WORK SESSION AGENDA

CITY COUNCIL WORK SESSION
TUESDAY
FEBRUARY 26, 2013

COUNCIL CHAMBERS
211 WEST ASPEN AVENUE
6:00 P.M.

1. **Call to Order.**

2. **Pledge of Allegiance.**

3. **Roll Call.**

NOTE: One or more Councilmembers may be in attendance telephonically or by other technological means.

MAYOR NABOURS
VICE MAYOR EVANS
COUNCILMEMBER BAROTZ
COUNCILMEMBER BREWSTER
COUNCILMEMBER ORAVITS
COUNCILMEMBER OVERTON
COUNCILMEMBER WOODSON

As a reminder, if you are carrying a cell phone, electronic pager, computer, two-way radio, or other sound device, we ask that you turn it off at this time to minimize disruption to tonight's meeting.

4. **Public Participation *(Non-Agenda Items Only).***

Public Participation enables the public to address the council about items that are not on the prepared agenda. Public Participation appears on the agenda twice, at the beginning and at the end of the work session. You may speak at one or the other, but not both. Anyone wishing to comment at the meeting is asked to fill out a speaker card and submit it to the recording clerk. When the item comes up on the agenda, your name will be called. You may address the Council up to three times throughout the meeting, including comments made during Public Participation. Please limit your remarks to three minutes per item to allow everyone to have an opportunity to speak. At the discretion of the Chair, ten or more persons present at the meeting and wishing to speak may appoint a representative who may have no more than fifteen minutes to speak.

5. **Preliminary Review of Draft Agenda for the March 5, 2013, City Council Meeting.***

** Public comment on draft agenda items may be taken under "Review of Draft Agenda Items" later in the meeting, at the discretion of the Mayor. Citizens wishing to speak on agenda items not specifically called out by the City Council for discussion under the second Review section may submit a speaker card for their items of interest to the recording clerk.*

6. **Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) Five Year and Long Range Transportation Plan Presentation.**

7. **Rio de Flag Flood Control Project - Path Forward Presentation.**

8. **Wildcat Hill Wastewater Treatment Plant Solids Handling Alternatives.**

9. **Discussion / direction on participants for upcoming Zoning Map Amendment Process Special Work Session of April 8, 2013.**

10. **Discussion/direction on Resolution of Support for HB2573, Prohibited Governmental Compliance; 2012 NDAA.**

11. **Review of Draft Agenda Items for the March 5, 2013, City Council Meeting.***

** Public comment on draft agenda items will be taken at this time, at the discretion of the Mayor.*

12. **Public Participation.**

13. **Informational Items To/From Mayor, Council, and City Manager.**

14. **Adjournment.**

CERTIFICATE OF POSTING OF NOTICE

The undersigned hereby certifies that a copy of the foregoing notice was duly posted at Flagstaff City Hall on______________________________, at _______ a.m./p.m. in accordance with the statement filed by the City Council with the City Clerk.

Dated this ______ day of ___________________, 2013.

____
Elizabeth A. Burke, MMC, City Clerk

Memorandum

6.

CITY OF FLAGSTAFF

To:	The Honorable Mayor and Council
From:	Barbara Goodrich, Management Services Director
Date:	02/19/2013
Meeting Date:	02/26/2013

TITLE:

Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) Five Year and Long Range Transportation Plan Presentation.

DESIRED OUTCOME:

For City Council's information as NAIPTA continues to develop and refine its' short and long term plans for service provision.

INFORMATION:

Please see attached power point.

Attachments: NAIPTA Presentation

Form Review

Inbox	Reviewed By	Date
Management Services Director (Originator)	Barbara Goodrich	02/19/2013 05:23 PM
DCM - Josh Copley	Josh Copley	02/22/2013 09:23 AM

Form Started By: Barbara Goodrich Started On: 02/19/2013 05:00 PM

Final Approval Date: 02/22/2013

Public Outreach

5-Year & Long Range Transit Plan

Getting you where you want to go

Agenda

- Where Are We Now?
- Where Do We Want To Go?
- How Do We get There?

Partnerships

ADOT

NELSON NYGAARD

FMPO

Kimley-Horn and Associates, Inc.

KDA creative™ relationships that build

NAIPTA

CITY OF FLAGSTAFF ARIZONA ESTABLISHED 1882

NORTHERN ARIZONA UNIVERSITY

MOUNTAIN LINE

MOUNTAIN LINK

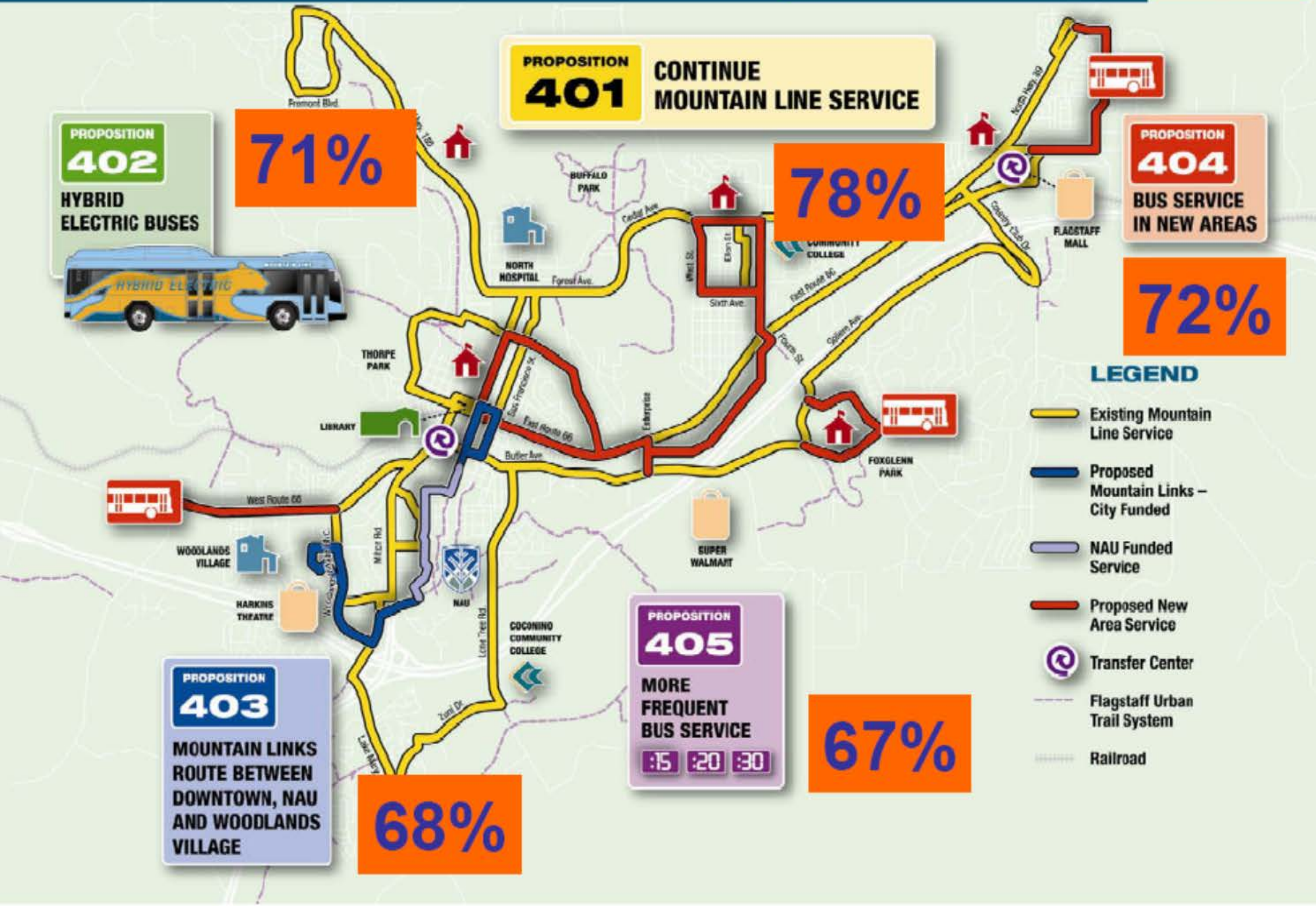
MOUNTAIN LIFT

Getting you where you want to go

Where Are We Now?

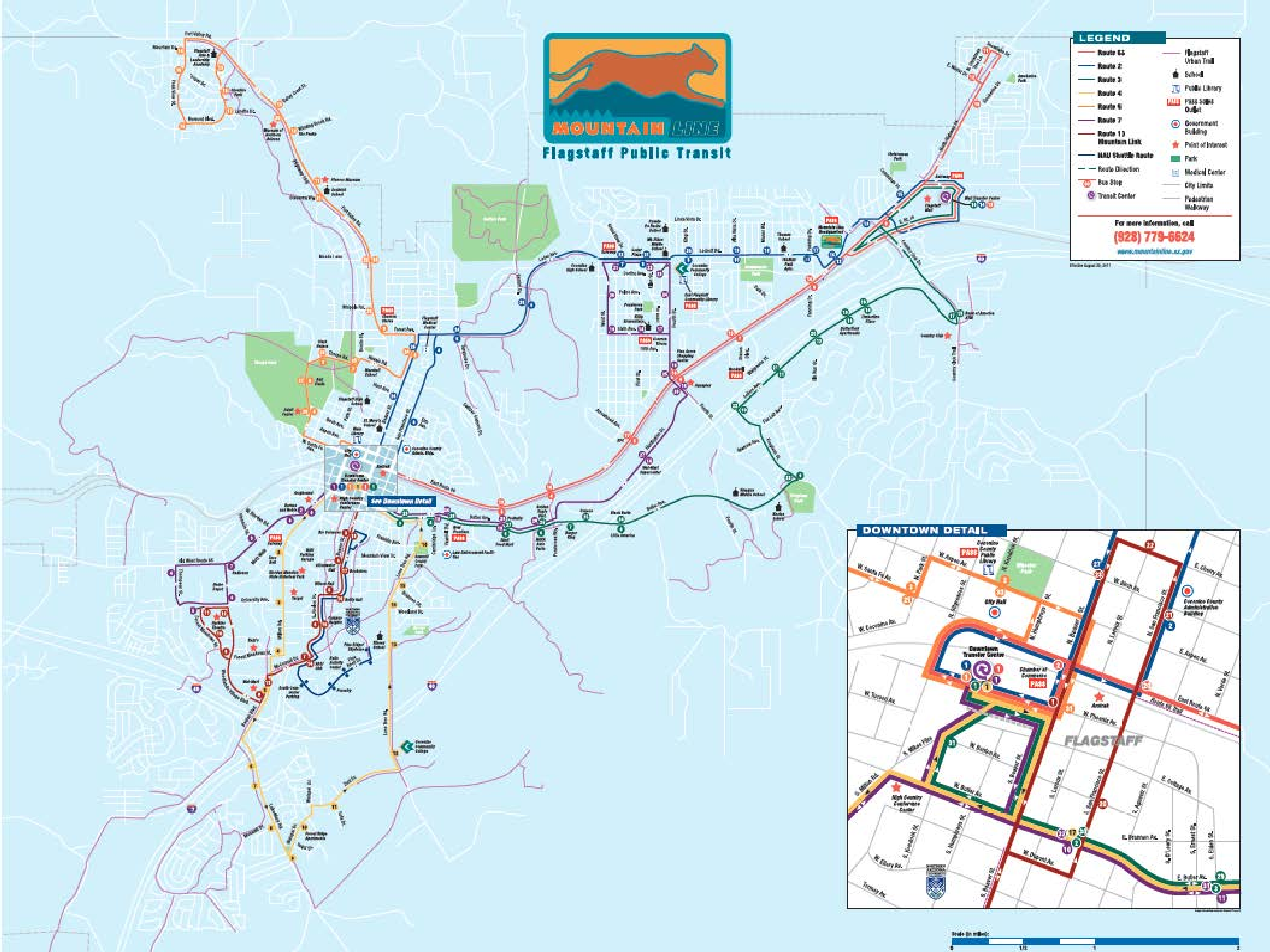
Getting you where you want to go

FIVE PROPOSITIONS LET YOU DECIDE... AND YOU DID!



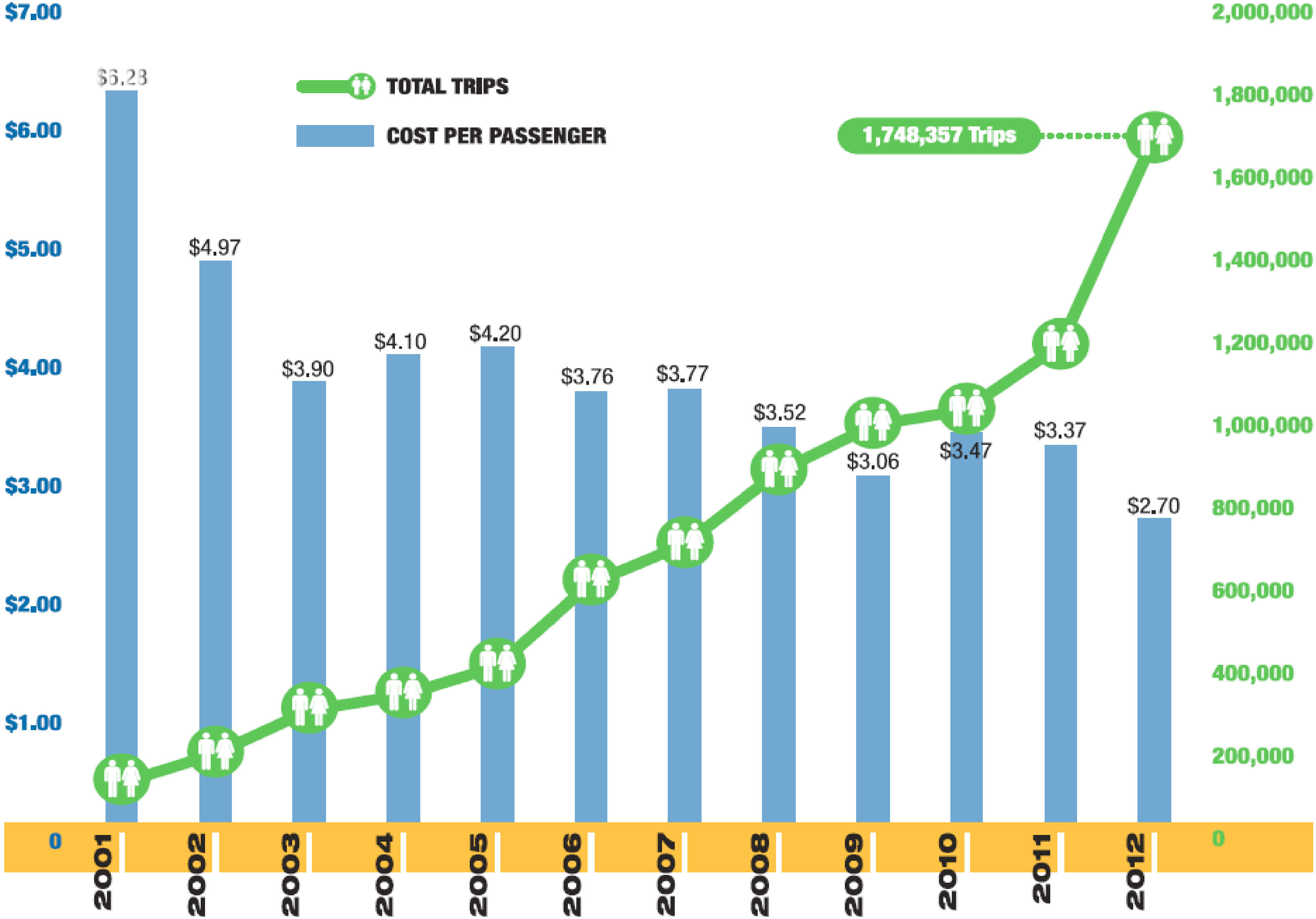
Prop	Promise	Result
401	Maintain	Done
402	Hybrid Fleet	Doing
403	Mountain Link	Done
404	New Service	Doing
405	More Frequent	Route 4 - August

Getting you where you want to go



MOUNTAIN LINE
Flagstaff Public Transit
LEGEND
Route 66
Route 2
Route 3
Route 4
Route 5
Route 7
Route 10
Mountain Link
NAU Shuttle Route
Route Direction
Bus Stop
Transit Center
Flagstaff Urban Trail
School
Public Library
PASS
Pass Sales Outlet
Government Building
Point of Interest
Park
Medical Center
City Limits
Pedestrian Walkway
For more information, call
(928) 779-6624
www.mountainline.az.gov
See Downtown Detail
DOWNTOWN DETAIL
Downtown Transit Center
City Hall
Chamber of Commerce
Amtrak
FLAGSTAFF
High Country Conference Center
Coconino County Administration Building
Route 66

Mountain Line – 12 Years and Growing Strong



Where Do We Want To Go?

