

**CITY OF BOULDER  
WATER RESOURCES ADVISORY BOARD  
AGENDA ITEM**

**MEETING DATE: July 20, 2015**

**AGENDA TITLE:** Information Item – Pre- and Post-Fire Watershed Planning Update

**PRESENTERS:** Jeff Arthur, Directory of Public Works for Utilities  
Bret Linenfelser, Water Quality and Environmental Services Manager  
Michelle Wind, Drinking Water Program Supervisor

**EXECUTIVE SUMMARY:**

The purpose of this memorandum is to update the Water Resources Advisory Board (WRAB) on the city's proactive efforts for pre- and post-wildfire planning, specifically related to protecting the city's water supply resources. Staff is not requesting any WRAB action at this time.

**BACKGROUND:**

The city's water supplies come from high elevation forested areas in the North and Middle Boulder Creek watersheds and from the Colorado-Big Thompson Project through Boulder Reservoir. Forest health and fires within these watersheds can significantly impact water quantity and quality. How wildfire may impact water quality and supply depends on wildfire extent and intensity, post wildfire precipitation, topography, and local soils and vegetation. Potential effects of wildfire on the city's water supplies, treatment facilities and downstream aquatic ecosystems can include changes in the amount and timing of snowmelt runoff; increased erosion and transport of sediment and debris; temporary system shutdowns; and increased loading of nutrients, natural organic matter, and metals. For example, if sediment and debris accumulated in the city's reservoirs following a wildfire, the city could experience serious treatment challenges, taste and odor issues, and a potential reduction in the city's usable water supplies.

In addition to fire suppression and impacts to environment and economy, wildfires can have direct and indirect associated costs to water quality and reliability that may include need for wildfire-related sediment and pollution controls and mitigation, degradation of municipal and hydropower supplies, system repairs, administrative costs, increased operation and maintenance, remediation, and long-term changes in water yield.

**Recent Watershed Fire History**

Characteristics of the city's drinking water supplies indicate they may have some protection from damaging forest fire, but fire is still a priority concern due to potential post-fire water supply and

quality impacts. Barker Reservoir and Lakewood Reservoir watersheds have some protection due to elevation, both above 8,000 feet, with more moisture and lower air temperatures. However, the 2012 Fern Lake fire area that burned approximately 3,500 acres in Rocky Mountain National Park, at approximately 8,000 to 11,000 feet, was higher than many of the recent fires in Northern Colorado and that area had not burned in more than 800 years. No damaging forest/wildfires have occurred within the Barker Reservoir or Lakewood Reservoir water supply watersheds over the last twenty years

Boulder Reservoir and the Boulder Feeder Canal supplies have mitigating factors of lower amounts of fire fuel, upstream dilution, settling, distance and limited watershed area below Lake Estes. The 2009 Olde Stage Fire, 2003 Overland Fire and the 2010 Four Mile Creek wildfires occurred within the Boulder Reservoir watershed but no water quality impacts were observed in Boulder Reservoir or the Boulder Feeder Canal. Attachment A includes a map showing the location of recent major wildland fires in Boulder County.

### **Initial Wildfire Planning Incorporating Water Supply**

The Colorado Front Range experienced major impacts on municipal water supplies in the past 15 to 20 years (e.g., 1996 Buffalo Creek Fire, 2002 Hayman Fire) and subsequent assessments concluded that climate factors and forest conditions place Front Range water supply watersheds at high risk from severe wildfires and erosion and flood damage to reservoirs. In 2007, the Colorado State Forest Service and the U.S. Forest Service hosted a meeting with Front Range water providers, and the Front Range Watershed Wildfire Protection Working Group was formed with a vision ‘to protect Colorado water supplies and critical infrastructure from catastrophic wildfire and other threats by maintaining healthy, resilient watersheds through collaboration, implementation, leveraging, and education.’ The city has been participating in this partnership effort that is still active. The working group developed a fire hazard assessment methodology and a prioritization process to evaluate mitigation potential for larger scale watersheds critical for public water supplies.

In 2010 and 2011, the city participated in an application of the assessment methodology for the Saint Vrain Watershed (i.e., the main streams that come together to form the Saint Vrain before the confluence with the South Platte River—Saint Vrain, Left Hand, Boulder, and Coal Creeks) developed through a stakeholder review process. The stakeholder group included representatives from water providers; federal, state and local land management agencies; counties; towns and other interested groups. The Saint Vrain Watershed assessment expanded upon existing wildfire hazard reduction efforts by including water supply watersheds as a community value. The analysis included wildfire hazard, flooding/debris flow hazard and soil erodibility, as well as incorporating opportunities and constraints to assist in determining where to pursue watershed protection/hazard reduction efforts. Factors for opportunities and constraints included land ownership, access, slopes, wilderness areas (restrictions), roadless areas, vegetation (fuel), See Attachment B for the Saint Vrain composite hazard ranking.

