadromous Fish Advisory Committee, Oregon Department of Fish and Wildlife, Idaho Department of Fish and Game and Washington Department of Fish and Wildlife.

The PTAGIS project is organized into five data systems staff located at PSMFC headquarters in Portland, Oregon and five field operations staff in Kennewick, Washington.

INTRODUCTION

In 2007, PTAGIS operated computer systems to collect and distribute PIT tag information related to various projects in the Columbia River basin as shown in Figure 1. In addition, we operated and maintained (O&M) equipment to assist various entities in efforts to monitor, manage and study the migration of juvenile salmonids at seven dams Federal Columbia River Power System (FCRPS) projects on the Columbia and Snake rivers. These O&M locations are Bonneville Dam (BON), John Day Dam (JDA), McNary Dam (MCN), Ice Harbor Dam (ICH), Lower Monumental Dam (LMN), Little Goose Dam (LGO), Lower Granite Dam (LGR). In addition, we monitor fish migration at the Bureau of Reclamation facilities at Prosser and Yakima Indian Nation acclimation ponds on Yakima River tributaries. We also operate the PIT tag volitional release system located at Rapid River Hatchery.

Figure 1 Hydroelectric projects on the Snake and Columbia Rivers. This figure is reprinted courtesy of the U.S. Army Corps of Engineers, Portland District. Red circles are Corps of Engineers projects, yellow circles are privately owned or Bureau of Reclamation projects.



PROJECT GOAL and OBJECTIVES

The goal of this project is to operate and maintain the Columbia River Basin-wide database for PIT Tagged fish and to operate and maintain the established interrogation systems. The data collected by this system is accessible to all entities. The measurable goal for the system is to collect 100% valid data[1] and provide that data[2] in "near-real" time with downtime of any system component of not more than one percent as measured during the period of peak outmigration.

The PTAGIS project achieved this goal. PTAGIS provides robust client software applications that capture field data, validate and submit this data to PTAGIS several times a day. Field data that are incorporated into the PTAGIS database are validated for conformance to format and content based upon rules defined in the 2004 PIT Tag Specifications Document. PTAGIS server and web systems performed reliably with down-time limited to less than four hours on few occasions for some system components. PTAGIS

[1] Valid Data is defined in the "2004 PIT Tag Specification Document" which is maintained by the Columbia Basin PIT Tag Steering Committee.

[2] This means PIT tag mark, recapture and release information provided by PTAGIS users in addition to interrogation data provided by PTAGIS or other system users.

supported interrogation equipment was also highly reliable and fully redundant. Any data outages are logged in the PTAGIS event logs which are available at the project's website (www.ptagis.org).

OPERATE, MAINTAIN and ENHANCE the PTAGIS SYSTEM

This objective relates to our BPA Work Element titled, A: 160. Create/Manage/Maintain Database". This objective intends to deliver near-real-time PIT tag mark, recapture and interrogation data and tools to allow for the collection and retrieval of that data to all entities. This objective also incorporates BPA Work Element, I: 119 Manage and Administer Projects, the purpose of which is to provide for the program and project management necessary for the PTAGIS efforts.

PTAGIS project headquarters staff and one contractor are organized into three parts to support this objective:

- O&M Server Systems Development
- O&M Client Systems Development
- O&M Web Systems Development

O&M Server Systems Development

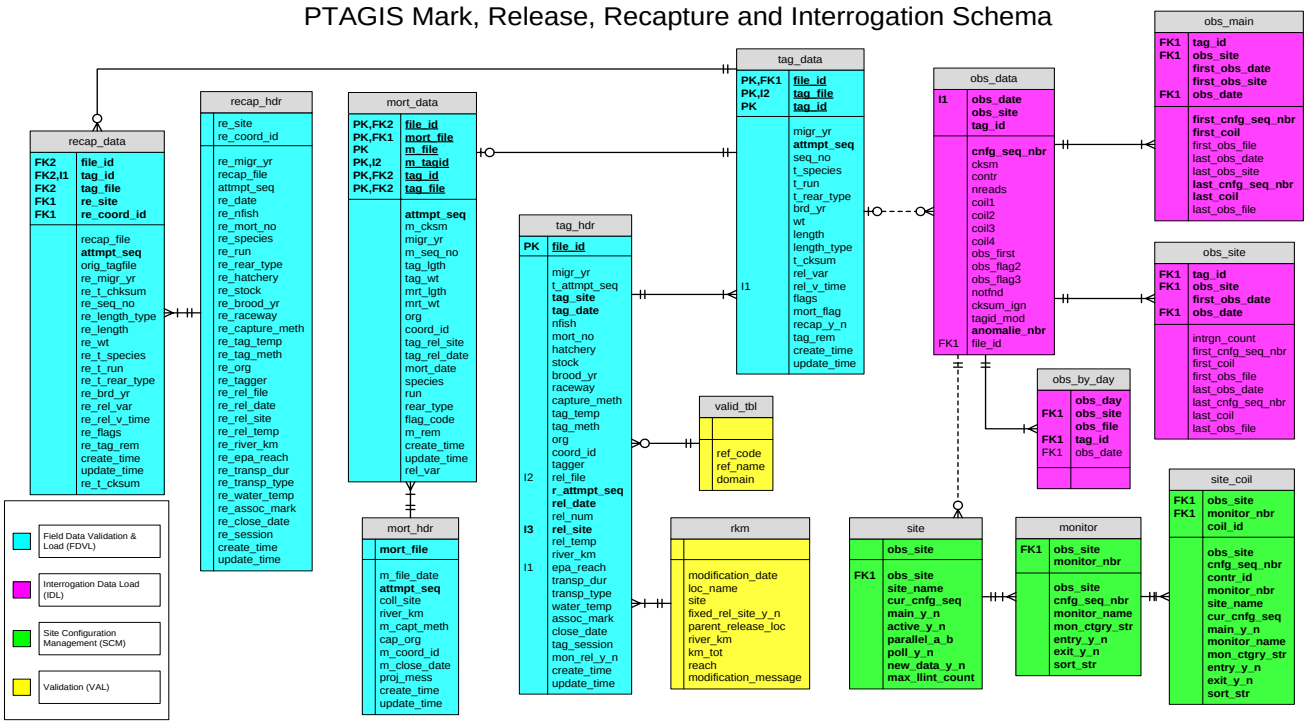
This objective addresses the continuous updating and refinements to the central repository for all PTAGIS data and related metadata. The central repository consists of a relational database system that contains several million rows of tagging and observation data. Key tasks related to this objective include:

- Maintenance and enhancement of system components that support the automated extraction, transformation and loading of field data into the central database.
- Systems management, including backup, performance tuning, capacity planning, system monitoring, database, hardware and operating systems upgrades and other necessary activities.
- Development of new database schema and supporting infrastructure to address new and changing user requirements.

Tables 1- 4 in the Abstract of this report summarize acquisition, processing and update of mark, release, recapture and interrogation data for this milestone.

The database server that stores all of the data events and some metadata is called PTAGIS3 and is a 64-bit Ingres 2006 Release 2/9.1 relational database server running Sun Solaris operating system. The schemas used to store PTAGIS data are described in the *PIT Tag Specifications Document* and haven't changed much in the last 15 years (with the exception of Tag Distribution data). Currently there are 22 million rows of tagging data and about 97 million rows of associated detection data.

Figure 2: PTAGIS3 Database Schema



In addition to normal operational and maintenance tasks, new server development tasks include support for Tag-Forecasting (TFW) and Tag Distribution System (TDS) web application which replaced features and functionality of the Tag Distribution and Inventory client-based application with an upgraded and a much more simplified tag procurement model.

2007 O&M Server System Development Activities

The following table describes 2007 O&M server system development activities performed primarily by a principal consultant for the PTAGIS project. These tasks are grouped into the following two task orders:

- TO 0701: Miscellaneous Server-Side Support
- TO 0702: Meta Data Integration and Data Access Definitions

Table 5

Task Order	2007 O&M Server System Development Activities
TO-0701	General support: includes minor bug-fixes, answering question about Ingres or other server-side components, and day-to-day monitoring of system behavior.
TO-0701	Upgraded to Ingres Database 2006 Release 2: includes pre-upgrade installation in the development environment on 'sockeye', stress-testing of IDL and FDVL loaders under the new Ingres release, fixing a handful of incompatibilities that were discovered (e.g. Perl DB-connect syntax, Ingres ABF 'telnet' application), working with Ingres Tech Support to investigate and fix a problem with the VisualDBA tool, and finally performing the upgrade in the production environment on 'blueback'.