Where do we want to go?

Short Term (0 – 5 years)

No Funding Changes

Re-design of System

Meet Public Needs

Planning

Medium Term (5 – 10 years)

50% Funding Increase

Growth of System

Capital Investments

Long Term (10 – 20)

Vision Driven

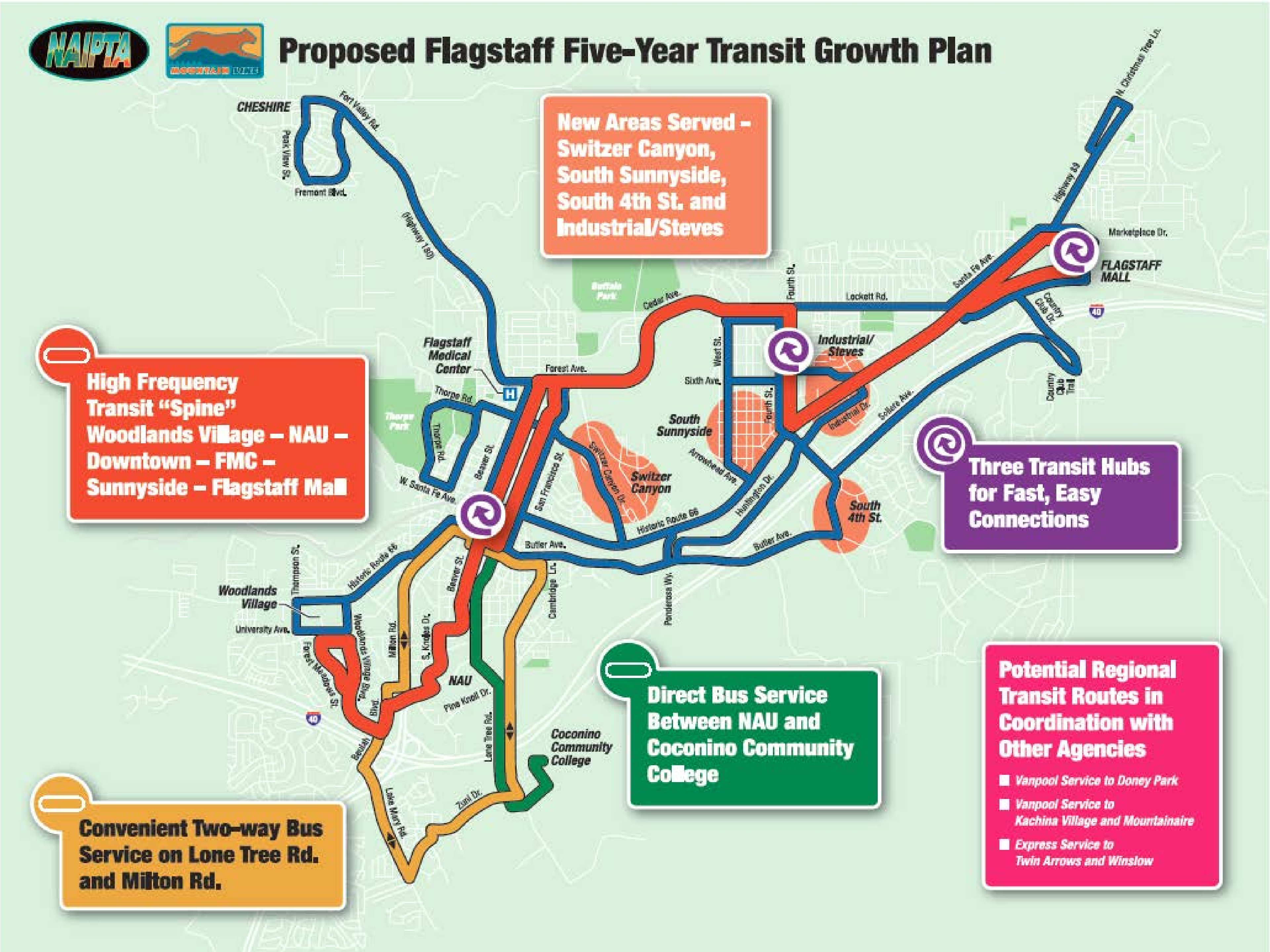
Capital Investments in place

Synergy of Transit

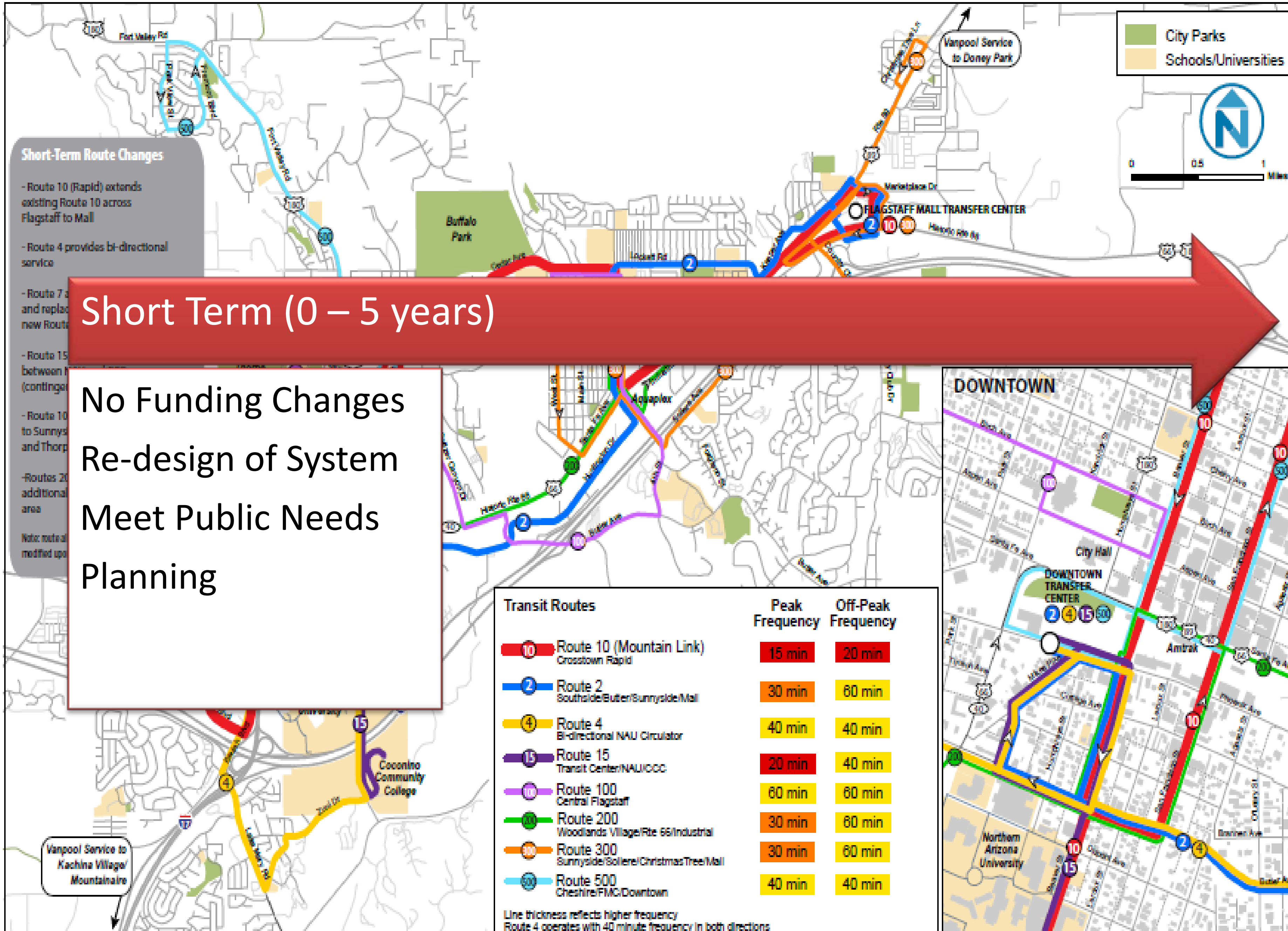
How Do We Know Where We Want To Go?

- Looked at Existing Conditions
- Attention to Flagstaff's Growth and Development (Regional Planning Process)
- Asked the Public
  - Rider Surveys
  - Citizen Review Commission
  - On line survey tool – 1,070 responses
  - *Mobile Public Outreach*

How Do We Get There?


NAIPTA
MOUNTAIN LINE
Proposed Flagstaff Five-Year Transit Growth Plan
New Areas Served – Switzer Canyon, South Sunnyside, South 4th St. and Industrial/Steves
High Frequency Transit "Spine" Woodlands Village – NAU – Downtown – FMC – Sunnyside – Flagstaff Mall
Three Transit Hubs for Fast, Easy Connections
Direct Bus Service Between NAU and Coconino Community College
Convenient Two-way Bus Service on Lone Tree Rd. and Milton Rd.
Potential Regional Transit Routes in Coordination with Other Agencies
Vanpool Service to Doney Park
Vanpool Service to Kachina Village and Mountainaire
Express Service to Twin Arrows and Winslow
CHESHIRE
Fort Valley Rd.
Peak View St.
Fremont Blvd.
(Highway 180)
Buffalo Park
Cedar Ave.
Fourth St.
Lockett Rd.
Santa Fe Ave.
Highway 89
N. Christmas Tree Ln.
Marketplace Dr.
FLAGSTAFF MALL
Country Club Dr.
Country Club Trail
Industrial/ Steves
Industrial Dr.
Soliere Ave.
West St.
Sixth Ave.
Fourth St.
South Sunnyside
Arrowhead Ave.
Huntington Dr.
South 4th St.
Butler Ave.
Flagstaff Medical Center
Forest Ave.
Thorpe Rd.
Thorpe Park
Beaver St.
W. Santa Fe Ave.
San Francisco St.
Switzer Canyon Dr.
Switzer Canyon
Historic Route 66
Butler Ave.
Ponderosa Wy.
Cambridge Ln.
Thompson St.
Woodlands Village
University Ave.
Forest Meadows St.
Woodlands Village Blvd.
Milton Rd.
S. Knoles Dr.
NAU
Pine Knoll Dr.
Lone Tree Rd.
Beulah Blvd.
Lake Mary Rd.
Zuni Dr.
Coconino Community College

Proposed Short-Term Fixed Route Network



Short Term (0 – 5 years)

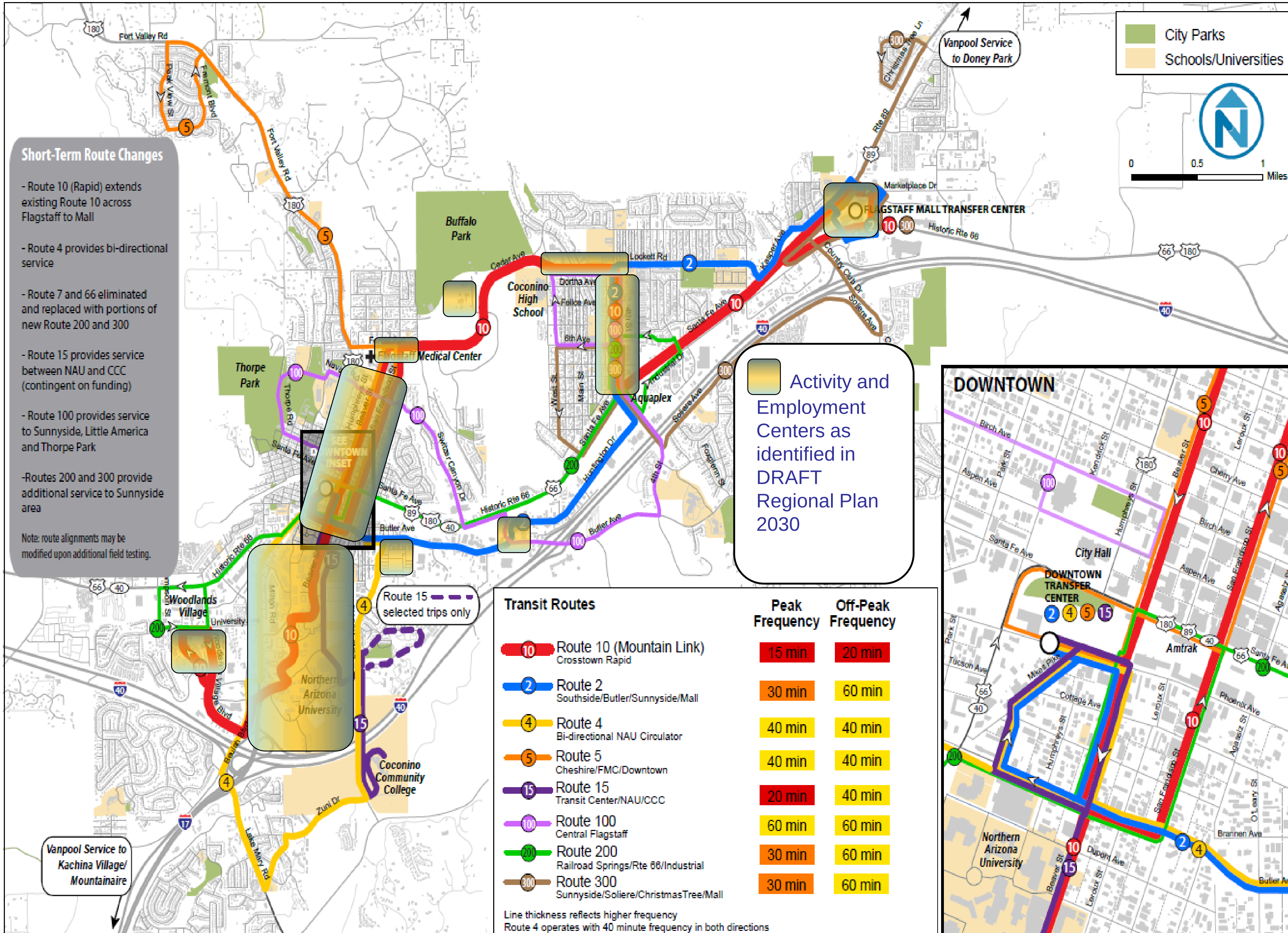
- No Funding Changes
- Re-design of System
- Meet Public Needs
- Planning

