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CECW-CO  
SUBJECT: Navigation Lock Levels of Service

30 April 2012

**MEMORANDUM FOR MSC CHIEFS OF OPERATIONS**

**SUBJECT: INLAND NAVIGATION LOCK LEVELS OF SERVICE**

1. Constrained funding and the Nation's fiscal deficit have led to reduced Operations and Maintenance (O&M) funding in the USACE FY12 Budget. This trend is expected to continue for the foreseeable future. When coupled with deteriorating infrastructure and increasing cost of operation, it becomes clear that the Levels of Service we have been providing on the Inland Marine Transportation System are not sustainable. The FY12 authorization required a reduction of 50% in the funding for the USACE Low Use Navigation Program. While this action enabled some additional funds to be applied to moderate and high use Inland Marine Transportation System (IMTS) navigation locks, it is not sufficient to significantly increase reliability or reduce the risk of unscheduled lock closures at those facilities. We need a more systemic solution.

2. The IMTS Board of Directors (BoD) saw the need for a system-wide approach to implement funding reductions through Levels of Service. Ideally Levels of Service address both the physical condition and the staffing at a facility or of a system. As physical condition was already being addressed by Asset Management and FEM/MAXIMO, the IMTS BoD tasked the IMTS Working Group with review of operating hours and service provided for all locks and to make recommendations. The Working Group reviewed Lock Performance Monitoring System (LPMS) data on commercial and non-commercial lockages, reviewed existing levels of service, and gathered information on communication strategies for implementing changes to levels of service.

3. The goals of this review were: (a) Provide levels of operating service for all locks across the IMTS with a consistent logic, (b) Optimize O&M expenditures for these assets and (c) Extend the service life of navigation locks by optimizing level of service.

4. The Working Group has developed a Levels of Operating Service proposal for the entire Inland Marine Navigation System. Six levels of service are proposed along with guidelines for how these should be applied based on the LPMS data. Copies of this info are attached.

5. To aid implementing these Levels of Service, the team developed the following products:

- Levels of Service guide that identifies categories of lock usage and proposed levels of service, including the data documenting present practice;
- Guidelines for reviewing, revising and implementing appropriate levels of service.

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Copies of these guides are enclosed with this memo. These products were distributed internally for comment and two conference calls were held with Operations Division Chiefs to receive feedback and make adjustments.

6. IMTS BoD met on 22 November 2011 and accepted these products. They have recommended and I approve and direct that Levels of Service be implemented for all USACE inland navigation locks. We will implement those levels of service consistent with the Navigation Business Line funding classification. Low Use systems will initiate implementation by 1 October 2012. Medium Use Systems will begin implementation by 1 January 2013 and High Use Systems will begin implementation by 1 April 2013.

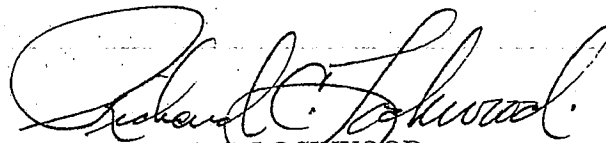
7. District and MSC Operations leadership will develop an analysis of each lock and river system. District Commanders will approve the analysis of the appropriate level of service. District Commanders will request exceptions to the baseline level of service based upon the work of the District team. Exceptions should identify the marginal increase in cost associated with each marginal increase in service. It would be possible to identify several service scenarios for any lock. Each should be treated as a separate exception.

8. MSC Commanders will review and approve exceptions and the Regional Team will develop a Level of Operating Service for each Navigation System in the Division. During the budget development process, only baseline level of service costs will be included in the MSC Increment 1 proposal. Costs of increased levels of service as defined in the exceptions will be included and prioritized in the MSC Increment 3 proposal.

9. In order to successfully accomplish this goal Districts and Divisions will need to establish teams, develop and implement a Communications Plan and immediately begin the analysis required to establish the baseline level of service for each lock. Progress in implementing this direction will be reported through District Commanders on a quarterly basis to the MSC Commander using the framework of milestones provided in the guidance.

10. The HQUSACE POC for this information is Jim Walker, 202-761-8648 or [james.e.walker@usace.army.mil](mailto:james.e.walker@usace.army.mil).

FOR THE COMMANDER:



RICHARD C. LOCKWOOD  
Chief, Operations and Regulatory  
Directorate of Civil Works (Acting)

2 Encls



## INLAND MARINE TRANSPORTATION SYSTEM (IMTS)

# LEVELS OF SERVICE GUIDE

MARCH 2012

### Purpose of This Guide

This document is intended as a guide to assist USACE Districts evaluate and establish the baseline level of service for each Navigation Lock and then implement a Level of Operating Service for each River System. This document is a companion to the IMTS Handbook "Guidelines for Changing Levels of Operating Service".