TO-0701	2007 Annual "Game Reset": includes yearly updates to configuration files for the following server-side components: • STA – SiteTally Application • TASS – Transceiver Annunciator / Statistical Summarizer • DEA – Instantaneous Detection Efficiency Analyzer • ADE – Adult Fish Detection Efficiency Analyzer • DGE – Diversion Gate Efficiency Analyzer Ingres Query Optimizer Statistics
TO-0702	Tag Forecasting Web-App (TFW) Design: includes conceptual design, preparation of design and as-built documentation, and conducting design review meetings. Note that TFW supported 'forecasting' only; PIT-tag approvals, receipts, distributions, and inventory were tracked in spreadsheets.
TO-0702	TFW – Implementation: includes configuring Subversion version-control repository and Ant build-scripts; development of Ingres-based meta-data describing tables of the PPO and TPA schemas; generation of SQL scripts to create the tables and their primary storage structures; coding of Java 'service' and 'data access' components for performing CRUD operations on pertinent tables; coding of Dynamic HTML user interface using JavaScript and 'prototype.js'; preparation of XML configuration files for SpringFramework and DWR (Direct Web Remoting – AJAX implementation); unit-testing of components in development environment on 'sockeye'; integration-testing of completed app, deployed to development environment on 'pitblade'.
TO-0702	TFW – Deployment: includes populating PPO tables with names, addresses, and phone numbers of personnel identified by BPA as 'COTR' and 'Point of Contact' on projects authorized to receive PIT tags during the 2008 BPA fiscal year (Oct 2007 through Sep 2008); deploying 'tfw.war' (Web-Application Archive) file to production WebLogic environment; preparation and deployment of user-oriented documentation; monitoring system behavior after production roll-out, making necessary adjustments to PPO data, and fixing bugs as they cropped up.
TO-0702	Tag Distribution System (TDS) Design: includes conceptual design, preparation of design and as-built documentation, and conducting design review meetings. Note that TDS supports the entire 'PIT-tag procurement process': request, approval, distribution, and receiving into inventory.
TO-0702	TDS Implementation: includes configuring Subversion version-control repository and Ant build-scripts; adjustment of Ingres-based meta-data describing tables of the PPO and TPA schemas; generation of updated SQL scripts to create the tables and their primary storage structures; coding of additional Java 'service' and 'data access' components for performing CRUD operations on pertinent tables; coding of Dynamic HTML user interface using JavaScript and 'prototype.js'; preparation of XML configuration files for SpringFramework and DWR (Direct Web Remoting – AJAX implementation); unit-testing of components in development environment on 'sockeye'; integration-testing of completed app, deployed to development environment on 'pitblade'.

2008 Planned O&M Server System Development Activities

This section describes next year's activity planning of development, operational and maintenance activities for all PTAGIS server system components.

Table 6

Task Order	2008 Planned O&M Server System Development Activities
TO-0701	Perform general support and maintenance duties as well as the 2008 Annual "Game Reset".
TO-0702	Continue development and deployment of TDS system.
TO-0702	Development of CRUD features for PPO tables.

O&M Client Systems Development

The PTAGIS project develops and maintains custom client software systems to capture mark/release and interrogation data from hundreds of field sites operated by PTAGIS staff, disparate fisheries management agencies and research organizations within the Columbia Basin. These complex software systems perform simultaneous communication with atypical hardware devices such as RFID tag readers, PLC devices, GPS units, digitizer boards and digital balances. Field data captured by client systems are validated and uploaded to the PTAGIS server to be incorporated into the regional database in "near real-time".

Tasks

The essential duties and skills required by staff to develop, operate, and maintain PTAGIS client systems are described in the following subsections.

Client Systems Development Tasks

All client development tasks are performed by two PTAGIS software engineers with occasional support of outside contractors for specialized tasks.

1. Requires technical proficiency in all aspects of software engineering including expertise in object-oriented analysis and design of mission-critical/high-performance systems; expertise with relational databases, hardware abstraction, network and device communication; and the ability to create intuitive graphical user interfaces for broad use-case scenarios.
2. In developing new client software systems, staff must evaluate and adapt emerging technologies and platforms to maintain efficiency, performance and cost.
3. Advanced project management and communication skills are necessary to capture complex system and performance requirements; target objectives, risks, quality assurance, deliverables and schedule for new software development projects; procure hardware and software systems; and hire and manage outside contractors for specialized development efforts.

Client Systems Operational Tasks

Operational tasks are divided between field staff, client software engineers and the PTAGIS data analyst.

1. To maintain project goals of 100% valid data and 99% system uptime during peak out-migration, standard operating procedures (SOPs) are used to deploy, upgrade and verify the operations of client systems at all data collection sites managed exclusively by PTAGIS staff.
2. To ensure the quality and availability of PTAGIS data from client systems operating at data collection sites not managed by PTAGIS, responsive technical support, comprehensive documentation and data specifications, end-user training, and industry-standard web deployment are vital to the success of the project.
3. Client systems that run unattended must provide robust event logging and notification services to identify any system-related issues that can impact performance or the availability of data. These event logs trigger automatic notifications to field staff to minimize downtime of automated client systems that are often located in remote areas of the Columbia Basin.

Client Systems Maintenance Tasks

PTAGIS client software engineers are responsible for the following client system maintenance tasks:

1. Quality control for client system upgrades requires comprehensive testing by PTAGIS staff before the software is released. Performance regression testing for separation-by-code client systems may involve additional field staff and resources.
2. PTAGIS client system upgrades are announced and released to the community typically twice a year and include bug fixes, feature enhancements and expanded hardware compatibility.
3. Industry-standard deployment tools provided by PTAGIS allow users to easily upgrade existing client systems by downloading and installing the latest versions of the software. Installation CD-ROMS can be mailed upon request.
4. All defects and feature requests from end-users are captured in an internal defect-tracking system and cross-referenced within the source code and release manifests.

PTAGIS Client Systems Overview

Tagging and interrogation client software systems capture and submit most of the PTAGIS data served to the public. In addition to tagging and interrogation types of software, utility and legacy systems are also described below. To maximize limited resources for PTAGIS client development and to utilize new PTAGIS data models, the overriding goal for fiscal 2008 and beyond is to streamline existing applications into just two systems: P4 tagging software and M4 interrogation software.

Tagging Software Overview

PTAGIS provides tagging software used in the field by various agencies and organizations to capture mark/release data. This software provides end users with form-based, rapid data entry integrated with a variety of peripheral hardware devices to accurately correlate each PIT tag code with a biological assessment of the host animal.

Interrogation Software Overview

PTAGIS provides interrogation software to observe and sometimes control the passage of fish marked with a PIT-tag (separation-by-code) at various data collection sites within the Columbia Basin Region. Data specified by the PTAGIS Specification Document are captured by interrogation software and then uploaded to the PTAGIS server. For interrogation sites that require separation-by-code features, MULTIMON software developed by NOAA Fisheries is currently used; all other interrogation sites use the PTAGIS MINIMON software.

PTAGIS Client Systems

The table below describes current software systems developed, operated and/or maintained by the PTAGIS project in 2007 unless otherwise noted.

Table 7

System	Type	Status	Description
P3	Tag	Community Release	P3 is a PC-based software system designed to efficiently capture mark/release and recapture tagging data. Developed in 2002, several enhancements have been made to the software over the years since the initial release. P3's stability, ease-of-use, and support for a variety of peripheral hardware have made this software popular among users inside and outside of the PTAGIS community.
P4	Tag	Planning Phase	P4 will replace the existing P3 tagging software with new features requested by the PTAGIS community and target emerging platforms, hardware devices and PTAGIS data models. The single most challenging aspect of this project is to produce a simple yet robust solution that can be used by researchers for a wide variety of usage scenarios.
MultiMon	Obs	Internal Release	Multimon is a Microsoft DOS operating system client used at the major FCRPS fish transportation and bypass facilities and adult fishways to separate (or sort) fish by code, also referred as separation-by-code or SbyC for short. This software was developed by NOAA Fisheries and is operated exclusively by PTAGIS field staff. MultiMon interrogation data is collected into files and uploaded to PTAGIS using the Uploader utility software.
MiniMon	Obs	Community Release	MiniMon was developed by PTAGIS in 1999 as a PC-based replacement for the MultiMon application at interrogation sites that do not have separation-by-code requirements. It provides 24x7 unattended monitoring for fish marked with a PIT Tag. MiniMon can collect data simultaneously from 50 or more transceivers. The collected data is transformed into interrogation files that are automatically uploaded to the PTAGIS database in "near real-time".
Mobile	Obs	Community	MobileMonitor is a Pocket PC (Windows Mobile) application

