5-2008

Emergency communications between water/wastewater utilities and their public and local governments procedure for message content analysis.

Melanie Annette Hunt
University of Louisville

EMERGENCY COMMUNICATIONS BETWEEN WATER/WASTEWATER UTILITIES AND THEIR PUBLIC AND LOCAL GOVERNMENTS PROCEDURE FOR MESSAGE CONTENT ANALYSIS

By

Melanie Annette Hunt
B.S., University of Louisville, 2004

A Thesis
Submitted to the Faculty of the
University of Louisville
J.B. Speed School of Engineering
in Partial Fulfillment of the Requirements
for the Professional Degree

MASTER OF ENGINEERING

Department of Civil & Environmental Engineering

May 2008

EMERGENCY COMMUNICATIONS BETWEEN WATER/WASTEWATER UTILITIES AND THEIR PUBLIC AND LOCAL GOVERNMENTS PROCEDURE FOR MESSAGE CONTENT ANALYSIS

Submitted by:_____
Melanie Annette Hunt

A Thesis Approved on

_____
(Date)

by the Following Reading and Examination Committee:

_____
Thomas D. Rockaway, Ph. D, P.E., Thesis Director

_____
J. P. Mohsen, Ph. D.

_____
John S. Usher, Ph. D.

_____
David M. Simpson, Ph. D.

ACKNOWLEDGEMENTS

I would like to take this opportunity to thank all of those who have assisted this researcher in her endeavors thus far. First and foremost I thank God and His One true Son, for without His divine guidance, Blessings and Sacrifice, none would be possible. I thank my entire family for their love and unfaltering support during my entire life and especially during my time spent at the University of Louisville and with this Master of Engineering Thesis. I sincerely thank my Thesis Director and Research Director, Mr. Thomas D. Rockaway, Ph. D, PE for all of his patience and intelligent guidance during this research and throughout the time of writing and revision. I thank my entire Civil Engineering Department for their unwavering devotion to the Grand Profession, that is, Civil Engineering and their efforts to create the Best of the future for that Profession. I thank the entire J.B. Speed School of Engineering, for their continuous advancement in the future of the many branches of Engineering in this State, this Great Nation and the World. I would like to thank my employers, from which I have gained the experience, devotion, direction, improvement and professionalism that have been, and will always be, a part of my life and Professional advancement. I would like to thank all of my friends whose loyalty and caring support will forever be cherished and always be true.

ABSTRACT

The purpose of the research is to assess the emergency communication messages that water and wastewater utilities used to correspond with the public during a crisis event. This assessment includes a review of data and disseminated messages provided by participating water and wastewater utilities. The work provides a coding procedure for quantitatively reviewing individual messages in a content analysis. This procedure shall be used for analyzing messages, developing trends and ultimately in deciding best management practices for message creation.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

Page

I. INTRODUCTION

A. Problem

During an emergency or crisis situation, communication is of the utmost importance to the community, the local government, and the organizations that may be affected by the crisis. A very critical part of providing information in a crisis is delivering clear, concise, and effective messages. However, a standard method does not currently exist to systematically assess the effectiveness of crisis messages. This leads to the continued use of ineffective and detrimental messages during emergencies. There is, therefore, a need for a methodology to critically analyze the multitude of emergency messages and determine if they appropriately convey their intent and that they generate their intended public response.

1. Critical Need

Since the acts of terrorism upon the United States on September 11, 2001, increased attention has been paid to the effectiveness of water and wastewater infrastructure's security before, during and after a crisis. Water and wastewater utilities have been designated as a possible target due to their accessibility, susceptibility to contamination, and the critical public dependence on their services. Due to the extensive consequences associated with a contaminated or disrupted water and/or wastewater system, the need for effective emergency messages is crucial in order to safeguard the mental as well as physical well-being of the public that a utility serves.

As utilities assess their emergency communication systems, it is important to determine that the messages delivered are appropriate and useful to the utility

stakeholders. There are many stakeholders in a typical utility, ranging from individual households to hospitals. Many stakeholders are considered critical stakeholders, particularly in their receipt of emergency notification. The emergency communications disseminated by a utility must convey the appropriate information to each of these stakeholders. When an untested message creation and dissemination system is activated during a crisis, it is not easy for a utility to gage how information is received by its stakeholders or the effectiveness of the message.

2. Objective

The objective of this research is to develop a methodology to critically analyze the appropriateness and understanding of emergency communication messages. This methodology can be used to test a message's effectiveness before it is disseminated to its stakeholders. Knowledge acquired from message analysis prior to dissemination should allow for fewer occasions of non-effective messaging and attempt to eliminate the time and expense, to the utility, caused by the use of untested and often hastily created media.

B. Background

Concisely and effectively communicating with both internal and external stakeholders during a crisis has always been an important consideration for water and/or wastewater utilities. As of September 11, 2001 and the resulting increase in focus on homeland security issues, utilities have been reviewing and improving emergency and communication processes for their effectiveness.

1. Emergency Communication Plan

Development and implementation of Emergency Communication Plans has now become a focal point of many organizations' Emergency Operating Procedure. A typical

company today will have a concise Emergency Operating Procedure (EOP) that will be enacted during a crisis event. Within this Emergency Operating Procedure is often an Emergency Communication Plan (ECP). Goals and objectives of an Emergency Communication Plan usually include the education and advisory of concerned stakeholders to minimize their inconvenience and maximize their safety from a service disruption. Emergency Communication attempts to delineate the steps that should be taken primarily after the onset of an emergency. Steps include those that specifically detail who, how, and when certain stakeholders in the organization shall be notified of the emergency. Key personnel are typically identified and contact information is provided in an easily accessible form for immediate location and use. Some plans contain sample messages, sample press releases and media listings for priority notification.

All emergency communication plans must have some established protocol detailing how and when the plan shall be implemented and who shall be in charge of doing so. This job may fall into the hands of an Emergency Communication Officer (ECO), a Public Information Officer (PIO) or a Utility manager.

Development of Emergency Operating Procedures and the proper implementation of the various plans has become a necessary part of water and wastewater security. A wealth of information and tools are available to utilities through newly funded research and practical utility experience. However, much of this information is unorganized and difficult to obtain. By organizing this information, effective techniques and Best Management Practices (BMPs) can be identified. Key concepts can then be used to improve individual Emergency Communication Plans.

2. Emergency Messages

One particularly important part of an Emergency Communication Plan is the messages that are created and disseminated during an emergency situation. These messages have a range of uses and share information internally as well as externally.

a. Internal Messages. Internally, messages are disseminated to employees that may or may not be directly involved in the crisis. These internal messages are meant to inform quickly and completely so that there are no misunderstandings by outspoken employees who may not know complete details of the situation or who may only know rumors and inconsistencies.

b. External Messages. Externally disseminated messages are those that are provided to inform the local governments, community, and quite possibly the state and federal governments. These messages are designed to inform the public of the severity of the crisis, any possible and/or imminent threat to their safety, what the utility is presently doing to remedy the situation, and any other relevant information that management deems appropriate for the particular crisis situation at hand.

Other crucial externally disseminated messages include those delivered to the local emergency services such as fire departments, police departments, hospitals, and local health departments, as well as schools which have populations with critical needs, particularly as it pertains to water shortages or contaminations. Without messages to adequately inform critical services an otherwise manageable situation can turn into a nationally declared emergency in moments.

3. Emergency Message Creation

Many organizations make it a part of their "plan" to develop or craft a message in response to emergencies, as they are needed. It is often the case that though one person may be chosen ahead of time to be in charge during an emergency, they are forced to determine much of their response during that chaotic time during and immediately following the onset of the emergency. Since it is left up to the emergency response officer to determine the best response and procedures during such a confusing time, it is not surprising that messages created in such an environment can often be confusing. Messages may contain incomplete, incorrect, or even irrelevant information that may not even need to be provided at that particular time. Messages may also be incomplete and not present adequate notification leading to confusion and suspicion.

Due primarily to the often frantic actions observed at the onset of nearly any emergency situation, the "crafting" of messages **prior** to the occurrence of the actual emergency, seems appropriate. The pre-crafting of event specific messages or generalized messaging templates would contain previously tested characteristics that have been deemed effective and make certain that those characteristics found to be detrimental to effective message deliverance, are removed. Guidelines developed for those templates would also reveal quickly and concisely what has proven to be effective in detailed case studies and event specific templates.

Often, organizations do not have pre-crafted or "canned" messaging systems, where messages can be called up, having been pre-written and edited for the particular event at hand. However, with advanced planning, it is estimated that 95% of the questions asked by the general public can be anticipated in advance (Covello 2005).

Additionally, coordination with field and service officials can likely identify the critical information that will be needed in an emergency event.

The use of messages created in an unguided and excited environment can sometimes yield messages that deliver insensitive, misdirected, or possibly incorrect information. A publicly disseminated message is delivered to a very broad, sensitive audience, especially when dealing with matters that may be beyond the realm of their knowledge, their comfort, and most importantly, one that deals with their health as critically as the water and wastewater industry does. Effective messages are a dire part of keeping a public at ease and with a feeling of safety and security before, during, and after a crisis event.

C. Purpose

The purpose of this research is the development of a method to analyze emergency messages disseminated from water and/or wastewater utilities. Through the use of content analysis, the formation of a methodology for the analysis of emergency messages will provide utilities a way of deciding upon and implementing characteristics related to the effectiveness of messages used in response to a crisis situation. Definitions of effectiveness as well as the various aspects that make up the analyzable characteristics of a message are critical parts of the methodology that has been developed.

Using content analysis procedures to assess Emergency Communication messages can significantly benefit utilities. The review of data gathered from content analysis may identify which message is more effective at conveying design information of similarly related or similarly prepared messages. It can also determine which components of a message are beneficial to an organizations needs and which are detrimental. It can also

reveal when a message does not need to be used at all, having proven an overall negative effect on its audience. Using the herein developed methodology and analyzing messages during non-emergency periods, as Best Management Practices (BMPs), will establish useful characteristics for their effective use in messages disseminated during emergencies. This will lend itself to a well-prepared calm versus an un-prepared reaction.

II. LITERATURE REVIEW

A. Emergency Communication

Most utilities have at least a basic Emergency Operating Procedure that they follow, and within the Emergency Operating Procedure is usually an Emergency Communication Plan (ECP). This ECP may consist of in-depth protocol and checklists that must go into effect when an emergency event occurs or it may simply dictate who takes charge of communications when such an event occurs. With the proper ECP in place, there would be zero or very low levels of uncertainty and threat present during an emergency since members of the response team will remain at ease and maintain a sense of certainty in their responses. The high priority goals of an organization, such as the provision of safe and secure drinking water, would continue to be met.

An organizational **crisis** is known as "a specific, unexpected and non-routine organizationally based event or series of events which creates high levels of uncertainty and threat or perceived threat to an organization's high priority goals' (Seeger et al, 1998, 233)" (Seeger et al, 2003, 7). Unexpected and non-routine events lend themselves solely to practical experience and play their own role in keeping the organization prepared but expected and routine events can provide a better route to preparedness by avoiding any stage of crisis.

There are many variables to be considered in review of adequate emergency communication. These variables include crisis type and crisis response, as well as message media, sender, and receiver, all of which must be fully considered for their

successful individual contribution to an emergency communication effort during all phases of an emergency event: before, during, and after.

1. Crisis Types

Several classifications of crises have been provided from various authors over the years such as Meyers and Holusha, Coombs, and Mitroff and Anagnos. (Seeger, et al, 47) Crisis types may include those of the informational/mis-informational type, economic type, those that occur in relation to organizational misdeeds, regulation/deregulation, top management succession, changes to an organization's reputation, or the physical-loss of key facilities, human induced breakdowns, rumor, workplace violence, public perception/mis-perception, or psychopathic acts. Crisis types may also consist of natural disasters which may include earthquakes, hurricanes, tornadoes, flood, drought, and winter storms. A technical crisis is a type that may consist of operational breakdowns through mechanical, electrical, or computer programming failures. A crisis type can also be an act of malevolence and particularly includes terrorism, which can occur in the known forms of physical, biological and cyber terrorism.

It should be obvious that with so many potential emergency and/or crisis events, that a detailed risk assessment should first be completed to reveal exactly which events hold critical relevance to an individual organization's emergency preparedness. Once an assessment of the risks pertinent to the particular organization has been established, then communications relative to those risks can be developed and implemented appropriately and economically within the organization. If managed properly, while being supported adequately and continuously by management personnel, emergency and crisis events

should remain few and far between. Most potentially devastating events will remain only as events or issues raised during the planning phase, and never reach the critical stage of "crisis".

2. Crisis Response – Mitigation (Before an Event)

An organization can and should be in one relevant phase of emergency communications, at all times. Crisis Response occurs in all stages of an Emergency: before, during and after.

Before any event occurs, mitigation may be performed. There are many forms of mitigation and particularly with water and wastewater utilities, mitigation through engineering and design are near the top of the list. Of particular susceptibility during an emergency are the facilities themselves, whether it involves the structural stability of the building or the critical equipment inside, the safe containment of potentially hazardous chemicals, or the design of the operational processes either mechanically or electronically. Assessment of the risks of failure of any of these aspects can be completed prior to the onset of an emergency event and through the use of engineering analysis, redesign and/or retrofit, mitigation measures can then be put into place.

a. Message Receiver – Calm Audience. Mitigation measures can be in the form of audience preparation. Before any emergency event has occurred, a calm audience permits the easy acceptance of thoughts within that audience that would be stifled in the environment surrounding an emergency. Non-critical and a somewhat unrestricted amount of time also allow for a significantly greater amount of organized thought, conversation, consideration, and most importantly, review, to take place that could not occur during the emergency. Time also

allows for the use of focus groups and advisory committees to take a very important role in the development of messages and the formulation of communication objectives for use within the organization.

b. Message Media – Preparatory. Many types of media are available for messages used as mitigation tools. These include paid television and radio advertisements that educate and inform on issues that prepare for possible future emergencies. Written forms of preparatory material may also be distributed such as flyers, newsletters, door-hangs, pamphlets, packets, brochures, and bill inserts. Written preparatory material may also include newspaper editorials or magazine articles that reach audiences about water conservation issues, upcoming seasonal risks, and general preparatory information, educating the audience about what can be done to mitigate the risks. Most communications before an emergency are not intended to motivate action except in the form of voluntary personal preparation or conservation.

3. Crisis Response – Emergency Response (During an Event)

a. Message Receiver – Sensitive Audience. Emergency response messages occur immediately following the onset of an emergency and are intended to inform and educate the audiences to the information that is known to the organization, relevant to the situation and necessary to disseminate. These messages are intended to be motivational to their intended audiences. These messages reveal exactly what is being done to remedy the situation and/or what will be done, what immediately relative risks there are to the audience, encourage any and all

necessary actions that need to be taken by the community and public apologies if they are deemed necessary.

Sensitivity to audience perceptions is critical at this point in time since the adequacy of response may make or break a situation from it's being a manageable event to a full blown crisis. Measures must be carefully taken to ensure the use of credible, trustworthy speakers and media outlets in order to maintain the public's trust and the organization's reputation.

b. Message Receiver – Employees. Response messages should also be disseminated to those advocates of the organization that can sometimes be overlooked; the employees. Employees are most often the audience least attended to during an emergency because management believes them to certainly "know what is going on right under their noses", but the fact remains that employees tend to receive and manage a lot of information only in bits and pieces. This ultimately leads to misconceptions, confusion, and subsequently, frustration, worry and anger. Employees should be one of the first notified during an emergency so that they may attend to personal issues and be available to the needs of the organization as soon as possible. The employees, after all, are the ones that will be most critical of the organization, seeing it as "theirs", and can ultimately be the best ambassadors for it.

c. Message Receiver – Emergency Services Preparation. Initial response during an emergency frequently includes the use of Emergency Services such as law enforcement, medical, health, and fire services. Notifications to, and requests from, these services may be rendered difficult relative to the type of emergency

that may have occurred. For instance, if a large natural disaster has occurred such as an earthquake, all major Emergency Service personnel may already be occupied by the time notice is provided to them that aid is needed by the organization. An earthquake may disrupt much of the community and water service disruption is a major event in itself. Water service is even consequential to certain emergency services such as health and hospital services, and particularly fire service, which, without adequate water service may be unable to meet their own responsibilities to emergency response.

Remedy to such a dire situation can simply be a part of preemptive measures. Time should be spent directly with these critical stakeholders to establish measures that must be taken by each one in order to reduce the potential impact to all services. Decisions should be made as to who shall be notified first and who shall be placed on prioritized lists in order to ensure that critical services are sustained.

Organizations should develop communications plans that establish protocol in contacting the prioritized stakeholders, and that document important contact information for quick reference. All of this preparation will reduce the sense of frantic behavior since contact numbers and systematic procedures will automatically be known and immediately followed.

d. Message Media – Motivational. Preparatory messages could be disseminated in forms such as press conferences, press releases, warnings, alerts, television or radio on-air interviews, or written media interviews.

e. Emergency Response Agreement – Mutual Aid. Attending to a disruption of emergency services or a temporarily irreparable service to a critical customer in a timely fashion is a dilemma of serious concern. Developments have been made in procedures and emergency planning which attempt to manage this situation. A concept, called Mutual Aid, has been developed in California and is a spreading phenomenon due to its proven effectiveness. Mutual Aid is a developed agreement between participating neighboring communities or locales that lend and receive assistance if an area utility is in need due to an emergency situation. The program develops, for each participating member, a prioritized contact list of the closest capacity service matches in the neighboring communities. In the case that the first listed utility is unable or unwilling to lend aid, the next, most capable utility listed is contacted. This provides a focused approach to finding assistance in case of overwhelming crisis. The California mutual aid program provides for all emergency services when implemented.

4. Crisis Response – Recovery (After an Event)

The most important phase in an emergency is recovery. Communications during this phase may begin, depending on the extent of the emergency, while response to the event is going on. Recovery occurs in order to bring the systems back to normal operating capacity.

a. Message Media – Lessons Learned. Recovery should include the accumulation of documents pertaining to lessons learned and in the end, a debriefing to make sure all ideas and situations dealt with by employees and management are documented and can be learned from by all those in the

organization. Recovery communication documentation may be utilized by way of additions to the communication plans, future employee and management training and even in public messages pertaining to the organization's accountability in the aftermath of the event.

b. Message Sender – Reputation. Most organizations have a single person titled specifically to deal with a crisis situation. This person may be a leader of a team of associates who are called upon in the time of an emergency, though only the leader does all of the public speaking. This Public Information Officer or Emergency Communication Manager is ultimately in charge of making sure that messages, mediums and channels of communication are appropriately developed, tested, and disseminated. Senders/speakers should be formally trained and educated on the effects of miscommunication to an audience and an organization. Miscommunications may lead to mistrust, lost credibility and lost reputation. An organization's good reputation may be one of the hardest things if not an impossible thing to re-earn, once it is lost.

c. "Hazard Vs. Outrage". Most emergency communications are created and disseminated in order to safeguard the audience's wellbeing. This is sometimes met with many obstacles. A concept of "Hazard" plus "Outrage" is an obstacle that must at least be considered when dealing with emergency communication. During an emergency "hazard", perception is a very important part of the emergency analysis. Public and/or stakeholder (those people of the organization with the most to gain and lose from association with the organization) perceptions of the emergency situation may be high or low and one of the biggest conflicts

comes when technical experts, on behalf of the organization, hold opposing perceptions. Such problems might occur more specifically when an organization believes an emergency to have very low hazard to public health and thus desires to allow the emergency to pass with little regard, but the public's perception of the hazard is high. Due to opposing perceptions a significant controversy arises, particularly when the organization does not recognize the opposition before the audience becomes "outraged".

"Outrage" is the feeling of anger and frustration felt by members of the addressed audience. Outrage has been researched and found to be high with certain types of crises. Outrage is considered high in crises that are government controlled, from an untrustworthy source, associated with disasters or "acts of God", imposed upon the public versus those voluntarily accepted by that public, exotic versus common, considered unfair, artificial, undetectable, and/or those considered dreaded such as cancer-causing. Also, crises with high outrage factors tend to be those which are not well understood by the audiences being addressed. Particularly hard to understand are those crises with difficult scientific explanations. Care should be taken in these occasions to avoid "dueling experts". When an audience encounters opposing "expert" viewpoints over a particularly difficult subject matter, they experience significant confusion due to a feeling of overwhelming frustration when "even the experts can't decide".

5. Audience Analysis and Feedback

The receiver of any communication, is the audience, and should be of the utmost concern to the organization during a crisis. Without knowing the effects that

communications will have on the audience and consequently on the organization, communication can seem futile and can quite possibly be damaging. Characteristics that should be known of the audience during a crisis event include their prior knowledge of the subject at hand as well as any prior assumptions made that may have to be changed or further enriched with the present situation. Certain audience beliefs and values that are held may also have to be changed in order to get an audience to do what may be necessary to keep them safe.

Audience analysis leads ultimately to the selection of even more appropriate messages, media, and channels for proper dissemination. Media available to an organization are of as much importance as utilizing that media. According to an audience analysis, decisions must be made as to the effect of written versus audio versus visual media on the various demographics within the community. Television may prove to be the most attended channel for visual messaging while radio messages may get to audiences at different key times of the day, say the working, commuting audience. Written pamphlets may be of better use, on the other hand, than cumbersome, in-depth packets. Bill inserts may be ultimately preferred since they are simple and applicable directly to the subject, and at the time when that particular subject is on the mind of the customer since a customer will be concerned about water service issues as he/she opens their service bill.

The preferences of the audience bring up a topic that must also be taken into consideration. Stakeholders of an organization often have much desire to have some say in how decisions are made; especially when those decisions involve the effects of a situation that may be affecting them in the future. Attempts must be made to include the

audience and particularly the critical stakeholders in focus groups, workshops, surveys, advisory committees, or even public meetings. Feedback on or during an event or simulated situation is one of the easiest and most efficient ways to find out the effectiveness, costs, and benefits that come from the communication effort.

In the event of an emergency, an organization should always be prepared. Emergency Management and Emergency Communication Plans should be developed and implemented, and mitigation procedures as well as developed messages and past lessons learned should all be included within those plans and procedures. Every organization, however, is different in its risks and priorities, and cannot feasibly assess and implement every possible emergency event. A way of focusing this plethora of information is to assess the risks related to each particular organization and focus the Emergency Communication Plan and Emergency Operating Procedures to these organization specific risks.

B. Content Analysis

In order to determine the Best Management Practices (BMPs) for use in emergency message creation, a quantitative content analysis of relevant messages must be performed.

Content analysis essentially consists of the systematic analysis of the content in a set of data, resulting in a statistical or trend analysis to render an appropriate solution to a formulated problem. Establishing the history behind the use of content analysis over the years, a description of the past content analysis uses provides insight into its usefulness for the solution of the problem stated for this project. Following the brief history will be a description of the major aspects of content analysis. Aspects include the data used

which constitutes the content that is to be coded for the analysis, the codebook which details the procedures to be followed during coding, the actual analysis procedure described as it should progress from coder training through reliability coding, and analysis results describing ways to analyze the content analysis to best solve the formulated problem.

Several definitions of content analysis are available as well as many insightful uses for how the quantifiable data can be analyzed. Basically stated:

> "Quantitative content analysis is the systematic and replicable examination of symbols of communication, which have been assigned numeric values according to valid measurement rules, and the analysis of relationships involving those values using statistical methods, in order to describe the communication, draw inferences about its meaning, or infer from the communication to its context, both of production and consumption." (Riffe, 1998, 20)

In the process of content analysis, as referenced in "Content Analysis of Communications", quoted by Fred N Kerlinger from "Foundations of Behavioral Research",

> "It is…a method of observation. Instead of observing people's behavior directly, or asking them to respond to scales, or interviewing them, the investigator takes the communications that people have produced and asks questions of the communications." (Budd, R.W., Thorp, R.K. et al, 1967, 2)

Richard Budd et al. from "Content Analysis of Communications", continues on to state that:

> "Content analysis allows the investigator to observe a communicator's public messages at times and places of the investigator's own choosing." (Budd, R.W., Thorp, R.K. et al, 1967, 2)

1. <u>Historical Use</u>

Several uses for content analysis can be found historically. Since the mid 20th century, content analysis has been used in analyzing various documents, particularly historic documents. Closer to the turn of the century, content analysis has been used in analyzing media messages, particularly as television began to take on a much larger role in society. Content analysis has been used in association with some large governmental and political occasions in history through the analysis of historic data. Content analysis was used, for example, to answer questions such as whether a noticeable increase in international communication could have foreseen the onset of an international war crisis. (North et al, 1963)

Content analysis has also been utilized to the agenda of researchers attempting to prove effects of media messages on the public. Through focus group analysis, initial claims were made that media messages unduly influenced the public, relinquishing them of their abilities to decide for themselves on matters such as politics. Later, analyses were made discovering that the public in its normal, non focus-group, environment, rarely actually listens and bases its knowledge solely on media messages, but in fact, on several aspects outside of media priority.

