Alaska's GAM Program

Understanding the Past; Building the Future

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Keys to Successful AKDOT GAM Program Development

- Consultant team: The excellence and commitment of R&M Consultants, Landslide Technology, Shannon & Wilson, PanGEO, Paul Thompson, and the University of Alaska Fairbanks
- A diverse Technical Advisory Team with representation from a cross section of national geotechnical and asset management professionals from agencies and consultants
- Critical support from a cadre of AKDOT staff in Materials, Contracts and Planning
- Support of TRB (L. Pierson and G.P. Jayaprakash and the EngGeol Comm.) for early recognition of the value of GAM. Continuing support of the Geotechnical Asset Management Subcommittee and our Section and Group leadership.
- The singular commitment and dedication of Barry Benko in taking over the job and getting the reports published despite internal opposition
- State law exempting Research activities at DOT from procurement processes, allowing sole source selection of the best candidates for the GAM Research Team

Brief History of the GAM Research Program

- 2000s – Early research by Loehr, Sanford-Bernhardt & Huaco
- **2002** - USMP Program research explored in-house; literature search
- 2004 - Comprehensive Material Site Inventory started (4 yrs - $4 million budget)
- **2008** - Initial idea to create comprehensive GAM program for slopes, materials sites, retaining walls and embankments (at NW Geotechnical Workshop)
- 2009 - USMP research started (5 yrs - $650,000 budget)
- **2009** - Memo to Chief Engineer suggesting Geotechnical Asset Management program for materials sites, soil and rock slopes, embankments, retaining walls, etc.
- 2010 - Initial start on USMP federally funded project (database and inventory)
- **2011** - Federal funding request for comprehensive GAM program (5 yrs - $6.5 million)
- 2011-16 - GAM Program Research carried out
- **2016-17** - Completion of GAM Research Reports

Lessons from AKDOT GAM Research

- Research can take a lot longer than you think
  - 6 years for AKDOT GAM concept to percolate and develop
  - 3 years to get funding to create project
  - 6 years to complete project
- Be Bold and even Audacious - An early mentor in developing this project recommended that the GAM funding request should be based on the wildest dreams of what funds would be required and then doubled. This worked to perfection. Over the course of the research, $11 million+ was awarded to the several projects associated with the research
- Be flexible
  - As research/development proceeds, there will be many, many unforeseen ideas and concepts that will pop up just begging to be included.
  - Make your project descriptions and contract scopes as broad as possible to account for serendipity.
  - Don't focus too close to the main topics, allow outside influences in. Borrow ideas from other areas and adapt to your project.
- The good news for other agencies
  - **No one has to reinvent the wheel and no one has to expect a 15 year process to put GAM tools to work.** Using the AKDOT GAM program as an example for new programs, and the NCHRP Report #903 will give you an advanced starting place.
  - AKDOT GAM was the pioneering program, but not the only program or guidance developed between 2008 and 2017
  - The AK program is the most comprehensive program to date. It was developed in accord with federal guidance for risk-based TAM, PM and all the reports and guidance documents are readily available (see below for links)
  - A cooperative Federal Land Management Agencies project created a GAM-based USMP based upon AKDOT GAM program.
  - NCHRP Report #903 Implementation Manual gives high level guidance on implementing GAM programs
  - Many other states have GAM or GAM-based programs developed or in development that can provide examples of how to build a GAM program

RESULTS
GAM Research Principal Deliverables

- Geotechnical Asset Management Plan
- GAM Program Development Final Report
  - Rock Slopes/Unstable Slopes,
  - Embankments,
  - Retaining Walls,
  - Materials Site Inventory (stand-alone)
- Risk-Based Framework for GAM
- GAM project report for Tongass Hwy Corridor – first full scale application
- Executive Summary
  - Reports Available in AKDOT Research Library at http://www.dot.state.ak.us/stwddes/research/results_lib.cfm?keywords=GAM&fields=All&mnuFORMAT=All&selectYear=&Submit=Submit+Search
  - See also AKDOT Statewide Materials GAM webpage: http://www.dot.state.ak.us/stwddes/desmaterials/mat_geotech_services/mat_gam2.shtml