Transit Routes	Peak Frequency	Off-Peak Frequency
Route 10 (Mountain Link) Crosstown Rapid	15 min	20 min
Route 2 Southside/Butler/Sunnyside/Mall	30 min	60 min
Route 4 Bi-directional NAU Circulator	40 min	40 min
Route 15 Transit Center/NAU/CCC	20 min	40 min
Route 100 Central Flagstaff	60 min	60 min
Route 200 Woodlands Village/Rte 66/Industrial	30 min	60 min
Route 300 Sunnyside/Soliere/Christmas Tree/Mall	30 min	60 min
Route 500 Cheshire/FMC/Downtown	40 min	40 min

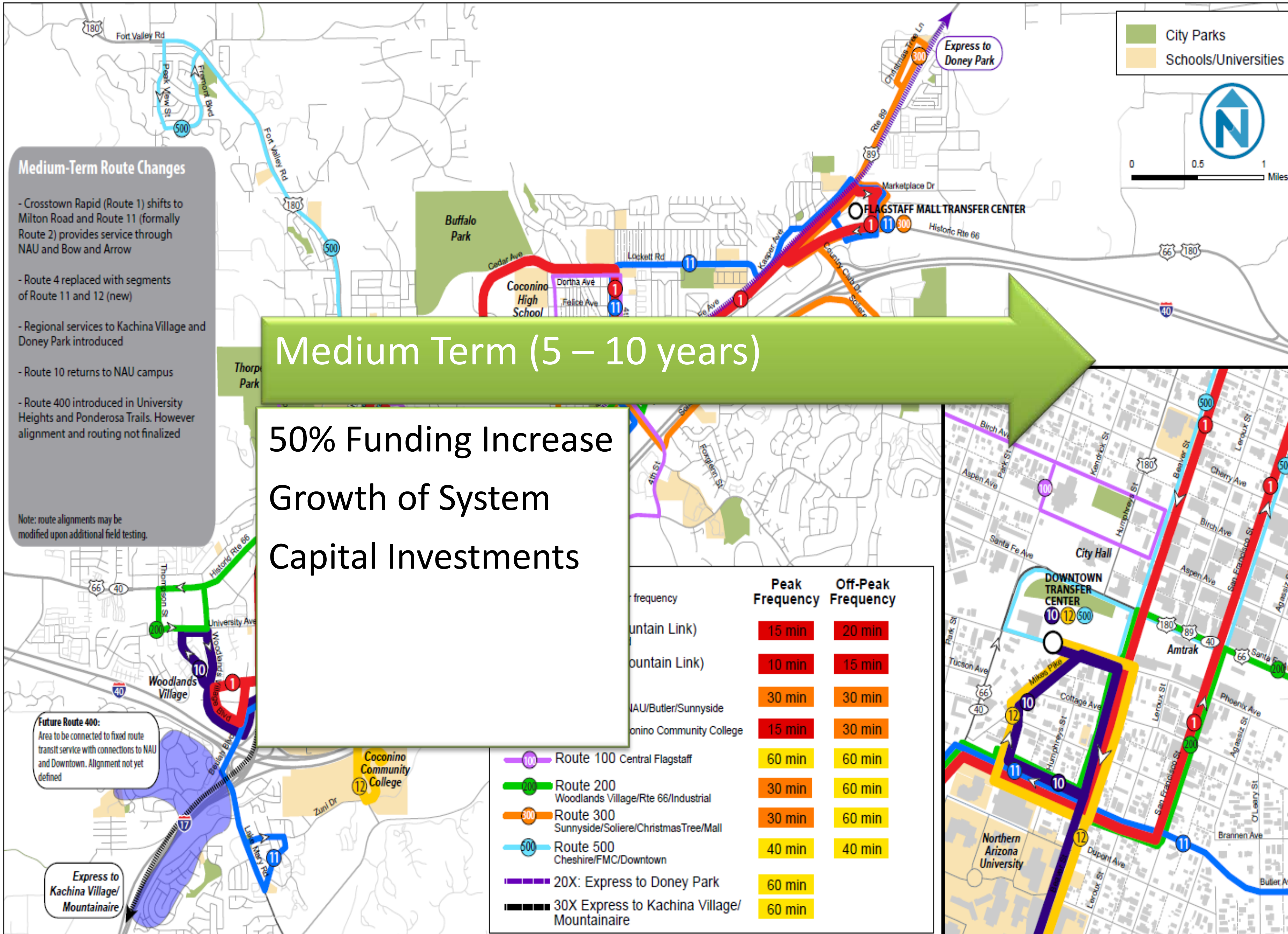
Line thickness reflects higher frequency
Route 4 operates with 40 minute frequency in both directions

February 18, 2013

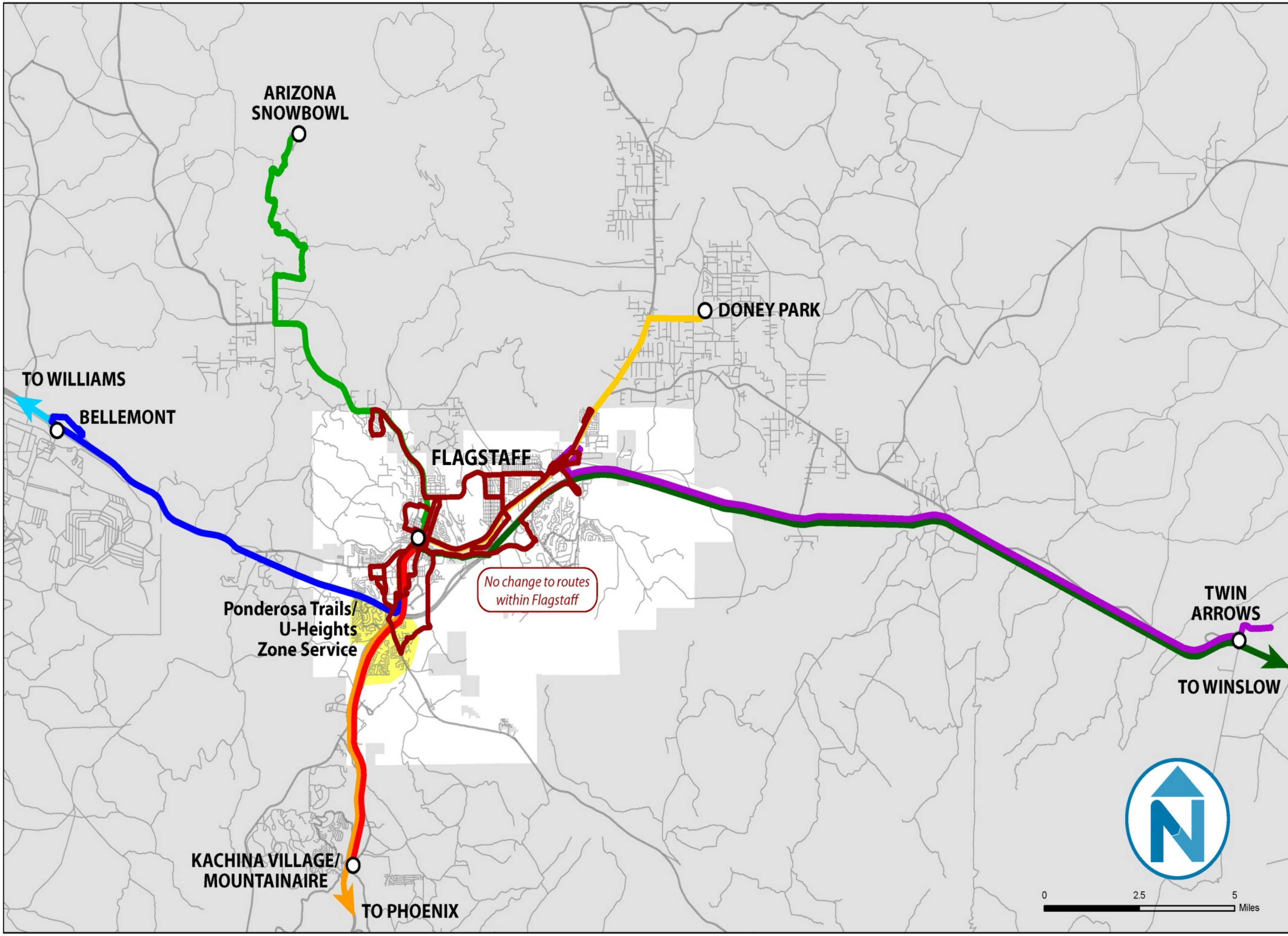
Proposed Short-Term Fixed Route Network



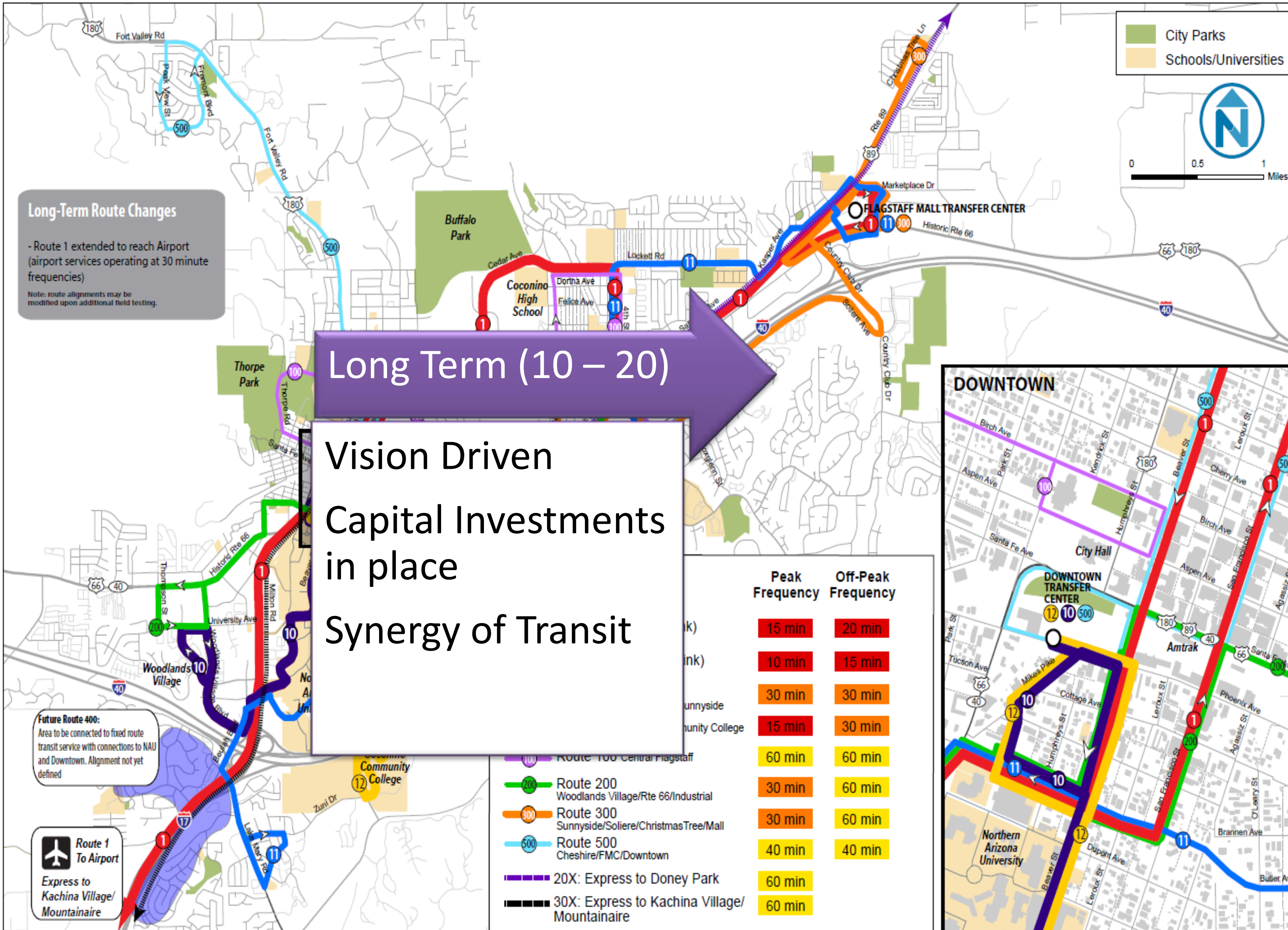
Proposed Medium-Term Fixed Route Network



February 18, 2013


ARIZONA SNOWBOWL
DONEY PARK
TO WILLIAMS
BELLEMONT
FLAGSTAFF
Ponderosa Trails/ U-Heights Zone Service
No change to routes within Flagstaff
TWIN ARROWS
TO WINSLOW
KACHINA VILLAGE/ MOUNTAINAIRE
TO PHOENIX
0
2.5
5
Miles

Proposed Long-Term Fixed Route Network



February 18, 2013

Capital Considerations

- Mall Connection Center (short term)
- Arterial street transit improvements
  - Bus May Use Both Lanes (short term)
  - Bus Pull-outs along Transit Spine (short term)
  - Yield to Bus Ordinance (short term)
  - Rapid Bus Only Lane (long term)
  - Signal Priority & Rail Road Advance Notice (mid term)
- Complete Trip – 1st mile/last mile (ongoing)
- Expanded maintenance and operations facility (short term)
- Van pool lots in Doney Park and Kachina Village (short to mid-term)

East Side Connection Center

“Bus May Use Both Lanes”

NAIPTA

"Yield to Bus"

MOUNTAIN LINE

MOUNTAIN LINK

MOUNTAIN LIFT

Getting you where you want to go

Concept for Vanpool at Silver Saddle & 89

Concept for Van Pool at Raymond Park - KV

Rapid Bus Only Lane

Mobile Public Outreach March 1 – 8th

Times to Be Determined

Event/Location	Address
City Hall/City-County Library	211 W. Aspen Avenue
Northern Arizona University – Student Union	On NAU Campus
Coconino Community College	2800 S. Lone Tree Road
Transfer Center	Downtown
Thorpe Senior Center	245 N. Thorpe Road
Flagstaff Regional Medical Center	1200 N. Beaver Street
North Country Clinic	2920 N. 4th Street
Flagstaff Mall and Marketplace	4650 N. Highway 89
First Friday Art Walk	Downtown
Fry’s	201 N. Switzer Canyon Drive
Walmart	2601 W. Huntington Drive
Sam’s Club	1851 E. Butler Avenue
Safeway	1500 E. Cedar Way
Target	1650 S. Milton Road

Getting you where you want to go

NAIPTA

Thank you!

www.Flagstafftransitplan.com

MOUNTAIN LINE

MOUNTAIN LINK

MOUNTAIN LIFT

Getting you where you want to go

Memorandum

CITY OF FLAGSTAFF

To:	The Honorable Mayor and Council
From:	James Duval, Sr. Project Manager
Date:	01/31/2013
Meeting Date:	02/26/2013

TITLE:

Rio de Flag Flood Control Project - Path Forward Presentation.

DESIRED OUTCOME:

Facilitate Council discussion on the path forward.

INFORMATION:

The City has been involved in a contractual relationship with the US Army Corps of Engineers for the Rio de Flag Flood Control project since 2004. To date there has been a significant lack of progress on the project.

The lack of progress can be traced to:

1. Lack of Federal funding
2. Federal process is too long and expensive
3. The benefit to cost ratio has been low, making the project uncompetitive with other national projects

Staff desires to facilitate a discussion with City Council on 4 options for the path forward for this project:

1. Stay the Course
2. Seek self administration through Congress
3. City delivers the project with no Federal assistance
4. Terminate the project

Staff seeks to make a presentation to Council to outline the problem, provide sufficient background and history and to provide options for consideration on the path forward.