2. Data Acquisition and Sampling

Once a problem has been formulated in which it is desired to use content analysis to solve, a data set is acquired as well as an appropriate way to sample the data.

In attempting to perform a content analysis on a set of messages, one must first decide on the sampling ability of the data set. Sampling of a set of data is done when a very large amount of data is accumulated and it is deemed unnecessary to analyze all of the data. A representative sample of the entire data set is selected instead of using all of

the acquired data. Sampling may be classified as random, stratified, systematic (interval), cluster, or multistage sampling. Whether there is enough data available to perform any of these sampling procedures must always be taken into foremost consideration. In some cases, such as when the individual data units are so unique from all other data units, a representative sample cannot be selected and all of the gathered data must be included in the content analysis.

Once it has been decided which type of sampling will be used, if it is to be used, a sample size should be decided upon. Sample size is something that depends on many factors in the data set, the problem, and the coding environment. These factors include such things as the precision required of the resulting statistics, the uniqueness of the data units in relation to the characteristics being analyzed, the need for and size of sub-samples, as well as the amount of time and monetary expenditures that is available for the analysis.

It is not necessarily a requirement to provide a sample of the universe of data for analysis. As stated by Krippendorff (1980, 66), "the practical need for sampling is to reduce a large volume of potential data to a manageable size." Content analysis sampling is sometimes "complicated by the difficulty or even the impossibility of physically securing necessary sample units" (Berelson, 1952, 175).

It is possible that an emergency message be so unique that the entire set of data available be used in the content analysis in order to properly reveal representative statistical results. On the other hand, one resource has stated that "when all sampling units are exactly identical, a sample size of one is satisfactory." But continues to say that "when there are a few rare and significant incidents on the list of units, the sample will

have to be large and will include the whole population when each sampling unit is unique" (Krippendorff, 1980, 69).

In the case of this research, publicly disseminated messages shall be the only data set analyzed. Theoretically, the entire set of data would include every document ever released or created for the purpose of the research. This would entail the use of every water and wastewater utilities' emergency messages ever released to the media in the form of public notifications, messages provided to critical agencies or customers, messages provided to emergency services personnel, and all internal messages provided to notify and update employees. Theoretically, again, every emergency message publicly issued by every water and wastewater utility within the United States should be included for a complete data set, but only a very precise number of utilities are available for this research. All public releases available to the researcher provided the sampling of relevant public releases. This qualified "sampling", while it utilizes all of the participating utility's provided messages, is still considered a sample since the theoretical full data set would be significantly larger in size.

3. Content Analysis Units

Following the selection of a proper sample and sampling size, the selection of a precise coding unit should commence. There are two major types of content analysis units; study units and content units. Coding units and context units are each considered study units. FIGURE 1, shows the typical categorization of the types of units commonly used in content analysis.

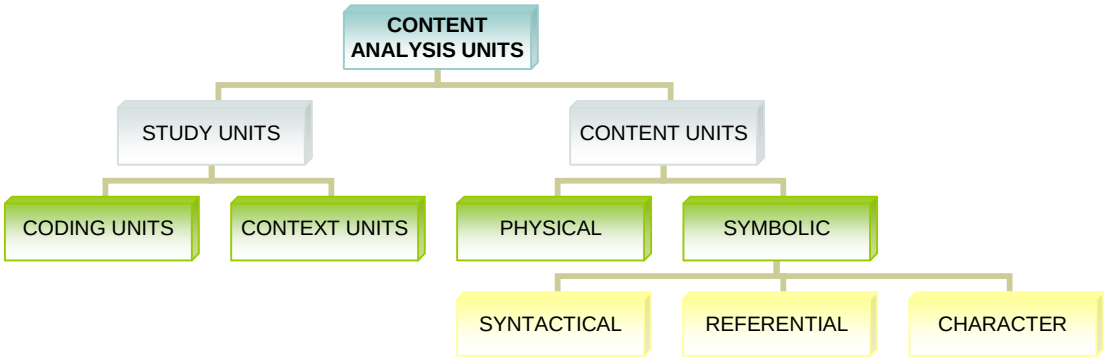


FIGURE 1 - Content Analysis Units

a. Study Units. A coding unit is the smallest form of content that is counted and scored in the content analysis. Typically, coding units can be words, sentences, paragraphs, items, characters, groups, objects, institutions, themes or assertions, and even space and time. Once the selection of a coding unit has been made, the appropriate context units should be detailed. Context units, according to Riffe,

> "are the content elements that should be examined in order to appropriately assign content to recording (coding) units. Context units can be the same as or larger than the recording unit, but cannot be smaller." (Riffe, 1998, 61 t 4.1)

These elements are those "elements that cue researchers to the context that should be examined in assigning content to categories." (Riffe, 1998, 61) A word for instance, may be qualified as the coding unit for a set of data. Each "word" in the data will be assigned a number or content classification during analysis. In order to assign the correct number to the word, the context within which the word is found in the data, such as surrounding words and sentences and even the entire

paragraph may provide the coder with enough information to properly number or "code" the coding unit.

b. Content Units. Under the content unit classification are physical units and symbolic units. The space and time devoted to messages are considered physical units. Physical units would be put to good use if the message analysis was performed on television, radio, or newspaper messages. Minutes of devoted television or radio air time or inches of message space provided in a newspaper would prove useful as content analysis units.

Syntactical, referential or character units are symbolic units. "Syntactical units occur as discrete units in a language or medium." (Riffe, 1998, 66) Scenes and acts within plays would be considered syntax units. If the use of multiple media were used within this project such as commercials and news spotlights, syntactical units could be classified and put to use.

Referential units are those which "involve some physical or temporal unit (e.g., event, people, objects, etc.) referred to or alluded to within the content." (Riffe, 1998, 66) This subclassification is most useful in this content analysis. The elusory effects within the messages' coding unit to emergency events, people, objects, agencies or organizations involved, can be directly classified as a referential unit.

Character units are those which allude to particular key characters or entities in the material.

4. Message Coding

Once all necessary analysis units for coding all content are established, actual message coding begins. First, a general idea of what characteristics would typically be present in most, if not all, messages, is established through message overview. After coding units are finalized for establishment in the codebook, context units are established. To further aid in establishing characteristics and to establish appropriate context units, some unique messages are coded.

A codebook is a detailed guidebook that provides a trained message coder with detailed information used for coding a message. Within the codebook, each line coincides, line for line, with the coding form. Each line which requires a code contains a detailed description of what and how a trained coder should interpret and quantitatively code the messages. According to selected characteristics and predefined coding context units which describe how a particular coding unit or category should be interpreted, trained coders shall be able to train from and reference the codebook for complete coding guidance.

The coding form, which is a blank line version of the codebook, is a form that includes all of the required analysis characteristics of the codebook, as well as physical lines for ease in coding and result accumulation. The coding form is a restatement of the same information listed in the codebook with lines provided for data being specifically coded. This is provided in a simple tabular form for noting ease as the data set is interpreted through the guidance of the codebook.

5. Content Analysis Results

Once the data set has been thoroughly analyzed, results must be accumulated, scrutinized and ultimately summarized. There are several desirable traits that should be taken into consideration throughout the content analysis process. A complete typical breakdown of these traits common to content analysis can be found in the following FIGURE 2.

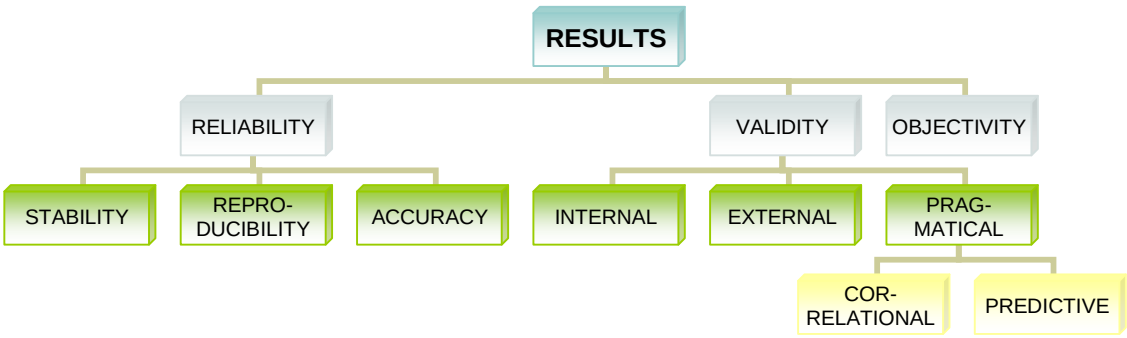


FIGURE 2 - Content Analysis Types of Results

a. Reliability. Reliability, in particular, is a necessary part of content analysis. Reliability should exist if the "procedure should yield the same results from the same set of phenomena regardless of the circumstances of applications." According to Kaplan and Goldsen's words as sited by Krippendorff, "Reliable data, by definition, are data that remain constant throughout variations in the measuring process." (Krippendorff, 1980, 129)

Reliability can be narrowed to three types as they relate to separate situations. Stability can be considered in such a situation as when a coder recodes the message twice, at different times, and develops the same results. This provides the ability to identify disagreements between unit descriptions, coding, measurement, and number or category assignments. This disagreement "reflect(s) intraobserver inconsistencies or noise, the cognitive changes that took place

within that observer, or that coder's difficulty in interpreting the recording instructions." Stability is also known as consistency and should not, according to Krippendorff, be trusted as the sole indicator of the acceptability of content analysis data. (Krippendorff, 1980, 130)

Reproducibility is another very applicable type of reliability. This can be most applied through the independent coding of the messages by more than one individual coder. Disagreements in this situation "reflect both intraobserver inconsistencies and interobserver differences in the way a recording instruction is interpreted." (Krippendorff, 1980, 131) In this test of reliability, changes may be necessary in the recording instruction to provide a more concise description of the coding unit and relative context.

Accuracy is the third type of reliability. Accuracy is established "when the performance of one coder, or measuring instrument is compared with what is known to be the correct performance of measure." (Krippendorff, 1980, 131) Although accuracy can be considered the strongest reliability test available, in this particular content analysis, there are no standards for comparison.

b. Validity. Once reliability factors are defined, validity can be considered and possibly measured. A content analysis may be considered valid if it is able to uphold the inferences that were developed "in the face of independently obtained evidence." (Krippendorff, 1980, 155) Validation is particularly important when dealing with policy association, when they affect human beings and when they are meant to aid government or industry; all of which are pertinent to this project's work.

Validity has often met with many obstacles, two in particular being conceptual and methodological. These obstacles have caused validity to be considered only lightly by many analysts past, which according to Krippendorff may provide a reason behind the preferred use of controlled experimentation and survey research over content analysis.

The conceptual obstacle stems "from uncertainties regarding a target for inferences from data" and where one might find the independent evidence for result support. The methodological obstacle can be related to the "narrow interpretation of validity." (Krippendorff, 1980, 156)

Validity can be further analyzed by distinguishing between internal and external validity. Internal validity can be considered another term meaning reliability. External validity on the other hand

> "assesses the degree to which variations inside the process of analysis correspond to variations outside that process and whether findings represent the real phenomena in the context of data as claimed."

Problems with validity occur in several aspects including within the "nature of the *data*, the analytical *results*, or the nature of the *process* connecting the two." Pragmatical validity is an assessment of the adequacy of a method under varying circumstances. A pragmatically valid analysis is revealed when the results agree with what claims were initially made.

Two types of pragmatical validity are correlational validity and predictive validity. Predictive validity relates the degree that predictions discovered through one method correlate to directly observed facts. Predictive validity may be useful in this project as predictions for useful messages are made from content analysis,

and through the use of head-of-household focus groups, the predictions may be correlated to actual group observations.

During the communication of emergency messages, the data most relevant to a set of messages disseminated in response to a crisis event are the reactions of the public audience or the receivers of the information and their subsequent reaction, whether it is action, non-action, or mere consideration. Ultimately, their perceptions and reactions will determine the effectiveness of the message, therefore monitoring and feedback is another necessary tool for the success of a set of analyzed messages.

c. Objectivity. Since much is on the observer or the investigator, objectivity is another aspect that must be monitored, along with reliability and validity. Category objectivity needs to be achieved through the coders. Unbiased interpretations of the coding units and messages shall provide the means for objectivity. A category can be considered objective if "it yields unbiased data independent of the idiosyncrasies of data collectors." (North, et al, 42)

6. Trends

The coding form itself may be put to direct use by creating summary columns to calculate the number of times that certain aspects, such as the general utility website address, appear within the entire set of messages. Summarizing rows may also be put to use calculating the number of paragraphs within a message that hold certain relevant characteristics and in summarizing trends in the value of messages. Trends may become apparent as numbers and reoccurring tendencies are revealed. Trends and repeated

characteristics may then be scrutinized and applied to selected messages for focus group analysis.

III. PROCEDURE

In content analysis, a certain flow should be kept which includes continuity as well as repetition. FIGURE 3 below depicts the general flow of a content analysis with directional arrows showing repetition and step coordination.

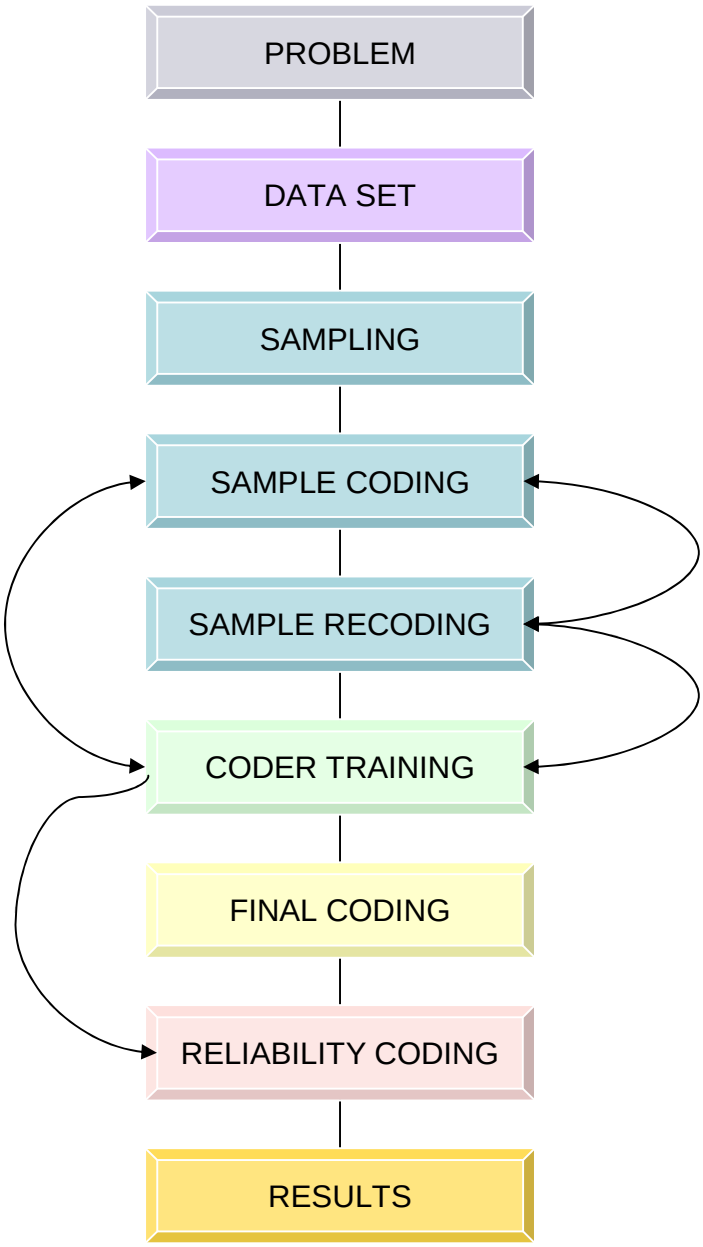


FIGURE 3 - Content Analysis Flow

A. Data

After a problem was formed which content analysis would serve well to solve, data useful for analysis was gathered. Data relevant to the research consisted of media released messages during an emergency event. The process of initial review of the data resources began with the determination that not all water and wastewater utilities would be willing and able to deliver any and all of the relevant messages and case study data that needed analyzing for theoretically true results.

In order to better narrow this data to a responsible and willing group of respondents, internet surveys were conducted. In order to ascertain a significant number of utilities, email addresses of utility managers were located via methods such as general agency membership listings such as WERF and AWWARF, agency resource listings in the resource sections of relevant literature, and electronic searches, using search engine technology online, for city utilities. Most email addresses were located online, through utility websites, after the agency name had been located by other means as mentioned.

Of the 832 utilities and 1,266 contacts, that the initial survey was sent out to, 194 responded, granting permission to further contact them for information as the research saw fit. A secondary survey was then released that pertained more specifically to the respondents' utility. Of these, 15 were chosen through selection methods according to the numbered and open responses of the utility from the second survey information. These 15 would be followed up on via email and telephone for the completion of a detailed emergency communications interview. An initial outline of this interview was sent ahead of telephone follow-up, via email, permitting time for the respondent to prepare their responses to their convenience. Once telephone interviews began,

respondents were asked for emergency response press releases as well as a copy of the portion of their emergency plan which pertained solely to communications.

Only 11 responded while only five fully responded, with press releases and communications plans, and only five responded with only one or the other. It was discovered that some utilities may yield press releases through their archives on their websites. It was thus found useful to locate any and all press releases belonging to the respondents, beginning with the 15 that had been most helpful so far. It was determined ultimately that it might well be worth the effort to obtain as many press releases as possible for better trend analysis, therefore the initially respondent 194 utilities were located online and attempts were made, to some avail, in locating archived press releases.

B. Sampling

After gathering the relevant emergency press releases disseminated from water and wastewater utilities, they were grouped by their basic emergency. This helped to determine what events were most occurring and what were most responded to as emergency events. Initial revelations included that of spills such as coal, chlorine, and wastewater, contamination such as chlorine and unknown substances, water main breaks, and flooding. Though there were some events that did not fit into these categories such as other natural disasters as hurricanes, they seemed to be few and far between in the utilities that were available as resources.

In the particular case of this research, as was mentioned in the latter portion of the introduction, pertinant to the available number of press releases and the necessity of sampling procedures for adequate results, the entire set of messages were used due to the uniqueness of each emergency message.

Once a somewhat complete set was gathered, a sample set was set aside which visually seemed to hold characteristics that could be used to outline a codebook. Using the sample set, initial characteristics included the notation “For Immediate Release”, ending notation “###”, relevant phone numbers and names and addresses for those such as the general manager, or in the case of a special emergency, the contact information for the affected organization.

C. Sample Coding

From the initial set of data, the appropriate coding unit was determined as well. At the outset, a coding unit was going to consist of each sentence and each sentence’s context would be determined from the surrounding sentences and sentence itself, but it was quickly determined that it was often difficult and somewhat impossible to code each sentence since the reading of the entire paragraph might be necessary to determine it’s appropriate code from context. It was therefore decided to code each paragraph using the message as a whole to help as context in coding.

After the choosing of coding units and context, initial coding was done on the sample set to begin determining what characteristics were common within the text of each message. With this initial coding, context units could be detailed within the codebook to describe how best to identify the appropriate coding number for each unit. After making notation of some topics that could be noticed within the message text, such as whether the message text pertained to response before, during, or after an emergency or whether the unit was related to a natural disaster or a human induced event, coding the sample set allowed the addition of detailed descriptions to be used as context units. These are particular in the way that they can be used to train and guide a coder in coding

all of the messages. Having the context clear, concise, and not easily misunderstood keeps all coders making the same decisions during coding and keeps reliability high.

A single run-through of coding does not do the job. After initial coding is complete, many discrepancies in understandability were determined and located. Once changes were made, a recoding of the messages was performed to permit observation of the effects of the changes, if any, which might occur, and thus cause more changes. Edits to the original codebook were therefore, frequent, and recoding of the set of sample messages commenced as many times as was necessary to completely detail the context units to provide consistent coding each time the coding was completed.

D. Final Coding & Results

Once the codebook was to the satisfaction that all coders should be able to train from it and utilize it efficiently as a guide in all message coding, a final empty coding form was developed that provided the coder with a user-friendly tabulating form to complete the coding work. The forms make it that much simpler to summarize numbers in coding and to immediately notice trends in the multitude of messages to ultimately be analyzed.

With the aid of the codebook and the convenience of the coding form, final coding commenced with the full set of messages. Final coding yields the results that are summarized in charts and graphs and the trends which can lend themselves to ideas and recommendations for best messages to disseminate during emergencies. Trends that develop in the messages that are already in use will reveal what is presently used most frequently by utilities and frequent use may indicate the non-use of ineffective messages from the utility's past.

E. Codebook

Emergency Message Analysis

Coding Unit: Each individual paragraph within the text of a communications message. Coding shall also, where relevant, include elements and phrases within the message not located in the body text of the message.

Message ID: Fill in the identifying message code as indicated on the Message ID list. More than one paragraph ID number may occur within a single identified message.

Coder ID: Fill in the identification number for the coder as indicated on the coder ID list.

Paragraph ID: Each paragraph shall be given a unique four digit number, beginning with 0001, 0002, 0003, etc. without duplication, for all messages. Message ID may be the same for more than one paragraph ID number.

Descriptive Element: Element or phrase describing the fact that it is "For Immediate Release", "Press Release", or "News Release". Leave blank if no apparent element is present.

Organization/Utility Name: Fill in name of organization/utility. Leave blank if not listed.

Message Title: Fill in title of message. Leave blank if not listed.

Message Date: Fill in date of message dissemination. Leave blank if not listed.

Message Time: Fill in time of message dissemination. Leave blank if not listed.

General Contact Name: Indicate 1 if general contact name is provided. This contact should be a direct link with the utility. General Manager, Executive Director, Public Relations contact, Media contact, Communications Manager, Public

Information Officer (PIO). Indicate 2 if more than one contact is provided. Indicate 0 if none are provided.

General Contact Title: Fill in Title of the general contact listed previously as General Manager, Executive Director, Public Relations contact, Media contact, Communications Manager, Public Information Officer (PIO). Leave blank if unable to determine.

General Contact Address: Indicate 1 if the physical address of General Contact is provided. If listed as general utility address, leave blank and indicate below in respective code line. Leave blank if not listed.

General Contact Telephone Number: Indicate 1 if general contact telephone number is provided. If listed as general utility telephone number, leave blank and indicate below in respective code line. Indicate 2 if more than one general contact number is listed. If one of these multiple numbers is the general utility telephone number, indicate here as 1 and below in respective code line. Leave blank if not listed.

General Contact E-mail Address: Indicate 1 if general contact e-mail address is provided. If listed as general utility e-mail address, leave blank and indicate below in respective code line. Indicate 2 if more than one general contact e-mail is listed. If one of these multiple e-mail addresses is the general utility e-mail address, indicate here as 1 and below in respective code line. Leave blank if not listed.

General Utility Address: Indicate 1 if general utility address is provided. If this is the same as the general contact address it should be indicated here ONLY.

General Utility Telephone Number: Indicate 1 if general utility telephone number is provided. If this is the same as the General Contact telephone number it should be indicated here ONLY.

General Hotline Number: Indicate 1 if a general Hotline number is provided. Code line should be left blank if hotline number is one initialized only for emergency situations. If unable to determine general from specialized hotline number, indicate 1. Leave blank if not listed.

General Customer Service Number: Indicate 1 if a general customer service number is provided. Leave blank if not listed.

General Utility E-mail Address: Indicate 1 if a general utility e-mail address is provided. If this email address is the same as the General Contact e-mail address, indicate here as 1, as well as in respective general contact code line. Leave blank if not listed.

General Website Address: Indicate 1 if a general website address is provided. This should be a website address for the utility in general and not be a specialized website address just for emergency situations. Website addresses for emergency situations shall be indicated in respective code lines. Leave blank if not listed.

Relevant* Contact Name: Indicate 1 if a contact name is given in relation to or in response to a relevant event as described in context and/or within the coded unit. Indicate 2 if more than one relevant contact name is provided. Leave blank if not listed.

*Relevant information is that information associated with contacts outside the general utility such as federal agencies, local business, local agencies, local emergency services, 911 services, and those which would generally not be listed. This information may include that contact information in direct relation to the effects of an emergency.

Relevant Contact Title: Fill in Title of the relevant contact listed previously as General Manager, Executive Director, Public Relations contact, Media contact, Communications Manager, Public Information Officer (PIO). Leave blank if unable to determine.

Relevant Contact Address: Indicate 1 if a contact address is given in relation to or in response to a relevant event as described in context and/or within the coded unit. Indicate 2 if more than one relevant contacts address are provided. Leave blank if not listed.

Relevant Contact Telephone Number: Indicate 1 if a contact telephone number is given in relation to or in response to a relevant event as described in context and/or within the coded unit. Indicate 2 if more than one relevant contacts telephone number are provided. Leave blank if not listed.