Monitor		Release	developed by PTAGIS in 2006 to provide a low-power monitoring solution primarily for in-stream interrogation sites. Similar in functionality to MiniMon, it collects data from standard readers (including GPS devices) and provides real-time status information as well as other reporting features. MobileMonitor also includes a companion PC-based application, MobileSync Manager, to allow users to synchronize data from multiple MobileMonitor sites to a common computer and provides advanced data management features, robust reporting and the ability to create traditional data files that can be uploaded to PTAGIS.
M4	Obs	Develop-ment	M4 interrogation software is a direct replacement for MULTIMON, MINIMON and MOBILEMONITER client systems. It incorporates many features of the legacy systems including time-critical Separation-by-Code (SbyC) and failover cluster features. M4 will use a richer data model to capture site configuration information, providing additional context to standard interrogation data. It is currently developed as a .NET Framework application using C# and a SQL Server client database. SbyC features of M4 have been developed concurrently with all non-SbyC features and target an embedded subsystem to perform real-time tasks on standard Microsoft Windows platforms. In addition to implementing the control logic for routing fish, this subsystem requires complex programming for communication with transceivers, a PLC device for controlling gates, and the M4 Windows monitoring service that collects and writes interrogation data to a database as well as publishes information to a graphical user interface. Details on M4 development are available on the PTAGIS wiki.
TDI	Dist	Obsolete	TDI was developed by PTAGIS 1999 as an internal client system to track the purchasing, inventory and distribution of PIT-tags to various Fish and Wildlife projects. Due to recent changes in the process for procuring and distributing PIT-tags, a decision was made in November 2007 to discontinue the use of TDI and replace it with a web-based/server-side system (refer to O&M Server Systems Development section for detail).
Uploader	Utility	Internal Release	A client software utility used at data collections sites to upload data files created by MultiMon application to the PTAGIS server. This software utilizes the same library developed for MiniMon and P3 to submit PTAGIS data and includes a simple user interface to allow end users to change configuration settings.
Load Emulator	Utility	Internal Release	An internal client software utility used by PTAGIS staff to emulate large data collection sites without additional hardware and is used for performance testing of M4, MultiMon and MiniMon software in

			laboratory situations. This utility system can broadcast tag codes from all supported types of "virtual" RFID readers at very high rates. It can also be configured to read actual data files created by the MiniMon application to emulate real-world scenarios of fish passage at a site. Staff also uses this software for "throughput testing" to verify the PTAGIS goal of collecting 100% valid data
Logix Scraper	Utility	Internal Release	In order to set the performance benchmark for M4 separation-by-code features, PTAGIS needed to measure the actual performance of the MultiMon application currently used at separation-by-code (SbyC sites). A black-box testing procedure was developed in the Kennewick lab to use a specialized PLC device to measure the latency between the input of a tag code and the output of a gate control signal using MultiMon. This latency can be calculated iteratively over time and use LoadEmulator to emulate real-world conditions within a laboratory. LogixScraper was developed by PTAGIS staff to capture the latency measurements computed by the PLC device and provide statistical analysis. This tool provides the means to perform regression testing throughout the stages of M4 development to identify any performance bottlenecks as SbyC features are added.

***Obs** = Observation or Interrogation Data; **Tag** = tagging data; **Dist** = Distribution data.

2007 O&M Client System Development Activities

This section describes any development, operational and maintenance activities performed for each client software system in the year of 2007.

Table 8

System	2007 O&M Client System Development Activities
P3	1. Version 1.4.5 was released in May of 2007 to correct minor issues. Details of this release are posted in the readme file accessed from the P3 Download page of the PTAGIS web site. 2. In May 2007, PTAGIS announced the end-of-life for the P3 client system; any new releases of this software will include only minor fixes– new features will not be added to this program. This software will eventually be replaced by P4. 3. Staff verified P3 and supported peripheral hardware devices to be compatible with the Windows Vista platform.
P4	A P4 project plan was created for in 2007 outlining the initial development phase for gathering software requirements. The plan involves creating an end-user questionnaire to identify new requirements, prioritize existing features, and target emerging hardware and platforms. After requirements are captured and the system is designed, a small committee of end-users will be established to provide important feedback during critical stages of project development. This plan is published on the PTAGIS wiki.
MultiMon	Standard operations and maintenance activities only. No modifications or upgrades were

	performed on this system in 2007.
MiniMon	1. MiniMon version 1.5.0 was released in November 2007 with minor bug fixes and includes support for the latest firmware for the FS100M RFID transceiver. Details of this release are posted in the readme file located in the MiniMon Download page of the PTAGIS web site. 2. Staff verified MiniMon 1.5.0 will run on the Windows Vista platform. 3. Staff developed an SOP for *Deploying MiniMon with Windows Remote Access*, and is available on the PTAGIS wiki. 4. A one-off version of MiniMon was created in 2006 to support specialized RFID tag readers for the Bonneville Corner Collector Site (BCC). Two upgrades of this specialized MiniMon were released in February and April of 2007 to support *spurious tag features*. Refer to BCC articles on the PTAGIS wiki for more information. 5. PTAGIS announced the MiniMon application has entered the end-of-life stage and is to be replaced by the new M4 system. Any new releases of MiniMon software will include only major fixes to existing features – new features will not be added to this program.
Mobile Monitor	1. Version 1.0.21 of MobileSync Manager was released in October 2007 to correct a major bug in the creation of interrogation files from data collected from MobileMonitor sites. 2. In the Fall of 2007, PTAGIS notified the community the MobileMon/MobileSync Manager software will no longer be supported after 2008 for the following reasons: • MobileMonitor can be replaced with an alternative low-power platform using M4 running on an XP Embedded/Micro-PC platform. • Very few MobileMonitor users actually submit data to PTAGIS. • Impact of supporting/maintaining these applications is delaying the development of core PTAGIS applications (M4 and P4). • A new interrogation data model introduced in the next generation of interrogation software (M4) would require extensive modifications to MobileMonitor. • Eroding market share of the PDA platform has limited the availability and support for the Windows Mobile PDA platform. • Difficult and expensive to enable serial communication on PDA devices.
M4	1. January 2007: the M4 Technical Committee reviews and approves an updated M4 design to accommodate a custom failover cluster solution and new data model. Documentation and notes from this meeting are provided on the PTAGIS wiki. 2. February 2007: Separation-by-Code (SbyC) requirements are reviewed and approved by a M4 Technical subcommittee. SbyC requirements and other detail are posted on the PTAGIS wiki.

	3. October 2007: a beta version of M4 is reviewed and accepted by the M4 Technical Committee. This beta is released for internal testing and is expanded to support SQL Server Express and SQL Compact databases depending upon the target platform: SQL Compact database will be used for low-power XP Embedded platforms; SQL Server Express will be used for all other platforms. The release notes for beta version of M4 are referenced in Appendix 1 of this report. 4. November 2007: a prototype of the SbyC subsystem using TenaSys INtime real-time kernel is demonstrated for the M4 Technical Committee. This prototype uses an intermediate device server (Comtrol's DeviceMaster) to capture RFID tag codes from a reader and sends a signal to a PLC device that would eventually activate a gate. 5. November 2007: a standard operation procedure is developed to describe hardware and software setup procedures for performance regression testing of M4 separation-by-code features. Details of the SOP can be found on the PTAGIS wiki.
TDI	TDI System was made available for remote Kennewick users over a Wide Area Network to be used during transition to a new tag procurement and distribution process. No upgrades were performed on this system in 2007.
Uploader	Uploader is used at all MultiMon site operations to upload data to PTAGIS. No upgrades were performed on this system in 2007.
Load Emulator	This tool was used extensively for M4 development testing and performance evaluation. No upgrades were performed on this system in 2007.
Logix Scraper	This tool was used for performance evaluation of MultiMon and other SbyC software and hardware components. Minor upgrades were performed on this system in 2007.

2008 Planned O&M Client System Development Activities

This section describes next year's activity planning of development, operational and maintenance activities performed for each client software system.