This document contains the following:

#### **Table 1. Definition of Levels of Operating Service**

This is a table with the levels of operating service defined based on past experience.

#### **Table 2. Guide to Identifying Levels of Service**

This table allows districts to identify a baseline level of service for each specific project (unique PWI number) by examining Lock Operational Performance data (such as tonnage per year, number of commercial and recreational lockages per year).

The definitions and values in the tables are intended to establish a baseline level of service. Districts will use the table to establish that baseline level of service for each Lock and then consider other issues, including user input before defining and implementing the Level of Operating Service for the system. The steps for using Table 2 and considering other issues and circumstances are explained in the sections following the tables. The entire process for changing levels of operating service is described in the IMTS Handbook "Guidelines for Changing Levels of Operating Service".

## Table 1: Definition of Levels of Operating Service

Service provided at USACE Navigation Locks is either an Operational Purpose or an Authorized Purpose (Section 311 of WRDA 1990 – PL101-640). Operational Purposes represent those general categories of service provided by the project simply because it exists – for the most part recreational vessel lockage is an Operational Purpose. Authorized Purposes are those categories of service that are (1) Provided for in the law authorizing construction, (2) Provided for in subsequent legislation or (3) Provided for in laws generally applying to Corps Projects.

It is clear that not every facility has sufficient traffic or user demand to justify the cost of "Full Service" (24 hours a day for 7 days a week and 365 days a year) operation. That Full Service cost not only takes the form of increased "O" - Operating costs but with flat budgets results in decreased Big "M", Maintenance Costs.

Over the years, individual districts have developed alternatives to the "Full Service" Operation in response to lock condition, lock staffing or funding limitations. The IMTS Working Group has chosen to develop Levels of Service for use on the IMTS system based upon those "proven" options. They are shown in the tables following. Districts are encouraged to be innovative and coordinate with all users and stakeholders about service needs, enhancements or modifications of these options that will best serve to meet the needs of the system. Proposed changes to the system Levels of Operating Service will be addressed as exceptions.

For the purposes of this service evaluation the number of cycles that the lock must perform to complete the service to the customer is the driving consideration. Each cycle of the lock is considered one lockage. If a tow is required to break into parts to transit a lock (cuts) the number of lockages will be considered to be equal to the number of cuts. Where a towboat uses the Auxiliary Chamber while the tow is locked through the Main Chamber (Fast Double) or any similar combination the number of lockages will be considered to be equal to the number of chamber cycles at the facility. Lockages for ice and debris will not be considered as lockages for the purposes of this evaluation.

**Table 1: Definition of Levels of Service**

<b>Level #</b>	<b>Title</b>	<b>Description</b>
<b>1</b>	Full Service 24/7/365	24 hours per day, 7 days a week, 365 days a year
<b>2</b>	Reduced Service - Two Shifts Per Day	16-20 hours per day, 7 days a week, 365 days a year (basically two shifts of either 8 or 10 hrs)
<b>3</b>	Limited Service - Single Shift	8-12 hours per day, 7 days a week, 365 days a year
<b>4</b>	Scheduled Service - Set times per day	Lockages (including recreation craft) at set times per day. For example 8 a.m. and 4 pm.
<b>5</b>	Weekends & Holidays	Lockages on weekends and holidays only
<b>6</b>	Service by Appointment	Commercial lockages by appointment*

**Table 2: Guide to Identifying Levels of Service**

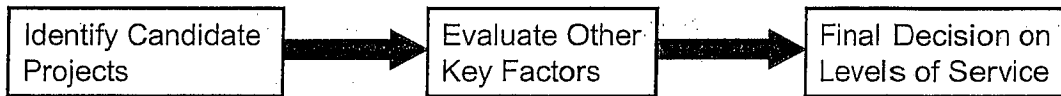
<b>Table 2: Guide to Levels of Service</b>		
<b>Level #</b>	<b>Title</b>	<b>Guideline for Range of Lock Operation Data</b>
<b>1</b>	Full Service - 24/7/365	More than 1000 commercial lockages per year
<b>2</b>	Reduced Service - Two Shifts Per Day	Between 500 to 1000 commercial lockages per year.
<b>3</b>	Limited Service - Single Shift	Less than 500 commercial lockages per year or greater than 1000 recreational lockages per year
<b>4</b>	Scheduled Service - Set times per day	Limited commercial and/or substantial recreational traffic, with a more consistent daytime pattern of lockage
<b>5</b>	Weekends & Holidays	Little to no commercial lockages with significant recreational lockages (500 or more per year).
<b>6</b>	Service by Appointment	Limited commercial traffic with no consistent pattern of lockage.