Relevant Contact E-mail Address: Indicate 1 if a contact e-mail address is given in relation to or in response to a relevant event as described in context and/or within the coded unit. Indicate 2 if more than one relevant contacts e-mail address are provided. Leave blank if not listed.

Relevant Hotline Number: Indicate 1 if a hotline number is given particularly in relation to or in response to a relevant event as described in context and/or within the coded unit. If only a general hotline number is listed, leave blank, indicating on the respective code line previous. Leave blank if not listed.

Relevant Customer Service Number: Indicate 1 if a Customer Service number is given particularly in relation to or in response to a relevant event as described in context and/or within the coded unit. If only a general Customer Service number is listed, leave blank, indicating on the respective code line previous. Leave blank if not listed.

Relevant Website Address: Indicate 1 if a website address is given particularly in relation to or in response to a relevant event as described in context and/or within the coded unit. If only a general utility website address is listed, leave blank, indicating on the respective code line previous. Indicate 2 if multiple relevant website addresses are provided. Leave blank if not listed.

Before/During/After a Crisis: Indicate if the paragraph can be related to before, during, or after a crisis event has occurred:

1. Before: General information insinuating that no crisis event has occurred.
2. During: Context of paragraph details actions or occurrences taken place during a crisis. This material may be present or past tense. General information on details occurring during the event.
3. After: Context of paragraph details actions or occurrences taken place after a crisis. Actions detailed as having happened after the crisis event has been resolved and the organization is back to normal operating procedures.

37. Unable to determine.

Natural Disaster/Human-Induced: Indicate by what means the event occurred, whether the paragraph is related to the effects of an earthquake, a natural flood, a human-induced flood, a hurricane, a landslide/mudflow, a natural sinkhole/karst, human-induced sinkhole, a thunderstorm, a tornado, a winter storm, a contamination, a technically induced fire, a power outage or a disruption. Further breakdown should reveal the specific effects of the means which directly result in response to the event as it pertains to the organization:

1. Earthquake – Structural damage to reservoirs, lines, mains, treatment facilities, chemical treatment containment facilities, towers
2. Earthquake – physical system failure
3. Earthquake – electrical system failure through computer or SCADA
4. Natural Flood – extensive rain
5. Natural Flood – extensive thaw
6. Human-Induced Flood – sabotage: terrorist activity to create failure or thwart effectiveness of water restricting devices
7. Human-Induced Flood – natural failure of manmade water restricting devices: dam, levee, floodwall
8. Human-Induced Flood – non or untimely mobilization of manmade water restricting devices: floodwall closures
9. Hurricane: wind or water damage, interior damage to facilities and electrical systems, mix of treated and untreated flows, breach of chemical containment facilities, release of treatment chemicals, release of wastewater

10. Landslide/Mudflow
11. Natural Sinkhole/Karst
12. Human-Induced Sinkhole – Sabotage of underground facilities: purposeful destruction of lines to compromise the surface integrity
13. Human-Induced Sinkhole – failure of underground facilities leading to collapse of lines, mains and subsequently ground surfaces through physical elevation drop as well as water washout from failure
14. Thunderstorm – Wind damage
15. Thunderstorm – Electrical Damage
16. Thunderstorm – Natural Fire Damage
17. Tornado – Wind Damage
18. Tornado – Hail Damage
19. Winter Storm – Extensive Ice Load: structural compromise
20. Winter Storm – Extensive Snow Load: Structural compromise
21. Winter Storm – Freezing (bursting): Line and main bursting
22. Winter Storm – Freeze/Thaw Cycles: structural fragility in concrete surfaces leading to reservoir, lines, mains and facility structural compromise over time
23. Natural Contamination: animal excess, domestic commercial animals, cattle or slaughterhouse runoff in excess to normal intake, above normal runoff from areas of excess in unregulated human waste or animal waste, cryptosporidium outbreak from such contamination, known natural blockage, unknown blockage, excess rainfall leading to design capacity overflow

24. Human-Induced Contamination – Bio-weapon terrorism/sabotage: biological agents sent via detonating devices or which act upon arrival/open (mailed packages)
25. Human-Induced Contamination – Chemical introduction terrorism/sabotage: chemicals introduced into reservoir/intake
26. Human-Induced Contamination – accidental but acknowledged by perpetrator or contaminator
27. Human-Induced Contamination – accident but unbeknownst to perpetrator or contaminator, structural failure, mechanical failure, man-made blockage
28. Technically Induced Fire – Intentional Arson
29. Technically Induced Fire – Unintentional Arson
30. Technically Induced Fire – Internal electrical: wiring
31. Power Outage – internal
32. Power Outage – external
33. Standard/typical disruption: water main or line break, valve or line repair
34. Violent/non-typical disruption: terrorist bomb
35. Non-typical disruption: accidentally created disruption
36. Terrorism: Sabotage, fraud, scare tactics
37. Unable to determine
38. Precipitation Shortage: Drought, Prompting water conservation
39. Human-Induced Contamination – Intentional man-made blockage

Message Type: Indicate whether the type of message the paragraph is trying to portray is general information, public action request, organization response to an event, or consumer alerts/immediate notifications:

General Information:

1. Pre-crisis or Preparatory Information: Informing messages relative to upcoming precaution seasons such as winter storm, hurricane, flood, drought or tornado seasons.
2. Water conservation messages: as precautionary measures and for voluntary conservation.

Public Action Request:

3. Boil-water advisories.
4. Fraud watches asking for immediate notification of anything suspicious seen or suspect full.
5. Danger watches in the case of burst water mains after an event.
6. Mandatory water conservation requests due to actual water shortages.
7. Prohibitive, recommended or precautionary measures – improper wastewater disposal from flood excess, line flushing, pollution or flooding avoidance recommendations

Organization Response to an Event:

8. Initial responses to an event to alleviate any fears, confusion, and just to inform.
9. Initial status report on the condition of the utility immediately following the onset of an event.

Consumer Alerts/Immediate Notifications:

10. Fraud awareness.

11. Water quality notifications without need for boil water advisories.

12. Informational/awareness messages or status reports which may include update information during and after a crisis event has occurred with no alarming intent. After initial status report. Explanatory report of cause of crisis.

37. Unable to determine.

Organization Response Action: Indicate 1 if utility has performed some remedy action in response to an event. Use of past tense in the detail of actions as they occurred would insinuate the response action has been completed. Indicate 2 if the utility is in the process of performing some action in response to an event. Indicate 3 if the utility is yet to respond to the event, or the message speaks of actions that will occur in the immediate future. No diagnosis made. Preliminary declarations made for status and remedying actions to follow. Indicate 37 if unable to determine.

Present Status: Indicate 1 if the utility is back to or never left normal operating status indicated through past tense reference to completed reparations. Indicate 2 if the utility is in the process of reparations. Even if at the very beginning of work. Indicate 3 if the utility is in the determination phase of what steps to take for reparations or the paragraph speak of the reparations that will occur in the near future. Decision and authorization has been made as to what to do but no beginning of work. Indicate 4 if the utility has only just discovered the need for a

determination phase, in other words, nothing has occurred but awareness of an event. Notice of awareness. Indicate 37 if unable to determine.

Termination: Indicate if there is some sort of termination notation:

1. ###
2. General Organization Information
3. No apparent notation
4. Other Closing Notation

After the development of a codebook to describe a procedure for performing content analysis on the selected number of emergency messages, a simplistic coding form was developed to aid in fast and convenient sheet coding for use by each identified coder. Messages were also assigned number IDs and were present on a Message ID list as mentioned within the codebook code line on Message ID. A Coder ID list was also maintained. Sample forms for Message ID and Coder ID can be found within the appendices.

F. Coding Frame/Form

Coding Form

Emergency Message Analysis

Message ID _____ Coder ID __001_____						
Paragraph ID:						
Descriptive Element:						
Organization/Utility Name:						
Message Title:						
Message Date:						
Message Time:						
General Contact Name:						
General Contact Title:						
General Contact Address:						
General Contact Telephone Number:						
General Contact E-mail Address:						
General Utility Address:						
General Utility Telephone Number:						
General Hotline Number:						
General Customer Service Number:						
General Utility E-mail Address:						
General Website Address:						
Relevant Contact Name:						
Relevant Contact Title:						
Relevant Contact Address:						
Relevant Contact Telephone Number:						
Relevant Contact E-mail Address:						
Relevant Hotline Number:						
Relevant Customer Service Number:						
Relevant Website Address:						
Before/During/After a Crisis:						
Natural Disaster/Human-Induced:						
Message Type:						
Organization Response Action:						
Present Status:						
Termination:						
VALUE						

FIGURE 4 – Coding Form

G. Example Message Coding

This section is meant to provide a step by step, detailed example of the coding of an emergency message, as was done for this research. The following emergency message (FIGURE 5), disseminated from the City of Golden, CO, is the original message that was coded and is used here to provide the example which attempts to better describe the procedure of performing a content analysis coding for Water and/or Wastewater Utility Emergency Messages.

City of Golden

911 10th St.
Golden, CO 80401
303-384-8000
www.ci.golden.co.us

For more information, contact:
Communications Manager/PIO
Sabrina Henderson
Office: 303-384-8132
Cell: 303-437-6671
shenderson@ci.golden.co.us

FOR IMMEDIATE RELEASE:

Flooding Caused by Severe Weather

Golden, Colo. — June 27, 2004 — Heavy rains that descended on Golden for several hours today flooded streets and homes in northern Golden, but no one was injured.

The Golden Police Department received 18 calls related to flooding from the rain between 3:30 and 6 p.m. The Golden Volunteer Fire Department sent out 31 crew members in all its vehicles to check public safety and mitigate potential problems with electric and gas utilities. At each of the calls, emergency responders checked neighboring homes as well. American Medical Response stationed two ambulances at the north and south ends of town, but were not needed.

City of Golden street crews closed roads that were flooded and worked to clear culverts and drains. The City closed State Highway 93 around 4 p.m. to allow several feet of water to subside. The northbound lane was reopened about an hour later, while the Colorado Department of Transportation cleared mud from the southbound lane.

# # #

FIGURE 5 - Original Emergency Message – Example Coding

A blank Coding Form as seen in the previous section F was used for all Emergency Messages being analyzed. FIGURE 6 shows a blank coding form with relative line identifiers (see red numbering and indicator) and column identifiers (blue lettering and indicator), for greater ease for description, in this section only.

LINE IDENTIFIERS
(reference only)

Coding Form

Emergency Message Analysis

		A	B	C	D	E	F
1	Message ID _____ Coder ID _____						
2	Paragraph ID:						
3	Descriptive Element:						
4	Organization/Utility Name:						
5	Message Title:						
6	Message Date:						
7	Message Time:						
8	General Contact Name:						
9	General Contact Title:						
10	General Contact Address:						
11	General Contact Telephone Number:						
12	General Contact E-mail Address:						
13	General Utility Address:						
14	General Utility Telephone Number:						
15	General Hotline Number:						
16	General Customer Service Number:						
17	General Utility E-mail Address:						
18	General Website Address:						
19	Relevant Contact Name:						
20	Relevant Contact Title:						
21	Relevant Contact Address:						
22	Relevant Contact Telephone Number:						
23	Relevant Contact E-mail Address:						
24	Relevant Hotline Number:						
25	Relevant Customer Service Number:						
26	Relevant Website Address:						
27	Before/During/After a Crisis:						
28	Natural Disaster/Human-Induced:						
29	Message Type:						
30	Organization Response Action:						
31	Present Status:						
32	Termination:						
	VALUE						

COLUMN
IDENTIFIERS
(reference only)

FIGURE 6 - Coding Form – Referential Line Numbering

All Emergency Messages were initially allocated a Message ID and this number was noted on line 1 of the Coding Form along with the Coder ID. The Message ID for this example was Message ID 0001 and the Coder ID for this researcher's work was 001. One must familiarize oneself with the codebook for the content analysis and follow all procedures to ensure proper coder training prior to commencing message coding. Once this was ensured, coding was begun while following the codebook in section E. Since the Coding Unit for this content analysis is: "Each individual paragraph within the text of a communications message", as indicated in the codebook, a Paragraph ID, in the form of a unique 4-digit number, was allocated for each paragraph in the example message. Message 0001, shown here, contained three paragraphs and was assigned consecutive Paragraph IDs 0001, 0002, and 0003. Each Paragraph ID was written in its respective blank, coordinated to columns A, B and C, on line 2 of the coding form (see FIGURE 6 for row and column reference).

Once the content analysis bookkeeping identifiers were allocated, the example message could be coded for its content. FIGURE 7 shows the original emergency message with several of the items mentioned above, labeled for reference to their location and appearance within the document.

City of Golden

General Utility Address
General Utility Telephone Number
911 10th St.
Golden, CO 80401
303-384-8000
www.ci.golden.co.us
General Website Address
General Contact Title
Organization/Utility Name
For more information, contact:
Communications Manager/PIO
General Contact Name
Sabrina Henderson
General Contact Telephone Number
Office: 303-384-8132
Cell: 303-437-6671
shenderson@ci.golden.co.us
Descriptive Element

FOR IMMEDIATE RELEASE:

Paragraph ID (Coder Defined)

Message Title

Flooding Caused by Severe Weather

Golden, Colo. — June 27, 2004 — Heavy rains that descended on Golden for several hours today flooded streets and homes in northern Golden, but no one was injured. 0001

Message Date

The Golden Police Department received 18 calls related to flooding from the rain between 3:30 and 6 p.m. The Golden Volunteer Fire Department sent out 31 crew members in all its vehicles to check public safety and mitigate potential problems with electric and gas utilities. At each of the calls, emergency responders checked neighboring homes as well. American Medical Response stationed two ambulances at the north and south ends of town, but were not needed. 0002

City of Golden street crews closed roads that were flooded and worked to clear culverts and drains. The City closed State Highway 93 around 4 p.m. to allow several feet of water to subside. The northbound lane was reopened about an hour later, while the Colorado Department of Transportation cleared mud from the southbound lane. 0003

Termination

# # #

FIGURE 7 - Referential Coded Emergency Message – Example Coding

The example message with Message ID 0001 had a line 3 Descriptive Element of "For Immediate Release". This content is noted directly on line 3 in the coding form. Line 4 of the coding form was the Organization/Utility name and for Message ID 0001 was clearly stated as the City of Golden. The message title was "Flooding Caused by Severe Weather". This content, as well as any date and/or time, was noted directly on lines 5, 6, and 7, respectively. Message ID 0001 was released on June 27, 2004 with no apparent dissemination time listed. The example message, line 32 on the coding form was noted as being code number 1 for the type of message termination present. According to the codebook for termination, notation could consist of ### (as noted for Message ID 0001), coded number 1, General Organization Information, coded number 2, No Apparent Notation, coded number 3, or Other Closing Notation, coded number 4.

There are several possible categories that can be coded on the coding form which relate to a message's general informational qualities. Lines 8-26 are code able items on the coding form that reveal how much publicly usable information the message contains such as general or relevant contact names, addresses, phone numbers, email addresses and website addresses. The example message coded here contains a general contact name and email address as well as two telephone numbers. The example message also contains general utility information including address, telephone number, and website address. The more of this publicly useable information that a message utilizes the more valuable a message will be to the audience it is attempting to reach.

On the coding form, lines 28, 30, and 31 are coding categories that require coder judgment of the entire message as a whole in lieu of the individually identified paragraphs (coding units). Line item 28, Natural Disaster/Human-Induced is coded

according to the indication by what means the event occurred, whether the message relates to the effects of an earthquake, a natural flood, a human-induced flood, a hurricane, a landslide/mudflow, a natural sinkhole/karst collapse, human-induced sinkhole, a thunderstorm, a tornado, a winter storm, a contamination, a technically induced fire, a power outage, or a disruption. The example message was coded as being a natural flood existing due to extensive rain. Often, enough information may be gathered about the means of the event's occurrence from the title of the message, or at least within a few preliminary lines of message text. This is the case in the example Message ID 0001. The codebook should be used to assist in the determination of line 28 as with all parts of the content analysis and coding process. Only from a very poor message should there be difficulty in determining the type of event that is occurring.

Line item 30, Organization Response Action, is coded according to how the message portrays the organization's response action to the event. In order for the coder to determine what stage of response that the organization is at, the coder must determine whether action has already been completed, whether it is presently underway, or whether it has yet to be done. At times the coder may be unable to determine at what stage the organization is at in it's response to the event. The example Message ID 0001 was coded number 1 for line 30 as it was determined that the utility has performed some remedy action in response to the event.

Line item 31, Present Status, is coded according to how the message depicts the present status of the situation, whether the organization/utility is back to or never left normal operating status, whether it is in the process of reparations, whether the organization/utility is in the determination phase of step progression or whether the

organization/utility has only just discovered the need for a determination phase and merely awareness on the part of the organization is all that is apparent. It is also possible here, as well, that the coder may be unable to determine at what status the organization is at, at the present time. The example Message ID 0001 was coded number 1 for line 31 as it was determined that the utility was at least back to normal operating status, if it ever left.

It may be obvious up to this point that a majority of the line items on the coding form analyze and code the content of the emergency message as a whole. There are, on the other hand, a few line items in the coding form that analyze and code each coding unit. Two such lines are lines 27 and 29. Line 27 of the coding form is a descriptor of whether the coding unit/paragraph indicated a temporal relationship to occurrence before, during or after an emergency event had occurred.

Each coding unit/paragraph is properly coded according to its coordinate Paragraph ID from line 2 on the coding form using the codebook. The final coding form is located in FIGURE 8. The example Message ID 0001, coded here, has three coding units/paragraphs as mentioned previously and shown on row 2, columns A, B and C of the final coding form (FIGURE 8). Each coding unit/paragraph, on line 27, for the example Message ID 0001, indicates coding of number 2, which indicates actions or occurrences taking place during the emergency event.

The last line item left un-discussed for the example Message ID 0001 used here, is line 29, Message Type. This coded portion of the content analysis coding form indicates whether the type of message the coding unit/paragraph is trying to portray is

that of general information, a public request for action, an organizational response to an event, consumer alerts, or immediate notification.

The example Message ID 0001 indicates, for line 29, that Paragraph ID 0001 has been coded number 7, while Paragraph ID 0002 and 0003 are coded number 12. A code number 7 is considered to consist of a subsection of Public Action Request. Code number 7 is given to Paragraph ID 0001 since it was considered precautionary measures. Code number 12 was given to both Paragraph ID 0002 and 0003 of the example Message ID 0001 since they were both considered informational and thus qualified under the codebook classifications as informational messages and status reports that included update information after the event had occurred.

Coding Form

Emergency Message Analysis

Message ID __0001_____ Coder ID __001_____

Paragraph ID:	0001	0002	0003			
Descriptive Element:	For Immediate Release					
Organization/Utility Name:	City of Golden					
Message Title:	Flooding Caused by Severe Weather					
Message Date:		June 27, 2004				
Message Time:						
General Contact Name:			1			
General Contact Title:	Communications Manager/PIO					
General Contact Address:						
General Contact Telephone Number:			2			
General Contact E-mail Address:			1			
General Utility Address:			1			
General Utility Telephone Number:			1			
General Hotline Number:						
General Customer Service Number:						
General Utility E-mail Address:						
General Website Address:			1			
Relevant Contact Name:						
Relevant Contact Title:						
Relevant Contact Address:						
Relevant Contact Telephone Number:						
Relevant Contact E-mail Address:						
Relevant Hotline Number:						
Relevant Customer Service Number:						
Relevant Website Address:						
Before/During/After a Crisis:	2	2	2			
Natural Disaster/Human-Induced:			4			
Message Type:	7	12	12			
Organization Response Action:			1			
Present Status:			1			
Termination:			1			
VALUE			**12**			

FIGURE 8 - Final Coding Form – Example Coding

IV. RESULTS AND DISCUSSION OF RESULTS

Utilizing the developed Codebook and Coding Form, coding and analysis was performed for 141 emergency messages which were disseminated by the respective water and wastewater utilities.

A. Trends

By analyzing the frequency of certain coding unit codes within the entire set of data particularly for such categories as "before-during-after" conclusion can be made as to basic trends within the data. For example, in the "before-during-after" category, the frequency of the use of coding units having been coded as being disseminated either before any event has occurred, during the event's onset, or after the event has ended can be tallied and trends within this category noted. The resulting tabulation and percentage results depict at what phase most coding units analyzed for these emergency messages were disseminated.

TABLE I – RESULTS: Before/During/After an Emergency

RESULTS

Before/During/After an Emergency? No. of Paragraphs indicating that the message speaks about:			
Before (1)	*During (2)*	*After (3)*	*Unable to Decide (37)*
33	609	27	1
Percentages			
4.93%	90.90%	4.03%	0.15%

Results show that nearly 91% of all analyzed coding units are those pertinent to information indicating response during the emergency. This trend analysis thus reveals that despite possible benefit resulting from a larger number of messages being released

before the event, such as preparatory measures; the vast majority is received upon the onset of the event. Even post-emergency indications only make up approximately 4% of the messages analyzed. One would expect that a larger number of "calming" post-emergency messages would be disseminated after the conclusion of an emergency event, but the results report otherwise.

Message type was a category used within the content analysis to determine what form most messages take during dissemination. Trend analysis regarding message type was completed through determination of the frequency of the various message types typically provided to the public and perhaps more on a message by message basis, whether that particular type of message is relevant and more precisely whether it is even necessary.

Results reveal that a very large "stand-alone" quantity of the analyzed coding units in this data set consist of generalized information (consumer alerts for information or awareness purposes). Approximately 38% (252 of the 670 total messages) were consumer alerts for informational or awareness purposes whereas the second largest message type was "initial response" at 19% (124 messages of the 670 messages). The third largest message type was "initial status reports" at 13% (85 of the 670 messages).

TABLE II contains each natural disaster/human-induced disaster as indicated within the codebook as well as the number of messages which were classified to each relative disaster. TABLE III is a detailed description of the disasters listed in TABLE II, for easy reference. FIGURE 4 is a graphical depiction of the data contained in TABLE II. This graphical depiction easily shows the nearly equal representation of Natural Flood

(#4), Standard/Typical Disruption (#33) and Natural Contamination (#23) messages within the total set of analyzed messages.

