

# Achievement of Provincial Guidelines for Partially Treated Soils

Presented By:

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# Content

- Overview of Bio-Synergy and GSI
- Historical sites; the PHC challenge
- Case studies

# Who is Bio-Synergy Resources?

- Specializes in the remediation of hydrocarbon contaminated soils and groundwater as well as the treatment of impacted drilling waste
- Incorporated in January 2000
- Currently working on projects throughout Alberta, Saskatchewan, Manitoba and British Columbia
- Regulatory approvals



# Who is GSI Environment?

- Founded in 1987, GSI specializes in engineering services, turnkey waste management, and soil & groundwater bioremediation
- Pioneering source of expertise consisting of engineers, chemists, hydrogeologists, agronomists, microbiologists and biochemists
- Currently serving clients in Canada, USA, France and Africa
- Manage four soil treatment centres in Quebec

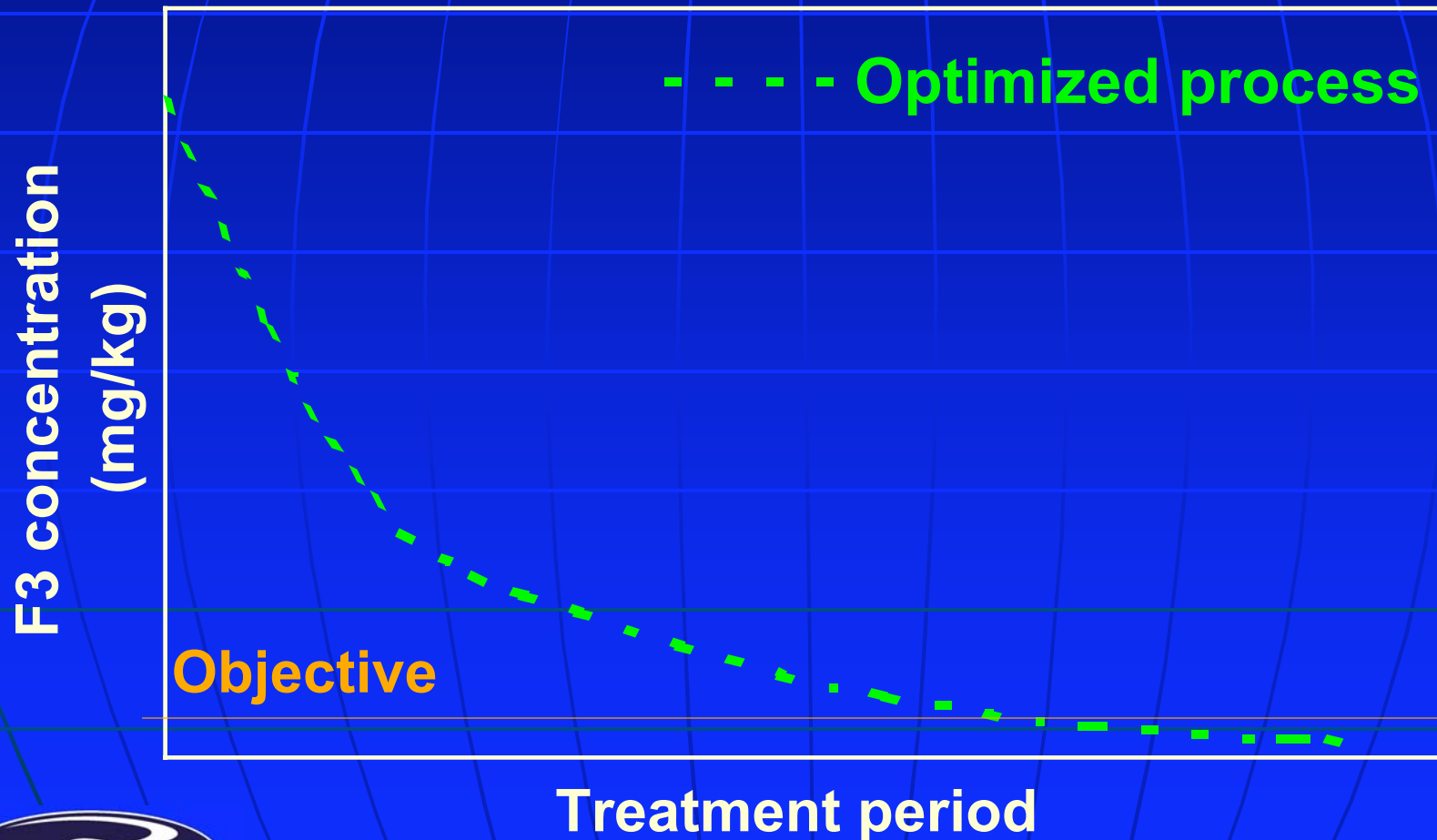
# Working Relationship

- Bio-Synergy / GSI working relationship expands our capacity:
  - Performance Bonding – Guaranteed Success
  - Research & Development Facilities
  - Depth in Technical Capacity & Experience