Table 9

System	2008 Planned O&M Client System Development Activities
P3	Standard operations and maintenance activities only. Unless a major issue is discovered requiring a new release, any minor issues with this software will be documented and work-around procedures will be published to the PTAGIS web site.
P4	P4 development is on hold until the production release of M4. P4 will reuse common libraries developed in M4, such as the code to interface with hardware devices and upload data PTAGIS.
MultiMon	Standard operations and maintenance activities only. No upgrades are planned for this

	software. System virtualization products may be evaluated to allow this DOS software to run on newly manufactured Windows PCs.
MiniMon	Standard operations and maintenance activities only. No upgrades are planned for this software. An SOP will be developed for deploying this software on a Windows Vista platform.
Mobile Monitor	After 2008, PTAGIS will no longer provide support for this software. No upgrades are planned for this software.
M4	1. Present review of M4 beta for PIT Tag Steering Committee Meeting in January 2008. 2. Spring 2008: a second beta release of M4 that includes majority of the monitoring, data management, topology versioning (site configuration) and event log features. 3. Summer 2008: M4 development to be migrated to Visual Studios 2008, .NET Framework 3.5, and SQL Server 2008 Express and Compact editions. 4. Fall 2008: M4 beta release that includes failover cluster features. 5. Winter 2008: delivery of M4 beta release that includes basic SbyC features for performance analysis. 6. Spring 2009: delivery of M4 beta release that includes data synchronization features for uploading client data to the PTAGIS server.
TDI	System is obsolete; no plans are required for this software in 2008. This system will be eventually replaced by the web-based TDS system.
Uploader	Standard operations and maintenance for this utility software. No plans to upgrade this software in 2008.
Load Emulator	Standard operations and maintenance for this utility software. Upgrade for this software is planned in mid-2008 for minor bug fixes.
Logix Scraper	Standard operations and maintenance for this utility software. Upgrade for this software is planned in late 2008 for minor bug fixes.

O&M Web Systems Development

The PTAGIS web site (www.ptagis.org) serves all of the PTAGIS data and includes real-time updates and audits of current PIT tag data collection activities. The PTAGIS web site was redesigned and deployed about 5 years ago with the goal to make it easier for researchers to find the data they're looking for. Advanced data management features are available through individual user accounts. Users can generate database queries store them to rerun at a later time. Often researchers need megabytes of data from the system to perform in-depth analysis.

Additionally the PTAGIS web site provides a portal for downloading and online help for all PTAGIS client applications released to the community. An online library contains the latest PTAGIS Specification Document and other useful information is maintained as well.

2007 O&M Web System Development Activities

This section describes any development, operational and maintenance activities performed for major components of the web application system in the year of 2007.

The PTAGIS web applications infrastructure continues to evolve toward more reliable components and better performance. The Sitescape forums have been replaced with a wiki that allows users and staff to collaborate easily. The ease of publishing via the wiki has enabled us to create more documentation with more professional formatting and to present it clearly to users. Testing the upgrade of the StyleReport tool showed that performance would increase with the new version but an even better performance increase could be had be optimizing our query engine and bypassing StyleReport. When we replace the graphing functionality of StyleReport, we'll be able to reduce licensing and maintenance costs further. Likewise, we plan to increase the stability and maintainability of our web applications server software by replacing Weblogic with Tomcat. This will be a better fit for our needs and will reduce software licensing costs.

Purpose-built health-monitoring graphs were developed for the Bonneville Corner Collector facility. These special projects allow for a clear view of the current operation and trends. Also, PTAGIS was able to generate custom reports to analyze noise data from BCC to help troubleshoot persistent problems.

In a move to increase bandwidth and reduce costs, PSMFC changed internet providers. To accomplish this, PTAGIS assisted in redesigning and implementing our network.

Table 10

System	2007 O&M Web System Development Activities
RDBMS	Upgraded Ingres Relational Database on development server to test different database drivers for web application (DAS from EDBC to resolve QSF overruns)
QueryBuilder	Wrote a query metrics report in PERL to analyze how researchers are querying PTAGIS data.
Hardware	Deployed new clustered web servers Bay and Jack. These servers were upgraded from Sun Fire 280R to Sun Fire T2000 and T1000.
FTP	Migrated PTAGIS FTP site (ftp.ptagis.org) to new Bay server.
Web	Implemented new My Messages service, replacing the need to use SiteScape.
Web	Prototype development incorportating AJAX technology with new PTAGIS data model: Activity Location River Segment (ALRS).

Web	Implemented new PTAGIS look-up code request utility using RequestTraker tool.
TDS	Assisted in Tag Forecast email submission.
Web	Replaced Flash-based navigation tool bars with Java-script to allow deep-links and improve maintainability.
QSF	Implemented the Query Storage Facility as a system maintenance tool track Ingres memory issues.
Web	Implemented specialized web-based O&M noise and transceiver diagnostic reports for the Bonneville Corner Collector site.
QueryBuilder	Implemented sanity filter for QueryBuilder to prohibit end users from consuming PTAGIS web resources beyond a reasonable limit.
Web	Performed an in-depth analysis of QueryBuilder performance.

2008 Planned O&M Web System Activities

This section describes next year's activity planning of development, operational and maintenance activities performed for each client software system.

Table 11

System	2008 Planned O&M Web System Activities
QueryBuilder	Deploy QueryBuilder into production replacing the need for StyleReport tools for general querying of the PTAGIS data.
Web Server	Replace a specialized WebLogic application server with a more general-purpose Tomcat web server.
LDAP	Migrate PTAGIS user accounts from LDAP to PPO schema in the Ingres database.
Graphing	Replace all StyleReport graphs displayed in the PTAGIS web application with BIRT.

SEPARATION by CODE SUPPORT

This objective relates to our BPA Work Element titled, B: 160. Create/Manage/Maintain Database. This objective intends to deliver a well coordinated and successfully implemented Separation by Code system for use by the research community. Key milestones include updating seasonal database support tables, capturing user requests, implementing user requests and monitoring separation by code passage on a daily or more frequent basis during the migration season.

Although we identified another work element, C: 158 Mark/Tag Animals in anticipation of M4 prototype testing of separation by code capabilities, we had to reschedule the activity because of the M4 delay.

We identified a third work element in our statement of work, D: 70 Install Fish Monitoring Equipment with the deliverable of providing instrumentation to activate fish routing gates based upon SbyC activity. This work is performed by PTAGIS Kennewick field staff.

In addition to providing O&M support in 2007 for most of the PIT tag interrogation sites in the mainstem Snake and Columbia Rivers, the PTAGIS project also coordinated, implemented, and supported all of the Separation-by-Code (SxC) activity conducted at the eight sites with SxC capabilities in the Columbia River Basin. The Separation-by-Code protocol is used to divert specific tagged fish, based on their individual tag codes, away from the general population of tagged or untagged fish. Separation-by-Code was originally developed to allow researchers to identify, divert, and trap specific tagged fish as they were detected in the juvenile bypass systems and adult fish passage facilities at the federal hydroelectric dams.

In 2007, researchers used the SxC systems to recapture individual PIT-tagged smolts in the juvenile bypass systems at Lower Granite, Little Goose, McNary, and Bonneville dams. Researchers also used the SxC systems to re-capture tagged adult salmon and steelhead at the Bonneville Dam Adult Fish Facility and in the trap in the Lower Granite Dam fish ladder. See appendix 3, "PIT Tag Detection and Separation by Code Activities at Interrogation Sites Operated by or for the Columbia River Basin PIT Tag Information system 2007 Annual Summary Report" at ftp://ftp.ptagis.org/Documents/PTOC_Site_Activity_Reports/2007%20Site%20Activity%20Summary.pdf for full details.

Table 12

Research and monitoring projects requesting actions in 2008

SxC ID	Project ID	Project Title	Project Description
2007001	COE: See Title	Fall Chinook salmon transportation and life history studies	Transport wild and hatchery subyearling Chinook, etc.
2007002	FWP: 1991-028-00	Monitor wild Salmon River Chinook salmon migrations – NMFS	Sample fish at Little Goose Dam that were marked in various Salmon River drainages in 2005 and 2006.
2007003	NMFS/COE: See Title	Compare effects of PIT and acoustic tags	Evaluate the effectiveness of using acoustic tags for system wide survival studies, relative to PIT tags.
2007004	FWP: 1996-043-00	Johnson Creek Artificial Propagation Enhancement Project/LSCRP agreement # 14110-3-j010-NPT	Treat PIT-tagged groups as non-tagged fish at juvenile fish transportation sites.
2007005	LSRCP: See Title	LSRCP M&E # 14110-6-J009: Clearwater/Sawtooth hatchery spring/summer Chinook	Treat PIT-tagged fish similar to the untagged population when detected in the juvenile fish facilities at LGR, LGS, LMN or MCN.
2007006	USFWS: 2005-002	Evaluate spring Chinook salmon releases from Kooskia National Fish Hatchery	Treat PIT-tagged fish similar to untagged fish when detected in the juvenile fish facilities at LGR, LGS, LMN, and MCN dams.
2007007	BPA: 00-GS-75064	Smolt outmigration timing and survival for LSRCP steelhead emigrating from the Grande Ronde River.	Treat PIT-tagged fish similar to the untagged population when detected in the juvenile fish facilities at LGR, LGS, LMN, or MCN. ODFW Project # 40800-732002.
2007008	BPA: 00-GS-75064	Estimate SARs for endemic stock hatchery steelhead released to the Touchet and Tucannon rivers.	Treat PIT-tagged fish similar to the untagged population when detected at LMN or MCN.
2007009	FWP: 1996-200-00	CSS – Comparative Survival Study	Proportional transportation of hatchery Chinook groups and wild dish at LGR, LGS, LMN, and (possibly) MCN dams.
2007010	COE: See Title	Disease Susceptibility Study – COE/NMFS	Chinook tagged at Dworshak NFH and Rapid River Hatchery will be collected at LGR and BON dams, and removed to a research facility.
2007011	FWP: 2002-053-00	Monitor Passage of Asotin Creek Steelhead at federal transportation facilities	Treat PIT-tagged fish similar to the untagged population when detected in the juvenile fish facilities at LGR, LGS, LMN, or MCN.
2007012	COE: See Title	U of I radio-tagging of adult salmonids and shad at the BON AFF. Contract # DACW68-01-D-0006-0005.	Selective trapping of PIT-tagged salmonids and shad at the BON AFF.
2007013	COE: See Title	Pressure Acclimation Investigations to Support Biological Index Testing – PNNL/NMFS	Remove some of these fish at McNary Dam to look at effects of turbine passage.
2007014	1991-029-00	Research, monitoring, and evaluation activities to recover Snake River fall Chinook	Collect previously PIT-tagged fall Chinook at the LGR JBS.