TABLE II – RESULTS: Disaster Classification

Disaster Classification*	
1: Earthquake	0
2: Earthquake	0
3: Earthquake	0
4: Natural Flood	24
5: Natural Flood	1
6: Human-Induced Flood	0
7: Human-Induced Flood	3
8: Human-Induced Flood	0
9: Hurricane	5
10: Landslide/Mudflow	0
11: Natural Sinkhole/Karst	0
12: Human-Induced Sinkhole	1
13: Human-Induced Sinkhole	2
14: Thunderstorm	1
15: Thunderstorm	0
16: Thunderstorm	0
17: Tornado	0
18: Tornado	0
19: Winter Storm	0
20: Winter Storm	0
21: Winter Storm	0
22: Winter Storm	0
23: Natural Contamination	23
24: Human-Induced Contamination	0
25: Human-Induced Contamination	1
26: Human-Induced Contamination	7
27: Human-Induced Contamination	11
39: Human-Induced Contamination	1
28: Technically Induced Fire	0
29: Technically Induced Fire	0
30: Technically Induced Fire	0
31: Power Outage	0
32: Power Outage	1
33: Standard/typical disruption	24
34: Violent Disruption	1
35: Non-typical Disruption	2
36: Terrorism	10
38: Precipitation Shortage	4
37: Unable to Determine	19

TABLE III – RESULTS: Classification Description

*Classification Description
1. Earthquake – Structural damage to reservoirs, lines, mains, treatment facilities, chemical treatment containment facilities, towers
2. Earthquake – physical system failure
3. Earthquake – electrical system failure through computer or SCADA
4. Natural Flood – extensive rain
5. Natural Flood – extensive thaw
6. Human-Induced Flood – sabotage: terrorist activity to create failure or thwart effectiveness of water restricting devices
7. Human-Induced Flood – natural failure of manmade water restricting devices: dam, levee, floodwall
8. Human-Induced Flood – non or untimely mobilization of manmade water restricting devices: floodwall closures
9. Hurricane: wind or water damage, interior damage to facilities and electrical systems, mix of treated and untreated flows, breach of chemical containment facilities, release of treatment chemicals, release of wastewater
10. Landslide/Mudflow
11. Natural Sinkhole/Karst
12. Human-Induced Sinkhole – Sabotage of underground facilities: purposeful destruction of lines to compromise the surface integrity
13. Human-Induced Sinkhole – failure of underground facilities leading to collapse of lines, mains and subsequently ground surfaces through physical elevation drop as well as water washout from failure
14. Thunderstorm – Wind damage
15. Thunderstorm – Electrical Damage
16. Thunderstorm – Natural Fire Damage
17. Tornado – Wind Damage
18. Tornado – Hail Damage
19. Winter Storm – Extensive Ice Load: structural compromise
20. Winter Storm – Extensive Snow Load: Structural compromise
21. Winter Storm – Freezing (bursting): Line and main bursting
22. Winter Storm – Freeze/Thaw Cycles: structural fragility in concrete surfaces leading to reservoir, lines, mains and facility structural compromise over time
23. Natural Contamination: animal excess, domestic commercial animals, cattle or slaughterhouse runoff in excess to normal intake, above normal runoff from areas of excess in unregulated human waste or animal waste, cryptosporidium outbreak from such contamination, known natural blockage, unknown blockage, excess rainfall leading to design capacity overflow
24. Human-Induced Contamination – Bio-weapon terrorism/sabotage: biological agents sent via detonating devices or which act upon arrival/open (mailed packages)
25. Human-Induced Contamination – Chemical introduction terrorism/sabotage: chemicals introduced into reservoir/intake
26. Human-Induced Contamination – accidental but acknowledged by perpetrator or contaminator
27. Human-Induced Contamination – accident but unbeknownst to perpetrator or contaminator, structural failure, mechanical failure, man-made blockage
39. Human-Induced Contamination – Intentional man-made blockage
28. Technically Induced Fire – Intentional Arson
29. Technically Induced Fire – Unintentional Arson
30. Technically Induced Fire – Internal electrical: wiring
31. Power Outage – internal
32. Power Outage – external
33. Standard/typical disruption: water main or line break, valve or line repair
34. Violent/non-typical disruption: terrorist bomb
35. Non-typical disruption: accidentally created disruption
36. Terrorism: Sabotage, fraud, scare tactics
38. Precipitation Shortage: Drought, Prompting water conservation
37. Unable to determine

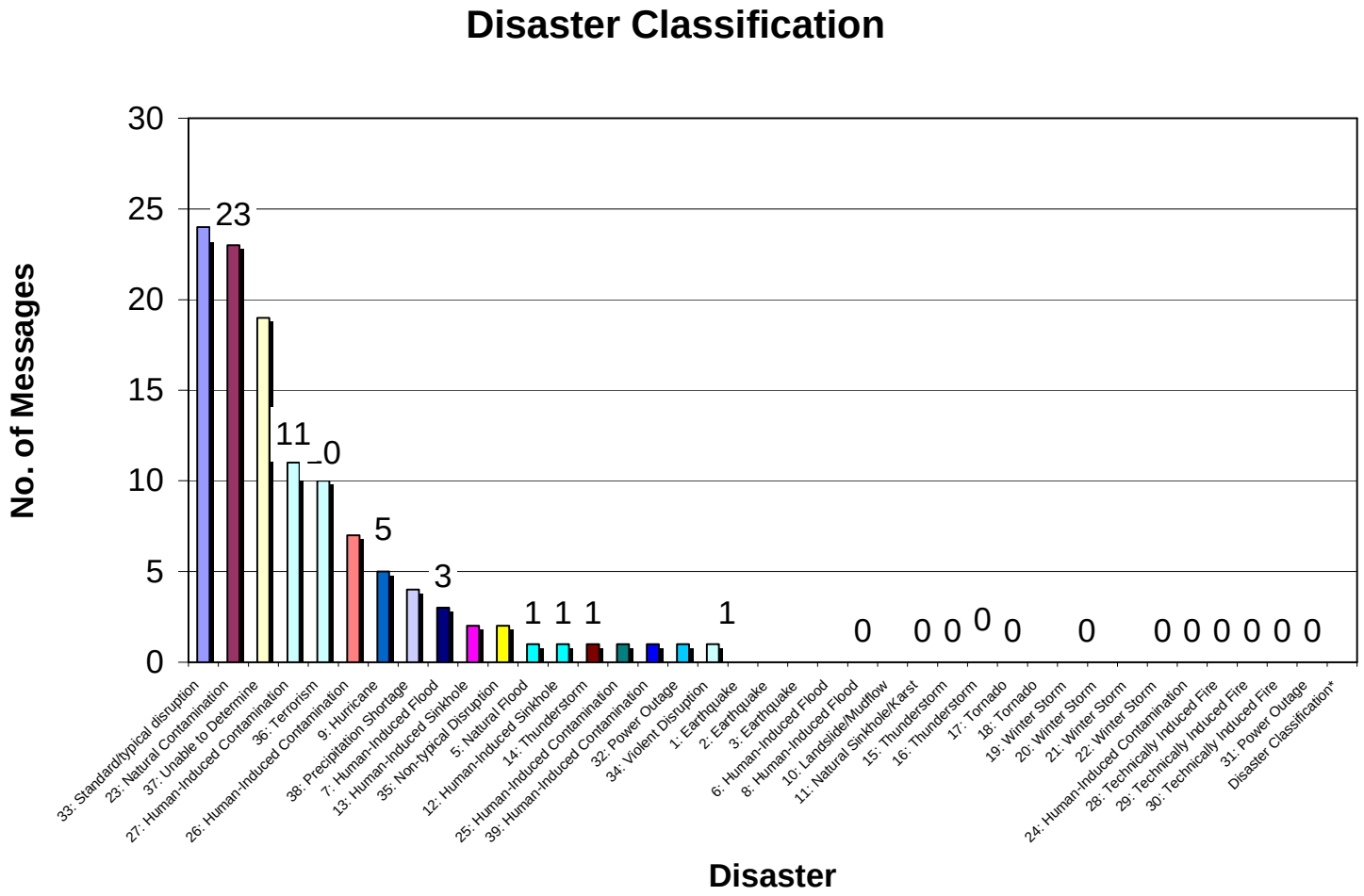


FIGURE 9 – RESULTS: Disaster Classification

TABLE IV contains the tabulation of the occurrence of coded termination per message. 53% of analyzed messages show No Apparent Notation. Though this codable entry can have no detriment to the understanding of a message, the lack of a definitive termination to an emergency message may leave audience confused if they expect further information or feel that they may be missing further information since a notation of termination could not be easily determined.

TABLE IV – RESULTS: Termination

Termination - No. of messages having termination of:			
### (1)	*General Org. Info. (2)*	*No Apparent Notation (3)*	*Other Closing Notation (4)*
45	3	75	18
Percentages			
31.91%	2.13%	53.19%	12.77%

TABLE V and TABLE VI both deal with the organizational response and status pursuant to the emergency event. Both tables reveal a trend for organizations to release messages as they relate to their already being in the process of making reparations or in performing some response/action to an event. It seems that very few organizations disseminate messages as they pertain to remedied situations or actions to take place in the immediate future. It seems that organizations typically disseminate messages when solutions or response to the event is already underway.

TABLE V – RESULTS: Organization Response Action

Organization Response Action - No. of messages indicating:			
1	*2*	*3*	*37*
11	110	10	10
Percentages			
7.80%	78.01%	7.09%	7.09%

1 Performed some remedy action in response to an event
2 In the process of performing some action in response to an event
3 Utility is yet to respond to the event, speaks of actions to occur in immediate future
37 Unable to determine

TABLE VI – RESULTS: Present Status

Present Status - No. of messages indicating:				
1	*2*	*3*	*4*	*37*
27	96	9	6	3
Percentages				
19.15%	68.09%	6.38%	4.26%	2.13%

1 Back/never left normal operating status
2 In the process of reparations
3 In determination phase of what steps to take for reparations
4 Awareness of an event, only just discovered the need for determination phase
37 Unable to determine

B. Value

A message's "value" should be monitored and evaluated through the realization of such desired traits developed from previously completed trend analysis and the utilization of a value measurement using the coding directly from the content analysis.

The determination of a "valuable" message begins with the determination of an "initial value". This "initial value" tally is a tally of the codes for descriptive categories, as well as whether the message has notation identifying it as a natural disaster or human

induced disaster, whether the message has some form of termination, as well as a tally of the number of undecipherable coding units found within each message.

Descriptive categories used in the tally for an “initial value” are lines on the coding form from each message’s coding and consist of:

- Descriptive Element
- Organization/Utility Name
- Message Title
- Message Date
- Message Time
- General Contact Name
- General Contact Title
- General Contact Address
- General Contact Telephone Number
- General Contact Email Address
- General Utility Address
- General Utility Telephone Number
- General Hotline Number
- General Customer Service Number
- General Utility Email Address
- General Website Address
- Relevant Contact Name
- Relevant Contact Title
- Relevant Contact Address

- Relevant Contact Telephone Number
- Relevant Contact Email Address
- Relevant Hotline Number
- Relevant Customer Service Number
- Relevant Website Address

.

The greater the number of descriptors within the message, the greater "value" the message is to those receiving the message, since their ability to use and understand the message is of the highest importance. The greater the amount of descriptive information, the more likely the audience will grasp the importance of the message or that they will at least utilize the contact information in order to obtain additional clarifying information for themselves.

Theoretically, one could present a message that only contains a massive amount of descriptive information containing only contact and organization information. At the same time this message could have no title and all coded information could be undeterminable. Considering how many lines qualify in the initial descriptive tally which has no bearing on the true emergency message, a message could have no beneficial information and yet still retain a high "value".

After "initial value" descriptor tallies, the presence of the major descriptors, "Natural Disaster/Human Induced Disaster" and "Termination" is noted via a checkbox system. The presence of these major descriptors in the message creates a greater likelihood of the message being useful to its audience. A message which is not even able to tell its audience the emergency event that it pertains to is rather useless as a tool in

getting the audience to rush into “trusting” action, since they would have no idea what event to take the action for.

Lastly, a count of undecipherable (coding number 37) elements is completed, tallying and noting the number of “undeterminable” Message Types, Organizational Response Actions, Present Statuses, and Before-During-After coding. In this case, the lower the frequency of undeterminable message descriptors, the greater the likelihood of an understandable message.

All data gathered for use in determining the value of all coded and analyzed emergency messages was placed into a Results Form as seen in Table VII.

TABLE VII – RESULTS: Message Value Calculations

Message No	Message ID #	Descriptive Tally	Presence of: ND/HI	Presence of: Termination	Decipherable Messages (No of Undeterminable)	"VALUE"
1	0001	12	☑	☑	0	12
2	0002	4	☑	☐	0	3
3	0004	6	☑	☐	0	5
4	0005	4	☑	☑	0	4
5	0006	7	☑	☑	0	7
6	0008	4	☑	☑	0	4
7	0009	6	☐	☐	0	3
8	0010	7	☑	☑	0	6
9	0011	10	☑	☑	0	10
10	0012	10	☑	☑	0	10
11	0013	9	☑	☑	0	9
12	0014	10	☑	☑	0	10
13	0015	9	☑	☑	0	9
14	0017	13	☑	☑	1	12
15	0020	8	☐	☑	0	6
16	0021	7	☑	☑	0	7
17	0023	8	☑	☑	0	8
18	0024	8	☑	☑	0	8
19	0025	8	☑	☑	0	8
20	0026	8	☑	☑	0	8
21	0027	8	☑	☑	0	8
22	0028	12	☑	☑	0	12
23	0029	8	☑	☑	1	7
24	0031	9	☑	☑	0	9
25	0032	8	☐	☑	0	6
26	0033	10	☐	☑	0	8
27	0035	8	☑	☑	0	8
28	0036	8	☑	☑	0	8
29	0037	4	☑	☑	1	3
30	0038	6	☑	☑	0	6
31	0039	4	☐	☑	0	2
32	0040	3	☑	☐	0	2
33	0041	3	☑	☐	0	2
34	0042	3	☑	☐	0	2
35	0043	2	☑	☐	0	1
36	0044	7	☑	☐	0	6
37	0045	7	☑	☐	1	5
38	0046	5	☑	☑	0	5
39	0047	7	☑	☐	0	6
40	0048	6	☑	☐	0	5
41	0049	12	☑	☐	1	10
42	0050	6	☑	☑	0	5
43	0051	3	☑	☐	0	2

TABLE VII (continued) – RESULTS: Message Value Calculations

Message No	Message ID #	Descriptive Tally	Presence of: ND/HI	Presence of: Termination	Decipherable Messages (No of Undeterminable)	"VALUE"
44	0052	3	☑	☐	0	2
45	0053	3	☐	☐	0	0
46	0054	3	☑	☐	0	2
47	0055	3	☑	☐	0	2
48	0056	3	☑	☐	0	2
49	0057	3	☑	☐	0	2
50	0058	3	☑	☐	0	2
51	0059	3	☑	☐	0	2
52	0060	3	☑	☐	0	2
53	0061	3	☑	☐	0	2
54	0062	3	☑	☐	0	2
55	0063	3	☑	☐	0	2
56	0064	3	☑	☐	0	2
57	0065	3	☑	☐	0	2
58	0066	3	☑	☐	0	2
59	0067	10	☑	☑	0	10
60	0068	3	☑	☐	0	2
61	0069	3	☑	☐	0	2
62	0070	3	☑	☐	0	2
63	0071	3	☑	☐	0	2
64	0072	10	☑	☑	0	10
65	0073	3	☑	☐	0	2
66	0074	3	☑	☐	0	2
67	0075	3	☑	☐	0	2
68	0076	3	☑	☐	0	2
69	0077	3	☑	☐	0	2
70	0078	3	☐	☐	0	0
71	0079	3	☐	☐	0	0
72	0080	3	☑	☐	0	2
73	0081	3	☐	☐	0	0
74	0082	3	☐	☐	0	0
75	0083	3	☑	☐	0	2
76	0084	3	☑	☐	0	2
77	0085	3	☐	☐	0	0
78	0086	3	☑	☐	0	2
79	0087	3	☑	☐	0	2
80	0088	3	☑	☐	0	2
81	0089	3	☑	☐	0	2
82	0090	3	☑	☐	0	2
83	0091	13	☑	☐	0	12
84	0092	6	☑	☑	0	6
85	0093	9	☑	☐	0	8
86	0094	8	☑	☐	0	7

TABLE VII (continued) – RESULTS: Message Value Calculations

Message No	Message ID #	Descriptive Tally	Presence of: ND/HI	Presence of: Termination	Decipherable Messages (No of Undeterminable)	"VALUE"
87	0095	3	☑	☐	0	2
88	0096	6	☑	☐	0	5
89	0097	7	☐	☑	0	5
90	0098	8	☑	☐	0	7
91	0099	9	☑	☐	0	8
92	0100	6	☑	☑	0	6
93	0101	6	☑	☑	1	5
94	0102	7	☐	☑	0	5
95	0103	7	☐	☑	0	5
96	0104	6	☑	☑	0	6
97	0105	3	☐	☑	0	1
98	0106	9	☑	☑	0	9
99	0107	7	☐	☑	0	5
100	0108	6	☑	☑	0	6
101	0110	10	☑	☑	0	10
102	0111	11	☑	☑	0	11
103	0112	6	☐	☐	0	3
104	0113	5	☑	☐	0	4
105	0114	7	☑	☐	0	6
106	0115	5	☑	☐	1	3
107	0116	4	☑	☐	0	3
108	0117	5	☑	☐	0	4
109	0118	9	☑	☑	0	9
110	0119	9	☑	☑	0	9
111	0120	8	☑	☐	0	7
112	0121	10	☑	☐	0	9
113	0122	8	☑	☑	0	8
114	0123	8	☑	☑	0	8
115	0124	8	☑	☑	0	8
116	0125	8	☑	☑	0	8
117	0126	9	☑	☑	1	8
118	0127	8	☑	☐	0	7
119	0130	6	☑	☐	0	5
120	0131	9	☑	☑	0	9
121	0132	11	☑	☑	0	11
122	0133	11	☑	☑	0	11
123	0134	6	☑	☐	1	4
124	0138	6	☑	☐	0	5
125	0139	7	☑	☐	0	6
126	0140	7	☑	☐	0	6
127	0141	5	☑	☐	0	4
128	0142	8	☑	☐	0	7
129	0143	7	☐	☑	0	5

TABLE VII (continued) – RESULTS: Message Value Calculations

Message No	Message ID #	Descriptive Tally	Presence of: ND/HI	Termination	Decipherable Messages (No of Undeterminable)	"VALUE"
130	0144	10	☑	☐	0	9
131	0145	7	☐	☐	1	3
132	0147	5	☑	☑	0	5
133	0148	5	☑	☑	0	5
134	0149	5	☑	☑	0	5
135	0150	6	☑	☑	0	6
136	0151	6	☑	☑	0	6
137	0152	6	☑	☑	0	6
138	0153	8	☑	☑	0	8
139	0154	8	☑	☑	0	8
140	0155	8	☑	☑	0	8
141	0156	8	☑	☑	0	8

"Valuable" messages were determined according to a literal tally of descriptors utilized during the coding process. Each descriptor is allocated a coding line on each message's coding form. It is possible for each coded line to have a code greater than one. In this case the code shall be used to represent tallies for that message's "initial value".

Attempting next to make certain that the greatest valued message would come from all aspects of the coded data, the undeterminable notations must not outweigh the greater value created by multiple descriptors.

The lack of termination, for instance, is not as important to the usability of a message, in its absence. The absence of the emergency event identification, whether it is identified as a Natural Disaster or a Human Induced Disaster, is a much more important factor in a message's value. If an audience cannot tell what the message pertains to, their appropriate response may be delayed from confusion, or nonexistent, if it is suddenly thrust upon them to interpret for themselves. This creates an even greater probability that

the audience will not even consider an event as affecting them, thus possibly ignoring the message entirely.

The amount of undeterminable notation can determine a message's understandability. If the message type is at all undeterminable from a coder's standpoint, how can an audience of concerned people, be expected to decipher the message's meaning and intent?

A lack of termination and a count of any undeterminable codes lowered the "initial value" descriptive tally, reducing it by one (1) for lack of termination, while reducing it by the actual count of undeterminable codes. A lack of Natural Disaster/Human Induced Disaster notation lowered the "initial value" descriptive tally by an additional two (2).

In determining the most and least valuable messages within this researcher's data set, tallies for descriptors revealed two (2) messages with the greatest "initial value" descriptive line tally. Additionally, there were four (4) messages considered second greatest in "initial value" and only one (1) considered of the least "initial value".

Due to the process of calculating value in this analysis, an "initial value" did not necessarily guarantee a message's "final value". There were two (2) messages of greatest "initial value". These messages, due to their count of undeterminable codes and lack of termination, respectively, ended up with "final values" which placed them, along with two (2) others, whose "initial value" did not change from second greatest value, with the greatest "final value". The least "initial valued" message had an initial value of two (2) and a final adjusted value of one (1) after a lack of termination adjustment reduced the "initial value" descriptive tally by one (1). This actually made the least "initial valued"

message of greater value than six (6) other messages whose higher “initial value” was reduced to zero (0) “final value”.

All “value” notations were made within the last column of the Results Table as shown in TABLE VII as well as the final row on the coding form for reference with each message’s coded data.

V. CONCLUSIONS

This research has provided conclusive evidence to the adequacy of content analysis in directly analyzing and indirectly concluding an emergency message's effectiveness, as well as those qualities which are most effective within such messages. The researcher was able to determine that utilizing a content analysis approach provides adequate identification of trends that occur in the data, as well as a system of measuring a message's value.

The evaluation of the numbers of messages within the data set that fell into certain applicable categories was useful in determining trends in what emergencies, according to publicly released messages, are most affecting water and wastewater utilities. Though surveys of the people involved with the management of the said facilities exist, their description or perhaps even their true knowledge of the emergencies most affecting their facility can often be biased. This bias can range from simple lack of knowledge being portrayed as such, or employer bias which instills a sense within the reporting employee that correct information might reflect badly on the employer or the entire institution. By utilizing a content analysis on the data, true revelation can be made as to the types of disasters a typical utility will be subjected to.

By evaluating the frequency within the entire set of results for such categories as the "before-during-after" notation, a resulting conclusion can be made as to the most common use of emergency messages as being disseminated either before any event has occurred, during the event's onset, or after the event has ended. This may lend some researchers to further analyze the usefulness of messages disseminated prior to an

emergency and whether a larger percentage of these types of preparatory messages might provide a benefit during the emergency. On the other hand, it may simply prove less of a need for larger quantities of clarifying messages when the emergency is already occurring.

The generalized informational types of messages could be seen as confusing and irrelevant as far as emergencies are concerned. The audience's attention to detail will likely be at a minimum therefore messages should be as concise and to the point as possible in order to maintain the audience's attention for as long as possible. Since this time for attention grabbing, is usually very short, a message should provide only the relevant initial responses, request any necessary actions that should be made by the audience and provide as much descriptive information, as far as names, phone numbers, website addresses, email addresses, etc., as ultimately possible.

It has been determined during this research that an excellent way of finding value in a publicly disseminated utility message is through the use of content analysis, subsequent trend analysis and allocating value to the message through the trends and frequencies found via the content analyses' numerical coding. Although much reactive data must be assumed and incorporated through the coding system and by implementing appropriate descriptions within the codebook, a great deal of the way an audience will perceive a message can still be used in determining whether a message is of value and whether it needs improvement, removal from the production system, or dissemination.

Once all messages were "valued", conclusions could be drawn as to whether water and/or wastewater utilities were providing adequate messages as far as the message's relative ability to provide information as indicated through the content analysis

methodology. According to a breakdown of each Natural Disaster/Human-Induced Disaster type present within each utility evaluated within this content analysis, calculations were made in order to determine whether the 23 analyzed utilities seemed to be doing an adequate job of message creation and dissemination in the form of a message's informational quality.

Since the total range of final valued messages was from 0-12 a graphical representation was developed to depict the overall message distribution throughout this range. FIGURE 10 below, shows this distribution. Calculations reveal that of 23 utilities, 12 (52%) have messages averaging between the 6-12 "value" range while only 11 (48%) have messages averaging between the 0-5 "value" range. . Any attempts to pre-analyze and pre-condition messages and dissemination systems can only improve the percentages of messages with high informational value.

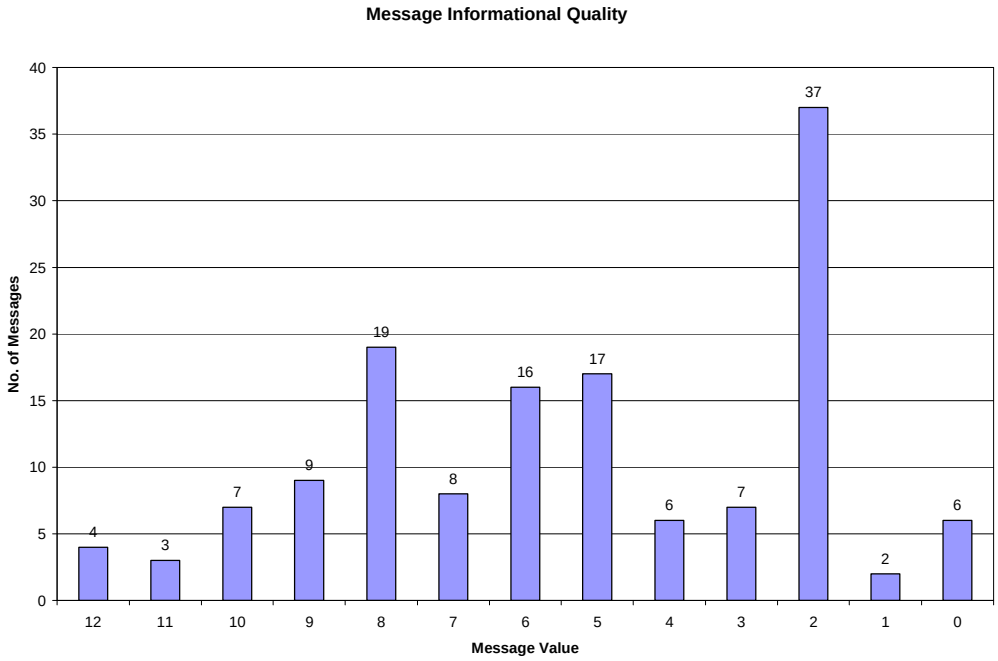


FIGURE 10 – MESSAGE INFORMATIONAL QUALITY DISTRIBUTION

VI. RECOMMENDATIONS

Audience reaction can be portrayed and utilized within the process of applying value to a message through the inclusion of typical audience characteristics, such as understanding and confusion, within the codebook and coder training, for it's implementation during the content analysis and the coding process. Although this much can be done to include some reactive measures within the message analyses, the only way to truly reveal an audience's perception of a message is to conduct several representative focus groups to directly analyze each message once it is to its valuable point in the content analysis process. These focus groups will yield insight into a message's effectiveness where a numerical analysis can only go so far because of rigid parameters. A focus group will provide all "reactive human" elements which become the main factor during an emergency.

Despite the use of focus groups, a major factor that cannot and will not be implemented easily into the group studies is the authenticity of reaction during the occurrence of an event and how messages are actually reacted to and acted upon during that time. Creating mock senses of emergency can only go so far due to restrictions which protect the psychological well-being of the subjects of the groups. A recommendation would be to attempt to assemble focus groups immediately following an emergency event while the events are still fresh within subject's memories. Group reaction to messages, particularly those messages pertinent to the same type of emergency that the group has just experienced, may be unrealistic reactions that portray a false-sense of concern or immediate reaction. This would be versus the non-reaction that

would come from an un-valuable message if the group were in their usual “safe and secure” environment.