Attachments: Council Power Point

Form Review

Inbox	Reviewed By	Date
Capital Improvement Engineer	Mo El-Ali	02/13/2013 01:52 PM
City Engineer	Rick Barrett	02/14/2013 08:27 AM
Community Development Director	Mark Landsiedel	02/15/2013 11:10 AM
DCM - Jerene Watson	Jerene Watson	02/15/2013 11:18 AM

Form Started By: James Duval Started On: 01/31/2013 09:22 AM

Final Approval Date: 02/15/2013

Rio de Flag Flood Control

Community Development Division

February 26, 2013

Problem Statement:
–Lack of Project Progress

1. Lack of Funding
   - No Earmarks
   - Never been in President's Budget

2. Federal Process
   - Schedule – too long
   - Cost – too expensive

3. Benefit to Cost Ratio (BCR)
   - Parity required by Office of Management & Budget
   - BCR of 3:1 or higher to compete nationally

Purpose

Facilitate Council Discussion of Options

- Option #1 – Stay the Course
- Option #2 – Self Administration
- Option #3 – City Project
- Option #4 – Terminate Project

Background

- PRELIMINARY STUDIES AND CONTRACTUAL AGREEMENT
- DESIGN & CONSTRUCTION
- FINANCIAL

BACKGROUND

Preliminary Studies & Contractual

- Reconnaissance Report – 1997
- Feasibility Study – 2000
- Project Cooperation Agreement – 2004

BACKGROUND

Project Cooperation Agreement

On August 3, 2004, the City Council approved a Project Cooperation Agreement (PCA) between the USACE and the City. This agreement established the roles and responsibilities for each agency.

BACKGROUND

PCA – Corps Responsibilities

- Administration
- Design
- Construction
- 65% of the total project cost

BACKGROUND

PCA – City Responsibilities

- Lands, Easements, Rights-of-way, Relocations, and Disposals (LERRDs) includes property acquisition, bridges, utilities and surface replacements
- 30% of the Flood Control Costs
- 5% Cash Contribution
- 100% of Environmental Remediation
- 50% of the Recreation Costs
- 100 % of “Betterments”

BACKGROUND

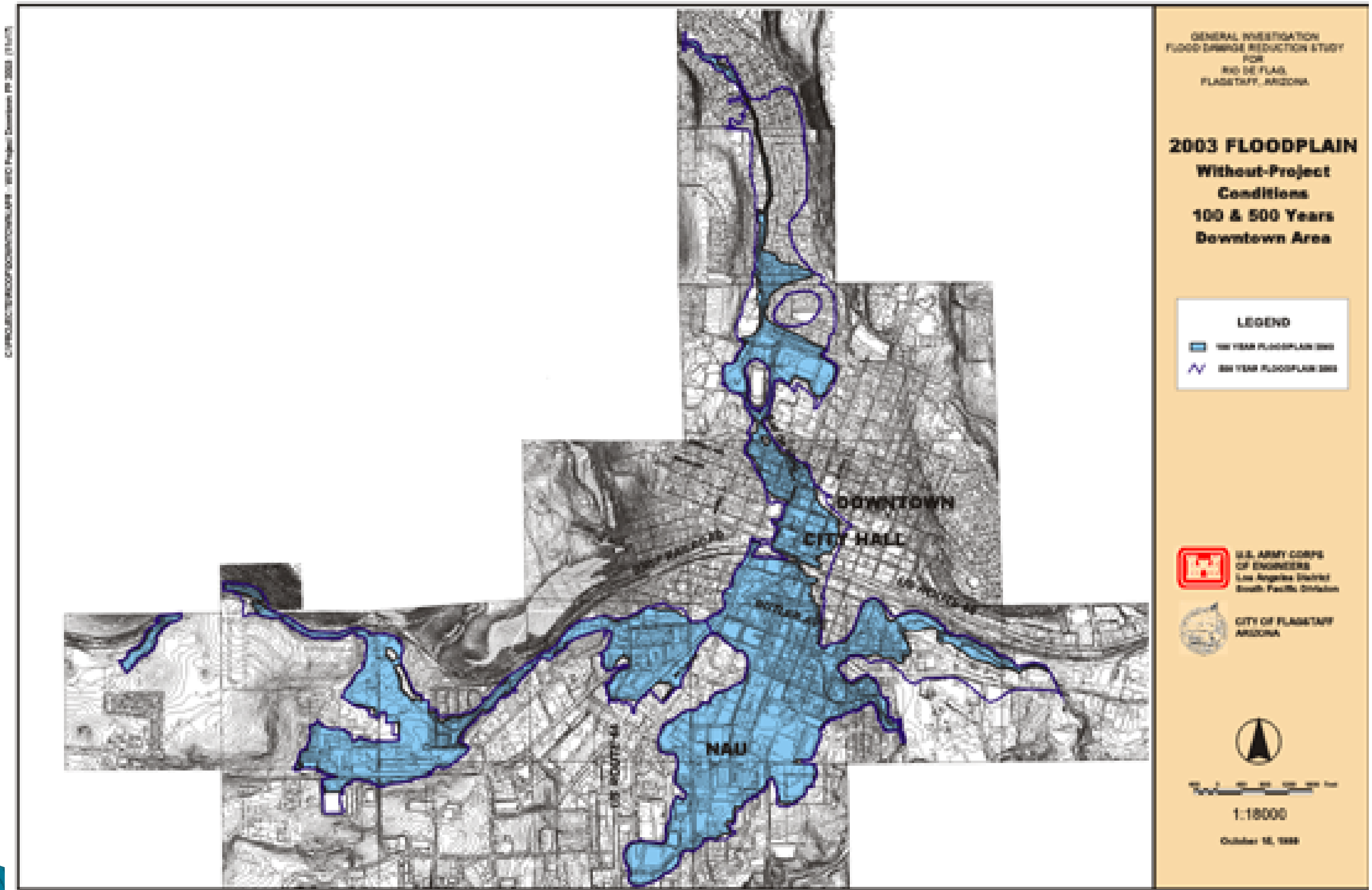
Design & Construction

- Feasibility Study Findings
- Project Design Alignment
- Construction Elements Completed

BACKGROUND

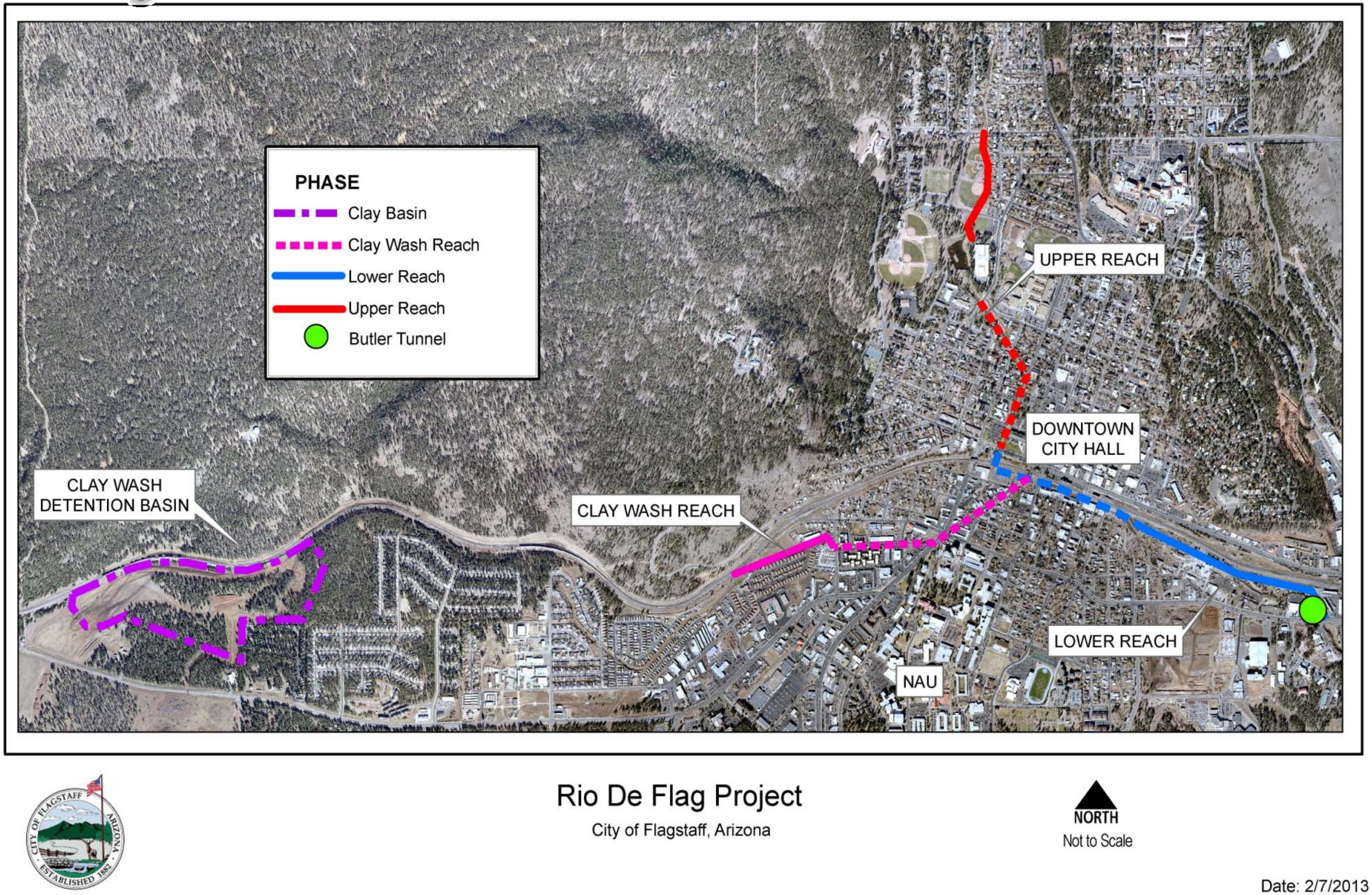
Feasibility Study Findings

- Over 50% of the Flagstaff population of 61,000 would be directly or indirectly affected.
- Structural damages estimated at over $395,000,000.
- A single 100-year flood event would cause an estimated $93,000,000 in economic damages.
- The main goal of this project is to reduce damages and economic losses of a major flood event by containing the 100-year flood within the proposed improvements.



2003 FLOODPLAIN
Without-Project
Conditions
100 & 500 Years
Downtown Area
LEGEND
DOWNTOWN
CITY HALL
NAU
1:18000

Project Elements & Status



BACKGROUND
Financial

- Amount Authorized – Federal Government
- Total Project Estimate–Army Corps of Engineers
- Project Expenditures to Date

BACKGROUND

Financial – Authorized

- 2000 – Water Resources Development Act (WRDA) authorized the project 902 limit for $24M
- 2007 – Reauthorized with a new 902 limit at $54M
- Corps recalculated 902 limit based on inflation rates at $72M

BACKGROUND

Project Estimate

- 2000 – Project Estimate $24M
- 2004 – Project Estimate $33.4M
- 2006 – Project Estimate $55.5M
- 2009 – Project Estimate $84M
- 2012 – Project Estimate $92M

BACKGROUND

Expenditures to Date

- To date, the City has expended approximately $14.7 Million on the project:

  –design and construction ($6.7M)

  –property acquisition ($6.35M)

  –staff time ($1.65M)
- As of November 2012 the Corps has expended $20.2M for administration, reports, design and construction
- $35M Total Expenditures

Federal Funding Outlook

- FY 11 – No Appropriations
- FY 12 – $2.5M for reconstruction of Clay Wash Detention Basin
- FY 13 – Uncertain
- FY 14 – Uncertain

Purpose

Facilitate Council Discussion of Options

- Option #1 – Stay the Course
- Option #2 – Self Administration
- Option #3 – City Project
- Option #4 – Terminate the Project

Option #1 – Stay the Course

PROS

- Federally funded cost share ($59.8M)
- Corps champions project funding

CONS

- Future Federal funding is uncertain
- Time consuming– Significant amount of bureaucratic reviews
- Expensive
- 20 year delivery starting FY 13

Option #2 – Self Administration

<u>PROS</u>

- More control over design & construction
- More control over budget & schedule
- CONTINUED FEDERAL FUNDING COST SHARE
- Lower Financial risk

<u>CONS</u>

- Under Federal and USACE regulation
- USACE reviews
- Federal funding uncertain
- Would require earmark to upcoming WRDA bill when earmarks may continue to be prohibited

Option #3 – City Project

PROS

- City management – Staff expertise to deliver
  - Concept Design Study using FEMA Criteria is Recommended
  - Cost estimate of study $200,000
- FEMA flows allow smaller structures, lower cost
- Control over budget and schedule
- Can use some elements of current design

CONS

- NEW LOCAL FUNDING SOURCES REQUIRED

Option #4 – Terminate Project

PROS

- City funding can go towards other needs

CONS

- Flooding conditions unchanged
- Limited redevelopment
- Flood insurance still required
- Does not meet community need for flood control

Conclusion

- Option #1 – Stay the Course
- Option #2 – Self Administration
- Option #3 – City Project
- Option #4 – Terminate the Project

Questions and Discussion

Memorandum

8.

CITY OF FLAGSTAFF

To:	The Honorable Mayor and Council
From:	Ryan Roberts, Utilities Engineering Manager
Date:	02/21/2013
Meeting Date:	02/26/2013

TITLE:

Wildcat Hill Wastewater Treatment Plant Solids Handling Alternatives.

DESIRED OUTCOME:

Consider Alternatives and provide Council Direction.

INFORMATION:

Significant concerns with the existing solids handling system at the City of Flagstaff Wildcat Hill Wastewater Treatment Plant (WWTP) have prompted Utilities staff to develop alternative handling options. The alternatives address the need to dewater and remove the waste solids from the Plant. All alternatives will require a FY14 capital project to implement a temporary (2-3 yr) solution.

The Wildcat Hill WWTP was originally designed in the 1970s to handle 700 tons per year of digested solids. Since that time the plant has continually added solids from other sources such as the Rio De Flag Water Reclamation Facility and septic haulers from Coconino County subdivisions, while never increasing the solids handling capacity of the Plant. Currently the plant is handling 1100 tons per year of solids loading which is 400 tons per year above the original design of approximately 700 tons per year. This is a 57% increase in solids handling due to growth in our community and the surrounding area. The upgrade to Wildcat Hill WWTP completed in 2010 did not include an upgrade to its solids handling and treatment process.

The Wildcat Hill WWTP has no mechanical dewatering of its digested sludge. Sludge is pumped from the anaerobic digesters to solids settling basins (SSBs or lagoons) that are located southeast of the WWTP for storage. At appropriate times, (seasonal, or when ponds are full) the solids from SSBs are disposed of using on-site land application in an approximately 40-acre "Dedicated Land Disposal" (DLD) area. The sludge is disked or injected into the soil within the DLD when frost or saturation conditions allow. When the DLD is shut down due to cold or wet weather, the SSBs are subject to overloading due to the inability to handle solids. During this time, the digested solids pumped to the SSBs are returned again to the treatment plant..

The Utilities Division contracted with Carollo Engineers to analyze, prepare preliminary cost estimates and provide recommendations for designing and installing a temporary solids dewatering system on-site. Currently the WWTP sends approximately 70,000 gallons per day (gpd) of digested sludge to the SSBs, which are experiencing operational issues. The SSBs and DLD (during rainfall/snowmelt events) are not functioning properly by adequately dropping the solids out of the dewatering system. Some of the digested sludge solids (with high nitrogen concentrations) are being returned back to the treatment plant in a centrate or liquid sidestream. This sidestream liquid flow comes back into the treatment process downstream of the primary clarifiers, which challenges the Plant's ability to adequately remove nitrogen.