Table 2 above is provided to identify an appropriate baseline level of service based upon usage. The key idea is to identify the baseline level of service and then look at other factors to establish the Level of Operating Service for the System. Other factors include:

- ◆ Gate Operations --- consider the requirement to operate dam gates where applicable (weather is 24/7 so means to operate the gates must be considered)
- ◆ Customer needs --- some customers may have a dependence upon the navigation path (e.g. only path for coal to a power plant)

The recommended process for using Table 2 is illustrated in the following chart.

## Process for Using Table 2



- Identify target reductions from budget constraints
- Sort Lock Data in Excel
- Use Table 2 as starting point
- Identify candidate projects
- Evaluate the amount of potential reductions relative to target
- If not enough, move the cut-off point higher

- User input of needs and impacts
- Economic impacts upon users and surrounding community
- Impacts upon workforce
- Infrastructure costs and timelines for site modifications required (security systems, remote operation of dam gates)
- Seasonal variation in lockages

- Team at district evaluates all factors
- Team makes decision based on all factors

**The team must consider all factors (not just lock data) in the Final Decision**

In addition to these specific factors listed in the table, Districts are encouraged to consider the impacts upon the regional economy and the economic impact to consumers, shippers and towing companies as explained below.

1. The current schedule and continued availability of a lock could be a factor in consideration for future economic development along a waterway. A decrease in level of service might impact the decision regarding new opportunities for job creation or maintaining current levels of employment by businesses or companies relying upon the transportation of products along the waterway.

2. Shippers could experience higher transportation costs and extended delivery times as a result of a reduction in service. Seasonal adjustment might be appropriate to avoid interruption of service with long lines of vessels waiting in the queue. Systems thinking must be applied to avoid trapping tows between locks where there are no available landings or moorings. Determine if the corresponding level of service cause Shippers to consider other methods such as rail or trucks to move products at greater cost to more effectively meet scheduled deliveries.

### Rationale for the Values in Table 2

The content of this guide was developed by an IMTS Action Team and assisted by the IMTS Working Group. The IMTS Action team determined that there was no simple variable in the lock operation data that could be used to determine the recommended levels of operating service. Rather, several other factors must be considered as explained above.

The values in Table 2 are a starting point for the evaluation. The values in Table 2 are based on professional judgment of IMTS Action Team members with an average of 20 or more years of experience. The action team determined the following:

- ◆ Commercial lockages are the best metric to use for the initial screening of projects in the evaluation process.
- ◆ This metric considers the time requirement for passing traffic and the workload on operating staff
- ◆ Other factors (such as economic impact) must be considered on a case-by-case basis as part of the decision-making process

### **Timeline for Implementation**

The timeline proposed for implementation is as follows:

- ◆ Districts use this in the execution of FY13 budget
- ◆ It is expected that this approach will be incorporated into the FY14 budget development process





**INLAND MARINE TRANSPORTATION SYSTEM (IMTS)**

# IMTS Handbook

## GUIDELINES FOR ESTABLISHING & IMPLEMENTING LEVELS OF OPERATING SERVICE

A guide to provide decision-makers at Districts a uniform and consistent approach to identifying and implementing levels of operating service for Locks and Dams and navigation Systems. The guide includes a "how-to" process as well as lessons learned from past experience.