On the other hand, if a group is brought into a study immediately following an emergency, reactions may be more serious than necessary to an otherwise un-valuable message. The group may misconstrue the value of the message due to the group’s proneness to the emergency. Having just experienced something that may not happen very often, subjects may overreact, relative to normal times, to emergency events that are actually few and far between.

APPENDICES

I. Sample Coder ID Form

Coder ID List

ID Number	Name	Contact Information	Project Affiliation
001			
002			
003			
004			
005			
006			
007			
008			
009			
010			
011			
012			
013			
014			
015			
016			
017			
018			
019			
020			
021			
022			
023			
024			
025			

II. Sample Message ID Form

Message ID List

ID Number	Title	Organization/Agency Name	Date
0001			__/__/____
0002			__/__/____
0003			__/__/____
0004			__/__/____
0005			__/__/____
0006			__/__/____
0007			__/__/____
0008			__/__/____
0009			__/__/____
0010			__/__/____
0011			__/__/____
0012			__/__/____
0013			__/__/____
0014			__/__/____
0015			__/__/____
0016			__/__/____
0017			__/__/____
0018			__/__/____
0019			__/__/____
0020			__/__/____
0021			__/__/____
0022			__/__/____
0023			__/__/____
0024			__/__/____
0025			__/__/____
0026			__/__/____
0027			__/__/____
0028			__/__/____
0029			__/__/____
0030			__/__/____
0031			__/__/____
0032			__/__/____
0033			__/__/____
0034			__/__/____
0035			__/__/____
0036			__/__/____
0037			__/__/____
0038			__/__/____
0039			__/__/____
0040			__/__/____
0041			__/__/____
0042			__/__/____
0043			__/__/____
0044			__/__/____
0045			__/__/____
0046			__/__/____
0047			__/__/____
0048			__/__/____

RESULTS

Message Type - Total No. of Paragraphs considered Message Type No.:

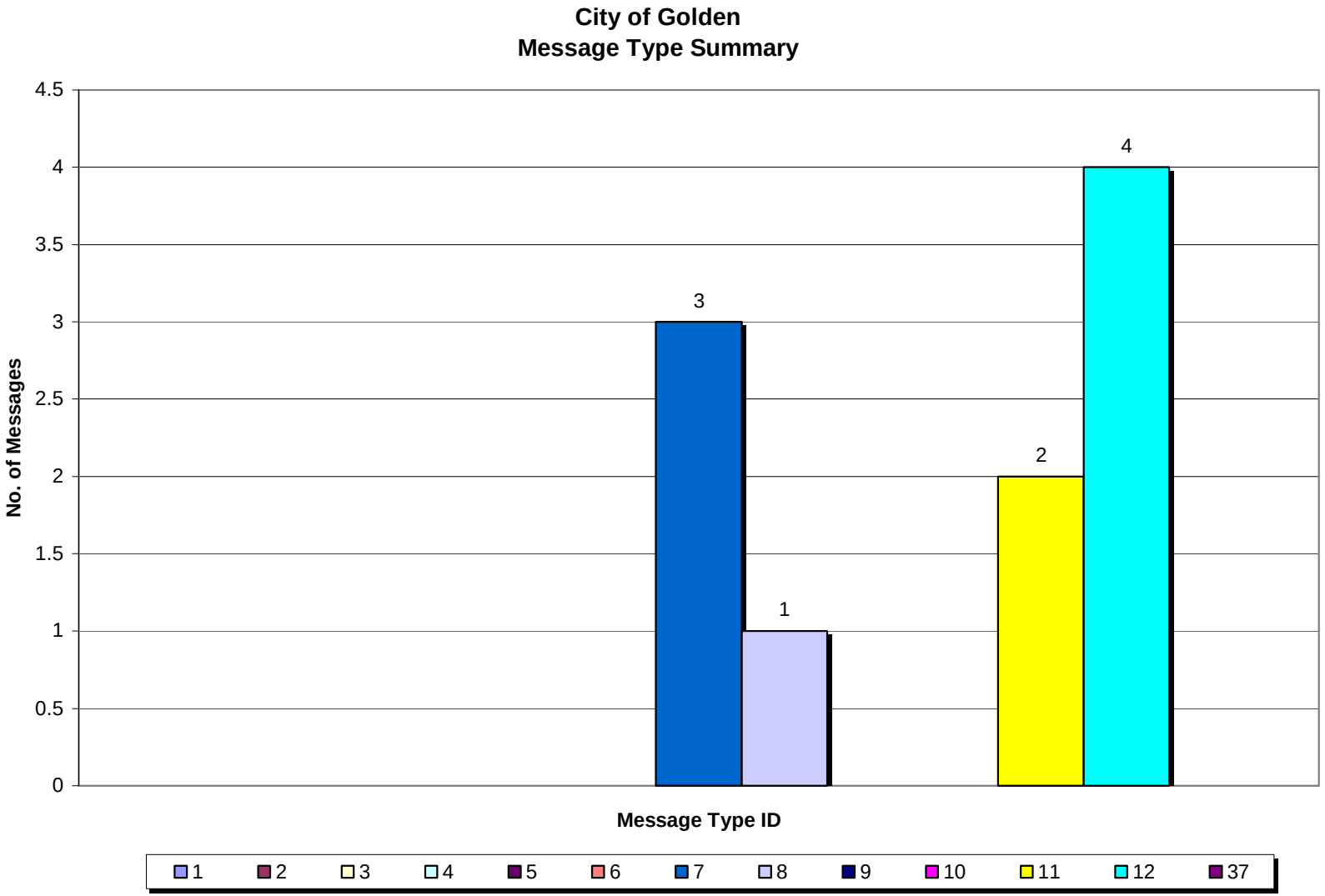
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
21	11	4	7	2	5	62	124	85	26	71	252	0
Percentages												
3.13%	1.64%	0.60%	1.04%	0.30%	0.75%	9.25%	18.51%	12.69%	3.88%	10.60%	37.61%	0.00%

Message Type - No. of Paragraphs from a single organization considered Message Type No:

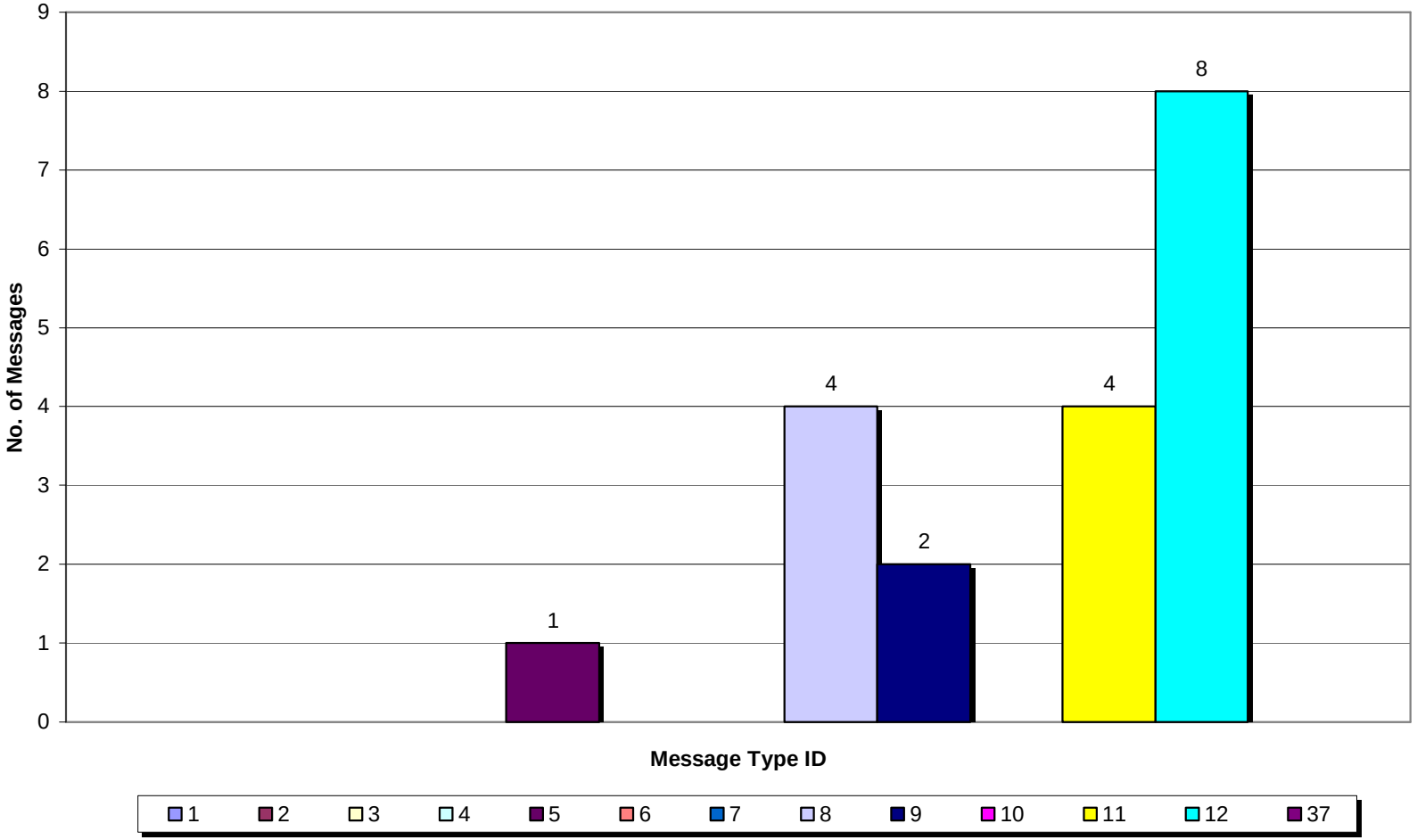
City of Golden												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						3	*1*			*2*	*4*	
Metropolitan Wastewater Reclamation District												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
				1			4	2		4	8	
OUC												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
									4	4	1	
United Water												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
4		4			1		4			5	12	
City of San Diego Water Department												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
			1				1		3	7	1	
Arlington Co. Department of Public Works												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
8						12	15	5		18	27	

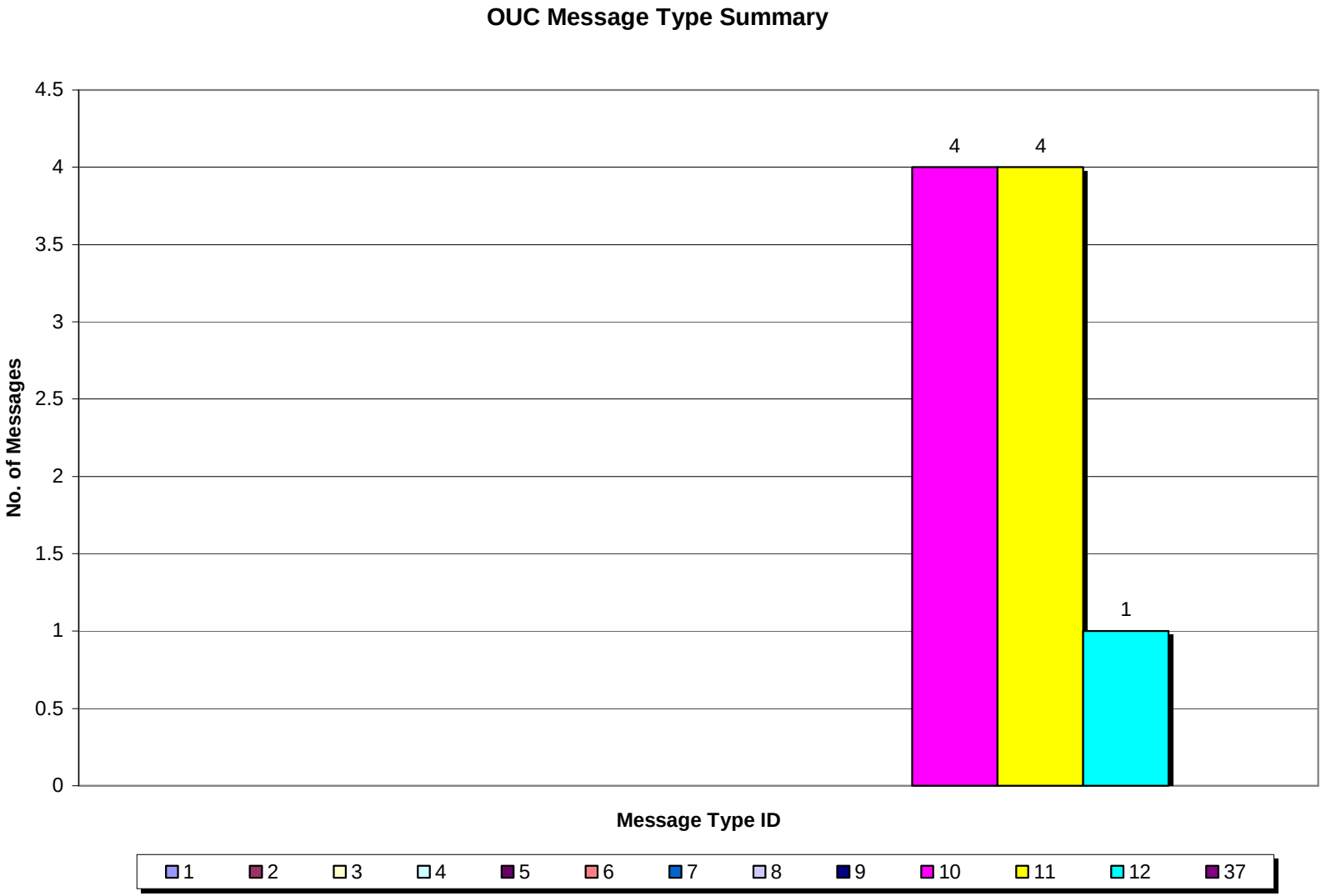
Tacoma Water												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
	4					2	2		3		8	
Northern Kentucky Water District												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
	1						9	4			6	
Wichita Water & Sewer Department												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
			1				7	1	2	3	6	
Portland Water District												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
							3			1		
Louisville MSD												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						9	13	23			66	
City of Portland												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						17	13	16			11	
City of Ames												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						1	2	2				
City of Claremont												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
6	1					2	8	2			22	
City of Norfolk												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						1	1				7	
Scottsdale Water Supply												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
							2			2		

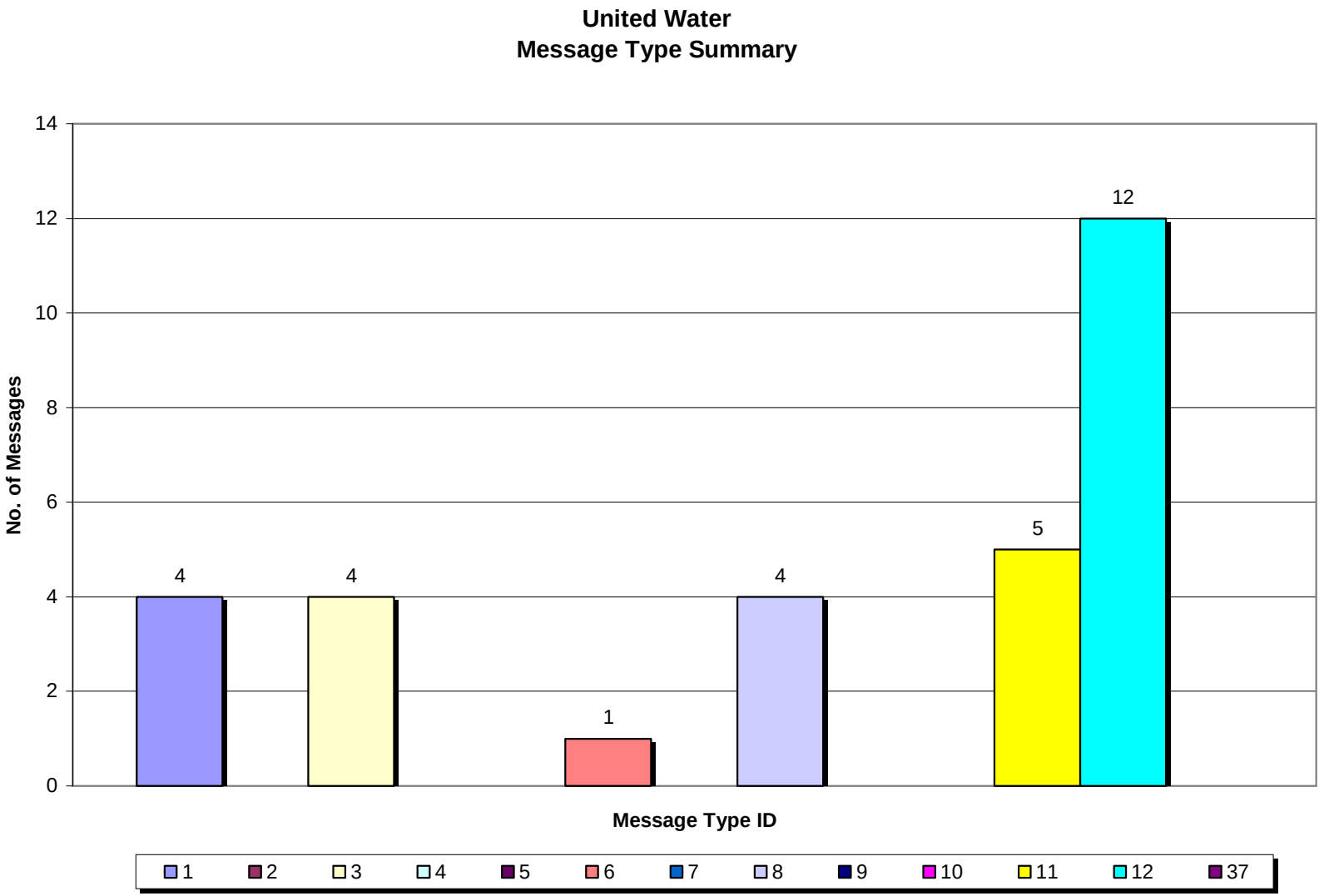
City of Tigard												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						1	1			2	1	
City of Durham												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
						3	7	4	2	3	6	
Erie Co Water Authority												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
			1		1		1		2		4	
Fort Worth												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
	3		3	1		4	12	13	3	10	34	
Newport News												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
					2						1	
MDC												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
	1		1				6	2	7	5	12	
City of Virginia Beach												
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*37*
3	1				1	7	12	11		5	15	


City of Golden
Message Type Summary
No. of Messages
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
3
1
2
4
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

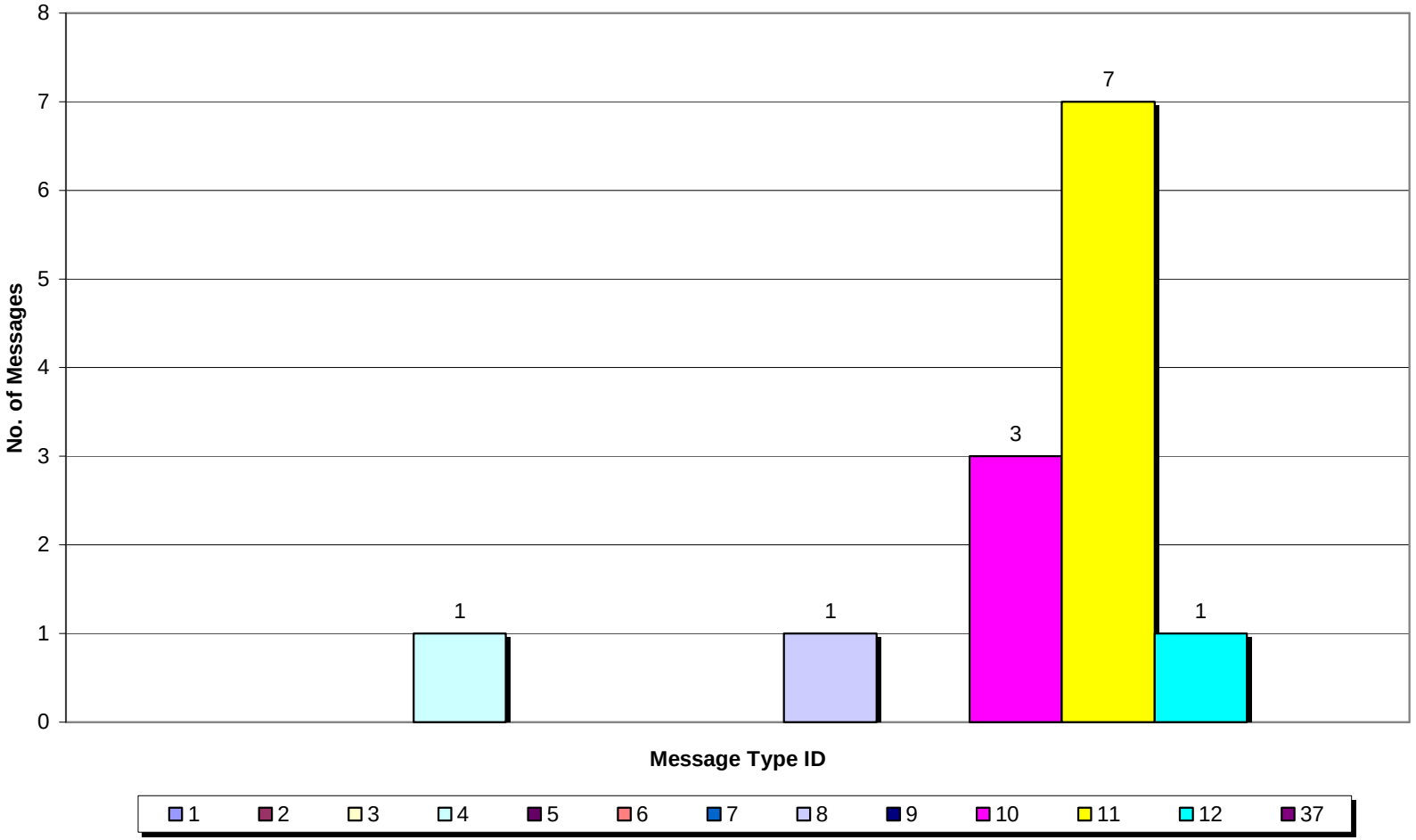
Metropolitan Wastewater Reclamation District
Message Type Summary



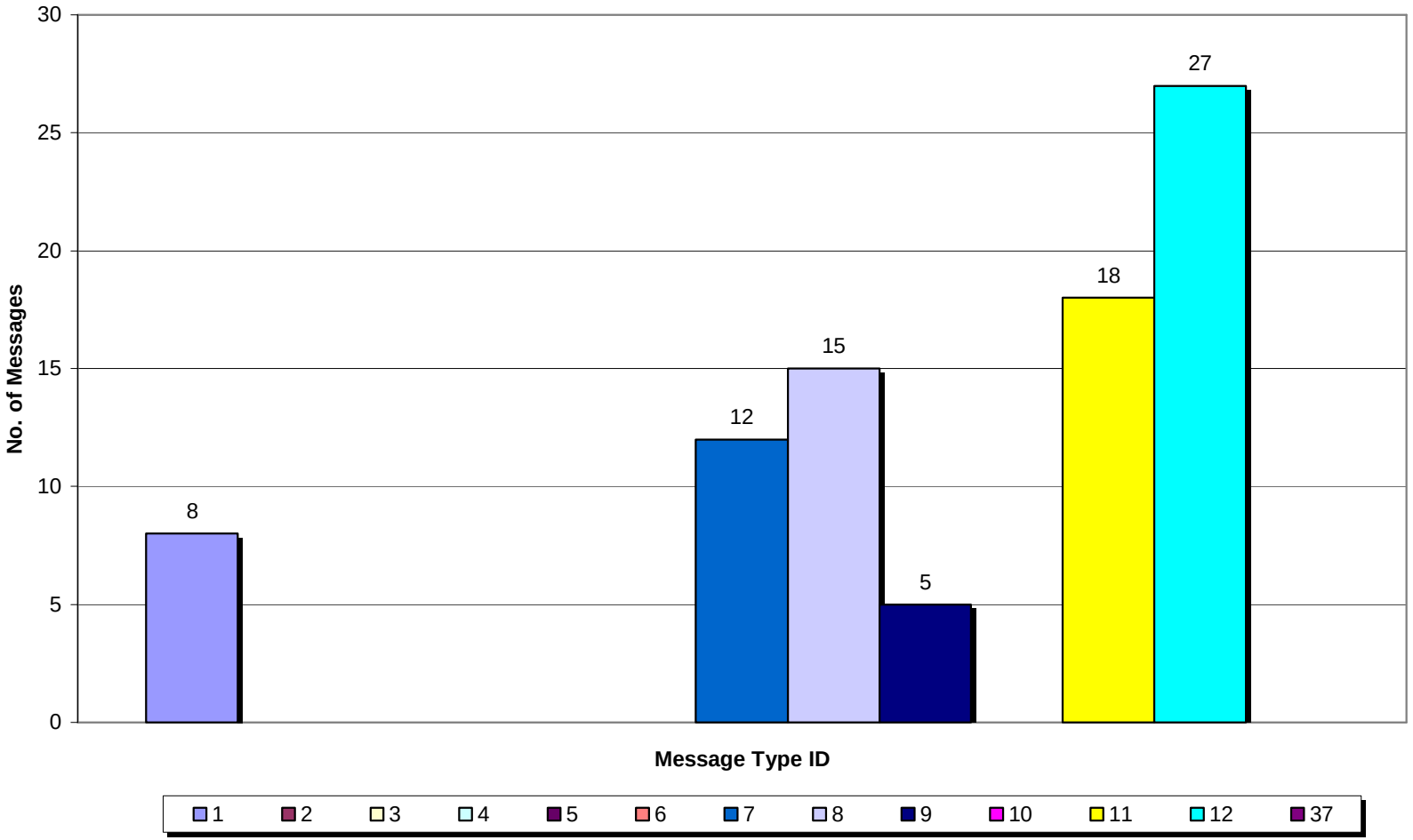

OUC Message Type Summary
No. of Messages
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
4
4
1
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