Currently, the centrate or liquid sidestream that is being returned to the treatment plant is thought to be one of the major problems with the treatment plants ability to remove nitrogen. The elevated nitrogen levels impact the City's ability to make Class A+ reclaimed water. Additionally, the digested sludge solids that are returned to the treatment plant do not settle out which causes bulking and solids overflow in other parts of the treatment process (i.e., tertiary filters)..

Some of the issues the City would like to address with the temporary dewatering system are: dewater the solids; reduce the amount of solids returning to the treatment plant; reduce the amount of nitrogen (i.e., ammonia) being returned to the treatment plant; and install a system that will function during cold weather months allowing solids handling year round.

The initial capital project is generally described as installing a temporary dewatering system,, although it could be part of a permanent solution. This system will work in conjunction with the existing SSBs and DLD site, to maintain compliance with the WWTP's permits. Carollo Engineers compared the following traditional solids dewatering options; cleaning existing basins, Geofabric containers, Belt filter press, and Centrifuge. Attached are the engineers initial recommendations and preliminary cost estimates for each option.

The purpose of this review is to describe the alternatives being considered as well as the recommendations from the City's engineering consultant (Carollo Engineers).

FISCAL IMPACTS

Continuing to utilize the existing SSBs and DLD method has historically been the least expensive method of dealing with sludge. This method has saved the City millions of dollars in operational and capital costs throughout the years compared to alternative solids handling methods such as belt filter presses and centrifuges. However, this method is antiquated and no longer a recommended industry practice. Thus continuing with this method in the long term is no longer a viable option.

The proposed capital project was originally budgeted for $800,000 in FY14, but only included dredging the existing solids basins. The total project cost for the recommended Geofabric option is estimated to be $1.2 M dollars. The increased cost is proposed to be funded from sewer capacity fees since the elevated solids volume coming into the Wildcat Hill WWTP is due to growth. This will have no impact to the Utility Fund balance in outgoing years and does not affect the current 5 year plan.

This project is budgeted for FY14; however staff proposes to use FY13 contingency funds to provide funding in order to accelerate the project schedule and begin construction in May 2013. Staff proposes to proceed immediately in the current fiscal year, using $800,000 in contingency funds and the remainder from sewer capacity fees.

Attachments: Carollo Solids Dewatering Report
Wildcat Hill WWTP Aerial Layout
Geotextile Cost Estimate
Belt Filter Press Cost Estimate
Centrifuge Cost Estimate
Dredging Cost Estimate

Form Review

Inbox	Reviewed By	Date

Utilities Engineering Manager (Originator)	Ryan Roberts	02/21/2013 10:07 PM
Utilites Director	Brad Hill	02/22/2013 09:24 AM
Finance Director	Elizabeth A. Burke	02/22/2013 01:27 PM
Senior Assistant City Attorney DW	Elizabeth A. Burke	02/22/2013 01:27 PM
Utilites Director	Elizabeth A. Burke	02/22/2013 01:28 PM
DCM - Josh Copley	Josh Copley	02/22/2013 02:24 PM

Form Started By: Ryan Roberts Started On: 02/21/2013 05:04 PM

Final Approval Date: 02/22/2013

CITY OF FLAGSTAFF
WILDCAT HILL WASTEWATER TREATMENT PLANT

CONCEPTUAL COMPARISON AND PRELIMINARY RECOMMENDATION

TEMPORARY DEWATERING SYSTEM

DRAFT
November 2012

4600 EAST WASHINGTON ST., SUITE 500 • PHOENIX, ARIZONA 85034 • P. 602.263.9500 • F. 602.265.1422

CITY OF FLAGSTAFF
WILDCAT HILL WASTEWATER TREATMENT PLANT

CONCEPTUAL COMPARISON AND PRELIMINARY RECOMMENDATION

TEMPORARY DEWATERING SYSTEM

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1.0 INTRODUCTION

The objective of this technical memorandum is to evaluate geotextile containers (Geotubes®) as a temporary wastewater solids dewatering option including cost effectiveness, ease of operation, labor intensiveness, solids retention, solids handling time, flow and volume rates, and seasonality. The City of Flagstaff, Arizona (City) has asked Carollo Engineers (Carollo) to compare Geotube® containers against two traditional solids dewatering options (dredging existing basins and belt filter press) and make an initial recommendation for the installation of a temporary dewatering process at the City's Wildcat Hill Wastewater Treatment Plant (WWTP). Geotube® containers, with the aid of dewatering polymers, have been implemented on several dewatering projects into which wastewater solids were pumped directly from digesters, storage basins or lagoons.

Thickening and dewatering sludge from wastewater treatment provides the following benefits:

- Reduces the sludge mass and volume, thus reducing storage and transportation costs
- Eliminating free liquids before landfill disposal
- Produces a material which will have sufficient void space and volatile solids for composting when blended with a bulking agent
- Avoids the potential for biosolids pooling and runoff associated with liquid land application
- Reduced fuel requirements if residuals are to be incinerated or dried
- Optimizes the subsequent process such as thermal drying

Geotube® containers are typically implemented on environmental dredging projects generally in remote locations requiring extensive site preparation time, lacking utilities, and are considered temporary construction sites. The Geotube® containers have begun to see an increased use in solids dewatering applications as contractual budgets for dewatering decrease and engineers search for innovative residuals management options without high associated costs.

2.0 BACKGROUND

The City of Flagstaff Wildcat Hill WWTP has no mechanical dewatering of digested sludge. Sludge is pumped from the anaerobic digesters to solids settling basins (SSBs or lagoons) that are located southeast of the WWTP for storage. At appropriate times (seasonal, or when ponds are full) the solids from SSBs are disposed of using on-site land application in an approximately 40-acre "Dedicated Land Disposal" (DLD) area. The sludge is disked, or knifed, into the earth on the DLD when frost or saturation conditions allow. When the DLD is shut down due to seasonality/weather, the digested solids are hauled to a landfill for disposal. The hauling of the sludge without dewatering is costly and the City would like to move away from this practice.

The City contacted Carollo to discuss the feasibility of designing and installing a temporary solids dewatering system on-site. Currently the WWTP is sending approximately 70,000 gallons per day (gpd) of digested sludge at 2-2.5% solids to the SSBs. The SSBs are experiencing operational issues. The SSBs and DLD (during rainfall/snowmelt events) are not functioning to drop the solids out of the dewatering system. Some of the digested sludge solids (and high nitrogen loads) are being returned to the WWTP in the centrate sidestream. The sidestream flow comes back into the WWTP downstream of the primary clarifiers. The digested sludge solids that are returned to the WWTP float (do not settle out), so they are not removed the secondary clarifiers, causing bulking and solids overflow to the tertiary filters, which causes additional problems with filtration and disinfection. The solids and nitrogen loads that are being returned are thought to be causing issues with the Integrated Fixed-Film Activated sludge (IFAS) process. Some of the issues the City would like to address with the temporary dewatering system are: dewater the solids; reduce the amount of solids returning to the plant; reduce the amount of ammonia being returned to the plant; reduce the amount of hauling and hauling costs; reduce the disposal fee being paid at the landfill; and install a temporary system that will function during cold weather months.

Figure 1 Wildcat Hill WWTP SSBs and DLD

3.0 COMPARISON

The comparison of the Geotube® containers is to result in the recommendation of a temporary dewatering process at the Wildcat Hill WWTP. **The final selection of a permanent dewatering process and dewatering equipment should be based on the results of a site specific biosolids management plan which identifies both processing and end-use alternatives and cost estimates**. Smaller facilities like the Wildcat Hill WWTP should evaluate mechanical (centrifuge or belt filter press) and non-mechanical (sludge drying beds) dewatering methods as part of an overall dewatering process alternative evaluation. An effective biosolids management plan will include the above alternative evaluation and long-term planning information. Odor complaints at WWTPs and biosolids end-use sites can interfere with implementation of the most cost-effective biosolids management options. Regardless of the final recommended dewatering method, it is important to note that even the temporary system has to be designed for excess capacity so that the anticipated amount of incoming solids can be easily dewatered during operating hours. Allowing for excess capacity also ensures that the plant will not experience a build-up of solids if a unit (part of a process) is out of service. If only one unit is required, the plant should have an alternate program to remove solids in liquid form.

The City has asked Carollo to compare the following three options for the temporary dewatering of digested solids at their Wildcat Hill WWTP. The comparison will result in the recommendation of a temporary dewatering process, and a preliminary design concept, which will be developed and implemented at the project site.

4.0 SOLIDS SETTLING BASINS (SSB) CLEANING

The City initially considered hiring a contractor to clean their Solids Settling Basins (SSBs) to allow access to enough storage capacity to allow operation over the next year. The SSBs would be used to dewater the digested sludge in the same manner that the WWTP currently operates. The centrate would return to the plant by gravity, upstream of the IFAS basin, and the settled solids would be hauled to a landfill for disposal ($40 per load disposal fee). The quoted cost for the SSB cleaning was $500,000 and the contractor estimated it would take more than two (2) months to perform the work. The SSB cleaning option would not necessarily solve/mitigate five (5) of the main issues the City wanted to address with their temporary solids dewatering system. The five issues that would not be addressed would be:

- Return of a high solids content to the plant in the SSB centrate
- Return of a high nitrogen load to the plant in the SSB centrate
- Relatively inexpensive capital cost to implement
- Reduction of hauling/disposal costs
- Expedited installation or implementation schedule

The City decided the SSB cleaning option did not meet the preliminary goals of the project and removed it from further consideration.

5.0 BELT FILTER PRESS

Belt filter presses (BFPs) are a common mechanical dewatering technique used to remove water from liquid residuals and produce a non-liquid material or “cake”. A BFP dewaters by applying pressure to the biosolids to squeeze out the water. Biosolids are sandwiched between two tensioned porous belts are passed over and under rollers of various diameters Increased pressure is created as the BFP passes over rollers which decrease in diameter. All BFPs utilize a polymer conditioning zone, gravity drainage zones, low pressure squeezing zone, and high pressure squeezing zone.

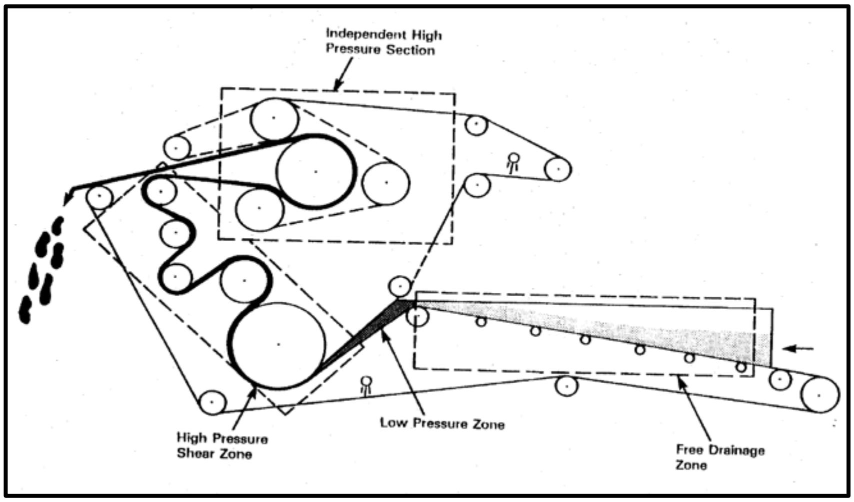

Figure 2 Cross-Section of a Belt Filter Press

BFPs are a common type of mechanical dewatering equipment, but may not be the most cost effective alternative for dewatering at WWTPs operating at less than about 4 mgd. The City is considering renting a used BFP and temporarily installing it to dewater solids at the Wildcat Hill WWTP.

Advantages of a BFP are generally considered to be:

- Staffing requirements are low, especially if the equipment is large enough to process the solids in one shift.
- Maintenance is relatively simple and can usually be completed by a wastewater treatment plant maintenance crew.
- Replacing the belt is the major maintenance cost.
- BFPs can be started and shut down quickly compared to centrifuges.
- Less noise associated with BFPs compared to centrifuges.

Disadvantages of a BFP are generally considered to be:

- Mechanical techniques may include excessive noise
- High energy requirements
- Blinding and short-circuiting due to a lack of optimal flocculation

- High daily maintenance time
- Expensive spare parts and major repair work that may take several days to weeks to complete.
- Odors may be a problem, but can be controlled with good ventilation systems and chemicals (some manufacturers offer fully enclosed equipment to minimize odors and reduce vapors in the operating room air)
- More operator attention if the feed solids vary in their solids concentration or organic matter.
- Solids with higher concentrations of oil and grease can result in blinding the belt filter and lower solids content cake.
- Solids must be screened and/or ground to minimize the risk of sharp objects damaging the belt.
- Belt washing at the end of each shift, or more frequently, can be time consuming and require large amounts of water.

5.1 Design Criteria

Belt presses are sized on the basis of weight or volume of solids to be dewatered rather than the wastewater flow to the plant. To determine the size (or how many presses are) needed, the wastewater treatment plant must:

- Determine the amount of primary solids that will flow through the plant per day
- Determine the amount of waste-activated solids produced per day
- Determine the volume of thickened solids to be dewatered per day
- Estimate the range of dry solids concentration in the feed
- Estimate future increases in solids production
- Anticipate changes in sewer discharges or operation that could change solids quality or organic matter content.

The BFP polymer conditioning zone is usually a tank located in close proximity to the press, a rotating drum attached to the top of the press, or an in-line injector. The gravity drainage zone is a flat or slightly inclined belt unique to each model. Solids are dewatered by the gravity drainage of the free water. A 5-10 percent increase in solids concentration from the original biosolids should occur in this zone. The free water drainage is a function of wastewater solids type, quality, conditioning, screen mesh, and design of the drainage zone. The low-pressure zone is the area where the upper and lower belts come together with the wastewater solids in between. The low-pressure zone prepares the biosolids by forming a firm cake that can withstand the forces of the high-pressure zone. In the high-pressure zone, forces are exerted on the solids by the movement of the upper and lower belts as they move over and under a series of rollers of decreasing diameter. It is estimated that a typical BFP operation will dewater digested sludge like the type found at the Wildcat Hill WWTP to 10 to 15 percent solids concentration.

An additional design feature is a self-enclosed facility to reduce odors and protect worker health. Workers in the belt press areas are exposed to aerosols from wash spray nozzles and pathogens and hazardous gasses such as hydrogen sulfide. Enclosing the press reduces visibility to the operators and produces a corrosive environment for the rollers and bearings. The choice of dewatering technique and chemical polymer or salts impacts dewaterability as well as the potential for odor during further processing or recycling to land. Ancillary equipment for efficient operation of a belt press includes: polymer, mixing, aging, feed, liquid feed day tank, liquid residuals feed pump, odor control and ventilation, conveyor and/or pump to move dewatered cake, and an enclosed area to load trucks or containers.

5.2 Performance

Manufacturers should be consulted for design and performance data early in the planning stage. Data should be confirmed with other operating installations and/or pilot testing. Evaluation of equipment should consider capital and operating costs (including polymer), electricity, wash water, solids capture, and ventilation and odor control during dewatering. Since solids characteristics and quantity vary from plant to plant, it is important to evaluate different weaves, permeability, and solids retention abilities of dewatering belts to ensure optimum performance. Surveys of similar plants or testing of wastewater solids can be helpful in the decision-making process. Table 1 displays the range of performance of a high pressure BFP on various types of wastewater solids.