SbyC Field System Support

During the migration season, PTAGIS field systems personnel inspect and test separation by code pneumatic, electrical, and mechanical components at each facility on a weekly basis. During these site visits, PTAGIS staff communicates with Corps of Engineers facility biologists and other researchers at the site. Often time's issues are identified during discussions. In 2006, there were 27 gate related issues between the Lower Granite, Little Goose, and Lower Monumental sites. The issues ranged from gates sticking open or closed to gates breaking due to slamming.

In October 2006, PTAGIS field O&M staff kicked off a project to upgrade slide gates in time for the 2007 migration season. The project included the collaboration of the NOAA Fisheries Pasco shop to provide fortification and mounting modifications to the slide gates. Three optical sensors were added to each gate and the programmable logic controllers (PLC) at the facilities were upgraded to incorporate these sensors as inputs. The PLC logic was updated to incorporate the optical sensor input to prevent gate slamming. In addition, human / machine interfaces (HMI) and signal lights were installed to notify on-site personnel when a gate problem alarm was issued by the PLC. As a result of these efforts, gate related issues were reduced from 27 issues in 2006 to 2 issues in 2007. Gate mechanical longevity has also increased, resulting in cost savings for the operating agencies. Gate diversion efficiency has also increased, due to the lower downtime and more precise control. A full summary report on this effort can be found in Appendix 2 of this report.

FIELD OPERATIONS and MAINTENANCE

This objective relates to the following BPA Work Elements in the PTAGIS Statement of Work:

- E: 70 Install Fish Monitoring Equipment. This work element provides for milestones (tasks) required to deliver installed PIT tag detection system as required by Action Agencies and approved by Bonneville Power Administration.

- F: 159 Transfer/Consolidate Regionally Standardized Data. This work element provides milestones (tasks) necessary to deliver high quality, near-real-time PIT tag interrogation data for incorporation into the PTAGIS database.

- G: 122 Provide Technical Review. This work element provides for development technical documentation, written standard operating procedures, provision of technical assistance and support to the research community related to the design, installation, operation and maintenance of PIT tag interrogation system by other entities engaged in PIT tag detection research activities in the Columbia Basin.

- H: 119 Manage and Administer Projects. This work element provides for the efforts necessary for planning, organizing work, and directing and controlling efforts to achieve optimal results for PTAGIS field system operations.

Details of the 2007 field systems operations can be found in the Event Logs accessed from the PTAGIS web site. PTAGIS field O&M staff utilizes daily operational reports, which are monitored multiple times each day during the fish migration season. During the portion of the season with high fish migration,

PTAGIS field staff performs a weekly, on-site, standard maintenance check at each facility. In periods with lower migration, these maintenance checks are bi-weekly.

In addition to the standard operations and maintenance of interrogation systems at FCRPS facilities, PTAGIS field operations staff was involved in several other efforts. Efforts that were conducted by PTAGIS field O&M staff are described herein.

ADMINSTRATION, MANAGEMENT, and COORDINATION

This objective relates to the following BPA Work Elements in the PTAGIS Statement of Work:

- I: 119 Manage and Administer Projects. This work element provides for the efforts necessary for planning, organizing work, and directing and controlling efforts to achieve optimal results for overall PTAGIS program and project management.
- J: 122 Provide Technical Review. This work element provides for development technical documentation, written standard operating procedures, provision of technical assistance and support to the research community related to the design, installation, operation and maintenance of PIT tag interrogation system by other entities engaged in PIT tag detection research activities in the Columbia Basin.
- K: 122 Provide Technical Review. This work element provides for development technical documentation, written standard operating procedures, provision of technical assistance and support to the research community related to the design, installation, operation and maintenance of PIT tag interrogation system by other entities engaged in PIT tag detection research activities in the Columbia Basin.
- L: 132 Produce (Annual) Progress Report. This work product is this report.
- M: 185 Produce Pisces Status Report. This work involves updating the BPA contracting data through its “PISCES” Microsoft Windows client application.

Administration and Management

This work consists of developing annual work statements and budgets and monitoring and controlling project activities and resources. The increase in the number of projects that rely on the PTAGIS infrastructure is placing a strain on existing staff resources. The PTAGIS proposal provided for the “FY 2007 F&W Program Project Solicitation” forecasted a need for additional two staff resources to be hired in the 2008 fiscal year.

Coordination

The PTAGIS project serves as a central support center for the region’s PIT tag research programs. PTAGIS staff field hundreds of telephone calls each year to answer questions related to the complexities of the system. In 2007, the PTAGIS project continued an effort to collect and distribute information via Wiki technology through the World Wide Web. The PTAGIS Wiki is proving useful as an easy to use information sharing and collaboration tool. PTAGIS field O&M and Data Systems Operations Standard Operating Procedures, data models, definitions, system activities, and other technical information are documented and updated in the PTAGIS Wiki.

Half-Duplex PIT Tag Coordination

PTAGIS staff continued to work in 2007 with the University of Idaho and NOAA Fisheries to troubleshoot problems caused by the installation of Half-Duplex (HDX) PIT tag interrogation systems adjacent to the Columbia River Basin PIT tag detection systems at Corps dams. Interference was caused by the HDX systems, which were installed as part of one of the Corps Anadromous Fish Evaluation Program (AFEP) projects. The fix to the problem was to assure that the HDX systems were on separate power systems from the production PIT tag systems and to assure that the HDX antenna systems were adjusted to minimize additional interference.

PIT Tag Distribution

During 2007, the PTAGIS project delivered 1,167,500 tags to over sixty Fish and Wildlife PIT tagging projects funded by Bonneville Power Administration. The tag distribution center was moved to the PTAGIS Kennewick Field Office in 2007.

Automatic PIT Tag Test System (APTTS)

The APTTS project kickoff meeting was held in December 2005. The project was motivated by the fact that the resources and time required to qualify, verify, and test new PIT tags was very high. For example, two to three staff people would be required to work from three to ten weeks to run a series of tests intended to determine whether PIT tags provided by a given manufacturer could be read in the Columbia River Basin PIT tag detection systems. Construction of the machine progressed through out 2006 and was brought into operation in 2007. The PTAGIS project is exploring various uses of the APTTS for assuring quality of PIT tags purchased for distribution to BPA funded projects. We hope to develop a process to test a 1% sub-sample of all tags delivered. This could be done by 2009. Assuming that sub-sample testing is efficient and effective; a higher percentage sub-sample could be tested. In addition, we expect to be able to study new tags as they are developed for use in the Basin.

Installation of New PIT Tag Detection Systems

Lower Monumental Dam Full Flow Detector

The PTAGIS project worked in collaboration with the Walla Walla District of the Corps of Engineers to design and install a PIT tag interrogation system on the full flow bypass line at Lower Monumental dam. The PTAGIS O&M staff provided technical services to the Corps and Corps contractors to locate the PIT tag detectors at a reasonable location and reviewed electrical and mechanical drawings to assure that facilities incorporating PIT tag electronics met PTAGIS standards. The PTAGIS project provided the labor for the installation, testing, and integration of the new detection system into the juvenile bypass system electronics at the dam. Costs of the electronic components of the system were funded through BPA Fish and Wildlife Program Project Number 2001-003-00 through contract 30318. Evaluation and testing of this new detection system was performed by NOAA subsequent to the installation. The PTAGIS staff completed this work in 2007.

