# NOVEC EXpansion Identification System
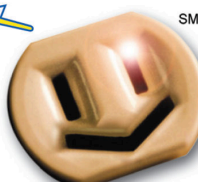## Project Proposal

February 2, 2015
Revision A

Austin Orchard
Brian Smith
Tygue Ferrier

# NOVEC EXpansion Identification System Project Proposal

## SYST 699 - Spring 2015

Austin Orchard
Brian Smith
Tygue Ferrier

| Version | Revision Status | Date |
|---------|-----------------|------|
| A | Initial Release | Feb 3, 2015 |
|  |  |  |

## Table of Contents

## Tables

## Figures

## 1.0  Executive Summary

Northern Virginia is a hub for development and population growth.  This growth results in a large number of development projects that increase the regional power consumption.  The GMU project team is proposing a tool to help energy suppliers monitor development projects for the use in business planning.  The team is comprised of combination of Systems Engineering and Operations Research students.  The document outlines the functionality gap and project approach NOVEC development tool.

## 2.0  Introduction

### 2.1  Background

The Northern Virginia Electric Cooperative (NOVEC) is one of the largest electric distribution cooperatives in the country.  NOVEC leverages over 25 years of experience in providing electric service to Northern Virginia. NOVEC's service area covers spans Clarke, Fairfax, Fauquier, Loudoun, Prince William, and Stafford counties.  This service area includes over 155,000 homes and businesses.  NOVEC has grown to support the ever-increasing population in the Northern Virginia area.

Population in Fairfax County has grown by over 100% in the past 40 years [1].  This growth leads to an increased demand on power suppliers and providers.  Increases in commercial business further add to the increased power demand.  At the beginning of the 20th century approximately 10% of Americans had access to electricity.  Many rural areas were left without access.  Cooperatives like NOVEC began to fill the gap between producers and consumers.

## 2.2  Statement of Problem

NOVEC uses publicly available information to create short term and long term load forecasts and material planning.  Currently, NOVEC uses regional data to determine their forecasts.  This does not adequately reflect where development is happening in a county and where energy demands will change.  With more localized data, NOVEC will be able to predict future energy demands and infrastructure needs in the short and long term with more precision.

The team will build a system that aggregates data from various county websites monthly, stores relevant data in a database, and generates reports detailing changes to the data and highlighting important existing or new projects.  NOVEC will be provided the means to retrieve specific data that is needed to incorporate into their existing forecasting models.

## 3.0  Scope

The team will use publicly available data from Loudoun County to build a prototype database to serve NOVEC's needs.  The team will create the database, provide the ability to update the database and provide the ability to create reports focusing on high value projects as determined by NOVEC.

## 3.1  Criteria for Success

- The team creates a functioning database for NOVEC.
- The team provides NOVEC the ability to easily update the records in the database.
- The team provides NOVCE the ability to easily generate useful reports from the records in the database.
- The team creates a final report and presentation detailing the project.

## 4.0  Technical Approach

The team has divided the approach into four sections: Data Discovery, Data Retrieval, Database Design, and Report Generation.

### Data Discovery

The team will search the websites provided by NOVEC to analyze what data is provided.  We will communicate with NOVEC to determine what data is relevant for their future analysis.  If the data is unable to be acquired from the websites, we will contact the counties directly to determine if there are alternate means to retrieve the data.

### Data Retrieval

Once it is determined what data is required and what format the data is in, the team will determine the best means to retrieve the data.  This could require researching a suitable scripting language or creating a manual retrieval process.  We will then create the code or the method to retrieve the data.

### Database Structure

Once the relevant data is determined, we can begin designing the database.  We will determine the database software based on ease of use and ability to interface with NOVEC.  We will then create the appropriate tables and use our data retrieval tool to populate the database.  We will provide NOVEC with the ability to add comments to the records and with the ability to flag important projects.

### Report Generation

Once the data is collected, we will generate reports when the data is updated.  These reports will highlight new projects, prioritizing according to categories specified by NOVEC.  The reports will also highlight updates to existing projects.  We also give NOVEC the ability to generate reports in a format convenient to interface with their existing forecasting models.