MARCH 2012

<p>IMTS Handbook</p> <p>Guidelines for Districts</p> <p>(This Document)</p>	<p>Lock Operation Data</p> <table border="1"> <thead> <tr> <th rowspan="2">Project Name</th> <th colspan="3">FY2010</th> </tr> <tr> <th>Recreation Lockages</th> <th>Commercial Lockages</th> <th>FY2010 Tonnage</th> </tr> </thead> <tbody> <tr> <td>Lock &amp; Dam 7</td> <td>518</td> <td>16</td> <td>9,900</td> </tr> <tr> <td>Lock &amp; Dam 8</td> <td>391</td> <td>6</td> <td>5,000</td> </tr> <tr> <td>Lock &amp; Dam 9</td> <td>559</td> <td></td> <td></td> </tr> <tr> <td>Emsworth Lock &amp; Dam</td> <td>1,375</td> <td>3,586</td> <td>14,630,867</td> </tr> <tr> <td>Dashields Lock &amp; Dam</td> <td>762</td> <td>3,191</td> <td>15,641,544</td> </tr> <tr> <td>Montgomery Lock &amp; Dam</td> <td>499</td> <td>3,647</td> <td>17,392,961</td> </tr> </tbody> </table>	Project Name	FY2010			Recreation Lockages	Commercial Lockages	FY2010 Tonnage	Lock & Dam 7	518	16	9,900	Lock & Dam 8	391	6	5,000	Lock & Dam 9	559			Emsworth Lock & Dam	1,375	3,586	14,630,867	Dashields Lock & Dam	762	3,191	15,641,544	Montgomery Lock & Dam	499	3,647	17,392,961	<p>Levels of Service Guide</p> <table border="1"> <thead> <tr> <th>Level #</th> <th>Title</th> <th>Guideline for Range of Lock</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Full 24/7/365</td> <td>More than 1000 commercial lock</td> </tr> <tr> <td>2</td> <td>Two Shifts Per Day</td> <td>Between 500 to 1000 comm</td> </tr> <tr> <td>3</td> <td>One Shift Per Day</td> <td>Less than 500 commercial lock</td> </tr> <tr> <td>4</td> <td>Set times per day</td> <td>Limited commercial and/or su traffic, with a more consistent</td> </tr> </tbody> </table>	Level #	Title	Guideline for Range of Lock	1	Full 24/7/365	More than 1000 commercial lock	2	Two Shifts Per Day	Between 500 to 1000 comm	3	One Shift Per Day	Less than 500 commercial lock	4	Set times per day	Limited commercial and/or su traffic, with a more consistent
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<p>Explains the overall process and gives lessons learned from past experience</p>	<p>Spreadsheet with FY10 data: These data are good input into identification of candidates for reduced levels of service</p>	<p>Tables with definition of options from past experience and some guidelines on how to use data to identify potential levels of operating service</p>																																														

# **GUIDELINES FOR ESTABLISHING & IMPLEMENTING LEVELS OF OPERATING SERVICE**

## **INTRODUCTION**

### **Why We are Evaluating Levels of Service**

Constrained funding and the Nation's fiscal deficit have led to reduced Operations and Maintenance (O&M) funding in the USACE FY12 Budget. When coupled with aging infrastructure and increasing cost of operation, it is clear that the Levels of Service we have been providing on the Inland Marine Transportation System are not sustainable.

While initiatives such as Asset Management and FEM/Maximo are helping us prioritize our requirements and spend our Maintenance resources where the risk and need to the system is greatest, it is clear that we are not providing a consistent level of service to our customers across the system.

USACE is facing new budget challenges and constraints across the board. All aspects of the budget are being looked at carefully to help meet these challenges. The IMTS Board of Directors has directed that an IMTS-wide approach be developed for evaluating the Levels of Operating Service for Inland Navigation Locks and Dams (there are other efforts to look at dealing with budget constraints elsewhere). In particular, there is a need for a uniform and consistent approach to evaluating Hours of Navigation Locks operation and lock operating staffing levels.

## **Purpose of These Guidelines**

The guidelines are to provide a uniform and consistent approach to aid districts in evaluating appropriate levels of service at Navigation locks and in making decisions on how to implement those Levels of Operating Service for the navigation Systems.

Based on past experience, the decision-makers at districts face intense pressure and have limited time to identify options and evaluate data during these times. The guidelines are to help decision-makers by providing the following:

- ◆ A description of the overall process to follow based on previous experience with success stories and pitfalls to avoid
- ◆ A list of options for Levels of Operating Service that others have tried
- ◆ A source of data for reviewing current operating hours and staffing levels
- ◆ A table that allows districts to identify levels of operating service and a list of other factors to consider
- ◆ "Lessons Learned" from experience at districts in the past

## **How These Guidelines were Developed**

The IMTS Board of Directors directed that the IMTS Working Group develop information and tools for Districts to use in defining levels of service. The Working Group established an action team with representatives from all five navigation divisions. The team developed the draft products for review and approval by the Working Group. After incorporation of review comments, the draft products were forwarded for review and approval by the Board.

## **Process to Follow**

The following is a general outline of the process that is suggested for districts to follow.