John Day Dam Full Flow Detector

The PTAGIS project worked in collaboration with the Portland District Corps of Engineers to design and install a PIT tag interrogation system on the full flow bypass line at John Day dam. The PTAGIS O&M staff provided technical services to the Corps and Corps contractors to locate the PIT tag detectors at a

reasonable location and reviewed electrical and mechanical drawings to assure that facilities incorporating PIT tag electronics met PTAGIS standards. The PTAGIS project provided the labor for the installation, testing, and integration of the new detection system into the juvenile bypass system electronics at the dam. Costs of the electronic components of the system were funded through BPA Fish and Wildlife Program Project Number 2001-003-00 through contract 30318. Evaluation and testing of this new detection system was performed by NOAA subsequent to the installation. The PTAGIS staff completed this work in 2007.

Little Goose Dam Full Flow Detector

The PTAGIS project worked in collaboration with the Walla Walla District of the Corps of Engineers to design and install a PIT tag interrogation system on the full flow bypass line at Little Goose dam. The PTAGIS O&M staff provided technical services to the Corps to locate the PIT tag detectors at a reasonable location and reviewed electrical and mechanical drawings to assure that facilities incorporating PIT tag electronics met PTAGIS standards. This project is scheduled to be complete in spring of 2009.

Roza Dam Adult Ladder Detector

PTAGIS field O&M staff consulted with Yakama Nation and Bureau of Reclamation to provide technical information and design drawings of a PIT tag detection facility at Roza Dam's adult fish ladder. Using the PTAGIS drawings and specifications, a new electronics room was built, and then implemented with a data collection platform and satellite communications. Working with PTAGIS drawings and specifications, three over-fall weir antennas were constructed by Biomark Inc. PTAGIS staff working with Biomark installed the antennas. All electronic components at the antennas were installed by PTAGIS. The site is in operation, with high detection efficiencies.

Lower Granite Dam Diversion Remodel

At the request of NOAA and Corps biologists, PTAGIS field O&M staff provided drawings and specifications on how tags would be detected and diverted for a proposed remodel of the diversion leg at Lower Granite Dam's juvenile fish facility. PTAGIS field O&M staff, working with NOAA fabricators and electricians relocated six existing antennas and related electronics. PTAGIS O&M staff designed the electrical controls for the new diversion gate and modified the existing programmable logic controller's program to control the gate. The new system has operated successfully since installed and has provided for a more efficient tagging operation.

BCC PIT Tag Detector Enhancements

On April 13, 2006, after several years of research and development, the PIT Tag Detector designed for and installed in the corner collector flume at Bonneville Dam (BCC) came into full operation. PTAGIS O&M staff was vital to the effort to have this system installed and collecting data. This data is now being sent to the PTAGIS data systems making it available to researchers and river system managers. PTAGIS O&M staff and project resources assisted Digital Angel and its contractors for the research, development, testing, and installation of the BCC system. After a year of operation and extensive investigation, it was concluded by PTAGIS O&M staff that enhancements could be made to the system that would improve reliability, detection efficiency, and ease of maintenance. PTAGIS O&M staff provided documentation to PTAGIS HQ staff for a BOG request to proceed with this work.

PIT Tag Recovery Rewards

In 2007, the PTAGIS project continued its incentive program to encourage people to report PIT tags found by fishersin the ocean or rivers and tributaries. The PTAGIS project offers a "PIT Tag Recovery Program" ball cap, a PTAGIS test-tag key chain and a reward letter with detailed information and history on the host fish marked with the recovered PIT tag. Details on the PIT Tag Recovery Program can be found on the PTAGIS Wiki at php.ptagis.org/wiki/index.php/PIT_Tag_Recovery_Program.

There were nine PIT tag recoveries reported to PTAGIS in 2007, including six from sport anglers in the Columbia River and two from commercial trollers. Two of the tags were recovered by a father and son sport fishing in the Columbia River. A troller who had previously reported three recoveries (including two in 2006) reported his fourth recovery in 2007. The most unusual in recovery in 2007 came from a juvenile sooty shearwater harvested in New Zealand. The details of this recovery are recorded on the PTAGIS Wiki at php.ptagis.org/wiki/index.php/Titi_Recovery.

Annual Report

This report is the 2007-08 Annual Report.

Appendix 1: M4 Beta Release Notes

The following notes provide instructions and information regarding the M4 Beta software. This beta software is released as is and is not intended for production data collection. Please read the notes carefully before installing any version.

System Requirements

- **Supported Operating Systems:** Windows XP Service Pack 2, Windows Vista, Windows Server 2003. This beta release does not support 64-bit edition platforms.
- **Disk Space Requirements:** At least 1GB free disk space.
- **Serial Ports:** One or more serial ports should also be available to test the beta release with reader and GPS devices. Serial ports can be native or from a USB, PCI or other network device.
- **Internet Access:** the installer may need to access the internet to automatically download and install prerequisite packages needed for the M4 beta release. If installing on a PC without internet access, please download the packages listed in *Installation Requirements* section and manually install them before running the M4 Beta Setup.

Installation Requirements

During installation of the M4 Beta software, the installer will automatically download and install the following dependent packages if the target PC does not already have them:

- Microsoft .NET 2.0 Framework (x86)
- SQL Server Express Edition with Advanced Services

Note: The current installer for this beta release installs SQL Server Express Edition *without* advanced services. This is because reporting features are not implemented in this release and does not require the additional overhead (250 MB compared to 30 MB) of Advanced Services.

Note: on some target platforms, the SQL Server Service Pack 2 package may need to be downloaded and installed separately before running M4. The installer can guide you to the location of this package or click the previous link to download and install this package manually.

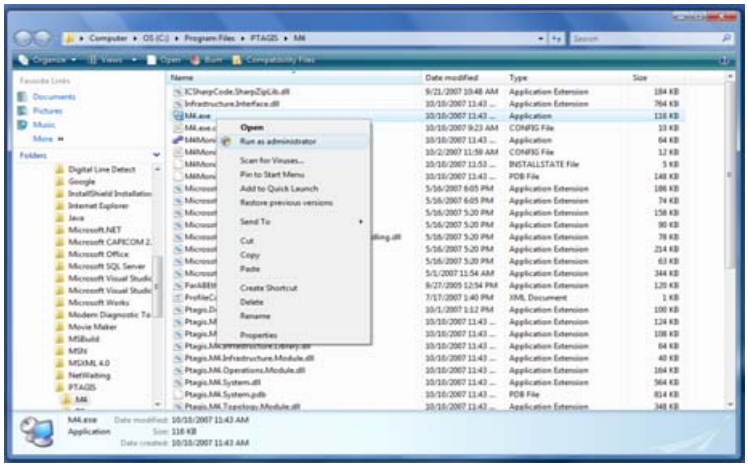
Instructions for Installing M4 Beta Release

1. Important: make sure you have the latest service pack and critical updates for the target PC. To find recent security updates for a system, visit Microsoft Update.
2. Download the M4 Beta Release setup and unzip them to a temporary location on the target PC.
3. **Important for Vista installation:** Initiate the M4 setup by running the setup.exe file from the local hard drive as an administrator by right-clicking the file and selecting Run as Administrator. Vista installations may also require that you manually uninstall any previous installations of M4 by selecting *Programs and Features* from the *Control Panel*.
4. The installer will guide you through the rest of the installation process. Please use the default settings for installation. Also, you may be directed to accept EULA agreements for SQL Server Express installation.
5. If the installer requested SQL Server Service Pack 2 to be installed, please do this before running M4.
6. The installer places a shortcut to the M4 executable on the desktop and in the PTAGIS start menu folder.

Instructions for Starting the M4 Application

M4 can be started by clicking either the desktop or *Programs Menu* shortcuts, or by navigating to the installation directory of c:\program files\PTAGIS\M4 and dbl-clicking the M4.exe program.