Table 1 Typical Data For Various Types of Sludges Dewatered on Belt Filter Presses (Source: U.S. EPA, 1987)
Temporary Dewatering System
City of Flagstaff Wildcat Hill Wastewater Treatment Plant

Type of Wastewater Sludge	Total Feed Solids (%)	Polymer (g/kg)	Total Cake Solids (%)
Raw Primary	3 - 10	1 - 5	28 - 44
Raw WAS	0.5 - 4	1 – 10	20 - 35
Raw Primary + WAS	3 - 6	1 - 10	20 - 35
Anaerobically Digested Primary	3 - 10	1 - 5	25 - 36
Anaerobically Digested WAS	3 - 4	2 - 10	12 - 22
Anaerobically Digested Primary + WAS	3 - 9	2 - 8	18 - 44
Aerobically Digested Primary + WAS	1 - 3	2 - 8	12 - 20
Oxygen Activated WAS	1 - 3	4 - 10	15 - 23

5.3 Operation and Maintenance

It is important to understand that with a BFP the City staff will be required to monitor operating parameters to achieve performance, ensure that solids are properly conditioned and that good gravity drainage occurs. The manufacturer (rental company) should provide operation and maintenance training after installation. Dewatering belts should be designed for easy replacement with minimum downtime. Belt washing should occur daily after the cake is removed. Replacement of filter belts is a common maintenance requirement. Historical information indicates that belt life averages about 2,000 running hours. In general, a BFP operator is responsible for polymer mixing, dosing and monitoring usage, observing the feed and cake several times per day, and making adjustments as necessary. Rollers and bearings require frequent lubrication. It is important for the operator to keep records of all press performance parameters, including the volume of biosolids fed to the press, polymer dosage, and chemical usage. A sample of the biosolids to the press, cake discharge, and filtrate should be taken at least once per shift and analyzed for total solids. At the end of each shift, the belt should be cleaned with high-pressure wash water. As with any mechanical WWTP process, labor is relative to plant size. The Town of Gilbert Santan Water Treatment Plant operated a rental BFP for solids dewatering in 2011. Their lead operator estimated it would take approximately six to eight staff hours per day (including lab testing) to operate that same BFP at a WWTP experiencing the flow/loading of Wildcat Hill.

5.4 Cost

Capital costs to purchase a BFP vary with the size of the equipment. Vendor estimates vary from $60,000 (approximate capacity of 500 dry pounds per hour) to $150,000 (approximate capacity of 1,600 dry pounds per hour). These estimates are based on a feed material which is 5 percent solids – twice that of the Wildcat Hill WWTP. These prices do not include the cost of installation, shipping, or ancillary equipment, such as flow control and centrate management. The rental of a BFP in a size that would dewater the solids at the Wildcat Hill WWTP (See Figure 3) costs approximately $5,000 per week (excluding set-up, piping, polymer, mobilization/demobilization, $10,000 security deposit, and a 60 hour a week limit on usage).

Figure 3 Rental Belt Filter Press

Neither of these costs (capital or rental) includes the construction of a building, conveyor, truck loading area, polymer cost; polymer feed system, power and fuel requirements, operations, maintenance, hauling, or disposal.

Anaerobically digested sludge solids from a BFP are typically dewatered to 10 percent moisture and hauled to the landfill the same processing day. Although the dewatered solids pass the required tests and were transportable, disposal fees could be reduced significantly by allowing the dewatered solids to dry to even 20 – 25 percent solids (such as in Geotube® containers). Overall operation and maintenance costs range from $80 per dry ton of solids (DTS) in a large treatment plant to $200 per DTS in plants in the 4 mgd size range. Typical polymer conditioning costs for BFP dewatering range from $5 per million gallons to $100 and average $25 per million gallons. Polymer costs increase sharply for residuals that are difficult to dewater. Permanganate adds about $1 per million gallons to the cost of dewatering the biosolids. These costs vary widely, depending on the source of the residuals.

6.0 GEOTEXTILE TUBES (GEOTUBES®)

Large-diameter geotextile tubes have been used to contain and dewater dredge materials from river channels and harbors for decades. In these applications, coarse-grain sediments pumped into the geotextile tube settle rapidly and slurry water is discharged through ports in the top of the tube. Use of geotextile tubes to thicken and dewater fine-grained sediments is a developing field and has had limited application in the municipal, industrial, and environmental excavation markets. Technological advances in the use and application of polymers and other chemical conditioning agents for the expedient separation of solids from water have facilitated the use of geotextile tubes for containment, dewatering, and consolidation municipal wastewater residuals. An alternative method for dewatering of wastewater residuals was sought by engineers to not only reduced costs associated with solids processing but required less facility resources to operate. Geotube® containment and dewatering technology was recommended as a cost effective, safe, and efficient method for handling biosolids in the shortest amount of processing time. The objective of this comparison was to evaluate Geotube® containers as a dewatering option for solids dewatering including cost effectiveness, ease of operation, solids retention, solids handling time, flow and volume rates, seasonality, and footprint required for process operations.

Geotube® containers are constructed of woven polypropylene material, which is extremely efficient at retaining solids and producing a clear effluent. The Geotube® units sit upon a constructed lay down area, which is designed to direct the filtrate to wherever the application demands. As sludge is pumped to the containers, it is chemically conditioned with a polymer to allow the Geotube® container to dewater at its maximum efficiency. Once pumping is complete, the Geotube® units are left to dewater until such time that the odorless, retained solids are land applied. The lay down area for the Wildcat Hill WWTP site will allow filtrate to be directed back to the treatment plant.

The lay down construction process generally consists of the following steps:

- Level the lay down area (dewatering pad) by creating a sand/aggregate subgrade
- Install a waterproof geo-synthetic membrane over the subgrade to allow the filtrate to drain
- For temporary laydown areas, use an impermeable liner and berms to create the dewatering cell.
- Install filtration media under the Geotube® units to promote dewatering from the bottom of the containers.
- Install a polymer mixing chamber, to inject a pre-determined amount of polymer solution into the sludge prior to dewatering and containment by the Geotube® unit.
- Keep the laydown area level and properly graded – you do not want the bags shifting.
- Orientate the Geotube® containers so that your collection basin is at the narrow end of the unit.
- Plan for a method to supply heat to the Geotube® containers if extended periods of below freezing temperatures are anticipated.

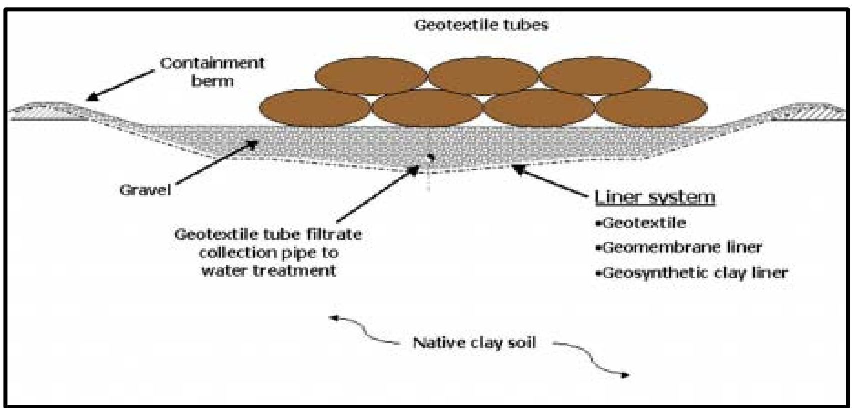

Figure 4 Geotube® Stacked Installation Cross-Section

Geotube® containers offer plant staff a non-mechanical dewatering system based on simplicity, affordability, versatility, environmentally friendly, and the standard Geoport plumbing fittings make connections for pumping simple. The Geotube® dewatering process for anaerobically digested sludge is essentially comprised of three distinct stages:

Containment Stage: The Geotube® container is filled with digested sludge that is treated with an environmentally safe polymer to make the sludge particles bind together. The containers unique fabric confines the fine grains of the sludge material.

Dewatering Stage: Excess liquid simply drains from the Geotube® container. The decanted liquid is often of a quality that it can easily be returned for processing without additional treatment.

Consolidation Stage: Solids continue to densify due to desiccation as residual liquid vapor escapes through the fabric. Volume reduction can be as high as 25 percent. In river dredging operations where a more sandy material is encountered, volume reduction can be as high as 95 percent.

Figure 5 Three Stages of Geotube Dewatering Process

The Geotube® system is available for purchase as Mobile Dewatering System (MDS). The Geotube® container units in the MDS set-up are sized to fit in a roll-off dumpster. As the solids in the MDS unit reach moisture content where the City decides to transport them for disposal, the entire dumpster container is transported with the MDS unit inside it. Although this system does make transport significantly easier, the amount of flow/solids at the Wildcat Hill WWTP would make the number of units/dumpsters required unfeasible.

6.1 Design Criteria

For Geotube® container sizing the day-to-day operational objectives and overall project goals must be considered. Geotube® container sizing is important in order to design an appropriate lay-down area for Geotube filling and contain the volume and mass pumped to the Geotubes®. In order to estimate the total operational and project containment capacity within the Geotube® containers, project engineers will require:

- Volume of liquid to be sent for dewatering
- Percent dry weight solids of the digested sludge
- Specific gravity of the digested sludge
- Daily sludge production rates and objectives
- Hourly/Peak/Minimum sludge flow rates to the Geotube® containers
- Space available for lay-down and dewatering of Geotubes®
- Timeline for project completion
- Chemical conditioning and/or hanging bag results
- Project objectives for percent dry weight solids for dewatered solids in the Geotubes®.

Figure 6 Geotube® Container on Lay Down Area

To help meet dewatering goals, the project team will performs a series of “chemical conditioning” tests (performance trials) on the digested sludge from the WWTP. The objective of the dewatering performance trials is to develop a chemical conditioning program for each potential Geotube® dewatering application. Polymers will be evaluated based on water release rate, water clarity, flocculent appearance, and water volume after passing through a Geotube® geotextile filter. In addition, dosing rate(s) will be determined during these bench-top dewatering experiments and recommendations will be provided as a part of these trials. Geotube® hanging bag performance evaluations should be performed with the recommended chemical conditioning program to evaluate filtrate quality and time to attain desired cake solids within the Geotube® container. Once a recommended chemical conditioning program is identified in the hanging bag test, other chemical application variables can be evaluated for potential full-scale operations.

6.2 Performance

In typical sludge dewatering applications, solids concentrations greater than, or equal to, 25 percent are routinely accomplished within the Geotube® containers. As pumping of solids is initiated to a new container, a layer of solids covers the inside of the geotextile and decreases the loss of solids due to surface tension. This process typically occurs within one to five minutes of solids flow to the new Geotube® container and clear filtrate is normally observed for the rest of the dewatering operation.

Raw digester sludge (left),
treated with polymer (middle),
and effluent from Geotube (right)

Figure 7 Geotube® Filtrate

With respect to solids handling time, each system and application will behave differently. An advantage of using Geotube® technology is that the system is a closed loop and solids are only handled one time, during the excavation of the full containers. A closed loop system eliminates odors, potential for spills, and solids handling, as well as decreases risk(s) of operator(s) exposure to pathogens and other solids contaminants. With a BFP system, solids are open to the atmosphere, potentially release volatiles and associated odors, are excessively noisy, can spill off the belt onto the ground if blinding occurs due to insufficient flocculation, and increases potential risk(s) of operator exposure to solids contaminants.

The flow and volume rates (100 to 2,000 gpm) to Geotube® containers are dependent on the equipment available on site. Typically, solids from the case study projects were pumped to the Geotube® containers at 100 to 300 cubic yards per hour (700 to 2,000 gpm). In comparison, a 0.5-m belt press (a typical belt size for a truck mounted rental unit) has a maximum solids flow rate of 150 gpm. There are very few reasons to stop the flow of solids to a Geotube® system except potentially changing an empty polymer drum/tote, or shifting solids flow from a full container to a new container. In comparison, BFP operations are typically considered efficient at greater than 75 percent working operations.

Flagstaff has a notable change in climate between seasons. The pumping of solids to a new Geotube® container can occur during any time of the year as long as the polymer feed lines and solids lines are freeze protected. The pumping of solids to a partially filled container with frozen solids is not recommended due to inefficient dewatering and filling and the potential for overfilling. However, allowing a full or partially full Geotube® container to sit outside during a freeze/thaw cycle typically releases additional free water and will not harm the container. For the temporary dewatering application at the Wildcat Hill WWTP, measures should be implemented to keep the Geotube® containers from freezing. A BFP is capable of operating through all seasons, as long as the polymer feed lines and solids lines are freeze protected. A belt press requires constant operator supervision, regardless of the weather. In comparison, a Geotube® system is hands off after daily start-up and calibration and an operator may not have to revisit the system during his/her shift, depending on the variability of the solids feed rate.

The Wildcat Hill WWTP has ample area for a Geotube® container lay-down area. The existing dedicated land disposal (DLD) area is approximately 40 acres in size. The footprint required for six 120-foot circumference x 100-foot long Geotube® containers should be approximately 140-feet by 360-feet, sufficient to collect filtrate from the Geotube® containers and channel it back to the facility. Geotube® containers can be site-specific manufactured to fit the facility's available footprint. For solids dewatering, containers are manufactured in 30-foot to 120-foot circumferences in 5-foot increments with lengths of 50-feet to 400-feet. Standard Geotube® sizes designed for containment of solids can hold between 20 and 1,750 cubic yards of material.

In comparison, a mechanical dewatering technique may be better suited for sites with a large volume of solids or sites that have limited space for an appropriately sized Geotube® lay-down area. A difficulty of using Geotube® containers in these situations is the large footprint required to contain the solids. Facilities in urban settings typically do not have the space available for a Geotube® dewatering systems and would have to make some capital improvements to accommodate these systems.

6.3 Operations And Maintenance

An added benefit to the use of the Geotube® containers for solids dewatering is their ease of operation. Start-up of these projects has typically required low man hours, including installation of the Geotube® containers and manifold system, set up of the polymer injection unit, time to initiate solids pumping, and calibration of the inline polymer feed rate. Once the system is calibrated to an optimal solids flow rate and sufficient inline flocculation is observed, the system will be monitored and adjustments made to the polymer feed rate. Throughout the start-up process, the solids flow rate to the Geotube® containers is neither reduced nor stopped. Geotube® containers continue to dewater and solids consolidate even as the percent solids of the sludge and strength of flocculation fluctuate during pumping. In comparison to belt press operations, the Geotube® dewatering system required little to no operation and maintenance time. Operation of a belt press requires nearly full-time monitoring and constant adjusting, particularly with an influent that fluctuates in percent solids and/or organic matter concentration. In order to complete the initial set-up, start-up and convey, and process approximately one week worth of solids at Wildcat Hill WWTP (500,000 gallons) with a BFP (maximum flow rate of 150 gpm), it is estimated that over 100 total man hours will be required by plant personnel.

Figure 8 Geotube® Dewatering

6.4 Cost

In order to try to determine a level of “cost effectiveness” for any dewatering system, some assumptions, or initial criteria, need to be developed. Initial discussions with the City established that their main concern was the digested sludge material and nitrogen load that return to the plant from the SSBs and DLD filtrate. At Wildcat Hill, there is no mechanical dewatering of digested sludge. Sludge disposal is on-site land application. Sludge is first sent to the SSBs for storage. At appropriate times (seasonal, or when ponds are full) the sludge is disked into the earth on the 40-acre DLD site adjacent to the plant. The solids/nitrogen return is at its worst during heavy rain or snowmelts that occur in the spring or late fall. The DLD is not normally used in the winter due to frost.