United Water
Message Type Summary
No. of Messages
0
2
4
6
8
10
12
14
4
4
1
4
5
12
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

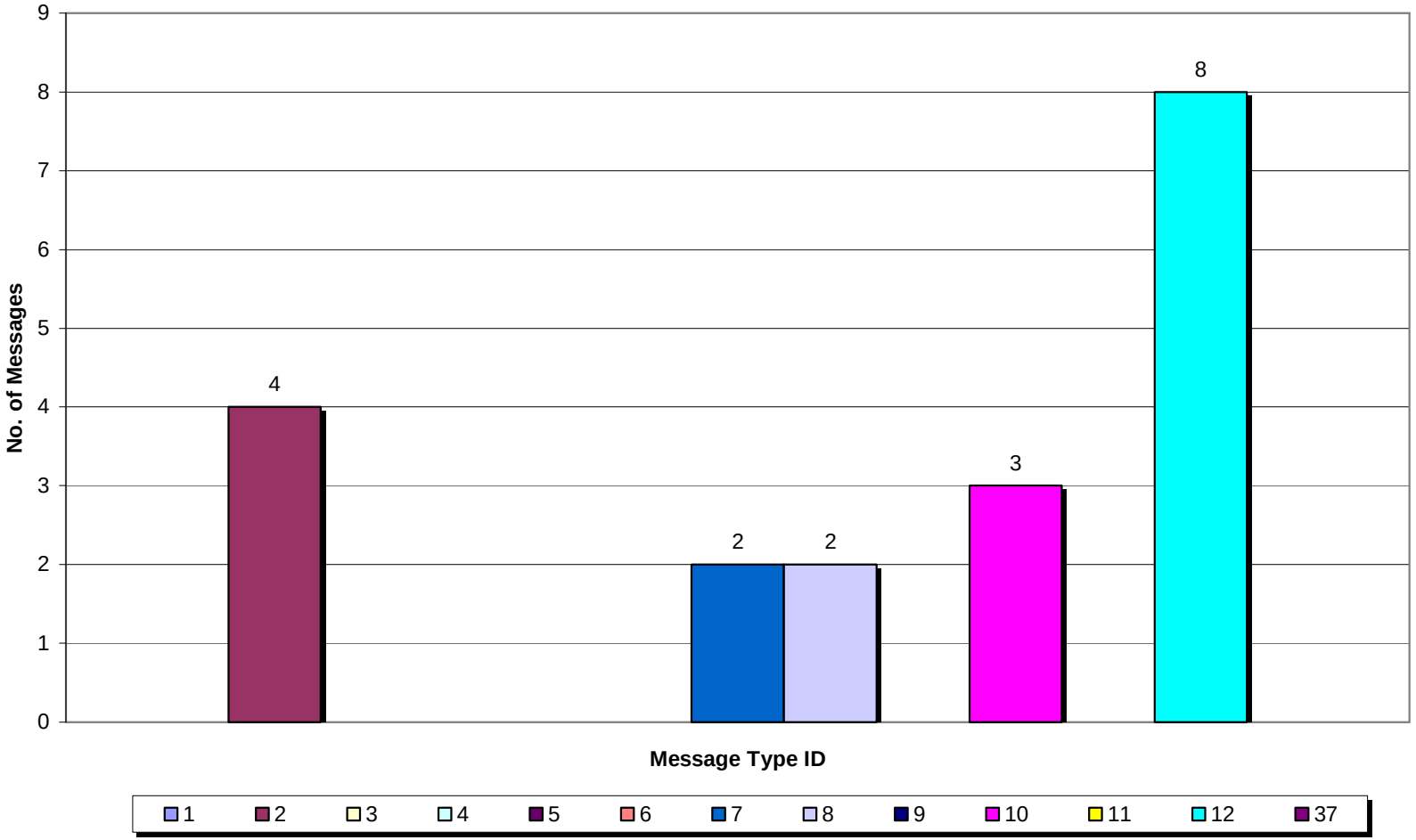
City of San Diego
Message Type Summary

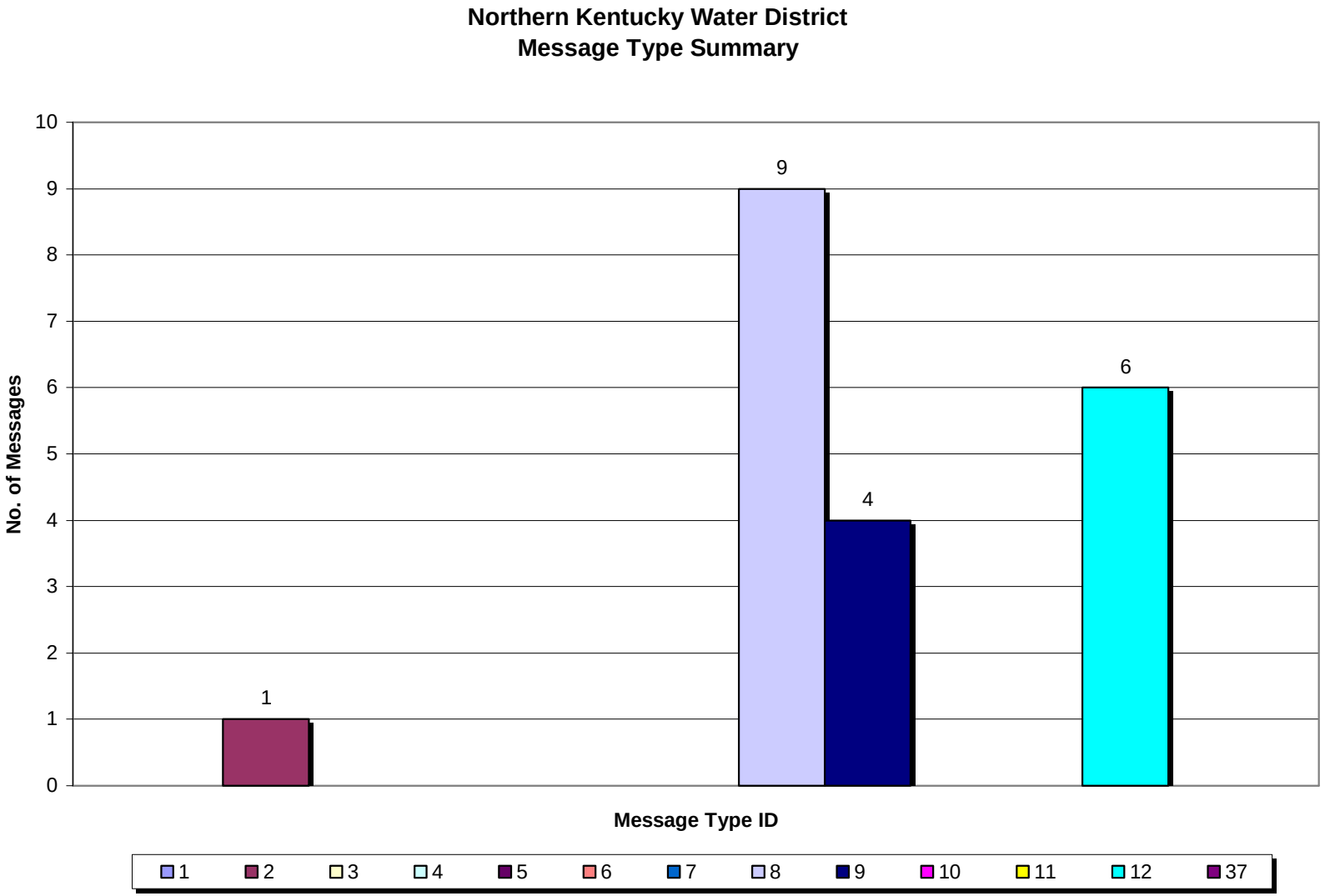


Arlington County Department of Public Works
Message Type Summary

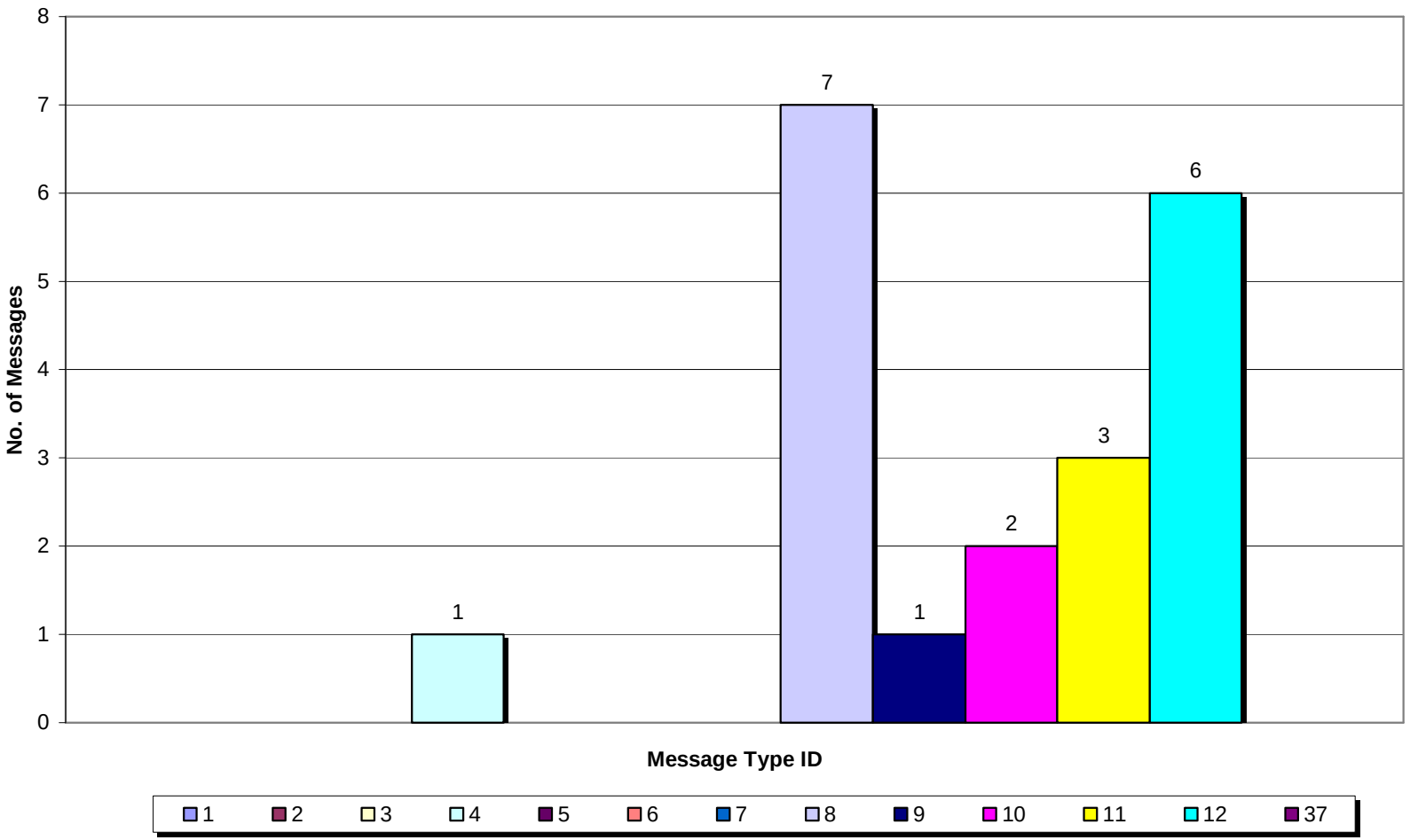


Tacoma Water
Message Type Summary

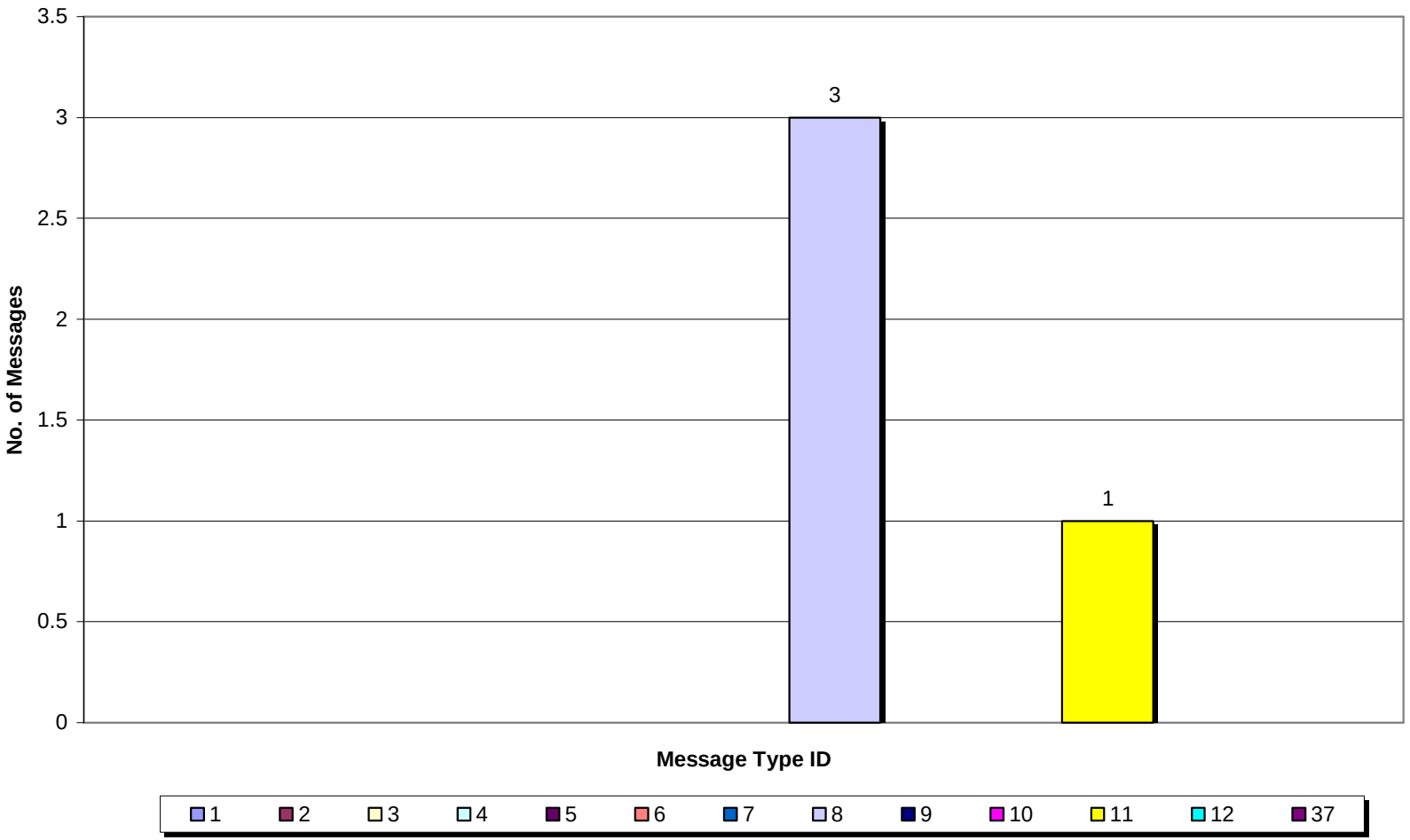



Northern Kentucky Water District
Message Type Summary
No. of Messages
0
1
2
3
4
5
6
7
8
9
10
1
9
4
6
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

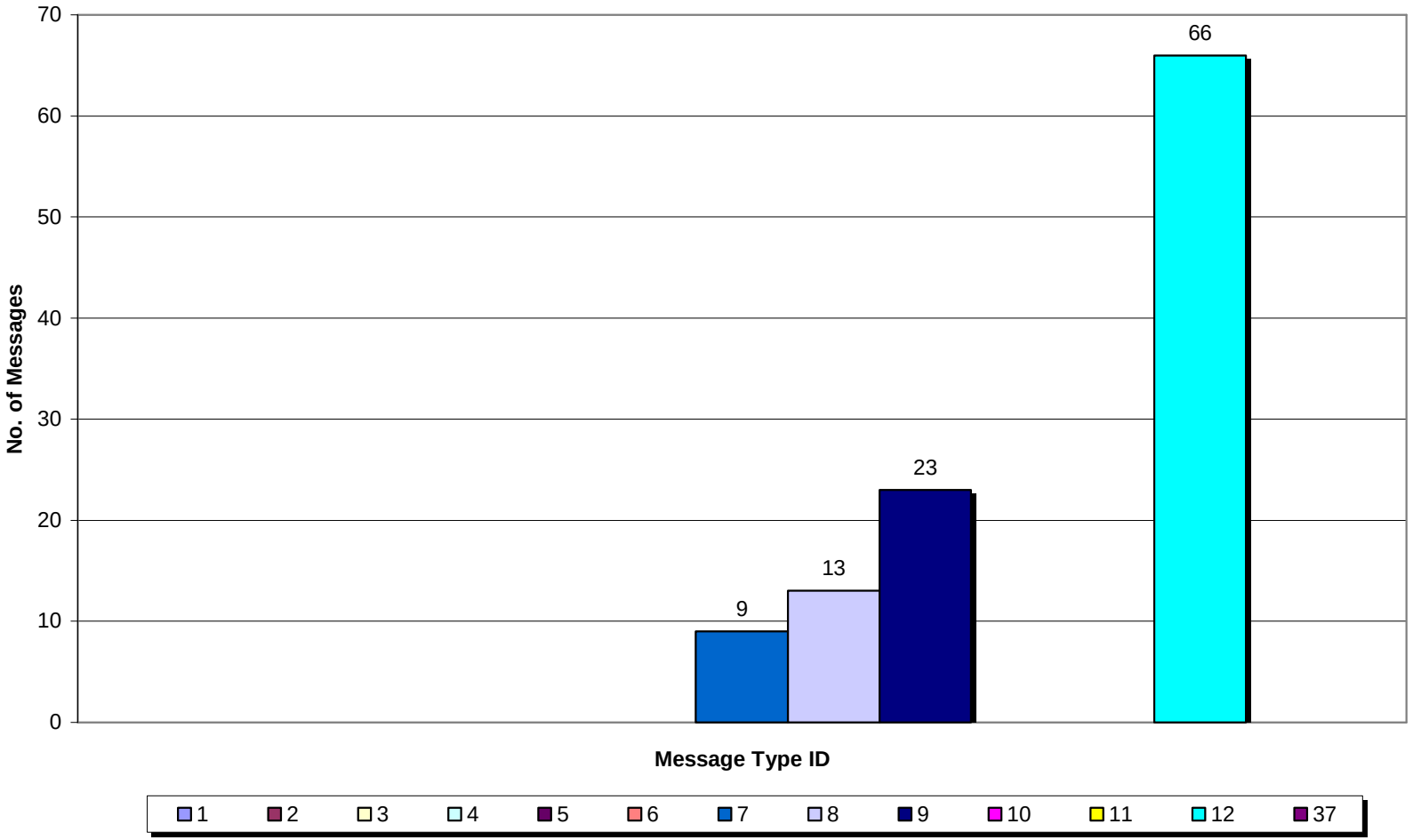
Wichita Water & Sewer Department
Message Type Summary

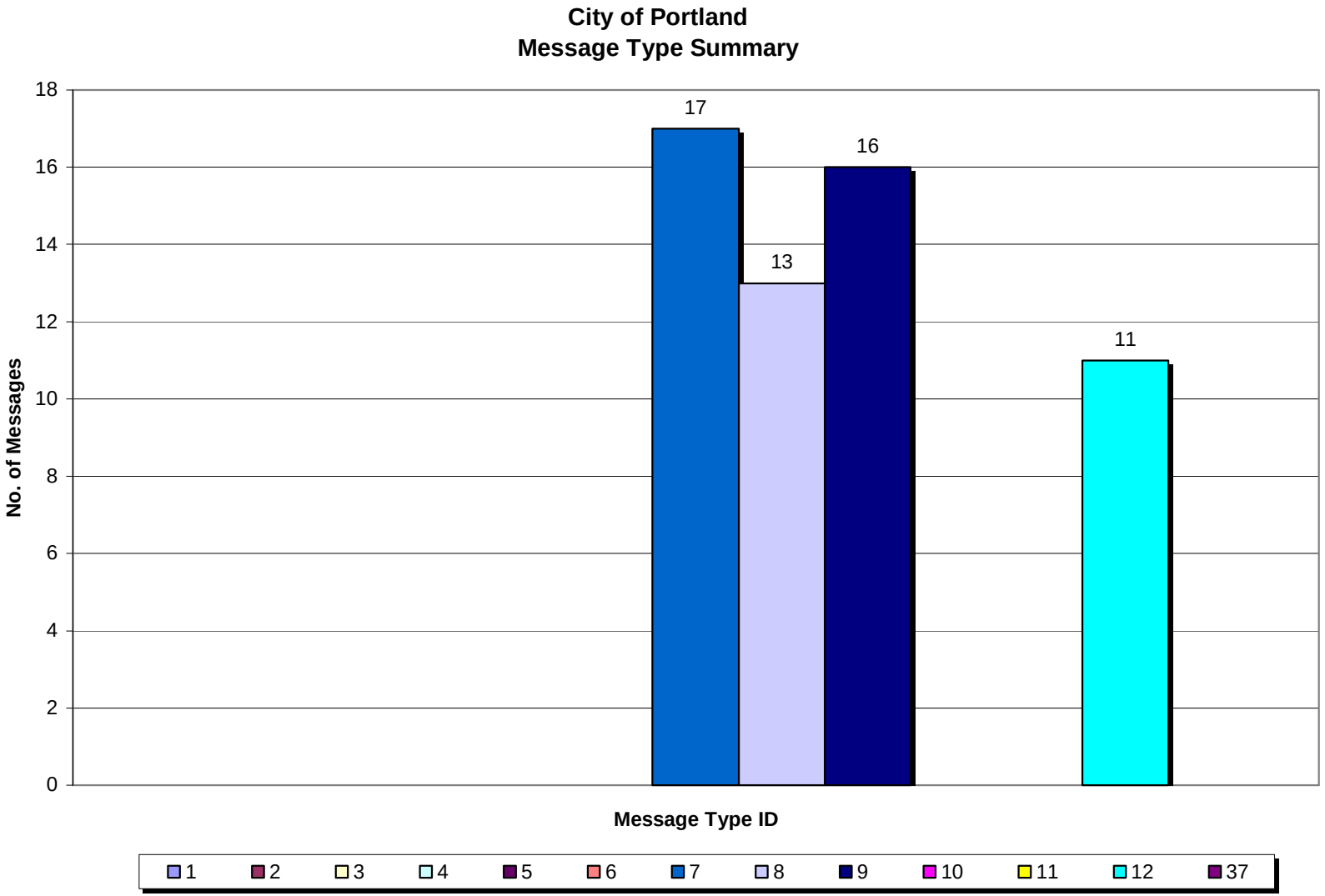


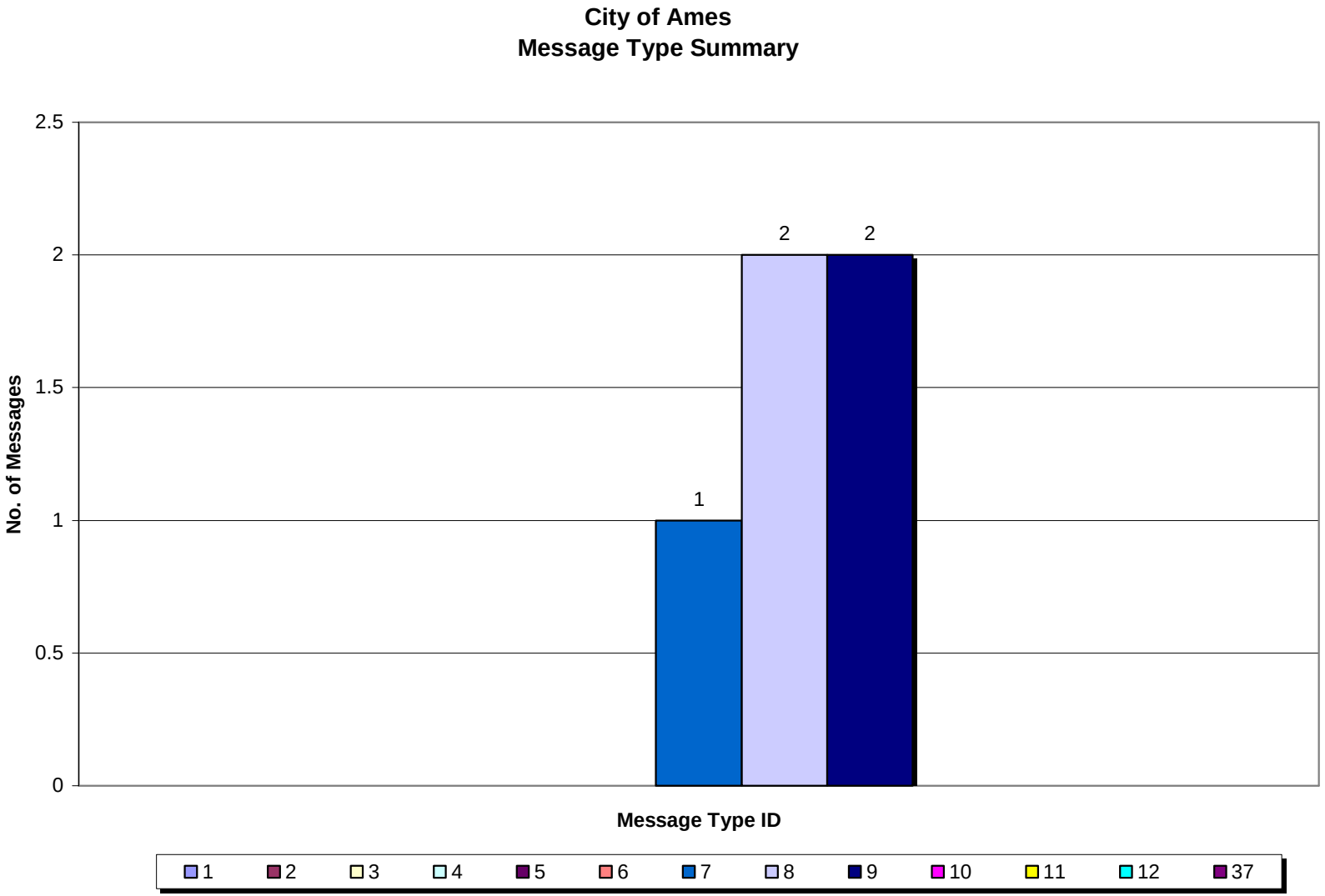
Portland Water District
Message Type Summary