### Testing

We will be able to test the system by creating a simulated data source.  We will then test whether our data retrieval tool is able to acquire the data correctly and insert the data into the database.  We can then verify the data is correctly stored in the database.  We can then determine whether the correct reports are generated, in terms of content and format.

## 5.0   Project Management

The GMU project team will engage in project management best practices in order to measure progress, ensure technical performance, and limit scope creep.  Project budget is of limited concern due to the nature of the design and develop labor planned for this project.  Best practices will include active schedule management, change management, and risk mitigation.

Change management will provide a method to resist scope creep.  Changes will be analyzed for necessity, value, and impact.  Only those changes that are necessary to meet the minimum success criteria will be approved.  Members of the review board will include project team member and key stakeholders.  This process is of utmost importance due to the short time period allocated for this project.  Additional project management processes are described in subsequent sections.

### 5.1   Engagement plan

The stakeholder engagement plan is provided in Table 5-1.  This plan will facilitate the participation of key stakeholders throughout the project development life cycle.  Table 5-2: Stakeholder Contact Information includes the contact information for the key project team members and stakeholders.

### Table 5-1: Stakeholder Engagement Plan

| Stakeholder | Modality | Frequency | Purpose | Responsible |
|---|---|---|---|---|
| Project Team | E-mail Google Hangout Face to Face | Semiweekly | **Project Planning:** Communicate project schedule, progress, risks, task assignment **Technical Reviews:** Review technical design artifacts and develop solutions to design challenges. | Team Lead |
| Project Sponsor | Phone Email | Weekly As Needed | **Requirements Elicitation:** Generate client input and develop a better understanding of the needs of the stakeholder. **Progress Report:** Discuss project progress and challenges.  Receive client feedback and relay information requests.  Develop a better understanding of stakeholder needs and close existing information gaps. | Client point of contact |
| Faculty Advisor | Face to Face | Weekly | Discuss progress and generate feedback for improvements. | Team Lead |
| Faculty Review Board | Project Briefing | End of project | Present project design and development.  Receive sign off for project completion. | Team Communications Officer |

**Table 5-2: Stakeholder Contact Information**

| Individual | Organization | Contact Information |
|---|---|---|
| Austin Orchard | GMU Team | Phone: 571.218.6638<br>Email: AJOrchard12@gmail.com |
| Brian Smith | GMU Team | Phone: 202.344.0721<br>Email: brianbsmith@gmail.com |
| Tygue Ferrier | GMU Team | Phone: 703.220.0311<br>Email: tygue.ferrier@gmail.com |
| Dr. Philip Barry | GMU Sponsor | Email: pbarry@gmu.edu |
| Bryan Barfield | NOVEC | Phone: 703.754.6723<br>Email: rbarfield@novec.com |
| Ally Shi | NOVEC | Email: XShi@novec.com |

### 5.2    Work Breakdown Schedule

1. Project Management
   1.1. Problem statement definition
   1.2. Project Proposal
   1.3. IPR Briefing 1
   1.4. IPR Briefing 2
   1.5. Final project briefing
   1.6. Risk Management plan
   1.7. Project Schedule
   1.8. Project Briefing
      1.8.1. Draft Project Briefing
      1.8.2. Final Project Briefing
   1.9. Project Report
      1.9.1. Draft Project Report
      1.9.2. Final Project Report

2. Systems Engineering
   2.1. Concept of Operations
   2.2. System specifications
   2.3. System Architecture
      2.3.1. Preliminary system design
      2.3.2. Detailed system Design
   2.4. Database Design
      2.4.1. Identify data
      2.4.2. Integrated data dictionary
      2.4.3. Develop database design
   2.5. User guide

3. Development
   3.1. Data mining application
      3.1.1. Research data mining
      3.1.2. Software design
      3.1.3. Code
   3.2. Develop Database
   3.3. Prototype User Interface
      3.3.1. Design user interface
      3.3.2. Develop user interface
   3.4. Web Site Development
      3.4.1. Design
      3.4.2. Develop

4. Integration and Testing
   4.1. VRTM
   4.2. Test procedures
   4.3. Qualification testing

## 5.3 Schedule

The major milestones planned for the NEXIS project are provided in table xx.xx. These milestones provide a framework for the deliverables and major project briefings.