For the Wildcat Hill WWTP dewatering system, Carollo will begin with the initial assumption that the system will remain in place for one calendar year. Our initial assumption, for cost estimating purposes, will be to design the installation of 6-months worth of dewatering/storage capacity using Geotube® containers. The units will be planned for removal and replacement at the six month (halfway point) of the project duration. By planning for 6-months of storage, we can cut the size of the lay down area in half, saving money on excavation, piping, impermeable membrane, aggregate, and filter fabric.

Items included in the cost to initiate this Geotube® project would include:

- Design of the dewatering program
- Determine the required Geotube® container capacity
- Develop a polymer injection system
- Chemical conditioning program
- Bench testing
- Mobilization/demobilization
- Excavation, subgrade preparation, membrane and liner installation
- Piping and ancillary equipment installation
- Manufacturer technical assistance during start-up

Over the one-year project duration, the container system would dewater approximately 15,707 cubic yards (13,333 tons) of digested sludge material (25.5 million gallons of liquid). The initial six-month portion of the project would incur the majority of the capital costs. The second six-month portion of project will basically only incur costs to replace the container units ($30,000) and polymer. Transportation and disposal of dried solids were not included in list of costs to initiate the project, as these costs would fluctuate depending on the percent solids in the containers and final mass disposed of at the landfills.

For the Wildcat Hill WWTP projects, there is sufficient time for solids to dry to 25 percent solids and take advantage of the added savings of excavation and disposal of significantly less residuals mass. Many project sites and facilities do not have the luxury of waiting for further drying beyond 15 to 20 percent solids and must remove solids from their facilities immediately upon processing. In these instances, a mechanical dewatering technique may be more appropriate for efficient and timely results.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Based on literature review, case studies, end-user input, and historical information, the Geotube container dewatering methodology reduced the volume and mass of residual solids and costs associated with hauling and disposal while allowing continual operation of treatment facilities. In instances where time and space were available for Geotube® operations, like at the Wildcat Hill WWTP, Geotube® applications were significantly less capital intensive compared to BFP onsite dewatering techniques. For this comparison technical memorandum, Geotube® containers were evaluated as a solids dewatering option and compared to a BFP operation, including cost effectiveness, ease of operation, solids retention, solids handling time, flow and volume rates, seasonality, and footprint required to operate. The Geotube® dewatering methodology's ability to reduce the volume and mass of residual solids can result in saving the City as much as 50 percent of the costs associated with hauling and disposal while allowing continual operation at the project site. Geotube® containers also allow the City to save money by dewatering and containing the sludge in one process. Mechanical dewatering requires the City to incur the cost of removal (dewatering) and disposal at the same time. In addition, the City will not be disposing of a material that is over 97 percent liquid, they will be disposing of a material that could reach up to 25 percent solids content, greatly reducing the volume to be hauled off site, transportation costs, and disposal fees. Table 2 presents a preliminary cost estimate for comparison purposes of the design concepts. This “level of magnitude” cost estimating is to allow the City to make an initial comparison of three alternatives being studied.

Table 2 Conceptual Cost Comparison of Solids Dewatering Technologies for Wildcat Hill WWTP
Temporary Dewatering System
City of Flagstaff Wildcat Hill Wastewater Treatment Plant

Description	Geotube® - 120′ Circumference X 9′ Height	Belt Filter Press - 1.7 meter, 300 gpm	SSB Cleaning
Cost to Buy/Rent (52 weeks)	$60,000 ($5,000/bag)	$820,000 ($0.032/gal)	$500,000
Mobilization/Demobilization	$10,000	$25,000	-
Security Deposit	$0	$10,000	-
Excavation	$20,000	$10,000	-
Set-Up	$10,000	$25,000	-
Membrane/Filter Fabric	$100,000	-	-
Dewatering Polymer	$30,000	$330,000 ($0.013/gal)	-
Odor Control Chemical	-	$1000	-
Hauling	$75,000	$150,000	$150,000
Disposal ($40/LD Tipping Fee)	$25,000	$50,000	$50,000
Miscellaneous	$25,000	$25,000	$25,000
Total	**$355,000**	**$1,446,000**	**$725,000**

Based on the initial evaluation of the use of Geotube® containers compared to a BFP operation as a temporary solids dewatering option including; cost effectiveness, ease of operation, solids retention, solids handling time, flow and volume rates, seasonality, and footprint required to operate, ***the Geotube® containers, with the aid of dewatering polymers, were preferential to the BFP for the application required at the Wildcat Hill WWTP.***

8.0 DESIGN CONCEPT

The preliminary recommendation for the temporary solids dewatering system at the Wildcat Hill WWTP is the use of Geotube® containers within an engineered dewatering cell. The design concept must be reviewed and approved by the City prior to moving into detailed design of the facilities. The detailed design effort will address the principal objectives and goals as developed collaboratively between the City and Carollo. The detailed design effort will develop plans and specifications (contract documents) that address the technical issues for the project and will allow a contractor sufficient information to construct the temporary dewatering system. For the Wildcat Hill WWTP temporary solids dewatering system using the Geotube® containers, the general design concept will consist of the following principal steps:

- Locate the site utilities, including the piping in the DLD, specifically any utility that may be present within the area or limits of the dewatering cell.
- Excavate the lay down area (dewatering pad) to the required dimensions, while windrowing the excavated material to the outer perimeter of the dewatering cell to create a containment berm.
- Grade and compact the in-situ material within the dewatering cell, if the material appears to be soft or unstable, place and compact sand/aggregate to establish a stabilized subgrade.
- Install a waterproof (impermeable) geo-synthetic membrane over the subgrade and up to the top of the perimeter berm, to allow the filtrate to drain.
- Place, grade, and compact filtration media (gravel) on top of the impermeable membrane to act as a driving surface. Install a geotextile filtration fabric (if necessary) under the Geotube® units to promote dewatering from the bottom of the containers.
- Bench test the flagstaff digested sludge to determine the optimal polymer type and polymer dosage rate to chemically condition the sludge. Bench testing will also determine how many, and what size, Geotubes® will be required to complete the project.
- Install a polymer injection system (determine if mixing required), to inject a pre-determined amount of polymer solution into the sludge prior to dewatering and containment by the Geotube® unit.
- Design a contingency method to supply heat to the Geotube® containers if extended periods of below freezing temperatures are anticipated. Design the piping, pumping, and drainage systems to be insulated from the cold weather to mitigate freezing.

See conceptual design drawings FIGURE-1 and FIGURE-2 for preliminary information on the temporary dewatering system location and plan and section drawings showing the design concept.

REV	DATE	BY	DESCRIPTION

DESIGNED MLH
DRAWN MLH
CHECKED BJB
DATE OCTOBER 2012

CITY OF FLAGSTAFF
WILDCAT HILL WWTP
TEMPORARY SOLIDS
DEWATERING SYSTEM

carollo®

DEWATERING LAY DOWN AREA

CIVIL

LOCATION PLAN

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 9034A.40
DRAWING NO. FIGURE-1
SHEET NO. OF XX

PROJECT NO. FILE NAME: Figure-1.dgn

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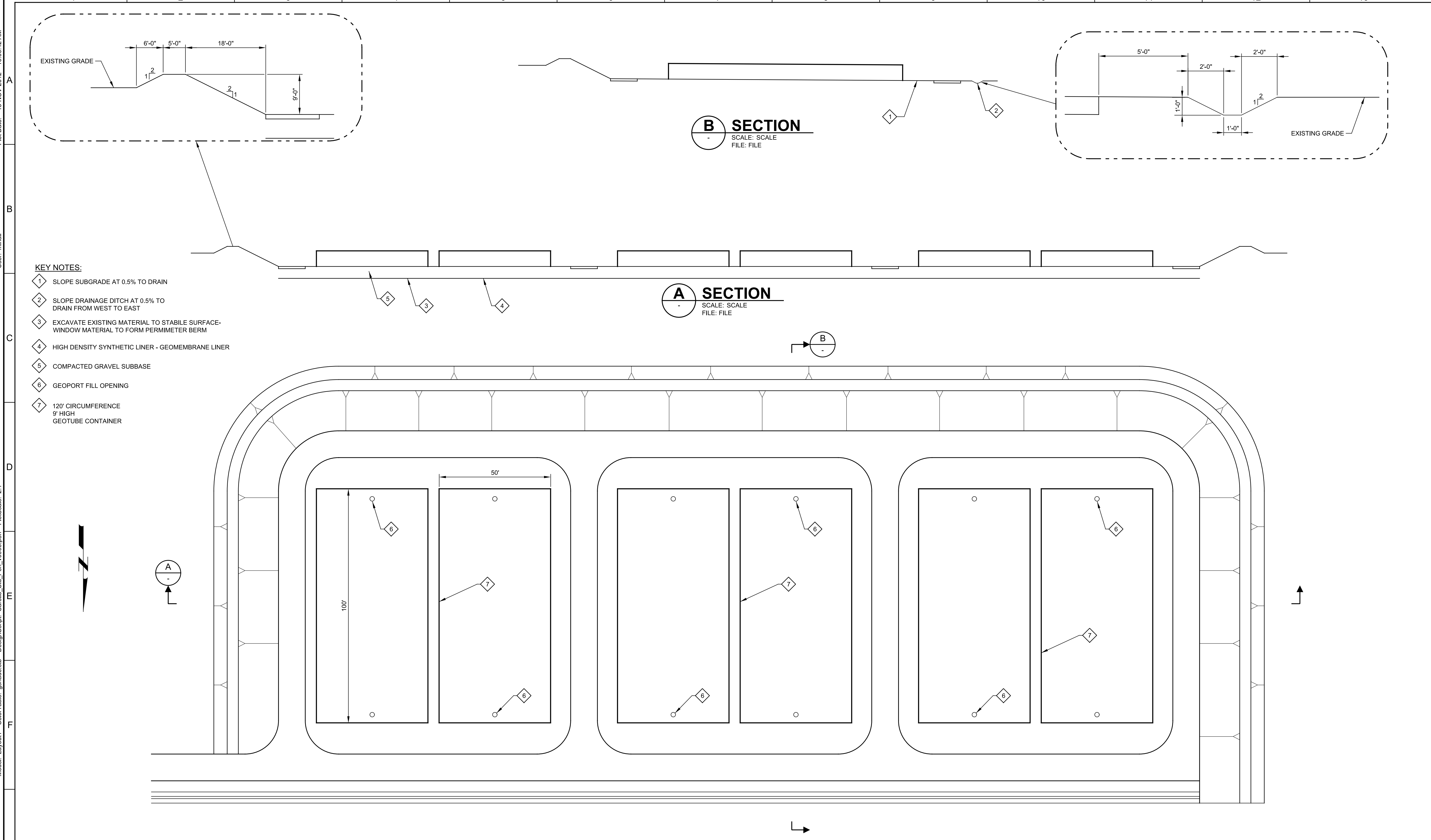

REV	DATE	BY	DESCRIPTION

DESIGNED: MLH
DRAWN: MLH
CHECKED: BJB
DATE: OCTOBER 2012

CITY OF FLAGSTAFF
WILDCAT HILL WWTP
TEMPORARY SOLIDS
DEWATERING SYSTEM

carollo®

DEWATERING LAY DOWN AREA

CIVIL

PLAN AND SECTIONS

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

JOB NO. 9034A.40
DRAWING NO. FIGURE-2
SHEET NO. OF XX

PROJECT NO.
FILE NAME: Figure-2.dgn

LAST SAVED BY: mlhall
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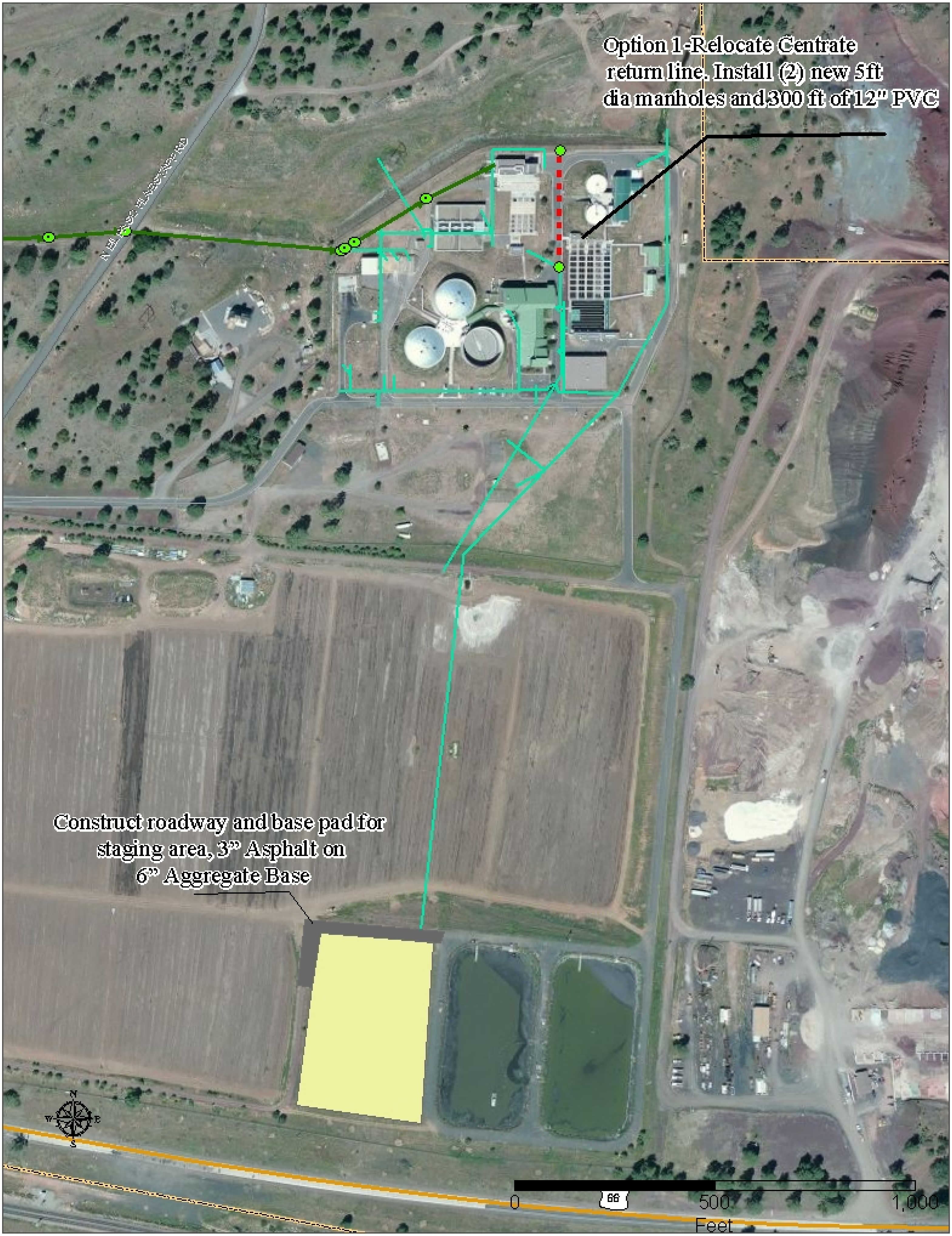
Option 1-Relocate Centrate
return line. Install (2) new 5ft
dia manholes and 300 ft of 12" PVC
Construct roadway and base pad for
staging area, 3" Asphalt on
6" Aggregate Base
N
S
E
W
0
500
1,000
Feet
66