## **1. FORM REGIONAL AND DISTRICT TEAMS**

Evaluating and implementing Levels of Operating Service will be a major effort and will require Regional and District Teams with appropriate leadership and skills. While participation may vary depending on the organization and representation of the Districts, the team should include at least the following:

- ◆ MSC or District Senior Leadership
- ◆ A PM or Team Leader
- ◆ Office of Counsel
- ◆ CPAC
- ◆ Operations Division Leadership
- ◆ PAO
- ◆ Union Representatives (if Lock and Dam staff are a part of a collective bargaining agreement)

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## **2. DEVELOP A COMMUNICATIONS PLAN**

Develop a plan for how this action will be communicated to the Elected Officials, Workforce, Commercial Interests, Navigation Stakeholders, Recreational Interests and the Media. Communication should include the reasons for the analysis, the need for change, benefits, possible outcomes and timeline for implementation.

It is imperative that the workforce learn of this early and from the Leadership. This should be a key element of any Communications Plan. HQUSACE will provide "top cover". It needs to be clear that this review is not a reflection on the services performed by the District or the employees. It is an attempt to bring the system levels of service into balance that has been stimulated by the budget process.

Where Lock and Dam employees are represented by one or more collective bargaining agreements, it is also important to involve the union representatives in the initial and subsequent discussions.

It is also important that communications be started with at least the following:

- ◆ Elected Officials (Federal, state and local)
- ◆ Commercial users
- ◆ Recreational users
- ◆ Towns & communities
- ◆ Any other key interested parties

The Communications message must be consistent with the USACE generated "talking Points" and the USACE Navigation Strategic vision.

### **3. DEVELOP AN ACTION PLAN**

Engage CPAC early. While the outcome of the analysis is not clear at the beginning, what is clear is that it will ultimately result in some "change". CPAC can help with plans that could involve:

- ◆ Hiring pause(s)
- ◆ Reassignments
- ◆ Transfers
- ◆ Preference in filling vacancies

Early discussions should include the availability of VERA and/or VSIP. Generally it is desirable to avoid the need to use these programs but a consistent Regional message with regard to them is important.

Team and Public meetings are essential. Districts will want to be clear that any changes resulting from this analysis are not District-centric and are a result of external drivers. Transparency is key and the use of Social Media (i.e. LinkedIn and Facebook) has been used with great success. A dedicated section on the District Division web site for communications with internal and external interests could also be useful.

District Commanders will approve the analysis of the team on the appropriate level of service for each lock. District Commanders will request exceptions to the baseline level of service based upon the work of the team. Exceptions should identify the marginal increase in cost associated with each marginal increase in service. It would be possible to identify several service scenarios for any lock. Each should be treated as a separate exception.

MSC Commanders will review and approve exceptions and the Regional Team will develop a Level of Operating Service for each Navigation System in the Division. During the budget development process, only baseline level of service costs will be included in the MSC Increment 1 proposal. Costs of increased levels of service as defined in the exceptions will be included and prioritized in the MSC Increment 3 proposal.

## **Key Lessons Learned (from past experience)**

This section will present "lessons learned" from past experience with changing the levels of operating service for Navigation Locks and Dams. The goal is to share this knowledge across IMTS. The lessons learned are divided into the following sections:

- ◆ Communications with workforce
- ◆ Communications with users (recreational & industry)
- ◆ Innovations on Levels of Operating Service
- ◆ Remote Operation of Dam Gates
  - Monitoring equipment
  - Costs and time estimates
  - Training

### **Communications with workforce**

- ◆ It is important to engage the workforce early and keep them apprised of management's realignment initiatives throughout the process – transparency is critical. HR's participation is helpful in explaining restructuring and personnel placement options.
  - Utilize town hall meetings, PAO publications, newsletters, briefings, etc. to convey the idea that management will be using all available legal options to maintain the permanent workforce and avoid the need for RIF, VERA, or VSIP.
  - Silence on this subject often leads to wishful thinking or expectations that VSIP/VERA may be offered. When that occurs, the normal attrition rate stalls out, thereby eliminating chances for personnel reassignments.

- It is important to clearly state that VSIP, VERA, and RIF are the last options management utilizes to align the workforce to the workload.
  - Explain to potentially impacted team members that management is looking out for them.
  - Avoid negatively phrased comments like, "Management will be working to avoid the need for a RIF or VSIP." Instead, make positive statements such as "Management will work aggressively to make sure our folks stay employed."
- ◆ Keep the bargaining unit up to date and provide them the opportunity for Implementation and Impact Bargaining if they so desire.
  - ◆ Periodic staff meetings, PowerPoint slides, emails, bulletin board postings, etc. can be utilized to communicate with the workforce. PAO can provide assistance when needed.
  - ◆ Allow ample time for Q&A at all meetings. Ensure OC, HR and Ops managers are available to respond to team members' questions.
  - ◆ Ensure the information communicated to the workforce is accurate and timely.
  - ◆ Interest-based discussions can be useful in communicating with the workforce. All team members should be encouraged to actively participate in discussions and offer suggestions in reaching the organization's over-arching goals.