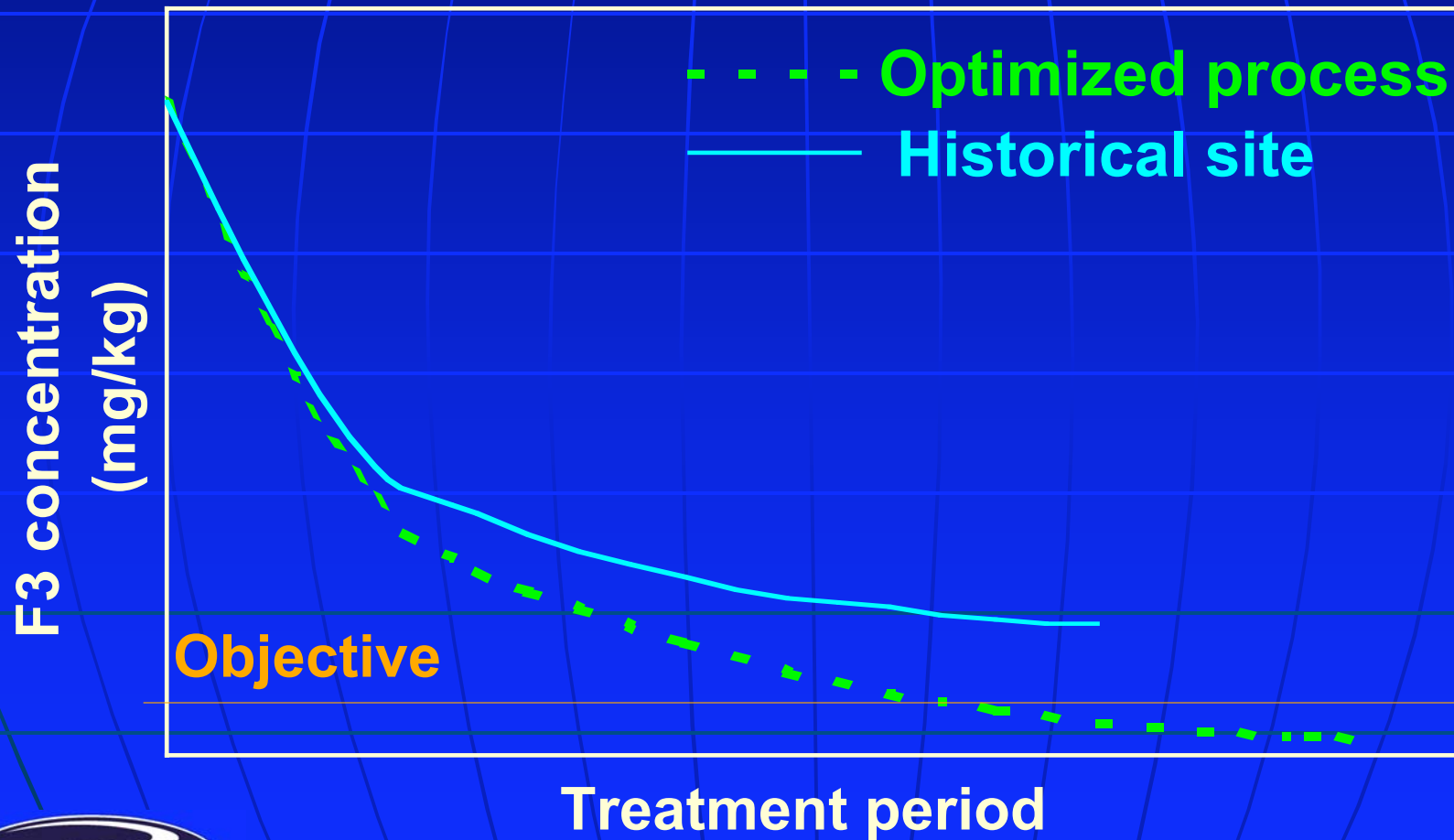
# Bioremediation Projects



# Historical HC Degradation vs Optimized Process

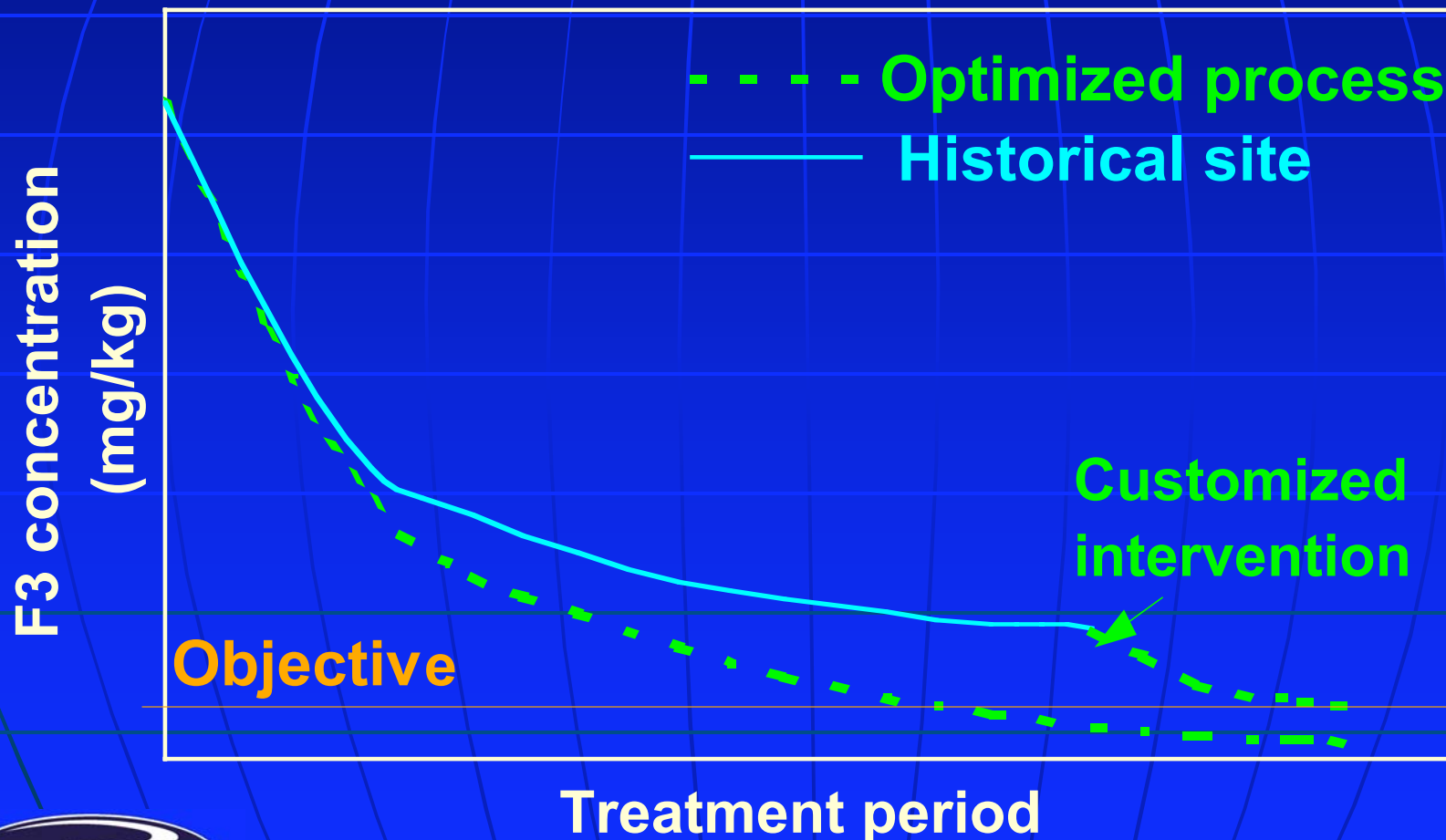


# Historical HC Degradation vs Optimized Process





# Historical HC Degradation vs