Note for Vista Users: you must run M4 Beta as an Administrator. To do this, right-click the program in the installation directory and select *Run as Administrator:*



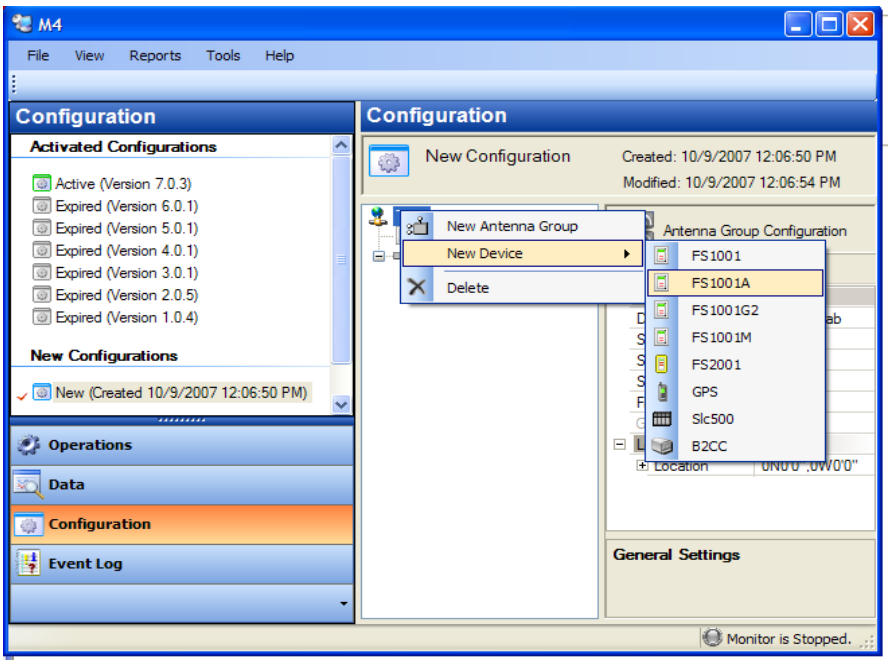
Once the M4 application starts, it will verify that the SQL Server engine and M4 database is installed. The first time M4 is run, it will automatically install the M4 database.

Basic Instructions for Configuring M4

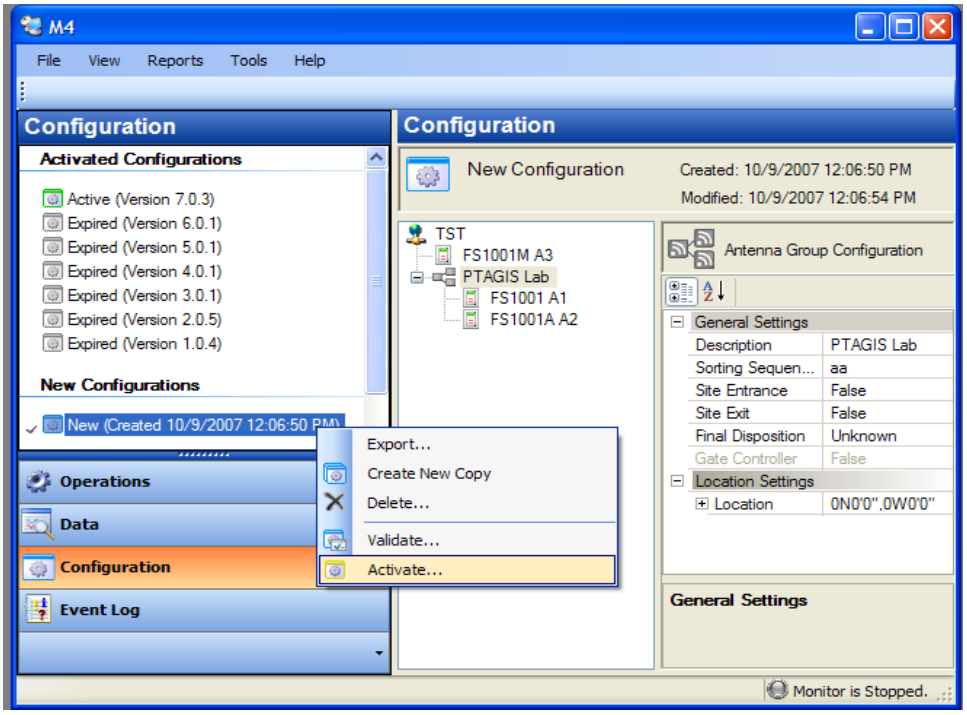
Before M4 can start monitoring, it must be configured. M4 tracks site configuration versions over time. Each time a component, such as a reader, is added or removed, this requires a new configuration versions. Keep in mind a configuration version has a direct relationship with the collected data during its lifetime.

To create the first site configuration for M4:

1. Click on the *Configuration* button and
2. Click the *Create and Empty Configuration* link.
3. Enter configuration any information regarding your interrogation site
4. Add a reader or antenna grouping to the site by right-clicking the site and selecting a component from the context menu as shown below:



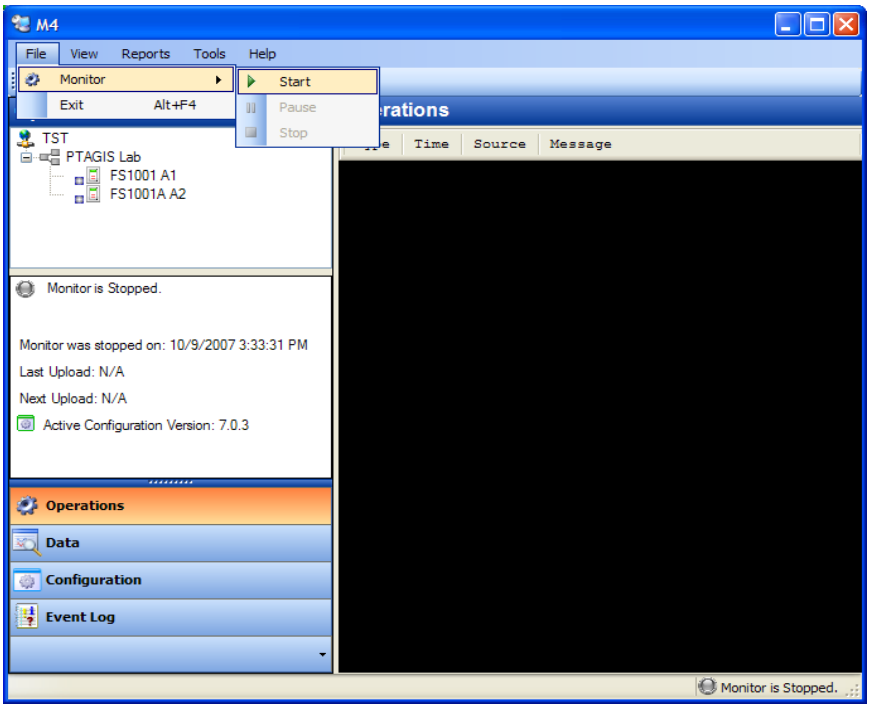
5. Trigger devices, such as GPS units, can be added to a site, antenna-group, reader or multiplexor antenna and they trigger their data input whenever a tag code is associated with its parent component.
6. Multiplexer devices, such as FS1001M reader, require each antenna to be configured by right-clicking the reader configuration and selecting *Add Mux Antenna*.
7. Configurations can contain multiple sites. To add an additional site to a configuration, right-click the configuration space and select *Add Site Configuration* from the context menu.
8. Important: once the configuration is completed, you must activate this configuration by right clicking the n and selecting *Activate* from the context menu as shown below. This tells the M4 that you are ready to use this configuration and to replace any existing version once the monitor is restarted.



9. Once the configuration is complete and activated, save the changes by selecting *Save* from the *File* menu.

Instructions for Starting the Monitor

No data is collected in M4 until the monitor is started. To start the monitor, click on the *Operations* button and select *Monitor*|*Start* from the *File* menu:



This will activate any new configuration, open serial ports and begin collecting data from the readers. To stop or *pause* the monitor, select the corresponding command from the *Monitor* section of the *File* menu. Pausing the monitor will close the ports only. Stopping the monitor will close the monitoring service completely, which is necessary to activate another configuration version or get the most recent changes to an existing configuration version.

Closing M4 will not stop the monitor as with MiniMon. The monitor runs as a separate process and in future release can be configured to automatically start when the system reboots.

Known Issues with this Release

1. The monitor service will not automatically start when the system reboots. This will be implemented in a future release of M4.
2. FS100M reader data does not identify the antenna that a tag message was received from. Additional feature may not work correctly with this device because it has not been thoroughly tested before this release.
3. In the *Export M4 Data Package*, there is a problem with entering dates directly in the *Message data created after* control. You must first click the drop-down on the control to view the calendar.
4. The following menu feature are not implemented yet:
    a. *Options* feature under the *Tools* menu
    b. *Report* and *Help* menu items.
    c. *Device Download Wizard* from the *Tools* menu in the *Data* section of M4.
    d. *Discover* feature from *New Configuration* located under the *File* menu in the Configuration section.
    e. *Validate* feature from the context menu on a new configuration.