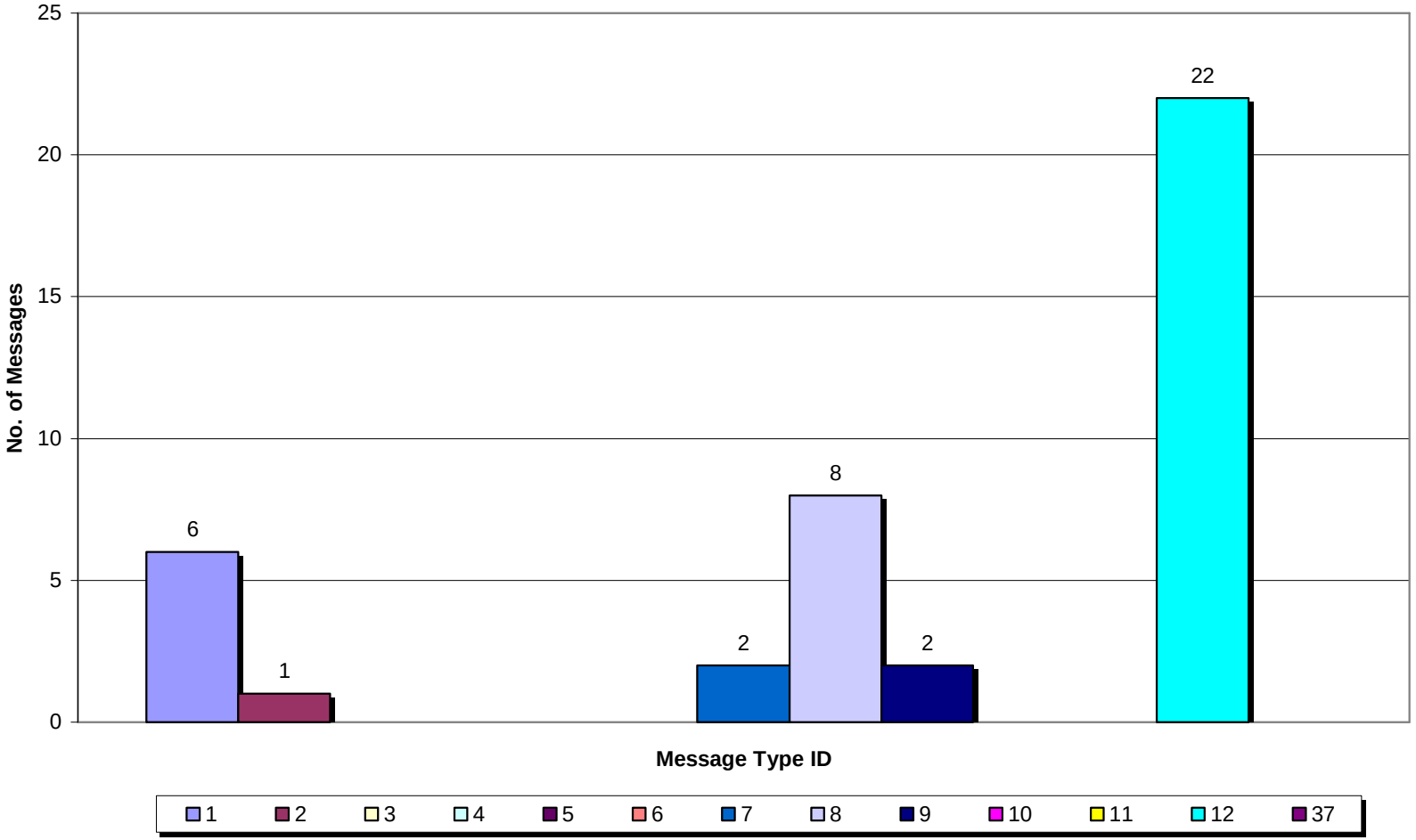
Louisville MSD
Message Type Summary



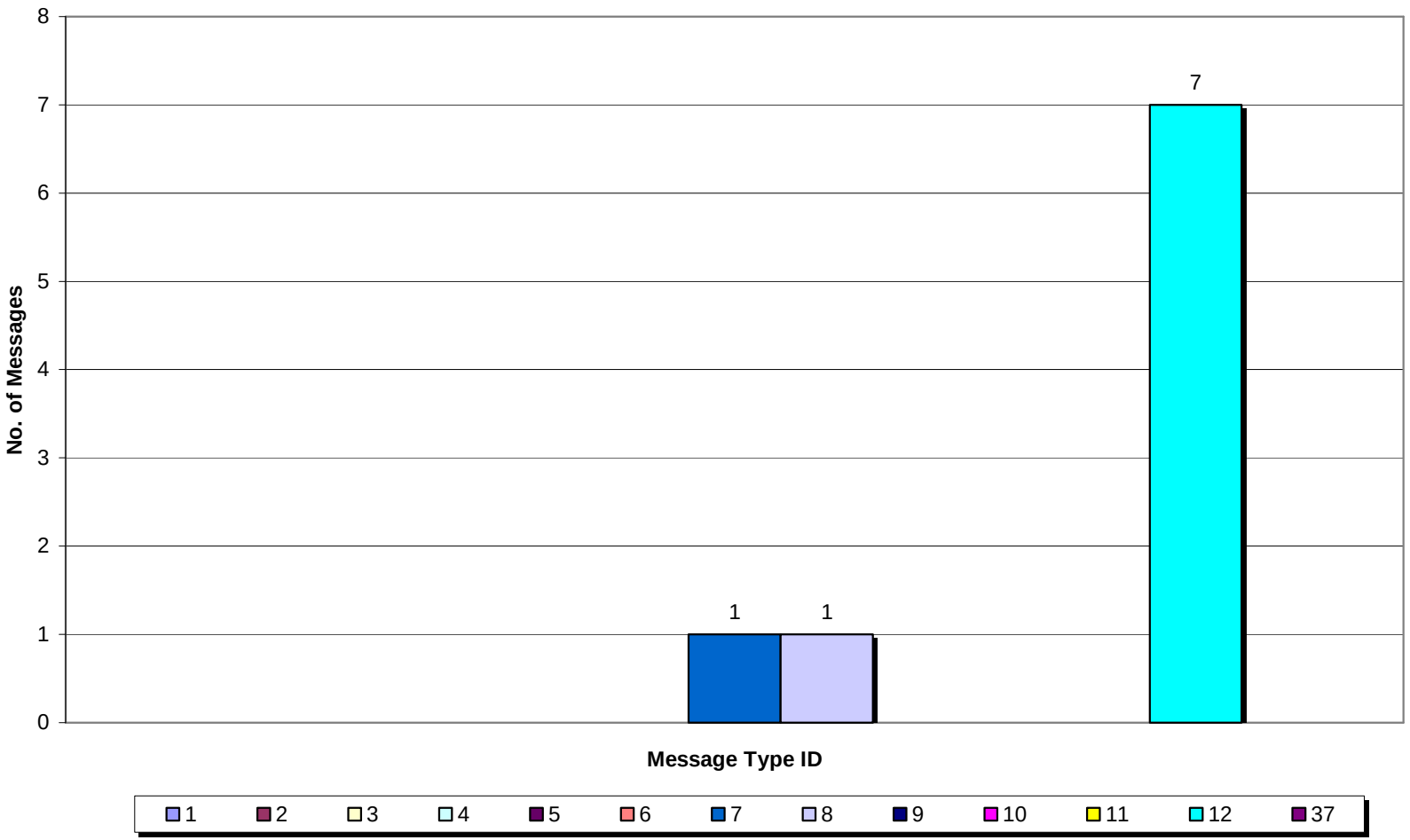

City of Portland
Message Type Summary
No. of Messages
0
2
4
6
8
10
12
14
16
18
17
13
16
11
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

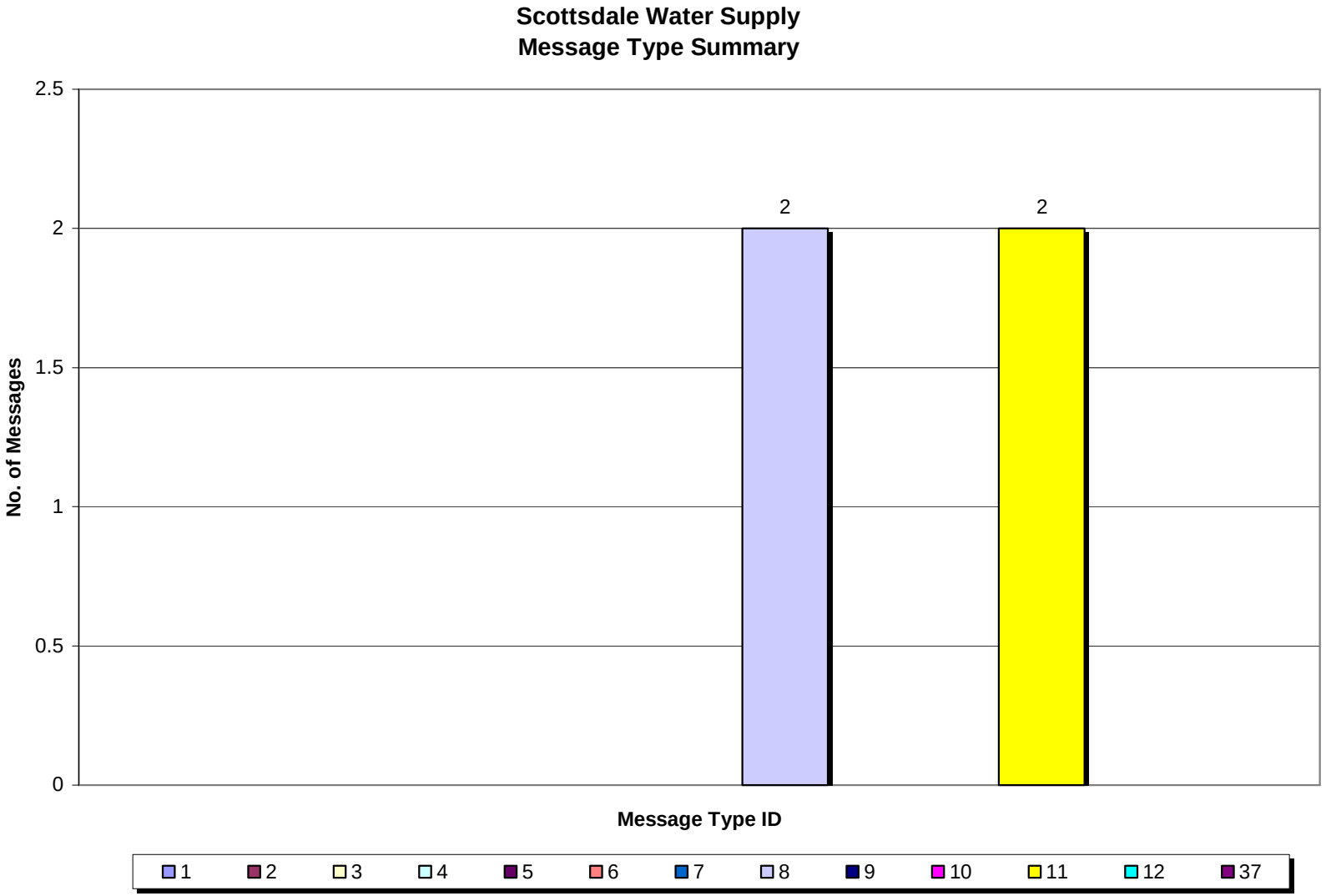

City of Ames
Message Type Summary
2.5
2
1.5
1
0.5
0
No. of Messages
1
2
2
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