## ANALYSIS:

In 2013, the city contracted with JW Associates Inc., to refine the prioritization and hazard assessment for the smaller watersheds within the city's water supply system, incorporate water supply components, include opportunities and constraints to reducing wildfire hazard to water supplies, and collaborate with watershed stakeholders to develop a wildfire watershed protection plan. Goals of the project include facilitating preplanning (e.g., permitting debris/sediment structures to avoid missing the first season after a fire) and identifying priority areas for vegetation management before fire or targeted mitigation efforts after fire. This ongoing project includes the following phases:

- **Phase 1** (*completed in 2014*) – Small-scale Watershed Hazard Targeting Assessment and Prioritization
- **Phase 2** (*start in 2015*) – Develop a Pre- and Post-Wildfire Plan
  - Establish watershed/forest goals with stakeholders
  - Identify potential projects
  - Host public meetings

### Results of Phase 1 Small-scale Watershed Hazard Assessment and Prioritization

The small watersheds defined for the analysis included 43 small watersheds with approximately 65,000 acres (Attachment C). The analysis identified zones of concern that areas above surface water intakes and reservoirs (generally 5 miles upstream) and operational components (e.g., Betasso Water Treatment Facility, Boulder Canyon Hydro). The hazard ranking components included:

- Wildfire hazard (flame length, mountain pine beetle activity)
- Flooding/debris flow hazard (watershed steepness/ruggedness, road density)
- Soil erodibility and land slope

A composite hazard ranking numerically combined the rankings for each small watershed to help compare relative watershed hazards based solely on environmental factors. The Boulder Reservoir watershed and the small facility areas in Boulder Canyon ranked low to medium. Attachment C includes the composite hazard ranking for the higher elevation watersheds. The highest ranked composite hazards are:

Upper Middle Boulder Creek	North Fork Middle Boulder Outlet
Middle North Boulder Creek	Lower North Fork Middle Boulder
Coon Track Creek	Lower South Fork Middle Boulder
Hicks Gulch	Lower Middle Boulder Creek

The analysis also included an estimate for sediment transport to indicate areas where sediment is deposited (red) and where it continues to move downstream (green) (Attachment D).

The highest priority post-wildfire hazard risk for the city water supply is an area above Barker Reservoir. This area has lodge pole pine and aspen and open area that provide opportunity for

hazard reduction efforts. Though ranked with a lower hazard risk, Como Creek and Lakewood Reservoir watersheds have significant areas of lodge pole, as well as areas of opportunity to implement mitigation (e.g., public land, not steeply sloped). The Silver Lake Watershed does not have significant priority issues related to fire hazard.

## **Project Stakeholders**

Phase 1 also included a meeting of stakeholders to provide an opportunity to discuss the watershed analysis and identify common interests and issues. Stakeholders include:

- City of Boulder (Water Quality, Water Resources, Open Space and Mountain Parks)
- Boulder County (Land Use, Sherriff Office, Public Health, Parks and Open Space)
- Town of Nederland
- Eldora Mountain Resort
- Nederland Fire Protection District
- Colorado State Forest Service
- US Forest Service (Arapaho Roosevelt National Forest, Regional Office)

## **Other Ongoing Projects**

*Colorado-Big-Thompson Watershed.* Northern Water is working with other agencies to address [forest and watershed health](#). Activities include the Colorado-Big Thompson Headwaters Partnership with the U.S. Bureau of Reclamation, Colorado State Forest Service, and U.S. Forest Service to prioritize and implement forest fuel-related projects, monitoring water quality impacts from recent fires (e.g., Fern Lake Fire) and baseline monitoring of rainfall and runoff, and funding post-fire response (e.g., seeding, mulching, debris booms, sediment basins).

*Pre-Disaster Mitigation Program Grant – City of Boulder Water Utility Infrastructure.* The city is partnering with Boulder County on a Boulder County Wildfire Mitigation project funded through a Department of Homeland Security FEMA Pre-Disaster Mitigation grant. The project includes fuel reduction work (e.g., thinning tree stands) around the west side of the Betasso Water Treatment Facility, Boulder Canyon Hydro, and Kossler Reservoir. The city and county will cooperate on the work at the Betasso Water Treatment Facility, and the county will perform the work on its adjacent Betasso property. Work will be conducted in the winter of 2015 and 2016.