RESULTS
Other Products from GAM Research

- GAM Program webpage – overview of GAM Program; links to additional information
- **KEY PRODUCT:** ArcGIS Online Gateway: The AGOL "GAM Program Gallery" is available to the public (link below). The excellent gateway platform is the vehicle for migration and consolidation of GAM data and displays links to much of the GAM program offerings in one location. The page links to the GAM Program Dashboard, there are AGOL layers available to copy, a "story map," research reports, rating guides for geo assets, Geo Event Tracker, GAM data on test holes and publications. (See next slide)
- On-line References:
  - AKDOT GAM Webpage:
    - http://www.dot.state.ak.us/stwddes/desmaterials/mat_geotech_services/mat_gam2.shtml
  - AGOL GAM Program Gallery – Under development, but public now.
    - https://akdot.maps.arcgis.com/apps/MinimalGallery/index.html?appid=61ce3c7a1dfe4e2ba8ea0cdd896fbe39
  - Asset Inventory Interface (Story Map):
    - https://akdot.maps.arcgis.com/apps/MapJournal/index.html?appid=15ca1b0297e94ad386c01cc459851ee8
  - Material Site Inventory:
    - http://www.dot.state.ak.us/stwddes/desmaterials/matsiteportal/welcome.shtml

GAM AGOL Gateway

- Program Dashboard
- Layer Gallery
- Storymap
- Data sets
- Geo Event Tracker
- Risk Assessment Map
- Report links
- Asset Rating Guides

GAM Program Dashboard

Dashboard to view and filter GAM program rock slope, soil sl...

GAM Program Layers Gallery

Quick access to GAM feature layers for use in your own AGOL ...

GAM Program Storymap

The original GAM Program interface. Overview Storymap introd...

Geo. Event Tracker & Risk Assessment

A filterable Dashboard map for the Event Tracker data (rock ...

Geo. Event Tracker-download data

Current thru November 30, 2020

Program Development

155 page report (w/o appendices), published June 2017

Rating Guide - Retaining Walls

Appendix to the GAM Program Development report published Sep...

Rating Guide - Rock Slopes

Appendix to the GAM Program Development report published Sep...

Rating Guide - Soil Slopes & Embankments

Appendix to the GAM Program Development report published Sep...

Statewide Materials Test Hole Locations

Subsurface investigation locations by Statewide Materials.

Tech. Report Executive Summary

12 page GAM Plan Report summary, published June 2017

Technical Report

62 page GAM Plan report, published June 2017

https://akdot.maps.arcgis.com/apps/MinimalGallery/index.html?appid=61ce3c7a1dfe4e2ba8ea0cdd896fbe39

History Recap: Mistakes Were Made

- Lack of foresight at the outset about an end game for the research: implementation!
- Casual assumption that the program results and deliverables would be so compelling that management would OK implementation: wrong.
- Major barrier to implementation: the lack of a federal funding imperative for the program: critical roadblock preventing full implementation
- Lack of coordination with parallel, but later and slower, transportation asset management program development: we were working ahead of the Department's asset management efforts.
- Competing Priorities. Actual conditions outside of "Research World" dictated other assets (pavements and bridges) were and are considered more important than geotechnical assets (all evidence to the contrary)
- Failure to give credence to a lack of interest (or outright opposition) by Management, some geotechnical staff and some other critical personnel
- **Despite the mistakes, the program was successful up to Implementation**

Current Status of GAM at AKDOT

- Research Reports shelved after completed and publishing: Management decided not to incorporate GAM with TAM Program, at least initially.
- Management directives have delayed full implementation of GAM and delayed projects needed for updating databases and GAM tools, AGOL and continued data collection.
  - No additional inventory inspection data may be collected
  - However, existing GAM data shall be provided to support project selection and development process
- **A Key Outcome not yet allowed:** no GAM-based cost analysis. Importantly, GAM users cannot yet proceed past asset inventories and condition assessments to reach the ultimate goal of aiding project decision-making using life cycle cost analysis or even simple benefit/cost analysis to support project planning and selection process

Current Status of GAM at AKDOT

- On the Bright Side, there is now a limited GAM Program STIP project funded and authorized to: revise and improve GAM AGOL online interface, customize it for user groups, and train user groups
- GAM Program staff have collected data to limited extent: input data for adverse events to *Geotechnical Event Tracker;* updated GAM inventory databases based on review of construction project closeouts (e.g., new or reconstructed soil or rock slopes)
- Regional Staff have utilized GAM processes/principles in grass-roots efforts to collect data and support scope and design decisions for several project- or event-related efforts:
  - Tongass Hwy - Ketchikan - first full scale test of process (report on GAM webpage)
  - Skagway, Haines & Kodiak – South Coast Materials Section is using GAM data to support GAM-based decision-making for several projects
  - Seward Hwy rock slopes prioritized into project with GAM program USMP
  - Nov 2018 Mag 7.1 EQ - Emergency funds used to assess damage with GAM tools
  - Haines extreme rain event and deadly landslide. Data collected with one-off phone app created by consultant for this event. DOT GAM collector offered but not used.