### Table 5-3: Project Milestones

| Milestones | Date |
|---|---|
| Project Definition Presentation | January 29, 2015 |
| Project Challenges Presentations | February 5, 2015 |
| Project Proposal | February 15, 2015 |
| In Progress Review 1 | February 17, 2015 |
| Professor Working Group Meeting | March 5, 2015 |
| In Progress Review 2 | March 19, 2015 |
| Professor Working Group Meeting | April 2, 2015 |
| Draft Final Report | April 16, 2015 |
| Final Presentation Dry Run | April 23, 2015 |
| Final Report | April 24, 2015 |
| Final Presentation Dry Run - NOVEC | April 28, 2015 |
| Professor Working Group Meeting | April 30, 2015 |
| Final Presentation (5/8/15) | May 8, 2015 |

Figure 5-1 depicts the baseline schedule for the NEXIS project. The schedule incorporates all of the items laid out in the WBS and milestones figures. The schedule will be managed as a living document and service as a measure of project progress. The project team will be able to identify schedule risks early and develop mitigation plans by managing the schedule and tracking progress.
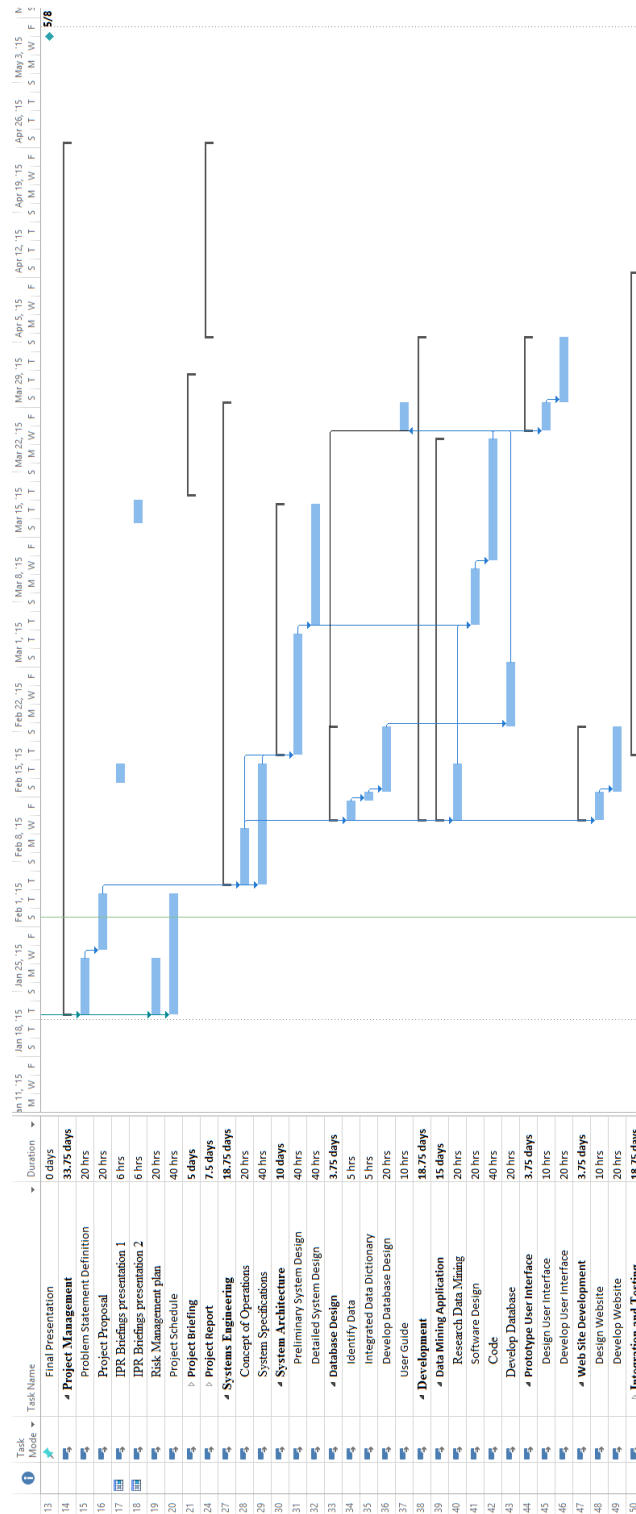
**Figure 5-1: NOVEC Project Schedule**