*Boulder Ranger District – South of Nederland and west of Gross Reservoir.* The [Forsythe project](#) is part of the Front Range Stewardship Project/Healthy Forest Initiative that has a 10-year contract for work to reduce forest fuel, and the threat to forest from mountain pine beetle. To date there have been large patch cuts in several locations south of Nederland and smaller projects in other areas such as along Sugarloaf Rd. Members of the public raised concerns regarding large patch cuts, and as a result subsequent patch cuts have been put on hold to resolve issues of public concern.

**NEXT STEPS:**

Phase 2 was initiated this year and will begin with a stakeholder watershed tour and more detailed vegetation mapping, and developing resilient watershed goals. The planning process will also include collaborative meetings with stakeholders to identify forest management and road projects, as well as public meetings before finalizing the plan.

**ATTACHMENTS:**

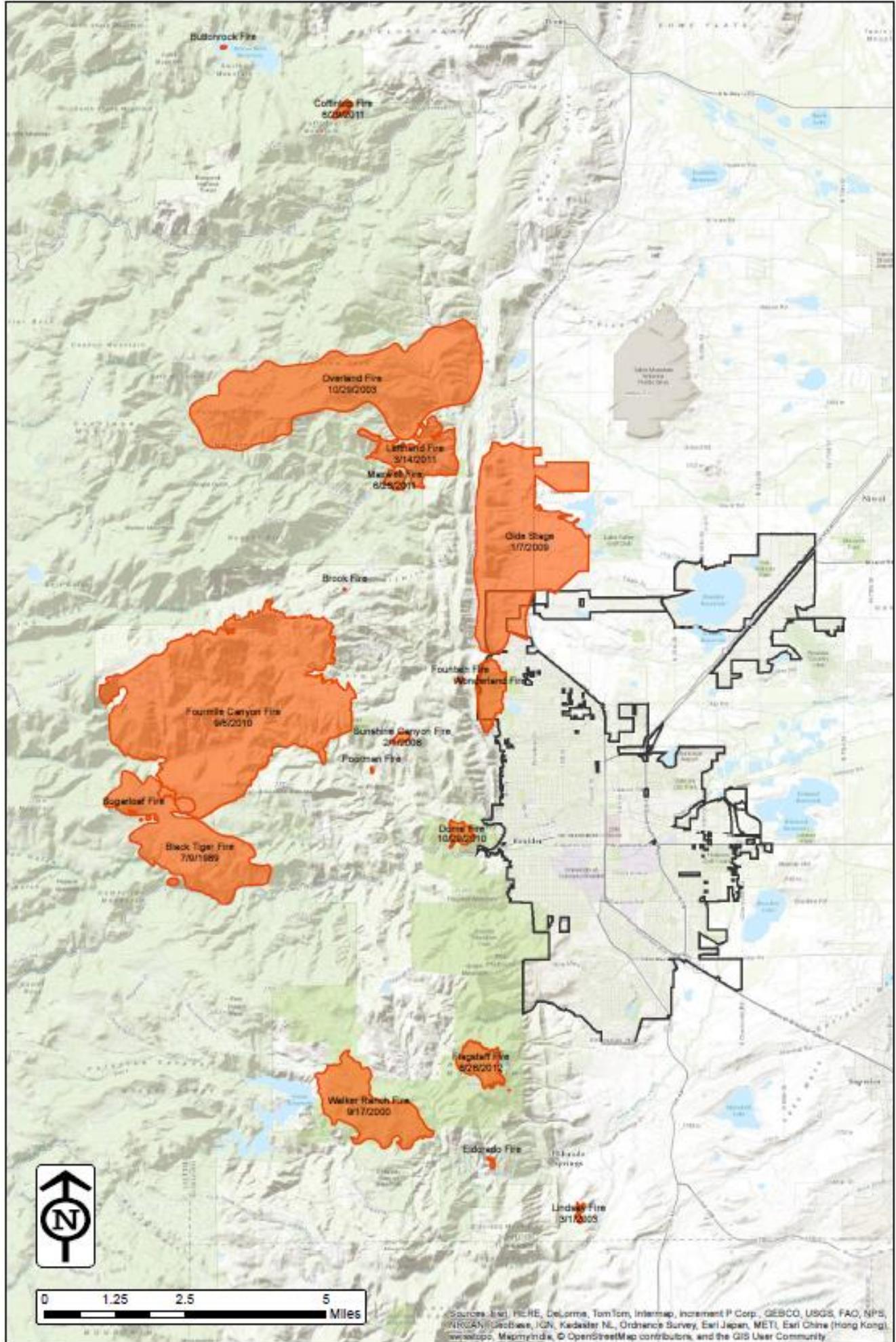
- A – Boulder Area Major Wildland Fires since 1989
- B – Saint Vrain Watershed Assessment Priority
- C – City of Boulder Small Watersheds Analysis
- D – Phase 1 Small Watershed Sediment Transport Assessment