Future of GAM 1

- When and how will GAM processes be in general use for most transportation agencies? GAM is too useful to fail as a tool for agencies. It was developed initially at AKDOT as a stand-alone program, but it became obvious that GAM would have to go hand-in-hand with asset management programs for assets such as bridges and pavement. As bridge and pavement programs mature, it will be come apparent that management of geotechnical assets is necessary to support the other programs. GAM will then be required by federal law prompting transportation agencies nationwide to develop GAM programs.
- When: for top-down implementation of GAM, probably not before further development of risk-based Asset Management and Performance Management for federal highways and the next federal transportation law that provides explicitly for GAM assets.
- When: Both ad hoc grassroots (project level) and top-down directed applications of GAM tools are already in use around the country, mostly for unstable slopes, but also for hazard management, retaining walls, forensic engineering and geology, etc. Many of these programs have a focus on collecting data and making use of it in planning and design processes. There is also active development of GAM program concepts at FHWA.
- How: No agency need start from zero to build a GAM program. There is ample guidance in completed GAM or GAM-based programs and FHWA and TRB-sourced guidance. There is also active development of GAM progam tools at FHWA.
  - See: Multiple state DOT programs.
  - See: NCHRP #903 GAM Implementation Manual
  - See also a quick start concept: "Jump-Starting a Geotechnical Asset Management Program with Existing Data," D. Beckstrand & A. Mines, 2017: https://journals.sagepub.com/doi/pdf/10.3141/2656-03

Future of GAM 2

- There is a wealth of documentation available on GAM programs and applications. See how reports and documentation for existing programs can be incorporated into your agency
- Data. Develop understanding of and facility for collecting, storing and manipulating, and publishing geotechnical data (ArcGIS, DIGGS, etc.). No need for one-off applications for collecting, analyzing and communicating information about GAM data.
- Climate Change. Investigate how climate change mitigation concepts fit in asset management programs. Learn how sustainability, vulnerability and resilience concepts are drivers for development of effective management processes and programs for geotechnical assets.
- Be Ready – Have a Strategy for your agency or company to get started using GAM tools, concepts and processes. Take advantage of short cuts like making use of your existing Maintenance management data. Prepare to take advantage of asset management funding when it comes your way. Create a priority list for program elements that you would like to have and tackle the projects as funding becomes available. Look at AGOL formats and databases from other agencies and learn how to incorporate them in your area.
- Have a strategy for obtaining funding for your programs. Learn who is responsible for decision-making and know how to ask for funds. Try some of the ideas in these publications:
  - "Communication Matters: Communicating the Value of Transportation Research," Guidebook, NCHRP Report 610, 2009
  - "Communicating the Value of Preservation: A Playbook," NCHRP Report 742. 2012
- **Think about your end game** from the beginning – what do you want to accomplish, what will the deliverables be, who will approve progress and the final product? How can you implement it?

Closing

- An important lesson learned from AKDOT's GAM program is that an agency does not need an entirely implemented top-down comprehensive GAM program to have successes in supporting decision-making that addresses geotechnical assets and the transportation assets that geo assets physically support. Preserving geo assets in a state of good repair is an appropriate goal. Supporting decision-making has been the principal goal of GAM since its inception. Plenty of examples of useful tools to accomplish these and other goals are available for the taking.
- Geotechnical Asset Management has a big future. This last year has shown all of us the fragility and vulnerability of our infrastructure to the effects of climate change. We can also see the uncertainty of future funding for infrastructure. Meanwhile budgets for DOTs have shrunk and assets continue to suffer accordingly. GAM, even as a limited program offers the data basis and decision-support processes for well-informed decision making to protect geo assets that in turn support all of our other structure assets from bridges to pavements/subgrades to retaining walls, etc.

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