### **Communications with users (recreational & industry)**

- ◆ Communicate with user groups during the developmental stage of realignment options and after options are identified. A good way to do this is through Town Hall Meetings and/or User Meetings.
  - Identify group: Include all concerned parties in discussions, i.e., media, political interests, port authorities, commercial and recreational dock owners and managers, Coast Guard and Coast Guard Auxiliary, American Waterways Operators (AWO), water safety personnel, state and local governments, waterways service providers (midstream suppliers, fuelers), etc.
  - Invite participants through local media, Public Notices, direct email or telephone, trade publications, etc.

- Ensure support personnel (PAO, OC, OP Managers, etc.) attend meeting(s).
  - Explain the need for change.
  - Discuss details and options; ask for input from waterways users.
  - Keep interested parties informed regarding implementation process and timeframes.
- ◆ Seek assistance from PAO and OC when appropriate.
  - ◆ Explain the rationale for modifying current levels of service.
  - ◆ Seek commercial and recreational users' input on structural changes that are mutually acceptable if possible.
  - ◆ Be open and transparent in dealing with the public.

### **Innovations on Levels of Operating Service**

The following are examples of innovations. These are presented in hopes of helping to stimulate similar innovations.

#### *1. Reduce Hours from 24 to 20 per day*

One Tennessee River Lock studied traffic tonnage, recreation traffic patterns, lockage cycles and other operational factors as well as the facility's maintenance requirements. Particular consideration was given to workforce to workload staffing and estimated out-years' budgets. A lockage scenario was developed to transition the lock from 24/7/365 service to 20/7/365. The lock would be closed for four hours (2400-0400) daily. However, if traffic, especially commercial traffic, was projected to arrive at the lock during closure hours, the outgoing operator would remain on duty two additional hours and if necessary, the incoming operator would arrive two hours early.

This was communicated to waterways users, TVA and all interested parties through face-to-face meetings, email, and telephonic communications. The two-10 hour shift arrangement was approved and put into effect, and it has worked flawlessly for over two years. This change in operating hours allowed management to move one operator to a maintenance position to assist with reducing the facility's maintenance backlog.

#### *2. Use of Operators from Adjacent Projects*

If it is determined to curtail regular services at one or more locks, it is important to establish alternative methods of passing traffic, for example



utilizing lock operators from adjacent projects, having an "on-call" operator, having an operator following a vessel(s) from project to project, etc. It is equally important to communicate this alternate method of performing lockages with appropriate waterways users and interested parties.

### *3. Use Hydropower Operators to Operate Locks*

Where applicable, hydropower operators have been successfully utilized to operate locks, especially those with limited usage. Of course, those operators need to successfully complete the IMTS Lock and Dam Training and Certification program just like other Lock and Dam Operators.

## **Remote Operation of Dam Gates**

For locks that also have dams with operable gates, it is important to consider how the gates will be operated when contemplating a reduction in level of service below 24/7. One possibility is to provide for remote operation of gates. When you consider this option, it is important to involve the water control personnel in the district in the process. When you change to remote operation of the dam, you will still need to follow the water control procedures but you are doing it in a different way.

Changing to remote operation of dam gates can be a major challenge. Below are two examples with valuable lessons learned as well as two Points-of-Contact for further information:

- ◆ 2010 experience with three dams in Pittsburgh District
- ◆ Experience with two Alabama-Coosa Waterway Dams in Mobile District

### *1. 2010 Experience in Pittsburgh District*

In 2010 Pittsburgh District (LRP) converted manually operated tainter gates on three Monongahela Dams to remote operation at a cost of \$1.37 million. Remote operation requires completely reliable communication lines (T1 at a minimum) and fully functional and reliable cameras to monitor upstream and downstream of the dam, as well as visual and audible warning devices, etc. Cost is a concern when considering remote operations, but safety, reliability and risk are of primary importance. The following are LRP's lessons learned:

## Dam Operations

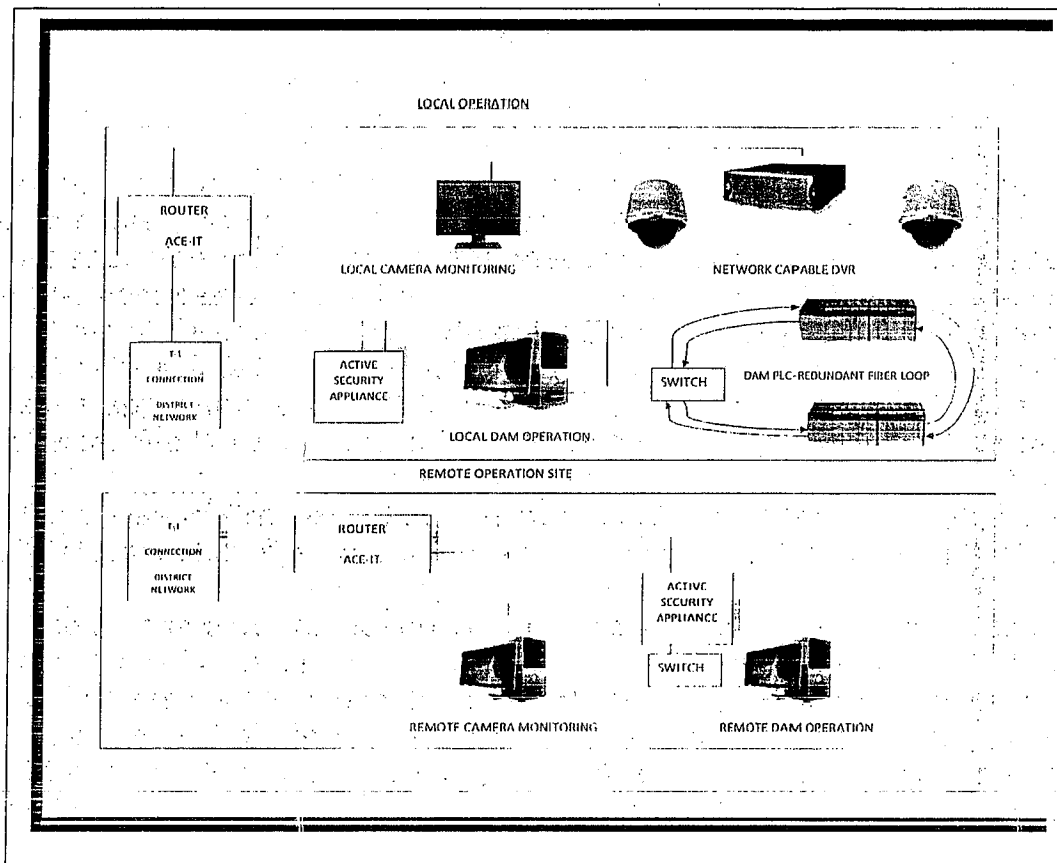
- Dam operations via a remote site require the use of an Active Security Appliance (ASA) to maintain the integrity of dam operational security, thereby preventing unauthorized access to the system. Both the local and remote operations computers are located behind the ASA. The system is designed so that either of the operation computers can operate the dam independently of the other. Should the local operations computer crash during non-manned hours, the critical gate operations can still be made via the remote computer.
- The dam's PLC's are set up on a redundant fiber optic ring. This ensures that if there is a break in the fiber line anywhere on the dam, the second redundant communications line automatically takes over. The entire dam will remain operational and allow the maintenance staff to troubleshoot and repair the system without any down time.
- Remote operations computers are capable of operating up to six (6) remote sites. Currently the Pittsburgh District has a remote operations computer at Point Marion Lock and Dam that is capable of operating six (6) dams. They are Opekiska, Hildebrand, Morgantown, Maxwell, Charleroi, and its Point Marion locally. However, only four sites are currently being operated from Point Marion, including their own.
- The cost of upgrading the systems (PLC upgrades, network upgrades, etc) was approximately \$1.4 million.

## Remote Monitoring

- Once remote operations are decided upon, remote monitoring of the dam is essential to the safety of the public and adds situational awareness to the facility should unforeseen events take place during non-staffed hours.
- The remote operator should be able to move the cameras at will and also call up camera presets for the gate they are going to operate. This will both turn and zoom the camera automatically to the specified and pre-arranged location.
- All connections of the cameras should be fiber optic, feeding back to the network capable DVR (Digital Video Recorder). The fiber optic camera feeds protect the cabling from lightning strikes and stops the degradation of picture quality over distance. The DVR is network ready and will stream the cameras video to the client monitoring station PC. The remote monitoring station has all the functionality that the local monitoring station has.