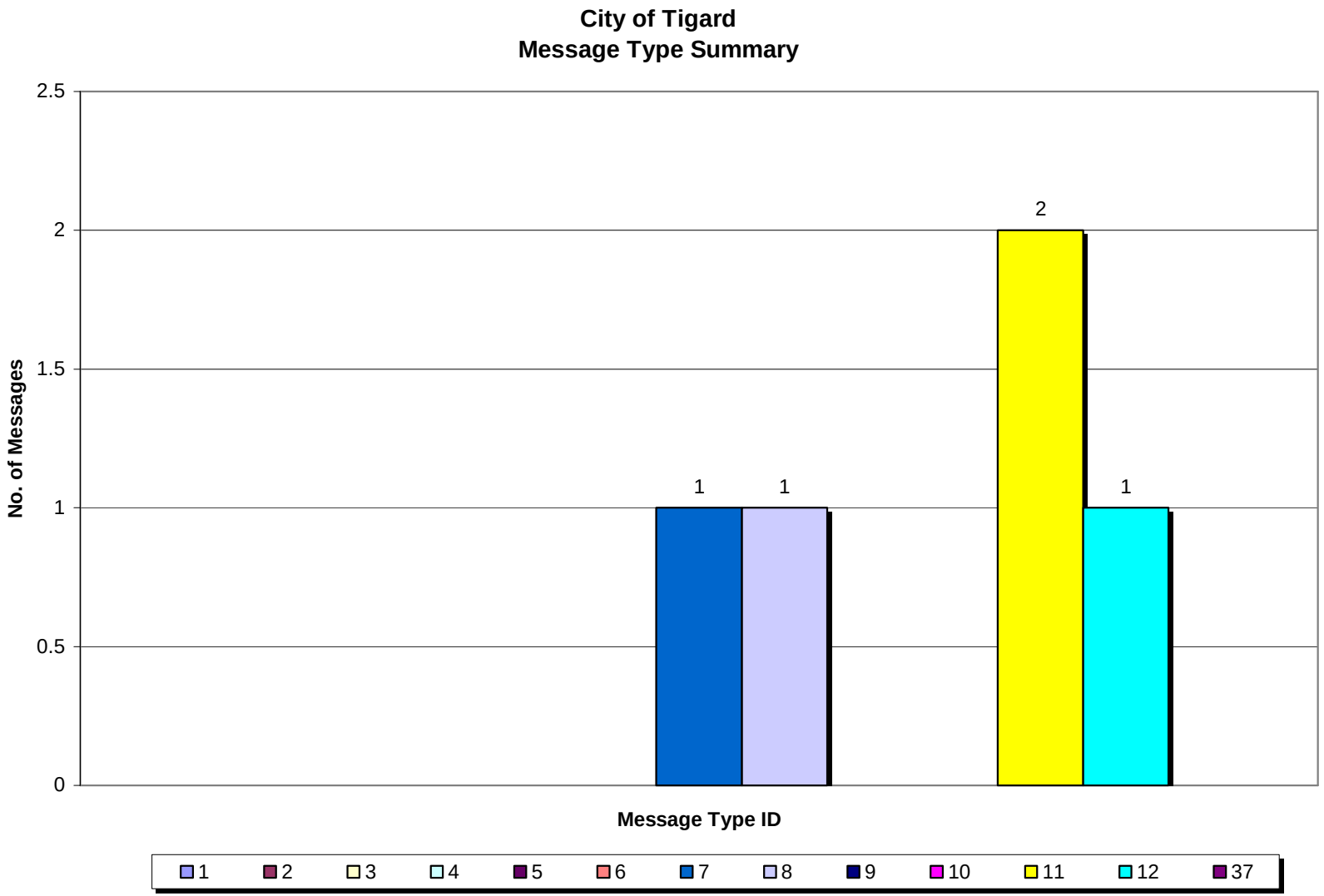
City of Claremont
Message Type Summary

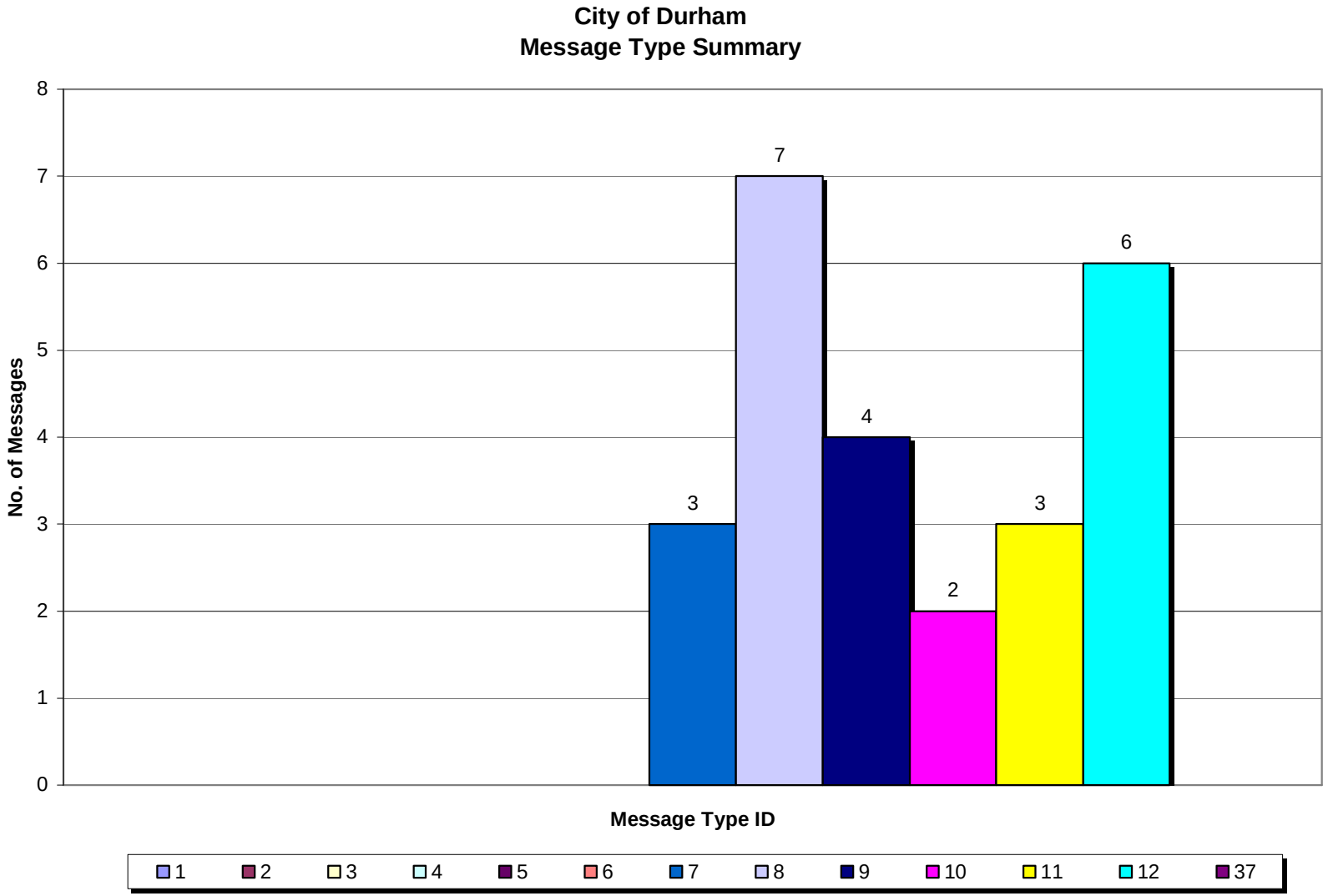


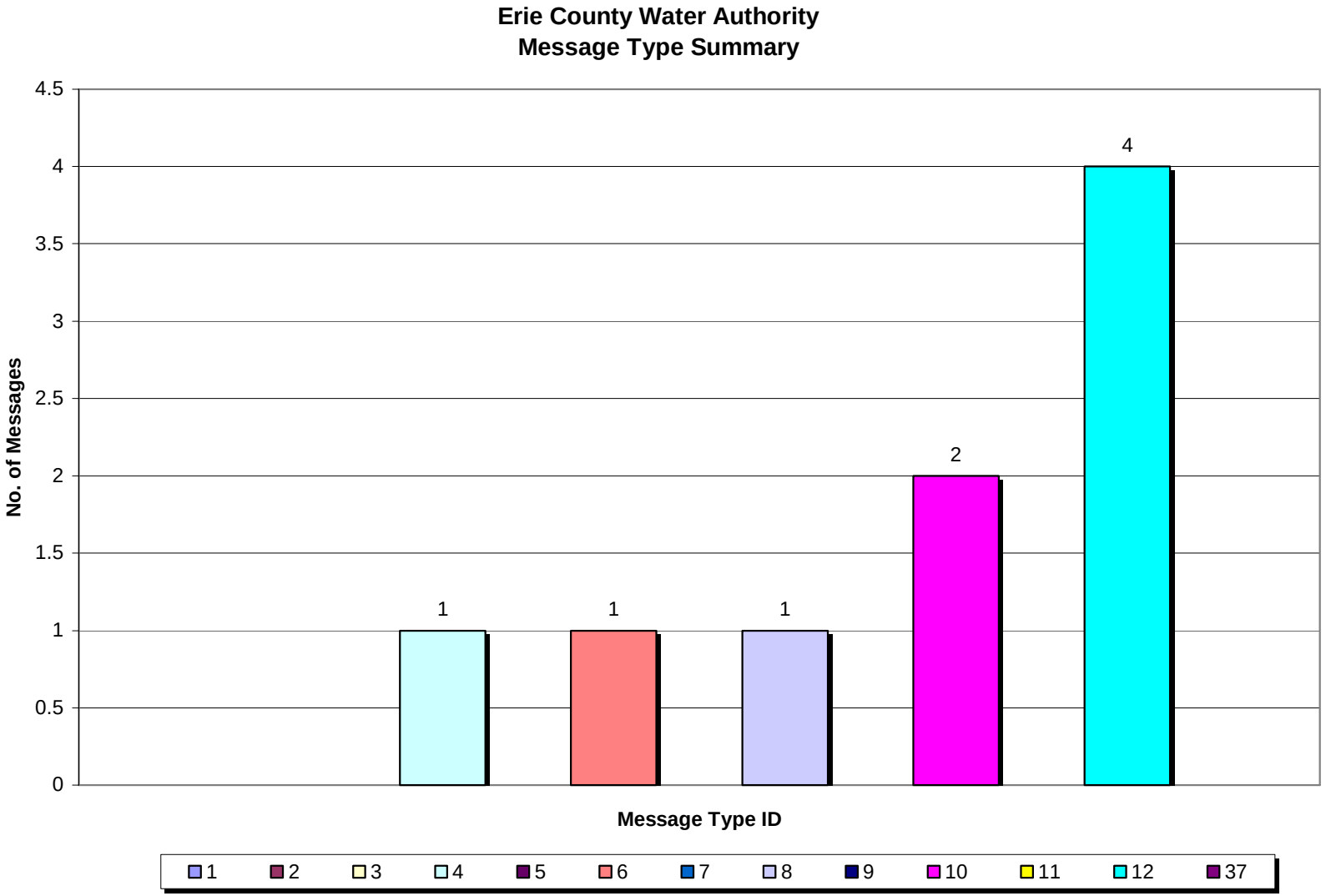
City of Norfolk
Message Type Summary

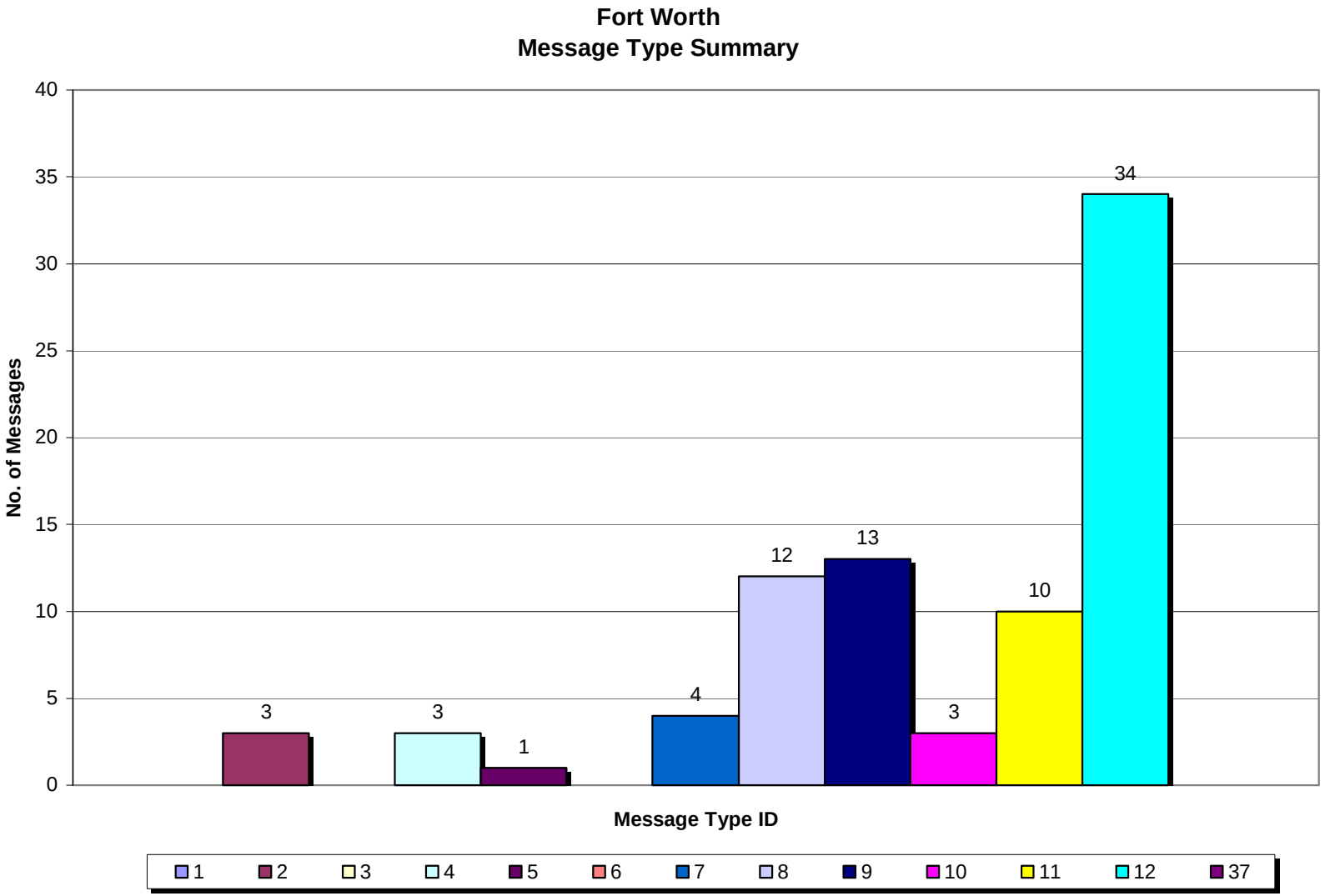


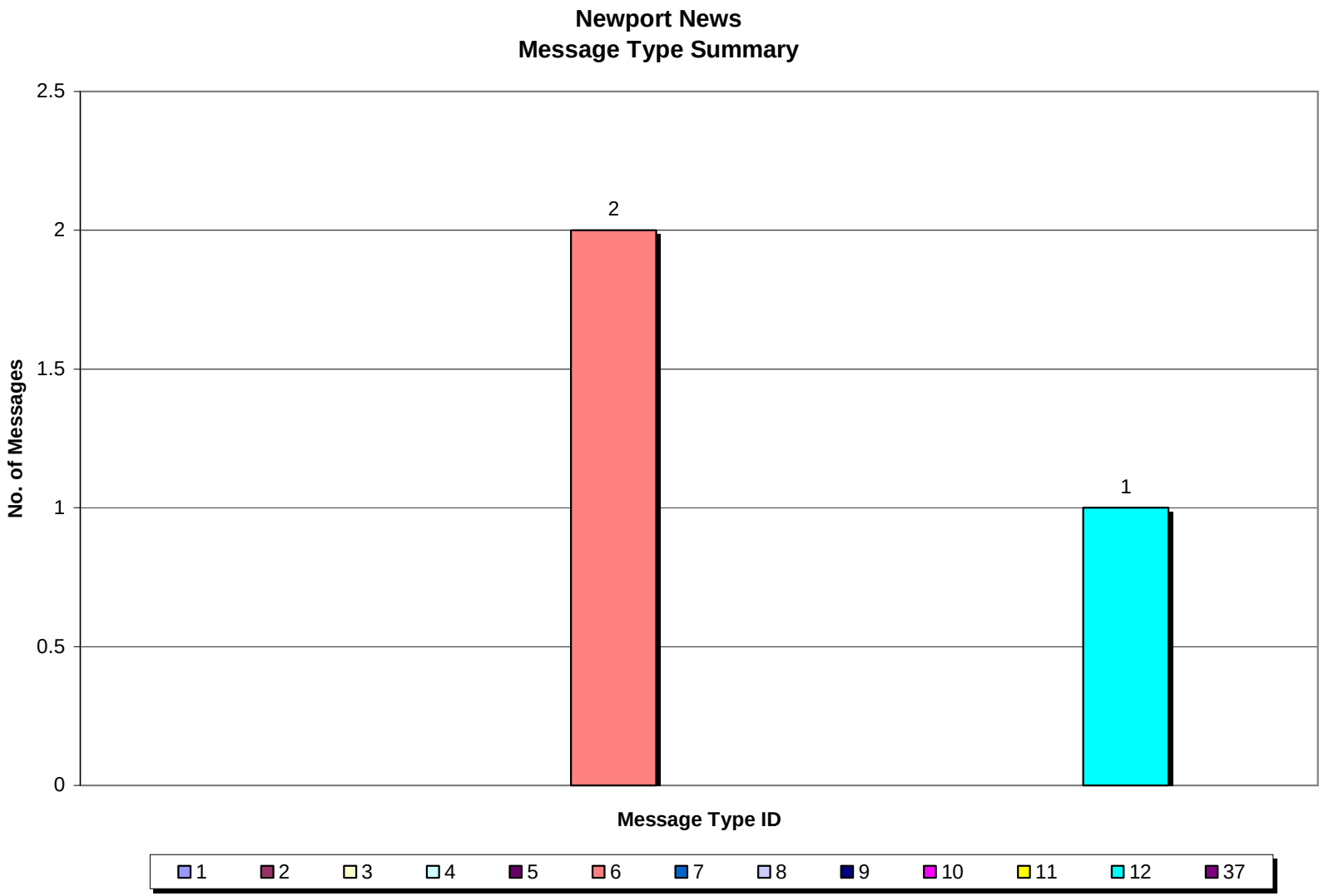

Scottsdale Water Supply
Message Type Summary
2.5
2
1.5
1
0.5
0
No. of Messages
2
2
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

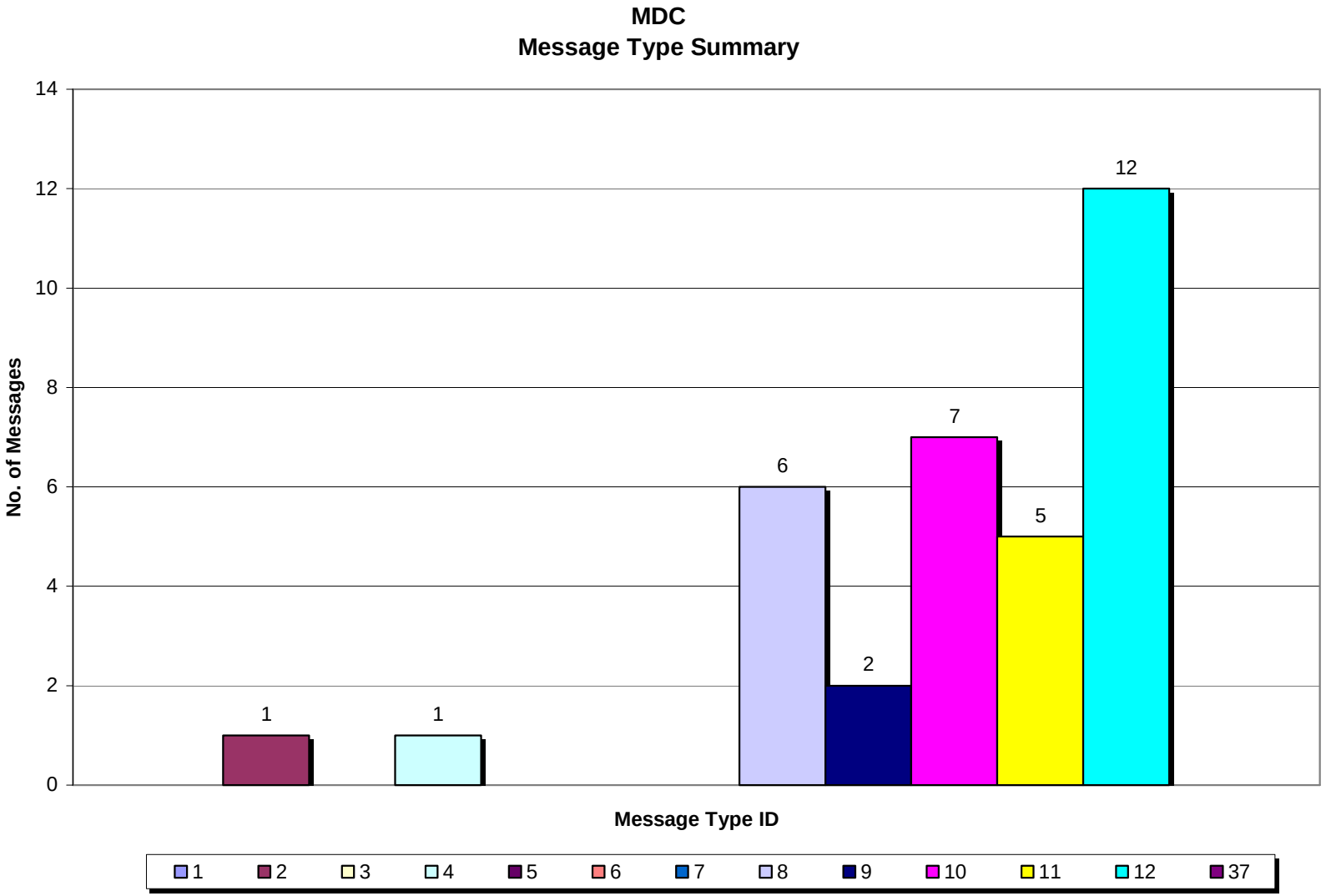

City of Tigard
Message Type Summary
2.5
2
1.5
1
0.5
0
No. of Messages
1
1
2
1
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

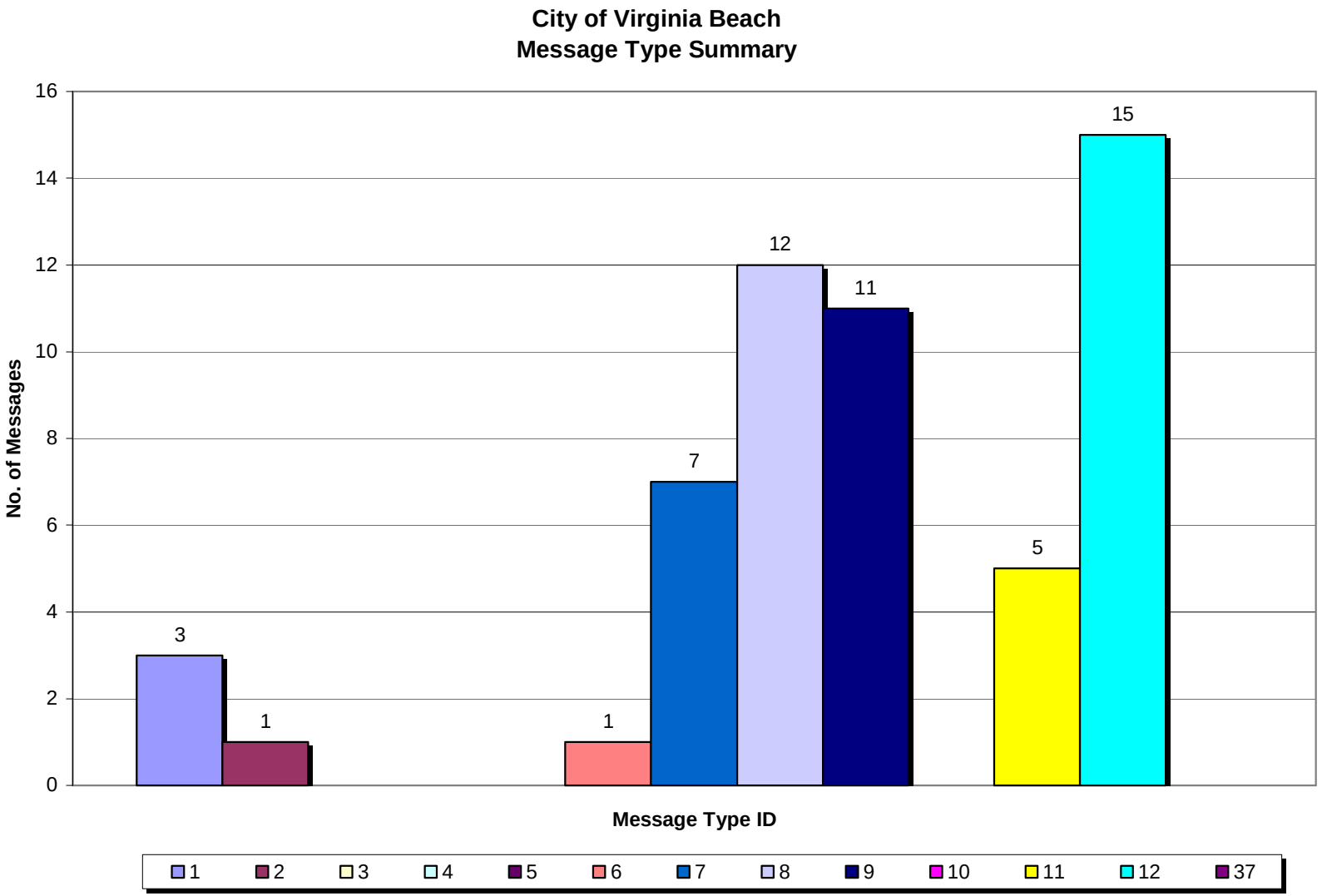

City of Durham
Message Type Summary
No. of Messages
0
1
2
3
4
5
6
7
8
3
7
4
2
3
6
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


Erie County Water Authority
Message Type Summary
No. of Messages
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1
1
1
2
4
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


Fort Worth
Message Type Summary
No. of Messages
0
5
10
15
20
25
30
35
40
3
3
1
4
12
13
3
10
34
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


Newport News
Message Type Summary
2.5
2
1.5
1
0.5
0
No. of Messages
2
1
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


MDC
Message Type Summary
No. of Messages
14
12
10
8
6
4
2
0
1
1
6
2
7
5
12
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37


City of Virginia Beach
Message Type Summary
No. of Messages
16
14
12
10
8
6
4
2
0
3
1
1
7
12
11
5
15
Message Type ID
1
2
3
4
5
6
7
8
9
10
11
12
37

LIST OF REFERENCES

Berelson, Bernard. (1952). Content Analysis in Communication Research. New York: American Book-Stratford Press Inc.

Budd, R. W., Thorp, R. K., et al. (1967). Content Analysis of Communications. New York: The Macmillan Company.

Krippendorff, Klaus. (1980). Content Analysis: An Introduction to Its Methodology. Beverly Hills, CA: Sage Publications.

North, Holsti, et al. (1963). Content Analysis: A Handbook with Applications for the Study of International Crisis. Northwestern University Press.

Riffe, Daniel. (1998). Analyzing Media Messages: Using Quantitative Content Analysis in Research. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc., Publishers.

Seeger, M.W., T.L. Sellnow, et al. (2003). Communication and Organizational Crisis. Westport, CT: Praeger.

BIBLIOGRAPHY

American Academy of Environmental Engineers. (1995). Natural Disaster Experiences: How to Prepare Environmental Facilities for the Worst. Annapolis, MD: American Academy of Environmental Engineers.

American Water Works Association. (2003). Protecting Our Water: Drinking Water Security in America after 9/11. Denver, CO: American Water Works Association.

Association of State and Territorial Directors of Health Promotion and Public Health Education. (2000). Model Emergency Response Communications Plan for Infectious Disease Outbreaks and Bioterrorist Events. Washington, D.C.: Association of State and Territorial Directors of Health Promotion and Public Health Education.

Berelson, Bernard. (1952). Content Analysis in Communication Research. New York: American Book-Stratford Press Inc.

Berry, L., Jones, A., et al. (1999). Media Interaction with the Public in Emergency Situations: Four Case Studies. Washington D.C.: Federal Research Division Library of Congress.

Budd, R. W., Thorp, R. K., et al. (1967). Content Analysis of Communications. New York: The Macmillan Company.

Caponigro, J.R. (2000). The Crisis Counselor: A Step-by-Step Guide to Managing a Business Crisis. Chicago: Contemporary Books.

Haimes, Y.Y., D.A. Moser, et al. (1992). Risk-Based Decision Making in Water Resources V. New York City: American Society of Civil Engineers.

Haimes, Y.Y., D.A. Moser, et al. (1994). Risk-Based Decision Making in Water Resources VI. New York City: American Society of Civil Engineers.

Haimes, Y.Y., D.A. Moser, et al. (1996). Risk-Based Decision Making in Water Resources VII. New York City: American Society of Civil Engineers.

Haimes, Y.Y., D.A. Moser, et al. (1998). Risk-Based Decision Making in Water Resources VIII. Reston, VA: American Society of Civil Engineers.

Haimes, Y.Y., D.A. Moser, et al. (2001). Risk-Based Decision Making in Water Resources IX. Reston, VA: American Society of Civil Engineers.

Haimes, Y.Y., D.A. Moser, et al. (2003). Risk-Based Decision Making in Water Resources X. Reston, VA: American Society of Civil Engineers.

Krippendorff, Klaus. (1980). Content Analysis: An Introduction to Its Methodology. Beverly Hills, CA: Sage Publications.

Lindell, M.K. (2000). An overview of protective action decision-making for a nuclear power plant emergency. Journal of Hazardous Materials. 75: 113-129.

Lundgren, R.E. & A.H. McMakin. (1998). Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks. Columbus, OH: Battelle Press.

Mobley, J., C. Tatham, et al. (2004). Customer Attitudes, Behavior, and the Impact of Communications Efforts. Denver, CO: American Water Works Association.

Neuendorf, Kimberly A. (2002). The Content Analysis Guidebook. Thousand Oaks, CA: Sage Publications.

North, Holsti, et al. (1963). Content Analysis: A Handbook with Applications for the Study of International Crisis. Northwestern University Press.

Pan American Health Organization. (2002). Emergencies and Disasters in Drinking Water Supply and Sewerage Systems: Guidelines for Effective Response. Washington, D.C.: Pan American Health Organization.

Riffe, Daniel. (1998). Analyzing Media Messages: Using Quantitative Content Analysis in Research. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc., Publishers.

Riordan, R.A. (1995). Mutual aid and emergency response for water utilities. Journal American Water Works Association. 87(5): 52-58.

Russell, C. & K. O'Grady. (1996). Applied Risk Communication within the Corps of Engineers. Alexandria, VA: U.S. Army Corps of Engineers.

Santos, S.L. (1990). Developing a risk communication strategy. Journal American Water Works Association. 82(11): 45-49.

Seeger, M.W., T.L. Sellnow, et al. (2003). Communication and Organizational Crisis. Westport, CT: Praeger.

Shimoda, T.A. (1994). Emergency preparedness and response. Journal American Water Works Association. 86(1): 84-92.

Shovlin, M.G. & S.S. Tanaka. (1990). Risk communication in Los Angeles: A case study. Journal American Water Works Association. 82(11): 40-44.

Task Force on Natural Disaster Management for Wastewater Treatment Facilities. (1999). Natural Disaster Management for Wastewater Treatment Facilities. Alexandria, VA: Water Environment Federation.

U.S. Army Corps of Engineers. (1992). Explaining Flood Risk. Washington, D.C.: U.S. Army Corps of Engineers.

U.S. Department of Health and Human Services. (2002). Communicating in a Crisis: Risk Communication Guidelines for Public Officials. Washington, D.C.: U.S. Department of Health and Human Services.

U.S. Department of Homeland Security. (2004). National Response Plan. Washington, D.C.: U.S. Department of Homeland Security.

U.S. Environmental Protection Agency. (2003). Considerations in Risk Communication: A Digest of Risk Communication as a Risk Management Tool. Washington, D.C.: U.S. Environmental Protection Agency.

U.S. Environmental Protection Agency. (2004). National Water Security Risk Communication Symposium, San Francisco: May 20-21.

U.S. Federal Emergency Management Agency. (2004). Responding to Incidents of National Consequence: Recommendations for America's Fire and Emergency Services Based on the Events of September 11, 2001, and Other Similar Incidents. Washington, D.C.: U.S. Federal Emergency Management Agency.

U.S. House of Representatives Subcommittee on Water Resources and Environment. (2001). Terrorism: Are America’s water resources and environment at risk? Hearing, October 10. Washington, D.C.

Water Environment Research Foundation. (2004). Emergency Response Plan for Wastewater Systems. Alexandria, VA: Water Environment Research Foundation.

Water Protection and Soil Conservation Division. (2003). Emergency Operating Plan for Public Water Supplies Security Threat. Jefferson City, MO: Missouri Department of Natural Resources.

Water Protection Task Force. (2002). Guidance for Water Utility Response, Recovery & Remediation Actions for Man-made and/or Technological Emergencies. Washington, D.C.: U.S. Environmental Protection Agency, Office of Water.

Weber, R. P. (1990). Basic Content Analysis. Newbury Park, CA: Sage Publications.

Yoe, C, E.,Ph.D, & Orth, K. D. (1996). Planning Manual. Institute for Water Resources.

VITA

This researcher graduated from Butler County High School of Morgantown, Kentucky as Salutatorian of her Class of 2000. She continued her higher education at the University of Louisville, declaring a Major in Civil Engineering, at which she received her Bachelor of Science in Civil Engineering on the fifteenth day of December 2004. Upon successful passing of the Fundamentals of Engineering Examination this researcher was confirmed as an Engineer-In-Training on the fifteenth day of December 2004. Through the program at the University of Louisville, this researcher participated in the mandatory co-operative education program and spent three alternating semesters in various departments of the United States Army Corps of Engineers. Two semesters were spent at the Louisville District offices in Surveying and Mapping Section as well as Civil Section, while the third semester was spent at Fort Knox Kentucky in the Construction Division Field Office. This researcher spent much of her time involved in the University of Louisville Student Chapters for the American Society of Civil Engineers, the Society of American Military Engineers and the Society of Women Engineers. Prior to final completion of this research and coordinating Master Thesis work, this researcher relocated back to her home town of Morgantown, Kentucky, where she is presently employed with DDS Engineering, PLLC, of Bowling Green, Kentucky.