## 6.0   Risk Analysis

## 6.1  Risk Identification:

Risk identification is dictated by the categories included in table 1. Each risk as identified in the risk assessment will be weighted based upon probability of occurrence and impact to project scope/schedule/deliverable. Responsibility for risk is shared but task work is dictated in the Risk Responsibilities section. Likewise the risk register is dictated in the Risk Assessment section.

## Table 6-1: Risk Assessment Matrix

| | | Impact | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Probability | >0.8 | | 4 | | 2 | |
| | 0.6-0.8 | | 6, 15, 20 | 5, 10, 19 | 11, 24 | 1 |
| | 0.4-0.6 | | 18, 21, 22 | | 17 | 3 |
| | 0.2-0.4 | | | 14 | 7, 13 | |
| | 0-0.2 | | 16 | | | 8, 9 |

The risk action plan will be supplemented using several generic responses. The possible responses are:

- Avoidance - Avoidance is the nominal risk case where changes are required and acceptable to the project. A contingency plan is enacted should this risk occur. No mitigation plan accompanies these risks.
- Mitigation - A mitigation plan is determined prior to project start and placed in the risk charter. An additional mitigation plan is put into place due to increased importance of the risk. All risks rated "High" will obtain a risk management plan with both mitigation and contingency components.
- Transference - Inherent to the risk is a source outside of normal operational procedures and a stakeholder other than the team members are essential to executing the contingency plan outlined.
- Deferred - Risk is accepted and changes to the project will be implemented only if feasible and buy in is obtained. Otherwise the changes to be enacted will wait until additional clarification or until next semester's project.

## 6.2  Risk Responsibilities:

All project team members will have access to the risk register dictated in Risk Assessment. The roles and responsibilities for managing risk are outlined as follows:

- Risk Identification and Assessment: All project stakeholders
- Risk Registry: Project Manager

- Risk Response Approval: Team lead with concurrence from sponsor
- Risk Contingency Planning: All team members
- Risk Response Management: All team members
- Risk Reporting: Project Manager

## 6.3 Risk Assessment:

| Risk plan for project | NOVEC system design | | | |
|---|---|---|---|---|
| Assessment team members | Tygue, Brian, Austin | | | |
| R# | Risk | prob. | Impact | Priority | Actions |
| 1 | Project sponsor (or major stakeholder) changes agreement with existing requirements | 0.8 | 5 | High | Response: Avoidance<br><br>Mitigation: Conduct project sponsor communication as dictated in the communication plan. Ask the correct questions and give suitable information during meetings to obtain buy in and subsequent sign off on established requirements (preferably with actual signature)<br><br>Contingency: Team will address issues during same meeting/forum or schedule a follow-up clarification meeting with sponsor for guidance. Team will mark changes to all applicable requirements document and will schedule a follow up meeting with sponsor for agreement on either: new requirements or feasbility of requested change. Team will determine impact of possible changes and develop action items offline. |