Appendix 2: Snake River Slide Gate 2007 Season Summary Report

Snake River Slide Gate
2007 Season Summary

Version 1.0

08 October 2007

Prepared for:

WW District and Site Biologists, Don Warf and Carter Stein

PIT Tag Information System
Columbia Basin | ptagis.org

Prepared by:

Troy Humphrey

_____

Electronic Engineering Technician

TABLE OF CONTENTS

INTRODUCTION

Background

2004 through 2006 were difficult times for the slide gates at Lower Granite, Little Goose and Lower Monumental. In 2006 alone there were 27 gate related issues between the three sites. The issues ranged from gates sticking open or closed to gates breaking due to slamming.

These difficult years resulted in a meeting held on October, 25th 2006 at Lower Monumental Juvenile Facility to discuss the gate problems that occurred throughout the 2006 season and possible ways to mitigate future problems. Each site was represented by the site biologist and lead mechanic. Also in attendance were Dave Hurson and John Bailey from the WW district office, Carter Stein, Don Warf and Troy Humphrey from PSMFC and Jim Simonson from NMFS.

Several topics were discussed and below are a brief summarization of what was discussed.

a) Responsibilities

(1) It was established that the COE is responsible for the gates from the solenoids to the gate and PSMFC is responsible for the PLC and wiring to the solenoids.

b) Documentation

(1) PSMFC to provide links to gate information they have via the web and keep that up to date. Included on the web page:

1. Standard Operating Procedures
2. Electrical Schematics
3. Mechanical Drawings
4. Solenoid Sequence of Events
5. Photos
6. Recommended Maintenance Procedures and a Spare Parts list.(Gate Maintenance WW District-1.pdf)
7. Memorandum of Agreement, USACE-BPA
8. Updated spare parts list with items that would be most helpful to have in stock at all times.(this includes a new slide for each site)

c) Pilot Air for Solenoids

(1) Pilot air was discussed and PSMFC recommended that the site mechanics review the SOP provided on the web page (SOP Solenoid Porting Required for Pilot Air) prior to changing out solenoids in the future as pilot air has been added to the side to side gate at Little Goose and to all WW district slide gates (except for McNary).

d) Anti-Slam Sensor Installation and Testing

(1) PSMFC inquired about the possibility of having the gates pulled and delivered to NMFS Pasco shop so that sensors could be tested and installed.

e) Training

(1) PSMFC was asked to meet with the site biologists and the mechanics prior to water up each season and go through the operation of each gate and provide troubleshooting and maintenance tips along with things to look for when testing a gate.

Purpose of Document

The purpose of this document is to capture what was done and by whom, what the results were from the actions taken and recommendations for future actions.

Definitions and Acronyms

This section provides the definitions of terms and acronyms used in the document.

Definitions

1) *Slide Gate* –A gate mounted on the bottom of a flume typically just downstream of the separator used to divert specifically tagged fish back to the river by opening and letting the fish drop down another path.
2) *Tagging* - The process of imbedding a transponder into a fish for the purpose of tracking the fish.

Acronyms

1)	NMFS	National Marine Fisheries
2)	COE	Corp of Engineers
3)	PLC	Programmable Logic Control
4)	SOL	Solenoid
5)	MOU	Memorandum of Understanding
6)	PSMFC P	Pacific States Marine and Fisheries Commission
7)	HMI	Human Machine Interface, used to view and manipulate PLC values

References

This section lists reference documents available on the web

1) http://php.ptagis.org/wiki/index.php/Fish_Diversion_Gate_Documentation%2C_Operation_and_Maintenance ; Author - Troy Humphrey; Organization - PSMFC November, 2006.
2) http://php.ptagis.org/wiki/index.php/Gate_Maintenance_WW_District ; Author - Troy Humphrey; Organization – PSMFC November, 2006.
3) http://php.ptagis.org/wiki/index.php/SOP_Soleniod_Porting_Required_for_Pilot_Air ; Author - Troy Humphrey; Organization – PSMFC October, 2006

Project SUMMARY

The following is a brief description of what was done as a result of the meeting. Please refer to the sub list under section 1.1 of this document.

a.) Site personnel addressed all issue that fell under their responsibility, PSMFC addressed all issues that fell under their responsibility. On the very few instances where there was a gate related issue both organizations work well at resolving the issue.

b.) Please refer to the References section of this document, section 1.4 to find links to web pages that encompass all that is listed for PSMFC to provide.

c.) No solenoids were changed this year so Pilot Air was not an issue. Links to documentation concerning pilot air are listed above in section 1.4 reference 3)

d.) Little Goose and Lower Granite pulled and delivered their gates to the NMFS shop. Jim Simonson and crew in conjunction with PSMFC performed the following on each gate:

- Replaced the slide.
- Replaced the cylinder.
- Replaced the guide rails.
- Upgraded and Replaced the shocks.
- Attached a mounting bracket for the sensors.
- Added a mounting bracket for the sensor control wire box.
- Added a flag for the sensors.
- Installed a guard to protect personnel from the flag.
- Re-worked the mounting holes for GRJ's slide gate cylinders.
- Re-programmed the PLC.
- Thoroughly tested the sensors and PLC program.
- Installed trouble lights in 2 locations at each site that flash when the PLC logic determines there is a problem with either the gate or the sensors.

Lower Monumental mechanics in conjunction with PSMFC and NMFS performed the following for each gate:

- Jim Simonson and crew built new slides that were installed by Lower Monumental mechanics.
- Replaced the shocks.
- Replaced the cylinders.
- The gate structure was modified by Lower Monumental mechanics to accommodate the sensors.
- Re-programmed the PLC.

- Thoroughly tested the sensors and PLC program.
- Installed trouble lights in 2 locations that flash when the PLC logic determines there is a problem with either the gate or the sensors.

e.) PSMFC met with site personnel prior to the season start up and trained them on possible causes of a trouble light and how to respond to a trouble light.

2007 Season Results

The 2007 season showed marked improvement in gate efficiencies and overall gate performance. Gate banging was virtually eliminated by the sensors and anti-slam PLC logic. PSMFC was on site weekly and sometimes twice a week during the peak of the season. The operation of the gates during the peek was exceptional. Not one single gate failure occurred during the 2007 season. The trouble lights gave site personnel and PSMFC early warning when there was a potential problem which was followed by a joint effort to resolve the issue. Early on in the season there were some nuisance alarms that occurred while the PLC program was being fine tuned, once those issue were resolved the trouble lights became a very useful tool. The following is a breakdown by site of the gate issues that occurred at each site during the 2007 season.

GRJ 2007 Slide Gate Performance

Lower Granite had two viable gate trouble alarms both on A Gate.

- The first being an instance where a separator operator inadvertently set the gate travel open time to 0 as a result of a PSMFC screen being left open. The gate remained closed until PSMFC arrived and set the parameter back to the proper value.
- The second pointed to an issue with the cylinder for A Gate. There is slight air leak most likely on the rear seal of the cylinder. Re-timing the gate has eliminated the major issue but the gate cylinder still needs to be replaced. During a long sample the gate creeps completely open throwing the travel close timing off.

GOJ 2007 Slide Gate Performance

Little Goose had three viable trouble lights, two on B Gate and one on A Gate.

- The cylinder on B Gate had developed a leak on the front side of the cylinder which caused a weak and erratic soft close and resulted in a trouble light. Site personnel replace the cylinder; PSMFC was on site to assist.
- The second B Gate trouble light may have been due to the soft close/open regulator being closed too far? The trouble light was cleared by site personnel but no report as to the cause was phoned in.
- The A gate trouble light was due to a sensor that had lost its alignment and was missing the flag. The sensor was repositioned and the problem was solved.

LMJ 2007 Slide Gate Performance

Lower Monumental had one viable trouble light.

- The A Gate trouble light may have been due to the soft close/open regulator being closed too far? The trouble light was cleared by site personnel but no report as to the cause was phoned in.

Recommendations for the future

PSMFC would like to recommend the following actions be done on a yearly basis.

General Winter Maintenance

1. Replace the cylinders on all gates.
2. Replace the soft close/open regulator on all gates.
3. Replace the shocks on all gates.
4. Inspect the leading edge of each gate for signs of banging.
5. Inspect the connection point between the gate and cylinder for signs of elongations.
6. Inspect and tighten the flag.
7. Inspect and clean the lenses of the sensors (PSMFC to do).
8. Inspect the pass through port that the flag rides on for signs of wear.
9. Inspect and possibly replace the guide rails.

Site Specific Winter Maintenance

1. Lower Granite
    a. Move the sensor for E gate to the opposite site of the gate to help eliminate sensor misses.
        i. NMFS and PSMFC to do.
2. Lower Monumental
    a. Clean moss from sensors
        i. COE and PSMFC to do in conjunction.