City of Flagstaff Wildcat Hill WWTP - Temporary Geotextile Solids Dewatering System

Capital Cost Estimate (Based on One Year Use)

Item Description	Units	Capital Cost	Operational Cost
Mobilization/Demobilization	1 Each	$2,000	
Clearing/Grubbing of Solids Settling Basin (SSB) III	8500 SY	$2,000	
Prep and Compact SSB III	8500 SY	$6,000	
Furnish/Install Geogrid & 12" Thick Compact Agg Base	8500 SY	$100,000	
Prime and 2-Inch Thick Asphaltic Concrete	8500 SY	$85,000	
Grade and Compact Access Roadway to SSB III	975 SY	$3,000	
6" Thick Compacted Aggregate Access Roadway Base	975 SY	$5,000	
Prime and 3-Inch Thick Asphaltic Concrete Roadway	975 SY	$15,000	
Geotube® - 60-Foot Circumference X 50-Foot Length	3068 LF	$0	$172,000
Maintenance	1 LS	$0	$5,000
Filter Fabric	50 Rolls	$25,000	
Dewatering System Site Set-Up	1 Each	$5,000	
Piping, Valving, and Appurtenances	1 Each	$20,000	
Connection to Existing System - Piping to Headworks	1 Each	$50,000	
Dewatering Polymer Pilot Testing (and Site Start-Up)	1 Each	$0	$7,000
Dewatering Polymer (Purchase)	22 Totes	$0	$90,000
Construction and Operation Superintendent	0 Each	$0	
Hauling (9,000 CY – Worst-Case Scenario All Haul)	9,000 CY	$0	$117,000
Disposal ($40/Load Tipping Fee)	750 Loads	$0	$30,000
Permitting (City of Flagstaff and ADEQ)	2 Each	$10,000	
Engineering – Design Services	1 Each	$54,000	
Engineering – CA&I Services	1 Each	$44,000	
Engineering – Allowances	4 Each	$20,000	
Flagstaff Project Administration	0 Each	$0	
Subtotal =		**$446,000**	**$421,000**

City of Flagstaff Wildcat Hill WWTP - Temporary Geotextile Solids Dewatering System

Capital Cost Estimate (Based on One Year Use)

Contingency @ 10%	1 Each	$87,000	
Bond	1 Each	$24,000	
Insurance	1 Each	$24,000	
Tax (45% @ 9.3%)	1 Each	$40,000	
Total =		**$1,042,000**	

City of Flagstaff Wildcat Hill WWTP - Temporary Mechanical Solids Dewatering System

Belt Filter Press

Capital Cost Estimate (Based on One Year Use)

Item Description	Units	Capital Cost	Operational Cost
Mobilization/Demobilization	1 Each	$25,000	
Belt Filter Press Rental ($3,500/Week)	1 Year	$0	$182,000
Shipping	2 Ways	$25,000	
Security Deposit	1 Year	$0	$10,000
Maintenance	1 LS	$0	$25,000
Mechanical Dewatering System Site Set-Up	1 Each	$15,000	
Mechanical Dewatering System Canopy/Protection	1 Each	$10,000	
Piping, Valving, and Appurtenances	1 Each	$25,000	
Connection to Existing System – Piping to Headworks	1 Each	$50,000	
Dewatering Polymer Pilot Testing (and Site Start-Up)	1 Each	$0	$20,000
Dewatering Polymer ($0.013/Gallon)	1 Year	$0	$275,000
Odor Control Chemical	1 LS	$0	$5,000
Electricity/Power	1 LS	$0	$25,000
Construction and Operation Superintendent	0 Each	$0	
Operator	1 Each	$0	$75,000
Hauling	16,000 CY	$0	$208,000
Disposal ($40/Load Tipping Fee)	1,333 Loads	$0	$53,000
Permitting (City of Flagstaff and ADEQ)	2 Each	$10,000	
Engineering – Design Services	1 Each	$54,000	
Engineering – CA&I Services	1 Each	$44,000	
Engineering – Allowances	4 Each	$20,000	
Flagstaff Project Administration	0 Each	$0	
Subtotal =		**$278,000**	**$878,000**

City of Flagstaff Wildcat Hill WWTP - Temporary Mechanical Solids Dewatering System

Belt Filter Press

Capital Cost Estimate (Based on One Year Use)

Contingency @ 10%	1 Each	$116,000	
Bond	1 Each	$32,000	
Insurance	1 Each	$32,000	
Tax (45% @ 9.3%)	1 Each	$53,000	
Total =		**$1,389,000**	

City of Flagstaff Wildcat Hill WWTP - Temporary Mechanical Solids Dewatering System

Centrifuge

Capital Cost Estimate (Based on One Year Use)

Item Description	Units	Capital Cost	Operational Cost
Mobilization/Demobilization	1 Each	$25,000	
Centrifuge Rental ($10,000/Month)	12 Months	$0	$120,000
Control Panel & Programming	1 Each	$0	$50,000
Shipping	2 Ways	$25,000	
Security Deposit	1 Year	$0	$10,000
Maintenance	1 LS	$0	$25,000
Mechanical Dewatering System Site Set-Up	1 Each	$15,000	
Mechanical Dewatering System Canopy/Protection	1 Each	$10,000	
Piping, Valving, and Appurtenances	1 Each	$25,000	
Connection to Existing System – Piping to Headworks	1 Each	$50,000	
Dewatering Polymer Pilot Testing (and Site Start-Up)	1 Each	$0	$20,000
Dewatering Polymer ($0.013/Gallon)	1 Year	$0	$275,000
Odor Control Chemical	1 LS	$0	$5,000
Electricity/Power	1 LS	$0	$40,000
Construction and Operation Superintendent	0 Each	$0	
Operator	1 Each	$0	$100,000
Hauling	12,000 CY	$0	$156,000
Disposal ($40/Load Tipping Fee)	1000 Loads	$0	$40,000
Permitting (City of Flagstaff and ADEQ)	2 Each	$10,000	
Engineering – Design Services	1 Each	$75,000	
Engineering – CA&I Services	1 Each	$75,000	
Engineering – Allowances	4 Each	$30,000	
Flagstaff Project Administration	0 Each	$0	
Subtotal =		**$340,000**	**$841,000**

City of Flagstaff Wildcat Hill WWTP - Temporary Mechanical Solids Dewatering System

Centrifuge

Capital Cost Estimate (Based on One Year Use)

Contingency @ 10%	1 Each	$118,000	
Bond	1 Each	$32,000	
Insurance	1 Each	$32,000	
Tax (45% @ 9.3%)	1 Each	$54,000	
Total =		**$1,417,000**	

City of Flagstaff Wildcat Hill WWTP - Dredging Solids Dewatering System

Capital Cost Estimate (Based on One Year Use)

Item Description	Units	Capital Cost	Operational Cost
Mobilization/Demobilization	1 Each	$5,000	
Clearing/Grubbing of Solids Settling Basin (SSB) III	0 SY	$0	
Dredge SSB I and SSB II (One Dredging to Last the Year)	2 SSBs	$750,000	
Furnish New Dredging Equipment For Plant	1 Each	$356,000	
Prime and 2-Inch Thick Asphaltic Concrete	0 SY	$0	
Grade and Compact Access Roadway to SSB III	0 SY	$0	
6” Thick Compacted Aggregate Access Roadway Base	0 SY	$0	
Prime and 3-Inch Thick Asphaltic Concrete Roadway	0 SY	$0	
Geotube® - 60-Foot Circumference X 50-Foot Length	0 LF	$0	
Maintenance	1 LS	$0	$5,000
Filter Fabric	0 Rolls	$0	
Dewatering System Site Set-Up	1 Each	$5,000	
Piping, Valving, and Appurtenances	1 Each	$5,000	
Connection to Existing System - Piping to Headworks	1 Each	$50,000	
Dewatering Polymer Pilot Testing (and Site Start-Up)	0 Each		$0
Dewatering Polymer (Purchase)	0 Totes		$0
Construction and Operation Superintendent	0 Each		$0
Hauling (6,000 CY – Worst-Case Scenario All Haul)	6,000 CY	$0	$78,000
Disposal ($40/Load Tipping Fee)	500 Loads	$0	$20,000
Permitting (City of Flagstaff and ADEQ)	2 Each	$10,000	
Engineering – Design Services	1 Each	$54,000	
Engineering – CA&I Services	1 Each	$44,000	
Engineering – Allowances	4 Each	$20,000	
Flagstaff Project Administration	0 Each	$0	
Subtotal =		**$1,299,000**	**$103,000**

City of Flagstaff Wildcat Hill WWTP - Dredging Solids Dewatering System

Capital Cost Estimate (Based on One Year Use)

Contingency @ 10%	1 Each	$141,000	
Bond	1 Each	$39,000	
Insurance	1 Each	$39,000	
Tax (45% @ 9.3%)	1 Each	$65,000	
Total =		**$1,583,000**	

Memorandum

10.

CITY OF FLAGSTAFF

To:	The Honorable Mayor and Council
From:	Elizabeth A. Burke, City Clerk
Date:	02/22/2013
Meeting Date:	02/26/2013

TITLE:

Discussion/direction on Resolution of Support for HB2573, Prohibited Governmental Compliance; 2012 NDAA.

DESIRED OUTCOME:

Council direction.

INFORMATION:

Councilmember Oravits has asked that we place this item on the February 26, 2013, Work Session to determine whether there was interest in considering a Resolution of Support at the March 5, 2013, Council Meeting for House Bill 2573, Prohibited Governmental Compliance; 2012 NDAA, being sponsored by Representative Barton, et al.

Attached is a copy of the House Bill Summary along with the proposed bill for your information. This item would normally be placed on the March 5, 2013, agenda as a Section 15, Discussion Item; however, due to time constraints he is asking if there is interest in placing a Resolution of Support on the March 5, 2013, agenda for consideration and possible action.

Attachments: HB2573 Summary/Bill

Form Review

Inbox	Reviewed By	Date
City Manager	Kevin Burke	02/22/2013 10:25 AM
DCM - Jerene Watson	Elizabeth A. Burke	02/22/2013 10:40 AM

Form Started By: Elizabeth A. Burke — Started On: 02/22/2013 09:28 AM

Final Approval Date: 02/22/2013

HOUSE OF REPRESENTATIVES

HB 2573
prohibited governmental compliance; 2012 NDAA
Sponsors: Representative Seel, Senator Burges: Representative Barton, et al.

X Committee on Judiciary

Caucus and COW

House Engrossed

OVERVIEW

HB 2573 prohibits this state and any state agency from giving material support or from participating with the implementation of sections 1021 and 1022 of the 2012 National Defense Authorization Act (NDAA) (P.L. 112-81).

HISTORY

On September 18, 2001, the Public Law 107 Authorization for Use of Military Force was approved which established the joint resolution to authorize the use of the United States Armed Forces against those responsible for the recent attacks launched against the United States.

NDAA is a federal law specifying the budget and expenditures of the United States Department of Defense (DOD). Each year's act also includes other provisions. In December 2011, President Obama signed the 2012 NDAA, codifying indefinite military detention without charge or trial into law.

The NDAA authorizes appropriations for fiscal year 2012 for military activities of the DOD, military construction and defense activities of the Department of Energy, to prescribe military personnel. Specifically, Section 1021, affirms the authority of the Armed Forces of the United States to detain covered persons pursuant to the Authorization for Use of Military Force. Furthermore, Section 1022, establishes military custody for foreign al-Qaeda terrorists.

PROVISIONS

- Prohibits this state and any state agency from providing material support or participating in any way with the implementation of sections 1021 and 1022 of the NDAA of 2012 against any U.S. citizen.
- Mandates the Director of the Department of Public Safety or county sheriff to report any attempt by federal government agencies or agents to secure the implementation of sections 1021 and 1022 of the NDAA to the Governor and the Legislature.

---------- DOCUMENT FOOTER ---------

Fifty-first Legislature
First Regular Session 2 February 20, 2013

---------- DOCUMENT FOOTER ---------

REFERENCE TITLE: prohibited governmental compliance; 2012 NDAA

State of Arizona
House of Representatives
Fifty-first Legislature
First Regular Session
2013

HB 2573

Introduced by
Representative Seel, Senator Burges: Representatives Barton, Borrelli, Dial, Lesko, Lovas, Petersen, Thorpe

AN ACT

AMENDING TITLE 41, ARIZONA REVISED STATUTES, BY ADDING CHAPTER 51; RELATING TO THE NATIONAL DEFENSE AUTHORIZATION ACT OF 2012.

(TEXT OF BILL BEGINS ON NEXT PAGE)

Be it enacted by the Legislature of the State of Arizona:

Section 1. Title 41, Arizona Revised Statutes, is amended by adding chapter 51, to read:

CHAPTER 51

PROHIBITED GOVERNMENTAL COMPLIANCE WITH THE NATIONAL DEFENSE AUTHORIZATION ACT OF 2012

ARTICLE 1. GENERAL PROVISIONS

41-5100. National defense authorization act of 2012; prohibited acts; report

A. THIS STATE AND ANY AGENCY OF THIS STATE SHALL NOT PROVIDE MATERIAL SUPPORT OR PARTICIPATE IN ANY WAY WITH THE IMPLEMENTATION OF SECTIONS 1021 AND 1022 OF THE NATIONAL DEFENSE AUTHORIZATION ACT OF 2012 (P.L. 112-81) AGAINST ANY CITIZEN OF THE UNITED STATES.

B. THE DIRECTOR OF THE DEPARTMENT OF PUBLIC SAFETY OR A SHERIFF OF A COUNTY SHALL REPORT TO THE GOVERNOR AND THE LEGISLATURE ANY ATTEMPT BY AGENCIES OR AGENTS OF THE FEDERAL GOVERNMENT TO SECURE THE IMPLEMENTATION OF SECTIONS 1021 AND 1022 OF THE NATIONAL DEFENSE AUTHORIZATION ACT THROUGH THE OPERATIONS OF THAT OR ANY OTHER STATE DEPARTMENT.

Sec. 2. Findings

A. The legislature finds that the enactment into law by the United States Congress of sections 1021 and 1022 of the National Defense Authorization Act of 2012 is inimical to the liberty, security and well-being of the people of Arizona and that those sections were adopted by Congress in violation of the limits of federal power in the United States Constitution.

B. The legislature further finds that sections 1021 and 1022 of the National Defense Authorization Act of 2012, as they purport to authorize the detainment of persons captured within the United States without charge or trial, military tribunals for persons captured within the United States, and the transfer of persons who are captured within the United States to foreign jurisdictions, violate the following rights enshrined in the Constitution of the United States:

1. Article I, section 9, clause 2 relating to the right to seek a writ of habeas corpus.

2. The First Amendment right to petition the government for a redress of grievances.

3. The Fourth Amendment right to be free from unreasonable searches and seizures.

4. The Fifth Amendment right to be free from charge for an infamous or capitol crime until presentment or indictment by a grand jury.

5. The Fifth Amendment right to be free from deprivation of life, liberty or property without due process of law.

6. The Sixth Amendment right in criminal prosecutions to enjoy a speedy trial by an impartial jury in the state and district where the crime was allegedly committed.

7. The Sixth Amendment right to be informed of the nature and cause of the accusation.

8. The Sixth Amendment right to confront witnesses.

9. The Sixth Amendment right to counsel.

10. The Eighth Amendment right to be free from excessive bail and fines, and cruel and unusual punishment.

11. The Fourteenth Amendment right to be free from deprivation of life, liberty or property without due process of law.

Sec. 3. Short title

This act may be cited as the "Liberty Preservation Act".