| | | | | | |
|---|---|---|---|---|---|
| 2 | Project sponsor (or major stakeholder) changes interpretation of existing requirements/team member misinterprets stakeholder's input to requirements | 0.9 | 4 | High | Response: Mitigation<br><br>Mitigation: Conduct project sponsor communication as dictated in the communication plan. Ask the correct questions and give suitable information during meetings to obtain buy in and subsequent sign off on established requirements (preferably with actual signature)<br><br>Contingency: Team will address issues during same meeting/forum or schedule a follow-up clarification meeting with sponsor for guidance. Team will determine impact of change in terms of documentation modifications and develop action items offline. |
| 3 | Project sponsor (or major stakeholder) changes scope of project/team lead needs to request change to scope of project | 0.6 | 5 | High | Response: Mitigation<br><br>Mitigation: Conduct project sponsor communication as dictated in the communication plan. Ask the correct questions and give suitable information during meetings to obtain buy in and subsequent sign off for problem statement and measures of success. Communicate all recommended changes to sponsor immediately.<br><br>Contingency: Team will interpret scope of change and affected documents in terms of action items. Team will schedule a meeting/create a forum after action items have been listed and seek buy-in on recommendations. Team will enact changes to document offline with roles and responsibilities decided likewise. |

| | | | | | |
| --- | --- | --- | --- | --- | --- |
| 4 | Project sponsor does not accept recommendations for project changes | 0.9 | 2 | Medium | Response: Avoidance<br><br>Contingency: Team will re-iterate effort, based on new sponsor input, with same roles and responsibilities established in action items. |
| 5 | Project sponsor (or major stakeholder) requests additional functionality to deliverables | 0.8 | 3 | Medium | Response: Avoidance<br><br>Contingency: Team will delegate tasks as addition to existing action items. If additional software development is required these tasks will require special interpretation from OR SME and agreement from project sponsor before implementation. Action items will be executed. |
| 6 | Project timeline changes or deadline for deliverables changes "moves to the left" | 0.8 | 2 | Low | Response: Mitigation<br><br>Mitigation: Allow schedule to be a living document. Anticipate incoming events (blizzards etc) and plan accordingly.<br><br>Contingency: Team will immediately develop and delegate action items as a high priority. The list of affected documents and changes will immediately move up in priority. |
| 7 | Delegated team member is not able to complete task as assigned in action items | 0.4 | 4 | Medium | Response: Avoidance<br><br>Contingency: Team will determine if skill set is available/able to be developed to complete task. If not team will develop recommendation to project sponsor for scope changes. |
| 8 | Delegated team member becomes indisposed for task work | 0.2 | 5 | Medium | Response: Deferred<br><br>Contingency: Team will reallocate tasks based on action item lists. Team will complete tasks in parallel with new tasks (schedule over-time if needed). |

| | | | | | |
|---|---|---|---|---|---|
| 9 | Group charter changes | 0.2 | 5 | Medium | Response: Transference/New team member<br><br>Contingency: Team will determine skill set of new team member and re-establish charter. Member will reallocate tasks assigned to former colleague. |
| 10 | Data from different locations is not compatible | 0.8 | 3 | Medium | Response: Deferred<br><br>Contingency: Team will coordinate with sponsor/stake holders to limit or filter data. Team will identify necessary changes to all documentation. Recommendations will be made to sponsor based on level of effort. If it is agreed to be infeasible to incorporate changes to system outside of current scope, changes will be deferred to next semester. Otherwise system changes will be executed. |
| 11 | Sponsor/Stakeholder does not specify the important/relevent information or gives low quality input | 0.8 | 4 | High | Response: Transference/Sponsor<br><br>Mitigation: Follow communications plan as dictated in project charter. Answers to all agenda items should be dictated and recorded in meeting minutes. Should this information be lacking and require project changes execute contingency plan.<br><br>Contingency: Team will discuss clarification with sponsor/stake holder.  If necessary, team will make assumptions and detail assumptions in documentation to be communicated to sponsor. |
| 12 | Scope becomes inflated | 0.6 | 5 | High | Response: Avoidance<br><br>Contingency: Scope will be readjudicated in next meeting and recommendations will be made to project sponsor for approval of reduced scope. |