- Ample bandwidth must be available and video feed rates should be adjusted to prevent/minimize the impact to the remote and monitoring sites workstations. A T-1 line should provide satisfactory performance of the network with no noticeable impact to other users.
- In the event a site is designed to monitor multiple sites, such as Point Marion, a separate computer should be set up to receive the video feed for each remote site. This enables the simultaneous monitoring of all remote site video feeds in real time.
- The Pittsburgh District is in the process of upgrading/installing the remote monitoring systems on the upper Monongahela River. Current camera upgrades are approximately \$700K.
- With the sheer number of video feeds being sent to Point Marion Lock, LRP is looking into installing a second network (T-1) at the site. Current cost for two T-1 lines is approximately \$1100.00 per month.
- Shown below in Figure 1 is a schematic of a typical remote installation.
- Should you have any questions regarding remote operations and monitoring, contact Mr. Ron Gadomski by email at [Ronald.R.Gadomski@usace.army.mil](mailto:Ronald.R.Gadomski@usace.army.mil) or by phone at 412-395-7272. Ron is the electronic design engineer who designs all of the Pittsburgh Districts Remote system, and he will be happy to provide assistance.

Figure 1. Schematic of a typical remote installation.



## Training

LRP utilized on-the-job training to educate their operators on remote tainter gate operations and found OJT provided sufficient training to safely operate the equipment. This was accomplished by having the lock's lead mechanic on sight during installation of the remote operating equipment and subsequently training the lock operators on its usage.

## 2. Experience with two Alabama-Coosa Waterway Dams in Mobile District

The following are specific examples and lessons learned from recent installations of remote dam operating systems at two Alabama-Coosa Waterway Dams.

- Cost of remoting RF Henry Dam - ± \$800K (11 gates).
- Cost of remoting Miller's Ferry Dam - ± \$825K (17 gates).

- A similar installation in 2011 would cost ± \$1 million.
- Time estimates vary according to funding flow, contractor speed, contract modifications, operation anomalies, and other variables. Past projects ranged in times of completion from six months to over one year.
- Utilized fiber optic cable because of its reliability.
- Cameras are required, ideally one directly above gate looking down at gate and one zoom capable camera looking across spillway. These cameras should give the remote operator the same view as if he/she were on-site.
- Remote operators should have capability of using on-site alarm system (horn or siren) as a warning prior to operating gate.
- Ensure over-travel Limit Switches and/or stops are retained. Need to ensure proper protection is installed for over travel in case of control system malfunction or human error from remote operation site.
- Proper training is required for those that will be operating gates from remote location.
- Ensure remote operators utilize established operating procedures when raising gates for balancing flow across spillway (Water Control Manuals).
- All personnel should be aware of and trained on gate opening procedures. For example, at some locations certain gates should not be used for washing drift or raising gates to certain levels (without distributing water across dam) due to possible undermining under gate.
- Isolate individual gate or gates when needed for maintenance or greasing (safety due movement of equipment) is required. Good lock-out-tag-out procedure between lock and remote operation location is essential since maintenance is performed on-site and gate operation is performed at a remote location.
- Need local control capability at each gate in case problems with remote system are encountered, or for maintenance. This could involve local/remote switch (w/ default to remote) and raise/lower/stop settings for local control.
- Need local gate position indicator (digital read-out or gage), so any on-site personnel can quickly and easily determine existing gate setting.

### *3. Special Considerations for Remote Operation of Dam Gates*

Operation of dam tainter gates can occur frequently over a relatively short period of time in certain situations. In the Vicksburg District, two separate rain events required adjustments to dam tainter gates to pass rising water in the upper pool at two different locks and dams on the same waterway during different months. In one instance within an 18-hour period, five dam tainter

gates were raised incrementally a total of 18.5 feet each. In another instance within a ten hour period three dam tainter gates were raised incrementally a total of 19 feet each. The lock and dam operator at these locations was monitoring the rising water and making gate adjustments within several hours of one another. The dependence of remotely controlling these gates from another location may not be as efficient in these circumstances as having the operator on site.

### *3. Points-of-Contact for Further Information Remote Operation of Dam Gates*

#### *a. Point-of-Contact at Pittsburgh*

Should you have any questions regarding remote operations and monitoring, contact Mr. Ron Gadowski by email at [Ronald.R.Gadowski@usace.army.mil](mailto:Ronald.R.Gadowski@usace.army.mil) or by phone at 412-395-7272. Ron is the electronic design engineer who designs all of the Pittsburgh Districts Remote system, and he will be happy to provide assistance.

#### *b. Point-of-Contact at Mobile District*

For information on the experience with remote operations at Mobile District, contact Mr. Anthony Perkins by e-mail at [Anthony.C.Perkins@usace.army.mil](mailto:Anthony.C.Perkins@usace.army.mil).