# ATTACHMENT A BOULDER AREA MAJOR WILDLAND FIRES SINCE 1989

## Boulder Area Major Wildland Fires

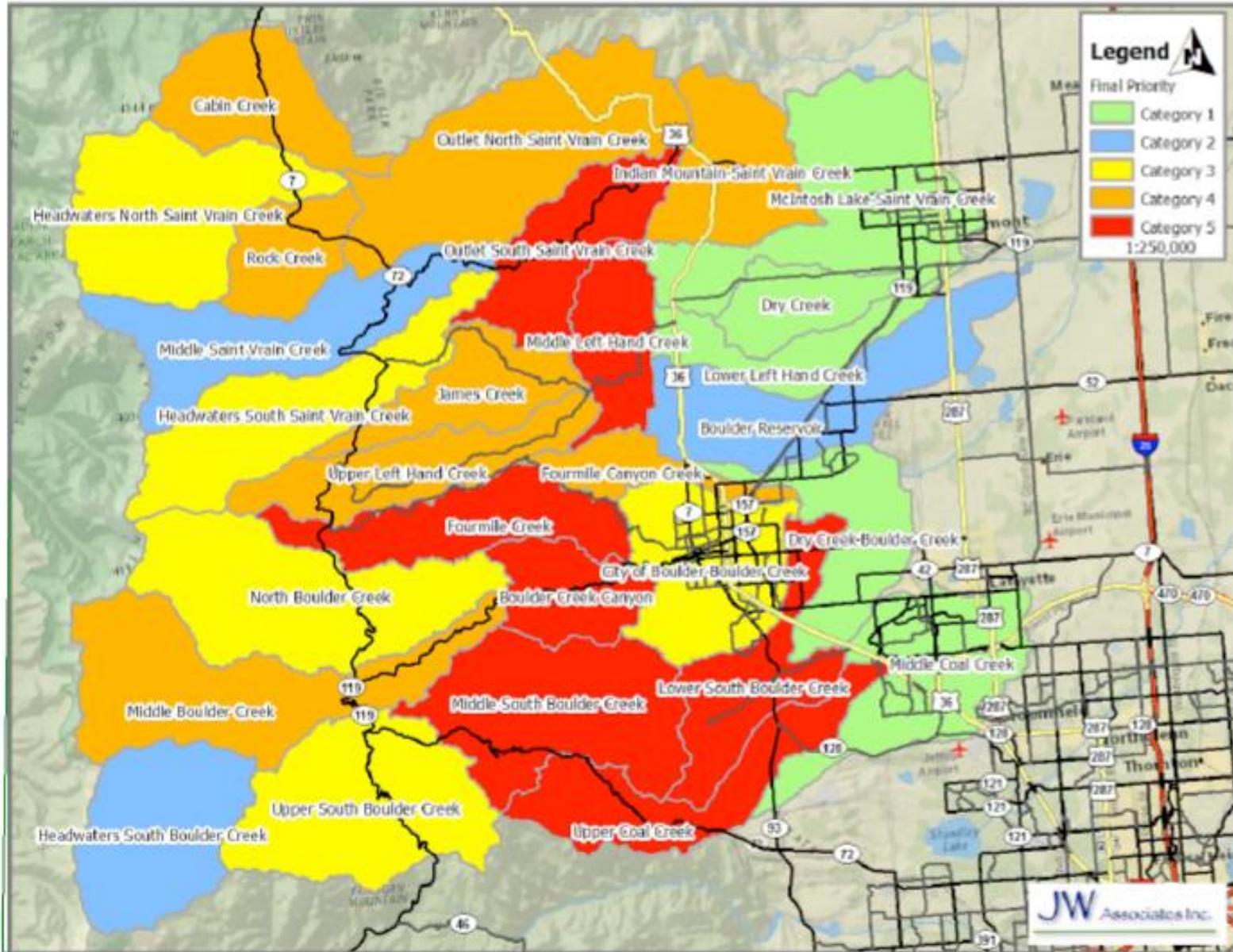
Major Wildland Fires In Boulder County Colorado since 1989

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Sources: Esri, DeLorme, GeoEye, (GeoEye, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, Mapbox, © OpenStreetMap contributors, and the GIS User Community.

**ATTACHMENT B  
SAINT VRAIN WATERSHED ASSESSMENT PRIORITY**



Category 1 – Lowest Hazard/Priority  
Category 5 – Highest Hazard/Priority

# ATTACHMENT C CITY OF BOULDER SMALL WATERSHEDS ANALYSIS