| 13 | Data gathered is inaccurate | 0.2 | 4 | Medium | Response: Mitigation<br><br>Mitigation: Find format of raw data to be polled from. Find validation source from public record.<br><br>Contingency: Data validation tool will be developed if data source is found to be inaccurate. (Current data sources:  Planning and Zoning department's Loudoun Online Land Applications System,  Economic Development Department's Loudoun County Available Land database,  Loudoun subdivision approval forms). Communicate discrepancies to county. |
|---|---|---|---|---|---|
| 14 | Sponsor specifies incorrect information | 0.4 | 3 | Low | Response: Transference/Sponsor<br><br>Mitigation: Follow communications plan as dictated in project charter. Answers to all agenda items should be dictated and recorded in meeting minutes. Should this information be incorrect and require project changes execute contingency plan.<br><br>Contingency: Team will discuss with sponsor/stake holder and obtain clarification.  If necessary, team will make assumptions and detail assumptions in documentation. |
| 15 | Time required estimates are too low | 0.8 | 2 | Low | Response: Avoidance<br><br>Contingency: Team will readjudicate schedule. Team will meeto to develoop action items. Team will work overtime to complete tasks as dictated by the action items. |

| | | | | | |
|---|---|---|---|---|---|
| 16 | Change management system is insufficient for project scope | 0.2 | 2 | Low | Response: Mitigation<br><br>Mitigation: Execute change management system as dictated in the proposal. Google drive is to be used for all versioning. Meeting minutes will be taken for all actions and documents resulting from actions will result in new document versions.<br><br>Contingency: Current system of google drive and naming documents with version numbers, will be supplemented with dedicated change control personnel, and a change approval board (team members). |
| 17 | Activities are missing from scope | 0.6 | 4 | Medium | Response: Avoidance<br><br>Contingency: Scope will be readjudicated in next meeting and recommendations will be made to sponsor for increased scope. |
| 18 | Major stakeholder or project sponsor becomes indisposed or disengaged | 0.6 | 2 | Low | Response: Mitigation<br><br>Mitigation: Develop acceptable communication plan. Accept input from all appropriate stakeholders and sign off. Make communication plan a living document.<br><br>Contingency: Find an alternative stakeholder to receive approval on project changes. (i.e. Sponsor/Professor and vica versa) |
| 19 | Stakholders develop a fundamental disagreement of project scope/intent/requirements | 0.8 | 3 | Medium | Response: Avoidance<br><br>Contingency: Team will adjudicate all disagreeable items and find a compromising position. These recommendations will be provided to both stakeholders preferably in the same forum. Action items will be developed and assigned to execute recommendations. |

| | | | | | |
|---|---|---|---|---|---|
| 20 | Users/Teammembers/ Stakeholder/Sponsor have unrealistic expectations of project outcome | 0.8 | 2 | Low | Response: Avoidance<br><br>Contingency: Team members will readjudicate scope of project and present recommendations to all appropriate parties. Action items will be developed and assigned in followup meeting. |
| 21 | Design/deliverables are not fit for purpose | 0.6 | 2 | Low | Response: Mitigation<br><br>Mitigation: Communicate with sponsor on impact of design changes. Keep good change process. Allow design to evolve based upon architectural feedback.<br><br>Contingency: Effort will be reiterated and changes will be readjudicated. Product changes will be presented to sponsor and all affected stakeholders in next IPR. |
| 22 | Design/deliverables lack flexibility | 0.6 | 2 | Low | Response: Mitigation<br><br>Mitigation: Communicate with sponsor on impact of design changes. Keep good change process. Allow design to evolve based upon architectural feedback.<br><br>Contingency: Effort will be reiterated and changes will be readjudicated. Product changes will be presented to sponsor and all affected stakeholders in next IPR. |
| 23 | Data analysis is not in good format | 0.8 | 4 | High | Response: Mitigation<br><br>Mitigation: Research possible sources of database. Have atleast three options to create code for polling data.<br><br>Contingency: Obtain additional information from website and data sources. Identify backup databases or raw data format. Identify process that is not automated. Finally text base presentation of reporting. |

## 6.4  Risk Management Reporting:

The risk management plan is a living document that will allow for input from all stakeholders. As such changes to it will be documented and addressed in all meeting minutes. The risk register will accompany the project proposal and if no changes are are identified this version will act as the baseline.