Optimized Process



# Case 1

## Achievement of Guidelines on Partially Treated Soils

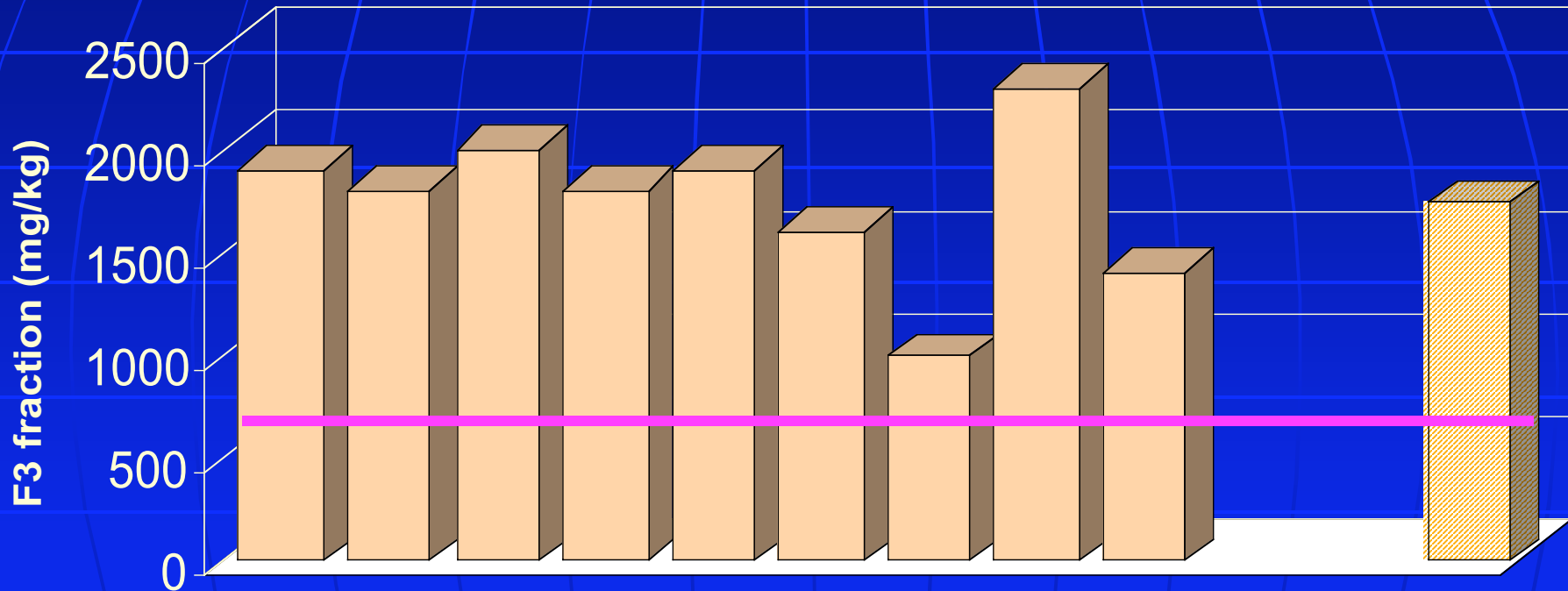
- 5,000 m<sup>3</sup> originating from an abandoned flare pit and a buried pit of unknown origin
- Location was drilled in 1958
- Project conducted between May and September 2002

# Site-Specific Challenges

- The region (Rocky Mountain House area) is the second wettest area in Alberta\*
- Actively producing oil & gas location
- No electricity on-site

\*RRTAC 93-7, 1993.