If a risk occurs the risk will be identified in the meeting minutes and appropriate action items will be adjudicated in the same meeting if possible. If additional stakeholders are required a follow up meeting will occur. The reported risk will be recorded as complete when all action items are addressed from the adjudicating meeting members.

Should the encountered risk be unforeseen the risk register will be updated with an appropriate action plan adjudicated in the next meeting as dictated in the communications plan.

## 6.5  Accompanying processes:

The risk management plan will be supplemented by the following processes with rationale:

- The change management process will apply to the risk management plan.
- The meeting minutes process will record all risk responses and action items resulting from encountered risk.
- All risk will be communicated to the sponsor and professor as dictated in the communication plan.

# Appendix A: Work Package Dictionary

| ID | Work Package | Format | Description |
|---|---|---|---|
| 1 | Problem Statement Definition | Briefing | Brief presentation of problem statement, schedule, and risks. |
| 2 | Project Proposal | Document | Deliverable containing problem statement and project outline.  This document contains the following: background, statement of problem, scope, approach, schedule, and risk analysis. |
| 3 | IPR Briefing 1 | Briefing | Briefing summarizing current progress and challenges.  Overview of CONOPS and preliminary system design. |
| 4 | IPR Briefing 2 | Briefing | Briefing summarizing current progress and challenges.  Overview of detailed system design and software development. |
| 5 | Final project briefing | Briefing | Summary of project design and development. |
| 6 | Risk management plan | Document | Outline of anticipated risks with definitions, impacts, and mitigation plan. |
| 7 | Schedule | MS Project | Project schedule and allocated resources. |
| 8 | Final Project Report | Document | Final report consisting of all project management, design, and development artifacts. |
| 9 | Concept of Operations (CONOPs) | Document | Description of system capabilities. |
| 10 | System specifications | Excel | Document containing user requirements |
| 11 | System Architecture | Document | Document composed of the preliminary system design and detailed system design. |
| 12 | Preliminary system Design | | High-level system design outlining approach for meeting system capabilities. |
| 13 | Detailed system Design | | Complete system design. |
| 14 | Database design | Document | Document containing the database design and integrated data dictionary. |
| 15 | User Guide | Briefing | Briefing describing how to use the system. |
| 16 | Identify data | | Summary of all available data on each webpage. |
| 17 | Integrated data dictionary | | Documentation of the data to be stored in database with description and format. |

| ID | Work Package | Format | Description |
|---|---|---|---|
| 18 | Database design | | Summary of the data base design and hierarchy. Outline of the tables, fields, relationships, and keys to be used in the database. Design should include description of implementation including the tools to be used. |
| 19 | Data mining application | Document/ Software | System used to parse webpages and populate the database. |
| 20 | Research data mining | Briefing | Summary of findings and important resources for use in the data mining tool |
| 21 | Software design | Briefing | Software design document including algorithms and activity diagrams. |
| 22 | Code | Software | Data acquisition tool software code. |
| 23 | Database | Software | |
| 24 | Develop Database | Software | Completed database with defined tables. |
| 25 | Populate database | Software | Database populated with all currently available data |
| 26 | Database Gui Prototype | Software | A front end prototype of the data visualization tool user for interfacing with the database |
| 27 | User Interface Design | Briefing | Design of functionality, work flow, and layout of the GUI. |
| 28 | User Interface Code | Software | HTML code that provides functionality that displays information to consumer in a useable format. |
| 29 | Requirements Verification Tractability Matrix (VRTM) | Excel | Matrix depicting the relationship between test approaches and requirements. |
| 30 | Test procedures | Document | Test step procedures used for verifying and validating user requirements. |
| 31 | Qualification Testing | Briefing | This package includes the process of conducting the qualification testing and resulting briefing summarizing the results. |
| 31 | Web Site Development | Webpage | Project webpage used for documenting the projects deliverables and process. |
| 32 | Design | Briefing | Design of webpage layout and pages. |
| 33 | Develop | Software | HTML and CSS code that implements the webpage design |