# Pre-Treatment Soil Conditions



- Composite sampling = 1000 to 2300 mg/kg
- Average =  $1744 \pm 200$  mg/kg @ 95 % conf.
- Tier 1 surface - fine grained : 800 mg/kg

# - Phase 1- Preparation of Soils

- Levelling of the subsoil surface
- Confirmatory subsoil sampling
- Placement of bottom liner and installation of forced air system
- Biopile construction
  - Processing and structuring agent/amendment addition
  - Placement of processed material
  - Anchoring of cover liner

# Processing



# Placement of Processed Material

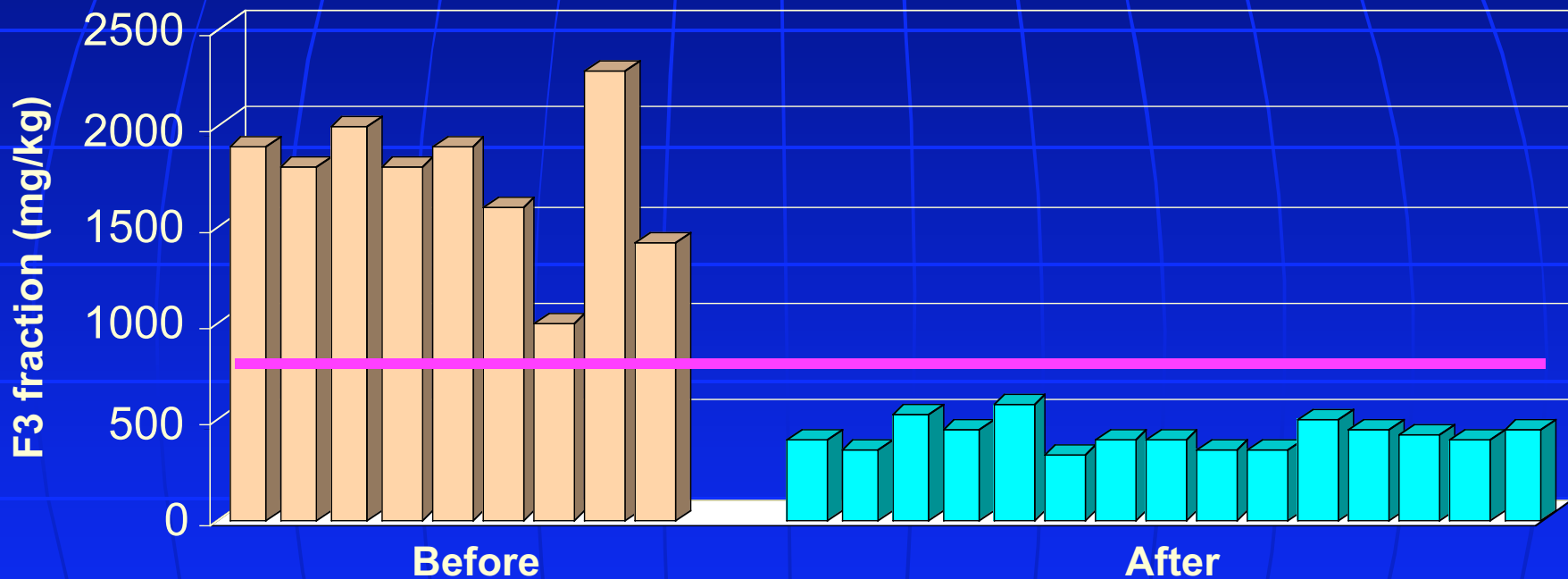


# - Phase 2 - Treatment Follow-up

- Periodic monitoring
- Final sampling event on August 8, 2002
- All samples below criteria for fine-grained surface soil in a natural area landuse



# F3 Hydrocarbon results



- Before =  $1744 \pm 200$  mg/kg @ 95 % conf.
- After =  $427 \pm 40$  mg/kg @ 95 % conf.
- Tier 1 surface - fine grained : 800 mg/kg

# Site Closure

- Biopile dismantling and backfilling
- Disposal and salvage of liners
- Subsoil recontouring

# Case 2

## Current Project

- On-going project initiated in June 2003
- Volume is approximately 1,350 m<sup>3</sup>
- Former flare pit containing weathered and potentially burned hydrocarbons
- Average F3 concentrations reached a plateau of 2,425 mg/kg

# Site-Specific Challenges

- Heavy clay material
- Treatability study required
- No electricity on site during bio-treatment initiation





# Biopile Construction



**Forced Aeration System**

# Expectation



**F3 hydrocarbon concentrations  
below 800 mg/kg by the end of the  
2004 field season**

# Cost

- Projects of this type range from \$25 to \$65 per tonne
- Variables include: soil volume, level of contamination, contaminants present, moisture, etc.



# Conclusion

- Monitoring and maintaining an optimal soil environment for microbial activity is crucial to ensuring the success of any bioremediation project
- This is done to guarantee results, timeframes, and costs

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